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8041	563	1923	138	4357	425	7153	359	9705	314	12,163	691	14,585	710
		1947	214	4379	415	7238	377	9707	739	12,182	789	14,606	490
		1961	306	4382	376	7278	85	9803	703	12,204	742	14,615	484
1901.		1973	298	4434	22	7319	411	9854	690	12,229	490	14,688	761
16.653	18	1982	21	4479	409	7352	426	9868	1008	12,305	622	14,693	96
18,157	109	1990	87	4604	212	7387	293	9902	619	12,355	298	14,699	880
18,800	158	1998	95	4622	290	7436	507	9936	648	12,362	735	14,727	696
22,841	380	2039	17	4644	421	7463	212	9974	568	12,363	619	14,739	804
23,181	416	2071	204	4646	18	7496	17	9990	223	12,373	793	14,771	860
23,470	37	2131	18	4653	209	7505	368	9992	572	12,444	622	14,789	942
23,486	42	2149	90	4660	150	7613	900	9993	440	12,445	691	14,849	909
23,551	440	2155	314	4662	368	7618	290	9996	410	12,453	708	14,893	900
23,840	34	2163	91	4693	469	7647	421	10,094	439	12,461	900	14,935	818
23,904	17	2174	425	4708	209	7694	555	10,187	489	12,473	307	14,936	746
23,939	34	2264	303	4735	367	7744	568	10,188	362	12,552	789	14,982	801
23,993	35	2281	294	4779	289	7745	544	10,204	703	12,584	548	15,041	746
24,012	34	2292	88	4788	434	7767	547	10,243	489	12,627	696	15,043	858
24.456	93	2303	503	4886	315	7774	646	10,351	553	12,648	797	15,066	898
24,514	485	2306	137	4892	226	7778	557	10,503	756	12,691	742	15,113	804
24 569	220	2307	204	4909	439	7822	359	10,516	489	12,700	803	15,128	804
24,832	494	2358	289	4914	299	7832	31	10,530	757	12,702	872	15,153	868
24,920	93	2376	216	4917	95	7836	867	10,628	753	12,717	624	15,154	735
24,960	17	2384	223	4918	86	7841	96	10,655	512	12,762	868	15,222	746
25,092	17	2402	145	5018	216	7849	209	10,690	572	12,778	870	15,266	564
25,338	91	2447	91	5108	318	7870	623	10,712	546	12,796	697	15,271	371
25,493	18	2461	695	5110	409	7871	414	10,719	757	12,818	709	15,272	913
25,604	86	2476	91	5118	304	7919	376	10,723	696	12,834	746	15,280	1246
25,698	32	2524	141	5140	298	7925	545	10,724	734	12,857	216	15,312	509
25,699	15	2529	569	5238	377	7956	486	10,729	1061	12,859	701	15,437	867
25,756	28	2545	302	5242	94	8015	375	10,844	690	12,861	797	15,498	860
25,772	15	2587	18	5277	293	8071	425	10,853	629	12,867	787	15,537	904
25,880	93	2668	150	5326	205	8083	550	10,872	642	12,922	18	15,586	955
25,993	85	2669	156	5360	109	8084	429	10,876	691	12,957	751	15,599	791
25,994	441	2697	287	5402	307	8114	359	10,896	287	13,025	746	15,600	791
26,166	96	2713	226	5403	307	8195	414	10,903	568	13,034	987	15,619	1055
26,214	95	2805	147	5404	307	8199	618	10,937	111	13,093	923	15,632	817
26 258	555	2856	93	5482	420	8279	362	10,962	645	13,104	87	15,633	879
26,260	109	2898	204	5531	423	8300	420	11,042	619	13,111	769	15,646	708
26,363	148	2987	304	5538	306	8302	627	11,069	619	13,114	867	15,656	752
26,396	145	3045	229	5559	364	8509	623	11,100	644	13,269	646	15,659	90
26,425	17	3051	366	5598	225	8510	362	11,119	796	13,348	441	15,660	791
26.461	87	3119	18	5604	870	8515	488	11,131	546	13,429	548	15,730	87
26,470	149	3137	377	5628	510	8590	423	11,179	510	13,430	737	15,735	306
26,537	145	3152	209	5638	359	8618	546	11,217	734	13,442	761	15,828	987
26,619	43	3161	92	5794	223	8651	619	11,235	697	13,447	789	15,857	735
26,625	43	3164	372	5799	378	8685	564	11,280	691	13.471	624	15,881	899
26,647	20	3177	287	5835	366	8693	801	11,305	757	13,508	225	15,889	875
26,673	371	3259	486	5860	368	8696	697	11,325	111	13,536	696	15,890	808
		3268	307	5873	366	8759	561	11,328	546	13,547	220	15,891	808
		3331	214	5912	485	8787	547	11,351	816	13,614	870	15,897	751
1902.		3334	229	5921	363	8828	561	11,403	489	13,643	697	15,917	859
28	109	3343	486	5954	290	8856	618	11,410	571	13,669	870	15,958	943
58	90	3344	96	5998	211	8876	568	11,438	551	13,744	746	16,037	815
81	109	3362	140	6016	299	8955	378	11,450	544	13,749	304	16,038	1201
179	217	3364	95	6021	508	8973	484	11,494	807	13,767	644	16,062	710
234	302	3375	22	6051	907	9024	1085	11,503	760	13,785	860	16,066	868
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267	36	3555	366	6134	496	9043	710	11,535	708	13,956	202	16,105	789
268	36	3641	486	6145	494	9048	642	11,552	302	13,970	816	16,138	945
304	40	3643	486	6153	485	9070	546	11,609	795	13,982	862	16,175	858
385	158	3644	368	6304	370	9126	414	11,622	690	14,017	557	16,206	795
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788	26	3912	217	6421	294	9211	372	11,684	705	14,050	735	16,295	795
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1040	289	4028	209	6642	425	9340	498	11,778	807	14,133	803	16,438	862
1116	26	4029	314	6645	694	9408	708	11,790	551	14,135	803	16,461	943
1164	18	4034	22	6728	31	9412	546	11,877	108	14,149	793	16,511	790
1328	158	4035	22	6738	545	9416	621	11,882	571	14,166	789	16,548	218
1368	294	4085	368	6752	214	9480	511	11,886	302	14,167	900	16,559	108
1424	24	4137	150	6987	293	9481	441	11,898	548	14,328	287	16,568	1011
1465	705	4153	377	7023	879	9506	706	11,969	695	14,366	816	16,590	1099
1561	21	4154	544	7039	304	9619	414	12,115	787	14,432	153	16,615	995
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1688	100	4175	211	7073	362	9622	486	12,157	619	14,525	624	16,665	998
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1790	317	4298	366	7119	504	9696	498	12,162	735	14,583	803	16,807	899

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1902.	
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5339	817

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1903.		**1903.**		**1903.**		**1903.**		**1903.**		**1903.**		**1903.**	
5439	811	7562	862	9078	876	11,320	919	13,557	1052	16,060	1096	19,168	[illegible]
5448	805	7693	746	9087	859	11,325	1061	13,682	1007	16,070	1087	19,233	[illegible]
5565	735	7695	822	9142	1130	11,526	1144	13.748	1039	16,127	1079	19.242	1291
5693	873	7712	822	9242	878	11,547	942	13,750	1299	16.223	1138	19,356	1306
5745	787	7776	1251	9322	1256	11.749	1144	13,812	1006	16,263	1189	19.434	1307
5792	693	7831	1286	9340	880	11,750	1039	13,813	1006	16,302	1303	19,446	1345
5901	648	7838	1001	9401	859	11,756	960	13,837	1190	16,372	862	19,537	1250
5902	950	7850	909	9453	1085	11,820	989	13,877	1133	16,377	1090	19,538	1250
6060	860	7853	819	9504	860	12,001	1341	13,918	1133	16,453	1090	19.623	1237
6086	808	7855	801	9505	943	12,032	1297	13,920	1015	16,466	1245	19,783	1247
6091	797	7872	904	9532	993	12,035	1006	14,006	1062	16,549	1345	19,962	1301
6204	1296	7897	913	9570	899	12,040	960	14,098	989	16,641	1190	20,147	292
6261	735	7913	793	9573	1039	12,095	1088	14,112	1085	16,839	1133	20,223	1306
6311	860	7923	426	9605	989	12,182	943	14,113	1081	16,848	1130	20.413	1006
6356	1256	7976	951	9683	993	12,191	1077	14,182	1142	16,988	1356	20,488	1300
6387	860	7998	1057	9715	914	12,194	1093	14,194	1085	17,035	1250	20,497	1297
6521	807	8091	1254	9835	868	12,256	951	14,303	1347	17,061	1131	20,548	1306
6694	1077	8099	815	9932	1054	12,477	1122	14,305	1133	17.183	1247	20,655	1299
6724	1352	8166	900	10,094	878	12,506	1079	14,342	1085	17,434	1198	20.677	1286
6727	557	8167	904	10,124	878	12.513	1015	14,385	1055	17,514	1237	20,709	1345
6811	1051	8194	1342	10,194	873	12.518	944	14,461	1095	17.608	1192	20,758	1353
6817	709	8287	795	10,280	1055	12,555	1145	14,483	1345	17,666	1210	20,841	1088
6824	742	8399	905	10.426	1061	12,584	952	14.518	1138	17,784	1200	21,030	1363
6845	860	8466	914	10,508	1141	12,644	953	14,522	998	17,785	1200	21,122	1292
6847	787	8591	870	10,532	1309	12,645	998	14,547	1140	17,793	1237	21,365	1367
6848	1088	8602	899	10,551	943	12,674	961	14,564	1090	17,808	1193	21,665	1353
6849	868	8646	1011	10,648	1051	12,675	961	14,565	1001	17,812	1196	21,799	1343
6933	950	8679	1299	10,659	1001	12,776	1040	14,839	1144	17,817	1140	21,967	1341
6950	700	8743	815	10,703	1053	12,867	960	14,939	1038	18,166	1286	22,069	1358
7016	801	8821	800	10,925	1345	12,880	705	15,037	1054	18,279	1306	22,272	1341
7025	861	8833	954	10,936	924	13,035	946	15,207	1083	18,284	1195	22,567	1357
7060	1345	8900	805	11,038	1009	13,102	1055	15,274	1203	18,292	1188	23,042A	1296
7410	874	8964	872	11,112	918	13,119	1297	15,425	1254	18,300	1357		
7448	789	8983	1011	11,113	918	13,202	1039	15,696	1079	18,623	1293		
7466	1039	8984	961	11,126	1045	13,457	963	15,739	1041	18,675	1192		
7492	1201	8996	868	11,221	907	13,466	943	15.752	1145	19,016	1293		
7519	956	9017	1083	11,223	921	13,477	1083	15,935	1144	19,167	1216		

TABLE OF ERRATA.

Month.	Page.	Column.	Line.	Description.
1903. February 16th.	163	1	14 from bottom	*For* " Framm " *read* " Fromm."
February 28th.	208	2	21 from top	*After* " 3.4-Dihydroxychromone " *insert* " [7.8]."
March 31st.	361	1	17 from top	*For* " Heerman " *read* " Heermann."
,,	361	2	21 from top	*After* " although " *insert* " in the case of raw silk."
April 30th.	492	1	18 from top	*For* " Tung " *read* " Jung."
,,	511	1	4 from bottom	*For* " Spy " *read* " Sy."
May 15th.	550	1	29 from top	*After* " discharged " *insert* " by the indigo mixture."
,,	552	2	12 from top	*After* " print " *substitute a* comma, *and delete the words* " These are."
,,	563	1	6 from top	*Add reference* " and 1902, 1461."
May 30th.	600	2	9 from top	*For* " thiocyanite " *read* " thiocyanate."
,,	600	2	17 from top	*For* " Friction " *read* " Ignition."
July 15th.	821	2	—	*In second table, under* " Temp.," *for* " 8384 " *read* " 3384."
July 31st.	876	2	5 from top	*Insert after* " Eng. Pat." *its number,* " 9078."
September 15th.	1011	1	16 from bottom	*For* Crossfield *read* Crosfield.
,,	1021	1	18 from bottom	*For* " Allen " *read* " Allan."
,,	1021	1	15 from bottom	*After* " condenser " *insert* " with bismuth oxalate."
October 15th.	1102	2	23 from top	*For* " drawn up " *read* " determining."
November 30th.	1226	2	11 from top	*For* " phosphorous " *read* " phosphorus."
,,	1226	2	14 from top	*For* " phosphrus " *read* " phosphorus."
December 15th.	1300	2	6 from top	*For* " threads " *read* " treads."
December 31st.	1363	1	15 from bottom	*In table, for* " Cornwallis " *read* " Cornwall."

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Notices.

SECTIONAL ARRANGEMENTS FOR 1903.

Liverpool :—

Jan. 28, 1903.—M. Paul Kestner, Lille. "Artificial Draught in Vitriol Chambers, and the use of a Water Spray in the place of Steam."

London :—

Feb. 2, 1903.—Mr. Thos. Tyrer. "The Need of Duty-free Alcohol for British Manufactures."

Nottingham :—

Feb. 25, 1903.—Mr. Loxley Meggitt. "The Fractional Distillation Test for Petrols, Petroleum Spirit, or Benzine."

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of this year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows :—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products :—
  Subsection A.—Organic Preparations, including Tar Products.
  Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsengesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hold their respective annual meetings for 1903 in connection with the Congress.

An executive local committee will make arrangements for the entertainment of visitors during their stay.

As formal invitations are now being sent out, applications to join the Congress, accompanied by a remittance of 1*l*., should be sent in to the General Secretary without delay.

All communications and questions, so far as they cannot be answered by the various organising committees, should be addressed to the Secretary of the Congress, Dr. G. Pulvermacher, Charlottenburg, Marchstrasse No. 21. The formation of organising committees is already in progress in England, Belgium, France, Italy, Portugal, Switzerland, Servia, and Turkey.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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Akitt, T., l/o Upper Skelmorlie; Birksgate, Kirkcaldy, N.B.; Journals as before.
Allison, T. M., l/o Clifton; Sargent Street, Bedminster, Bristol.
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Banter, W. H.; communications to Nuthurst, Streatham, S.W.
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Brown, Thos., l/o King's Lynn; Skopelos, Hunstanton.
Bull, Dr. Benj. S., l/o Westcombe Rise; 104, Humber Road, Blackheath, S.E.
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Cooper, Walter J.; Journals to the Elms, Lower Penarth, South Wales.
Craven, C. E.; Journals to Valley Dyeworks, Brokfoot, Brighouse, Yorks.
Dains, Herbert H., l/o India; 27, Inderwick Road, Stroud Green, N.
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English, Frank H., l/o Monega Road; 217, Strone Road, Manor Park, E.
Francis, E. G.; communications to 29, Matheson Road, West Kensington, W.
Friswell, R. J.; Journals to 43–45, Great Tower Street, E.C., and communications to Bound Reed, Higham, Kent, Consulting Chemist.
Frith, J. Mason, l/o Norman Road; Linden Lodge, Runcorn.
Gerland, Dr. B. W., l/o Queen's Terrace; 105, Plantation Street, Accrington.
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Haddock, Arthur G., l/o Abchurch Lane; Lynwood House, Norman Road, Runcorn.
Hope, Jas.; communications to Dean House, Lenzie, N.B.
Hunter, H. Blount, l/o New York City; Hunter Chemical Co., Norfolk, Va., U.S.A.
Hurry, E. H., l/o Connaught Street, W.; retain Journals.
Ichioka, T., l/o Hiroshima; No. 10, Nishikatamachi, Hongo, Tokio, Japan.
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Nacf, Dr. E., l/o Blackley; 28, George Street, Cheetham Hill, Manchester.
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Rawson, C.; all communications to 44, St. Augustine's Road, Bedford.
Readman, Dr. J. B.; Journals to Mynde Park, Hereford.
Schjolberg, T. E., l/o Bartholomew Close; Taltal, Chile, South America.
Shores, Dr. Jeff H., l/o Mill Brow; Derby Road, Farnworth, Widnes.
Silberrad, Dr. O.; Journals to Hill Top, Shooter's Hill, Kent.
Smiles, Jas.; Journals to Blandfield Chemical Works, Lower Broughton Road, Edinburgh.
Spence, J. Napier, l/o Harrow; 69, Frithville Gardens, Shepherd's Bush, W.
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Warnes, A. R., l/o Sculcoates; 8, Suffolk Villas, Beverley Road, Hull.
Wielandt, Dr. W., l/o Kristiania; Philippstrasse 7–8, Berlin, N.W.

Deaths.

Flower, Major Lamorock, 12, Finsbury Square, E.C.
Mellors, Paul, Pelham Road, Sherwood Rise, Nottingham. Dec. 11.
Taylor, G. W. H., 56, Meanley Road, Manor Park, E.

Canadian Section.

Meeting held at Toronto, on Tuesday, November 25th, 1902.

PROF. W. R. LANG IN THE CHAIR.

TECHNICAL ANALYSIS OF FERRO-NICKEL BRIQUETTES.

BY J. H. JAMES AND J. M. NISSEN.

We have found the scheme given below for the complete analysis of ferro-nickel briquettes preferable to the ordinary course pursued in the complete analysis of iron ores, since the presence of copper and nickel oxides necessitates a modification of the usual procedure.

The complete technical analysis involves the determination of the following constituents:—SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO, CuO, NiO, SO_3, P_2O_5. Volatile matter = Org. matter + H_2O + practically all of the SO_3.

CuO, NiO, P_2O_5.—One grm. of the sample, pulverised to pass an 80-mesh sieve, is weighed out and dissolved in 15 c.c. of conc. HCl at a heat just short of boiling. The solution is evaporated down until pasty, 5 c.c. of conc. H_2SO_4 added, and heated until copious fumes are given off. After cooling, it is taken up with 50 c.c. of water, filtered, and the residue fused with about four times its bulk of sodium carbonate, and the fused mass dissolved out with dilute H_2SO_4 (1:4). The solution is evaporated until white fumes are evolved, and filtered, adding the filtrate to main solution. The solution is made slightly alkaline with ammonia, just acidified with H_2SO_4, 3 c.c. of conc. HNO_3 added, diluted to about 150 c.c., and the copper deposited by electrolysis, using a current of about 0·3 ampère per 100 cm.^{2} of the cathode surface. The solution from the copper deposition is treated with sufficient hydrogen peroxide solution to oxidise the iron. The excess of hydrogen peroxide is boiled off and the iron separated from the nickel by three ammonia precipitations, dissolving each time with warm dilute H_2SO_4 (1:4), and washing at least eight times with hot water at each precipitation. The final precipitate, which contains the phosphorus as ferric phosphate, is dissolved in warm nitric acid (1:1), and the phosphorus determined in the solution by any of the common methods, after its precipitation with ammonium molybdate solution.

The first filtrate from the iron separation is boiled down to small bulk, 15 c.c. of conc. H_2SO_4 added, and the solution evaporated until strong white fumes come off. The washings are added to the main solution and the whole made strongly ammoniacal. After dilution (if necessary) to about 450 c.c., the nickel is deposited by electrolysis with a current of 0·5 ampère per 100 cm.^{2} of cathode surface.

SiO_2, Al_2O_3, CaO, MgO—Two grms. of the sample are dissolved in 30 c.c. of conc. HCl as above, the solution evaporated to dryness, and the residue baked to render the silica insoluble. After taking up in 15 c.c. of dilute HCl (1:4), filtering and washing, the siliceous residue is fused with four times its bulk of sodium carbonate, dissolved in dilute HCl, and evaporated to dryness. The residue is baked, taken up with dilute HCl, the SiO_2 filtered off, washed, dried, ignited, and weighed, and the filtrate and washings added to the main solution. The iron is oxidised by the addition of nitric acid to the heated solution, about 2 grms. of ammonium chloride added, and the solution made slightly alkaline with ammonia. The excess of ammonia is boiled off, and the precipitate of ferric and aluminium hydrates filtered off and well washed with hot water. The precipitate is dissolved in hot dilute H_2SO_4 (1:4), the solution made just ammoniacal, and the precipitate carefully redissolved in H_2SO_4, so as to leave the slightest possible excess of free acid. The solution is now diluted to about 500 c.c., and 200 grms. of pure mercury placed in the bottom of the beaker to serve as a cathode for the electro-deposition of the iron according to the method of Drown (Trans. Am. Inst. M.E., vol. XX., p. 242), using a current of two ampères. We have found that the resolution of the iron, whilst pouring off the electrolyte, after interrupting the current, does not take place to any appreciable extent, so we dispense with the use of siphons or pipettes. About one grm of ammonium chloride and a slight excess of ammonia are added, and the solution boiled to expel the excess of ammonia. The precipitate of aluminium hydrate is filtered off, washed, ignited, and weighed as Al_2O_3.

CaO, MgO—The filtrate from the iron and aluminium precipitation contains the copper and nickel as double ammonium salts. To avoid the tedious separation of these metals we tried the method of precipitating the calcium and magnesium in their presence, keeping a large excess of ammonia present. This we found to be perfectly successful, the calcium being precipitated as oxalate and filtered off, the precipitate dissolved in dilute sulphuric acid, and the oxalic acid titrated with permanganate in the usual way.

The filtrate and washings from the calcium oxalate precipitate are boiled down to small bulk, an excess of conc. HNO_3 added to destroy the excess of ammonium chloride, and the solution evaporated to dryness. The residue is now taken up in the least possible amount of water, conc. ammonia added in quantity sufficient to keep the copper and nickel salts in solution, and the magnesium precipitated as magnesium ammonium phosphate in the usual manner. The ignited magnesium pyrophosphate is free from copper or nickel, as we have verified by numerous determinations.

SO_3, Fe_2O_3. — One grm. is fused with 9 grms. of the ordinary sulphur mixture (10 Na_2CO_3 to 1 KNO_3), the melt dissolved in hot water, and after filtering, the ferric oxide in the residue is dissolved in 1 : 1 hydrochloric acid, one ammonia precipitation made to separate the iron from most of the copper and nickel, the ferric hydrate dissolved and the iron titrated by any of the common methods. The filtrate is evaporated to dryness, taken up in hot water, filtered from the silica, and the sulphur precipitated as $BaSO_4$ in the usual manner.

Volatile Matter.—One grm. of the sample is heated in an open platinum crucible over a strong blast, until the weight is constant. The loss in weight = organic matter + water + practically all the sulphur trioxide. (A small amount of the sulphur trioxide may be retained as calcium sulphate.)

Note.—If tar, pitch, or other organic material be used in the manufacture of the briquettes, it is advisable, for each of the above sets of determinations except that of the sulphur and iron, to ignite the material cautiously in an open platinum crucible until all the organic matter is burned off, before proceeding with the solution. In this case, in making the sulphur determinations, a flux containing two to three times as much nitre should be used.

A discussion took place on "The use of Trained Chemists in Industrial Concerns, and how the Chemist may benefit the Manufacturer," introduced by Mr. Van der Linde (Vice-Chairman of the Section), Profs. Ellis, Mavor, and Miller, Dr. Smale, Mr. James P. Murray, and the Chairman taking part.

COMPOSITION OF THE VOLCANIC ASH FROM THE SOUFRIÈRE, ST. VINCENT, WHICH FELL ON BARBADOS, MAY 7—8, 1902.

BY W. P. KAUFMANN.

The sample was specially collected by Dr. D. Morris, C.M.G., on sheets to avoid contamination.

—	—	Soluble in	
		Hydrochloric Acid.	1 per Cent. Citric Acid.
Moisture	0·180	..	..
Loss on ignition*	0·440	..	..
Silica	51·760	..	..
Titanium oxide	2·778	..	..
Alumina	22·679	7·745	0·652
Manganese peroxide	0·081	..	..
Iron peroxide	3·290	4·470	0·400
Iron protoxide	1·760		
Calcium oxide	9·440	4·779	0·397
Barium oxide	0·132	..	..
Magnesium oxide	4·230	0·871	0·214
Sodium oxide	2·500	1·782	0·003
Potassium oxide	0·458	0·076	0·004
Phosphoric anhydride	0·111	0·044	0·019
Sulphuric anhydride	0·067	0·067	..
Sulphur (in sulphides)	0·007	..	..
Lead	Traces	..	..
Copper	Nil	..	..
Nickel	Traces	..	..
	99·913	19·834	1·689

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* Including nitrogen, 0·011.

(See also this Journal, 1902, 931 and 993.)

Liverpool Section.

Meeting held at the University College, on Wednesday, November 26th, 1902.

MR. FRANK TATE IN THE CHAIR.

SIZING AND SIZING MATERIALS.

BY H. B. STOCKS, F.I.C., AND H. GRAHAM WHITE.

The subject of "sizing" has not, so far as we are aware, been treated upon in any paper read before this Society; therefore it may be of interest to give a short account of sizing materials and the method of applying them. Sizing is an essential operation in the manufacture and finishing of cotton and linen goods, in the manufacture of paper and of twine and thread. In cotton manufacture the term "sizing" is applied to the stiffening of the longitudinal thread or "warp" preparatory to weaving. The warp threads must be made much stronger than the "weft," as they have to withstand more wear and tear; hence they are sized, firstly to lay all the loose fibres and produce a smooth surface, and secondly to give strength to the yarn. In the finishing of cloths sizing is also employed to give weight to the pieces and to produce a smooth surface.

In the present paper we shall deal with the sizing of cotton yarn preparatory to weaving, and more especially with the materials used in the preparation of the size. Sizing of the yarn for weaving purposes is a process which has been gradually developed. In hand-loom weaving the weaver would, by means of a brush, apply a little size to the warps in the loom itself, with the object of rendering them smoother and stronger; but as soon as the power loom came into operation this method was found to be much too slow, and others were from time to time devised, culminating in the present method, in which the "slasher" machine is employed.

Sizing was soon found to give an improvement in the appearance of the finished cloth, and also a slightly increased weight; it then became a permanent operation, and endeavours were made to still further improve upon the results. This led to the addition of weighting materials, and during the American Civil War, when cotton was very scarce and costly, manufacturers had to produce cotton goods for India, China, and elsewhere with as little cotton in them as possible; they rose to the occasion, and the practice, instead of falling off when cotton became cheaper, remained, but the price of these heavily-weighted goods went down until now it is as low as possible consistent with obtaining a profit.

Sizing may be divided into two classes:—(*a*) Pure sizing, (*b*) Sizing for weight.

In pure sizing, only sufficient material is added to the yarn to enable it to weave well, no account being taken, as a rule, of its increased weight, which in no case exceeds 20 per cent.

Sizing for weight may be subdivided into two grades:—*medium sizing*, representing an addition of from 20 to 50 per cent., and *heavy sizing*, representing an addition of 50 to 260 per cent. of size to the warp.

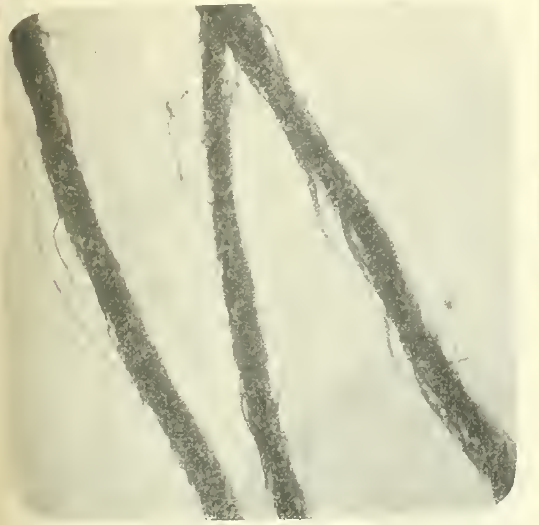
The increases in these cases are upon 100 parts of untreated warp; thus, 100 lb. of untreated yarn would become 260 lb. of sized warp if 160 per cent. were added. Fig. 1 is an unsized yarn; Fig. 2 a heavily-weighted yarn.

Size consists of several ingredients, which may be conveniently divided into the following classes:—(*a*) Binding or stiffening materials; (*b*) Softening materials; (*c*) Weighting materials; (*d*) Antiseptic materials; (*e*) Whitening materials.

Binding Materials.—These are wheat flour, wheat starch, sago starch, Indian corn starch, potato farina, and rice starch, tragasol, tragacanth, Irish moss, dextrin, and glue.

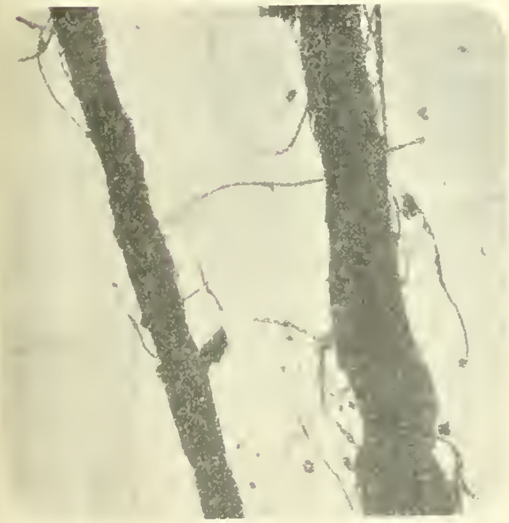
Wheat flour is the ordinary wheat flour of commerce, t the best quality as used for baking purposes, but usually second best, or "seconds," as it is called. Sometimes a ry inferior flour is used, but this is not usual, because it is ore liable to decomposition and to growth of moulds. ood flour has a creamy white colour, and has a smooth y feel, not adhering in lumps when pressed; it is almost ee from odour either dry or when boiled with water. It ust be stored in a cool, dry place, because damp and warmth favour the growth of bacteria and moulds that are very destructive to flour, which is naturally a pabulum for them owing to the gluten it contains. Flour is sometimes adulterated with Indian corn starch and with rice starch, so that a sample should be examined under the microscope before buying; the moisture ought also to be estimated.

Fig. 1.



Unsized Yarn.

Fig. 2.



Heavily-sized Yarn.

The difference between wheat flour and the other starches is due to the presence of gluten, which is considered by some to be a very important agent in fixing mineral matter upon the cloth.

Wheat Starch is prepared from ordinary or damaged wheat by first grinding it and then steeping in water for 14 to 20 days, during which time a fermentation takes place and a considerable amount of gluten is destroyed, the remainder caking itself into a pasty mass which can be easily washed. The mass is then thrown on to sieves, and the starch washed out of it by a stream of water; the milky fluid is run into large vats and allowed to stand, when the starch settles out; it is stirred up with fresh water and again allowed to settle, and this procedure is repeated until the products of decomposition are removed. The water is then drawn off and the starch dried on porous tiles on slightly heated floors. Wheat starch is also prepared by simply kneading the flour into a dough with water and washing the starch out, the gluten being utilised for other purposes. Wheat starch is a fine white product with the general character of the starches.

Potato Starch, generally known in the trade as potato farina, is prepared by rasping the potatoes in a current of water; the cellulose tissue is caught by a fine sieve, while the starch is carried by the water into a settling tank in which the starch is allowed to subside. It is washed several times by subsidence to free it from colouring matter and then dried. The potato contains from 12 to 26 per cent. of starch with a mean of about 20; there are small quantities also of nitrogenous and fatty matters, woody fibre and ash, but the water is equal to about 76 per cent. The amount of starch in any variety of potato can thus be roughly estimated by the gravity of the tubers.

Potato starch is a pure white substance with a glistening appearance and a crisp feel. When boiled with water it produces a stiffer jelly than any of the other starches: it always has a slight odour of dextrin; it gives a harsh feel to the yarn and in sizing cannot be used in large amounts for this reason. In sizing mixtures it is used as an auxiliary to some of the other starches, or if used alone for light sizing its harshness is counteracted by the addition of a softening agent, such as tallow or wax.

Indian Cornflour or Maize Starch.—A very full account of the manufacture of maize starch in America is given by Dr. Archbold (this Journal, XXI., 5). Maize starch is a fine white product, not so crisp as potato starch; on boiling with water it does not produce quite so stiff a jelly.

Rice Starch is prepared from ground rice; it contains the largest amount of starch of any known plant—according to Letheby, 79 per cent.

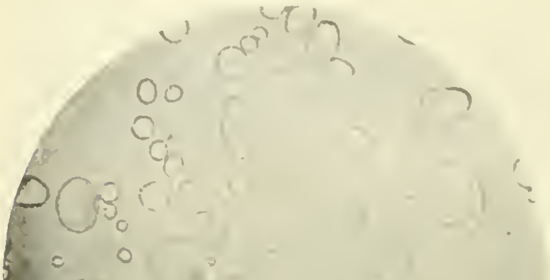
Rice starch is very similar to maize starch both in appearance and feel; when boiled with water it produces a jelly which is rather stiffer than maize.

Sago Flour or Sago Starch.—This is obtained from the pith of several species of palm, especially *Metroxylon sagu* and *M. Rumphii.* Sago starch has a faint violet tint, and when boiled with water it yields a paste of a dull violet colour; this, however, is no disadvantage for sizing purposes, as the material dries quite white. Sago starch is most often used for light sizing.

The microscopic appearance and the general properties of the starches are so well known that we have not touched upon these, but there are some properties belonging to them that affect their use for sizing purposes, and about these we have a few remarks to offer. Starches always contain a certain amount of water; this may vary from seven to as much as 20 per cent.; hence it is necessary to determine the water before buying.

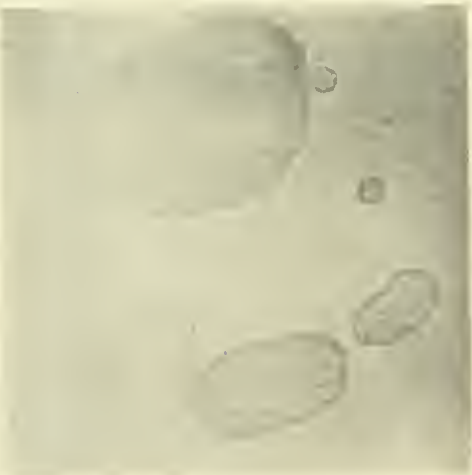
Starch granules consist of two portions, an outer thin membrane known as "starch cellulose," and an inner material called "granulose." The granulose is unaffected by long-continued steeping in cold water, but when the water is heated a point is reached when the mass thickens very considerably; on examination under the microscope it is found that the granules are burst and the granulose has escaped into the water to form a jelly. If the appearance of the granules be noted immediately after the thickening occurs, they are found to be much swollen up and slightly crinkled, but not otherwise altered. (Fig. 3, potato starch; Fig. 4, potato starch, after boiling.) The whole of the granulose does not appear to escape into the water at this point, but only when nearing the boiling point, the cells then appearing as irregular bits of cellulose. The stiffest paste is not obtained until nearly a boiling temperature is reached, but it is a remarkable thing that starch paste heated to 85° C. is stiffer when cold than one heated to 100° C., yet the latter is smoother and more homogeneous, will penetrate the yarn better, will lay the fibres more evenly, and therefore will produce a smoother yarn. Starches do not all stiffen at the same temperature when heated with water; for instance, we found that wheat flour stiffened at 65° C., maize starch at 70 C., sago flour at 72° C., Austrian wheat at 64° C., rice starch at 74° C., and potato starch at 63° C. The smaller starches require a higher temperature for stiffening. This stiffening point is, however, not a definite value; it varies too much under altered conditions. By examining under the microscope we also found that the thickening was coincident with the bursting of all the granules; in most cases at 55° C. a few granules were swollen and burst, and these increased as the temperature rose, but no appreciable thickening took place until all the granules had burst. Starch paste is very much less viscous when hot than when cold; this is an important point in sizing; when heated by steam in the sizing box the size flows on more evenly, and in certain cases the size would be far too stiff to apply cold. Starch is readily acted upon in the cold by a solution of zinc chloride (sp. gr. 1·5), the so-called starch cellulose dissolves entirely, and the whole forms a stiff transparent or translucent jelly. Materials of this kind are very often sold for sizing purposes, but the addition of such mixtures means simply an addition of materials that are already present in the size, seeing that starches and zinc chloride are universally used in heavy sizing. One of these products contained:—

Fig. 3.



Potato Starch. × 170.

Fig. 4.



Potato Starch Granules Burst by Heat. × 170.

Zinc chloride	19·70
Starch	9·29
Water	71·01
	100·00

This led us to the investigation of the action of chlorides upon starch. We found that the chlorides which will dissolve starch in the cold are those that are deliquescent. Strong solutions of the chlorides of zinc, magnesium, calcium, iron, manganese, cobalt, and nickel will do this, while common salt, ammonium chloride, and potassium chloride do not affect it. Strong hydrochloric acid dissolves starch immediately, converting it into dextrin and then into glucose. Another product highly extolled for sizing purposes as a substitute for tragacanth consists of starch merely altered in some manner so that its structure is destroyed. Still another product of French manufacture is simply coarsely-ground wheat in nowise altered.

Dextrin or British Gum.—The commercial dextrins are generally coloured yellow or brown, have a peculiar odour like roasted potatoes, and a sweetish taste. They contain as a rule both glucose and unaltered starch, so that they reduce Fehling's solution and are coloured blue by iodine. Dextrin is used by some light sizers, and is said to strengthen the yarn considerably; it is also used for filling certain kinds of cloth, but it is an unsatisfactory substance, being much too sticky for general application.

Tragasol is a comparatively new material for sizing purposes, and is manufactured by the Gum Tragasol Supply Co., Ltd., at Hooton. It is prepared from the pip or seed of the locust bean, the fruit of *Ceratonia siliqua*.

The seeds of the locust are extremely hard, and the husk and germ cannot be removed by the ordinary processes of milling, which fail to touch them; hence special processes of treatment had to be devised. The seeds are split by a disintegrator, and the germ, which is more or less broken by this treatment, is separated in a grading machine, leaving the two halves of the seed with the adhering husk intact. The husk is then ground off between mill-stones, and that on the edges of the seed removed by treatment in perling mills, leaving the cotyledons in the form of small circular white discs, somewhat like buttons. These discs are composed principally of a peculiar gum contained in the cellular tissue which is shown in the photograph. (Fig. 5.)

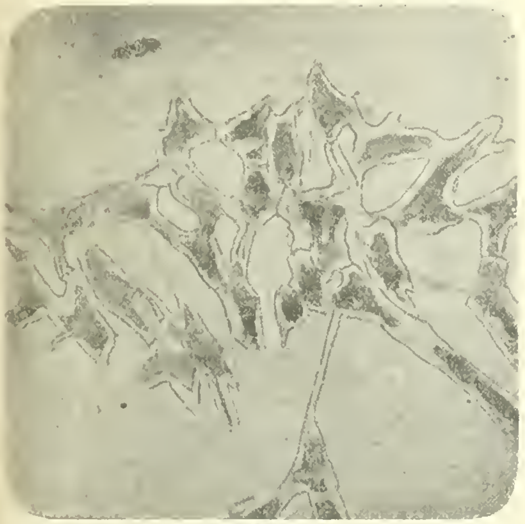
The water in these beans varies from 2·29 to 22·06 per cent., according to the length of time they have been milled and where stored. The ash is 0·92 per cent.: insoluble in hydrochloric acid 2·49 per cent., cellulose 0·24 per cent., and gum about 86 per cent.

The gum is obtained by treatment with water at a regulated temperature, the process of manufacture requiring a considerable amount of care; the gum gradually absorbs water and the mass swells up, until it is of a workable consistency, when it is pressed through bags in a filter-press, leaving a residue of cellular tissue but little altered. (Fig. 5.)

The gum is extremely viscous, even when it is hot, and the problem of filtering it is one of some difficulty. When filtered a preservative is added and it is cooled as rapidly as possible.

Tragasol forms a stiff yellowish-white transparent jelly. It resembles tragacanth paste in some respects, but in others it is quite different; we regard it for the present as a peculiar carbo-hydrate, and we are engaged in experiments with a view to establishing its constitution. It contains no starch whatever, and is quite neutral. We have given the mean of several combustions of the dry mucilage, which show it to have a carbohydrate formula. The gum contains 0·39 per cent. of nitrogen, equal to 2·4 per cent. of albuminoids.

Fig. 5.



Cellulose of Locust Bean. × 170.

When treated with water Tragasol does not dissolve in it, but after a few minutes' stirring the water appears to be taken up by the gum, and the mass is nearly as stiff as before; warm water at a temperature of 100° F. to 140° F. mixes with it much more readily. In using Tragasol for sizing purposes it is very important that it should be properly mixed with the water or other ingredients, or no improvement in the results is obtained. It acts in two ways; it is a remarkable binding agent, not only fixing china clay to the yarn in heavy sizing, but also holding the starch, which would otherwise dry and fall off; in light sizing it supplements the starch in a very useful manner; in addition tragasol also produces a smooth and strong yarn, hence the necessity to use tallow is not so great, and it is replacing tallow to a very large extent. Tallow is about three times the price of this material, and this shows a very considerable saving to the manufacturers.

Tragacanth is the product of various species of Astragalus, the most common being the *Astragalus gummifera* growing in Lebanon, Syria, Central Asia and Armenia. Gum tragacanth occurs in two forms:—(1) *Leaf-gum*, in small irregular curved strips with a crinkled surface. (2) *Vermicelli gum*, in cylindrical sticks.

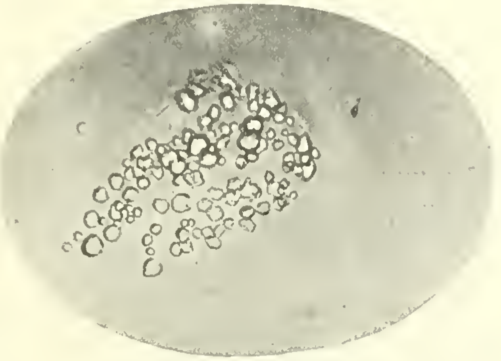
It varies in colour from white to yellow or brown and grey; it is entirely without taste and odour.

When treated with cold water tragacanth softens, and after a long time swells up, but it does not dissolve; on boiling with water it disseminates itself, and on cooling forms a jelly. The jelly, however, is not clear like tragasol, it is more or less turbid, and white specks are seen disseminated through it. When these are examined under the microscope they are seen to consist of oval cells, each containing a few granules (no doubt starch granules, as they are coloured violet by iodine) of the same shape as rice starch, but larger, somewhat like maize starch (Fig. 6).

When boiled with more water these granules dissolve, and the fluid is then coloured violet by iodine, but the original jelly does not contain any starch.

The amount of water in tragacanth varies considerably; in a damp atmosphere we found it to contain as much as 26 per cent. The sample we worked upon contained 3·49 per cent. of ash. The analysis of the dry gum mucilage is given in the table; it contains 0·3 per cent. less hydrogen than would be required for the formula $C_6H_{10}O_5$. This is the result of several closely agreeing determinations

Fig. 6.



Starch in Tragacanth. × 170.

On heating with 5 per cent. hydrochloric acid the gum is destroyed and a reducing sugar is produced; it yields 1·55 per cent. insoluble in acid and 0·5 per cent. of cellulose. It contains a mere trace of nitrogen. Though the gums are supposed to contain acids, tragacanth shows very little evidence of any acid constituent; it is neutralised by a mere fraction of alkali, about equal to 1 part KHO per 100 of gum. O. Sullivan has given an account of researches on tragacanth (J. Chem. Soc., 1901, 156).

Tragacanth is a very useful material for binding the sizing materials to the yarn, and for stiffening, but good qualities are extremely high in price and it is too scarce for general application. The common qualities often termed hog trag. contain many other things besides tragacanth, and they make a much poorer gum than the better qualities even in proportion to their price.

Irish Moss, a variety of seaweed collected on the Irish and Scotch coasts, is used to a certain extent in sizing. The *Chondrus crispus* and *C. polymorphus* are the two varieties gathered. Irish moss has the usual fleshy appearance of the seaweeds and a yellow colour.

When heated with water it swells up considerably and much of it remains undissolved; it is difficult to press even under the best conditions, the jelly passing through being turbid and containing a considerable amount of the finer cellulose tissue. On cooling the product sets to a very stiff jelly; it is, however, much more fluid when hot than either tragasol or tragacanth. The cellular tissue of Irish moss has a pretty appearance (Fig. 7), consisting of triangular cells surrounded by short threads each ending in a smaller granular cell, but there are some larger granular cells which are stained a faint violet with iodine.

Irish moss is different in some of its properties from both tragasol and tragacanth; it is destroyed by boiling with hydrochloric and a reducing sugar is produced. As might be expected, it contains a considerable amount of ash; the nitrogen is nearly 1 per cent., representing 6 per cent. of albuminoids, and the analysis suggests that it is not a pure carbohydrate.

There is no doubt that if Irish moss could be obtained in sufficient quantity and a clear solution of it easily prepared, it might be much more used than it is. There are some sizing materials sold that are made up of it, but we have not found it to be extensively used; the amount of salt in it is a drawback, producing a harsh feel on the yarn, but this might be removed by a preliminary steeping in water.

Composition of the Mucilages, dried at 100° C.

—	Tragasol.	Tragacanth.	Irish Moss.
Carbon	43·51	42·33	30·97
Hydrogen	6·23	5·59	4·83
Oxygen	48·38	47·85	44·86
Nitrogen	0·89	0·05	0·97
Ash	1·49	4·18	18·37
	100·00	100·00	100·00

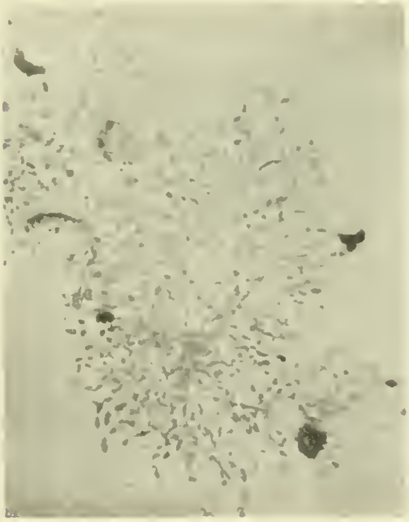
The above, Calculated on Ash-free Substance.

—	Tragasol.	Tragacanth.	Irish Moss.	For $C_6H_{10}O_5$.
Carbon	44·17	44·18	37·94	44·44
Hydrogen	6·32	5·83	5·92	6·17
Oxygen	49·11	49·94	54·95	49·39
Nitrogen	0·40	0·05	1·19	..
	100·00	100·00	100·00	100·00

Softening Materials are of three kinds, fats and waxes, soaps, and deliquescent substances.

The fats and waxes used are—tallow, bone-fat, wool-grease, cocoa-nut oil, bleached palm-oil, castor oil, olive oil, Japan wax, spermaceti, and paraffin.

Fig. 7.



Cellulose of Irish Moss. × 170.

The soaps are both hard and soft soaps.

The deliquescents are zinc chloride, magnesium chloride, calcium chloride, and glycerine. The softeners are used very largely in heavy sizing to counteract the harshness which the size imparts to the yarn, but in light sizing also a small quantity of tallow or paraffin wax is employed. Softeners furthermore prevent the size from drying too much and from dusting off.

Tallow is the principal softener used. This name is given to both beef and mutton fat, and also to a mixed fat (town tallow), but sizing tallows do not always belong to these classes. The chief characteristics of tallow for sizing purposes are its colour and its melting point. It should be as white and as fresh as possible, and the higher the melting point the better. The following are some of our analyses of tallow:—

—	1.	2.	3.	4.	5.
Melting point	44° C.	46° C.	46° C.	46° C.	43° C.
Iodine equivalent	43·55	34·95	34·42	40·27	43·15
Free fatty acids	3·35	1·00	0·68	2·46	6·44

Tallow may be adulterated with bone fat, or with recovered grease. A sample containing the latter gave:—Melting point, 41 C.; melting point of acids, 43° C.; unsaponifiable, 2·9 per cent.; free acids, 2·80 per cent.

It melted at 35° C., and gave reaction for cholesterin.

Besides the adulteration with other fats, tallows for sizing are liable to be adulterated with water and mineral matters.

Bone Fat is usually a dark-coloured fat with an unpleasant odour, and in this condition is not suitable for sizing; but when fresh, there is no objection to its use.

Wool Grease is used to some extent in the impure form known as "recovered grease" or "Yorkshire grease." It is prepared by acidifying the waste soap liquors from wool-washing works, collecting the fatty matter in bags, and filter-pressing it at a temperature above the melting point. It has a dirty yellow colour and a foul smell, and contains large quantities of free fatty acids.

Wool fat is an undesirable fat for sizing purposes, its colour, smell, and free acids being decidedly objectionable.

Cocoa-nut Oil is obtained from the kernels of the cocoa-nut (*Cocos nucifera*), and is very largely extracted from the dried material known as "Coprah."

Coprah oil contains about 25 per cent. of free fatty acids; this is not desirable, and yet cocoa-nut oil is often used as a softener.

Castor Oil is sometimes used in admixture with solid fats or waxes; it is not suitable for use alone.

Olive Oil is also sometimes used, but oils are not suitable for sizing purposes; they dull the colour of the yarn, and this may be noted even with tallow if too large a quantity is used.

Oils are more powerful softeners than the fats, and smaller quantities are of necessity used; they do not hold so well as tallow.

Bleached Palm Oil is used in some mills.

Japan Wax is misnamed; it is really a fat. It is stated to consist principally of palmitin, but this can scarcely be correct, as the analyses show.

Samples we examined gave:—Melting point, 52·5 C. (tripalmitin = 62° C.); acidity equivalent, 15·7—16·7; saponification value, 204·5—217·4; melting point of acids, 53° C. (palmitic acid = 62° C.).

Japan wax is yellowish or creamy white, it has a very slight tallowy odour, and is hard and tough. It is a good material for sizing purposes, but is comparatively expensive.

Spermaceti.—This wax is used to a limited extent.

Paraffin Wax and Ceresins.—There is considerable variation in the melting points of paraffin (41°—55° C.), and the specific gravity increases with an increase in the melting point (from 0·875 to 0·908 at 15° C.).

The ceresins have higher melting points than the paraffins (55°—74° C.), and they are more expensive. For sizing purposes, a paraffin with a melting point of about 50° C. is employed.

Waxes do not readily emulsify with the other sizing materials; hence there is a tendency for them to come to the surface and agglomerate in masses. The use of paraffin is restricted to yarn for unbleached cloth; it cannot be used for materials that are afterwards to be bleached or dyed, owing to the difficulty of removing it by washing; goods, sized with a preparation containing it, will, after being dyed, show spots or patches on the finished fabrics.

Soaps.—Both hard and soft soaps are used for sizing purposes. Their function is to act as softeners, and also to emulsify the fats that are used for a similar purpose. It is questionable whether they ought to be used in heavy sizing along with magnesium chloride, &c., because they are decomposed, and insoluble soaps are produced which may make the size lumpy; nevertheless they are used in this way. Soaps are a source of trouble to the sizer if used indiscriminately, that is they often cause frothing when the size is boiled during the passage of the yarn through the size-box, and this frothing leads to the production of yarn that is very imperfectly sized.

White Castile soap is very frequently used in sizing, both under its own name and under fancy names, and there are other products made from soft soap or yellow soap simply by addition of water. The following is an example:—

	Per Cent.
K_2O Na_2O	5·28
Fatty anhydrides	27·53
Water	66·97
Salts	0·22
	100·00

Deliquescents.—The deliquescents act as softeners by reason of the water they will retain, and by means of this faculty they are able to hold the other materials to the yarn and prevent the size becoming hard. Four softeners of this kind are used: zinc chloride, magnesium chloride, calcium chloride, and glycerin. Zinc chloride is also used as an antiseptic, and is therefore included under that head.

Magnesium Chloride.—This material is usually added in the form of a strong solution, the gravity being approximately 55° Tw., or 1·27 sp. gr.

The amount of magnesium chloride in a sample we examined was 23·63 per cent.; there are probably traces of other chlorides present; the liquid is quite neutral and is a fairly pure product. Magnesium chloride is known in the trade as "antiseptic," or simply "anti," a very misleading term, because it actually favours the growth of mould by keeping the goods moist; in a size mixing it is always accompanied by zinc chloride, which has a destructive action upon mould spores.

Calcium Chloride is sometimes used in very heavy sizing; it also favours the growth of moulds, and for this reason should also be accompanied by zinc chloride.

Glycerin will absorb water when exposed to air, and it behaves in this respect like the other softeners of the group. Pure, colourless glycerin would be the best to use were it not that the price is too high; for this reason an amber-coloured product is employed. Glycerin should be as pure as possible, and for the purpose of examination the specific gravity is a good guide except with crude material.

Samples we examined contained 92 to 98 per cent. of glycerin, estimated by the acetin method.

Weighting Materials.—China clay is the chief weighting material employed; it is used in enormous quantities, not only for sizing the yarn, but also in finishing certain descriptions of cloth.

For sizing purposes the china clay should be as fine and as white as possible, any gritty particles would cut the fibres and make the yarn tender. The colour of the clay is of great importance. Many clays have a slight yellow tinge due to a trace of iron—this is either removed by boiling with hydrochloric acid or the colour is corrected by precipitating a little Prussian blue upon the clay. A naturally white clay is the most valuable.

French chalk or steatite, gypsum, terra alba, or sulphate of lime, heavy spar or barium sulphate, sodium sulphate, and magnesium sulphate have been used for weighting purposes, but almost exclusively in the finishing of cloth. We shall not deal with them in this paper.

Antiseptic Materials.—Only two antiseptics are used; these are zinc chloride and carbolic acid. Zinc chloride is used in the form of a strong solution of about 100° Tw., or sp. gr. 1·5, containing 35—37 per cent. of zinc chloride, for heavy sizing, especially in conjunction with the chlorides of magnesium and calcium. It is used primarily as a preservative to prevent mildew in the cloth. Zinc chloride may possibly be adulterated with common salt or calcium chloride, but both these would lower the density of the solution, and they are not commonly used.

Carbolic acid is used to a certain extent in heavy sizing; it is the best and cheapest preservative that could be used, but many of the buyers of cloth object to the smell which always remains when this substance is added to the size; hence the manufacturers do not employ it as much as they otherwise would do. The commercial varieties of carbolic acid vary very much in composition. They are usually dark-coloured, and often contain impurities which unfit them for use on cotton goods. Many of the commercial acids consist principally of cresol, which is much less soluble in water than phenol, and in order to make them emulsify with water, soft soap is dissolved in them It is remarkable what a quantity of soft soap can be dissolved in carbolic acid without any separation.

Whitening Materials. — To correct the yellow colour which size possesses when dried, a little blue is employed; this is either artificial ultramarine or aniline blue.

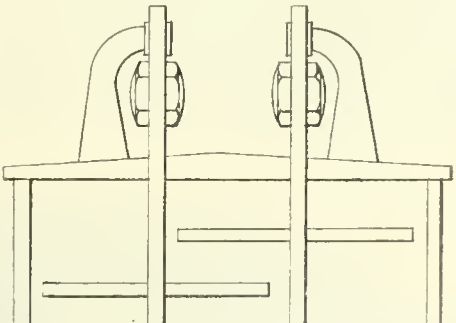
The list of sizing materials we have given is a long one, but of course these are not all used at each mill; a choice is made of those which give the result desired, and when the quantities best suited for the purpose are defined, these are rigidly adhered to. Of course, each mill has its own recipe.

Mixing the Size.—Typical size mixtures are made up as follows:—*For light sizing:* sago or potato starch, 280 lb.; tallow or tragasol, 10 to 20 lb.; water, 600 galls. *For heavy sizing* (quantities very variable): flour, farina of some kind, china clay, tallow or tallow and tragasol, zinc chloride, magnesium chloride, water.

The method of mixing for *light sizing* is simple enough. Sago is usually employed; this is made with water to form a paste like clay; sufficient of this is weighed out and thrown into a beck containing the requisite quantity of water; the tragasol is mixed with water and also added; the tallow is then put in and the mass boiled up with steam; the size is run straight away to the size-box. It is very thin, and there is no difficulty whatever with it. For *heavy sizing*, however, the case is quite different; the size is much thicker and will not flow so readily; for this reason it is not properly boiled until it reaches the size-box.

The mixing of the size requires several large tanks, or "becks," as they are called (Fig. 8). These are built of wood, the mixing arrangement usually consisting of two upright shafts fitted with blades, the whole worked by spur

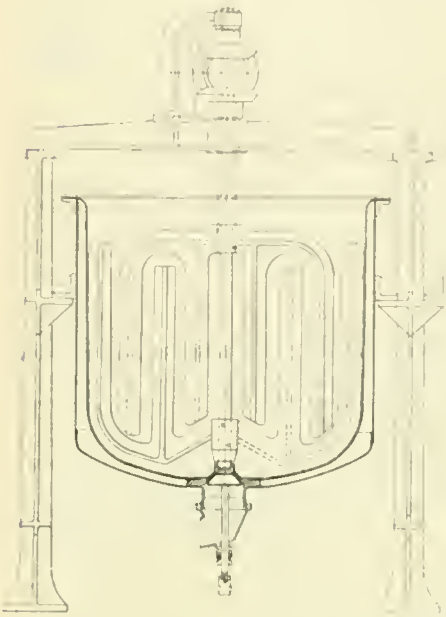
Fig. 8.



Mixing Beck, with Dashers.

gearing at the top of the tank; the blades serve to dash the materials about, hence they are called "dashers." The newer mixing vats are bowl-shaped, lined with lead or tinned sheet copper, and are provided with two sets of blades working in opposite directions, thus mixing the materials very quickly and effectively (Fig. 9). As a rule four or five "becks" are used, the material being pumped from one to the other, or to the sizing machine as required. The becks are provided with open steam coils. Raised upon a platform above the "becks" is an iron tank called the "clay-pan," which is provided with dashers and an open steam coil.

Fig. 9.



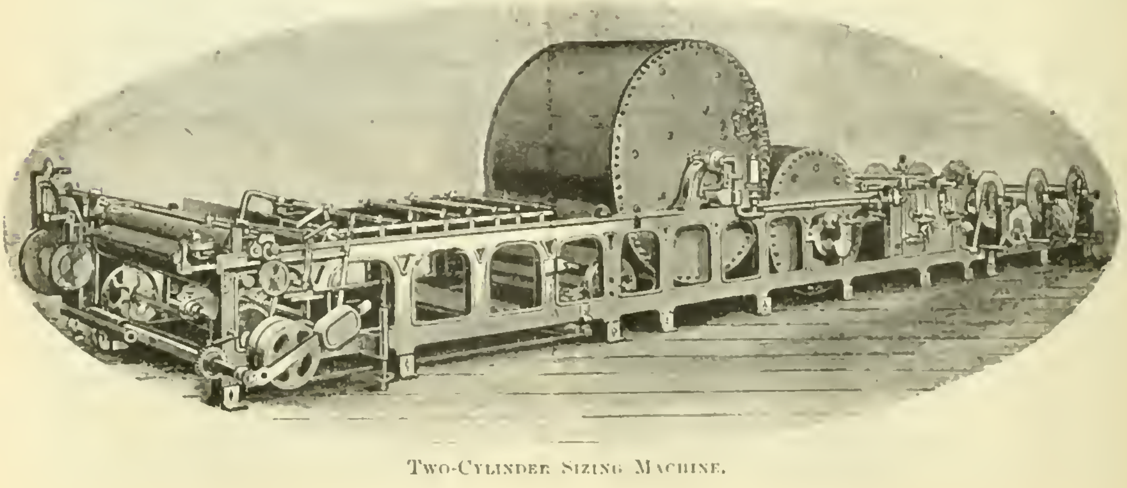
Water is run into the clay-pan, the steam turned on, and when the water is boiling, the china clay is added with constant agitation; it is usually boiled for several hours, thus producing a very smooth paste. The tallow, wax, magnesium chloride, and zinc chloride are added to it during the boiling. Water is run into one of the becks below and agitated, then the flour is added gradually one bag at a time until the whole has been introduced. In some works the flour is kept in the "beck" for several weeks, during which time fermentation sets in, and a large proportion of the gluten is destroyed; the whole mass is then mixed up and water added to a certain density, then a proportion of the zinc chloride is added to prevent further change. In other works fermentation is never allowed to take place, sufficient zinc chloride being added to entirely prevent any such change.

The farina is mixed to a definite density with water in a second "beck," and then the clay, &c., the flour and the farina are brought into a third "beck," where they are thoroughly mixed by the dashers and steamed up to the temperature of the bursting point of the starch granules so that the mixture may be stiff enough to hold the china clay in suspension, and yet not too stiff to flow, the final boiling being carried out in the size-box or reservoir, into which it is pumped from the mixing "beck."

Sizing Machine.—There have been a considerable number of improvements and inventions in relation to the sizing machine since it was first brought into use, but without entering into details we take for the purpose of illustration the "slasher" sizing machine, as it is used to-day (Fig. 10). At the extreme right of the figure is shown the "creel" upon which the warper's beams are placed then comes the size-box, or "sow-box," as it is called, next two large drying cylinders, then the wraith or comb, and at the extreme left is placed the weaver's beam. The "creel" is simply a frame of iron, sometimes upon wheels, which serves to support the warper's beams. These beams are large wooden rollers fitted with plates at each end; they are not unlike large bobbins, but they are fitted with spindles, on which they can revolve. The beams are fitted at different levels on the creel, and the warps are taken from one beam to the other, so that from the last beam the whole of the warps, or "ends," pass off in a continuous sheet. The numbers of "warp" threads in a piece vary considerably, but supposing 2,500 "warp" threads are required in the width, then five warper's beams, each containing 500 threads or ends, would be placed upon the creel, and the whole 2,500 threads would pass over the beam nearest the size-box. The size-box, or "sow box," as it is familiarly called (Fig. 11), is a tank for holding the size: it is provided with a perforated steam pipe for heating the size with open steam, and has a cock at the side for running off old material. In the size-box there are usually five rollers; the first roller is of copper; it is called the immersion roller; next come two size-rollers, the lower one of wood, and the upper one of iron covered with flannel; and lastly, two other rollers, the lower of copper turned perfectly true, and the upper also of iron covered with flannel.

The drying cylinders are large cylinders made of sheet copper with iron or steel ends. They are heated internally by steam, and there are waste pipes for running off

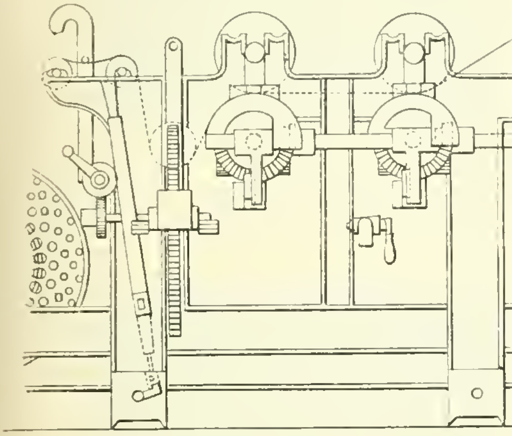
Fig. 10.



Two-Cylinder Sizing Machine.

condensed water. These cylinders revolve as the yarn passes over them. The diameter of the smaller cylinder varies from 40 to 48 inches, and the larger one from 60 to 70 inches. A fan is also fitted to the machine for cooling the yarn and finishing the drying. The "wraith" is really a large comb for separating the sized threads from one another; by a mechanical device invented by Mr. Mark Knowles, of Blackburn, the teeth of the comb may be se' as close or as far apart as may be required. The wraith serves to separate the sized fibres, and it removes any ot the size that may have lumped up on the fibre.

Fig. 11.



Size or "Sow" Box.

The weaver's beam is placed in the headstock of the machine, and it is sufficiently wide to take the whole of the warps side by side; when full it is taken direct to the weaving shed and is ready to put into the loom

We may shortly trace the course of the yarn through the machine. It is reeled off the warper's beams, passes under the immersion roller into the size, then through the size rollers and finishing rollers and over the larger drying cylinder, round which it passes, next back and over the smaller drying cylinder, then through the wraith, and finally the sized and dried yarn is wound upon the weaver's beam.

There is a skill in sizing; in some mills one sizing machine will keep 300 or 400 looms going with scarcely any stoppages, and with little or no dust to be swept up; in other places the floor below both the sizing machines and the looms will be covered with dust, and stoppages will be frequent. This depends to some extent upon intelligent men being employed as sizers or "tapers," but it depends also upon the materials used, the loss being as a rule very great with heavy sizing.

There is room for improvement, and by bringing the subject of sizing before the notice of this Society, we hope we are helping somewhat to put it on a scientific basis. There is a considerable amount of work to be done before sizing becomes as perfect as some of the other textile arts. Speaking particularly, it would be an immense advantage to be able to do without tallow, which has a disagreeable odour. It would be an advantage also to be able to banish zinc chloride, magnesium chloride, and other deliquescent substances from the list of sizing materials. The other ingredients cannot be objected to, but still it may be possible to improve upon them, and we have no doubt that as time goes on improvements in sizing will be found.

Discussion.

The **Chairman** said they had been given a very interesting review of the various materials used in sizing, and the authors had treated the subject from a scientific point of view, which was not always grasped by those engaged in sizing. Even to-day sizing was a process which was conducted very much by rule of thumb, and it was not so scientifically understood as it should be. He did not think many sizers kept chemists, and they did not always consult chemists. They went on using materials which they did not altogether understand, and the result was that sometimes cloth got spoiled. Then came complaints, and perhaps claims, and by that time it was a very difficult thing to say which of the materials had caused the damage. He thought that Messrs. Stocks and White, in treating the subject from the scientific point of view, had done a very great service, and he hoped they would continue to investigate the chemistry of sizing, and that on some future occasion they would hear more about it from them. That which had specially interested the speaker was the use of gum tragasol. Some years ago he had some matters brought before him in connection with the preparation of gum tragasol, but in those days it was quite in its infancy. Since then, however, there was no doubt the material had been perfected and brought upon the market as a scientific process, and he thought he might say that to Mr. Stocks a very great deal of the credit of that was due.

Mr. **R. J. Davenport** (Golborne) said that the majority of sizers had had handed down to them from their forefathers a certain mixing, and they went on working with that mixing; if one attempted to suggest anything new one sometimes only met with abuse, and so far as any chemical formula was concerned, or the question of any chemical reaction taking place, it did not interest them. With respect to the fermentation of flour, he should like to ask Mr. Stocks if he had gone into this matter, and if he could give them some idea as to the length of time flour should be fermented. This was a point about which there was considerable difference of opinion; some held that it should not be fermented, others said it should be fermented for about three weeks, and others again put it at seven weeks. He should like to ask Mr. Stocks if, in the course of his investigations, he had formed any definite opinion on this point, because wheat flour was given a very high position, especially in heavy sizing, and was one of the materials very largely used for mixing in conjunction with china clay. With respect to tragasol, he had had no experience of it, but he should like Mr. Stocks to say whether he considered it was safe to use tragasol alone without tallow, and whether a greater amount of it would be required than of tallow. Did he consider that tragasol was any improvement on good beef tallow? He should also like to ask whether, taking the thing on a commercial basis, Mr. Stocks thought it necessary, in order to produce a good sized yarn, to use many of the things he had mentioned? Did he not think it was better to stick to the old-fashioned wheat flour and sago or farina, with tallow for softening, and let those form the mixing? One was not going to use a lot of fancy things, the effect of which one did not know.

Mr. **Arthur Carey** asked what were the reasons for desiring the abolition of the use of zinc chloride, magnesium chloride, &c.

Mr. **Ed. Rhodes** asked whether Mr. Stocks was aware that some years ago there was an antiseptic brought out for sizing by Mr. Thomson, of Manchester—sodium silicofluoride—and whether he thought it might not be less objectionable from a poisonous point of view than zinc chloride.

Dr. **Herbert Levinstein** (Manchester) said that it was most important that the threads of sized warps should be perfectly separated and distinct, and not glued together to any extent, and he should like to ask whether the use of tragasol or its substitution for tallow had any influence, one way or the other, in securing that desirable feature in sizing.

Mr. **Livsey Taylor** (Golborne) said that, taking sago, for instance, the question arose whether it should be only brought to the boil or boiled for, say, half an hour. It was sometimes suggested that they should do away with the greater part of the boiling, and treat the sago or farina with a solution of caustic soda to burst the granules, subsequently neutralising with a weak solution of sulphuric acid. He should like the opinion of the authors as to the length of time for boiling in order to break up the granules properly, and as to whether they thought that treating with alkali and acid was a better method than boiling.

Mr. Stocks, in reply, said that for most purposes it did not appear necessary to ferment flour at all. If the flour were fermented, the gluten was largely destroyed and that meant simply the formation of a very impure wheat starch. The sides of the becks and the surface of the liquid were covered with a pasty mass of the decomposed gluten, and though in some cases this was removed, in others the whole mass was mixed up and boiled together. The decomposition of the gluten coloured the flour very much, and this was a great disadvantage. At a temperature of about 70° F. moist flour commenced to ferment in about three days; in about seven days it was in a state of active fermentation, and from that time up to about three weeks this would go on; but after that the products of decomposition were so great that they spoiled the colour of the flour entirely. The longest time of fermentation should be three weeks, if fermented at all. Many people did not ferment their flour, but put the zinc chloride into the flour beck immediately, and they got very good results. As to tragasol being used to replace tallow entirely, he said this could be done in light sizing with satisfaction, but in heavy sizing some tallow was necessary, but two-thirds of the tallow could be replaced by tragasol. Tragasol was not a softener in the same sense as tallow, but it produced a very much smoother and stronger yarn. In reference to the simplifying of the sizing formula this was very desirable, and ought to be attempted; for instance, farina might be left out and flour alone used. In reply to Mr. Carey, he said it was very desirable that such materials as zinc chloride and magnesium chloride should be replaced by something better fitted for the purpose; the harmful effects of such materials in clothing were well known. With regard to the use of sodium silicofluoride as a preservative, he said it was not very soluble in water, and was acid to litmus; it might be a good preservative, but he was not in favour of it for sizing materials, but experiments were in progress upon this point. In reply to Dr Levinstein's question he said, if properly mixed, tragasol made practically no difference to the separation of the threads. Regarding Mr. Taylor's question as to the boiling of sago, it required some little time for the granulose of the starch to entirely escape into the water, and it was no doubt better to boil for half an hour than to raise to the boiling point only.

Nottingham Section.

Meeting held at Nottingham, on Wednesday, December 17th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

ANNEALING OF MUNTZ METAL.

BY ERNEST A. LEWIS, F.C.S.

I have studied with the microscope the effect of annealing Muntz metal rod at different temperatures, and as the results may be of interest to members of the Society who are interested in the heat-treatment of alloys, I have taken the accompanying micro photographs of the alloy.

A rod of Muntz metal was taken, about ¼ in. in diameter, which had been hot-rolled and finally cold-drawn down from a casting 3 ins. in diameter, and was therefore in its hardest condition. It contained :—

	Per Cent.
Copper	61·19
Lead	0·24
Tin	Nil.
Iron	0·42
Zinc	38·25
	100·00

The rod was cut into pieces 2 ins. long, and these were heated in a gas-muffle, connected with an electric pyrometer, to various temperatures for half an hour and seven hours at a time. One piece which had been heated to a definite temperature was allowed to cool down slowly, and another piece was quenched in cold water. Sections were cut off each of the pieces, polished, and etched with dilute ammonia until the structure was developed.

Muntz metal consists of two constituents: the one is a solid solution of Cu-Zn in copper (Cu-Zn + xCu), the other, which solidifies last, is probably a solid solution of Cu-Zn in one of the compounds of copper and zinc containing a larger proportion of zinc; it is best represented as "Cu-Zn + xZn." This latter compound is not a true eutectic alloy, but is itself made up of very small crystals; it is more easily attacked by ammonia and solvents than "Cu-Zn + xCu."

Photograph No. 1 shows the longitudinal section of a bar of Muntz metal which has been cold-drawn. No. 2 shows the vertical section of the same bar. The dark portions are where the "Cu-Zn + xZn" is dissolved away by the ammonia. No. 2*a* is a vertical section after heating to 450° C. for half an hour, and slowly cooling it; the "Cu-Zn + xZn" is coagulated together: a similar section when quenched has practically the same structure. No. 10 is a vertical section after heating to 450° C. for seven hours, and slowly cooling it; the "Cu-Zn + xZn" is much less in quantity; it appears to have been absorbed by the solid solution of "Cu-Zn + xCu"; a similar section quenched has the same structure. After heating to 450° C. for 30 hours, the "Cu-Zn + xZn" constituent has disappeared, and a crystalline structure is developed which is very similar to burnt brass when quenched. No. 3 is a vertical section heated to 600° C. for half an hour and slowly cooled; the eutectic "Cu-Zn + xZn" is more easily distributed, and there is more of it than after annealing at 450° C.

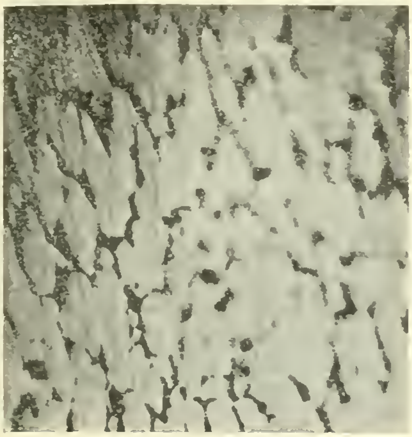
No. 4 is a similar section heated to 600° C. for half an hour and quenched; in this the eutectic alloy has increased in quantity. No. 6 is a vertical section heated to 700° C. for half an hour and slowly cooled. No. 5 is the same quenched; the eutectic is present in much greater quantity, and some of the "Cu Zn + xCu" is enclosed in it. No. 12 is a vertical section heated to 600° C. for seven hours and slowly cooled; the structure is rather coarse. No. 11 is the same quenched; it is very evident that the "Cu-Zn + xZn" constituent has considerably increased. No. 7 is a vertical section heated to 800° C. for half an hour and slowly cooled, magnified 200 diameters; it is overheated or burnt. No. 8 is the same magnified 50 diameters. No. 9 is a vertical section heated to 800° C. and quenched, magnified 50 diameters; when examined under a higher power each single grain is seen to have a structure. No. 13 is a vertical section heated to 700° C. for seven hours and slowly cooled, magnified 50 diameters. In this photograph the eutectic is the white portion. After heating to 800° C. for seven hours the structure is the same as after half an hour at 800° C.

It is evident from the above that the annealing of the alloy Muntz metal and similar alloys is best carried out by a four-hour annealing at not more than 550° C. rather than a quick annealing at 600° C. to 700° C.

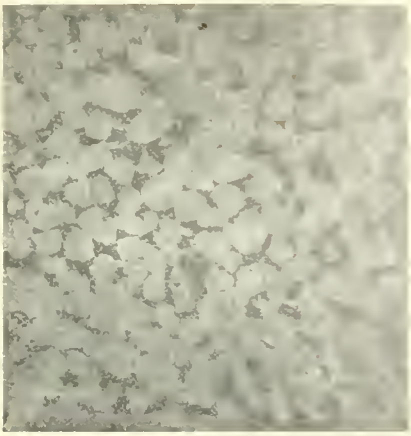
It is very remarkable that the "Cu-Zn + xZn" constituent should increase in bulk at a high temperature and at a low temperature diminish in quantity. A seven-hour annealing at 600° C. is sufficient to induce a coarse structure in the metal, and after heating to 700° for seven hours the metal is burnt; although heating the metal for half an hour at 700° C. causes a coarse structure, it is not burnt.

A long heating at 450° C. causes the "Cu-Zn + xCu" to dissolve some of the "Cu-Zn + xZn," and by heating to this temperature for 30 hours the whole of the eutectic has practically disappeared, and the metal has a crystalline structure similar to No. 9. I do not think it has been previously noticed that the structure of burnt brass can be developed at so low a temperature. As the temperature of annealing is raised it gradually throws the "Cu Zn + xZn" out of solution again, and the constituent containing the excess of zinc gradually absorbs the "Cu-Zn + xCu" till it nearly absorbs the whole of it and forms the course crystals, which are characteristic of burnt brass, each of which when examined under a higher power has a structure.

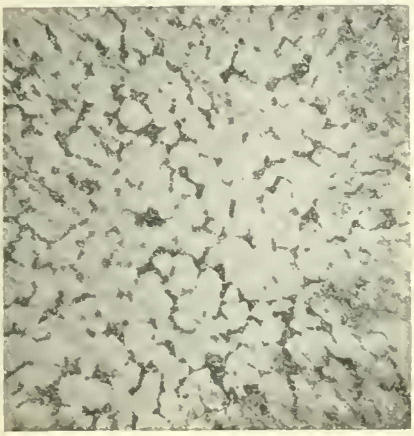
My assistant, Mr. A. G. Armstrong, has assisted me in this research.



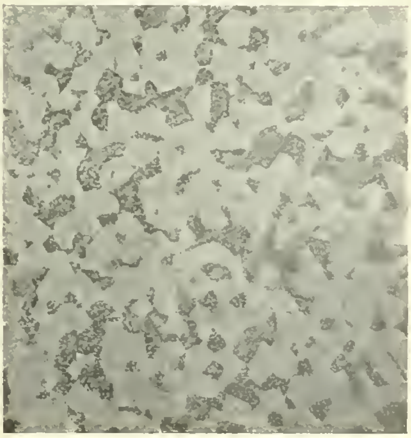
No. 1. × 200.
Muntz Metal Bar, Hard. Longitudinal Section.



No. 3. × 200.
Muntz Metal Bar, Annealed at 600 C. for ½ Hour and Slowly Cooled.

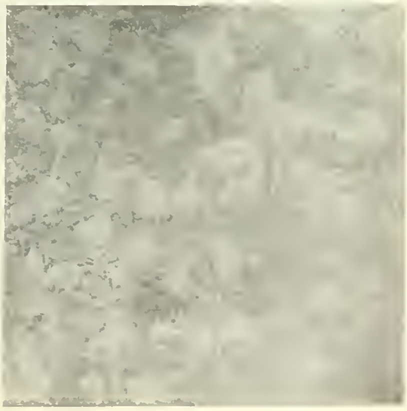


No. 2. × 200.
Muntz Metal Bar, Hard. Vertical Section.

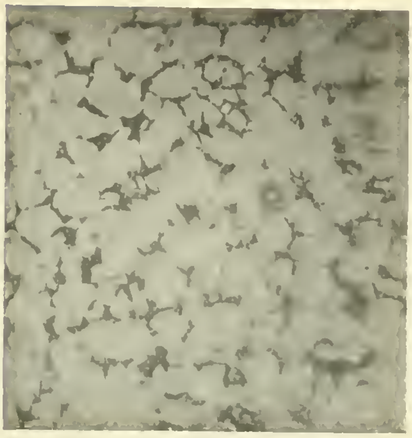


No. 4. × 200.
Muntz Metal Bar, Annealed at 600° C. for ½ Hour and Quenched.

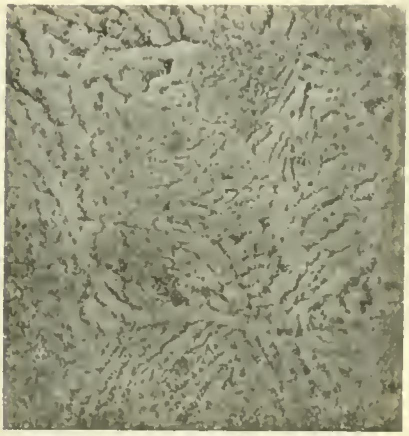
No. 2a. × 200.
Muntz Metal Bar, Annealed at 450° C. for ½ Hour and Slowly Cooled.



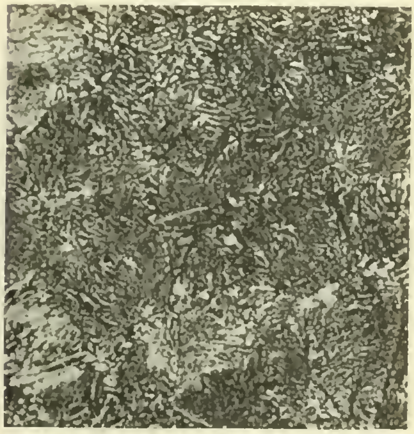
No. 5. × 200.
Muntz Metal Bar, Annealed at 700° C. for ½ Hour and Quenched.



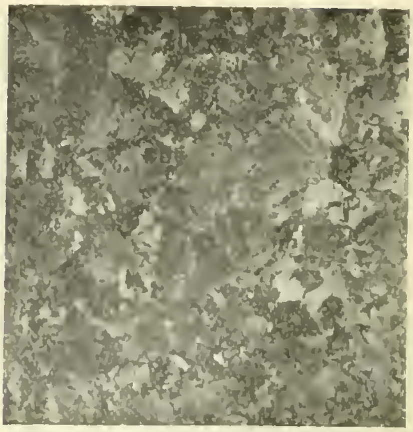
No. 6. × 200.
Muntz Metal Bar, Annealed at 700° C. for ½ Hour and Slowly Cooled.



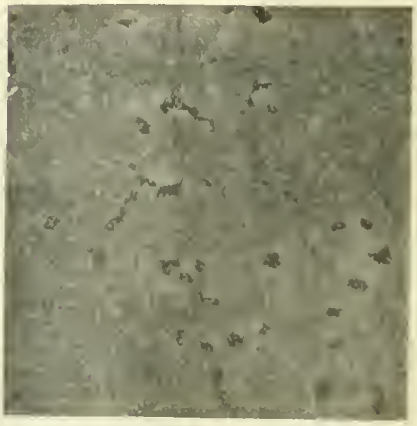
No. 7. × 200.
Muntz Metal Bar, Annealed at 800° C. for ½ Hour and Slowly Cooled.



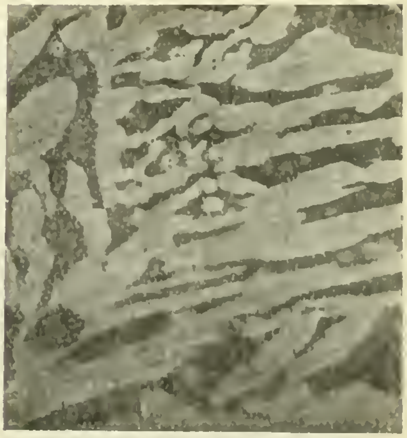
No. 8. × 50.
Muntz Metal, Heated to 800° C. for ½ Hour and Slowly Cooled.



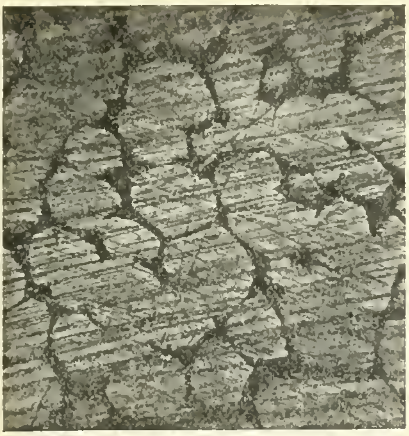
No. 9. × 50.
Muntz Metal Bar, Annealed at 800° C. for ½ Hour and Quenched.



No. 10. × 200.
Muntz Metal Bar, Annealed at 450° C. for 7 Hours and Slowly Cooled.

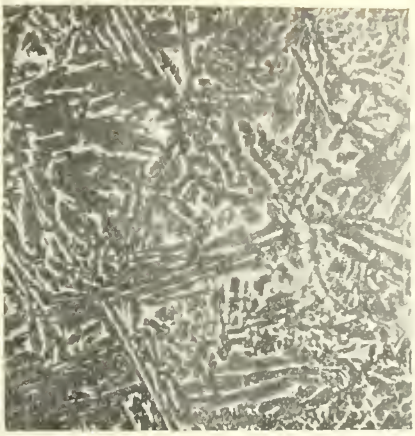


No. 11. × 200.
Muntz Metal Bar, Annealed at 600° C. for 7 Hours and Quenched.



No. 12. × 200.

Muntz Metal Bar, Annealed at 600° C. for 7 Hours and Slowly Cooled.



No. 13. × 50.

Muntz Metal Bar, Annealed at 700° C. for 7 Hours and Slowly Cooled.

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English.—8*d.* each, to the Comptroller of the Patent Office, C. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W.C.
United States.—6*d.* each, to the Commissioner of Patents, Washington, D.C., U.S. America.
French.—1*s.* each, to Belin et Cie., 52, rue de Vaugirard, Paris.

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Fractional Distillation; Manufacture of Substances usually Prepared by ——, and Apparatus therefor. W. R. Bousfield, London. Eng. Pat. 25,699, Dec 16, 1901.

The mixed vapours are led into a chamber or series of chambers, and condensed on a series of surfaces which are kept at different suitable temperatures, the apparatus being arranged so that the products of condensation on the surfaces can be separately collected and the process carried on as a continuous one, the mixed liquid to be distilled, being fed continuously into the still.—L. A.

Still for the Direct Recovery of Alcohol or other Volatile Liquid from Solid or Semi-Solid Substances, the Evaporation of Liquids, and the Drying of Solid Materials. F. C. J. Bird, London. Eng. Pat. 25,772, Dec. 17, 1901.

Surface condensation is applied in close proximity to the material undergoing distillation, by keeping the condensing surface close to and parallel with the material in the still, which latter may be of shallow rectangular shape, the whole being supported on trunnions so that it may be inclined at an angle, thus allowing the vapour condensed on the surface to trickle downwards into a collecting channel provided at the lower edge of the condensing surface. Heat is distributed throughout a solid or semi-solid material by means of hollow metal conductors conveying steam or hot water, and of such a form that no part of the material is more than one inch distant from a heating surface; these conductors may take the form of hollow ridges projecting from the bottom of the still-body.—J. F. B.

Towers; Impts. in Cooling ——. G. Brewer, London. From The Wheeler Condenser and Engineering Co., Manhattan, U.S.A. Eng. Pat. 17,669, Aug. 12, 1902.

In cooling towers of the open type, the mats are arranged in independent series at right angles to each other, with intervening spaces between the different series, and with means for distributing the circulating water independently to the mats of each series.—L. A.

Tower; Water-cooling ——. W. Ostendorff, New Jersey, U.S.A. Eng. Pat. 21,830, Oct. 7, 1902. (Under Internat. Conv., Oct. 7, 1901.)

A number of spraying pans arranged one above the other on a supporting framework, the bottom of each pan being formed on its underside with inclined deflecting flanges, and perforated above the upper sides of the said flanges. The upper edges of the pans are reinforced by wooden strips, which also serve for the attachment of guard nettings arranged in the spaces between the pans.—R. A.

United States Patents.

Tanks; Apparatus for Discharging Inflammable or other Liquids from Storage ——, *at the Outbreak of Fire.* C. Allenou, Sèvres, France. U.S. Pat. 710,091, Sept. 30, 1902.

A discharge pipe leading from the bottom of the storage tank is normally closed by a frangible disc or diaphragm. A puncturing rod supported by a fusible joint is adapted, when released, to break the diaphragm and establish communication between the tank and discharge pipe. When the liquid has been discharged from the tank, the discharge pipe is closed by a stop or plug mounted on the rod. The rod is also adapted to open a valve in a water-supply duct, to admit water to the interior of the tank. —R. A.

Heating Liquid or Gaseous Bodies under Pressure; Apparatus for ——. A. Prat, Lyons, France. U.S. Pat. 710,608, Oct. 7, 1902.

See Eng. Pat. 2592, 1902; this Journal, 1902, 1523.—R. A.

Filter. G. F. Goddard, St. Louis, Mo. U.S. Pat. 711,046, Oct. 14, 1902.

An outer casing is divided into open spaces by a number of vertical filter-beds. The filtering material is placed in chambers formed in the filter-beds, and is held in position by gratings and perforated covers at each side of the filter. Valved inlets open into pockets formed by partitions at the lower part of each filter-bed, outlets being also provided.—W. P. S.

Filter-Press. F. S. Guy, Peoria, Ill. U.S. Pat. 714,174, Nov. 25, 1902.

The filter-press comprises a cylinder perforated over the whole of its surface for the escape of water, a perforated lining therein, a screw conveyor within the lining for moving the sludge away from the inlet and compressing it into a chamber at the opposite end, which contains two screws revolving in opposite directions, and fitting so tightly as to carry away the solid matter without allowing passage of the liquid.—L. A.

Distilling Liquors; Apparatus for ——. J. C. Bertsch, Atlanta, Ga. U.S. Pat. 714,438, Nov. 25, 1902.

The apparatus is particularly applicable for the distillation of water used in the manufacture of ice. Steam from a boiler is led through a drum, then through a condenser of such character that, as soon as the steam is condensed, the hot water formed is run off. This hot water then passes through a coil in the afore-mentioned drum, where it is reheated by the steam before running into the "reboiling" tank. Any steam condensing in the drum is conducted by a separate pipe to the "reboiling" tank. The object is to remove air as far as possible from the condensed water. —W. P. S.

Evaporating Apparatus; Vapour ——. C. Ordway, Brooklyn, New York. U.S. Pat. 714,513, Nov. 25, 1902.

The evaporating apparatus is composed of a number of effects joined together in series, each effect comprising a series of vertical coils enclosed in a cylindrical shell, the tubes being aligned horizontally, and the liquid to be evaporated being conducted back and forth through the tubes of each coil by means of channels in the cylinder heads, which are fitted with glass windows opposite the ends of the tubes. A separating chamber surrounds each shell at one end, into which the liquid from the last tube-coil flows, the vapour passing into the shell of the next effect, and the liquor falling into a receiver furnished with an automatic valve and connected with a pump, by which the proper circulation of the liquid through the series of effects is controlled.—L. A.

II.—FUEL, GAS, AND LIGHT.

Combustibility; The Limits of ——. L. Pelet and P. Jomini. Bull. Soc. Chim., 1902, **27**, [24], 1207—1212.

When substances are burnt in a closed vessel containing a limited amount of air until they are extinguished spontaneously, it is found that the quantity of oxygen consumed bears a definite ratio to the quantity remaining. The proportion of oxygen consumed (limit of combustibility) depends on the nature of the substance, the temperature of the flame, the quantity of gaseous combustible supplied to the flame in a unit of time (volatility of the substance and size of the flame), and lastly on the temperature of the surrounding air. The temperature of the flame and the supply of gaseous combustible are both dependent on the nature of the substance. It is found that the proportion of oxygen consumed is greater in vessels of small capacity than in large ones. The reason for this lies in the fact that in small vessels the air becomes heated to a higher temperature than in large ones, and the limit of combustibility is thereby raised. In larger vessels the limit of combustibility appears to approach a constant value, and it may be expected that in the open air the limit would be the same, whatever the size of the flame.—J. F. B.

Coal-Gas; Extraction of Cyanogen from ——. W. Feld. J. f. Gasbeleucht., **45**, [50], 933—940.

In the removal of cyanogen from coal-gas, whether by the oxide (purifier) method or by washing with alkaline ferrous hydroxide in suspension, it is necessary, for realising a high yield, that the ammonia should previously be removed from the gas as perfectly as possible; otherwise the free sulphur which is always produced, acting on the cyanogen and ammonium compounds present, forms sulphocyanide, which represents a serious loss of cyanogen.

The wet method is preferable to absorption in the purifier, for obtaining crude ferrocyanide of high strength. As ordinarily conducted—as, for example, in the Foulis process adopted in Glasgow—a solution of a ferrous salt is treated with sodium carbonate, and the precipitated ferrous hydroxide, after a washing to remove the sodium salts, is introduced into the scrubber along with a further quantity of sodium carbonate solution. The cyanogen of the gas is retained by this mixture, mainly in the form of sodium ferrocyanide; but about 20 per cent. is found in the insoluble form, as Prussian blue, which reduces the value of the product. The formation of this compound is due to the partial oxidation of the ferrous hydroxide to ferric hydroxide during the preliminary precipitation and washing, a part only of the ferric hydroxide being again reduced by the sulphuretted hydrogen in the gas. To prevent the production of the insoluble ferrous cyanide, $FeCy_2$, it is essential that an adequate proportion of alkali be used, namely, 6 mols. of a monovalent alkali to 1 mol. of ferrous salt. For the recovery of the cyanogen exclusively in the soluble form, therefore, the ferrous salt used must be free from ferric salt, the right proportion of alkali must be employed, and the ferrous and alkaline solutions must only be mixed in the scrubber in an atmosphere of coal-gas, to prevent oxidation of the precipitated hydroxide.

In order that the absorption of the cyanogen may take place quickly, uniformly, and almost perfectly, the scrubbing solutions should not be introduced in large quantities all at once into the apparatus, but should be added continuously and regularly; otherwise the sulphuretted hydrogen and (when lime is used as the alkaline reagent) the carbon dioxide in the gas, form sulphides and carbonates with the excess of the reagents, which then absorb the cyanogen with comparative difficulty.

It is sometimes desirable to recover the cyanogen entirely in the form of insoluble ferrous cyanide. In this case only 1 mol. of divalent alkali is used with 1 mol. of ferrous salt, any excess of alkali leading to the production of soluble alkali ferrocyanide. The two liquids should be run separately into the washer, to prevent as much as possible the oxidation of the ferrous hydroxide, since ferric hydroxide causes the absorption of cyanogen to take place slowly, and the product is contaminated with free sulphur.

Lime is, on the whole, preferable to sodium carbonate as the alkaline reagent. It is cheaper. On using sodium carbonate the product is contaminated, both with the excess of alkali and with part of the sodium salts formed on decomposing the ferrous salt for the production of ferrous hydrate; but the calcium ferrocyanide solution contains no foreign calcium salts, especially if ferrous sulphate be used as the ferrous salt.—H. B.

Acetylene; Hydrogen Silicide as an Impurity in Crude——. N. Caro. Zeits. Calciumcarbid-Fabrik., 1902, **6**, 225.

The existence of hydrogen silicide as an impurity in crude acetylene was first demonstrated by Wolff; but although his statement has been controverted by several investigators, their failure to discover it has been due to the use of defective analytical processes. A large number of samples of carbide have been examined by the author during 1901—1902; and by burning the gas he has found it almost invariably to contain silicon compounds, sometimes in very small quantity, but generally in amounts up to 0·8 per cent. One specially bad sample gave a spontaneously inflammable gas, the acetylene containing only traces of phosphine, but deriving its inflammability from 2·1 per cent. of silicon hydride. The silicon occurs both as hydride and as certain organic compounds of unknown composition; for although hydrogen silicide is absorbed completely, and more or less rapidly, by copper sulphate and silver nitrate solutions, commercial acetylene contaminated with silicon is not wholly freed from that impurity by similar treatment. The residual silicon compounds can only be recovered by prolonged contact with water or with alkaline solutions of copper sulphate.

Generators of the drip and contact patterns generally yield a gas containing more silicon compounds than those of the carbide-to-water or flooded-compartment systems. This is chiefly due to the fact that in the latter the acetylene is more thoroughly washed with an alkaline liquid (lime water), which determines the reaction observed by Friedel and Ladenburg:—

$$SiH_4 + Ca(OH)_2 + H_2O = CaSiO_3 + 4H_2.$$

Even when carbide is decomposed in such fashion that a rise of temperature within the mass is prevented, the acetylene may contain silicon compounds other than hydrogen silicide, for they are not extracted by means of copper sulphate. Still, a high temperature in the generator does affect the silicon in the gas, as a hot generator may yield a condensed tarry product in which silicon can be detected.

—F. H. L.

English Patents.

Fuel Briquettes; Manufacture of ——. O. C. Blunden, London; W. J. Malden, Uckfield; and A. Malden, London. Eng. Pat. 23,904, Nov. 25, 1901.

To prevent the briquettes from softening under the action of heat, the inventors propose to first incorporate the combustible material (fuel dust) with a small quantity of powdered alkaline earth, and then with heated tars, oils, and resins, to serve as binding material, the tars and oils having been previously heated and mixed with a proportion of any suitable acid.—C. S.

Peat and Similar Substances; Method of and Means for Expressing the Moisture from ——. A. H. Higginbottom and A. B. Lennox, both of Newcastle-on-Tyne. Eng. Pat. 26,425, Dec. 27, 1901.

The peat or the like, is passed between endless bands, the adjacent sides of which travel in the same direction and at the same speed, with a convergence towards each other at a convenient point. The bands are normally guided and supported so as to ensure a steady yet yielding pressure, whereby stones, &c. can pass without damaging the machine.—R. S.

Furnaces. J. Reagan, Philadelphia, Pa. Eng. Pat. 16,285, July 22, 1902.

See U.S. Pat. 707,157, Aug. 19, 1902; this Journal, 1902, 1324.—R. S.

Burners for Liquid Hydrocarbon. T. Clarkson, London. Eng. Pat. 7496, March 27, 1902.

The vaporiser tube, which is intended for paraffin, kerosene, or the like, is covered with a non-oxidising or incorrodible metal wire or ribbon, such as of nickel. The tube is enclosed in a casing containing a secondary burner and communicating with a fan or blower.—R. S.

Gas-Generators; Method of Regulating ——, and Apparatus employed in connection therewith. A. J. Boult, London. From F. M. Hille, Dresden-Löbtau. Eng. Pat. 25,092, Dec. 9, 1901.

Not only is the amount of air, necessary for the production of a quantity of gas sufficient for one working stroke of the motor, drawn through the generator at each stroke of the motor, but the required amount of water is sent through a vaporiser and thence to the generator.—R. S.

Carburetting Air or Gas for Lighting, Heating, or Motive Power; Methods of and Apparatus for ——. H. Marshall, Edinburgh. Eng. Pat. 2030, Jan. 25, 1902.

The air to be carburetted is divided into several portions, and these portions are passed through different carburetters which are in varying stages of exhaustion. The various fractions of carburetted air are subsequently mixed so as to obtain a gas of uniform composition. Each carburetter consists of a metal casing, preferably cylindrical, fitted with an absorbent, vertically-perforated block, which leaves free spaces at the top and bottom of the casing. The air to be carburetted passes up a central tube within the block to the top space, and down the perforations to the lower space, from which it passes away. When a carburetter requires recharging, it is turned down upon its hinge, whereby the ports for ingress of air and egress of carburetted air are closed. The blocks used in the carburetters are preferably formed of a mixture of two parts by weight, of plaster of Paris, one part of kieselguhr, and five of water.—R. S.

Gas Cleaning and Cooling Apparatus. W. J. Crossley, Openshaw, and J. Atkinson, Marple. Eng. Pat. 24,960, Dec. 7, 1901.

This apparatus, which is intended for blast-furnace or producer gas, consists essentially of an arrangement of cooling towers placed in separate tanks. The gas passes through the cooler or coolers in one tank, then through those in the next, and so on, if there are more than two sets, then through a rotary cleaning machine, and finally through a rotary fan. The washing water passes in the reverse direction. The object in using separate towers and tanks in succession is to keep the coolest water to the tank containing the towers through which the coolest gases pass, and the hottest to the tank containing the towers for the hottest gases. The tanks have sloping bottoms leading to sludge troughs.—R. S.

Gas; Apparatus for Extracting Tar from Illuminating ——. E. D. Holmes, Huddersfield. From O. N. Guldlin, Fort Wayne, Ind., U.S.A. Eng. Pat. 25,493, Dec. 13, 1901.

The combinations in the apparatus include: a seal-cup with vertical gas-inlet passages; two or more counterbalanced regulating and tar-extracting drums, connected one within the other, and having walls composed of injecting and impact plates in the cup, one of the gas-inlet passages opening into each drum, the arrangement being such that the gas, after passing through the plates forming the inner wall, traverses the space between the two walls and passes through the plates of the outer wall. The seal cups communicate with a tar-pocket, extending below and connecting them with the outer wall of the regulating chamber; and an overflow trap connects with the wall at the opening of the tar-pocket.—C. S.

Spent Substances in the Purification of Gas; The Treatment of the ——, *and Desulphurisation of Sulphurous Substances.* C. F. Maybluh, Levallois Perret, France. Eng. Pat. 4646, Feb. 24, 1902. (Under Internat. Conv., Sept. 25, 1901.)

To extract the sulphur from the spent oxides from the gas purifiers, they are treated with petroleum or similar oils at a temperature of 135°—150° C., the liquid being then separated from the insoluble residues and cooled until the sulphur separates out. The latter can be rendered merchantable by distilling. The oil adhering to the residues and the sulphur is extracted by means of benzine, which is then removed by distillation.

The desulphurised oxides are next treated with water, lime added, and the mixture boiled, the ammonia being volatilised and recovered, whilst the ferrocyanides interact, forming the calcium salt, this being afterwards converted into the potassium or sodium salt.

The apparatus consists of a desulphurising tank, a refrigerating tank, a filter tank, all connected to a main vacuum pipe, and also to a main steam pipe fitted with a Körting injector.—C. S.

Acetylene Gas Generators. M. Paterson, Glasgow. Eng. Pat. 1164, Jan. 16, 1902.

A hand-fed central-shoot carbide-to-water apparatus, in which the mouth of the hopper is normally closed by a counterpoised conical valve. The generating chamber is provided with a movable reaction grid, and with a constant-level water supply so arranged as to form a hydraulic seal. —F. H. L.

Acetylene Generator. B. Bailly and V. Chauvin, Isigny, France. Eng. Pat. 19,135, Sept. 1, 1902.

See Fr. Pat. 319,028; this Journal, 1902, 1447. —F. H. L.

Incandescent Vapour Lamps. F. Oelerich, Plön, Prussia. Eng. Pat. 3119, Feb. 7, 1902.

The oil passes up a tube to a horizontal hollow ring, within which it is vaporised. Part of the vapour is carried downwards to a nipple delivering the vapour and a supply of air to a central vertical mixing tube or chamber, outside which is a tube supporting the mantle. The remainder of the vapour passes to a flat upper chamber surrounding the mantle-supporting tube, and is there mixed with air admitted through a ring of short tubes. This mixture is ignited, and the flames therefrom pass through a central opening in the cover of the chamber and surround the mantle-supporting tube. The cover of the flat chamber supports the glass chimney. A starting cup is provided beneath the burner.—R. S.

Incandescent Vapour Lamps. M. A. Hartmann, Dresden. Eng. Pat. 12,922, June 6, 1902.

A suspended vapour-lamp, having a vaporising tube mounted obliquely, so that the upper portion only is acted upon by the heat of the flame, and a valve device for controlling the admission of vapour to the burner, and simultaneously the admission of the liquid fuel to the starting cup. The vaporising tube is filled with thin metal bars, parallel to the axis of the tube or arranged helically round the axis. A spring cushion is provided at the top of the lamp, for preventing shocks when the lamp is drawn up. —H. B.

Incandescent Petroleum Burners. P. Lucas and the Allgemeine Beleucht. und Heizindustrie Akt.-Ges., Berlin. Eng. Pat. 18,844, Aug. 27, 1902.

A double cap, instead of a single cap, is arranged round the blue flame of the burner, so that the outer cap, over which the mantle is suspended, prevents the latter from extending into the flame and from receiving a deposit of soot. The arrangement of the parts of the burner is designed to prevent as completely as possible the transmission of heat from the flame to the lower parts surrounding the wick; the wick tubes are constructed of thin material which is a bad conductor of heat, air currents are allowed free access to all the metallic parts, and the central spreader is thermally insulated from the other parts of the burner. —H. B.

Filaments for Incandescing Electric Lamps; Manufacture of ——, *and Apparatus for Use in such Manufacture.* W. L. Voelker, London. Eng. Pat. 16,653, Aug. 19, 1901.

A thread of cotton or cellulose is soaked in a solution of the desired salt or salts of the metal or metals intended to form the metallic base of a carbide. It is then dried, spooled, carbonised in the presence of a hydrocarbon gas or vapour in a sealed crucible provided with a central tube or core, upon which the spools of filaments are strung, and through which the heating gases pass. The furnace used for carbonising, comprises a burner formed as a hollow ring in connection with gas and air supplies, whence jets or nozzles project towards the centre. The thread is finally heated in an electric furnace lined with the oxide of the metal or metals used. Means are provided for passing the filament transversely through the crucible or chamber at a short distance from the axis of the electrodes, and also for displacing the surrounding atmosphere by carbon monoxide or a hydrocarbon vapour.—R. S.

Electrodes for Arc-Lamps. C. D. Abel, London. From Siemens and Halske Akt.-Ges., Berlin. Eng. Pat. 2587, Jan. 31, 1902.

See Fr. Pat. 318,774, 1902; this Journal, 1902, 1448. —H. B.

Illuminants, such as are used for making Candles and the like. J. Lewy, Frankfurt a Main, Germany. Eng. Pat. 2131, Jan. 27, 1902.

See Fr. Pat. 318,129, 1902; this Journal, 1902, 1448. —C. A. M.

United States Patents.

Peat Briquettes; Process of Producing ——. G. Hartmann, Munich. U.S. Pat. 714,578, Nov. 25, 1902.

See Eng. Pat. 6260, March 25, 1901; this Journal, 1902, 330.—R. S.

Fuel; Apparatus for Combustion of Finely-divided Solid ——. J. W. Bailey, Jersey City, N.J. U.S. Pat. 710,033, Sept. 30, 1902.

The apparatus consists of a conical burner tube, within which is an adjustable conical plug, leaving an annular space into which the finely-pulverised fuel is discharged, and through which it is carried by an air-blast to the annular outlet, where it is ignited. Passing through the centre of the plug, and projecting beyond its outlet end, is a blast-tube within which is a water-tube, providing a spray of water and air to assist combustion.—R. S.

Gas; Apparatus for Manufacturing ——. H. M. Papst, San Francisco, Cal. U.S. Pat. 710,336, Sept. 30, 1902.

This is a furnace for making oil-gas. It consists of two base furnace chambers, separated, except at the rear, by a wall, whereby a continuous furnace or combustion chamber s formed. A cupola-like structure is built above each hamber, each of these structures being formed in two arts, one above the other, and each being filled with hecker-work. Inlet pipes for air and oil lead into each of he base chambers, and for steam, air, and oil into each of he upper structures or regenerative or fixing chambers.)utlet pipes for the gaseous product are provided.—R. S.

Gas-Producer. J. Radcliffe, Wrexham. U.S. Pat. 715,144, Dec. 2, 1902.

See Eng. Pat. 21,377, Oct. 24, 1901; this Journal, 1902, 109.—R. S.

Water-Gas; Process of Generating ——. H. Strache, Vienna. U.S. Pat. 715,218, Dec. 2, 1902.

According to this process, the gas is made in an inclined furnace having a step-grate, so that the fuel is in layers of from 4 to 20 ins. only, and is burned by natural draught. Opposite the grate is a set of horizontal fireclay tubes, between which the heating gases pass. The latter next pass through a boiler or heater having horizontal tubes. Thence they pass to the chimney. When the fuel is incandescent, a thin layer of fresh fuel is added, the furnace is closed, and steam or water passed through the boiler. This steam or water becomes superheated in passing through the incandescent fireclay tubes. It then strikes against the fuel, and, together with the gases distilled from the fuel, passes through the grate to an outlet. When the water run is finished, the process is restarted as at first. (See also U.S. Pat. 703,619; this Journal, 1902, 1021.)—R. S.

Acetylene Gas Generator. E. R. Angell, Derby, New Hampshire. U.S. Pat. 714,125, Nov. 25, 1902.

An automatic drip generator in which the water supply is governed by the bell movements. The water-valve consists of an open-mouthed depending pipe attached to the bottom of the reservoir, which is surrounded with a cup containing sufficient mercury to overcome the gravitative force acting on the head of liquid. When the holder bell falls, a striker depresses the lever carrying the mercury cup, and permits water to run out into the leading tube. There are two or more carbide containers arranged horizontally, and the water has to fill one completely before entering the next. Liquid enters and gas escapes from the container through a three-way cock, which is fitted with a cam device to lock the lid of the carbide receptacle when the gas- and water-ways are open. Each decomposing chamber is provided with an indicator to show when its contents have been submerged, this indicator being a water tube with float and exposed pointer.
—F. H. L.

Acetylene Gas Generator. N. A. Renstrom, Omaha, Neb. U.S. Pat. 714,238, Nov. 25, 1902.

An automatic carbide-feed apparatus in which the supply of solid is governed by the expansion and contraction of a flexible chamber. The carbide hopper is annular, the central space being a drying vessel and containing the feed valve rod. When the flexible chamber is distended, the mouth of the hopper is closed by a diaphragm and the sides of a hollow open-ended cylinder; but when the chamber contracts, the attached rod falls, and the upper end of the cylinder collects a charge of carbide, and allows it to drop into the decomposing vessel. The water in the latter carries a circular float, to which is fastened a vertical rod. At its base this rod bears a valve sealing the sludge orifice, and, just above, it is fitted with a set of agitating blades. When the carbide-feed cylinder drops, it moves a lever and opens the cock on the water inlet, and the water, running down a vertical pipe, is diverted in a horizontal direction as a jet which impinges against teeth on the circumference of the reaction float. In this way the float is made to revolve on its vertical spindle, and the agitator joined to the latter stirs up the sludge; simultaneously the float rises, so that the loosened sludge is free to run off. The generator requires "finely-divided" carbide, which is fed into the hopper through an orifice that cannot be opened till the feed gear is locked.—F. H. L.

Acetylene Gas Generator. F. M. Moore, Providence, R.I. U.S. Pat. 714,318, Nov. 25, 1902.

This is a small, portable contact apparatus designed to bear agitation, as in hand lanterns. It consists of a perforated cylindrical carbide basket with a bottom of felt or the like, which is held within a wider vessel having a cock and burner at its top, and a self-acting inlet valve for water at its base. To this vessel is attached an annular jacket, closed at its top, except for an air hole, and open at its base, which makes a tight friction joint against the walls of a water tank. The water flows from the latter through the inlet valve, penetrates the disc of felt, and attacks the carbide, any excess being driven backwards by the pressure of the gas. When the apparatus is put aside, the aperture in the middle vessel which leads to the valve is closed by means of a washer and milled cap.—F. H. L.

Acetylene Gas Generator. F. M. Moore, Providence, Assignor to B. J. White, Westfields, Mass., and C. E. Merrill, Providence, R.I. U.S. Pat. 714,319, Nov. 25, 1902.

A small contact generator primarily intended for portable use. The apparatus consists of a tall cylinder mounted on trunnions, one of which is plain, while the other is the gas tube leading to the burner. Inside the main casing, and towards one end of it, is an annular carbide container, with its water inlet at one extremity. When the outer cylinder is revolved into its operative position, the carbide cage is at the lower end, and the water is free to enter into the cage through a disc of porous material; the gas way to the burner is also open. If the make exceeds the consumption of gas, the liquid is driven downwards out of the cage, back into the surrounding space. By rotating the main cylinder on its axis, the gas-way to the burner is shut, and as the carbide cage is then at the upper end of the cylinder, and its orifices are at the top, no more acetylene can be evolved.
—F. H. L.

Acetylene Gas Generator. H. Kinsey, G. Challenger, and J. H. Nott, Swansea. U.S. Pat. 714,490, Nov. 25, 1902.

See Eng. Pat. 11,714, 1901; this Journal, 1902, 397.
—F. H. L.

Acetylene Gas Generator. W. S. May, Clifton, Arizona. U.S. Pat. 714,929, Dec. 2, 1902.

A drip generator to which the supply of water is governed by pressure. The generating apparatus consists of a pair of vertical cylinders, the upper one holding the water, and the lower one the carbide. The acetylene travels to a closed storage drum, so that if the make of gas exceed the consumption, back pressure is set up in the decomposing chamber, and water cannot fall from the nozzle depending from the water reservoir. In order that the liquid may not have to percolate through spent lime before reaching the fresh carbide, the solid is carried on a conical false bottom in the lower cylinder. The water supply needle-valve can be closed by a hand-operated wheel and spindle. The gas-storage drum contains a layer of filtering material.
—F. H. L.

Electrode for Arc Lamps. H. Bremer, Neheim, Germany. U.S. Pat. 710,943, Oct. 14, 1902.

A self-fluxing electrode for arc lamps, consisting of carbon intimately mixed with over 10 per cent. of a fluoride of an alkaline earth. In addition there may be added from 1 to 3 per cent. of calcined oxide or salt of boron, sodium, or potassium.—H. B.

Carbon Electrode for Arc Lamps; Composite ——. A. Blondel, Paris. U.S. Pat. 714,277, Nov. 25, 1902.

Each electrode consists of three concentric parts: a core, an intermediate portion composed of a mixture of carbon with from 10 to 90 per cent. of mineral colouring and light-producing salts, and a thin outer coating of non-scorifiable carbon.—R. S.

French Patents.

Acetylene Generator. H. Chaveau. Fr. Pat. 320,355. April 11, 1902.

An automatic water-to-carbide apparatus, of the contact pattern, in which the supply of water is governed by the bell movements. One or more generating vessels are placed alongside a central holder, the water of the latter being also used for attacking the carbide. There is free communication between the lower part of the holder-tank and the bottoms of the decomposing chambers, so that the liquid is able to rise among the carbide lumps. But the gas has to traverse a flexible pipe leading from the top of the decomposing chambers, in order to enter the holder-bell; and when the bell rises, it operates a lever which shuts a cock on the gas pipe, thus driving the water downwards and backwards from the carbide into the holder-tank again.
—F. H. L.

Acetylene Generator. J. C. Laval and L. A. Reynier. Fr. Pat. 320,373, April 12, 1902.

A carbide-feed apparatus of the side-hopper type, in which carbide is periodically admitted to the decomposing chamber by the removal of a ball-valve from its seat each time the bell descends. The solid is made to pass a baffle-plate, constructed in the form of a spiral worm, or otherwise, before reaching the water; and the gas is compelled to bubble through a great depth of the liquid in the holder-tank, in numerous fine streams, before entering the bell of the latter. The water of the holder-tank is separate from that used for decomposition, but the holder is carried, as part of the same casing, above the generator proper.
—F. H. L.

Acetylene Generator. P. Mimolle. Fr. Pat. 320,398, April 14, 1902.

An automatic apparatus belonging to the "dipping" principle of generation. The carbide basket, slung centrally, as usual, from the crown of the holder-bell, sinks into or rises out of the water in a small compartment arranged concentrically within the main vessel, so that the spent lime which falls out of the basket can be removed by a separate outlet, and does not contaminate the water of the holder-tank. A water-seal, carried by the bell, prevents return of gas from the latter into the space above the basket when the generator is being charged afresh, and the gas has to travel through a worm in the water-holder before it enters the service-pipe. An automatic device for removing the lime-water is also proposed. The small decomposing compartment is connected through a U-tube, which bears the sludge outlet at its lower bend, with a separate water reservoir fitted with a float, hinged lever, upright rod, and valve controlling the said outlet. When the generator is at work, the effective pressure raises the water level in this reservoir till the float closes the outlet, but when the lid of the carbide-basket holder is removed, the resulting equilibrium causes the float to sink and the outlet to be opened, thus permitting some foul water from the decomposing chamber to escape.—F. H. L.

Acetylene Generator. G. Béguère. Fr. Pat. 320,625, April 26, 1902.

A contact apparatus with its supply of water controlled by the movements of the liquid in the adjacent holder, which is of the displacement variety, with a lateral aperture in the lower compartment leading to the carbide chambers. These are in duplicate, and comprise subdivided, superposed boxes containing the carbide. The water enters at, and the acetylene escapes from, the bottom of the chambers.
—F. H. L.

III.—DESTRUCTIVE DISTILLATION TAR PRODUCTS, PETROLEUM.

Petroleum; Chemical Composition of Roumanian ——. P. Poni. Ann. scient. de l'Univ. de Jassy, **2**, 1—16. Chem. Centr., 1902, **2**, [22], 1370.

The substance thought to be butane previously discovered by the author in the petroleum from Colibasi has now been identified as trimethylmethane. The secondary hexane detected at the same time has not yet been identified. Nitro derivatives such as Zaloziecki and Frasch obtained from the fractions of Galician petroleum, boiling between 61 and 65 C. (this Journal, 1902, 335) could not be obtained from the corresponding fractions of Colibasi petroleum. The portion boiling between 100 and 200° C., contained about 24 per cent. of aromatic hydrocarbons, of which toluene, *m*-xylene, mesitylene, and compounds of the formula $C_{10}H_{14}$ were detected. The high-boiling fractions also contain methyl and ethylhexamethylene and two paraffins boiling at 116°—118° C. and 140—142° C. respectively.—A. S.

English Patent.

Shale or other Oil-yielding Materials; Retorts for the Destructive Distillation of ——. N. M. Henderson, Broxburn, N.B. Eng. Pat. 26,647, Dec. 31, 1901.

In the retorts referred to in Eng. Pat. 6726 of 1889 (this Journal, 1890, 382), it is now proposed to introduce two toothed rollers, in place of a single one, to ensure the more regular withdrawal of the exhausted earthy residues.
—C. S.

French Patent.

Petroleum or Mineral Oils; Nitration of Substances Extracted from ——, by Distillation. L. Edeleanu and G. A. Filiti. Fr. Pat. 320,618, April 23, 1902.

The heavy distillation residues from petroleum, &c. (sp. gr. 0·870 and more) are nitrated by the aid of three times the quantity of a mixture of fuming or concentrated sulphuric acid, and nitric acid (about 5:1) at a temperature not exceeding 80 C. The following applications of the product are also claimed:—(1) As a substitute for camphor in the preparation of celluloid. (2) As a constituent of explosives when mixed with oxidising agents. (3) As varnish, dissolved in suitable vehicles. (4) In the preparation of brown to black substantive dyestuffs, by fusion with alkali sulphides.

As a modification, the oil residues may be freed from resins by sulphuric acid, before nitration.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Salts. A. Binz and A. Kufferath. Annalen, 1902, **325**, [2], 196—204.

The assumption that Indigo is insoluble in ordinary solvents, and does not form salts, is not strictly true, since, when suspended in glacial acetic acid, benzene, or chloroform, and treated with gaseous hydrochloric acid, it dissolves even in the cold; and, moreover, an unstable Indigo disulphate has also been described in Ger. Pat. 121,450 (Eng Pat. 23,122 of 1899; this Journal, 1900, 1009). The hydrochloride $C_{16}H_{10}N_2O_2HCl$ is obtained by passing a current of dry hydrochloric acid gas for two hours in the cold through 400 c.c. of glacial acetic acid containing 1 grm. of pure Indigo. Part of the Indigo dissolves with a deep blue colour. After allowing the solution to settle, the clear portion is siphoned into 400 c.c. of dry ether, and the dark blue precipitate is separated and washed with ether. For analysis the product was decomposed by water, the acid being determined in the filtrate. The hydrobromide was obtained in a similar manner, and possesses an analogous composition. The hydriodide could not be obtained, since hydriodic acid reduces Indigo in admixture with glacial acetic acid. The chloroplatinate $(C_{16}H_{10}N_2O_2HCl)_2PtCl_4$ forms bluish-black microcrystalline rhombic plates, and is obtained by mixing saturated glacial acetic acid solutions of Indigo hydrochloride and chloroplatinic acid. With sulphuric acid, Indigo forms two salts. One, having the composition $C_{16}H_{10}N_2O_2H_2SO_4$, is formed by digesting 4 grms. of powdered Indigo with 50 c.c. of glacial acetic acid and 10 c.c. of concentrated sulphuric acid for half an hour on the water-bath, filtering through a Gooch crucible, and allowing the solution to cool in a desiccator. Crystalline needles are deposited, and a further amount can be precipitated by adding 200 c.c. of ether. The salt forms small, well-characterised blue needles. It is decomposed by alcohol in the cold or by glacial acetic acid on warming, but is stable in air even at 100° C. The second salt, which has already been referred to above, has the composition—

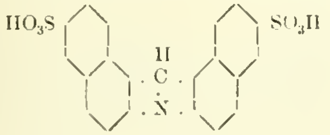
$$C_{16}H_{10}N_2O_2 2H_2SO_4,$$

and is produced by treating Indigo with sulphuric acid of 60° B. The magma of dark green crystalline needles cannot be filtered, but the product, after washing with ether, gives numbers on analysis corresponding to the above formula.

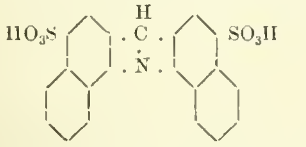
The authors suggest the use of acetic acid containing sulphuric acid for the analysis of fabrics dyed with Indigo, in place of the tedious method hitherto employed of extraction with glacial acetic acid in Soxhlet's apparatus. Wool dyed with Indigo is digested for half an hour with glacial acetic acid containing one-tenth its volume of sulphuric acid, and is subsequently washed with the same mixture. The blue solution is poured into water, and the precipitated Indigo, sulphonated and titrated with sodium hydrosulphite. In the experiment described, the results obtained are almost identical with those given by the old method, which required about five hours for extraction.
—T. A. L.

Naphthacridine Disulphonic Acids. R. Möhlau and O. Haase. Ber., 1902, **35**, [19], 4172—4177.

Formaldehyde readily reacts when boiled in aqueous solution with β-naphthylamine 3′-sulphonic acid, forming naphthacridine disulphonic acid, having the formula—



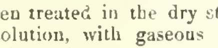
The product is sparingly soluble in water, readily soluble in dilute caustic alkalis, ammonia, and alkali carbonates, the solutions having a light bluish-violet fluorescence. It dissolves in concentrated sulphuric acid with a yellow colour and a greenish-blue fluorescence, and dyes animal fibres light lemon-yellow. A similar product having the constitution—



is obtained by heating together two molecular proportions of sodium naphthionate and one molecular proportion of formaldehyde in aqueous solution under a pressure of 10 atmospheres. The product, which consists of a mixture of sodium naphthacridine sulphonate and its hydro compound, is then oxidised with potassium bichromate, the chromium salt being subsequently decomposed with soda lye, yielding the sodium salt of the new acid, separating from water in long white needles. The free acid is very hygroscopic, and crystallises in golden-yellow plates from the aqueous solution, which, like the colourless solution of the alkali salts, has a light bluish-violet fluorescence. The solution in concentrated sulphuric acid is yellow with a greenish-blue fluorescence. The product dyes animal fibres dark lemon-yellow shades. The colour of the aqueous solution of both the acids described, becomes paler on warming, the shade gradually returning on cooling, or directly on adding a dilute mineral acid. Moreover, a dyed fibre, on boiling with pure or faintly acid water, becomes decolorised without losing much of the dyestuff. The fibre again becomes yellow when treated with warm dilute acid. Since the naphthacridine disulphonic acids do not form salts with dilute acids, these phenomena are due to the internal salt formation in the molecule between a sulphonic group and the chromophoric nitrogen. The colourless sodium salt of triphenyl-*p*-rosaniline monosulphonic acid shows a similar behaviour, since it also is taken up by animal fibres from a faintly alkaline bath in a colourless condition, the blue colour being subsequently developed by acid. Internal salt formation undoubtedly plays an important part in dyeing, in developing the colour of acid dyestuffs. The function of the sulphonic acid group, in addition to increasing the solubility and property of penetrating the fibre, is primarily to form a salt with the basic auxochromic group or chromophoric element, subsequently acting as a salt-former in other directions.—T. A. L.

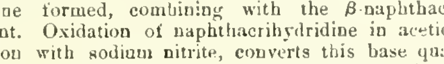
Naphthacrihydridine. R. Möhlau and O. Haase. Ber., 1902, **35**, [19], 4164—4172.

According to Morgan (J. Chem. Soc., 1898, **73**, 536) one of the products of the action of formaldehyde on β-naphthylamine is a substance to which he assigns the formula—



$$C_{10}H_6 \left< \begin{matrix} CH \\ N \end{matrix} \right> C_{10}H_6$$

and designates isonaphthacridine. The authors find that this product, which they term naphthacrihydridine, is a molecular compound of naphthacridine and hydronaphthacridine corresponding to quinhydrone, having the formula—



$$(a)HC \left< \begin{matrix} C_{10}H_6 \\ C_{10}H_6 \end{matrix} \right> \overset{(\beta)}{N}H . \overset{(\beta)}{N} \left< \begin{matrix} C_{10}H_6 \\ C_{10}H_6 \end{matrix} \right> CH_2(a)$$

and is obtained by boiling together two molecular proportions of β naphthylamine and one molecular proportion of formaldehyde in glacial acetic acid. The substance reduces ammoniacal silver solution. It gives a green hydrochloride when treated in the dry state, or in benzene or acetic acid solution, with gaseous hydrochloric acid, losing hydrochloric acid on exposure to air, and is converted by the prolonged action of hydrochloric acid in solution into the hydrochloride of β-naphthacridine. The substance is also produced by reducing β-naphthacridine in alcoholic solution with sodium amalgam, the hydronaphthacridine formed, combining with the β-naphthacridine present. Oxidation of naphthacrihydridine in acetic acid solution with sodium nitrite, converts this base quantitatively into β naphthacridine. The product crystallises from ether in orange-yellow silky needles melting at 236° C. The authors also obtain other products by the action of formaldehyde on β-naphthylamine. The interaction of equimolecular proportions in glacial acetic acid solution at about 20° C. gives methylene-β-naphthylamine, $C_{10}H_7NCH_2$, melting at 61° C. The product readily forms a polymeric modification crystallising from benzene-petroleum spirit in colourless plates or needles melting at 206° C. By reacting with two molecular proportions of β-naphthylamine on one molecular proportion of formaldehyde in boiling acetone solution, the resulting product is methylene-di-β-naphthylamine, $C_{10}H_7NHCH_2NHC_{10}H_7$, which separates from alcohol in groups of colourless needles melting at 104° C.
—T. A. L.

English Patents.

Anthranilic Acid [Indigo Dyestuffs]; Manufacture of ——. O. Imray. From Farbwerke vorm. Meister, Lucius und Brüning, Hochst a/Main. Eng. Pat. 1982, Jan. 24, 1902.

See Fr. Pat. 318,050; this Journal, 1902, 1392.—T. A. L.

Blue [Anthracene] Dyestuffs: Manufacture of New ——. O. Imray. From Farbwerke vorm. Meister, Lucius und Brüning, Hochst a/Main. Eng. Pat. 771, Jan. 10, 1902.

Supplementary to Eng. Pat. 7541 of 1901. See Fr. Pat. 317,734; this Journal, 1902, 171 and 1392.—T. A. L.

Azo Colouring Matters; Manufacture of ——, *and of Material for Use therein.* J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 1561, Jan. 20, 1902.

See Fr. Pat. 313,671 (suppl.); this Journal, 1902, 1392.
—T. A. L.

Disazo Colouring Matters [Azo-Dyestuffs]; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 3375, Feb. 10, 1902.

See Fr. Pat. 318,567; this Journal, 1902, 1451.—T. A. L.

Azo Colouring Matters; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 4034, Feb. 17, 1902.

See Fr. Pat. 318,919; this Journal, 1902. 1451.
—T. A. L.

Colouring Matters of the Anthracene Series [Anthracene Dyestuffs]; Treatment of ——, and the Production of Derivatives thereof. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng Pat. 4035, Feb. 17. 1902. Supplementary to Eng. Pats. 3239 and 22,762 of 1901.

See Fr. Pat. 319,018; this Journal, 1902, 249, 1391, and 1451.—T. A. L.

Aromatic Derivatives of certain Amino Compounds; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 4434, Feb. 21, 1902.

See Fr. Pat. 318,920; this Journal, 1902. 1452.—T. A. L.

Grinding Dyes, Paints, and the Like, and Washing, Bleaching, Beating, Pulping; &c. Fibrous and other Materials; Apparatus for ——. G. E. Hibbert. Eng. Pat. 23,486, Nov. 20, 1901.

See under XIX., *page* 42.

UNITED STATES PATENTS.

Indigo Colour, and Process of Making Same. H. S. A. Holt, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 715,074, Dec. 2, 1902.

Brom-indoxyl (U.S. Pat. 713,437; this Journal, 1902, 1530), when condensed with indoxyl in an alkaline solution, yields a new brom-indigo. See Eng. Pat. 11,358 of 1901; this Journal, 1902, 608.—T. A. L.

Anthracene Dye, and Process of Making Same. M. H. Isler, Mannheim, Assignor to The Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 715,662, Dec. 9, 1902.

Dyestuffs for wool, giving blue to green shades from an acid bath, are obtained as follows from 2-methylanthraquinone:—After nitration, the nitro compound is converted into an amino compound, either by reduction or by heating with an aromatic amine, in which case alphylaminomethylanthraquinones are obtained. These compounds are treated with halogens, then condensed with aromatic amines, and finally sulphonated; or the sulphonic acid group or groups may be introduced wholly or partially at an earlier stage of the process; for example, after the formation of the amino derivative.—T. A. L.

Amino Compounds of the Fatty Series, and Process of Producing Same; Aromatic Derivative of ——. G. W. Meiser. Assignor to The Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 715,680, Dec. 9, 1902.

Amino-acetonitrile is treated with ethylaniline, giving a colourless crystalline product, which distils *in vacuo* at 183° C., and on treatment with concentrated sulphuric acid is converted into an amide melting at about 114 C. See Eng. Pat. 4434 of 1902 and Fr. Pat. 318,920; this Journal, 1902, 1452.—T. A. L.

Orange-Brown Sulphur Dye [Sulphide Dyestuffs], and Process of Making Same. A. Weinberg and O Lange, Assignors to L. Cassella and Co., Frankfort-on-the-Main. U S Pat. 714,542, Nov. 25, 1902.

By heating together *m* tolylenediamine and sulphur at a final temperature of 250° C. until no more sulphuretted hydrogen is evolved, a brittle insoluble mass is obtained. This is powdered and heated under pressure with sodium sulphide at 120 C. until the melt becomes soluble. The new dyestuff is precipitated by an acid, and gives, on unmordanted cotton, orange-brown shades, which are not much altered by treatment with chromates, but are brightened by hyerogen peroxide.—T. A. L.

Monazo Dye, and Process of Making Same. O. Ernst, Assignor to Farbwerke vorm Meister, Lucius und Brüning, Hoechst a Main. U.S. Pats. 714,882 and 714,883, Dec. 2, 1902.

Diazotised *p*-nitraniline-*o*-sulphonic acid or *o*-nitraniline-*p*-sulphonic acid, is combined with β-naphthol. Eng. Pat. 16,409 of 1901; this Journal, 1902, 401.—T. A. L.

Lakes from Sulphur Dyes; Process of Making ——. E. A. Fourneaux, Assignor to H. A. Metz. U.S. Pat. 714,687, Dec. 2, 1902.

See under XIII. A., *page* 36.

Nitro Compounds; Process of Reducing Aromatic ——. E. Wirth, Dortmund. U.S. Pat. 714,428, Nov. 25, 1902.

Aromatic nitro compounds containing two or more nitro groups are completely reduced by heating with alkali sulphides in open or closed vessels to a temperature above 110° C.—T. A. L.

FRENCH PATENTS.

Leuc-Indigo; Manufacture of Acid Solutions of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 320,259, April 7, 1902.

The addition of an excess of boric acid to an alkaline solution of Indigo white gives a fluorescent solution which reddens litmus paper, and in which the dyestuff still remains dissolved. The solution is covered with a scum of Indigo, and may be employed for dyeing like an ordinary vat. It gives, however, stronger shades, and, since it penetrates better, the dyed fabrics are faster to rubbing.—T. A. L.

Anthracene Dyestuffs. Badische Anilin und Soda Fabrik. Supplement, dated April 7, 1902, to Fr. Pat. 307,104, Jan. 14, 1901.

Halogen derivatives of hydroxyanthraquinones are heated under pressure to about 200° C. with a salt of an aromatic aminosulphonic acid in aqueous solution.—T. A. L.

Anthracene Dyestuffs soluble in Water; Manufacture of ——. Badische Anilin und Soda Fabrik. Supplement, dated March 26, 1902, to Fr. Pat. 308,661, March 2, 1901.

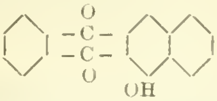
Hydroxyanthraquinones, like the nitroanthraquinones in the chief patent, readily react under pressure with the sulphonic acids of aromatic amines. For instance, Purpurin, when heated to about 200° C. in an enamelled autoclave with a solution of sodium sulphanilate, is converted into a water-soluble dyestuff giving red shades on unmordanted, and violet-blue to blackish-blue shades on chrome-mordanted wool.—T. A. L.

Formyl-1.4-*Naphthylene Diamine 6- or 7-Sulphonic Acid; Manufacture of ——.* T. Gaess. Fr. Pat. 320,263, April 7, 1902.

Formic acid, when heated in aqueous solution with 1.4.6- or 1.4.7-naphthylene diamine sulphonic acid, or a mixture of the two acids, gives a monoformyl derivative more or less quickly according to the concentration of the formic acid. The same compound can also be obtained by boiling together the diformyl derivative with the 1.4.6- or 1.4.7-naphthylene diamine sulphonic acid. The product yields a sparingly soluble yellow diazo compound, which combines with naphthols, naphthylamines, and their sulphonic acids to form valuable azo dyestuffs.—T. A. L.

Naphthacene and Intermediate Products; Manufacture of Derivatives of ——. F. Bayer and Co. Fr. Pat. 320,327, April 18, 1902.

When equimolecular proportions of α-naphthol and phthalic acid or phthalic anhydride are heated together with concentrated sulphuric acid, α-hydroxynaphthoylbenzoic acid is formed as an intermediate product, which is subsequently converted into hydroxynaphthacenequinone having the formula—



The reaction takes place at about 140° C., and is assisted by the addition of boric acid. The product crystallises from toluene in red needles, and on distillation with zinc dust yields naphthacene. If the sulphuric acid melt be carried to a higher temperature (220°—250° C.), until the presence of hydroxynaphthacenequinone can no longer be detected by means of the spectroscope, the resulting product is dihydroxynaphthacenequinone (iso-ethindiphthalide). The same derivative is obtained by fusing hydroxynaphthacenequinone with caustic potash. If in the above condensation the α-naphthol be replaced by the 1.4, 1.5, 1.8, &c. sulphonic acid, there are produced, according to the conditions of the experiment, either the products already mentioned or their sulphonic acids. Moreover, hydroxynaphthoylbenzoic acid is also formed by fusing with caustic alkali the so-called naphthophthalides, naphthofluorane, &c. obtained by condensing two molecular proportions of naphthol with one molecular proportion of phthalic acid or anhydride.—T. A. L.

Anthraquinone [Anthracene Dyestuffs] Derivatives: Manufacture of New ——. F. Bayer and Co. Fr. Pat. 320,481, April 18, 1902.

The 1.4-diamino- and the 1.4.5.8-tetramino-anthraquinone or their derivatives are obtained by the action of sodium sulphide or other suitable reducing agent on 1.4-nitro-amino-anthraquinone or 1.5.4.8- or 1.8.4.5-dinitro-diamino-anthraquinone or their derivatives. The nitro-acidyl compounds may also be employed, and subsequently hydrolysed, if necessary.—T. A. L.

Dyestuffs [Sulphide] for Unmordanted Cotton. Soc. Chem. Werke vorm. H. Byk. Fr. Pat. 320,369, April 12, 1902.

Nitrohydroxy- or aminohydroxy-diphenylamines are heated with sulphur and alkali sulphides in presence of iron salts or of metallic iron. The dyestuffs are said to give bluer shades than those obtained without the use of iron.—T. A. L.

Yellow, Yellowish-Orange, and Reddish-Orange Dyestuffs of the Acridinium Series. Cie. Par. de Coul. d'Aniline. Fr. Pat. 320,570, April 21, 1902.

The undermentioned bases or their leuco compounds, obtained by heating with dilute hydrochloric acid, tetra-aminoditolylmethane, dialkyl-tetra-aminoditolylmethane, or tetra-alkyl-tetra-aminodiphenylmethane, are heated in dilute aqueous solution in presence of hydrochloric acid and methyl or ethyl alcohol. The dyestuffs are precipitated from dilute aqueous solutions of their hydrochlorides by caustic soda, but not by ammonia.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Dyeing Process; The ——. A. Binz and G. Schroeter. Ber., 1902, **35**, [19], 4225—4229.

The chemical theory of dyeing in its usual form assumes that the fibre has the nature of an amino carboxylic acid, and is therefore capable of combining with either acid or basic substances. If this theory were correct, the affinity of dyestuffs would be a function of their salt-forming power —a consequence which leads to many difficulties and contradictions. For example, an acid group like SO_3H or CO_2H, when introduced alone into a chromogen, does not confer any marked dyeing property, while the much weaker salt-forming phenol-hydroxyl and amino-groups give rise to some of the fastest dyes.

In the experiments described, attempts were made to dye wool and silk with acid dyestuffs in presence of caustic soda and with basic dyestuffs in presence of hydrochloric acid—conditions which render impossible a combination between fibre and dyestuff of the character assumed in the ordinary theory. A simple chromogen, azobenzene, was selected and the compounds chosen contained only one kind of auxochrome or salt-forming group. In every experiment 5 grms. of wool were immersed for half an hour in 150 c.c. of a boiling 0·1 per cent. solution of the pure substance, and then well washed in a stream of water.

1. *Azobenzene Sulphonic Acids.*—These hitherto have generally been supposed to have little or no tinctorial power. The potassium salt of the di-*m*-sulphonic acid was prepared by reducing *m*-nitrobenzene sulphonic acid with zinc dust and alkali. In a neutral or alkaline bath it leaves the wool quite colourless, but the bath is quickly exhausted on the addition of the usual quantity of sulphuric acid (4 per cent. on the wool). *p*-Azobenzene mono-sulphonic acid, prepared by sulphonating azobenzene is also taken up in presence of acid. In both cases the wool is intensely coloured by the monosulphonic acid a fine golden yellow, by the disulphonic acid, a duller yellow. Soap or very dilute soda lye completely extracts these dyes from the wool at 25° C. The reversibility of the dyeing process in these cases suggests salt-formation.

2. *p-Hydroxyazobenzene* gives in acid, neutral or strongly alkaline solution a strong yellow dyeing. (It must be noted, however, that the caustic alkali attacks the wool.) In this case, therefore, salt formation, is, to say the least, doubtful.

3. *p-Aminoazobenzene* and *p-dimethylaminoazobenzene* dye wool in an alcoholic solution a strong yellow shade, but only in presence of acid, which may be increased to a very large excess without reversing the process.

4. *Di-m-aminoazobenzene* and *tetramethyl di-m-amino-azobenzene,* as hydrochlorides in aqueous or aqueous-alcoholic solution, give medium yellowish-red shades, but the wool remains colourless if the acid be increased to 6—10 molecules per molecule of base. Here, then, the process is quite different from that of No. 3, being reversible like No. 1.

Some of the experiments were repeated on silk, and even more marked results obtained.

The conclusion is that the groups NH_2 and $N(CH_3)_2$, when in the meta position to the azo group, confer, as does also the SO_3H group, a dyeing power which is only recognisable as a weak salt formation. But the dyeing process is quite different in character when it is determined by OH, NH_2, or $N(CH_3)_2$, in the para position.

Most, if not all, of the fast substantive silk and wool dyestuffs can be represented as quinone derivatives convertible by desmotropic change into the ordinary phenolic and aminic forms. On this hypothesis it is conceivable that the shifting OH or NH_2 from the para or ortho to the meta position in relation to the chromophor may destroy the true tinctorial character of the molecule and produce a substance which is only attached to the fibre by a salt-forming process, as in the case of sulphonic and carboxylic acids. The fast quinoid dyestuffs are probably fixed by a ring condensation between fibre and dyestuff, though salt formation may act here as a secondary factor.
—T. A. L.

Light on Dyed Colours; The Chemical Action of ——. D. Brownlie. J. Soc. Dyers and Colourists, 1902, **18**, [12], 288—297.

The influence of the constitution of a series of benzidine dyestuffs on their fastness to light has been examined by exposing cottons, dyed a 1½ per cent. shade, to light behind a glass window for seven days in summer. Of the 95 colours examined, 20 per cent. may be classed as "fast," 10·5 per cent. as "fairly fast," 15·8 per cent. as "not fast," and 53·7 per cent. as "loose." The rules which govern the influence of constitution on the fastness to light are:—(1) The diphenyl base plays no part in the action (2) Dyestuffs derived from phenol, its homologues and their sulphonic and carboxylic acids give fast shades. (3) Dyestuffs derived from hydroxybenzenes and their homologues containing more than one hydroxyl group give loose shades. (4) Dyestuffs derived from amines of the benzene series and their sulphonic and carboxylic acids give loose shades. (5) Dyestuffs derived from α- and β naphthylamines and their sulphonic acids give loose shades. (6) Dyestuffs derived from α- and β-naphthols and their sulphonic acids also give loose shades. (7) Dyestuffs derived from aminonaphthols and their sulphonic acids vary: those from 2 : 6 : 8 monosulphonic acid and from 2 : 3 : 6 : 8 disulphonic acid are fast, whilst those from 1 : 8 : 3 : 6 and 1 : 8 : 2 : 4 disulphonic acids give loose shades. (8) Dyestuffs derived from dihydroxynaphthalenes and their sulphonic acids agree with those derived from the corresponding aminonaphthols. (9) The replacement of an amino-group by a hydroxyl group results in increased fastness. (10) The salt-forming groups—SO_3H and CO_2H—cause no difference in the resistance to light; but the auxochromic groups—NH_2 and OH—play an important part in the action.

Mixed colours more or less follow the above rules, so that it is possible to predict the fastness of a benzidine colour from its constitution, with a fair amount of certainty.

In order to ascertain, if possible, the cause of the fading, 50 selected colours were compared with respect to their resistance to light, to oxidation by a N/50 neutral potassium permanganate solution, and to reduction by a sodium hydrosulphite solution. Dyestuffs derived from phenol and its homologues are fast to light and oxidising and reducing agents. Dyestuffs derived from phenols containing more than one hydroxy group give shades loose to light and varying from loose to fairly fast towards oxidising and reducing agents. Those derived from α- or β-naphthylamines give shades loose to light, fast to oxidising agents, and varying from loose to fairly fast towards reducing agents. Those derived from α- or β-naphthols give shades loose to light, fairly fast to oxidising agents, and loose to reducing agents. These results are too anomalous to be interpreted in favour either of the oxidation or the reduction theory. The dyed fabrics are not affected by light in a vacuum. In an atmosphere of nitrogen, hydrogen, carbon dioxide, sulphur dioxide, or coal gas, light has no effect. In nitrous oxide the action takes place just as in oxygen. In quite dry air or oxygen there is no action. The amount of water vapour in the atmosphere slightly affects the action. In an alkaline atmosphere (ammonia) the action is very considerably increased. Oxygen and water are essential, but the action does not appear to be due to ozone or hydrogen peroxide, although it is slightly accelerated when either of these is present. The addition of traces of alcohol or pyridine to the atmosphere causes an increase of the action to an enormous extent; chloroform and solvent naphtha slightly retard it.

The resistances of a number of colours to light, and to oxidising and reducing agents before and after coppering, were compared. In every case, after coppering, the colours were much faster to light, but as regards oxidation and reduction there was practically no difference in fastness.

Twenty colours were dyed an equal shade on cotton, oxycellulose, trinitrocellulose, jute, and silk, and in the case of wool, 48 colours were compared with cotton. No difference could be observed in the fastness when dyed on cotton, oxycellulose, trinitrocellulose, or jute. 84 per cent. of the colours showed no difference on silk, and 16 per cent. were slightly faster on this material. In the case of wool, 34 per cent. were much faster than on cotton, 36 per cent. were slightly faster, and 30 per cent. showed no difference.

It has further been noticed that solutions of direct cotton dyestuffs are considerably affected by sunlight.

The author combats the view that the change is produced by an interaction of the dyestuff with the cotton.—J. McC.

English Patents.

Wool from Imported Sheepskins; Method of Cleaning, Purifying, and Removing the ——. A. C. Granville and R. G. J. Rawlinson, Waltham Cross. Eng. Pat. 1421, Jan. 18, 1902.

The skins are softened for the cleaning or burring machine by allowing the flesh side of the skin to remain in contact with pieces of sacking soaked in a mixture composed of tungstate of soda, "sulphurosum" acid, and water. From the burring machine the skins are taken and treated on the flesh side with a compound made by heating together, in certain proportions, "sulphurosum" acid, sulphur, tungstate of soda, glycerin, caustic potash, salammoniac, and lime water. After remaining in a warm place for some time and then steaming, it is found that the wool is easily removed.—L. G. R.

Spent Iron Pickling or Cleaning Liquors or other Solutions containing Sulphate or Chloride of Iron; Treatment of ——, *for obtaining Sulphate or Chloride of Iron or other useful Products* [*"Black Liquor" for Mordant*] *therefrom.* F. B. Crossley. Eng. Pat. 7832, April 3, 1902.

See under X., page 31.

Finishing Textile Fabrics; Apparatus for ——. A. Heaton, Liversedge. Eng. Pat. 18,596, Aug. 25, 1902.

An improved machine for "decatising," *i.e.*, improving the lustre and handle of textile fabrics by forcing or drawing water, steam, or air through the material. The decatising roller is permanently fixed in the boiler, being revolved by worm gearing; access to the roller is obtained through a hinged lid in the side of the boiler. A specially constructed axle for the roller is also claimed, having for its object the removal of condensed steam from the interior of the roller in dry decatising.—L. G. B.

United States Patents.

Artificial Silk. H. S. Mork, Boston; A. D. Little, Brookline; and W. H. Walker, Newton, Mass., Assignors to Chemical Products Co., of Boston, Mass. U.S. Pat. 712,200, Oct. 28, 1902.

Filaments of sufficient tenuity and strength to permit of their use as artificial silk, which are stated to be waterproof, are obtained from the cellulose esters of organic acids, and particularly from cellulose tetracetate. Various softening agents, as oleic acid, acetylated castor oil, thymol, phenol, &c., may be incorporated with these. (See also U.S. Pat. 709,922; this Journal, 1902, 1345.)—E. B.

Artificial Silk; Manufacture of ——. H. Bernstein, Philadelphia, Pa. U.S. Pat. 712,756, Nov. 4, 1902.

Filaments, produced in the usual manner, from a solution of 6½ parts of gelatin in 3 parts of the liquor resulting from the boiling-off of raw silk, are twisted into threads and treated with formaldehyde vapour. The soap in the liquor "unites with the other ingredients and adds pliability" to the product.—E. B.

Lustrous Yarns; Machine for Manufacturing ——. A. Le B. d'Asson and J. Stoerk, Brussels, and G. Dubois, Tubize, Assignors to A. de B. d'Asson, Brussels, Belgium. U.S. Pat. 713,360, Nov. 11, 1902.

To ensure the production of filaments of uniform thickness, and hence the manufacture of yarn of regular quality, from suitable viscous solutions, a filter of special construction, with a large surface and working at a low pressure, is employed in connection with a tube provided with special filament-forming cocks instead of the long capillary tubes hitherto used. The yarn obtained from the elementary threads thus produced, is wound in uniform quantity upon bobbins by means of special apparatus.—E. B.

Ramie, China-Grass, or other Fibrous Material [*Ungumming*]; *Treating* ——. C. Masse, Rantigny, France, Assignor to La Société Française de Ramie, Paris. U.S. Pat. 711,577, Oct. 21, 1902.

See Eng. Pat. 11,858, 1901; this Journal, 1901, 985.
—E. B.

Mercerising Apparatus. P. Hahn. Niederlahnstein, Germany. U.S. Pat. 711,623, Oct. 21, 1902.

See Fr. Pat. 316,963; this Journal, 1902, 1133.—E. B.

Indigo-Vats; Process of Preparing ——. A. W. Playne, Stroud, England, Assignor to L. W. Macdonald, Isle of Skye, Scotland. U.S. Pat. 715,213, Dec. 2, 1902.

Zinc dust mixed with bisulphite of soda is treated with alkali and the whole boiled, the resulting clear liquor is decanted off into the dye-vat, below the surface of the hot water already in the vat. Some of the liquor from this vat is removed and mixed with the finely-ground indigo paste, and after straining, is returned to the bath, which is now brought to the boil; after cooling by the addition of cold water, the vat is ready for use.—L. G. R.

Acid Colours [*Blacks*]; *Dyeing* ——. C. Engau, Assignor to L. Cassella and Co., Frankfort-on-the-Main, Germany. U.S. Pat. 711,953, Oct. 28, 1902.

In imitation of Logwood Black dyeings upon woollen and mixed cotton and woollen tissues, these are treated first with black naphthalene disazo dyestuffs and tannin matters, *e.g.*, Sumac extract, and then with metallic salts, *e.g.*, copper sulphate and ferrous sulphate. The cotton in mixed tissues composed of cotton and wool is preferably dyed black with direct cotton dyestuffs, which are capable of withstanding cross-dyeing, before dyeing both fibres as described.
—E. B.

Dyeing Enveloped Yarns. S. W. Wardwell, Providence, R.I. U.S. Pat. 712,987, Nov. 4, 1902.

See Eng. Pat. 3,422 of 1902; this Journal, 1902, 1025.
—E. B.

Bleaching, Dyeing, &c.; Apparatus for ——. J. Failenschmidt, Mülheim-on-the-Ruhr, Germany, Assignor to C. Roesch and Co., Ltd., Duisburg, Germany. U.S. Pat. 713,755, Nov. 18, 1902.

See Eng. Pat. 26,155, 1901; this Journal, 1902, 473; also Fr. Pat. 312,424; this Journal, 1902, 342.—E. B.

Coloured Designs on Textile Goods [*Carbonising*] ——. A. and H. Barraclough, Halifax. U.S. Pat. 713,837, Nov. 18, 1902.

See Eng. Pat. 20,401 of 1901; this Journal, 1902, 546.
—E. B.

Glossing Yarn; Process of ——. J. H. Ashwell, Nottingham. U.S. Pat. 713,936, Nov. 18, 1902.

See Eng. Pat. 19,912 of 1901; this Journal, 1902, 1393.
—E. B.

French Patents.

Filaments from Cellulose Solutions; Process for Manufacturing ——. E. Thiele. Fr. Pat. 320,446, April 16, 1902.

See U.S. Pat. 710,819; this Journal, 1902, 1393.
—J. F. B.

Textile Threads; Manufacture of ——, *from Short Fibres, particularly from Paper Pulp.* A. Leinveber. Fr. Pat. 320,529, April 21, 1902.

Paper as it comes from the machine is slit longitudinally into a number of narrow strips. These strips are separated, moistened, rubbed between rollers, and delivered into metal pots containing a core in the centre. The pots may be caused to revolve, and may be perforated in order to obtain the correct amount of moisture in the fibres by the introduction of air or steam through the cores. From the pots the strips are delivered to a spinning apparatus. The metal pots may be replaced, if desired, by a funnel-shaped spiral wire or by a funnel containing a solid core.—J. F. B.

Decoration of Unbleached Silk, Pure or Mixed, and Cotton, Pure or Mixed; Process for ——. J. Cadgène. Fr. Pat. 319,342, March 10, 1902.

Combined matt and brilliant effects are produced by passing the material through a solution of caustic soda after having previously printed it with a special mastic not affected by this. The brilliant effects are then obtained by the mercerisation of the non-printed parts and the matt effects appear on the printed parts.—J. McC.

Viscose on Textile Fabrics; Process for Fixing ——. A. Fielding. Fr. Pat. 320,178, April 12, 1902.

See U.S. Pat. 708,761; this Journal, 1902, 1230.
—J. F. B.

Impregnation [*Tissues, &c.*]: *A Process of* ——. Hulsberg et Cie. Fr. Pat. 319,758, March 19, 1902.

See Eng. Pat. 6844, 1902; this Journal, 1902, 1028.
—J. McC.

Colour in Textiles; Process for Hindering the Production of, and effecting the Removal of ——. E. Knecht. Fr. Pat. 319,543, March 13, 1902.

See U.S. Pat. 702,566, and Eng. Pat. 9847, 1901; this Journal, 1902, 969 and 1025.—J. McC.

Dyeing on Cloths; Impts. in [*Resist*] ——. Englische Wollen - Waaren - Manufactur (formerly Oldroyd and Blakeley). Fr. Pat. 319,652, March 15, 1902.

A resistant impression is produced by means of an agglutinate formed by fusing resin, caoutchouc, or gutta-percha, or the substance obtained by the transformation of drying oils, or *rhusol* (from the sugar of *Rhus vernicifera*). These may be used singly or mixed.—J. McC.

Sulphur Dyestuffs; Process for the Direct Production on Textiles of ——. Actien-Gesellschaft für Anilinfabr. Fr. Pat. 319,876, March 22, 1902.

The process of producing sulphur dyestuffs direct on the fibre consists in printing the cottons with solutions containing alkali polysulphides and certain aromatic compounds, and then, after drying, in steaming the material. The aromatic substances used are:—Dinitrophenol, nitro-aminophenol, *p*-aminophenol, *o*-*p*-dinitro-hydroxydiphenylamine, *o*-*p*-nitroamino-p^1-hydroxydiphenylamine, *o*-*p*-diamino-p^1-hydroxydiphenylamine, and *p*-dimethylamino-p^1-hydroxydiphenylamine.—J. McC.

Printing with Sulphur Dyestuffs; Process of ——. Fabriques de Produits chimiques de Thann et de Mulhouse. Fr. Pat. 319,504, March 11, 1902.

The sulphur dyestuff is produced without the aid of alkali sulphides, but by means of a mixture of sulphur and alkali carbonate, in presence of a reducing agent, if need be, with subsequent steaming. The advantage of the process is that when the colour is used in printing the copper rollers are not attacked.

The colours may be reserved by reserve acids or by soluble salts of the metals.—J. McC.

Striping Tissues; Machine for ——. J. Kean. Fr. Pat. 319,587, March 18, 1902.

The machine consists of a trough divided into as many compartments as there are colours to be used, and each provided with an orifice of dimensions corresponding with the size of the required stripe. The cloth is drawn along under this trough, and if a wavy effect be desired, a transversal motion can be given to the cloth.—J. McC.

Tapestries, Printed and Painted; Process for making ——. J. S. Schmitz. Fr. Pat. 319,631, March 15, 1902.

Designs or the basis of designs are printed in different colours and varied tones on cloth or paper, and the material is then filled in with a transparent colour in such a way that, after its application, the colours of the design show through.—J. McC.

Steaming, Oxidising, Drying, or otherwise Treating Threads or Textiles; Machine for ——. J. W. Fries. Fr. Pat. 319,725, March 18, 1902.

See Eng. Pat. 6661, 1902; this Journal, 1902, 1392.
—J. McC.

VII.—ACIDS, ALKALIS, AND SALTS.

Manganese Aluminate. F. Dufau. Comptes Rend., **135**, [22], 963–964.

Ebelmen, in 1847, by heating manganese oxide and alumina with boric acid, obtained a blackish brown mass, full of cavities containing brown triangular crystalline plates, which he assumed, without analysis, to be $MnO.Al_2O_3$. The author has obtained, by heating a mixture of manganese oxide and alumina in the electric furnace, a similar black-brown mass, which left, on treatment with hydrochloric acid, a bright yellow crystalline powder, which analysis shows to be the manganese aluminate formulated above. The crystals are modified octahedra: the substance is harder than quartz, and has a density of 4·12. It is a very stable substance, and only oxidises superficially when heated; but it is readily attacked by nitric, hydrofluoric, or sulphuric acid, or by fusion with alkali hydroxide, carbonate, nitrate, or chlorate.—J. T. D.

English Patents.

Sulphuric Acid or the like; Concentration of ——. S. Dreyfus and the Clayton Aniline Co., Ltd., Manchester. Eng. Pat. 788, Jan. 10, 1902.

In concentrating sulphuric acid or similar liquids, the weak acid vapours are conducted, without suction, so that they come in contact with the acid to be concentrated, heating this acid to such a limited extent that from it is evolved only water or very weak acid. This is done by leading the vapours into the lower part of a tower containing acid-proof packing, down which the acid to be concentrated runs.—J. T. D.

Hydrosulphurous (Hyposulphurous) Acid and Hydrosulphites; Mixture capable of Giving off, by Treatment with Water ——. B. J. B. Mills, London. From A. Lumière et ses Fils, Lyon-Monplaisir, France. Eng. Pat. 1116, Jan. 15, 1902.

See Fr. Pat. 317,569, Jan. 7, 1902: this Journal, 1902, 1395.—J. T. D.

Oxygen Gas; Apparatus for Producing ——. W. C. Hughes, London. Eng. Pat. 21,242, Sept. 30, 1902.

A flexible cylindrical gas bag, secured to the floor of a containing box, is attached on its upper surface to a vertically movable platform, connected by spiral contractile springs to the floor. The platform carries a retort supported on standards, charged with oxygen-producing blocks, spaced from one another by metallic devices; also a vessel containing water, to the bottom of which a tube passes from the retort, conveying the gas, which issues from its upper part to pass through a flexible tube to the gas bag. A lamp, supported on guide rails under the retort, is provided with mechanism whereby it is automatically moved from end to end of the retort, as the platform rises by inflation of the bag, so that the flame is brought successively under each of the oxygen-producing blocks.—E. S.

United States Patents.

Nitre Cake; Recovery of Free and Combined Acids of ——. L. Cheeseman, Sen., Assignor to P. Agnew, A. H. Agnew, and M. B. Harlow, of Alexandria, Virginia. U.S. Pat. 714,145, Nov. 25, 1902.

The nitre cake is dissolved in water, the free acid neutralised, and the iron precipitated by adding lime, thus forming a "land-plaster" for manurial purposes. The neutral sodium sulphate solution run off from this is used to manufacture "blanc fixe" by precipitating with barium hydrosulphide solution.—J. T. D.

Bromine; Extraction of —— *from Brine.* H. H. Dow, Assignor to the Dow Chemical Co., Midland, Mich. U.S. Pat. 714,160, Nov. 25, 1902.

A main and an auxiliary system. In the main system the brine flows into an "oxidiser" in which the bromides are oxidised, though incompletely. The liquor flows from the oxidiser through a series of "blow-out towers," where a current of air deprives it of the free bromine and chlorine it contains. The brine then goes to the auxiliary system, where it is farther (and completely) oxidised, and after having had the bromine and chlorine "blown out" from it runs to waste. The circulating current of air in the main system passes from the blow-out towers through a series of "purifiers," in which it meets with brine, which removes nearly the whole of the chlorine. The brine from the purifiers goes through the oxidiser with the rest. The air next passes through a second purifier containing a strong solution of bromide, which completely removes the chlorine, and then enters the absorber, containing some substance which extracts from it the bromine in a form in which it can be worked up. The circulating air in the auxiliary system passes from the blow-out towers there to a purifier supplied with fresh brine; this, owing to the hydrogen sulphide and other reducing substances which it contains, completely removes the chlorine and bromine from the circulating air, which then passes on to the blow-out towers again, while the brine passes to the brine-reservoir of the main system.—J. T. D.

Soda Alum; Making ——. J. F. White, Buffalo. U.S. Pat. 714,846, Dec. 2, 1902.

To a hot solution of nitre cake, bauxite or other aluminous mineral is added, with afterwards sufficient aluminium sulphate to form the alum. The cleared solution, after oxidation, if necessary, of any ferrous salt, is boiled to a syrupy consistence, and run on to plates to cool. The cake is then calcined, ground, and finished in the usual manner.
—E. S.

Magnesium Sulphate; Making ——. H. H. Wing, New Brighton, N.Y. U.S. Pat. 714,984, Dec. 2, 1902.

Magnesium hydroxide or other suitable magnesium compound, is subjected in the presence of moisture, to the action of fumes (which may be dilute) containing sulphur dioxide and air. Magnesium sulphate may be dissolved out of the product, leaving the insoluble magnesium sulphite, which is afterwards oxidised into sulphate, or the mixture of the salts may be oxidised. Of the magnesium sulphate thus produced, a portion is added to a solution of calcium chloride; the calcium sulphate precipitated is separated, and milk of lime is added to the resulting magnesium chloride solution, whereby magnesium hydroxide is precipitated, leaving calcium chloride in solution. (See also U.S. Pats. 712,225 and 712,226; this Journal, 1902, 1534.)—E. S.

French Patent.

Sodium Peroxide; Preparation of Hydrated ——. Bauer. Fr. Pat. 320,321, April 10, 1902.

Sodium peroxide is mixed with six or eight times its weight of crushed ice or snow; the temperature rapidly falls to the cryohydric point, and there is no danger of decomposition. Small white crystals are formed, having the composition $Na_2O_2.8H_2O$, which are separated by means of alcohol and dried.—J. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

Stoneware Slips or Engobes. S. Geijsbeek. Trans. Amer. Ceramic Soc., 1902, **4**, 48—60.

Engobes or slips are natural clays or clay mixtures used for covering clay bodies and for concealing their colour, and may serve as ground layers in decorated articles. Under the name "coloured slips" they are extensively used in art ottery, especially by terra-cotta manufacturers. Engobes nay be white, viz.: mixtures of pure white burning clay naterials, or coloured, either naturally or artificially; the ormer are generally used for stoneware, and the latter for rt-ware. They may be applied by dipping or spraying, and an be covered with a glaze or may form a vitrified coating. A good white engobe clay should have a certain degree of lasticity, should burn white, and should adhere to another lay so as to yield a uniform coat, when applied as a thin lip, and should have the same shrinkage as the clay to which it is applied. Some white engobe clays exist in Germany, but the author has not found any in America. Ball clays may be used for coloured engobes, combined with rdinary underglaze colours.

The author experimented with a washed stoneware clay, of which the rational analysis was :—

	Per Cent.
Clay substance	66·54
Felspar	2·46
Flint	31·02

and Florida kaolin as a basis, but as this shrunk more than he clay, the addition of non-plastic material to it was tried. From the experiments, the best result was obtained with the following for a "white lining" or engobe for stoneware, in which body, engobe, and glaze are completed in one burning—

	Per Cent.
Florida kaolin, raw	35·0
,, ,, calcined	34·5
Brandywine felspar	10·0
Commercial whiting	15·0

Engobe glazes should have a low solvent power, and those rich in alumina and silicic acid are suitable; those which require a high temperature for "finishing" dissolve too much of the body of the article.

For Colchester and Tennessee clays, of the Western States, the author found the following engobe suitable :—

	Per Cent.
Florida kaolin	32·5
Graham kaolin	37·5
Brandywine felspar	20·0
Commercial whiting	10·0

—W. C. H.

Stoneware Glazes. R. C. Purdy. Trans. Amer. Ceramic Soc., 1902, 4, 61—78.

The glazes used for American stoneware, which is a lower grade of ware than is usually so designated in Europe, are classified as :—I. Salt Glazes. II. Slip Glazes. III. Bristol Glazes, clear, white, and coloured; and the present paper is an investigation of white Bristol glazes, composed essentially of silicates of the alkalis, alkaline earths and alumina, applicable to green ware, and capable of being burnt in open fire with slip glazes. The best glazes had an oxygen ratio of 1 : 2 or 1 : 2·5, and a silica alumina ratio of 1 : 5 or 1 : 7. In Bristol glazes, alumina is intermediate between fluxes and the acid and regulates shrinkage; about 0·55 of an equivalent, however, induces crawling and the formation of pinholes. Potash is the general alkali flux in these glazes; zinc oxide both acts as a flux and causes opacity, when present above 0·35 of an equivalent. The lime is obtained by the addition of whiting, and assists the opacity. The following formula was arrived at from these experiments, when used at cone 6 :—

$$\left.\begin{matrix}0·5\ K_2O\\0·4\ ZnO\\0·1\ CaO\end{matrix}\right\}0·55\ Al_2O_3\left\{3·30\ SiO_2\right.$$

Crawling of the glaze may be due to too high a proportion of Al_2O_3 or ZnO, or to too thick a dipping, to dusty ware, or to sweating in drying or early stages of the burning, due to imperfect ventilation of the kiln, or to injudicious stacking close to larger articles, in order to save kiln space. As an antidote to crawling, either borax, sodium carbonate, or plaster of Paris slip is used, the effect possibly being due to crystallisation of the soluble salts, which thus exert a binding influence.

Pinholes, due to the bursting of air-bubbles formed during dipping, are often caused by imperfect finishing of the ware.

Dryness, a third common defect in Bristol glazes, may be due to raising the heat too rapidly in the early stages of burning, or to too much or too little SiO_2.

Dusting may be prevented by the use of ball clay, or borax in place of plaster slip, or the use of plaster of Paris before it has had time to harden.—W. C. H.

Clay Mixtures; Bacterial Growth as a Factor in Ageing ——. E. C. Stover. Trans. Amer. Ceramic Soc., 1902, 4, 183—188.

The proper ageing of clay mixtures greatly increases plasticity, and lessens cracking in drying and firing. The author attributes the effects to the re-adjustment of affinities in the batch, and finds that the change is brought about by bacterial action. The predominating species found in clay mixtures is believed to be *Bacillus sulphureum* (or *proteus sulphureus*) which produces sulphuretted hydrogen gas, and develops well at 37°—38° C. In a fresh mixture allowed to stand in the slip state, the fermentation will be complete in six to twelve weeks, according to temperature, &c., but if inoculated with organisms, the change is complete in two to four weeks under the same conditions.

—W. C. H.

Clay; Relation between the Constitution of a ——, and its Ability to take a good Salt-glaze. L. E. Barringer. Trans. Amer. Ceramic Soc., 1902, 4, 211—229.

Clays with a molecular ratio of alumina to silica varying from 1 : 4·6 to 1 : 12·5 were capable of taking a good salt glaze. It was also found that a soda-lime glass can be made in which alumina partly or entirely replaces the lime, and that alumina and silica may vary between wide limits in glasses. From these points it is probable that the composition of the salt-glaze on different clays varies with the composition of the clay. It was found, by efflorescence tests, that soluble salts up to 3 per cent. may be present in clay without seriously affecting the salt glaze, when the process is carried out at a temperature corresponding to cone 8.—W. C. H.

Porcelain for Electrical Purposes; The Composition of ——. A. S. Watts. Trans. Amer. Ceramic Soc., 1902, 4, 86—130.

The object of the investigation was to arrive at the proportions of the essential constituents of the best insulating porcelain, which should possess high efficiency as a non-conductor, should withstand, without snapping, all ordinary strains due to wiring, and should resist missiles, even bullets. To cover these points, electrical, tensile and abrasion tests were carried out on the porcelains tested.

Specimens with a high silica and moderately low alumina content stood the electrical resistance tests best, and when the proportion of potassium oxide is larger than that of the lime. However, with potassium oxide alone, the porcelain was brittle.

With potassium oxide alone as a flux, even in presence of a considerable amount of clay, the porcelain is brittle and weak, but tough and well vitrified when even 20 per cent. of the potassium oxide is replaced by lime, though the translucency is apparently reduced. The silica and alumina contents affect abrasion little; but specimens with a moderately high content of silica seemed to chip more easily than those with a very high content of silica, and those with a very low content of silica were easily abraded.

Six of the 49 specimens tested were more or less porous. It is noted that lime substituted for an equivalent of potassium oxide does not produce at temperatures corresponding to cones 6, 9, and 12 an equal amount of vitrification. Practically the same limits hold here as in the tensile tests given below.

In the tensile tests the best results were given with a moderately high silica and alumina content, but the ratio should not be over $1Al_2O_3 : 6·2\ SiO_2$. The best proportion of the RO constituent was between—

$$\left.\begin{matrix}40\text{ per cent. }K_2O\\60\text{ per cent. }CaO\end{matrix}\right\}\text{ and }\left\{\begin{matrix}80\text{ per cent. }K_2O.\\20\text{ per cent. }CaO.\end{matrix}\right.$$

The amount of clay substance introduced, the variation in the kind of flux used, and the amount of silica present, all influence the shrinkage.

The author considers that an ideal electrical porcelain may be matured at any temperature between those corresponding to cone 6 and cone 12 respectively, with a composition expressed by the formula :—

$$\left.\begin{matrix} 0\cdot5 \text{ to } 0\cdot8\ K_2O \\ 0\cdot5 \text{ to } 0\cdot2\ CaO \end{matrix}\right\} 0\cdot8 \text{ to } 1\cdot0\ Al_2O_3 \left\{ 1\cdot2 \text{ to } 6\cdot2\ SiO_2.\right.$$

—W. C. H.

Ceramics ; Use of Lead Ores in ——. H. A. Wheeler. Trans. Amer. Ceramic Soc., 1902, **4**, 131—136.

The usual lead compounds employed in raw glazes, frits, or glasses to obtain low fusing points, or soft enamels, or a highly vitreous lustre are the oxides, litharge (PbO), minium (Pb_3O_4) and basic carbonate or white lead, artificial products which often contain less than one per cent. of impurities, but are expensive and liable to cause lead poisoning. To meet the requirements of ceramic work, sufficiently pure natural ores can be obtained, and successfully substituted for the artificial products. The ores are, cerussite (carbonate), anglesite (sulphate), and galena (sulphide), and the latter two are said to be free from poisonous effects, and on this account are strongly recommended, and where a sufficiently pure natural sulphate cannot be obtained, the artificial sulphate should be used, as it is non-poisonous, and is preferable, if not essential in crucible work.—W. C. H.

Ceramic Fluxes ; Tin Oxide in ——. S. G. Burt Trans. Amer. Ceramic Soc., 1902, **4**, 139—145.

The main object of the experiments was to determine whether any stannic oxide is soluble in a glaze, and not only held in suspension, as is generally believed to be the case. A certain percentage of stannic oxide was found to be soluble in a glaze, and as sodium stannate is soluble in borax, it is suggested that a super-saturated solution of this, added to a frit under proper conditions, might give satisfactory results.—W. C. H.

Mica in Ceramic Bodies ; Fluxing Power of ——. R. T. Stull. Trans. Amer. Ceramic Soc., 1902, **4**, 255—269.

The mica in these experiments was ground as fine as the felspar to ensure equal conditions of fusibility and chemical activity.

Contrary to the opinion of the majority of ceramists, the author finds—

(1) Mica, if fine enough, is plastic, and so need not diminish the plasticity of the clay.

(2) Mica, if fine enough, exerts a fluxing action on kaolin and ceramic mixtures at temperatures below that of cone 4.

(3) Mica alone, when in an extremely fine powder, vitrifies sufficiently to produce a non-absorbent body, below the temperature of cone 4.

Some observers have found grains of mica unchanged in ware after passing the biscuit fire, but substances present in coarse grains do not lose their identity, even when the mass is vitrified so as to be non-absorbent; and to be an efficient flux the substance must be finely divided and uniformly distributed through the mass.—W. C. H.

Chromium-Tin Pink ; Constitution of ——. W. A. Hull. Trans. Amer. Ceramic Soc., 1902, **4**, 230—254.

It was found that the quantity of lime and silica used in the frit may vary widely, and that the colour of the frit is not a sure indication of the colour which it will produce in the glaze. The best colours in these experiments were produced by frits containing no silica, probably because the other constituents were present in larger proportions and had therefore greater colouring power. Almost any combination of tin with a very small proportion of chromium, together with some lime or silica, appears to make a frit that produces a good pink-coloured glaze of the type RO, 0.2 Al_2O_3, 2.0 SiO_2, provided the ratio of lime to the alkalis in the glaze is high, and the lead does not exceed 0·4 equivalent and the boric acid does not exceed 0·6 equivalent. A high temperature is necessary to develop a frit that will produce a pink glaze, but the colour of the frit changes at a comparatively low temperature. The contents of lime and silica have a marked effect on the colour of the frit, but a frit with silica and no lime produces a glaze similar in colour to that developed by a frit with lime and no silica. On the other hand a glaze too low in either silica or lime is detrimental to the colour.—W. C. H.

Glazes ; Note on the Development of Greens from Cupric Oxide in ——. F. W. Walker. Trans. Amer. Ceramic Soc., 1902, **4**, 278—292.

The experiments show that any proportion of silica and boric acid can be used, but alumina should not exceed 0·25 equivalent, unless a yellow tint is required, and not more than 0·30 equivalent of any one base of the RO elements for the best effects. The quantity of CaO does not affect the colour produced from copper, but K_2O gives a yellow tint, and must not exceed 0·15 equivalent when combined with Na_2O or PbO. The colour becomes deeper with an increase of ZnO, combined with which as much as 0·30 equivalent of K_2O may be used; with Na_2O, the ZnO deepens but changes the colour, and also with BaO. The barium-zinc glaze has a blue shade when combined with Na_2O or K_2O, but chrome green with PbO. A more marked effect is produced by 0·15 equivalent of ZnO than by the same amount of any of the other bases. A clear deep green is produced by 0·30 equivalent of PbO combined with 0·45 equivalent of CaO and 0·15 equivalent of one of the other bases, but PbO loses its controling power when the CaO is reduced. Replacement of lime by magnesia retards the fusion.—W. C. H.

English Patent.

Glass Plates ; Joining —— [*Electric Heating*]. B. M. Drake and J. M. Gorham, London. Eng. Pat. 25,756. Dec. 17, 1901.

The claim is for the use of a refractory wire in a glass tube placed at the junction of glass plates which it is required to weld together, the plates being heated in an oven, and the local heat required at the junction being generated by the passage of an electric current.—E. S.

United States Patents.

Glassware ; Machine for making Hollow ——. G. C. Pyle, Indianapolis, Ind. U.S. Pat. 714,396, Nov. 25, 1902.

This refers to improvements in the construction of machines for making hollow glass articles. The whole of the work is done automatically except that of charging the machine with glass and removing the finished articles therefrom. The U.S. patents on which the improvements are made are 647,276 and 650,555 of 1900, and 668,858, 672,987, and 675,166 of 1901.—W. G. M.

Muffle Furnace [*for Glass*]. E. Geille, Brussels. U.S. Pat. 714,473, Nov. 25, 1902.

See Eng. Pat. 20,998, 1901 ; this Journal, 1902, 1330.

—E. S.

Glass-melting and Mould-charging Apparatus. H. H. Bridgwater and J. Haley, Akron, Ohio, Assignors to the Akron Glass and Machinery Co. U.S. Pat. 714,558, Nov. 25, 1900.

Glass or glass-making materials are charged into a hopper at one end of a gas- or oil-fired furnace, and are fed into the melting pot continuously by means of a screw conveyor. A constant stream of molten glass is run out of each of the two opposite corners by a spout provided with a heating jet that may be used at will. Beneath each spout is a circular table rotated intermittently. Moulds are placed on the table near the circumference and are so supported by carriers passing through the table (and free from it), that when they severally come under the furnace spout, they rest on one arm of a balance, which carries at the other end a counterpoise corresponding to the weight of charge required for the mould. Between the spout and the mould is a pair of bowl-shaped shears with the cutting edges at the lower edge of the horizontal bowl. These shears are so actuated that when the mould is full the shears close and the table rotates until the next mould comes underneath the spout, the glass running from the furnace in the meantime being collected in the closed shears.—W. G. M.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Sand Stone; Manufacture of Artificial ——. S. V. Peppel. Trans. Amer. Ceramic Soc., 1902, **4**, 156—182.

Sand brick is a mass of sand particles bound together by calcium carbonate, or calcium hydrosilicate, or a mixture of both. The raw materials are sand or a granular silicate, and lime (either a high calcium or a dolomite lime). The finished products may be sand brick with (1) exclusively carbonate "filler" or binding material; (2) partly carbonate and partly silicate filler; or, (3) hydrosilicate filler. Of these (1) obviously would be weaker than the others in which there is a chemical union between the sand and the filler. The hardening, due to absorption of CO_2 by the calcium hydrate, may be effected by mere exposure to the atmosphere, or to an atmosphere rich in CO_2, with or without pressure. In (2) the hardening is effected in a moist atmosphere saturated with CO_2, at a temperature of 60°—70° C.

The author considers the third class—with hydrosilicate filler—the most important. The sand should be comparatively pure, made up of medium coarse and some very fine grains, and, preferably, with thin sharp corners, which promote the chemical combination. The lime must be properly burnt, in order to slake satisfactorily; fat lime is, perhaps, the best, but dolomite lime is satisfactory, if properly slaked. One of the following methods is used, prior to hardening.—(1) Wet slaking process, *i.e.*, slaking the lime to a fat putty; (2) Dry slaking, *i.e.*, slaking the lime with just enough water, so that the heat of the reaction dries the finished hydrate; (3) Acid slaking, in which 5—10 per cent. of hydrochloric acid, 19° B., is added to the lime after slaking has begun. In the fourth process, quicklime and sand are mixed and then sufficient water added to render the mass fit for the press.

The hardening is effected either by low-pressure steam with long exposure, say, 2 atmospheres for 72 hours, or high pressure for a short time, say, 8—10 atmospheres for 6—10 hours.

The proportion of lime varies from 5 to 10 per cent., and of water, above that used for hydration, from 7 to 9 per cent.

With regard to the quality of these products, the author gives results of crushing tests, &c. made on the bricks dry, after soaking in water, and, after freezing, according to which they appear satisfactory for building purposes and are fire-resistant, besides being hard, uniform, cheap, &c. The paper concludes with details of the equipment necessary for manufacture, and cost of plant and production.

—W. C. H.

Plaster; Hardening ——. Pharm. J., 1902, **69**, [1693], 602.

If plaster of Paris be mixed with a solution of boric acid to which some ammonia has been added, instead of with water, the set plaster is stated to be more resistant to "weathering." Ammonium borate solution may also be painted over stucco articles, in order to harden their surface.—A. S.

Clay; Plasticity of ——. B. Zschokke. Bull. de la Soc. d'Encourag. pour l'Ind. Nat., 1902, **101**, [5], 619—658.

A long article, copiously illustrated, in which the author first reviews the literature of the subject, and gives a short summary of Rejto's work on the internal friction of solid bodies, in so far as it bears on the plasticity of substances. He then treats of the plasticity of clay under the headings:—(1) Resistance to deformation; (2) Cohesive power; (3) Cause of plasticity. The results of the numerous experiments are briefly summed up in the following conclusions:—Plasticity is the property of a body, possessing as perfect cohesion as possible, for undergoing considerable permanent deformation under the action of exterior force, without the deformed body showing any alteration of cohesive power as compared with the original material. The causes of the plasticity of clay are intimately connected with its pronounced absorptive power, and the mutual attraction between the clayey material and the water used in mixing. The great absorptive power is due partly to the extreme fineness of the individual particles of the clay and partly to a chemical or physical affinity of the argillaceous substance for water.—A. S.

Clay; Note on the Relative Point of Dehydration of Pure and Calcareous ——. W. M. Kennedy. Trans. Amer. Ceramic Soc., 1902, **4**, 146—155.

Experiments were made on two series of briquettes, one of Florida kaolin and the other of a mixture of 70 parts of Florida kaolin and 30 parts of whiting. The experiments were conducted in a muffle in a down-draught kiln, and the temperatures taken with a Le Chatelier pyrometer. Briquettes from each series were taken out at various times, weighed, and the percentage loss calculated. With the kaolin briquettes a very slight loss occurred at 150° C., and very little up to 450°, from which up to 600° the loss was rapid, and fell off again between that and 725°, which temperature was maintained for 12 hours to observe the effect of "heat soaking," which was very slight. Practically, no further loss occurred up to 1,000° C. Hence the dehydration occurs mainly between 450° and 600°. With the kaolin-lime briquettes very slight losses occurred up to 450°. From 475° to 600° the rate of loss corresponds very nearly with that of the kaolin briquettes; losses beyond the temperature of 600°. are due to the expulsion of CO_2 gas, which is rapid up to 725°, and a considerable loss occurred during the heat-soaking for 12 hours at this temperature, and another rapid loss occurred between 850° and 900°. Consequently, the CO_2 in these briquettes, containing 30 per cent. whiting, prolongs the dehydration up to 900° C., and the heat-soaking does not drive off all the CO_2.

—W. C. H.

Portland Cement Industry; The ——. E. Candlot. Bull. de la Soc. d'Encourag. pour l'Ind. Nat., 1902, **101**, [5], 589—618.

A monograph on the Portland cement industry, including descriptions of the method of preparing the raw material, roasting it, and grinding the finished cement, together with illustrations of the principal forms of apparatus. Some statistics relating to the Portland cement industry are also given. The total production of the world may be estimated at 7,000,000—8,000,000 tons, of which 2,500,000 tons are produced in Germany, 1,500,000 tons in England, 450,000 tons in France, nearly 1,000,000 tons in Russia, 50,000 tons in Belgium, and a total of 400,000—500,000 tons in Switzerland, Austria, Denmark, Sweden and Norway, Roumania, and Italy. It is difficult to ascertain the exact production of Portland cement in the United States, but it certainly is not less than 1,000,000 tons.—A. S.

Portland Cement; Influence of Sea-water on Hydraulic Materials, particularly on ——. A. Meyer. Buletinul Societăţii de Sciinţe Bucuresci, **11**, 432—448. Chem. Cent., 1902, **2**, [22], 1368.

On contact with sea-water, the strength of cement is at first increased, but subsequently decreases gradually. In fresh water, the strength remains constant. Of the salts present in sea-water, magnesium and calcium sulphates have the greatest influence; then follow the chlorides and bicarbonates of the alkaline earths. Magnesium sulphate reacts with the tricalcium silicate in the cement with the formation of magnesium hydroxide and calcium sulphate. Calcium sulphate acts on the $Al_2O_3 . xCaO . aq$ in the cement.

and forms $Al_2O_3.3CaO.3CaSO_4+26{\cdot}5H_2O$, with a considerable increase of volume, thereby causing cracks in the cement. When free lime is no longer present, the $Al_2O_3.3CaO.3CaSO_4 + 26{\cdot}5H_2O$ reacts with magnesium salts, with the formation of aluminium and magnesium hydroxides, calcium sulphate, and calcium chloride. To avoid these reactions it is necessary to use a cement which is, as far as possible, impermeable, and which must, consequently, contain only the smallest practicable proportion of alumina.

For examination of cements as to their applicability for marine structures, the author recommends mixing samples with increasing amounts of gypsum, with and without the addition of sand, and forming briquettes of the mixture. The briquettes are immersed in fresh water, and after 7 and 28 days respectively, examined with regard to alteration of form and tensile strength. By the addition of gypsum, the formation of the alumina-lime-gypsum compound is so accelerated that in the short period of time mentioned, the action of the latter on the volume and strength of the cement becomes perceptible.—A. S.

English Patents.

Coating or Impregnating Pasteboard and the like for Roofing and other Purposes; Compositions for ——, also applicable for Coating the Walls of Buildings and for other Purposes. L. Kerkow, Gross-Buchholz, Germany. Eng. Pat. 6502, Mar. 17, 1902.

The pasteboard or other substance is impregnated with a composition consisting of colophony and "neutral yelk," or of a mixture of resins with fats not readily saponifiable (*e.g.*, cholesterol fats). Linseed oil carnauba wax, or magnesium oxychloride may be added as required to the composition, which is stated to offer great resistance to acids and alkalis, and not to melt in the sun.—C. A. M.

Marble (Statuary), Onyx Stone, Polychromatic Materials, and the like; Manufacture of an Improved Composition forming an Imitation of ——. L. A. Beaumel, Toulouse, France. Eng. Pat. 18,476, Aug. 22, 1902. (Under Internat. Conv., Feb. 22, 1902).

Alum, barium sulphate, and water are mixed together in suitable proportions (*e.g.*, 1,000:10—100:100), with the addition of colouring matter or fragments of insoluble substance. The alum is dissolved in warm water and boiled, the barium salt is then added, mixed with a little water and colouring matter. The mixture is evaporated until it has lost 3 per cent. of its original weight, and is then cooled and stirred until pasty, when pasty coloured substances and fragments may be added to produce marbling. The mixture may be run into a mould painted internally with several layers of collodion. Or 10 parts of alum, dissolved in 1 of water may be poured into a mould while the mixture is still very liquid and coloured fragments of alum may be added, and the whole allowed to cool.

—W. G. M.

Kilns or Furnaces; Upright [Cement]. H. Hauenschild, Berlin. Eng. Pat. 241, Jan. 3, 1902.

Relates to the method of charging. The central portion of the kiln is filled with the material (cement, &c.) to be burned, and the fuel is charged around the same. In a method illustrated, a ring of the material is packed against the kiln wall, then a ring of the fuel, and finally the centre is filled with more material. A movable hollow pattern or mould may conveniently be employed for charging.

—R. S.

United States Patents

Stone; Process of Manufacturing ——. J. C. McClenahan, Coldwater, Mich. U.S. Pat. 711,436, Oct. 14, 1902.

The process consists essentially in moulding a liquid stone composition in presence of a hardening chemical solution, *e.g.*, a mixture of sulphuric acid, alum, and lime-water. The face of the mould is coated with a granular, silicious material (sand), with or without addition of colouring matter, and this coating is saturated with the hardening solution. The liquid stone composition is then poured in, and after the stone has set, the residual coating of hardening material is removed.—A. S.

Sand Bricks: Apparatus for Making ——. L. T. Leet, Montreal, Canada. U.S. Pat. 714,807, Dec. 2, 1902.

In the manufacture of bricks from sand, the lime is slaked by means of steam. The slaking is effected in a closed box contained in a cylinder capable of sustaining great pressure, this box being provided with a partition screen or grid in its upper portion, with perforations above the grid for admitting steam, and with means for preventing admission of water of condensation.—A. S.

Cement: Art of Manufacturing ——. R. F. Wentz, Nazareth, Pa. U.S. Pat. 714,842, Dec. 2, 1902.

A process of burning cement by means of coal dust injected into the kiln with an air-blast, the heat of the finished clinker being utilised, as well as the heat radiated or conducted from the walls of the furnace, to raise the temperature of the fuel and of the air-blast, which, together with the steam produced by the cooling and disintegration of the highly-heated clinker by means of water, are injected together into the furnace.—L. A.

Cement: Apparatus for the Manufacture of ——. R. F. Wentz, Nazareth, Pa. U.S. Pat. 714,843, Dec. 2, 1902.

At the lower end of a rotary kiln, a chamber is placed, through which the highly-heated clinker is discharged. This chamber contains a series of cones and hoppers for the purpose of imparting a zigzag direction of movement to the falling clinker, which is cooled by water admitted through perforated rings of piping underneath the hoppers, and falls out of the lower end of the chamber more or less disintegrated and ready for grinding. Air, blown in at the bottom of the chamber, takes up the heat from the clinker, and, mixed with the water vapour, is injected into the kiln through a nozzle which also conveys the coal-dust fuel, the latter having been previously heated by passing through tubes around which the heated air is conducted on its way to the nozzle. A further supply of heated air is drawn through channels formed in the firebrick casing of the kiln.

—L. A.

French Patent.

Impregnation [Wood, &c.]; Process of ——. Hulsberg et Cie. Fr. Pat. 319,758, March 19, 1902.

See under V., page 25.

X.—METALLURGY.

Zinc Gold Slimes; Lead Smelting of ——. P. S. Tavener. J. Chem. and Metall. Soc. of S. Africa, 1902, **3**, [6], 70—78.

The precipitate from the zinc boxes is pumped into a filter-press at the time of the 'clean-up,' and the residual fine zinc at the bottom of the clean-up tub is allowed to drain in a heap for about half an hour on one side. The press cakes and fine zinc are then placed on trays in a drying oven for 15 minutes, care being taken to keep the two products separate. The warm slime from the oven is rubbed through a sieve with four holes to the linear inch, weighed, the fluxes which have been previously mixed added, and the whole again sieved to ensure thorough mixture, and shovelled into a reverberatory furnace. Then the fine zinc is similarly treated and charged on to the top of the slimes, in order to prevent dusting, and to ensure that the largest proportion of litharge is at the top. The fluxes used may be as follows:—Slime, 100 parts by weight; PbO, 60; assay slag, 10—15; slag previously used, 10—15; and SiO_2, 5—10 parts by weight; or fine zinc, 100; PbO, 150; and slag, 20 parts by weight. The slag used contains precious metal which is otherwise wasted, and old clay liners and other objects more or less charged with gold may also be added with advantage. A few trials on a small scale are made to determine the proportions of the flux, but about 30 per cent. less slag may be safely used in the reverberatory furnace than is ndicated by the crucible trials. Sawdust is added to the slimes charge, to the extent of 1 per cent. of the litharge used (or of 1½—2 per cent. if the latter be more than 60 per cent.) The fine zinc is itself a sufficiently good reducing agent, and requires no sawdust. The charge in the furnace is heaped up on the centre of the hearth, so that no particles may remain on the sides above the slag-line. The whole is then covered, first with a layer of litharge, and then with a light covering of easily fusible slag. The furnace being charged during one day, a night-shift man lights a slow fire at 3 a.m. to dry the charge. At 5 a.m. the damper is opened and the fire urged, and by 5.30 the furnace is at a smelting heat. By 9 or 10 a.m. the charge is reduced, sweepings from the cyanide works or smelting room, and any slag requiring re-smelting, are now added and melted in; the whole is well-rabbled, and sawdust is thrown in to reduce the litharge in the slag. This is repeated until, by inspection of a sample removed on a rabble, the slag is found to be clean. The slag is now run off into pots through the slag door. This door, which is 4 ins. above the centre of the lead bath, is at the outset banked up with ½-in. cast-iron plates bedded in fireclay one above another. In tapping the slag, the several plates are removed one by one. When no more slag runs from the furnace, as much as possible of the remainder is removed by rabbling. When only a thin layer remains, the fire door is opened and a little lime is added, to render the molten slag more viscid. The latter is then pulled off, leaving a clean lead surface. Any zinc remaining in the lead will readily oxidise at the bright red heat at which the bath now is. The lead is next stirred well, a ladle sample is taken (this sample is absolutely reliable), and the metal is tapped. The lead should be quite soft, and, if the charge has been correctly calculated, should not contain more than 8, or at most 10 per cent. of gold. The base bullion is then cupelled, and the fine gold remaining on the hearth at the end, is re-fused n crucibles, and run into bars. The furnace and cupels are described and figured. The advantages of the process are fourfold. (1) There is a saving in the cost of smelting. It is estimated that the treatment of the zinc with sulphuric acid in the ordinary process costs from 4*d.* to 8*d.* per ounce of fine gold smelted, and that the smelting cost of the product is 4*d.* to 6*d.*, exclusive of labour and furnace repairs This is equivalent to a total cost of 1*s.* per ounce by the old process. By the new process the cost should not exceed 3*d.* per ounce. (2) There are no by-products, which are commonly a source of loss. (3) There is less liability to oss in handling. (4) More gold is actually obtained from a given material by the new than by the old process.

—W. G. M.

Metallurgical Purification Process [*Copper Matte*]. Thofehrn and St. Seine. Oesterr.-Zeits. f. Berg- u. Hüttenw., **50**, 584.

A MIXTURE of air, superheated steam, and sand (or other silicious material) is blown on to the surface of a bath of molten matte or crude metal in a reverberatory furnace. The metals to be removed in the zone of action of the uyères, are rapidly oxidised and scorified, without any mingling of the slag with the bath, the action of the blast being to drive the slag towards the skimming doors, and keep the surface of the molten metal uncovered. In the oncentration of matte containing 33 per cent. of copper, a ather large proportion of silica is used at first in the blast. Most of the iron is slagged and the sulphur expelled as ulphur dioxide in about six hours from a charge of 50 tons. The bath contains now about 80 per cent. of copper. In rder to slag the remainder of the iron and burn the last of he sulphur, the proportion of sand in the blast is reduced, r sand is added intermittently; antimony, arsenic, hosphorus, &c., are converted into volatile products by the ydrogen formed from the steam, and are thus removed. The molten bath finally contains about 99 per cent. of opper. If the matte under treatment be auriferous, the old contents collect in the copper first separated, and it s stated that if the first tenth or eighth part of the copper e tapped off, almost all of the gold will be found therein. The process may also be used for the refining of black copper and of nickel matte. Furnaces of large size can be used, and it is possible to refine charges of 100 tons or more in a comparatively short time.—A. S.

Lead; Loss of ——, *in Roasting Plumbiferous Blende.* K. Sander. Berg- u. Hüttenm. Zeit., 1902, **61**, [45], 561.

THE author has previously determined the loss of silver by volatilisation in the roasting of zinc blende (this Journal, 1902, 616), and has now determined the loss of lead under similar conditions. The following results were obtained:—

——	I.	II.	III.	IV.	V.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Loss in weight.....	9·90	8·60	9·65	9·70	9·80
Lead assay, raw ore	9·84	11·38	6·60	7·73	6·00
„ „ roasted ore.	9·88	11·47	6·10	6·93	5·20
Lead volatilised (per cent. of total).	9·53	7·88	16·44	19·65	21·80

In roasting, the lead sulphide is converted into lead sulphate and lead oxide, and these compounds react with undecomposed sulphide, with the formation of sulphur dioxide and metallic lead. The latter volatilises, but is partially recovered in the dust chambers of the furnace, in the Glover-tower acid, and in the slime of the acid chambers.—A. S.

Minerals; The Briquetting of ——. R. Schorr. Eng. and Mining J., 1902, **74**, [21], 673.

IN making ore briquettes, from 4 to 6 per cent. of milk of lime is generally used as a binding agent. The materials must be thoroughly mixed and kneaded together, and if this operation be properly carried out, only a comparatively low pressure will be required for the production of good solid briquettes, which, after being dried in the air for six or eight hours, or in hot-air chambers for a shorter period, are ready for use. A good briquette should be sufficiently solid to allow of being transported, without excessive breakage or dust, a few hours after being made, and it should retain its shape in the furnace until fused, so as to create as little flue-dust as possible. In the United States, the total cost of briquetting is stated to be from 0·65 to 1·25 dols. per ton of briquettes.

In the manufacture of artificial building stones, tiles, grindstones, and emery and polishing wheels, magnesia cement is mostly used as a binding agent. By the use of about 5 per cent. of a mixture of the following composition: magnesium chloride (45 per cent.), 30 parts; magnesia (93 per cent.), 30 parts; and water, 60 parts; very solid blocks are obtained, which harden thoroughly in a few hours.—A. S.

Lead in Furnace Slags; Determination of ——. H. Svoboda.

See under XXIII., *page* 46.

Manganese in Minerals; Determination of ——. M. Dittrich.

See under XXIII., *page* 46.

English Patents.

Steel; Manufacture of ——. L. V. Pratis, Turin. Eng. Pat. 6728, March 19, 1902.

THE manufacture of steel by melting cast iron with magnetic oxide of iron, obtained by dissolving finely-divided iron in sulphuric acid and igniting the ferrous sulphate so formed. The addition of aluminium after the magnetic oxide is also claimed.—J. T. D.

Spent Iron Pickling or Cleaning Liquors, or other Solutions containing Sulphate or Chloride of Iron; Treatment of ——, *for obtaining Sulphate or Chloride of Iron or other useful Products therefrom.* F. B. Crossley, Wakefield. Eng. Pat. 7832, April 3, 1902.

THE spent liquors are boiled with iron waste, and, when sufficiently concentrated, are allowed to crystallise in lead or lead-lined conical vessels. The mother-liquor is returned to the boiler for retreatment in the same way (additional acid being in some cases added), and the process is repeated as often as necessary. To obtain a liquor directly serviceable in dyeing, the solution is concentrated to 60°—100 Tw. over the iron waste, and is run into a vessel in which, while boiling, a suitable nitrate is added until the colour changes. The cleared liquor may be used as a mordant; or, if "black liquor" be required, it may be heated with acetic acid or an acetate.—E. S.

Ores: Apparatus for Pulverising and Amalgamating ——. Redruth Foundry Co., Ltd., and T. H. Tregoning, Redruth, Cornwall. Eng. Pat. 25,698, Dec. 16, 1901.

The pan of the apparatus has a fixed grinding surface, which acts in conjunction with a rotary perforated grinding ring. The ring is automatically raised and lowered for effecting the feed of the ore, the admission of water or mercury being regulated by adjustable gratings or the like. —R. A.

United States Patents.

Briquetting Iron-bearing Substances. J. H. Long, Chicago, Assignor to Chisholm, Boyd, and White Co., Ill. U.S. Pats. 711,059 and 711,060, Oct. 14, 1902.

The briquettes are composed of 95 parts of iron-bearing substance, 2½ parts each of lime and of sodium chloride, the latter rendered non-deliquescent by addition of one-eightieth of one part of sodium carbonate. The soda is added to strong brine, which is then heated (to effect the required chemical reactions), cream of lime is added, and then the iron-bearing substance, all being in the indicated proportions, prescribed quantities of water being used in forming the brine and cream of lime. The briquettes formed by compression are dried—E. S.

High-Tungsten Steel. G. B. Brown, Reading, Pa., Assignor to Carpenter Steel Co., New Jersey. U.S. Pat. 714,139, Nov. 25, 1902.

Tungsten steel, containing 15—30 per cent. of tungsten, with or without 1—3 per cent. of chromium, is made by melting steel with tungsten or ferro-tungsten, or by any of the processes for making ordinary tungsten steel with lower percentages of tungsten. The advantages of the metal are to be found in its increased density, its very high melting point, and its high tenacity, all of which characters fit it for making projectiles.— J. T. D.

Converter. G. C. Carson, Redding, Cal., Assignor to A. Miller, Redding, and F. Hurst, Washington, D.C. U.S. Pat. 714,449, Nov. 25, 1902.

The converter is essentially described in the following abstract of U.S. Pat. 714,450.—J. T. D.

Metal [Iron]; Process of Treating ——. [*Converter with both Acid and Basic Linings.*] G. C. Carson, Redding, Cal., Assignor to F. Hurst, Redding, and A. Miller, Washington, D.C. U.S. Pat. 714,450, Nov. 25, 1902.

The molten metal is fed direct (from a blast-furnace, for example) into a converter, broad above, narrow below the tuyère line, and provided with overflow arrangements for slag. The length of the converter is divided by transverse walls with openings in such a way that the metal is gradually and automatically worked from entrance to exit, leaving each compartment at the bottom and entering the next at the top. The converter is provided with tuyères along its whole length. In treating pig-iron, the first compartment is acid-lined, and here the carbon and silicon are burnt out, the treated iron accumulating below the tuyère line, and being no longer unnecessarily exposed to the blast. The metal then flows into the basic compartment where phosphorus is removed, and is ultimately delivered quite clean and free from slag.—J. T. D.

Converter; Continuous ——. G. C. Carson, Redding, Cal., Assignor to F. Hurst, Redding, and A. Miller, Washington, D.C. U.S. Pat. 714,451, Nov. 25, 1902.

The converter is described in the preceding abstract of U.S. Pat. 714,450, but may have four or five compartments. —J. T. D.

Iron and Steel; Apparatus for Manufacture of ——. G. J. Snelus, Frizington, England. U.S. Pat. 714,616, Nov. 25, 1902.

See Eng. Pat. 12,950; this Journal, 1902, 1333.—J. T. D.

Alloy; Metallurgical Product or ——. [*Manufacture of Steel.*] J. Stevenson, jun., Sharon, Pa. U.S. Pat. 714,618, Nov. 25, 1902.

An alloy containing manganese (68 per cent.), phosphorus (25 per cent.), carbon (5 per cent.), and impurities, including iron (2 per cent.), or other proportions to effect the re-manganising, re-phosphorising, and re-carburising of steel at one operation.—J. T. D.

Gold, Fine, and Sulphurets; the Saving of ——. F. M. Graham, San José, Cal. U.S. Pat. 711,047, Oct. 14, 1902.

A process for amalgamation, which consists in passing the stream of pulp over a stream of mercury moving in the opposite direction, the object being to extend the time during which the heavier particles of the pulp remain in contact with the mercury, and further to carry back the sulphurets floating on the surface of the mercury against the current of pulp.—J. H. C.

Precious Metals; Apparatus for Extracting ——, *from their Ores.* H. Smith and P. C. Brown, Salt Lake City. U.S. Pat. 711,236, Oct. 14, 1902.

The ore is lixiviated in a revolving barrel provided with pipes entering axially through stuffing boxes for the supply of steam, air and solvents, and for the expulsion of air or gas.—J. H. C.

Quicksilver Furnace. R. Scott, San José, Cal. U.S. Pat. 710,897, Oct. 7, 1902.

Brackets are built into the walls of the furnace and are formed with protruding upper edges. Tiles rest on the inclined surfaces of the brackets and are provided with lips which slip over the edges of the brackets, and key-bricks are built into the wall, resting on the upper edges of the tiles. The tiles are so set, inclined downwards, from opposite neighbouring walls of the furnace, as to deflect the vapours into a sinuous downward course. (See also U.S. Pat. 699,822; this Journal, 1902, 977.)—E. S.

Metallurgical Furnace. P. Meehan, Lowellville, Ohio. U.S. Pat. 711,062, Oct. 14, 1902.

The furnace for treating molten metal is barrel-shaped, having an open neck at each end. Heating pipes, with cup-shaped ends are provided, mounted on pivots to swing on vertical planes, and connected with reversible regenerative furnaces. The heating pipes can be connected to and disconnected from the open necks of the furnace. The barrel is mounted rotatably on a frame and is provided with mechanism for tilting the frame, about the trunnions. One of the adjustable pipes has an opening in its end on the lower side, to permit the escape of slag.—E. S.

Furnace for Roasting Ores. T. Edward, Ballarat, Australia. U.S. Pat. 714,464, Nov. 25, 1902.

In combination with a tilting ore-roasting furnace, a hollow rabble therein having a hollow stem, is claimed, and also means for rotating this stem and rabble. A water-supply and discharge pipe are connected with this hollow stem, these being so arranged as to permit of the tilting of the furnace.—J. T. D.

Ingot-] *Heating Furnace; Continuous* ——. H. B. A. Keiser, Edgewood Park, Pa. U.S. Pat. 714,710, Dec. 2, 1902.

A long heating furnace is mounted on openwork supports, giving access to the bottom, and to the mechanism connected therewith. The bottom is made to move continnously in one direction at any desired speed. It is made dish-shaped in cross-section and carries the ingots vertically from end to end of the furnace. The bottom is sealed to prevent loss of heat, and the rollers and moving parts beneath it are sprayed with cooling liquid. A series of folding doors at each end, opened by the ingots themselves and automatically closing behind them, serves the purpose of an air-lock. The furnace is fired at one end and has a flue at the other.—W. G. M.

Tap-hole Plug. A. Dickey, Buffalo, N.Y. U.S. Pat. 714,159, Nov. 25, 1902.

A conical plug of paper-pulp, sawdust, or other "reconstructed" cellulose-like material, which when inserted into the tap-hole of a converter or other container for molten metal, becomes, when the metal enters, carbonised at its inner end, partly decomposed at its centre, and remains undecomposed at its outer end. It is thus readily removable, and a new plug can be readily inserted, without using any force which might damage the tap-hole or adjacent parts of the converter.—J. T. D.

Slag Steam Generator. L. D. Copeland, Assignor to G. Mitchell, Los Angeles Cal. U.S. Pat. 711,290. Oct. 14, 1902.

This slag steam generator consists of a pair of cylindrical vessels connected by a narrow neck, hour-glass fashion. Slag is charged into a small pot-shaped vessel in the top part of the upper vessel, which is then inverted to drop its contents into the water, the granulated slag being removed at the bottom of the lower vessel through an appropriate valve.—J. H. C.

Slag Steam Generator. L. D. Copeland, Assignor to G. Mitchell, Los Angeles, Cal. U.S. Pat. 711,291, Oct. 14, 1902.

This slag steam generator is similar to that described in the preceding abstract, except that the slag pot discharges at the bottom instead of by being inverted, and that the discharge arrangement for the granulated slag is different. (See also U.S. Pats. 711,331, 711,332, 711,333; this Journal, 1902, 1401.)—J. H. C.

Zinc; Extraction of ——, *from Zinc Skimmings.* H. C. Meister, St. Louis, Mo. U.S. Pat. 714,502, Nov. 25, 1902.

The zinc skimmings (from the process of galvanising iron) are treated with a caustic alkali or alkaline earth (preferably lime) and water, so as to convert the zinc compounds into oxide, which is then, either after separation by decantation from the other substances produced, or without such separation, treated by reduction with carbon for the recovery of the zinc. The ammonia formed from the ammonium chloride present, and the calcium chloride produced in the reaction, may be recovered.—J. T. D.

Zinc; Extraction of ——, *from Zinc Skimmings.* H. C. Meister, St. Louis, Mo. U.S. Pat. 714,503, Nov. 25, 1902.

See preceding abstract. The use of alkali carbonate (preferably sodium carbonate) is claimed; this converts into zinc carbonate all zinc compounds in the skimmings, except the oxide. This oxide, with the carbonate produced, is smelted for zinc.—J. T. D.

Zinc Sulphide Ores; Treating ——. J. C. Clancy and L. W. Marsland, Sydney, N.S.W. U.S. Pat. 715,023. Dec. 2, 1902.

The crushed ore is mixed with lead sulphate and roasted at a temperature insufficient to volatilise the lead present in the charge. The roasted ore, while still very hot, is run into dilute sulphuric acid, which is thus raised to the boiling point, the mixture being kept agitated. When the zinc has thus been dissolved, the mixture is run over concentrating tables to recover the lead. The lead oxide is converted into sulphate and is ready for use again. The tailings are run into settling tanks; zinc is then extracted from the separated liquors and silver and lead from the residue.—W. G. M.

Ores; Extracting Metal from Complex ——, *or Sulphides.* J. C. Clancy and L. W. Marsland, Sydney, N.S.W. U.S. Pat. 715,024. Dec. 2, 1902.

The ore is mixed with lead sulphate, in quantity sufficient to react with the metallic sulphides present; the mixture is treated in a blast furnace, so that the lead, zinc, and other volatile matters may be expelled as fume, which is treated with a dilute sulphuric acid spray after leaving the furnace in order to sulphatise the oxides. The sulphate and the liquid furnace-products are then treated by any of the ordinary methods.—W. G. M.

Metals from their Ores; Process of Obtaining ——. N. S. Keith, Arlington, N.J. U.S. Pat. 714,914, Dec. 2, 1902.

The crushed ore is mixed with finely-divided carbon and heated in a reducing atmosphere to the temperature of fusion of the ore-particles only. After cooling, the reduced metals are separated by mechanical concentration.
—W. G. M.

[*German Silver*] *Scrap Metal; Method of Treating* ——. J. M. O'Connor, Assignor to Connorite Manufacturing Co., both of Port Washington, Wis. U.S. Pat. 715,211, Dec. 2, 1902.

The scrap is melted with from 1 to 20 per cent. of lead until the fused mass is homogeneous. A small quantity (less than 10 per cent.) of aluminium is then added and the charge is poured. The resulting alloy should be white, malleable, and readily machined.—W. G. M.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Potassium Chlorate; Electrolytic Reduction of ——. G. H. Burrows. J. of Phys. Chem., **6**, 417—426. Chem. Centr., 1902, **2**, [23], 1378.

By the electrolytic reduction of potassium chlorate solution with employment of copper electrodes, and without separation of the electrode spaces, a yield of nearly 200 per cent. (calculated from the amount of electricity passed) is easily attained. Temperature and concentration of the electrolyte have little influence. The yield is favoured by a high current density at the anode, but is independent of the current density at the cathode. Free alkali considerably reduces the yield. From the results of experiments made with a view of determining the rôle of the copper in the attainment of such a high current yield, the author concludes that the phenomenon is analogous to that observed by Binz in the electrolytic reduction of indigo (this Journal, 1898, 759, 1141), and that it is connected with the solution of copper at the anode. In no case was spontaneous decomposition of the chlorate observed, and the chlorate appeared to be converted directly into chloride.—A. S.

Formic Acid, Oxalic Acid, and Potassium Carbonate; Electrolysis of ——. F. Salzer. Zeits. f. Elektrochem. 1902, **8**, [49], 893—903.

This is an attempt to elucidate the reactions which take place at the anode during the electrolytic oxidation of organic compounds. Formic and oxalic acids were specially chosen on account of their ready oxidation to carbon dioxide. Both polished and platinised platinum anodes were employed. With the former the P.D. of the cell was invariably higher (compare this Journal, 1902, 1235—1236), but at present no satisfactory explanation of the difference can be given.

With regard to the electrolysis of potassium carbonate, it was found that the percarbonate was most readily formed in neutral solution, and that an excess of hydroxyl ions or the presence of bicarbonate was unfavourable to the production of percarbonate. The yield of this substance was also very much reduced when platinised anodes were employed. The results of twenty-five experiments, under different conditions, are given in as many tables, along with two sheets of curves.—J. S.

Porcelain for Electrical Purposes; Composition of ——. A. S. Watts.

See under VIII., *page* 27.

English Patents.

Insulating Material for Electrical Purposes. R. W. James, London, from the Mica Insulator Co., New York. Eng. Pat. 24,012, Nov. 26, 1901.

Alternate layers of oxidised linseed oil, mixed with about one-fifth of its weight of gum copal and dissolved in benzine, and of the thinnest obtainable flakes of mica, laid so as to overlap one another, are built up on a heated plate until a sheet of the desired thickness is obtained. The compound sheet is lightly pressed to expel air, without squeezing out the adhesive substance, and is then dried at a temperature rising from 100 to 400 F. It may be improved by applying external layers of tissue paper covered with the solution of dissolved oil. Each one-thousandth of an inch in thickness will resist 1,500 volts.—M. J. S.

Electric Cells or Batteries. H. H. Lake, London. From the Société Anon. "Le Carbone," Paris. Eng. Pat. 4254, Feb. 19, 1902.

The depolariser is contained in a vessel having its walls constructed of the same material as that constituting the electrode with which it is to be used, and means are provided whereby, after charging the vessel, it can be readily detached when requiring to be recharged. The terminal of the electrode is connected to the electrode itself and is not mounted on the vessel, so that it remains undisturbed during the attachment and detachment of the vessel.
—G. H. R.

Accumulator Plates; Composition of Electrolytes for Formation of ——. E. Sandhagen and J. Lürgen, London. Eng. Pat. 19,713, Sept. 9, 1902.

An electrolyte is used containing 12 grms. of sodium sulphate, ½ grm. of glycerin, and 1 grm. of potassium hydroxide to 1 litre of water. In this solution a positive plate is formed in 30 hours with a current density of from ¼ to 1 amp. per sq. decim.—W. G. M.

United States Patents.

Battery; Storage ——. S. Laszczynski, Assignor to T. von Michalowski, both of Berlin. U.S. Pat. 714,201, Nov. 25, 1902.

The negative electrode is nickel oxide, the positive a spongy-zinc plate, and the electrolyte a solution of potassium, sodium (or other suitable) aluminate. This solution is capable of conducting the current, but not of dissolving the sponge-zinc electrodes after discharging.
—W. G. M.

Cell; Electrolytic ——. M. C. Rypinski, Schenectady, N.Y, Assignor to Gen. Elect. Co, N.Y. U.S. Pat. 714,400, Nov. 25, 1902.

The electrolytic cell has electrodes in an electrolyte containing a salt of an organic acid. One of these electrodes may be of aluminium. A cell with at least one aluminium electrode in a solution of or containing, Rochelle salt is also claimed.—W. G. M.

Battery Depolariser. C. E. Lockwood and W. C. Banks, both of New York. U.S. Pat. 714,590, Nov. 25, 1900.

The depolariser consists of iron particles coated with copper by electro-deposition, the superficial layer of copper being subsequently oxidised. W. G. M.

Spongy-lead Plates for Secondary Batteries; Manufacture of ——. H. W. Batler and J. H. May, Assignors to J. J. Courtenay, all of London. U.S. Pat 715,016, Dec. 2, 1902.

A paste of lead oxide and powdered carbon, or other suitable organic substance capable of being decomposed and oxidised by electrolysis, is applied to a grid or support, and subjected to the action of the electric current in "a forming solution," the current being first applied while the element being formed is attached to the positive pole of the source of electricity, so as to oxidise the organic substance, or any desired portion of it, and convert the lead oxide into porous peroxide. The current is then passed in a reverse direction to reduce the porous peroxide to spongy lead.—G. H. R.

"Crude Kerite" and "Kerite" [Insulator]; Manufacture of ——. W. R. Brixey, Seymour, Conn. U.S. Pats. 714,858 and 714,859, Dec. 2, 1902.

According to the first patent "Crude Kerite" is made by heating together coal tar, asphalt, linseed oil, sulphur, and talc; and in the second patent, this material is converted into "Kerite" by mixing it with india-rubber and vulcanising the whole. The composition is intended for use as a dielectric.—F. H. L.

French Patent.

Insulating Material for Electrical and other purposes. Basenau. Fr. Pat. 320,198, April 4, 1902.

Asphaltum, purified by heating for several days out of contact with air (72 hours at 160° C. sufficing if the asphaltum be of best quality), is mixed with petroleum (in the proportions of from 7:3 to 4:6 according to the uses of the product), followed by 1 per cent. of aluminium hydroxide dissolved in a minimum of acetic acid, and finally by an addition of about 7 per cent. of colophony and 8 per cent. of alkali. The whole is kept liquid by heat for some time, with continued stirring, and is then allowed to cool.

The product softens at about 70° C., hardening rapidly on re-cooling, and is proof against the action of strong or weak acids, alkalis, and water or sea water.—C. S.

(B.)—ELECTRO-METALLURGY.

Ores; Electrical Separation of —— from Gangue. D. Negreano. Comptes Rend., **135**, [24], 1103.

A metallic plate has a disc cut from its centre, and the two portions, insulated, are connected respectively with the positive and negative poles of a Wimshurst electrical machine. The crushed ore and veinstone are blown through a perforated wooden disc on to the metallic plate, when the ore collects on the one portion (say the disc) and the gangue on the other. The author has in this way separated, on the small scale, malachite and ferric and cupric oxides from a siliceous matrix, limonite from a quartzose rock, and pyrites from lignite.—J. T. D.

English Patents.

Toughening or Annealing Steel, Iron, and other Metals. W. F. L. Frith, London. Eng. Pat. 23,929, Nov. 25, 1901.

The metal articles are heated in a closed receptacle charged with mercury vapour, or with other gas or vapour, the receptacle and its contents being allowed to cool slowly. An electric current may be passed through the metal articles while they are enclosed. Reference is made to Eng. Pat. 13,352, 1900; this Journal, 1901, 1218.—E. S.

Titaniferous Ores; Treatment of ——. W. L. Wise, London. From C. H. Homan, Christiania. Eng. Pat. 23,810, Nov. 23, 1901.

Titaniferous ores are heated with carbon in an electric furnace, and the reduced iron is run off; the remaining anic acid is then subjected to the action of air or nitrogen a high temperature to obtain "nitrogenised titanium." lime is added to the ore, the residual charge is treated th a nitrogen blast and with aluminium to reduce the anic acid, and form titanium nitride and calcium alumi te. To obtain artificial rutile, titanic acid, obtained as scribed, is subjected to an oxygen blast, and suitable louring materials are added.—E. S.

res, Slimes, and the like; Electro-Magnetic Treatment of ——, for Separating their Constituents. C. Leuschner, Friedrichssegen an der Lahn. Eng. Pat. 17,380, Aug. 7, 1902.

HE working surface of a percussion table or other itable wet ore-dressing device (or a layer immediately eneath this surface) is made of a magnetic material which ay be rendered more or less magnetic at will by means of ire coils connected with a dynamo. In this way the ow of magnetic particles over the surface of the table or earth is made more sluggish and separation from non-agnetic particles is facilitated.—W. G. M.

UNITED STATES PATENTS.

Metals from Solutions containing same; Apparatus for Separating ——. S. T. Muffly, Bowdre, Georgia, Assignor to R. Pyatt, New York. U.S. Pat. 714,598, Nov. 25, 1902.

A NUMBER of similar electrolytic cells are placed end to end, cascade fashion, with an inlet pipe for the electrolyte at one end, an overflow from each cell to the next, and a reservoir at the other end to receive the spent solutions. The several cells have their own separate batteries and connections. Each cell has two compartments separated by a transverse partition which does not extend to the bottom. Within the larger of these is an iron (or other metal) anode, and separated therefrom by a glass or porcelain partition that does not reach to the bottom, a mattress cathode, consisting of a cellular porous carbon plate, surrounded first by a filiform packing of zinc or lead, and then by a porous carbon casing, enclosed in fabric. Beneath the cathode is a pipe through which air can be passed into the electrolyte.—W. G. M.

Metals from Solutions containing same; Process of Precipitating ——. S. T. Muffly, Bowdre, Georgia, Assignor to R. Pyatt, New York. U.S. Pat. 714,599, Nov. 25, 1902.

SOLUTIONS of alkali-metal cyanides, bromides, chlorides, or hyposulphites containing metals (especially cyanide solutions of gold and silver) are treated electrolytically in the apparatus specified in U.S. Pat. 714,598 (see preceding abstract). The solution and air are used warm.—W. G. M.

Copper and Nickel; Electrolytic Separation of ——. D. H. Browne, Assignor to the Canadian Copper Co., both of Cleveland, Ohio. U.S. Pat. 714,861, Dec. 2, 1902.

COPPER-NICKEL matte is treated to form a copper-nickel alloy practically free from sulphur by subjecting it to chlorine and to a solvent for cuprous chloride introduced concurrently into the mass, but at different levels. The solution of copper and nickel chlorides thus formed is electrolysed, and the copper deposited, leaving a residuary solution of nickel chloride which is further electrolysed, the nickel being thus deposited and the chlorine separated. The steps in the process may be varied.—G. H. R.

XII.—FATS, FATTY OILS, & SOAP.

"*Degrasine.*" W. Fahrion. Zeits. angew. Chem., 1902, **15**, [49], 1261—1263.

THE author describes experiments tending to disprove Jean's statements (Monit. Scient., 1889, **15**, 1889; this Journal, 1891, 557). It appears that the oxidised fatty acids are only in small part, removed in the precipitate produced by the addition of salt after saponification; it leads a portion of the unoxidised fatty acids (or at least of the fraction of them which dissolves in petroleum spirit) remains in solution after the salt is added. The ratio of the amount of oxyacids precipitated by the salt to that of the oxyacids not so precipitated is variable, and it would therefore be wrong to base on this ratio any inference as to the preparation of the degras.—W. G. M.

Olive-Skins; Composition of ——, and a New Constituent contained therein. E. Peano. Staz. sperim. agrar. ital., **35**, 660—664. Chem. Centr., 1902, **2**, 122[illegible], 15[illegible]

THE author states that for the determination of the fat in olive-skins and also in fresh olives, carbon bisulphide should be used as the solvent and not ether, as the latter in quantities of 10 per cent. and over dissolves another substance present in the skins. This new substance has been localised in the epicarp of the fruit, and it can be extracted by means of methyl alcohol from olive fruits and residues which have been previously exhausted with carbon bisulphide for removal of the fat. It forms a faintly acid, white powder, melting at 250° C., soluble in alcohol, ether, and acetone, insoluble in water, petroleum spirit, chloroform, and carbon bisulphide.—A. S.

ENGLISH PATENTS.

Soap Tablets or other Soft Substances; Machine for Moulding, Stamping, and Wrapping in Paper Wrappers ——. W. Jamieson, Ilford. Eng. Pat. 23,993, Nov. 26, 1901.

THIS apparatus has a rocking table with a vertically-working piston at one end, a die being fixed to this piston. The rough cake of soap is placed in a depression above the die, and is brought by the table exactly under a moulding box, which contains an upper die, and is worked by a descending piston. The cake, after being stamped, is pushed out into a wrapping box with a loose bottom, where it is folded in paper by means of lever arms carrying a thin metal plate at right angles, and movable wings which close in together to fold in the side portions. The paper is supplied sheet by sheet to the gripping arms of the folding apparatus by means of rubber pushes, and the wrapped tablets are delivered by means of a sliding table.—C. A. M.

Candles and the like; Illuminants such as are used for making ——. J. Lewy. Eng. Pat. 2131, Jan. 27, 1902.

See under II., *page* 18.

Coating and Impregnating Pasteboard, &c., for Roofing and other Purposes; Compositions for ——; also applicable for Coating the Walls of Buildings and for other Purposes. L. Kerkow. Eng. Pat. 6502, March 17, 1902.

See under IX., *page* 30.

UNITED STATES PATENTS.

Oil Filter. A. H. Franke, St. Louis, Mo. U.S. Pat. 715,047, Dec. 2, 1902.

THE filter consists of an inner and outer chamber, the latter being surrounded by a double heating-jacket. A filtering bag is suspended between the walls of the two chambers, its edges being held about a perforated straining disc, and its bottom supported by a vertical rod from the centre of the disc. The oil passing through this bag enters the inner chamber through vertical strainers, and is then filtered through a second filtering bag similarly suspended. Water and impurities separated during the filtration are removed through discharge outlets.
—C. A. M.

Paint and Varnish; Process of making a Composition for Removing ——. C. Ellis. U.S. Pat. 71[illegible], Dec. 2, 1902.

See under XIII. A, *page* 36.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A*.)—PIGMENTS, PAINTS.

English Patent.

Grinding Dyes, Paints, and the like, and Washing, Bleaching, Beating, Pulping, &c., Fibrous and other Materials: Apparatus for ——. G. E. Hibbert. Eng. Pat. 23,486, Nov. 20, 1901.

See under XIX., *page* 42.

United States Patents.

Nitre Cake; Recovery of Free and Combined Acids of —— [*Blanc Fixe*]. L. Cheeseman, sen., Assignor to P. Agnew, A. H. Agnew, and M. B. Harlow. U.S. Pat. 714,145, Nov. 25, 1902.

See under VII., *page* 26.

Lakes from Sulphur Dyes; Process of Making ——, E. A. Fourneaux, New York. Assignor to H. A. Metz, New York. U.S. Pat. 714,687, Dec. 2, 1902.

The solution of a sulphide dyestuff is precipitated with barium chloride or other salt of an alkaline earth, the precipitate is washed free from all soluble impurities and is then suspended in a solution of an alkali carbonate. Finally a solution of aluminium sulphate or other suitable metallic salt is added, and the whole is boiled until the lake formed no longer increases in brightness.—T. A. L.

Lead Carbonate; Process of Converting Lead Sulphate into ——. A. S. Ramage, Cleveland, Ohio. U.S. Pat. 715,214, Dec. 2, 1902.

The treatment of lead sulphate with an alkali carbonate is claimed. The lead sulphate (waste from sulphuric acid chambers) is first washed free from acid, then heated with an excess of alkali carbonate sufficient to convert it completely into lead carbonate. The solution is then treated with an excess of lead sulphate to utilise the whole of the alkali carbonate, and the resulting mixture of lead sulphate and carbonate is treated with excess of the alkali carbonate.—M. J. S.

Paint and Varnish; Process of Making a Composition for Removing ——. C. Ellis, Brookline, Mass. U.S. Pat. 714,880, Dec. 2, 1902.

A wax or waxlike substance, such as beeswax, Japan wax, paraffin wax, or a metallic soap, is dissolved in an aromatic hydrocarbon or other suitable solvent, and the solution mixed with an alcohol (*e.g.*, methyl, ethyl, butyl, amyl alcohol, &c.), which will precipitate the substance in a gelatinous condition.—C. A. M.

(*B*.)—RESINS, VARNISHES.

English Patents.

Floor Cloth, Carriage Roofing, &c.: Composition for Use in the Manufacture of ——. M. G. Peters and J. A. Shepherd, Glasgow. Eng. Pat 267, Jan. 4, 1902.

An intimate mixture of whiting, 13 parts; gum tragasol, 5 parts; dried linseed oil, 5 parts; any of the usual driers, part. The gum tragasol accelerates the drying of the composition and increases its flexibility. In making linoleum, the whiting is wholly or partially replaced by cork dust.—M. J. S.

Waterproof Covers or Tarpaulins; Dressing for ——. M. G. Peters and J. A. Shepherd, Glasgow. Eng Pat. 268, Jan. 4, 1902.

An intimate mixture of boiled linseed oil, 15 lb.; gum tragasol, 5 lb.; colouring matter, 1 lb.; litharge or other drier, lb.; Russoline or petroleum spirit, 1 lb.; lime water, gall.—M. J. S.

Coating and Impregnating Pasteboard and the like for Roofing and other Purposes: Compositions for ——; *also applicable for Coating the Walls of Buildings and for other Purposes.* L. Kerkow. Eng. Pat. 6502, March 17, 1902.

See under IX., *page* 30.

United States Patent.

Floor Covering. J. Sanders, Assignor to E. Berliner, both of Washington, D.C. U.S. Pat. 715,155, Dec. 2, 1902.

Matting is backed by a composition, formed of an intimate mixture of asbestos or other refractory substance with resin and mineral oil. The backing material, while warm and plastic, is rolled into sheets, which are then laid upon the underside of the matting and passed through a hot press, which forces the plastic material into the interstices of the matting and firmly unites the two together.—L. A.

(*C*.)—INDIA-RUBBER.

Caoutchouc; Homologue of ——. C. O. Weber.
Gummi-Zeit., 1902, **17**, [10], 207.

Kondakow has described (J. prakt. Chem., **64**, 109) a remarkable instance of the polymerisation of di-*iso*-propenyl—$CH_3C:(CH_2)C:(CH_2)CH_3$. This liquid hydrocarbon, boiling at 69·5° C., when exposed in a closed tube for 12 months to the action of light was polymerised into a white spongy mass closely resembling caoutchouc in its physical properties, but differing from it in not being soluble in any of the usual solvents. The author points out with reference to this that isoprene has the constitutional formula $CH:(CH_2).(CH_2):CH$, and that Kondakow's compound may therefore be regarded as methylisoprene. It has been shown by Tilden, by Bouchardat, and by the author, that isoprene, which is obtained by the dry distillation of caoutchouc, can be reconverted (polymerised) into that substance. In the author's opinion Kondakow's compound must be regarded as the first known homologue of caoutchouc, and its behaviour is the first fact indicating the possibility of the artificial manufacture of caoutchouc.—C. A. M.

Rubber Goods; Analysis of ——. C. O. Weber.

See under XXIII., *page* 47.

French Patent.

Plastic Composition [*Cotton Mill Rolls, &c.*].
L. P. Hemmer. Fr. Pat. 320,228, April 5, 1902.

Equal parts of caoutchouc or gutta-percha, long-fibred asbestos, calcined borax or other salt soluble in water, and the necessary quantity of sulphur are mixed together, formed into the desired shape, and vulcanised. When rollers made in this fashion are used under water, the soluble salts dissolve slightly, so that the surface acquires a roughness which bites the passing fabric satisfactorily. Another method of arriving at a similar result consists in moulding the rollers with a thin layer of porous fabric close to their surfaces, which also affords the required roughness.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Mangrove Bark; Employment of ——, *for Tanning.*
J. Paessler. Collegium, 1902, **1**, [40], 322—324.

In reply to Eitner (Gerber, **671**), who considers that mangrove bark fails to tan thoroughly, the author states that, in his own experience, very satisfactory leather has been manufactured by the aid of this material, and this not merely on an experimental scale, but working with whole hides and skins. The objectionable red colour produced by mangrove bark may be overcome by a judicious admixture with myrobalans, oak-bark, &c., as was stated by Eitner himself over 20 years ago.—R. L. J.

"*Degras.*" W. Fahrion.

See under XII., *page* 35.

English Patent.

Gelatinous Compound for Making Printers' Inking Rollers and other Purposes; Manufacture of an Elastic Insolubilised ——. J. Deborde, Berlin. Eng. Pat. 23,470, Nov. 20, 1901.

Gelatin that has been rendered insoluble by treatment with formaldehyde, is mixed with about 5 or 10 per cent. of turpentine, or of mixtures of German or Venice turpentine and ordinary turpentine, and is thereby rendered elastic.
—W. G. M.

United States Patents.

Hides, Pelts, or other Animal Tissues; Solution for Tanning ——. O. P. Amend, New York. U.S. Pat. 714,433, Nov. 25, 1902.

A tanning liquor is used consisting of an aqueous solution containing chromium nitrite or a salt of a "leather-forming metal" (chromium, iron, or aluminium) and a soluble nitrite of an alkali or alkaline earth. (See also U.S. Pat. 713,046; this Journal, 1902, 1544).—W. G. M.

Tanning Skins or Hides. A. J. Pilar, Philadelphia, Pa. U.S. Pat. 715,139, Dec. 2, 1902.

Skins, more especially calf-skins, are tanned in a single liquor containing chromium chloride and chromium thiosulphate. A stock solution of these salts is prepared by the interaction of bichromate of potash (1 lb.), hydrochloric acid of 21° B. ($2\frac{1}{4}$—3 lb.), crystallised sodium thiosulphate ($2\frac{3}{4}$—3 lb.), and water (1 gall.), and this, before use, is diluted with 5 parts of water.—R. L. J.

Artificial Leather. G. S. and C. Falkenstein, Assignors to O. Wolff and A. D. Wiler, all of Philadelphia, Pa. U.S. Pat. 714,791, Dec. 2, 1902.

This is a modification of U.S. Pat. 667,770, Feb. 12, 1901 (see this Journal, 1901, 731), and consists in treating only one of the two textile sheets with the parchmentising fluid and affixing it whilst moist to the second web or backing by means of pressure rolls. The double web is washed free of acid, stuffed, dried, and finished as in the earlier patent (*loc. cit.*).—R. L. J.

[Moulding Composition] Composition of Matter. J. Poliakoff, Moscow. U.S. Pat. 714,235, Nov. 25, 1902.

To produce an unbreakable and waterproof composition capable of being moulded, 100 parts of glue are liquefied by heating with sufficient water; from 100 to 200 parts of a body-material, such as clay or plaster, are added in admixture with water. After boiling, with constant agitation, from 20 to 30 parts of glycerin are added, and a like amount of wax. Immediately before running into a mould, from 2 to 5 parts of chrome alum are introduced.
—W. G. M.

XV.—MANURES, Etc.

Phosphoric Acid and Magnesia; Gravimetric and Gasometric Determination of ——. E. Riegler.

See under XXIII., *page* 46.

Potassium in Kainite and 40 per cent. "Manuring Salt"; Simple Method for the Rapid Determination of ——. M. Passon.

See under XXIII., *page* 47.

United States Patents.

Basic Slag [Imitation]; Method of Making ——. J. Reese, Philadelphia, Pa. U.S. Pat. 714,330, Nov. 25, 1902.

The slag is prepared by fusing, in an oxidising flame, a mixture of a mineral calcareous phosphate with manganese oxide and iron oxide.—N. H. J. M.

Phosphate [Manure Imitation], and Method of Making same. J. Reese, Philadelphia, Pa. U.S. Pat. 714,331, Nov. 25, 1902.

The manure is prepared by fusing, in an oxidising flame, a mixture of basic open-hearth slag and mineral calcium phosphate, both of which should be free from or poor in silica. The product is "annealed" and afterwards ground.
—N. H. J. M.

Coated Chemically-active Substance [Fertilisers, &c.]. F. J. Smith, Elizabeth, N.J., Assignor to W. H. Bowker, Boston, Mass. U.S. Pat. 714,960, Dec. 2, 1902.

A basic comminuted substance is stirred in a bath of a molten salt, and is then cooled and powdered. The salt must be soluble in water, and "inert when mixed with such fertilising ingredients as nitrogenous matters, potash salts, and soluble phosphates," or with cupric sulphate. For example, comminuted burnt lime may be thus coated with fused sodium nitrate, and mixed with blue vitriol to form, when water is added, the "Bordeaux mixture." Or either coated lime or coated potassium carbonate may be mixed with an ammoniacal fertiliser without occasioning loss of ammonia.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar; Solubility of ——, in Impure Solutions. E. Sellier. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [5], 587—590.

The author draws attention to the discrepancy between the co-efficients of saturation of impure sugar solutions as given by Claassen and by French observers, taking for the latter the figures of Boire as quoted by Fradiss.

Claassen states that, at a low temperature, syrups of purity 70, have a co-efficient of saturation below 1·0, the non-sugar acting as a precipitant, and that the co-efficient increases as the purity decreases, or with rise of temperature. Thus a syrup of purity 75 has co-efficient 1·0 at a temperature of 40°—50° C.; one of purity 60 has 1·3. The co-efficient for syrups of purity 63, varies from 1·6 at 80° C. to 1·15 at 20° C.

The French observers find the same values as Claassen for pure sugar solutions at various temperatures, but obtain a constant figure of 1·29 for a syrup of purity 63 for temperatures 80° C. to 35° C. For syrups of purity 75 the co-efficient is 1·15 to 1·16; for syrups below 60 of purity, 1·32 to 1·34. In other words, the saturated syrups examined by Boire contained more sugar to one of water than those analysed by Claassen.—L. J. de W.

Diffusion [Sugar]; Influence of the Quantity of Juice extracted in ——, on Exhaustion and Density. G. Collignon. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [5], 560—561.

It is desirable, in working the diffusion process, to draw off the least quantity of juice possible, whilst still obtaining the greatest exhaustion. The density of the juice will then be at a maximum, resulting in economy of fuel for evaporation. If, at the same time, the pulp is more perfectly exhausted, the extra quantity of sugar recovered is a nett gain.

To obtain dense juice with minimum quantity, diffusion should proceed slowly, heating should be regular, and the diffuser well filled with chips. To increase exhaustion, the volume of chips in the diffusers should be diminished, the temperature of the battery raised, and the quantity of juice drawn off increased.

Suppose that 112 litres of diffusion juice are drawn off from the battery, density 5·30, sugar in the pulp 0·32, and in the final sweet water 0·17; the total exhaustion is 0·49.

If the exhaustion is carried further, by drawing off more juice, it is found that the exhaustion diminishes rapidly, but the density remains sensibly the same. If the juice continues to be drawn off, the density begins to fall, and the exhaustion remains stationary.

Thus, while the exhaustion falls from 0·32 to 0·20, the sugar in the final water is likewise lowered from 0·19 to

0·08, or a total exhaustion of 0·28, representing a gain of 0·2 of sugar.

The exhaustion should be pushed therefore to 0·20. The thin juice obtained would have a density of 1·0015, 0·23 of sugar, purity 52·60. Thus pulp water, when subjected to three carbonatings, as is done with the juice, would give a density of 1·0012, sugar 0·22, purity 78·24. The purity obtained is then not a bad one.

On pushing the exhaustion further, the purity would fall, and there would then be no advantage.—L. J. de W.

Diffusion: Hot —— [Beetroot]. K. Cerny. Zeits. Zuckerind. Böhmen, 1902, **27**, [2], 51—56.

The term "hot diffusion" is misleading, inasmuch as the temperature of the battery is no higher than usual, but the juice is drawn off hotter. Hot diffusion as hitherto used, was only a partial process, the chips being merely mashed with hot juice, the upper layers remaining cold, and there being no circulation of the juice.

Melichar's process of complete hot diffusion, used in Austria Hungary, differs only in minor details from that of Naudet, introduced simultaneously into France. It requires two additional pipes and a heater to each diffuser, capable of raising the contents to the diffusion temperature in five to seven minutes.

In the ordinary method of diffusion, the juice reaching the fresh chips is at 40° to 45° C., and by the time three or four diffusers have been drawn off, the freshly-filled one has reached the right temperature.

In hot diffusion this preparation is completed in the first diffuser, and the temperature remains then constantly normal in about six diffusers, when it falls off towards the water pressure.

It is an error to suppose the temperature is higher in the first diffuser; it is only apparently so. If the fresh chips are at 10° C., and they are warmed with juice at 75° or 76° C., a mixture is obtained at 45° or 48° C. Circulation then begins, introducing juice at 95° C. to the top of the diffuser, and after being cooled by warming the contents, passes off through the pump to the circulation again.

No trouble has been found in practice from expected frothing, nor from deposition of albuminous matter or slime on the pipes in the heaters, the rapid passage of the juice preventing any deposit.

The exhausted pulp also keeps well.

The advantages of the process are a saving of 7 to 9 kilos. of steam per 100 kilos. of beetroots, accelerated work with increased output of 20 per cent. The juice is more concentrated, and has a higher quotient of purity. The beating of the battery is quite regular, and independent of the workmen.—L. J. de W.

Sugar Losses in Refining. K. Wasilieff. Zeits. Vereins Deutsch. Zuckerind, 1902, **52**, [561], 864—887, and [562], 957—976. From Westnik Sacharnoi Promischlennosti, 1902.

The raw material of the refineries in Russia is, almost without exception, white granulated sugar. The sugar bought is required to be of prime quality, white and dry. Yellow after-products of raw-sugar factories are mostly returned to the juice to be worked up for white sugar.

During the last ten years the quality of the raw sugar has sensibly deteriorated, notwithstanding improvements in the cultivation of the beetroot, the result being due to the use of char being abandoned, its place being taken by mechanical filtration, sulphuring, and a quicker working up of after-products by returning the low syrups to the juice.

The losses of the refinery in raw material are due—(1) to increase in moisture during transport and storage; (2) to increase of non-sugar formed at the expense of the saccharose; (3) to the presence of dextro-rotatory substances, as raffinose and bodies produced by overheating.

When the water content exceeds 0·16, a deduction is made. Sugars which have become damp in the warehouse and have been re-bagged may contain up to 0·25 per cent. of water. The presence of moisture favours decomposition, and, conversely, the amount of moisture present depends on the reducing bodies present. A sugar containing altered sugar is strongly hygroscopic (becomes creepy). A sugar of normal composition may become moist in store from purely physical causes. When the temperature of the ore differs more than 5° from that of the outer air, moisture condenses on the cold bags.

A refinery may lose, from January to June, several tenths per cent. of saccharose, and, moreover, obtain a raw material containing more organic non-sugar of an acid character, yielding liquor which darkens on heating.

The general losses in the refinery are due to direct loss of sugar in the char, in the washing-off water, in the mould-washing tank, and as molasses; to loss by inversion and overheating, mechanical losses in spraying, spills, and undetermined losses, including the sugar consumed by workmen.

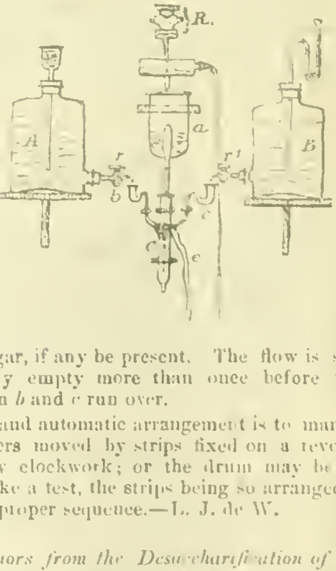
A characteristic feature of Russian refining is the loss due to decomposition of sugar by overheating. The oftener sugar is re-melted the more sugar is lost, and principally in clearing and in the filling-house.—L. J. de W.

Sugar; Automatic Control of ——, in the Feed Water of Steam Boilers. E. Lallemant. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [4], 425—428.

The method of detecting traces of sugar is based on the reaction with α-naphthol and sulphuric acid, and serves to prevent loss of sugar in waste water or its introduction into boiler feed water.

The water to be tested runs continously from R into a cup *a*, which it gradually fills, and then passes through a siphon tube into the testing vessel C. The overflow from the latter is also by a tube bent over as a siphon, so as to draw off part of the contents intermittently.

The bottle A contains a weak solution of α-naphthol, and B, strong sulphuric acid. These are run at a slow rate through the cups *b* and *c*, to mix in the testing vessel and indicate sugar, if any be present. The flow is so adjusted that C may empty more than once before the liquids collecting in *b* and *c* run over.



Another and automatic arrangement is to manipulate the taps by levers moved by strips fixed on a revolving drum actuated by clockwork; or the drum may be turned by hand to make a test, the strips being so arranged as to open the taps in proper sequence.—L. J. de W.

Waste Liquors from the Desaccharification of Molasses; Conversion into Ammonia of the Nitrogen of the ——. K. Andrlik. Zeits. Zuckerind. Böhmen 1902, **27**, [3], 109—114.

The author has made a number of experiments on the action of various bacteria on the waste liquors from the desaccharification of molasses, to see whether the nitrogen present can be converted into ammonia in sufficient amount to allow of the process being used commercially as a means of utilising such nitrogen. The liquor was used in different dilutions, and the organisms employed were: *Bac. Proteus vulg.*, *Bac. rhamnosus*, *Bac. megatherium*, *Bac. mycoides* and *Bac. subtilis*. The results show that, under the conditions of the author's experiments, the conversion of the waste nitrogen into ammonia is too slow to be technically employed.

The best results were obtained with the liquor inoculated with *Bac. megatherium*, in which as much as 62 per cent. of the nitrogen present was transformed into volatile products. If the action of the bacterium is allowed to proceed further than this, the proportion of amines formed increases, and may contain 62 per cent. of the total volatile nitrogen; 87 per cent. of the amines formed then consists of trimethylamine. The amines are undoubtedly formed by the decomposition of the betaine, of which as much as 77 per cent. is destroyed.

The acids extractible with ether, as measured by their acidity, in general increase in quantity, as does also the part of such acids volatile in a current of steam, this latter increase in some cases amounting to 300 per cent. of the original quantity present.—T. H. P.

Reducing Sugars; Iodometry of ——. M. Buisson.
See under XXIII., *page* 48.

Molasses Distillery. A. Vasseux.
See under XVII., next column.

[*Sugar*] *Cane Molasses: Production of Sulphites of Ethyl in the Distillation of* ——. M. Elwart.
See under XVII., *page* 40.

English Patent.

Liquids [*Gum Solutions*]; *Process for Clarifying* ——. R. B. Ransford, Upper Norwood. From L. W. Gans, Frankfort-on-Maine, Germany. Eng. Pat. 593, Jan. 8, 1902.

See U.S. Pat. 706,075; this Journal, 1902, 1340.—J. F. B.

United States Patents.

Evaporating Pan [*Sugar*]. C. A. Porter, Ohio.
U.S. Pat. 714,740, Dec. 2, 1902.

On an arch is arranged a series of heaters in which the juice to be evaporated is raised to a suitable temperature. The juice then passes into a series of independently removable pans carried by the arch. These pans are provided with corrugations, longitudinally of the arch, forming containing channels inside the pans, and conducting flues for the products of combustion underneath the pans, the ends of the pans being connected alternately so as to form a continuous tortuous passage for the juice.—J. F. B.

Sugar; Treating Massecuite of ——, *by Centrifugal Action.* H. Claassen, Dormagen, Germany. U.S. Pat. 714,863, Dec. 2, 1902.

See Eng. Pat. 14,108 of 1902; this Journal, 1902, 1288.
—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Occurrence of Glycogen in —— [*S. apiculatus*]. W. Henneberg. Woch. f. Brau., 1902, **19**, [51], 781.

Lindner and the author have observed that some species of yeast (milk-sugar yeast, *Sacch. exiguus*) are always free from glycogen. The author has examined in this respect the behaviour of *S. apiculatus*, the wild yeast largely found on fruit and in the spontaneous fermentation of wine. In all the cultures of this species which were studied, the secretion of glycogen was found to be extremely small. At most only a few cells in several thousands showed the presence of glycogen. This yeast forms spores only when in the wild state, and cultivation changes its nature in this respect; it is suggested that a similar change may have taken place with regard to the secretion of glycogen.
—J. F. B.

Yeast Preparations; Commercial Permanent ——. R. Rapp. Münchener Medizinische Wochen., 1902, [36]; through Woch. f. Brau., 1902, **19**, [49], 748—749.

According to the author the therapeutic value of permanent yeast preparations depends on their content of enzymes. A preparation possessing fermentative power, although containing no living cells, has, when a certain amount of sugar is added to it, germicidal properties which are less if the addition of sugar be omitted, or if the preparation has no fermentative power. It being now recognised that alcoholic fermentation is occasioned by zymase, the presence of this restricting enzyme must therefore be the first condition in judging the medicinal value of a yeast preparation. The proteolytic enzyme is also of importance, as it exerts an influence on antagonistic organisms, such as bacteria. Of all the known constituents of yeast, zymase is the least stable and the easiest destroyed. Its presence in a yeast preparation forms a good basis for valuing the same, for if the zymase is active, the other cell constituents will be unaltered. Living yeast cells are not of value in medicinal yeast preparations.

Many yeast preparations have been examined on the basis of these considerations, determinations being made of moisture, fermentative energy, contamination with other organisms, proteolytic activity, and capability of destroying other germs.—J. L. B.

Emulsin and other Ferments; Action of ——, *on Acids and Salts.* M. Slimmer. Ber., 1902, **35**, [19], 4160—4162.

Kastle (Amer. Chem. J., 1902, **27**, 481) has studied the action of the enzyme lipase on the esters of certain dibasic acids, and found that whilst the diethyl esters of these acids were hydrolysed by the ferment, the salts of the mono-ester acids were unaffected. Hence he propounded the general theory that ferments are inactive towards ionisable substances. The author quotes several known instances against the general application of this theory, and describes experiments in support of his view. For instance, both amygdalinic acid and the sodium salt of this acid were readily hydrolysed by emulsin, with production of glucose and mandelic acid or its sodium salt. Extract of dried yeast also split up the sodium salt of amygdalinic acid into glucose and a new glucoside, glucomandelic acid. Moreover, the sodium salt of gluco-vanillic acid was hydrolysed by emulsin even more readily than the free acid itself. Finally, the author prepared glucosalicylic acid, and found that it was split up slowly by emulsin into glucose and salicylic acid.—J. F. B.

Molasses Distillery. A. Vasseux. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [4], 438—445.

Molasses from different factories should be mixed so as to obtain regular fermentation. This is done in the distillery tanks or reservoirs, which should be covered to avoid dilution by rain and consequent inversion and acidification. From the reservoir there should be drawn off the quantity required for the day's work into a gauged tank, in order to have control of the amount worked up. The molasses is then sent to the acidification tank, where dilute sulphuric acid is added equal to 2 grms. of acid per litre of molasses at 25° B. It is then heated to 90°—100° C., to effect denitration, after which it passes, first through a refrigerator, then to a mixer, where it is diluted till its sp. gr. is 1·098—1·105, and finally to the fermentation vat.

Yeast.—The use of beer yeast has been abandoned in the molasses distillery, and pure wine yeasts, although giving good results as regards activity, give too much aldehyde and ethers. A pure cultivation in the laboratory of wild yeasts which find their way into molasses gives the best result. These yeasts are preserved in a state of purity by the addition of 2 grms. per litre of malic acid. The acid does not injure the cells, and is very noxious to bacteria. Although the acid is expensive, the quantity used is a minimum, being sufficient only to preserve the mother cells.

Losses.—During fermentation the carbon dioxide carries off 0·03 per cent. of the alcohol formed. The acids formed, 0·3—0·6 grm. per litre (reckoned as sulphuric acid), lower the yield by 1 per cent. of the alcohol obtained. The loss is much greater if distillation is not proceeded with as soon as fermentation is complete, since there is then a considerable amount of acetic acid formed.

Rectification.—To remove sulphides before rectifying, acetate of lead is used, afterwards neutralising with caustic soda. Excess of soda must be avoided, lest there should be resinification of the aldehydes.

Vinasses.—The best method of utilising the nitrogen is to treat with sulphuric acid, and centrifugalise out the potassium sulphate crystals formed. The fluid part sets on cooling, and is then powdered. It contains 6·5 to 8 per cent. of nitrogen, and only 4 to 5 of potash.—L. J. de W.

[*Sugar*] *Cane Molasses; Production of Sulphites of Ethyl in the Distillation of* ——. M. Elwart. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [5], 562—564.

The presence of ethyl sulphite has been recognised in rectified spirit prepared from cane molasses at an Argentine works. In taste the spirit was normal, but it was refused on the market on account of the slight odour,—'tufo,' as the buyers termed it.

As pure yeasts were used, and the final acidity 4 to 4·5 was obtained, the special odour could not be attributed to bad fermentation. The spirit did not contain a trace of sulphurous acid. It was supposed, therefore, that the sulphurous acid came from sulphites, particularly bisulphites of lime, potash, and soda contained in the molasses. In presence of the acids of the raw spirit, aided by heat, and the violent ebullition in the Ilges column, the bisulphites were decomposed into sulphurous acid. The spirit was therefore saturated with milk of lime, leaving an acidity of only 1 grm. It was not made neutral, for fear of producing the resinous taste so injurious in rectification. The result corroborated the supposition, the sulphites of ethyl being suppressed, and less ethers were produced.

Neighbouring factories used far less sulphurous acid in the manufacture of the sugar, or lost part of it during use, and they had no sulphurous acid in the spirit.—L. J. de W.

Fluorine in Wine; Simple and Rapid Method for the Detection of ——. F. Tusini.

See under XXIII., *page* 15

English Patents.

Malt: Process for Manufacturing Mash from ——. V. Lapp, Leipzig, Germany. Eng. Pat. 21,721, Oct. 6, 1902.

Malt is separated, by bruising, into grain and husks, the two constituents being mashed separately. The grain portion is mashed from the beginning under a pressure of air, or preferably of carbon dioxide, of about 3 atmospheres at a low temperature (31°—32·5° C.). When the temperature of the mash is increased, a corresponding decrease of pressure is allowed, at the rate of about 0·5 atmosphere per 6·25° C., until, at the saccharifying temperature of 62·5°—70° C., the pressure is about 0·5 atmosphere, which is maintained during the boiling process by means of the steam produced, the proportion of carbon dioxide which escapes being renewed all the time. The husks are mashed in the ordinary way, but with great care, to avoid the extraction of objectionable matters.—J. F. B.

Malting: Improvements in ——. V. Lapp, Leipzig, Germany. Eng. Pat. 21,749, Oct. 6, 1902.

Barley for malting is first moistened or steeped for 1—3 hours, and is then passed between revolving brushes or rollers, which open or tear the husk in such a manner that the grain is more easily accessible to water and air during malting, and that the husk is split and thrown off during germination or kilning.—J. F. B.

Brewing: Improvements relating to ——. V. Lapp, Leipzig, Germany. Eng. Pat. 21,731, Oct. 6, 1902.

The malt is separated into grains and husks, which are treated separately. The grain portion is mashed by itself, whilst the husks are lixiviated with water at a temperature not exceeding 50° C. for about 45 minutes, the extract thus obtained being incorporated with the flour mash after the separation of the husks. Thus only the superior constituents of the husks are utilised, whilst the objectionable constituents remain unextracted.—J. F. B.

Beer Wort; Method of Boiling, Caramelising, and Colouring ——. J. A. Buckdeschel, Kulmbach, Germany. Eng. Pat. 20,097, Sept. 12, 1902.

The hot wort is caused to flow over a heated trickling apparatus, whereby the contact of the wort with the air during boiling is vastly increased.—J. F. B.

Spirits; Maturing or Purifying ——. J. T. Norman, London. Eng. Pat. 304, Jan. 4, 1902.

The aldehydes, especially furfural, which are present in crude spirits, are removed by adding to the spirit a mixture of albumin and magnesia, which exerts a selective absorbing action on these bodies. The purified spirit is then separated by decantation, and the residues are subjected to fractional distillation.—J. F. B.

Still for the Direct Recovery of Alcohol or other Volatile Liquid from Solid or Semi-Solid Substances, the Evaporation of Liquids, and the Drying of Solid Materials. F. C. J. Bird, London. Eng. Pat. 25,772, Dec. 17, 1901.

See under I., *page* 15.

United States Patent.

Malt Liquors; Process of Treating Air for Forcing ——, *from Kegs.* C. A. Bartlitt, St. Louis, Mo. U.S. Pat. 710,404, Oct. 7, 1902.

Air is heavily impregnated with the aroma of hops, compressed, and stored in a receptacle containing a solution of hops. The compressed impregnated air is then used for forcing malt liquors from kegs.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Colourless Albuminoids; Preparation of ——, *from Coloured Plant Juices.* A. Rümpler. Ber., 1902, **35**, [19], 4162—4164.

From plants, the juices of which darken in the air, the albuminoids are, as a rule, obtained in a dark-coloured, impure condition. This is especially the case with the sugar-beet, and to obtain the albuminoids of the latter in a pure state, the author has employed the following process. Two kilos. of the pounded beet were rubbed up with as much powdered ammonium sulphate (about 1,200 grms.) as was required to saturate the water present, until the whole of the salt was dissolved. The pasty mass was then pressed in a powerful press, and the residual mass washed by repeated pounding with ammonium sulphate solution and pressing until the expressed liquid was no longer coloured. The mass, which contains the albuminoids, was then quickly and thoroughly mixed with 250 c.c. of distilled water which had been previously boiled and cooled to 40°—45° C.; it was then pressed in a powerful press, this treatment being afterwards repeated with 10 or 12 successive quantities of 250 c.c. of water. The whole of the solution thus obtained was filtered on to a quantity of powdered ammonium sulphate sufficient to give a saturated solution. This liquid, containing the precipitated albuminoids, was placed in large separating funnels, and after standing over night, the lower layer of clear liquid was run off and the remaining albuminoids filtered through perforated porcelain plates, covered with paper pulp, by means of an air pump. The residue was then washed with ammonium sulphate solution until the wash liquor remained clear, and was then shaken up with some of the same solution in order to disintegrate it. Repeated shaking of the mass with not too large a quantity of water at about 40° C., and filtering through the paper-pulp filter, gave a solution of the albuminoids of which the first portions were of a faint yellow colour, but the last quite colourless. The dissolved albuminoids were then coagulated, either by alcohol, or by boiling, or by some other means.

Proceeding in the above way, the author has separated from the beet two different albuminous substances, vegetable caseïn (?) and vegetable albumin (?), which he is further examining.

The residue left after removal of the albuminoids can be used with advantage for the preparation of the fatty constituents of the beet.—T. H. P.

Caffeine in Coffee. Bertrand. Bull. des Sciences Pharm., **4**, 230. Pharm. J , 1902, **69**, [1693], 601.

The amount of caffeine in the berries of *Coffea arabica*, when cultivated in different countries, varies between 0·69 and 1·60 per cent. Of species other than *C. arabica*, the berries of *C. canephora* yield 1·97 per cent. of caffeine; those of *C. mauritiana* contain 0·07 per cent.; whilst those of *C. humblotiana* contain no caffeine, but a bitter principle, *cafamarin*.—A. S.

English Patent.

Macaroni, Food Pastes, and the like; Process and Apparatus for the Manufacture of ——. V. Tommasini, Milan, and G. Ceschina, Brescia, Italy. Eng. Pat. 17,399, Aug. 7, 1902.

The cut paste, or lengths of the same arranged on canes, is dried in a chamber through which currents of air are caused to pass, from above downwards, by means of electric fans. The partially dried paste is then placed for a time, as usual, in a damp chamber, and finally dried on supports in a second chamber, through which a current of air, previously heated by steam or electricity, is drawn. The inlet for the warm air is covered with jute, or canvas, to prevent too rapid local drying.—W. P. S.

United States Patents.

Milk; Process of Aërating and Preserving ——. R. G. Nash, Lucan, Ireland. U.S. Pat. 714,510, Nov. 25, 1902.

The milk is first partially sterilised by heating to a temperature of 150°—160° F., and is then cooled to 40° F., and aërated with carbon dioxide, oxygen, or air. The aërating gas is previously sterilised by passing through hot and cold pipes, and then through sterilised water, which, if desired, may contain a flavouring material. The partially sterilised, aërated milk is filled into bottles, which, with their conents, are then completely sterilised in the usual manner. 1·5 drams of "potash" and 3 drams of sugar may be added to each gallon of milk to prevent curdling.—W. P. S.

Centrifugal Liquid Separator [*Milk*]. J. J. Berrigan, Orange, N.J., Assignor to the De Laval Separator Co., N.J. U.S. Pat. 715,001, Dec. 2, 1902.

A number of superposed conical division plates are connected to the central vertical feed pipe in the drum, and a adial partition is provided in the liquid space of the drum and rotatable with it. There is a whole-milk inlet to the drum on one side of this partition, and a number of skim-milk outlets on the opposite side of the partition.—W. P. S.

Rennet; Composition of Matter for Use with ——. H. M. Scott and H. Anderson, Shebogan Falls, Wis. U.S. Pat. 714,748, Dec. 2, 1902.

The composition is intended to aid the coagulation of milk in cheese making, and consists of calcium sulphite, 75 parts; potassium nitrate, 10 parts; sodium phosphate, 10 parts; nd magnesium phosphate, 5 parts.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

English Patent.

Waste-liquors or the like; Apparatus for Purifying ——, *and for Dehydrating the Residues contained therein.* H. H. Lake, London. From Maschinenfabrik Buckau, Mudgeburg-Buckau, Germany. Eng. Pat. 18,779, Aug. 26, 1902.

The apparatus is intended for the continuous purification f waste liquors from mines, fuel-block or briquette actories or the like. The liquid is passed through a preliminary filter, whilst the residues remaining behind are also freed from liquid in a second or finishing filter The filters are so connected with each other, that, by means of a cut-off device, the finishing filter may be temporarily disconnected from the preliminary filter, for dehydrating and purifying purposes, whilst the filtration of fresh liquid proceeds in the latter filter.—W. P. S.

United States Patents.

Foul Vapours; Apparatus for Disposing of ——. E. R. Edson, Cleveland, Ohio, Assignor to the Edson Reduction Machinery Co., Augusta, Maine, U.S.A. U.S Pat. 714,165, Nov. 25, 1902.

The escaping gases or vapours pass into a condenser provided with a chamber into which water is discharged, and means are provided for the condensed liquid to fall into a well beneath, communicating with the sewer. The uncondensed vapours are drawn on by the pump into a tank through which flows a regulated current of water to carry away soluble substances, whilst the insoluble gaseous products are conducted to a furnace and there destroyed.
—C. A. M.

Sewage; Apparatus for Use in the Treatment of ——. [*Purification Beds*]. H. B. Killon, Manchester. U.S. Pat. 714,801, Dec. 2, 1902.

See Eng. Pat. 2647, 1900; this Journal, 1901, 61.
—W. P. S.

Filtration Apparatus for Municipal or Commercial Uses. J. P. Keane, Assignor to E. N. Roth, Cincinnati, Ohio. U.S. Pat. 711,709, Dec. 2, 1902.

The filtering tank is of an upright wedge form, with perforated sides, and contains suitable filtering material. The tank is connected with an auxiliary side-chamber for holding and delivering the water over and through the entire perforated area. The tank and side chamber are divided by cross partitions. The filtration takes place laterally through the tank. Two or more of the tanks may have a common side chamber.—W. P. S.

Filter [*Water*]. C. P. Simmons, Baltimore, Md. U.S. Pat. 714,956, Dec. 2, 1902.

This filter consists of two filtering chambers, which are connected both at their upper and lower ends by branch-pipes to the main water-supply pipe, the discharge-pipes leading from the upper ends of the chambers. The valves, which control the flow of water through the pipes, are connected to an actuating rod, whereby all the valves may be operated simultaneously.—P. A.

Water-purifying Apparatus. L. Gathmann, Washington, D.C. U.S. Pat. 714,793, Dec. 2, 1902.

See Eng. Pat. 9,982, 1901; this Journal, 1901, 1133.
—W. P. S.

Water-Purifier [*Softener*]. G. M. Davidson, Oakpark, Ill. U.S. Pat. 715,031, Dec. 2, 1902.

The softening solutions are delivered into the mixing tank by a tilting vessel, operated by a water-supply pipe, the tilting vessel also regulating the movements of a valve in the chemical discharge pipe. A water-motor is also actuated by the water-supply pipe, so as to work a stirrer in the mixing tank, and also a pump connecting the chemical, mixing, and feed tanks.—W. P. S.

(*C.*)—DISINFECTANTS.

United States Patent.

Disinfecting Apparatus. B. M. Davis, Los Angeles, and C. E. Cook, Whittier, Cal. U.S. Pat. 714,785, Dec. 2, 1902.

An open tube is suspended, by a suitable support, perpendicularly over the flame of an ordinary spirit lamp and at a definite distance from the flame. Owing to incomplete combustion, formaldehyde or acetaldehyde is formed, according to the kind of alcohol used in the lamp.
—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

Sulphurous Acid and other Constituents of the Sulphite Lyes from Cellulose Factories; Action of ——, upon Plants. A. Stutzer. W. Landw. Presse, 1902, **29**, 725. Chem.-Zeit., 1902, **26**, [98], Rep. 327.

The author's experiments have shown that sulphurous acid is extremely injurious to plants that grow in water. Hence, when sulphite lyes are discharged into small rivers, the plants on the banks turn yellow or perish completely. In further experiments it was found that under the conditions chosen, the influence of sodium bisulphite upon the germination process was only slightly weakened by the presence of potassium carbonate. The latter salt, however, was able to strengthen germinated plants, so that taking an approximately equal number of plants, the production of green leaves, &c., rose from 211 to 275 grms. The author concludes that the sodium bisulphite gradually reacts with the constituents of the soil to form less injurious compounds, and that this change is accelerated by the presence of calcium carbonate. Neutral compounds of sulphurous acid that are only sparingly soluble in water are much less dangerous to the plants than the readily soluble salts. Neutral potassium sulphite is soluble in 8·0 parts of water.

On mixing sulphite lyes, concentrated by evaporation, with an equal weight of powdered Thomas slag and evaporating the mixture, the amount of sulphurous acid fell to 1 or 2 parts per 1,000, and the lime in the Thomas slag converted this residue of sulphurous acid into neutral calcium sulphate. Similar results were obtained in the actual experiments on plants.—C. A. M.

English Patent.

Washing, Bleaching, Beating, Pulping, &c. Fibrous and other Materials, also applicable for grinding Dyes, Paints, and the like; Apparatus for ——. G. E. Hibbert, Manchester. Eng. Pat. 23,486, Nov. 20, 1901.

The machine consists of a tank in which the material is caused to circulate by revolving discs, which bring it more quickly into contact with specially designed disintegrating rolls, and thus greater efficiency in grinding is obtained.
—L. G. R.

United States Patents.

Vegetable Fibres [Paper Making]; Treating ——. C. T. Lee, Boston, Mass. U.S. Pat 713,116, Nov. 11, 1902.

To reduce them to pulp without damage or deterioration, the fibres are treated with an "alkaline saccharic solution," such as a solution of saccharate of magnesia or of lime. Flax waste is, for example, converted into pulp by boiling for three hours in a 3 per cent. solution of the latter compound.—E. B.

Paper Pulp; Bleaching ——. R. C. Menzies, Musselburgh, Scotland. U.S. Pat. 714,216, Nov. 25, 1902.

Paper pulp mixed with a bleaching agent is subjected to a pressure of air or gas within a closed vessel or vessels, the mixture being agitated by transference from one vessel to another by means of gaseous pressure.—J. F. B.

Stuff Chest; Paper Makers' ——. W. McKenney, Maine. U.S. Pat. 714,391, Nov. 25, 1902.

The stuff chest consists of a rectangular vessel divided down the middle into two chambers with semi-circular bottoms by means of a partition which does not reach to the two ends of the chest. In each chamber is placed a shaft provided with stirrer blades which cause the pulp to circulate up one chamber and down the other.—J. F. B.

French Patents.

Wood Pulp in Sheets; Process for Forming ——. Hughes. Fr. Pat. 320,162, April 3, 1902.

See U.S. Pat. 691,771; this Journal, 1902, 362.
—J. F. B.

Calcium Sulphates and Carbonates; Utilisation in Paper Making of Artificial ——. A. Monin. Fr. Pat. 320,130, April 15, 1902.

Precipitated sulphates and carbonates of calcium, obtained as by-products in several industries are calcined in a closed vessel at a temperature determined by their condition, origin, and purity. They are then ground and bolted either wet or dry and used for loading or coating paper. (See also Fr. Pat. 317,940; this Journal, 1902, 1408.)
—J. F. B.

Paper Pulp; Manufacture of Textile Threads from Short Fibres, particularly from ——. A. Lemveber. Fr. Pat. 320,529, April 21, 1902.

See under V., page 25.

Cellulose Fabrics: Treatment [for Embossing] of ——. A. J. Hill. Fr. Pat. 320,611, April 23, 1902.

See Eng. Pat. 8076, 1901, and U.S. Pat. 705,241, 1902; this Journal, 1902, 912 and 1074.—J. F. B.

Celluloid: Process for rendering ——, Incombustible. A. Mabille and G. Leclere. Addendum, dated April 10, 1902, to Fr. Pat. 317,884, Jan. 18, 1902.

Referring to the main specification (this Journal, 1902, 1409), the claim is made to cover all brominated products dissolved by a solvent of celluloid and capable of giving off a fire-extinguishing gas. Claim is also made for ferric chloride when dissolved by such a solvent.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Veratrols; Action of Chlorine and Bromine on Mononitro ——. H. Cousin. Comptes Rend., **135**, [22], 967.

By acting with bromine on nitro-veratrol, $C_6H_3.OCH_3.OCH_3.NO_2$ (1 : 2 : 3), a tribromo-nitro-veratrol is obtained which is identical with the compound obtained by nitrating tribromo-veratrol. A corresponding tribromo derivative could not be obtained from $C_6H_3.OCH_3.OCH_3.NO_2$ (1 : 2 : 4).

By the action of chlorine on the two nitro-veratrols, two dichloro-nitro-veratrols have been obtained, and are described. The author also discusses the constitutional formulæ of other catechol derivatives.—J. T. D.

Acetamino-p-benzoyl-β-naphthol and Benzoylamino-p-benzoyl-β-naphthol. F. Reverdin and P. Crépieux. Bull. Soc. Chim., 1902, **27**, [23], 1178—1881.

β-Naphthol was subjected to the action of *p*-nitrobenzoyl chloride in presence of dilute caustic soda, *p*-nitrobenzoyl-β-naphthol being produced. This latter was reduced by means of tin and hydrochloric acid, yielding amino-*p*-benzoyl-β-naphthol, m. pt. 171° C. This base was acetylated by boiling it with acetic anhydride and sodium acetate, yielding *acetamino-p-benzoyl-β-naphthol*, m. pt. 173° C., very soluble in chloroform and nearly insoluble in light petroleum spirit. The same base was also benzoylated, yielding *benzoylamino-p-benzoyl-β-naphthol*, m. pt. 210° C., sparingly soluble in benzene.—J. F. B.

Butylchloralantipyrine. B. Calderato. Boll. Chim. Farm., **41**, 569—671. Chem. Centr., 1902, **2**, [23], 1387.

Ten grms. of butylchloralhydrate are triturated with 9·7 grms. of antipyrine to the condition of a paste, and, after the addition of an equal quantity of water and a few drops of concentrated hydrochloric acid, the mixture is warmed till solution is complete. The reaction product, butylchloralantipyrine, $C_{15}H_{17}O_2N_2Cl_3$, crystallises from water in yellowish crystals melting at 70°—71° C., which sublime to a white mass of the same melting point. If warm aqueous solutions of equivalent quantities of butylchloralhydrate and antipyrine be mixed, filtered, and allowed to stand, white crystals of the same compound separate, which melt at 68°—69° C. Butylchloralantipyrine is easily soluble in alcohol, ether, and chloroform and soluble in 15·12 parts of water at 25° C.

Its alcoholic solution is coloured red by ferric salts, and, unlike "hypnal" (Mono-chloral-antipyrine), it does not reduce Fehling's solution. It is not decomposed on warming with caustic potash.—A. S.

Peppermint Oil; American ——. E. J. Parry. Chem. and Druggist, 1902, **61**, [1193], 948.

The author draws attention to the great increase of adulteration of peppermint oil. In 10 samples, all of which had been represented as pure oil, the specific gravity varied between 0·880 and 0·904, and the optical rotation between − 9° and − 14°, whilst none of the samples dissolved in 10 vols. of 70 per cent. alcohol. In the B.P. the specific gravity is given as 0·900—0·920, and the solubility 1 in 4 of 70 per cent. alcohol. None of the samples dissolved in 3 volumes of 90 per cent. alcohol, and in no case was any menthol separated on cooling to − 10° C. and adding a few crystals of pure menthol.—A. S.

Cadinene Dihydrochloride and Dihydrobromide; Dextro-rotatory ——, *and Dextro-rotatory Regenerated Cadinene.* E. Grimal. Comptes Rend., **135**, 1057—1059.

By repeated fractionation a dextro-rotatory cadinene, having the formula, $C_{15}H_{24}$, has been isolated from the essential oil of *Cedrus atlantica*. This cadinene had the sp. gr., 0·9224; refractive index, $n_D = 1·5107$; opt. rot., $\alpha_D = +48° 7'$. The ethereal solution of this gives, on chlorination, a crystalline dihydrochloride, similar to that of Wallach, but dextro-rotatory instead of laevo-rotatory, the opt. rot. being $[\alpha]^{20}_D = + 8° 54'$ in chloroform solution and $[\alpha]^{20}_D = + 25° 40'$ in acetic ether solution. The cadinene regenerated from this also agreed in characters with Wallach's cadinene, except that it was dextro-rotatory, $[\alpha]^{20}_D = + 47° 55'$.—J. O. B.

Isobarbaloïn. E. Léger. J. Pharm. Chim., 1902, **16**, [12], 592—595.

This body, which accompanies barbaloïn in the aloes of Barbadoes, Curaçao, and Jafferabad, is especially abundant in the last. It accumulates in the last fractions when the aloïns are crystallised from methyl alcohol, but its complete purification is impossible owing to the formation of molecular combinations with barbaloïn. Isobarbaloïn has the empirical formula, $C_{21}H_{20}O_9$, and crystallises from methyl alcohol with $4H_2O$ and from water with $3H_2O$. It yields a di-benzoyl derivative identical with that from barbaloïn. Its solution in ethyl acetate is laevo-rotatory, but in water it becomes very slightly dextro-rotatory. With nitric acid it yields a product having the properties of chrysammic acid. Isobarbaloïn is far more readily oxidisable than barbaloïn; it is the iso-body which gives Klunge's reaction, a red coloration with nitric acid in the cold, wrongly attributed to barbaloïn. This reaction is extremely delicate, and is also brought about by oxidising enzymes. *Tetrachlorisobarbaloïn* crystallises with $5H_2O$ in brilliant yellow prismatic needles, very different in appearance from the corresponding barbaloïn compound; it yields an amorphous pentacetyl derivative. *Tetrabromisobarbaloïn* is the body which has hitherto been wrongly regarded as the barbaloïn derivative; the latter, being far more soluble, having been overlooked. Tetrabromisobarbaloïn however, does not always appear to be a homogeneous substance, the percentage of bromine being variable and too low.

Isobarbaloïn and its above halogen derivatives, when treated with sodium peroxide, yield methyl-isohydroxychrysasin and its corresponding halogen derivatives respectively.—J. F. B.

Opium; Analysis of Preparations containing ——. A. H. Allen and G. E. Scott-Smith.

See under XXIII., *page* 48.

Narceine; Colour Reactions of ——. A. Wangerin.

See under XXIII., *page* 47.

Caffeine in Coffee. Bertrand.

See under XVIII. A., *page* 41.

Yeast Preparations [Therapeutic Value]. Commercial ——. R. Rapp.

See under XVII., *page* 39.

English Patents.

Alcohol or other Volatile Liquid; Still for the Recovery of ——, *from Solid or Semi-Solid Substances, the Evaporation of Liquids, and the Drying of Solid Materials.* F. C. J. Bird. Eng. Pat. 25,772, Dec. 17, 1901.

See under I., *page* 15.

Camphene; Manufacture of ——. A. Zimmermann, London. From Chem. Fabr. vorm. E. Schering, Berlin. Eng. Pat. 26,619, Dec. 30, 1901.

See U.S. Pat. 707,271; this Journal, 1902, 1194.
—J. F. B.

Aldehydes; Manufacture of ——. G. B. Ellis, London. From Soc. Chim. des Usines du Rhône, Lyons, France. Eng. Pat. 26,625, Dec. 30, 1901.

Aromatic aldehydes are prepared by oxidising aromatic hydrocarbons containing an unsaturated alkyl group, such as ethenyl, $CH:CH_2$, or allyl, "$CH_2:CH:CH_2$," in the side chain, by means of a higher metallic oxide, such as manganese dioxide and sulphuric acid. The process is also applied for the production of aromatic hydroxy or amino aldehydes, by the oxidation of the ethers or acidyl compounds of the corresponding bodies containing an unsaturated alkyl group in the side chain.—J. F. B.

United States Patents.

Oxalates; Process of Making ——. A. Wiens, Bitterfeld, Germany. U.S. Pat. 714,347, Nov. 25, 1902.

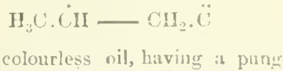
Oxalates are prepared from formates by heating a mixture of formate and previously produced oxalate at a temperature of 360°—410° C.—J. F. B.

Fatty Acid Series; Process of making Acids of the ——. H. von Hochstetter, Troppau, Austria. U.S. Pat. 714,484, Nov. 25, 1902.

The process is identical with that described in Fr. Pat. 318,710, 1902 (this Journal, 1902, 1469), except that calcium acetate is specified instead of sodium acetate.
—J. F. B.

Hydrobenzaldehyde, and Process of Making same. G. Merling, Frankfort-on-the-Main, Assignor to the Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Main. U.S. Pat. 714,931, Dec. 2, 1902. (See Eng. Pat. 1094 of 1900; this Journal, 1901, 152.)

Hydrobenzylamine bases are converted by the action of oxidising agents into the corresponding hydrobenzylidene compounds which, on heating with acids yield hydrogenised cyclic aldehydes. The product specially claimed is the terpenaldehyde, having the formula—



$$\begin{array}{c}CH_2.C(CH_3)_2.C.COH\\ H_3C.\dot{C}H \text{ —— } CH_2.\ddot{C}\end{array}$$

which is a colourless oil, having a pungent odour when concentrated and smelling of violets when diluted. It boils at 90—92° C. under a pressure of 13 mm. and is readily miscible with alcohol, ether, and benzene.
—T. A. L.

Methylene Citric Acid; Alkaline Salts of ——. R. Berendes, Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 715,239, Dec. 9, 1902.

Neutral alkali salts of methylene citric acid are prepared by treating the free acid with alkalis, and precipitating the salts by means of alcohol. Solutions of these salts split off formaldehyde on heating.—J. F. B.

French Patents.

Ketones; Process of Manufacturing ——. L. Wenghoffer. Fr. Pat. 320,519, April 21, 1902.

In the preparation of ketones, particularly acetone, the salt of the organic acid is introduced into the decomposing vessel, not, as heretofore, in the anhydrous state, but in the hydrated form or else as concentrated solution. It is stated that the yield is greater and the ketone is purer.
—J. F. B.

Aldehydes; Preparation of Sulphonated Aromatic ——. Fab. Prod. Chim., Sandoz. Fr. Pat. 320,621, April 23, 1902.

The sulphonic acids of toluene or its homologues are oxidised by suitable oxidising agents (*e.g.*, manganese dioxide) in presence of sulphuric acid anhydride; under these conditions the oxidation does not proceed further than the production of the aldehydes, even with excess of oxidising agent.—J. F. B.

XXI.—PHOTOGRAPHY.

Hydrogen Peroxide; Action of ——, *upon Silver Bromide Gelatin Emulsion*. Lüppo-Cramer. Phot. Corr., 1902, **39**, 642. (Chem.-Zeit., 1902, **26**, [98], Rep. 336.

In concluding his experiments on this subject (this Journal, 1902, 1411), the author mentions the following facts:—(1) A plate that has been completely "fogged" by a short immersion (one minute) in 3 per cent. hydrogen peroxide solution can be "solarised" by light, the "fog" being greatly diminished by exposing the plate to diffused daylight for five minutes. (2) Silver-bromide gelatin exposed to the action of the hydrogen peroxide solution for a longer period (24 hours), until complete transparency has resulted, behaves exactly like the normal emulsion. (3) The same kind of second reversal can be produced by hydrogen peroxide as by light. (4) No phenomena of light, phosphorescence, or radio-activity are manifested during the action of the peroxide. (5) Silver bromide gelatin treated with hydrogen peroxide is susceptible of *physical* development, although, according to previous experiments by the author on this point, no chemical alteration of the silver bromide occurs. It is still more remarkable that the reversal in physical development occurs much sooner than in chemical development. (6) The sensitiveness of different silver bromide gelatin emulsions in the hydrogen peroxide reaction apparently stands in proportion to their sensitiveness to light.—C. A. M.

Thiocarbamide; Acid Toning Baths containing ——. E. Valenta. Phot. Corr., **39**, 650; through Phot. J. 1902, **42**, [10], 236.

Helain has described a toning bath which contains gold chloride solution acidified with tartaric acid mixed with sodium chloride and thiocarbamide, its specific action depending on the formation of a well-defined colourless salt having the composition $(CSN_2H_4)_2AuCl$. 1 grm. of thiocarbamide is dissolved in 50 c.c. of water, and sufficient of the liquid (about 14 or 15 c.c.) is added to 25 c.c. of a 1 per cent. solution of gold chloride to redissolve the precipitate first formed; 0·5 grm. of citric or tartaric acid is then introduced, the whole is diluted to 1 litre, and 10 grms. of common salt are mixed in. The prints are well washed before toning, which proceeds rapidly; they are rinsed in water and fixed in 10 per cent. "hypo." Valenta finds the bath very satisfactory in the case of collodion papers. Citric acid is better than tartaric, for it accelerates toning and helps to keep the whites of the picture clear. The bath is permanent and cheap.—F. H. L.

English Patent.

Printing and Reproduction of Pictures, and Blocks or Printing Surfaces therefor. W. E. Heys, Manchester. From C. Schreiber and I. Levinstein, Potsdam, Germany. Eng. Pat. 18,593, Aug. 25, 1902.

A dia-positive, taken in the ordinary screen camera, is transferred to a plate of copper, zinc, &c., which is then etched until the successively darker tones are at successively lower depths. From this plate two casts are taken in a suitable plastic and elastic material, and the casts are superimposed to form the printing block. Both casts may be of celluloid, or one of celluloid and one of india-rubber, the latter material being best for the foundation block. (See also Eng. Pat. 24,132 of 1901; this Journal, 1902, 1469.)—R. A.

United States Patents.

Photographic Emulsion. Y. Schwartz, Hanover, Germany U.S. Pat. 710,019, Sept. 30, 1902.

See Fr. Pat. 320,451, below.—F. H. L.

Photographic Fixing Bath. A. Eichengrun, Elberfeld, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 710,568, Oct. 7, 1902.

See Fr. Pat. 316,501; this Journal, 1902, 1554.—F. H. L.

Printing Surfaces; Manufacture of ——. O. Foerster, Assignor to Universal Chromephoto Engraving Co., New York. U.S. Pat., 711,101, Oct. 14, 1902.

A method of producing printing surfaces directly within the substance of lithographers' stones or metal plates, which consists in coating the stone or plate with a sensitised film containing salts which have been crystallised out to form a fine even grain or stipple, printing a picture thereon by the employment of a negative and by exposure to light, and repeatedly washing, inking, and etching, until the entire film has been removed, and until the picture has been etched into the stone or plate.—F. H. L.

Multicolour or Polychromatic Printing; Process of ——. M. Rudometoff, Gattschina, Russia. U.S. Pat. 714,953, Dec. 2, 1902.

A process of multicolour printing in which the various colours are separately deposited upon a common form as lines which, for each colour lie at a different angle, certain of the lines being interrupted where the lines of other colours are crossed, so that there is no superposition of moist colours. An impression is taken of all the colours at once.
—L. G. R.

French Patents.

Surface, Metallic, for Photographic Positives. Soc. Metalline Platten Ges. m. b. H. Addition, dated April 16, 1902, to Fr. Pat. 310,161, April 22, 1901.

The film of bronze applied preferably to an aluminium plate, as described in the main patent, is prepared by giving it a coating of gelatin, with or without hardening materials, or of collodion, &c., and the whole is dried. On to the plate so prepared is brought the sensitised emulsion, and a positive picture is obtained on it by any of the usual methods. The bronze showing through the image is claimed to bring up the details and half-tones of the positive in an advantageous manner. The picture is finally protected by a coating of varnish.—F. H. L.

Photographic Emulsion [*Positive*]. Y. Schwartz. Fr. Pat. 320,451, April 16, 1902.

The emulsion is prepared from (A) 10·5 grms. of gelatin dissolved in 80 c.c. of water; (B) 1·9 grm. of disodium phosphate, 0·6 grm. of potassium chlorate, 1·7 grm. of potassium citrate, and 0·4 grm. of citric acid dissolved in 40 c.c. of water; (C) 5·2 grms. of silver nitrate dissolved in 10 c.c. of water. The prints may be obtained by complete insolation, or by exposure till only details are visible and then by development. The emulsion is so sensitive that an exposure of 20 to 30 seconds to diffused daylight or to the light given by 2·5 cm. of 3 mm. magnesium ribbon at a distance of 30 cm. from the frame suffices to yield a sufficiently dense picture by development.—F. H. L.

Paper: Preparation of Photographic ——. Y. Schwartz. Fr. Pat. 320,452, April 16, 1902.

The paper is treated with a solution composed of 19 grms. of nitrocellulose, 1 litre of 99 per cent. acetone, 875 c.c. of amyl acetate, and 875 c.c. of benzene; which is applied to the extent of 70 or 80 c.c. per square metre. This composition is said to protect the paper itself from the photographic reagents and to cause the sensitive emulsion to adhere well.—F. H. L.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Fluorine in Wine; Simple and Rapid Method for the Detection of ——. F. Tusini. Staz. sperim. agrar. ital., **35**, 654—659. Chem. Centr., 1902, **2**, [23], 1390.

The author found that vapours of hydrofluoric acid turn the colouring matter of Brazil wood yellow. In applying this reaction to the detection of fluorine in wine, the hydrofluoric acid is separated in an insoluble condition, in order to obtain it free from other volatile acids such as acetic acid, which also cause the yellow coloration. 100 c.c. of the wine are made alkaline with ammonia, precipitated with a solution of calcium chloride, heated nearly to boiling, cooled, filtered, and the filter washed several times with distilled water. The precipitate is then rinsed with a small quantity of water, into an Erlenmeyer flask, heated with a few drops of concentrated sulphuric acid, and the vapours tested with a strip of filter-paper impregnated with the colouring matter. For the preparation of the test-papers, 200 grms. of Brazil wood are treated for 10 days with 300 grms. of cold water, and strips of filter-paper are dyed in the extract; these strips are carefully dried and are preserved in the dark in a closed vessel.—A. S.

INORGANIC—QUANTITATIVE.

Gas Analysis; Use of V. Meyer's Vapour Density Apparatus for ——. J. Mai and M. Silberberg. Ber., **35**, [19], 4229—4238.

For the determination of gases evolved by the action of a liquid on a solid, the authors use Victor Meyer's vapour density bulb, the long stem being cut near the bulb and joined again (glass to glass) by india-rubber, so as to render cleaning easy. The bulb is contained in a jacket closed by a cork; the cork carries, besides the bulb, a condensing tube, bent away 30° from the vertical a few centimetres above the cork, to condense the vapour of the liquid (water, amyl alcohol, amyl acetate aniline) used in the jacket, and a Kemp's thermostat. The expelled air or gas is received in a Hempel burette with levelling-tube, over oil or other non-absorbent liquid. The bulb contains the liquid to decompose the solid; the solid is weighed off in little asbestos-paper tubes stopped at one end by a bit of glass rod, and is introduced in the usual way. Using concentrated sulphuric acid in the bulb, the authors determined with satisfactory accuracy the carbon dioxide in carbonates, the sulphur dioxide in sulphites, the hydrochloric acid from chlorides, and the oxalic acid (CO + CO_2) in commercial samples and in oxalates. One advantage of the process is that a series of determinations of the same kind can be carried out very rapidly, without taking the apparatus to pieces. The new solid is introduced, the gas-burette is emptied, and the apparatus is almost at once ready for the next operation. Details as to dimensions, &c. are given in the paper.—J. T. D.

Copper; Iodometric Determination of ——, as Copper Xanthogenate. E. Rupp and L. Krauss. Ber., 1902, **35**, [19], 4157—4160.

The method proposed by the author is an improvement on that of Grete in which xanthogenate solution of known strength is run into the copper solution so long as it forms a precipitate. As no indicator can be made use of, Grete's process is a tedious one, and the authors therefore add to the copper solution a known volume of xanthogenate solution in excess of that required to precipitate all the copper present; after making up to a definite volume, the liquid is filtered and the excess of xanthogenate in an aliquot part determined by titration with decinormal iodine solution. The titration with iodine must be carried out in half an hour or under, as only under these conditions does the reaction with the xanthogenate proceed according to the equations: (1) $2SK.CS.OC_2H_5 + 2I = 2KI + C_2H_5O.CS.S.S.CS.OC_2H_5$; (2) $2SK.CS.OC_2H_5 + 2H_2O + 2I = CS(SK)_2 . 2C_2H_5OH + 2HI + S$ (*sic*); in both of which two atoms of iodine correspond to 2 mols. of potassium xanthogenate; if the liquid is allowed to stand with the iodine solution, the amount of the latter absorbed gradually increases until after about 15 hours it becomes double of that indicated by the above equations. The end point of the titration is reached when the sharp blue colour obtained with starch persists for 10—20 seconds. 1 c.c. of N/10 iodine corresponds with 0·003172 grm. of copper.

In a typical estimation made by the author, 5 c.c. of copper sulphate solution containing 0·0508 grm. of copper were added gradually, and with shaking to 25 c.c. of xanthogenate solution containing 0·5 grm. of sodium carbonate; after making up to 100 c.c., 50 c.c. of the liquid were filtered, mixed with sodium bicarbonate and starch solution, and titrated with N/10 iodine solution; copper found = 0·0509 grm.

Neutral or acetic acid solutions of copper must be used for the precipitation with xanthogenate; if the liquid contain free mineral acid, sodium acetate must first be added. Whether the copper solution is neutral or contains free acetic acid, the xanthogenate must always be mixed with bicarbonate, as otherwise the copper xanthogenate is precipitated in a very finely-divided form which does not filter well.

The xanthogenate solution alters quickly, its iodine titre changing appreciably in a couple of days.

Commercial potassium xanthogenates give turbid solutions which cannot be clarified by titration. To prepare the solution for titration, it is best to make up a 2·5 per cent. solution of the xanthogenate and shake it up well with a little copper sulphate solution; after filtration a clear solution is obtained.—T. H. P.

Manganese; Determination of ——. H. Baubigny. Comptes Rend., **135**, [22], 965—967.

When manganese salts are oxidised by alkali persulphates, the manganese can be converted completely into MnO_2; and though this substance, as is well known, tends to carry down with it the oxides of other metals (including those of the alkali metals) as manganites, yet this can be prevented by proper treatment. The author promises details later, but meanwhile describes his method of procedure:—Acidify the solution of the manganese salt, contained in a conical flask provided with a watch-glass cover; add ammonium persulphate (more soluble and more rapid in its action than the potassium salt) in sufficient quantity, and heat on the water-bath till the evolution of oxygen slackens (20—25 minutes). Cool completely, and if any permanganate has formed, add 4—5 drops of alcohol, shake, and allow to stand till completely decolorised. Filter, wash, dry, ignite, and weigh as Mn_3O_4. Precipitation of the manganese is complete, even in presence of a considerable quantity of acid (3—4 grms. of H_2SO_4 in 100 c.c. of solution).—J. T. D.

Manganese Dioxide; Separation of Alkalis from ——. H. Baubigny. Comptes Rend., **135**, [24], 1110—1113.

In precipitating manganese dioxide in presence of alkali salts by alkali persulphate, acidulating the solution with sulphuric acid, though it lessens the amount of alkali carried down with the manganese dioxide, does not entirely prevent this co-precipitation; but if the precipitate be thoroughly washed with a moderately concentrated solution (either hot or cold) of an ammonium salt, preferably the nitrate, the alkali is completely removed, and the weight of the ignited manganese oxide agrees exactly, in the case of known amounts, with that calculated. The ignited oxide from the precipitates which have not been washed with ammonium nitrate, contain alkali base, but no sulphate, showing that the alkali sulphate is not precipitated as such with the manganese dioxide, but only its alkali in the form of manganite. Ammonium nitrate will not wash out the alkali from the ignited precipitate; if this be suspected to contain alkali, the latter can only be removed by re-dissolving, re-precipitating, and washing the moist precipitate with ammonium salt. Metallic oxides other than the alkalis cannot be removed from the precipitate by this process.

—J. T. D.

Manganese; Determination of ——, in Minerals. M. Dittrich. Ber., **35**, [19], 4072—4073.

The traces of manganese present in many minerals are very difficult to separate exactly, and to determine accurately by the usual methods. The author adds a little hydrogen peroxide to the solution before adding ammonia, and thus brings the whole of the manganese, as peroxide, into the ammonia precipitate. In separating the iron and alumina in this by fusion with sodium carbonate or extraction by caustic alkali, more hydrogen peroxide is added to the alkaline liquid, so that all the manganese is left with the iron and any titanic acid. After removal of the titanic acid by fusion with potassium hydrogen sulphate, the iron and manganese go together into the filtrate. To this hot filtrate, the author adds some dilute sulphuric acid and 10—15 c.c. of 10 per cent. filtered ammonium persulphate solution, and heats for some hours on the water-bath, occasionally stirring. The whole of the manganese precipitates, but the precipitate may contain a little iron; this is separated by one of the known methods—best by Jannasch's method of precipitating the iron by ammonia in presence of hydroxylamine, when the manganese is completely retained in solution.—J. T. D.

Lead; Determination of ——, in Furnace Slag. H. Svoboda. Oesterr.-Zeits. f. Berg.- u. Hüttenw., 1902, **50**, 583. Chem.-Zeit., 1902, **26**, [98], Rep. 325.

Ten grms. of the finely pulverised slag are stirred with 10 c.c. of water, then rapidly treated with 50 c.c. of concentrated hydrochloric acid, and the liquid diluted with 30—40 c.c. of water and boiled. To oxidise the lead sulphide eventually formed, potassium chlorate is added, the chlorine boiled off, the liquid filtered, and the residue of silica boiled several times with water. The filtrate and washings are treated with an excess (20 grms.) of lead-free zinc, allowed to stand, and then filtered from the deposit, which is dissolved in dilute nitric acid. The solution is diluted to 250 c.c. and filtered, and 200 c.c. (= 8 grms. of slag) of the filtrate are treated with 25 c.c. of sulphuric acid (1:4) and 70 c.c. of alcohol, and allowed to stand over-night. The precipitate is then collected in a Gooch's crucible, washed with alcohol and ether, and dried at 150° C. It is shown by the results of test analyses that it is quite unnecessary to dissolve the lead sulphate in ammonium acetate and to repeatedly precipitate the lead as sulphide.—C. A. M.

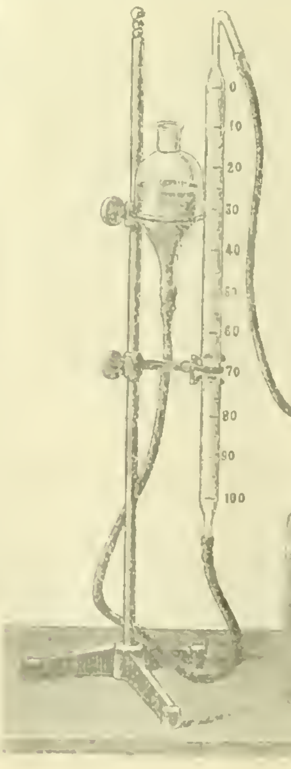
Phosphoric Acid and Magnesia: Gravimetric and Gasometric Determination of ——. [By the Molybdate Method.] E. Riegler. Zeits. anal. Chem., 1902, **41**, [11], 675—686.

The gravimetric method for the determination of phosphoric acid is based upon the precipitation of the phosphoric and molybdic acids from ammoniacal solutions of ammonium phospho-molybdate by means of barium chloride. The barium precipitate is quite insoluble in water; it has the formula $Ba_{27}(MoO_4)_{24}P_2O_5.24H_2O$, and when dried at 100° C. contains 1·75 per cent. of phosphoric anhydride (P_2O_5).

From 40 to 50 c.c. (containing not more than 0·125 grm. of P_2O_5) of the phosphate solution to be tested are placed in a flask of 200 c.c. capacity, 5 c.c. of nitric acid (sp. gr., 1·2) are added, and the whole is heated to boiling. After removing the flask from the flame, 50 c.c. of 5 per cent. molybdic acid solution are added, the mixture is shaken for two minutes, and allowed to stand at the ordinary temperature for two hours, the flask being closed by an india-rubber stopper. The precipitate is filtered off, washed with about 50 c.c. of 20 per cent. ammonium nitrate solution, and then rinsed from the filter into a [illegible] c.c. conical flask, using as little water as possible for this purpose. Any precipitate adhering to the filter is dissolved in 10 per cent. ammonia, and the filter is washed with about 30 c.c. of water. The solution in the flask, amounting to about 60—70 c.c., is now precipitated by the addition of 20—25 c.c. of 10 per cent. barium chloride solution. After mixing, but not violently shaking, the solution, and testing a drop of the clear liquid with a little potassium chromate to make certain that an excess of barium chloride is present, the precipitate is collected on a dried weighed filter, washed with water until free from chlorides, dried at 100° C., and weighed.

The gasometric method is carried out by adding a known weight of barium chloride to precipitate the ammoniacal solution and gasometrically estimating the excess of barium chloride added. Barium chloride is precipitated by iodic acid, barium iodate being formed ($BaCl_2 + 2HIO_3 = 2HCl + Ba(IO_3)_2$). The latter on treatment with hydrazine sulphate evolves nitrogen ($Ba(IO_3)_2 + 3N_2H_4H_2SO_4 = BaSO_4 + 2H_2SO_4 + 2HI + 6H_2O + 6N$). The method is as follows:—46·1585 grms. of pure crystallised barium chloride are dissolved in water and made up to 1 litre, 1 c.c. of this solution exactly precipitates 1 mgrm. of P_2O_5. The quantity of phosphate solution employed in the estimation is about 40 c.c., and should not contain more than 0·025 grm. of P_2O_5. This is precipitated as in the gravimetric method. The ammonium phospho-molybdate precipitate is dissolved in 10 per cent. ammonia and water, the resulting solution not exceeding 10 c.c. 5 c.c. of the above barium chloride solution are then added, and after the precipitate has settled, a drop of the solution is tested to see whether an excess of barium chloride be present. If not, another 5 c.c. are added. There must not be a greater excess than 5 c.c., otherwise the volume of nitrogen subsequently evolved will be too large to deal with. The precipitate is collected on a filter, washed with 30 c.c. of water, and the filtrate and washings collected in a flask containing 10 c.c. of 5 per cent. iodic acid solution. After standing 15 minutes the barium iodate is filtered off, washed with a little water, so that the filtrate amounts to 150 c.c., and the filter and precipitate placed in the small cylinder of the evolution vessel, which is placed in a vessel containing water as shown in the illustration, the level of the water just covering the india-rubber stopper.

Outside the cylinder are placed 40 c.c. of a 2 per cent. hydrazine sulphate solution. The evolution vessel is then connected to the measuring tube.



The water in the measuring cylinder is levelled and the contents of the evolution flask are mixed by shaking. After 15 minutes the volume of the evolved nitrogen is read off. When corrected to 0° C. and 760 mm. pressure, the volume of nitrogen in c.c. multiplied by 0·08 (more exactly 0·0783) gives the weight of P_2O_5 in mgrms. A correction of 0·4 mgrm.

added, as barium iodate is slightly soluble in the water sed for washing the precipitate. The actual amount f P_2O_5 in the solution analysed is thus found by he formula: $P_2O_5 = N - (V_o \times 0{\cdot}08 + 0{\cdot}4)$ mgrm., where N denotes the number of c.c.s of barium chloride sed and V_o the volume of nitrogen at 0° C. and 760 mm.

The two methods can obviously be combined, by employing the standard barium chloride solution as precipitant in the gravimetric process.

Magnesia may be gravimetrically estimated by dissolving the ammonium magnesium phosphate as usually obtained in about 50 c.c. of water and 5 c.c. of nitric acid, precipitating with molybdic acid solution, and weighing the barium compound obtained from this as above. On multiplying the weight of the latter by 0·0099, the magnesia (MgO) is given.

The gasometric method consists in first converting ammonium magnesium phosphate into ammonium phosphomolybdate, dissolving the latter in ammonia, precipitating with a known volume of barium chloride solution (81·7284 grms. per litre), and proceeding as described above. 1 c.c. of this solution corresponds to 1 mgrm. of magnesium oxide, and 1 c.c. of nitrogen to 0·0445 mgrm. of magnesium oxide. The amount of the latter is thus found from the formula: $MgO = N - (V_o \times 0{\cdot}0445 + 0{\cdot}23)$ mgrm. The correction (0·23 mgrm.) is for the solubility of the barium iodate.—W. P. S.

Potassium in Kainite and 40 *per cent. Manuring Salt (Crude Potassium Salts); Simple Process for the Rapid Determination of* ——. M. Passon. Zeits. angew. Chem., 1902, **15**, [49], 1263—1265.

Ten grms. of the salt are dissolved in 300 c.c. of water containing hydrochloric acid in a 500 c.c. flask. The solution is boiled with an excess of barium chloride to precipitate sulphuric acid and to convert all salts into chlorides. After cooling, the flask is filled, up to the mark, with 96 per cent. alcohol and shaken well. The temperature rises but a contraction in bulk sets in. After cooling to the precise room temperature, the flask is filled accurately to the mark, and shaken, and the contents are filtered through a folded paper filter. 25 c.c. of the filtrate (containing 0·5 grm. of the original substance) are mixed with 5—15 c.c. of platinic chloride solution and 125 c.c. of 96 per cent. alcohol. The mixture is agitated for five minutes in an apparatus such as is used in phosphoric acid determinations, and is then filtered through a Gooch porcelain crucible. The precipitate is washed with 80 per cent. alcohol, and rinsed with ether, dried for two hours at 100° C., cooled in the desiccator, and weighed. The precipitate is then dissolved in hot water, and the crucible afterwards washed with 80 per cent. alcohol, rinsed with ether, dried, and, after cooling, weighed again. The loss of weight gives the potassium platinic chloride.

—W. G. M.

ORGANIC—QUALITATIVE.

Narceine; Colour Reactions of ——. A. Wangerin. Pharm.-Zeit., 1902, **47**, 916. Chem.-Zeit., 1902, **26**, [98], Rep. 326.

The following test is described as a distinctive and exceedingly sensitive colour reaction of narceine:—From 0·01 to 0·02 grm. of resorcinol is rubbed in a watch glass with 10 drops of concentrated sulphuric acid, and after the addition of a trace of narceine (0·002 to 0·005 grm.) the mixture is warmed on the water-bath with continual stirring. The colour of the liquid becomes crimson to cherry red, whilst after cooling, the colour gradually changes from the edge inwards to blood red, and after 12 hours becomes orange yellow.

Another colour test for narceine consists in warming about 0·002 to 0·01 grm. of narceine with 10 drops of concentrated sulphuric acid and 0·01 to 0·02 grm. of tannin, a bright green colour being produced. Narcotine and hydrastine, however, which approach narceine in chemical constitution, also give similar green colorations in this test.—C. A. M.

ORGANIC—QUANTITATIVE.

Indigo Salts; Determination of Indigo in Dyed Fabrics.
A. Binz and A. Kufferath.

See under IV., *page* 20.

Rubber Goods; Analysis of ——. C. O. Weber. Gummi-Zeit., 1902, **17**, [10], 207—208.

The methods in general use are (1) Extraction with acetone, giving free oils, fats, paraffin, and free sulphur; (2) Extraction with alcoholic sodium hydroxide: rubber substitutes; (3) Determination of sulphur of vulcanisation; and (4) Determination of mineral constituents. The author points out that the results obtained by (1) and (2) are accurate, but that the determination of the sulphur of vulcanisation is in many cases rendered inaccurate by the presence of certain mineral constituents, whilst the determination of the mineral matter by ignition is almost invariably incorrect. The caoutchouc determined by difference is affected by these errors, and a completely accurate rubber analysis can only be obtained by tedious control determinations.

The author has shown that the solution obtained by treating rubber with nitro-benzene is not caoutchouc, but a decomposition product, which, like the parent substance, yields an addition compound with bromine, $C_{10}H_{16}Br_4$, which is quantitatively precipitated by alcohol.

In a previous communication (Ber., **35**, 1947) the author also showed that caoutchouc was quantitatively converted by nitrogen peroxide into the compound, $C_{10}H_{16}N_2O_4$, and that this compound was readily soluble in acetone. His recent extended experiments have fully confirmed these statements, and a long series of determinations of the yields thus obtained from different kinds of pure caoutchouc agreed closely with the theoretical amount (167·6 per cent.), notwithstanding the presence of a small proportion of oxygen (under 3 per cent.) in the different samples. As is shown in the following results the error in calculating the proportion of caoutchouc from the percentage of dinitro-polyprene is less than 1 per cent.:—Para, 166·9; Castilloa, pure, 167·1; Lagos, 166·3; Kassai, 167·1; Sierra Leone, 167·1; Borneo, 166·6; Madagascar, 167·3; Balata, 165·8; and gutta-percha, 167·4 per cent. In each case the samples were previously extracted with acetone.

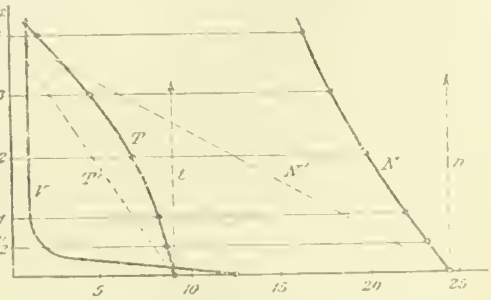
The experiments with vulcanised rubber were made upon (1) pure Para vulcanised elastic threads; (2) finely-divided patent sheet rubber; and (3) highly vulcanised Para sheet rubber. The finely-ground samples were extracted with acetone, then dried in a current of carbon dioxide, suspended in chloroform, and treated with a current of nitrogen peroxide, which changed the colour of the rubber to bright yellow. After standing for some time the chloroform was filtered off, and the residue washed with small quantities of chloroform, and repeatedly treated with hot acetone, in which it speedily dissolved, leaving the insoluble mineral matter. The filtered solution was treated with water, and the precipitated nitro compound washed with hot water, dried at 60° C., and weighed. It was found that the percentage of caoutchouc calculated from the results was too high in proportion to the degree of vulcanisation. This indicated that the vulcanised sulphur had also passed into solution, and by deducting its amount as previously determined, the results agreed closely with the known composition of the samples. Excellent results were also obtained in the analysis of a highly-vulcanised rubber containing 50 per cent. of chalk and lead oxide, which had offered great difficulties in the usual method of analysis. The mineral matter, after removal of the nitro compound by acetone, was left in a form ready for immediate weighing. (See this Journal, 1902, 626, 1401.)—C. A. M.

Glue Analysis. A. Müller. Zeits. angew. Chem., 1902, **15**, [48], 1237—1241.

Commercial samples of glue and gelatin contain varying quantities of nitrogenous decomposition products. These so-called glutoses are derived from the glutin, but, being devoid of adhesive properties, are worthless from a practical standpoint. A mere determination of the nitrogen in a sample may accordingly give misleading results. The titration method is also open to objection, as the glutoses (semi-glutin and hemi-collin) precipitate tannic acid.

The author has investigated the subject by gradually decomposing a good sample of gelatin. A 15 per cent. solution of the best gold-label gelatin was prepared, and equal quantities were heated in an autoclave with superheated steam at a pressure of two atmospheres for periods of a half, one, two, three, and four hours, the following factors being determined at each stage: viscosity, total nitrogen in the liquor, and tannin absorption (by adding excess of standard tannin solution to two similar portions, treating one with hide powder, and titrating each with standard potassium permanganate).

The adjoined figure shows the results graphically, where the periods of time in hours are plotted as ordinates, and the viscosity, amount of nitrogen, and amount of tannic acid fixed as abscissæ.



The curve V represents the viscosity, which, after four hours becomes practically nil, *i.e.*, all the glutin is converted. N shows the loss in nitrogen; N′ and *n* are the lines which would be followed (1) if the amount of nitrogen decreased regularly, and (2) if no loss occurred. The curve T shows the change in combining power with tannic acid, T′ and *t* are curves corresponding to N′ and *n*.

The decrease in the amount of nitrogen is probably due to the formation of a fine, amorphous, insoluble brown powder, which, when purified, contained 12·34 per cent. of nitrogen. In order to determine why the curve T practically vanishes, notwithstanding the fact that glutose combines with tannic acid, samples of glutin tannate and glutose-tannate were examined, and it was found that the former is a stable substance, whilst the latter very readily decomposes when washed or digested in water. It appears, therefore, that when a sample of glue is precipitated with tannin, the glutose-tannate decomposes, and may be washed out from the mixed precipitate, whilst under the conditions of these experiments, the liberated tannin was absorbed by the hide powder, thus giving gradually diminishing values for the tannin-absorption value.

In order to ascertain the probable percentage of error of the nitrogen test and the tannin test, a number of commercial samples were examined by both methods, and also by Stelling's method of precipitating the glutin with alcohol (Chem.-Zeit., **20**, 461).

For good samples, where the amount of glutose is small, the nitrogen estimation gave a probable error of about 2 per cent., and the tannin estimation about ½ per cent., whilst in bad samples the corresponding errors were about 6 and 2 per cent. respectively.—R. L. J.

Reducing Sugars; Iodometry of ——. M. Buisson. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [1], 429—436.

In applying Haen's method of determining unreduced copper solution when titrating reducing sugars, it is found that the decolorisation of the iodide of starch at the end of the reaction is not permanent, the blue colour reappearing at the end of a few minutes unless care is taken to render the copper solution only just acid before adding the thiosulphate. It is necessary to determine the amount of oxide of copper held in insoluble combination with the filter-paper and to correct for this. The amount of copper precipitated also should not exceed half that contained in the solution used.—L. J. de W.

Opium: Analysis of Preparations containing —— [Detection of Morphine in the Presence of Ipecacuanha Alkaloids]. A. H. Allen and G. E. Scott-Smith. Analyst, **27**, [321], 350—353.

Detection of Morphine in the Presence of Ipecacuanha Compounds.—In view of the marked similarity of colour reactions afforded by the ipecacuanha alkaloids (this Journal, 1902, 1475) with those given by morphine with Froehde's reagent, ferric chloride, iodic acid and starch, and with ferric chloride and potassium ferricyanide, the presence of morphine, and, by inference, of opium, in a preparation containing ipecacuanha, cannot be pronounced with certainty on the results of these tests alone. Confirmation of the presence of morphine may be obtained by shaking out an amylic alcohol solution with a little dilute acetic acid, placing a few drops of this acetate solution in a watch-glass or on a celled microscope slide, and covering it with a watch-glass moistened with strong ammonia solution. After allowing to stand for 30 minutes, any morphine liberated will be found to have crystallised in elongated prisms, easily identified by microscopic examination, and quite distinct from the octahedra or rice-starch-like crystals of the psychotrine of ipecacuanha.

Examination of Paregoric.—The composition of "paregoric" of commerce often varies considerably from that prescribed in the British Pharmacopœia for "Compound tincture of camphor." The preparation may be deficient in alcoholic strength or in the proportion of anise oil or of benzoic acid. To evade the poisons regulations of the Pharmacy Act the opium is often entirely omitted; occasionally alkali-metal bromides are substituted for this ingredient. If 25 c.c. of paregoric be neutralised and distilled to about 10 c.c. the alcohol may be approximately determined from the specific gravity of the distillate. A portion of the camphor and anise oil will be carried over, the remainder may be extracted from the distillation residue by shaking out with ether. If the aqueous layer be then acidulated with HCl and again shaken out with ether, the benzoic acid may be obtained in a weighable condition on evaporating the ethereal extract. It is preferable, however, to shake out the ether layer with successive washings of water, until these are no longer acid to litmus, and to titrate them with N/20 $Ba(OH)_2$ solution, using phenolphthalein as indicator, and shaking the aqueous solution with the original ethereal layer. The number of mgrms. of benzoic acid thus found, × 0·35, gives the amount of benzoic acid per pint of the paregoric examined. The amount of meconic acid present in the aqueous liquid is too small to affect the results appreciably. Its presence, however, may be indicated by separating the ether, destroying the pink colour due to the slight excess of alkali in the aqueous layer, and adding a drop of Fe_2Cl_6 solution, when the familiar purple-red tint will be produced. Since meconic acid is not readily extracted from acid aqueous solution by ether, better results may be obtained by employing amylic alcohol as the immiscible solvent. The presence of meconic acid leads to the inference of the presence of opium also. When only this ingredient is sought for, the original sample may be simply diluted with proof spirit until the colour is reduced to a light yellow tint, and then treated with a drop of Fe_2Cl_6 solution. By comparing this colour with that given by a standard tincture, a rough approximation of the amount of opium present may be obtained. The proportion of opium in paregoric is too small to allow of a ready gravimetric determination of the morphine. But fair results, sufficiently accurate for most purposes, may be obtained by volumetric or colorimetric application of the reaction with iodic acid.—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Cerite Elements; Separation of the ——, by the Chromic Acid Method. C. R. Böhm. Zeits. angew. Chem., **15**, [50], 1282—1299.

Muthmann and Bohm (this Journal, 1900, 267) have described a process for the separation of the cerite elements.

based upon the fact that the neutral chromates of the elements are less soluble than the corresponding sulphates. The author has found that by fractional precipitation with successive additions of potassium chromate, the earths may be separated much more rapidly than by any other method, especially if they exist in solution as the readily soluble bichromates. To attain success by this method, certain conditions of dilution, temperature, and agitation must be adhered to. The experimental manipulation is described in detail, and a series of fractionations of rare earth mixtures is described, with the aid of several tables and remarks thereon.

The order in which the earths are separated out by the new method is as follows:—(1) cerium, (2) lanthanum, (3) praseodymium, (4) neodymium, (5) samarium, (6) terbium, (7) ytterbium, (8) erbium, (9) yttrium, (10) gadolinium. The separation of the cerium is extremely good. If a mixture of the crude oxides with an excess of chromic acid is added gradually, with constant stirring, to a small quantity of water, and, after heating, the solution of the bichromates is diluted slightly, the cerium is precipitated almost entirely as basic chromate. The separation of the elements by this method is not a complete one, but they are so concentrated into the various fractions that the latter are very suitable for further treatment by known methods. The behaviour of the various earths is treated of under separate headings, and the results of the spectroscopic investigations are fully discussed.—H. B.

Bismuth; Radio-Active Constituent of the ——, from the Joachimsthal Pitchblende. W. Marckwald. Ber., 35, [19], 4239—4240. (See this Journal, 1902, 1301.)

The author has suggested that the active constituent of this metal is related rather to tellurium than to bismuth. When to the hydrochloric acid solution of the active bismuth oxychloride a few drops of stannous chloride are added, the solution darkens, and a black substance slowly settles out, which, when collected on a filter, is found to be highly radio-active, while the filtrate has lost all activity. This black substance is much more active (but is correspondingly smaller in quantity) than the electrolytically-obtained product. It differs, apparently, in no respect other than its activity, from tellurium, and the author proposes to call it *radiotellurium.*

The author replies to some remarks of Giesel's on his work, pointing out that Giesel's statements do not represent the views the author has expressed, and that he is in accord with Giesel and the Curies as to the probable constitution of polonium.—J. T. D.

Silver; Colloidal ——. F. Küspert. Ber., 35, [19], 4066—4070.

Continuing his former work (this Journal, 1902, 1301), the author finds that concentrated pure sodium silicate solution is not necessary, but that a solution of ordinary brown sodium silicate of 10 per cent. strength gives clear solutions of colloidal silver of red-brown or yellow-brown tint. Dust and any inequalities on the surface of the glass vessels used, cause rapid precipitation of the silver, and hence it is desirable to use new vessels. The speed of reaction was measured by adding to 1 c.c. of N/10 silver nitrate solution in 25 c.c. of sodium silicate solution of 1:10 strength, solutions of from 2 c.c. to 10 c.c. of 1/60 formalin solution made up to 24 c.c. with water, and estimating the depth of tint after varying intervals of time. The speed increases with the concentration of the formalin, with the intensity of the light to which the liquid is exposed, and with rise of temperature. The colour of the solutions, when greatly diluted, varies with the temperature of reduction. More concentrated silver solutions than those mentioned can be used, and will give stable colloidal solutions; but if dilute colloidal solutions be concentrated by evaporation, some of the silver deposits, and ultimately the whole sets to a jelly, insoluble in water.—J. T. D.

Silver and Gold; Colloidal ——. F. Küspert. Ber., 35, [19], 4070—4071.

The deposited silver mentioned above (see preceding abstract) exists in the form of extremely minute particles, for they require many weeks to settle out. Microscopic examination of the blackish jelly formed on evaporation shows that it is not homogeneous, but contains minute drops of water. If in the preparation of these colloidal solutions less than 0·1 c.c. of the 10 per cent. silicate solution be used in 50 c.c. of the liquid, the silver always separates as a mirror. The solutions previously described were all, after dilution, yellow, brown-yellow, or brownish-green; but one made from 0·5 c.c. of concentrated water-glass, 1 c.c. of N/10 silver nitrate, 5 c.c. of 1/60 formalin, and 1 litre of water, after 20 hours' standing, was intensely carmine-red. Hydroxylamine sulphate used instead of formalin does not give colloidal silver.

Gold chloride solution, with water-glass and formalin, heated on the water-bath, gave, according to quantity, bright-red, claret-red, blue, and, in one case, green colloidal solutions. Very small amounts of gold give a rose-red coloration. The blue-green solutions looked greenish-black by reflected light, but by transmitted light showed the same colour as gold leaf.—J. T. D.

Boron Trichloride; Action of ——, on Ammonia. A. Joannis. Comptes Rend., 135, [24], 1106—1109.

Hydrogen containing the vapour of boron trichloride is passed into liquid ammonia, the temperature being kept between −50° and −70° C.

From an examination of the amounts of ammonia which escape when the temperature is raised successively to −23° C. and to 0° C., the author concludes that boramide and ammonium chloride are formed:—

$$BCl_3 + 6NH_3 = B(NH_2)_3 + 3NH_4Cl.$$

At low temperatures the ammonium chloride unites with more ammonia to form the compound $NH_4Cl.3NH_3$. The boramide has not yet been separated from the associated ammonium chloride. If the temperature be allowed to rise, the boramide slowly decomposes, with evolution of ammonia and formation of borimide:—

$$2B(NH_2)_3 = B_2(NH)_3 + 3NH_3.$$

This substance is stable up to 440° C. It can be readily separated from the associated ammonium chloride by dissolving out the latter with liquid ammonia, and appears to be identical with the borimide obtained by Stockes and Blick by heating ammoniacal boron sulphide. Possibly the "ammoniacal sulphide, bromide, and iodide" of boron are really mixtures of boramide with ammonium sulphide, bromide, and iodide.—J. T. D.

Pyrophosphoric Acid; Transformation of ——, into Orthophosphoric Acid. H. Giran. Comptes Rend., 135, [22], 961—963.

Syrupy pyrophosphoric acid, kept for three months about −10° C., solidifies to a crystalline mass. A calorimetric study of it has yielded the following results:—

$$\begin{aligned} &H_4P_2O_7 \text{ sol.} + H_2O \text{ liq.} = 2H_3PO_4 \text{ sol.} + 6{\cdot}97 \text{ cal.}\\ &H_4P_2O_7 \text{ liq.} + H_2O \text{ ,,} = 2H_3PO_4 \text{ ,,} + 9{\cdot}09 \text{ ,,}\\ &H_4P_2O_7 \text{ diss.} + H_2O \text{ ,,} = 2H_3PO_4 \text{ diss.} + 4{\cdot}25 \text{ ,,} \end{aligned}$$

$$H_4 + P_2 + O_7 = H_4P_2O_7 \text{ cryst.}: + 532{\cdot}23;\ \text{liq.}: + 529{\cdot}94;\ \text{diss.}: + 540{\cdot}16 \text{ cal.}$$

The last result is dependent on Thomsen's figure (+304·1 cal.) for the formation of orthophosphoric acid from its elements.—J. T. D.

Ignition of Guncotton with Water [Reaction of Sodium Peroxide on Guncotton and Formaldehyde]. L. Vanino. Zeits. angew. Chem., 15, [50], 1299—1300.

If dry guncotton be impregnated with sodium peroxide and a few drops of water be then added, the guncotton is ignited (but not detonated) immediately. Excess of water must be avoided. The addition of formaldehyde to the water promotes the reaction very considerably. If to ordinary commercial formalin a small quantity of sodium peroxide be added, a violent detonation occurs, with destruction of the glass vessel. When the peroxide is added in too small amounts, only small sparks of flame appear, unaccompanied by an explosion, or only a development of gas is observed; with larger additions, however, the explosion occurs regularly, with a dull report.—H. B.

Light; Chemical Action of ——. G. Ciamician and P. Silber. Ber., 1902, **35**, [19], 4128—4131.

As a result of the continuation of their former work (see this Journal, 1901, 844 and 943; 1902, 876, 1477), the authors find that, under the influence of light, unsaturated compounds exhibit a decided tendency to polymerise.

It has been already shown by Bertram and Kürsten that, when dry cinnamic acid is exposed to sunlight, it is rapidly and almost completely transformed into α-truxillic acid. The authors have found, however, that when an absolute alcoholic solution of cinnamic acid is left in the light for nearly five months, about half the acid is converted into the ethyl ester, the rest being unchanged; no sign of truxillic acid could be found. When suspended in and partially dissolved by paraldehyde, and exposed for some months to the action of light, cinnamic acid is, to some extent, polymerised into α-truxillic acid, but the authors consider that it is only the undissolved cinnamic acid which undergoes this change.

A solution of stilbene in benzene assumes, under the influence of light, a pale yellow colour, part of the stilbene being polymerised into a compound having the doubled formula $C_{28}H_{24}$, as is shown by a molecular weight determination in naphthalene solution. This compound crystallises from ether in colourless prisms, and in alcoholic solution is stable towards permanganate.

Exposed to light in either alcohol or paraldehyde solution, coumarin undergoes partial polymerisation into a di-polymeride, $C_{18}H_{12}O_4$, which is probably identical with Dyson's dihydrocoumarin, and separates from the solution in colourless, well-formed crystals melting at 262°.—T. H. P.

Aromatic Hydrocarbons; New Method of Chlorinating ——. Seyewetz and Biot. Comptes Rend., **135**, [24], 1120—1122.

Hydrocarbons of the benzene, naphthalene, and anthracene series, heated with ammoniacal lead tetrachloride to 150°—200° C., are readily chlorinated in the nucleus. The reagent is prepared by passing chlorine gas through lead chloride suspended in hydrochloric acid till complete solution takes place; the calculated quantity of ammonium chloride ($2NH_4Cl : PbCl_2$) dissolved in ten times its weight of water is then added, and the yellow crystalline precipitate of $2NH_4Cl : PbCl_4$ collected and dried at 70°—80° C. —J. T. D.

Paraformaldehyde; Solubility of ——, *in Solutions of Sodium Sulphite.* A. and L. Lumière and Seyewetz. Bull. Soc. Chim., 1902, **27**, [24], 1212—1215.

Paraformaldehyde [trioxymethylene] dissolves readily in solutions of sodium sulphite. The maximum solubility of paraformaldehyde occurs when the solid mixture contains from 30 to 60 per cent. of anhydrous sodium sulphite; solutions can then be obtained containing 25—29 per cent. of paraformaldehyde.

The presence of paraformaldehyde in sufficient proportion (25 per cent.) increases the solubility of sodium sulphite to such an extent that the solution of the mixture contains about 55 per cent. of the anhydrous salt, as against 28 per cent. in pure aqueous solutions; the total solid matter in such a solution amounts to 74 per cent. It is assumed that a loose molecular combination of the two bodies occurs in solution.—J. F. B.

Formic Acid; New Synthesis of ——. H. Moissan. Bull. Soc. Chim., 1902, **27**, [23], 1148—1152.

Potassium hydride, prepared by heating the metal in a current of hydrogen at a temperature of 360° C., reacts with carbon dioxide and with carbon monoxide.

The hydride is heated in sealed tubes in presence of excess of carbon dioxide at 225° C., when potassium formate is produced, according to the equation—

$$CO_2 + KH = HCOOK.$$

With carbon monoxide, reaction does not take place so readily. If potassium be heated at a temperature of 350° C. with a mixture of hydrogen and carbon monoxide, potassium formate and carbon are the products of the reaction according to the equation—

$$2CO + KH = HCOOK + C.$$

Sodium hydride gives similar results.—J. F. B.

New Books.

Inorganic Chemistry, with the Elements of Physical and Theoretical Chemistry. By J. I. D. Hinds, Ph.D., Professor of Chemistry in the University of Nashville. First Edition. John Wiley and Sons, New York, U.S.A. 1902. Price 3 dols. Chapman and Hall, Ltd., London.

8vo volume, containing chart of the spectra of the alkali and alkaline-earth elements, preface, list of suggestions to teachers, table of contents, subject-matter (illustrated with 66 engravings) filling 543 pages, an addendum on Radium, appendix, and alphabetical index of subjects. The matter is dealt with under four divisions:—I. Introduction. II. Physical Chemistry. III. Theoretical Chemistry: (i.) Statics. (ii.) Dynamics. IV. Descriptive Chemistry.

Handbuch der Elektrochemie. Bearbeitet von Prof. Dr. W. Borchers, Dr. E. Bose, Dr. H. Danneel, Prof. Dr. Elbs, Prof. Dr. F. Küster, Bergingenieur F. Langguth, Prof. Dr. W. Nernst, and Prof. Dr. H. Stockmeier.

Elektromagnetische Aufbereitung. Von F. Langguth, Bergingenieur, Mechernich. Wilhelm Knapp's Verlag, Halle a. S., Germany. 1903. Price M. 3.

Large 8vo volume, containing 64 pages of subject-matter, with 49 illustrations. This book evidently forms part of the contemplated entire handbook, and contains neither table of contents nor index. The chapters treat of the following subjects. I. Development of Electro-magnetism. II. The Principle of Electro-magnetic Separation. III. The Electro-magnetic Ore Separator. IV. Results achieved by Electro-magnetic Separation. V. Contributory Processes in Electro-magnetic Separation (Reduction to Smalls, Sifting, Briquette-forming, &c.). VI. Magnetic Separation Establishments.

Specielle Elektrochemie. Von Dr. H. Danneel, Privatdozent für phys. Chemie und Elektrochem. an der königl. tech. Hochschule zu Aachen. Lieferung I. Wilhelm Knapp's Verlag, Halle a. S. 1903. Price M. 3.

This section of the Handbuch appears now in its first issue. It will be completed in 14 Parts. Part I. is devoted to the Special Electro-chemistry of the Elements and Inorganic Compounds: their Preparation by Electrochemical Methods and their Electrolysis.

Einführung in die Elektrochemie, nach der elektrolytischen Dissociationstheorie. Bearbeitet von Peter Gerdes. Wilhelm Knapp's Verlag, Halle a. S., Germany. 1902. Price M. 4.

8vo volume, containing preface, table of contents, and 117 pages of subject-matter, with 48 illustrations, followed by an alphabetical index of subjects and a list of errata. The text is subdivided as follows:—I. Principles of Electricity and Magnetism; Electrical Units of Mass, Ohm's Law, &c. II. Osmose and Osmotic Pressure. III. lectrolysis. IV. Polarisation. V. Acids, Bases, and Salts. Neutralisation, &c. VI. Production of Electric Current; (i.) Galvanic Elements, Primary and Secondary; (ii.) Electrical Machines, &c. VII. Electro-decompositions. Faraday's Law. Precipitation of Metals. Electro-plating, &c.

Ebungsbeispiele für die Elektrolytische Darstellung Chemischer Präparate, zum Gebrauch im Laboratorium für Chemiker und Elektrochemiker. Von Dr. Karl Elbs. Wilhelm Knapp's Verlag, Halle a. S. 1902. Price M. 4.

vo volume, containing preface, table of contents, and ubject-matter filling 98 pages, followed by the alphabetical dex. There are eight illustrations. The subject-matter is ubdivided as follows:—General Section. (1) Sources f Current and Conductors. (2) Resistances. (3) Measuring Apparatus and Measurements. (4) Apparatus for lectrolysis. Special Section: I. Examples from Inrganic Chemistry. (*a*) Experiments with Unattacked Anodes; (*b*) With Anodes suffering Attack. II. Examples rom Organic Chemistry: (*a*) Electrolysis of Organic cids. (*b*) Electro-chemical Reduction Processes: (i.) Reduction of Aromatic Nitro Bodies. (ii.) Reduction of arbonyl Compounds. (*c*) Electro-chemical Oxidation Processes. Preparation of Iodoform and *p*-Nitrobenzyl Alcohol.

Lead Smelting. The Construction, Equipment, and Operation of Lead Blast-Furnaces, and Observations on the Influence of Metallic Elements on Slags and the Scientific Handling of Smoke. By Malvern Wells Iles, Ph.D. First Edition. John Wiley and Sons, New York, U.S. America. Chapman and Hall, Ltd., London. 1902. Price, 2.50 dols. Postage, 9 cents additional.

Small 8vo volume, containing preface, table of contents, and subject-matter filling 211 pages, with 11 illustrations. The work closes with an alphabetical index. The following leading subjects are treated in detail in the text: I. Blast-Furnaces. II. Influence of Metallic Elements. III. Wall Accretions. IV. Handling of Smoke. V. Metallurgical Results. VI. Antimonial Lead. VII. Roasting Furnaces. VIII. Smoke. IX. Fume Experiments. X. The Bag House.

Physico-Chemical Tables for the Use of Analysts, Physicists, Chemical Manufacturers, and Scientific Chemists. In two volumes, each complete in itself. By John Castell-Evans, F.I.C., F.C.S., Superintendent of the Chemical Laboratories and Lecturer on Inorganic Chemistry and Metallurgy at the Finsbury Technical College. Vol. I.—Chemical Engineering and Physical Chemistry. Chas. Griffin and Co., Ltd., Exeter Street Strand, London. 1902. Price 24*s.* nett.

Large 8vo volume, with introduction and notes on the use of the tables, table of contents, and 548 pages of subject-matter, almost wholly tables. This mainly tabulated matter is subdivided as follows:—I. Mathematical. II. Mechanics. III. Physics and Physical Chemistry. This group is again subdivided, thus:—(i.) Heat. Thermometry. (ii.) Correction of Thermometric Readings. Composition of Glass for Thermometers. (iii.) Air or Gas Thermometers. (iv.) Measurement of Extreme Temperatures. (v.) Change of Dimensions dependent on Variation of Temperature. (vi.) Calorimetry. (vii.) Specific Gravities and Densities. Hydrometers. (viii.) Barometry. (ix.) Thermal Constants of Gases. (x.) Calculations of Gaseous Volumes. (xi.) Determination of Vapour Densities, &c. (xii.) Fusion. (xiii.) Vaporisation. (xiv.) Gases and Vapours. (xv.) Vapour Tensions and Boiling Points. (xvi.) Formulæ and Values of Constants for Latent Heats of Vapours.

The Evolution of Artificial Mineral Waters. By William Kirkby, F.L.S., Lecturer on Pharmacognosy in the Owens College, Manchester. Jewsbury and Brown, Ardwick Green, Manchester. 1902. Price 3*s.* 6*d.*

8vo volume, containing frontispiece, preface, table of contents, list of illustrations, and subject-matter filling 140 pages, followed by the alphabetical index. The work contains 50 illustrations, and is divided into the following sections:—I. Introduction. II. Early Speculations and Experiments on the Composition of Mineral Waters. III. Imitation of Natural Mineral Waters. IV. Discovery of the Properties and Composition of Carbonic Acid Gas. V. Methods and Apparatus for making Aërated Waters. VI. Origin and Development of the Syphon. VII. Present System of making Aërated Beverages. VIII. Bibliography.

The Chemistry of India-Rubber, including the Outlines of a Theory of Vulcanisation. By Carl Otto Weber, Ph.D. Charles Griffin and Co., Ltd., Exeter Street, Strand, W.C. 1902. Price 16*s.* nett.

This work, of 8vo size, contains a frontispiece representing, in two figures respectively, the Structure of the Insoluble Constituent of India-Rubber, and the Dendritical Crystallisation induced in deposit of Sulphur Globules. Then follow the title-page, preface, table of contents, list of illustrations, and subject-matter filling 308 pages, followed by the alphabetical index. There are 28 illustrations. The following are the leading themes:—I. Chemistry of India-Rubber. II. Examination and Valuation of Gutta-Percha and India-Rubber. III. Examination of India-Rubber Substitutes. IV. Inorganic Compounding Materials. V. Vulcanisers and Sulphur Carriers. VI. India-Rubber Solvents. VII. Colouring Matters. VIII. Constructive Components of India-Rubber Articles. IX. Analysis of Rubber Articles. Appendix: Sanitary Condition in India-Rubber Works.

A Research on the Eucalypts, especially in regard to their Essential Oils. By Richard T. Baker, F.L.S. (Curator and Economic Botanist), and Henry G. Smith, F.C.S. (Assistant Curator and Chemist). Technical Education Series, No. 13. Department of Public Instruction, Technological Museum, New South Wales. Published by Authority of the Government of the State of New South Wales. W. A. Gullick, Government Printer, Phillip Street, Sydney. 1902. Price 15*s.*

This is a large 4to volume, containing preface, list of acknowledgments, table of contents, list of illustrations, list of corrigenda, and text filling 287 pages, and the alphabetical index. The illustrations comprise the frontispiece, a tabular diagram representing the probable evolution of the eucalypts, and 45 engravings, nine of which take the form of coloured plates, representing the various types of eucalyptus leaves under various conditions of development. The subject matter is arranged under the following subdivisions:—I. The Genus Eucalyptus. II. Systematic Classification. III. Comparative Constancy of Specific Characters. IV. Hybridisation. V. Probable Evolution of the Eucalyptus. VI. Description of the Species and their Essential Oils. VII. Additional Species. VIII. Eudesmol, the Stearoptene of Eucalyptus Oils. IX. Aromadendral: an Aldehyde of Eucalyptus Oils. X. Eudesmic Acid and its Amyl Ester occurring in Eucalyptus Oils. XI. Piperitone: the Peppermint Constituent of Eucalyptus Oils. XII. Geraniol and its Acetic Acid Ester occurring in Eucalyptus Oils. XIII. The Pinenes of Eucalyptus Oils. XIV. Aromadendrene: the Sesquiterpene of Eucalyptus Oils. XV. The Valeric Acid Ester occurring in Eucalyptus Oils. XVI. The Free Volatile Acid of Eucalyptus Oils. XVII. Alteration of Specific Gravity of Eucalyptus Oils. XVIII. Extraction of Eucalyptus Oils in Australia. XIX. Determination of Eucalyptus Oil. The tables are as follows:—(i.) Average Yield of Oil obtainable from the several Species of Eucalypts. (ii.) Solubility in Alcohol of Crude Eucalyptus Oils. (iii.) Aggregate Results from the Crude Oils of the various Species.

Trade Report.

I.—GENERAL.

Trade of Chile.

Chem. and Druggist, Dec. 20, 1902.

Last year Germany shipped "perfumery, drugs, &c." to Chile to the value of 1,350,148 pesos (1 peso = 1*s.* 6*d.*). Great Britain shipped similar goods valued at 696,157 pesos, France shipped 591,472 pesos, and the United States 239,733 pesos. The above figures show that Germany is well in front of this country, but the United Kingdom's share of the total imports into Chile is about one-third of the whole, and is increasing. There is no English chemist in Santiago, and only one in Valparaiso. All the chemists are Germans, consequently they import largely from Germany, and in support of this the Consul gives figures showing the British and German shares of the imports of alkaloids and their salts, sulphuric, carbolic, and hydrochloric acids, &c. Among the exports from Chile last year were quillaia-bark 184,020 pesos (1900, 176,302 pesos), beeswax 582,045 pesos (1900, 503,413 pesos), borate of lime 1,302,401 pesos (1900, 1,317,676 pesos), and iodine 3,559,075 pesos (1900, 4,043,172 pesos).

VII.—ACIDS, ALKALIS, Etc.

Borax and Boric Acid in Italy.

Chem. and Druggist, Dec. 20, 1902.

The export of borax from Italy, in 1901, was 947 quintals only, against 3,735 quintals in 1900. The export of crude boric acid was 19,955 quintals, against 15,522 quintals in the previous year. The most important borax mines in the Leghorn district are near Cecina, whence 999 quintals of refined boric acid were exported. The production of the works situated near Pomarance (also in the Leghorn district) amounted to 19,236 quintals of crude boric acid, 2,286 quintals of refined boric acid, and 5,440 quintals of refined borax.

Rock-Salt Mine in Belgium.

Cons. Report, Dec. 15, 1902.

According to a communication to the Society of Archæology of Brussels, recent borings near Beeringen have resulted in the discovery of a mine of rock salt at a depth of about 3,000 feet.

Nitrate and Iodine in Chile.

Dipl. and Cons. Reps., Dec. 1902.

The value of the nitrate exported from Chile during 1901 amounted to 8,914,509*l.*, whilst the value of its by-product, iodine, was 266,930*l.*

Sulphur Wicks: U.S. Customs Decision.

Sulphur wicks composed of strips of cotton, about 8 ins. long, heavily coated with sulphur, and containing 91 per cent. of sulphur, intended to be burned in liquor casks for the purpose of purification, were held by the Board of General Appraisers, Dec. 8, 1902, to be dutiable at 20 per cent. *ad val.*, under section 6 of the Tariff of 1897, as a "manufactured article unenumerated," and not at 45 per cent. *ad val.* as "manufactures of cotton," under par. 322.

The importers claimed that sulphur was the component material of chief value, which was allowed by the Board.

—R. W. M.

VIII.—GLASS, POTTERY, AND ENAMELS.

Earthenware: U.S. Customs Decision.

Under date of Dec. 9, 1902, the Board of General Appraisers have decided that mortars, pestles, and evaporating dishes composed of plain white earthenware, with fittings of wood, are dutiable at 55 per cent. *ad val.* under par. 95 of the present Tariff Act, and not at 35 per cent. *ad val.*, under par. 97, as articles composed of mineral substances, nor at the same rate as manufactures of wood, under par. 208, as claimed by the importers.—R. W. M.

X.—METALLURGY.

Tin in Queensland.

U.S. Cons. Reps., Dec. 13, 1902.

The Stannary Hill mines in North Queensland are being steadily developed. At the Ivanhoe mine about 1,200 tons are in the ore bins. At the Kitchener mine the ore body opened up yields about 8 per cent. The erection of the Stannary battery and concentrating mill will be immediately commenced. The 20-head battery being erected will treat 400 tons weekly. At the Vulcan mine, at Irvinebank, there is still good ore, and last month the crushing of 800 tons gave over 10 per cent. of oxide. About five miles from Coolgarra very rich lodes are being developed.

Mercury Production in Italy.

Eng. and Mining J., Dec. 6, 1902.

There are now at the Monte Amiata five quicksilver works, which have the following equipment:—1. Siele, three furnaces of 24, 12, and 2 metric tons capacity per day, and three shaft furnaces of 4 to 6 tons capacity per day. 2. Cornacchino, two furnaces (24 tons and 2 tons) and one shaft furnace (4 to 6 tons). 3. Abbadia San Salvadore, two furnaces of 24 tons, two of 2 tons, and two shaft furnaces of 6 tons each. 4. Montebuono, one furnace of 12 tons. 5. Cortivecchie, two furnaces building, one of 24 tons, one of 12 tons. The following record shows the growth of the works from 1895 to 1901:—

Year.	Production.		
	Ore.	Average Yield.	Mercury.
	Tons.	Per Cent.	Tons.
1895	10,504	1·9	199
1897	20,659	0·99	192
1899	29,322	0·7	205
1900	33,930	0·75	260
1901	35,000	0·77	271

The average value of the quicksilver produced was 4·85 lire per kilo. in 1893, and 4·40 in 1894. Since then it has risen gradually but steadily to 6·50 lire per kilo., the price reported in 1901.

Manganese Ore in India.

Indian Engineering; through Eng. and Mining J., Dec. 13, 1902.

At present manganese ore is being very largely railed from Tharsa and Kampti stations on the Bengal-Nagpur Railway in the Central Provinces. In both cases the ore is carted from Ramtek, 12 to 15 miles north of these stations. Very recently good ore has been found near Balaghat on the southern section of the Satpura Railway, and it has been decided to run a short branch to the miners by the Bengal-Nagpur Railway.

Babbitt Metal: U.S. Customs Decision.

"Babbitt metal" was held, Dec. 3, 1902, by the Board of General Appraisers, to be dutiable at 45 per cent. *ad val.*, under par. 193 of the Tariff of 1897, as a "manufacture of metal," and the claims of the importers overruled that it was free of duty, either under par. 505, as old brass or Dutch metal; or under par. 532, as copper; or under par. 534, as regulus or black copper; or under par. 637, as pewter or Britannia metal; or under par. 683, as tin or oxide ore or metal; or dutiable at 20 per cent. *ad val.*, under section 6, as a "manufactured article unenumerated."

—R. W. M.

XIII. B.—RESINS, VARNISHES, Etc.

Marine Glue Pitch: U.S. Customs Decision.

Two compounds of this name were under consideration by the Board of General Appraisers. One was black, and consisted of a coal-tar pitch containing 9½ per cent. of ferruginous silicates; and one was white, and consisted of carbonates of lime and magnesia, soap, resin compounds, and oxidised oils. The Board decided them to be dutiable at 20 per cent. *ad val.* under section 6 of the Tariff of 1897, as a "manufactured article unenumerated," and not free of duty either as "pitch of coal tar" under par. 524, or "pitch of wood" under par. 678.—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Crop of Brazil: Gutta-Percha Industry.

U.S. Cons. Reps., Dec. 9, 1902.

The troubles in the Acre territory have affected the rubber trade there, and will largely reduce the crop. The rubber produced on the Beni and the Acre is considered the best that comes to Para. Rubber from the islands and from the Purus, Jurua, Madeira, Solimoes, Rio Negro, Javary, Japura, Jutahy, Ica, Baixo Amazonas, and Branco rivers and their affluents is coming down in great quantities, and the quality rules very high.

Caoutchouc.—It is said that the caoutchouc forests of Peru, from which nearly the whole supply has hitherto been drawn, are exhausted. This is the result of cutting down, instead of bleeding, the trees. There is, however, a large supply of caoutchouc in the regions about the Upper Madeira. In the near future, gatherers must look to Bolivia for their supply of this material. A strong effort will be made to prevent their destroying the trees, as in Peru. Experts state that the tree can be tapped in a special manner, and its gum extracted year by year for a long term before it becomes exhausted.

A serious obstacle to the production of rubber on the Upper Madeira is that rubber merchants are charged 23 per cent. *ad val.* export duty by the State of Matto Grosso. The State of Amazonas also charges 23 per cent. duty.

Gutta-Percha.—The supply of balata at Para is so great that there is no fear of a shortage for years to come. The tributaries of the Amazon all have forests of this tree upon their banks. Three syndicates (English, Belgian, and German) are now in the field to produce gutta-percha. The market price of balata is equal to that of the best rubber, and the cost of production is less than one-tenth that of rubber.

The balata fields of the Guianas and Venezuela are said to be nearly exhausted, which makes the discovery of the supply on the Amazon of great importance. The production of balata does not risk life like the gathering of rubber. The balata grows upon high ground, as well as on the margins of streams. Four men will gather as many kilos. of balata per day as 30 men can obtain of "boracha."

Gutta-Percha in Cameroon (German West Africa).

C. O. Weber. Gummi-Zeit., 1902, **17**, [12], 252.

Whilst a new rubber plantation becomes productive in 7 or 8 years, a gutta plantation requires 24—25 years, so that few capitalists can entertain such an investment.

According to Marckwald (Tropenpflanzer, 1902, 561), the industry in Cameroon will require the utilisation of twigs, leaves, and other waste portions of the plant. The amount of resinous substances present in these portions makes the product of low value, but experiments have been made in this direction with several South American and Malayan varieties.—R. L. J.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Japanese Isinglass or Agar-agar: U.S. Customs Decision.

Bd. of Trade J., Dec. 24, 1902.

The United States Board of General Appraisers have decided that so-called Japanese isinglass or agar-agar, manufactured from a seaweed found in Japanese waters, is to be dutiable by similitude under par. 23 of the Tariff at the rates applicable to "isinglass or fish glue," and not as a prepared vegetable under par. 241 at the rate of 40 per cent. *ad val.*

XVI.—SUGAR, STARCH, Etc.

Gum Arabic in British India.

Bd. of Trade J., Dec 4, 1902, 440—442.

East Indian gum is imported into Bombay from Aden and the Red Sea ports; it is not produced in India, but is picked and assorted and re-exported. There are two qualities, both of which are soluble gums, very little inferior to true gum arabic. Indian gum arabic or gum ghati consists of a mixture of a great number of different varieties. During the past six years, the exports from India (chiefly from Bombay) of Indian gum arabic to foreign countries have been:—1895-96, 32,236 cwts., value Rs. 7,72,642; 1896-97, 58,769 cwts., value Rs. 13,79,693; 1897-98, 46,525 cwts., value Rs. 9,06,178; 1898-99, 41,469 cwts., value Rs. 7,14,632; 1899-1900, 46,254 cwts., value Rs. 7,70,947; 1900-01, 37,553 cwts., value Rs. 6,99,883. With regard to foreign gums imported into India and re-exported as East Indian gum arabic, the imports from Aden, African ports, and Red Sea ports were 5,627 cwts., value Rs. 1,04,838, in 1895-96, and 2,355 cwts., value Rs. 49,879 in 1900-01. The gums re-exported, however, amounted to 11,400 cwts., value Rs. 1,72,991 in 1895-96, and 12,171 cwts., value Rs. 1,61,355 in 1900-01, and the difference between the imports and the amounts re-exported must be due to foreign gums brought across the land frontier; the varying extent to which stocks on hand are drawn upon; or adulteration with Indian gum arabic.—A. S.

Tariff Changes in the United Kingdom.

Bd. of Trade J., Dec. 24, 1902.

Articles.	Rate of Drawback per Net Cwt.
	d.
On rice flour	3
On rice starch	3·81
On offals or by products from rice starch	3
On maize starch (corn flour)	2·75
On offals or by-products from maize starch	0·75

Sugar Cartel in Austria-Hungary.

Bd. of Trade J., Dec. 24, 1902.

A contract was signed at Vienna on Oct. 29 last for the temporary renewal of the Austro-Hungarian sugar cartel. The new cartel was to take effect from Nov. 1, and remain in force for the period of one year, or—in the event of the ratification of the Brussels Convention—until Aug. 31, 1903.

The new arrangement only makes one change of importance in the provisions of the former sugar cartel. The modification in question is to the effect that an extra payment of two crowns is to be made by the refiners and the raw sugar producers for every 100 kilos. of refined sugar put on the home market, in addition to the sum guaranteed under the old contract.

Should the price of raw sugar fall as low as 16 crowns per 100 kilos., the new contract will be denounced, and the cartel cease, *ipso facto*, to exist.

Sago Flour: U.S. Customs Decision.

A recent decision of the United States Circuit Court held that sago flour, a substance much used in the textile industries, was free of duty as "sago crude," under par. 652 of the present Tariff, reversing both the action of the collector of Customs in assessing duty at 1 and 1½ cents per pound as "a preparation fit for use as starch" under par. 285, and the decision of the Board of General Appraisers, holding it to be dutiable at 20 per cent. *ad val.* as "a manufactured article unenumerated." The ground of the court's decision is that sago flour is the crudest form of sago known to commerce in the United States. The Treasury has decided to concur in the above decision.

—R. W. M.

XVII.—BREWING, Etc.

Bounty on Denatured Alcohol in Algeria.

Bd. of Trade J., Dec. 18, 1902.

A decree is published in the French *Journal Officiel* of 27th ult., which enacts that, taking into account the cost to the preparers of denatured alcohol in Algeria, according to the formula in force, of the denaturant, there shall be allowed to such, from the 1st January next, a bounty of 9 francs per hectolitre of pure alcohol submitted to denaturation.

XX.—*FINE CHEMICALS, Etc.*

Essential Oils in the West Indies.

Imp. Inst. J., 1902, **8**, [96], 322.

Essential oils to the value of 48,022*l.* have been exported during the past ten years from Dominica. From trees grown on the lands of the Botanic Department, Trinidad, the following oils have been prepared :—Citronella, lemon-grass, Seville-orange, sweet-orange, lime, lemon, mandarin-orange, clove, pimento, bay, lemon-bay, eucalyptus, mace, nutmeg, and camphor. The mandarin orange and camphor trees grow readily in Trinidad. Lemon-bay oil is obtained from the leaves of a variety of *Pimenta acris*; it contains citrol. It is stated that good samples of oils have been obtained from refuse mace and wormy nutmegs. The cultivation in the West Indies of the bergamot tree and of *Cananga odorata*, which grows readily in Jamaica, and which yields ylang-ylang oil, is recommended.—A. S.

Cinchona Plantations in India.

Chem. Trade J., *Dec.* 27, 1902.

According to the report of the Bengal Government the crop taken from the plantation in Bengal during the year 1901–2 has been 203,405 lb. of dry bark.

The raw material worked up during the year included 390,043 lb. of bark, which provided 10,010 lb. of quinine sulphate, the average yield being 2·56 per cent. The residual alkaloids left over in the process amounted to 5,367 lb. In addition to this quantity, 99,600 lb. of bark, to which 4,980 of residual alkaloids were added, yielded 3,424 lb. of cinchona febrifuge. The total output of manufactured products for the year has thus been 13,434 lb., an increase of 3,599 lb.

Camphor : U.S. Customs Decision.

Under date of Dec. 12, 1902, the Board of General Appraisers rendered a decision on a variety of camphor recently introduced to commerce. The camphor was in the form of fine white grains and possessed none of the safrol odour of ordinary crude or mountain camphor. It was claimed to be the result of more perfect and careful processes of manufacture, and contained no moisture and only 0·02 per cent. of non-volatile residue. According to the testimony of the Civil Governor of Formosa, who is also a director of the Bureau of Camphor Industries, a separate administrative bureau of the Japanese Government, the improvements in the process are as follows :—

Formerly the camphor vapour resulting from the distillation from the wood was cooled directly in water. Now it is cooled in a tube which is kept cool by a current of water. The old process yielded a crop of crystals attached to the tops and sides of the vessel containing water, and made it necessary to dry them by exposure to the air. This was effected in sheds of such imperfect construction as to admit much dust and impurities which lowered the quality of the product. By the improved process now in use, the camphor is either placed in closed chambers and treated with air fans or dried in a vacuum pan. This article is made in Japan and not in Formosa, where only the ordinary crude camphor is produced.

The present tariff imposes in par. 12 a duty of 6 cents. per pound, whilst crude camphor is free of duty under par. 515 of the Free List.

After comparison with a sample of ordinary crude camphor the Board discovered a difference of only a little over 0·3 per cent. in the non-volatile residue, and held that this was not sufficient to justify duty classification. They therefore decided the article to be free of duty.
—R. W. M.

Verdigris : U.S. Customs Decision.

An article described as "verdet raffine," valued at about 14 cents per pound, was assessed for duty by the collector at 25 per cent. *ad valorem* as a "chemical salt," under par. 76 of the present Tariff. The importers claimed it to be free of duty under par. 694 of the Free List, as "verdigris or subacetate of copper." Previous decisions under former Tariff Acts had established the rule that the only article exempt from duty was the kind of verdigris known as subacetate of copper.

Evidence was submitted to the Board showing that subacetate of copper is sold in the United States for 18 or 19 cents a pound, whilst acetate of copper commands a price of 35 to 50 cents a pound. From this and other testimony, the Board decided "verdet ratline" to be free of duty as claimed by the importers.—R. W. M.

XXI.—*PHOTOGRAPHY.*

Sized Print Paper : U.S. Customs Decision.

The Board of General Appraisers, in accordance with previous rulings covering blue print paper, have decided, Dec. 9, 1902, that various kinds of sized print paper are dutiable under the present Tariff under par. 396 at 15 per cent. *ad val.*—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 27,569. Kraus. Apparatus for reducing or grinding materials in wet state.* Dec. 15.

„ 27,629. Abraham. Filters.* Dec. 15.

„ 27,807. Baker. Method or process for making up or packing solid or semi-solid chemicals and other substances in small defined quantities.* Dec. 16.

„ 27,825. Pantin. Barrels and casks. Dec. 16.

„ 27,890. Herdman. Non-conducting coverings for pipes and other surfaces. Dec. 17.

„ 27,921. Mackenzie. Skips or hampers for carboys. Dec. 18.

„ 27,997. Liquid Register Syndicate, Ltd., and Cassal. Apparatus for delivering measured quantities of liquid. Dec. 18.

„ 28,085. Osbourn. Appliances for separating oil from steam. Dec. 19.

„ 28,150. Zeller. Process of, and contrivance for evaporating and drying substances. Dec. 20.

„ 28,259. Maybach. Condenser. Dec. 22.

„ 28,388. Thame and Oliver Mill Co. Pulverising or disintegrating machines. Dec. 23.

„ 28,395. Passburg. Process and apparatus for rapid continuous drying of solutions.* Dec. 23.

„ 28,402. Boult. Smoke-consuming furnaces. Dec. 23.

„ 28,464. Lipscombe. Filter. Dec. 24.

[A.] 28,732. Dorman. Grinding machines. Dec. 30.

,, 28,753. Menebröker. Rough-grinding mill. Dec. 30.

,, 28,756. Kerr. Furnaces. Dec. 30.

,, 28,850. Le Page. Mechanism for ascertaining and recording temperatures. Dec. 31.

,, 28,954. Becker. Cooling and heating apparatus. Dec. 31.

[C.S.] 25,993 (1901). Robertson and Rintoul. Apparatus for the treatment of gases with liquids. Dec. 24.

,, 26,715 (1901). Hultgren and Getzmann. Centrifugal separator drum. Dec. 31.

,, 1442 (1902). Reeves and Kynman. Funnel for separating froth from liquids. Dec. 24.

,, 1587 (1902). Pott and Williamson. Centrifugal machines. Dec. 24.

,, 1616 (1902). Robinson. Apparatus for automatically varying the direction of flow and point of discharge of a continuous stream of liquid. Dec. 24.

,, 1972 (1902). Railton and Campbell. Water filters. Dec. 24.

,, 22,935 (1902). Flügge. Cooling apparatus for liquids. Dec. 24.

,, 23,770 (1902). Ekenberg. Rotary drums for evaporation apparatus. Dec. 31.

II.—FUEL, GAS, AND LIGHT.

[A.] 27,568. Jakob Widmer. Improvements in the production of solidified fuel.* Dec. 13.

,, 27,634. Steilberg. Dividers or distributors for Bunsen gas burners. Dec. 15.

,, 27,657. Carbone. Arcs of arc-lamps. Dec. 15.

,, 27,658. Thompson. Liquefaction of gases. Dec. 15.

,, 27,836. Jackson. Method and means for automatically mixing or combining acetylene gas with oxygen, and for drawing or forcing such gas for the production of a flame or flames of such combined gases. Dec. 17.

,, 27,857. Mackay. Gas generators, especially carbonic acid gas generators. Dec. 17.

,, 27,917. Schill. Apparatus for washing and similarly treating gas. Dec. 18.

,, 27,964. Gunmaker. Apparatus for producing intensely hot flame by the combustion of carbon hydrates or petroleum or its equivalent.* Dec. 18.

,, 27,986. Otten. Gas-generating apparatus.* Dec. 18.

,, 28,057. Knowling. Apparatus for the consumption of smoke in furnaces. Dec. 19.

,, 28,138. Wadman-Smith. Tar-gas generator. Dec. 20.

,, 28,147. Crossley and Atkinson. Apparatus for cleaning producer or other kinds of gas. Dec. 20.

,, 28,177. Harrison. Process and apparatus for manufacture of water-gas.* Dec. 20.

,, 28,212. Steele. Gas-making apparatus.* Dec. 22. U.S. Application, April 10.

,, 28,614. Beilby and Christison. Method of and apparatus for removing tar and solid particles from fuel gas. Dec. 27.

,, 28,666. Harwood. Retort settings. Dec. 29.

,, 28,724. Eaton. Fuel. Dec. 30.

,, 28,797. Carman and Lawrence. Formaldehyde gas generators.* Dec. 30. U.S. Application, Feb. 4.

,, 28,813. Bronder. Gas retort-charging apparatus.* Dec. 30.

,, 28,855. Cliff. Muffle kilns.* Dec. 31.

28,874. Middleton. Agglomerating enricher for increasing calorific value of compressed fuel. Dec. 31.

[A.] 28,877. Hislop. Gas-producers. Dec. 31.

[C.S.] 23,363 (1901). Pease. Machinery or apparatus for extracting dust from blast-furnace gas, or tarry matter from coal gas. Dec. 24.

,, 26,396 (1901). Feld. Recovery of hydrocyanic acid from gases. Dec. 31.

,, 1931 (1902). Beaumont. Portable acetylene generators. Dec. 31.

,, 1990 (1902). Dowson. Production of generator gas and provision of hot air therefor. Dec. 24.

,, 2403 (1902). Salsbury. Acetylene generators. Dec. 31.

,, 2617 (1902). Robert Dempster and Sons, Ltd., and Broadhead. Retort-house for inclined gas-retorts and the like. Dec. 24.

,, 4918 (1902). Daniels and Daniels. Gas-cleaning machines and apparatus for purifying gas obtained from gas-producers and the like. Dec. 24.

,, 5052 (1902). Holt and Holt. Gas retorts. Dec. 31.

,, 12,563 (1902). Peterson and Ebert. Furnaces. Dec. 24.

,, 12,730 (1902). Woodall, Head, and Green. Arch pipe for use in gas manufacture. Dec. 24.

,, 16,388 (1902). Schmitt. Generators for acetylene gas. Dec. 24.

,, 19,255 (1902). Lake (Railroad Gas Lighting Co.). Acetylene gas-generators for railway carriages and the like. Dec. 24.

,, 21,543 (1902). Martius. Method of ascertaining the quantity of solid and liquid admixtures of gases. Dec. 31.

,, 22,648 (1902). Von Anrep. Process and apparatus for disintegrating peat. Dec. 24.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 28,251. Wilton. Apparatus for distillation of ammoniacal liquors. Dec. 22.

,, 28,516. Lendero. Method of deodorising naphtha and the products of its distillation.* Dec. 24.

,, 28,595. Thompson. Purifying and concentrating pyroligneous acid.* Dec. 27.

[C.S.] 2292 (1902). Wilton. Manufacture of pitch compounds or substitutes. Dec. 24.

,, 3362 (1902). Newton (F. Bayer and Co.). Production of new derivatives of the anthracene series. Dec. 31.

IV.—COLOURING MATTERS AND DYESTUFFS.

[C.S.] 2149 (1902). Ransford (Cassella and Co.). Manufacture of sulphide colours from nitrosotoluylenediamine. Dec. 24.

,, 18,127 (1902). Imray (Basle Chemical Works). Manufacture of indoxyl and its derivatives. Dec. 24.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 27,641. Hefford and Shuttlewood. Dyeing machines. Dec. 15.

,, 27,698. Morris. Rendering cotton and other textile goods and materials less inflammable. Dec. 16.

,, 27,847. Hardman and Hardman. Apparatus for degreasing cotton waste and other like fibrous materials. Dec. 17.

[A.] 27,902. Perkin and Whipp Bros. and Todd, Ltd. Treatment of cotton-and-flax and cotton-and-linen goods to reduce the inflammability thereof. Dec. 17.

„ 27,991. Carter and Baldwin. Scouring machines. Dec. 18.

„ 27,992. Dubrule and Dubrule. Wool-scouring machines.* Dec. 18.

„ 28,100. Gebauer. Apparatus for treating yarn, fibres fabrics, or other materials with heated liquid. Dec 19.

„ 28,142. Cleff. Dyeing and printing in aniline black.* Dec. 20.

„ 28,174. Bucher. Colouring woollen and like goods. Dec. 20.

„ 28,564. Imray. Process for avoiding the bleeding of dyestuffs in coloured, woven, or printed goods. Dec. 24.

„ 28,646. Ribbert. Manufacture of fabrics coloured with indigo. Dec. 27.

[C.S.] 2447 (1902). Aspinall. Method of sizing cotton. linen, and like fabrics. Dec. 24.

„ 22,468 (1902). Walker. Apparatus for treating flax and the like. Dec. 24.

„ 22,495 (1902). Carmichael, Carmichael, and Carmichael. Processes for dyeing and finishing. Dec. 24.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 2283 (1902). Moore. Machine for applying seasoning, colouring, and the like to skins. Dec. 24.

„ 6698 (1902). Schmitz. Printed and painted wall paper. Dec. 31.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 28,077. Cross and Young. Manufacture of useful products from or by means of nitrates. Dec. 19.

„ 28,091 Dreher. *See under* XIV.

„ 28,599. Kauffmann. Apparatus for evaporating leys and brines for the preduction of salts.* Dec. 27.

„ 28,600. Kauffmann. Process and apparatus for concentrating gypseous brine.* Dec. 27.

„ 28,799. Steinhart and Vogel. Producing neutral sodium sulphate and acetic acid from nitre cake and an acetate of an alkali or alkaline earth. Dec. 30.

„ 28,914. Smith and Hinchley. Recovery of ammonia from gaseous effluents. Dec. 31.

[C.S.] 25,880 (1901). Walker and Steele. Manufacture of caustic soda, and treatment of lime-sludge produced in such manufacture. Dec. 24.

„ 26,396 (1901). Feld. *See under* II. Dec. 31.

„ 26,537 (1901). Dieffenbach. Manufacture of chlorine. Dec. 31.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 27,802. Locke. Manufacture of porcelain insulators and other hollow earthenware articles, and apparatus therefor.* Dec. 16.

„ 27,804. Mills. Dyeing or colouring marble, onyx, calcareous stones, natural earths in an unbaked or baked condition, and the like. Dec. 16.

„ 28,955. Becker. Manufacture of glass.* Dec 31.

[C.S.] 1599 (1902) Thompson and Crystalline Co., Ltd. Manufacture of glass tiles and bending of sheet glass to form bullnoses, mouldings, angles, bendings, and the like. Dec. 24.

[C.S.] 3514 (1902). Von Poschinger. Manufacture of cathedral glass. Dec. 24.

„ 20,148 (1902). Lake (Tolendo Glass Co.). Production of articles of glass, and apparatus therefor. Dec. 24.

„ 22,923 (1902). Shuman and Shuman. Manufacture of glass. Dec. 24.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 27,855. Watson and Langston. Aerating and cooling Portland cement. Dec. 17.

„ 28,422. Hebblethwaite. Manufacture of bricks. Dec. 24.

„ 28,679. Laidet. Manufacture of artificial building materials and the like.* Dec. 29.

„ 28,788. Phillips. Process of separating clay, &c.* Dec. 30.

„ 28,810. Laudverlin and Chipaux. Cement.* Dec. 30.

„ 28,875. Schünemann. Kilns for burning cement, lime, &c. Dec. 31.

[C.S.] 2522 (1902). Whittaker. Manufacture of bricks or artificial stone blocks. Dec 31.

„ 4137 (1902). Thompson (Bevilacqua). Rustproof and fireproof compositions. Dec 31.

„ 17,369 (1902). Dhonòy. Artificial stone. Dec. 31.

„ 23,558 (1902). Venn and Dreessen. Artificial marble. Dec. 31.

„ 23,663 (1902). Gaspary. Manufacture of artificial stones with an outer layer of coloured or other material. Dec. 31.

X.—METALLURGY.

[A.] 27,583. Crowder. Concentration of ores and other like substances, and apparatus therefor. Dec. 15.

„ 27,622. Beringer. Treatment of residue and low-grade ores containing copper, tin, and other metals. Dec. 15.

„ 27,661. Thomson. Melting and treatment of metals and other materials. Dec. 15.

„ 27,710. Jardine and Goodlet. Puddling furnaces, re-heating furnaces, and the like.* Dec. 16.

„ 27,745. Contardo. Furnaces for the manufacture of steel. Dec. 16.

„ 27,778. Harmet. Compressing steel by forcing into conical moulds.* Dec. 16.

„ 28,110. Cowper-Coles Co., Ltd. Production of a standard silver alloyed with zinc. Dec. 19.

„ 28,112. Evans, Jones, and Richards. Treatment of copper ores. Dec. 19.

„ 28,178. Koller. Treatment of iron and steel. Dec. 20.

„ 28,181. Briede. Charging apparatus for blast furnaces. Dec. 20.

„ 28,240. Hunter. Manufacture of steel and malleable iron.* Dec. 22.

„ 28,256. Passow. Treatment of blast-furnace and other slags. Dec. 22.

„ 28,290. Mitchell. Conversion of copper matte into metallic copper.* Dec. 22.

„ 28,305. Newton and Billington. Alloys.* Dec. 23.

„ 28,387. Thame and Oliver Mill Co. O[illegible] Dec. 23.

„ 28,396. Gilmour, Lindsay, Myers, a[illegible] ising or Tempering or hardening of cast-iron [illegible]

„ 28,436. Newton and Billington. M[illegible] alloys. Dec. 24.

„ 28,492. Bennett. Manufacture or casting of iron, steel, &c. Dec. 24.

[A.] 28,544. Campbell. Composition for use in brazing. Dec. 24.

„ 28,605. M'Arthur. Special solder for aluminium. Dec. 27.

„ 28,613. Garrett. Furnaces for heating iron and steel. Dec. 27.

„ 28,734. Mason. Regenerator furnace for heating metals. Dec. 30.

„ 28,925. Marks. Extracting zinc and other metals from ores.* Dec. 31.

„ 28,938. Simpson. Purifying and separating metals. Dec. 31.

[C.S.] 26,166 (1901). Ellerhausen and Western. Treatment of zinc ore containing cadmium or otherwise Dec. 24.

„ 26,470 (1901). Thompson. Smelting of steel and other metals direct from their ores by heat and electricity. Dec. 31.

„ 2805 (1902). Westinghouse. Treatment of copper ores. Dec. 31.

„ 3344 (1902). Thiel. Manufacture of iron and steel. Dec. 24.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 27,720. Wilson. Electric batteries.* Dec. 16.

„ 27,755. Carolan. Electric furnaces or muffles. Dec. 16.

„ 27,786. Heany. Insulating metallic surfaces or wires.* Dec. 16.

„ 28,013. Chloride Electrical Storage Co., Ltd. Negative electrodes for electric accumulators, and the method of forming them.* Dec. 18.

„ 28,109. Sherard Osborne and Cowper-Coles Co., Ltd. Process for electroplating iron and steel. Dec. 19.

„ 28,353. Wetter. Electrolysing processes and appliances. Dec. 23.

„ 28,783. Lake. Secondary or storage batteries.* Dec. 30.

„ 28,820. Mann and Goebel. Electrodes for primary batteries. Dec. 30.

„ 28,848. Cowper-Coles. Secondary batteries. Dec. 31.

[C.S.] 26,229 (1901). White. Secondary electric batteries. Dec. 24.

„ 26,470 (1901). Thompson. *See under* X.

XII.—FATS, OILS, AND SOAP.

[A.] 27,889. Zadig. Manufacture of soap. Dec. 17.

„ 28,310. Stephenson. Extracting oil from seeds, &c. Dec. 23.

„ 28,717. Fischer. Soap-like remedy from fresh-water limestone.* Dec. 29.

[C.S.] 2668 (1902). Bousfield. Recovery of glycerin. Dec. 31.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

„ 28,. [illegible]

7,[illegible]39. Boult. Anti-fouling paints for vessels, &c.* Dec. 15.

„ [illegible]8,[illegible]31. Hardingham. Manufacture of paint. Dec. 31.

[C.S.] [illegible]66[illegible] (1902). Runcorn White Lead Co. Production of lead oxide. Dec. 31.

„ 24,719 (1902). Stewart. Copying ink. Dec. 24.

B.—Resins, Varnishes.

[A.] 28,236. Ellis. Composition for removing varnish.* Dec. 22.

C.—India-rubber, &c.

[A.] 27,580. Wiley. Method of and apparatus for waterproofing garments. Dec. 15.

„ 28,410. Newman. Waterproofing composition.* Dec. 23.

„ 28,567. Scammel and Muskett. Artificial gutta-percha. Dec. 27.

„ 28,640. Abel. Gutta-percha substitute. Dec. 27.

„ 28,901. Wagner. Elastic material. Dec. 31.

[C.S.] 26,363 (1901). Karavodine. Insulating material. Dec. 31.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 27,597. Dreher. Titanium solutions and the manufacture of leather. Dec. 15.

„ 28,091. Dreher. Titanic acid compounds and solutions. Dec. 19.

„ 28,257. James. Casein compounds.* Dec. 22.

[C.S.] 19,090 (1902). Dunham. Process of producing insoluble casein. Dec. 24.

„ 23,392 (1902). Schmalfeldt. Production of tannin. Dec. 31.

XVI.—SUGAR, STARCH, GUM, ETC.

[A.] 28,186. Deutsch. Apparatus for whitening sugar in centrifugal machines by means of steam. Dec. 20.

[C.S.] 3930 (1902). Johnson. Manufacture of starch. Dec. 31.

XVII.—BREWING, WINES, SPIRITS, ETC.

[C.S.] 2669 (1902). Southby. Brewing beer. Dec. 31.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 28,543. Donard and Labbé. Albuminoid substances from maize, &c. Dec. 24.

B.—Sanitation; Water Purification.

[A.] 27,748. Murphy and Mellor. Apparatus for the purification of sewer gas and the atmosphere. Dec. 16.

„ 28,621. Zalarski. Rendering putrefaction products innocuous.* Dec. 27.

[C.S.] 18,800 (1901). Wrightson. Treating and utilising town sewage. Dec. 31.

„ 20,056 (1902). Lees. Furnace for destroying refuse. Dec. 31.

„ 21,586 (1902). Backeljau. Apparatus for purifying smoke and gas charged with dust and the like. Dec. 24.

„ 23,750 (1902). Parker. Distribution of liquids as sewage on water beds. Dec. 31.

C.—Disinfectants.

[A.] 28,277. Rosemann. Deodorous carbolic acid and its homologues.* Dec. 22.

„ 28,547. Reeves. Sewage precipitant, disinfectant, and deodoriser. Dec. 24.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 28,423. Hawke. Copying paper. Dec. 24.

[C.S.] 26,260. (1901). Desmarest and Geyer. Method of treating vegetable matters with a view to obtaining paper pulp. Dec. 24.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 27,899. Zelinski. Process for producing organic acids. Dec. 17.

„ 28,638. Silberrad. Condensation products from mellitic or pyromellitic acids.* Dec. 27.

XXI.—PHOTOGRAPHY.

[A.] 27,607. Plummer. Photographic printing, and the apparatus therefor. Dec. 15.

[A.] 28,284. Bauer. Solution for treating photographic papers.* Dec. 22.

[C.S.] 23,250 (1902). Clarke. Development of photographic pictures. Dec. 24.

„ 23,809 (1902). Bromhead (Chem. Fab. Helfenberg, A.G.). Photographic toning and fixing sheets of absorbent material. Dec. 31.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 28,245. Bichel. Manufacture of explosives. Dec. 22.

„ 28,258. Frank. A safety explosive. Dec. 22.

[C.S.] 1578 (1902). Walker. Manufacture of matches. Dec. 24.

„ 22,945 (1902). Wright. Match-making machines. Dec. 24.

„ 23,622 (1902). Criswell. Match-making machine. Dec. 31.

„ 23,632 (1902). Czerweny. Match-making machines. Dec. 31.

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Friday, Feb. 6, 1903.—Dr. W. A. Bone. "Some Recent Developments in the Iron and Steel Industries, considered from an Economic Standpoint."

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Wednesday, Feb. 25, 1903.—Mr. Loxley Meggitt. "The Fractiona Distillation Test for Petrols, Petroleum Spirit, or Benzine."

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PATENTS RULES, 1903.

Compulsory Licenses and Revocation of Patents.

1. A petition to the Board of Trade for an order under Section 3 of the Patents Act, 1902, shall show clearly the nature of the petitioner's interest and the ground or grounds upon which he claims to be entitled to relief, and shall state in detail the circumstances of the case, the terms upon which he asks that an order may be made, and the purport of such order, and the name and address of the patentee and any other person who is alleged in the petition to have made default.

2. The petition and an examined copy thereof shall be left at the Patent Office, accompanied by affidavits or statutory declarations in proof of the allegations contained in the petition, together with any other documentary evidence in support; and the petitioner shall, simultaneously with, or as soon as may be after the leaving of such petition, deliver to the patentee and any other person who is alleged in the petition to have made default, copies of the petition and of such affidavits or statutory declarations and other documentary evidence in support.

3. The persons to whom such copies are delivered by the petitioner may, within 14 days after being invited to do so by the Board of Trade, leave at the Patent Office their affidavits or statutory declarations in answer, and, if they do so, shall deliver copies thereof to the petitioner; and the petitioner may, within 14 days from such last-mentioned delivery, leave at the Patent Office his affidavits or statutory declarations in reply, and, if he does so, shall deliver copies thereof to the patentee or any other person alleged in the petition to have made default, such last-mentioned affidavits or statutory declarations being confined to matters strictly in reply.

The times prescribed by this rule may be altered or enlarged by the Board of Trade, if they think fit, upon such notice to parties interested and upon such terms, if any, as they may direct.

4. No further evidence than as aforesaid may be left by either side at the Patent Office except by leave or on requisition of the Board of Trade, and upon such terms, if any, as the Board may think fit.

5. The Board of Trade shall consider the petition and the evidence, with a view to satisfying themselves whether a *primâ facie* case has been made out for proceeding further with the petition, and if they are not so satisfied they shall dismiss the petition.

6. If they are so satisfied, they shall consider whether there is any probability of an arrangement being come to between the parties, and if it appears to them that there is any reasonable probability that such an arrangement can be come to, they may take such steps as they consider desirable to bring it about, and in the meanwhile may defer the reference of the petition to the Judicial Committee of the Privy Council.

7. If the Board are not of opinion that there is a reasonable probability of any arrangement being come to between the parties, and are satisfied that a *primâ facie* case has been made out by the petitioner, they shall refer the petition to the Judicial Committee, with copies of any affidavits, statutory declarations, or other documentary evidence which may have been furnished under the foregoing Rules, and with certified copies of all entries in the Register of Patents relating to the patent in question, and any other information in the possession of the Board which it appears to them may be of service to the Judicial Committee in ascertaining what persons should be made parties to the proceedings before the Committee, and the Board shall give written notice to the parties that the petition has been referred to the Judicial Committee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of this year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows:—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products:—
  Subsection A.—Organic Preparations, including Tar Products.
  Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsengesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hold their respective annual meetings for 1903 in connection with the Congress.

An executive local committee will make arrangements for the entertainment of visitors during their stay.

As formal invitations are now being sent out, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

All communications and questions, so far as they cannot be answered by the various organising committees, should be addressed to the Secretary of the Congress, Dr. G. Pulvermacher, Charlottenburg, Marchstrasse No. 21. The formation of organising committees is already in progress in England, Belgium, France, Italy, Portugal, Switzerland, Servia, and Turkey.

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23rd JANUARY 1903.

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Pickard, Robt. H., l/o Technical School; Merlin Road, Blackburn.

Rae, Geo., l/o Kirkintilloch; Craigfoot, Milton of Campsie, N.B.

Remington, J. S.; all communications to Aynsome, Grange-over-Sands, R.S.O., Lanc.

Rust, R. R., l/o Beaumont; c/o Prime Western Spelter Co., Gas, Kansas, U.S.A.

Saxe, S., l/o Fulton Street; 107, Manhattan Avenue, New York City, U.S.A.

Spurge, E. C., l/o Witham; 21bis, Rue d'Armaillé, Paris.

Turnbull, G. W., l/o Lancaster Road; The Haws, Carnforth, Lancashire.

Warden, John B.; all communications to 5, Eton Gardens, Glasgow.

Watson, Herbert J., l/o Main Street; "Robert Land," Stevenston Road, Kilwinning, Ayrshire.

Webb, J. F.; Journals to 20, Louvaine Road, St. John's Hill, Battersea, S.W.

CHANGES OF ADDRESS REQUIRED.

Le Bosquet, M.; l/o Franklin H. Kalbfleisch Co., Brooklyn, N.Y., U.S.A.

Wedlake, H. D.; l/o Johannesburg, Transvaal.

Deaths.

Bischof, Gustav, 19, Ladbroke Gardens, W. Jan. 13.

Hogg, Quintin, 61, Threadneedle Street, E.C. Jan. 16.

Schunck, Dr. Edw., F.R.S., Oaklands, Kersal, Manchester. Jan. 13.

Canadian Section.

Meeting held in Chemical Building, Toronto University, on Thursday, December 18th, 1902.

PROF. W. R. LANG IN THE CHAIR.

CASSAVA AS A COMPETITOR OF MAIZE IN THE PRODUCTION OF STARCH AND ALLIED PRODUCTS.

BY GEO. ARCHBOLD, PH.D.

In 1887, a paper of mine was read at the Liverpool Section of this Society, "On the Manufacture of Maize Starch in America" (this Journal, 1887, 84 and 334), the discussion on which brought out the fact that there was a great waste of nitrogenous matter in the manufacture of starch from maize and other foodstuffs; the use of arrowroot (*Marante Arundinacea*) was also advocated.

At the present time the demand for maize and other cereals is advancing their value, so that in the near future they will not be available for the manufacture of starch.

The manufacture of starch from maize was introduced into America over 60 years ago by Thomas Kingsford, who established the Oswego Starch Factory. The superior quality of the product soon created such a demand for "corn starch" that other factories were erected in different States, and to-day all are owned by the trust known as the "Corn Product Co." Maize starch has its own characteristics, which distinguish it from other starches. If a cheaper raw material be suggested for the production of starch and allied products, it must yield them of the same quality.

In the plant commonly known as "cassava" we have such a raw material, which yields a starch of the highest purity, possessing all the characteristics of the maize product, the cost of production being one-fifth that of the maize.

The name "cassava" should properly apply only to the purified starch derived from the roots of two species of Euphorbeaceous plants: (*a*) *Manihot utilissima*, or bitter cassava; (*b*) *Manihot aipii*, or sweet cassava. According to Dr. Wiley, it has passed into general use to designate the plants.

The expressed juice of the bitter variety, *M. utilissima*, contains 0·5 per cent. of hydrocyanic acid, and is therefore in its raw state poisonous. The sweet variety, *M. aipii*, contains only a trace of this acid, and is non-poisonous, being freely eaten as a table vegetable. The former is recognised by the fact of possessing seven divisions to its leaves, while the non-poisonous variety shows but five points to its palmate leaves. Both, however, are equally important sources of starch for edible and manufacturing purposes. The plant is indigenous to the West Indies, and has been introduced into most tropical regions. It is extensively cultivated in the East Indies, Brazil, and elsewhere for its starch, which, in the form of tapioca and arrowroot, is a staple article of export.

When the expressed juice is heated and concentrated, the poisonous principle is entirely dissipated, and it becomes what is known as "Cassareep sauce," much used as a flavour. The first variety, *M. utilissima*, is therefore the more important of the two in an economic sense.

The roots are covered with a thin, reddish-brown fibrous bark which is removed by washing or light scraping; it is this bark which, in the tropical variety, contains much of the poisonous ingredient, which, being volatile, is entirely removed by heating.

Wiley obtained from two experiments, made with a view of determining the starch value of the fresh roots in Florida, 25·97 and 23·60 per cent. of starch, being an average of 24·75 per cent.; and from over 100 analyses of these roots from Jamaica I found the average to be 26·23 per cent. of dry starch; the product obtained from several pounds of the root had all the characteristics of the best maize starch, and 4 per cent. of cane sugar was recovered from the liquor.

Analysis of Cassava Root.

	Natural Root.	Dry Root.	Flour.
Water	66·745	5·170	10·560
Protein	0·855	2·455	1·310
Fat	0·188	0·525	1·500
Resins, alkaloids, &c	0·115	0·325	0·640
Amides and sugars	5·650	16·090	16·540
Crude fibre	1·685	1·800	2·960
Starch	24·075	68·530	64·630
Ash	0·740	2·105	1·860
Potash	0·300	0·860	..
Phosphoric acid	0·080	0·235	..

Cassava as a Competitor of Maize.—From the above analysis it is safe to assume that, on an average, 25 per cent. of pure starch can be obtained from the fresh roots, with proper mechanical arrangements. Compared with maize and potatoes, upon which practically the whole world depends for its supply of starch, the average yield of starch is as follows:—Maize, 53; potatoes, 18; cassava, 25 per cent. An acre of ground yields 40 bushels of maize, which in turn yield 1,200 lb. of starch, whilst the same ground will yield 10 tons of cassava, yielding 6,720 lb. of glucose and 5,600 lb. of starch. I am informed by Mr. Perkins, of Florida, who has given great attention to the cultivation of the root for this manufacture, that it is possible to reach a much greater amount per acre in Florida.

In Jamaica, where the plants grow all the year round, 20 tons per acre could be grown with ease by proper cultivation and proper attention to modern agriculture, or nearly 10 times as much starch per acre as from maize. Should the proper cultivation of the plant be attempted, the cheap labour and other advantages in Jamaica would be an important factor in ruling the price of the world's starch supply. Even at present, in Florida, the attempts to manufacture starch from cassava in limited quantities prove that it is destined to take an important position in this industry in the United States of America, and, as already stated, several States outside Florida are adapted to its growth.

Great Britain, with her important tropical possessions, could rule the world in the manufacture of starch and allied products, as cassava flour could be made and shipped to the great manufacturing centres at a price far below the lowest point of maize, in addition to which 65 per cent. of the cassava flour would be available for pure starch and over 80 per cent. for glucose of the highest grade on the market. If such were the case the maize product could not compete; it would displace that material, leaving it in its proper place as food for man. Furthermore, the treatment of maize for starch and glucose is tedious and costly, whilst the process for cassava products is simple and cheap and the resulting products purer.

The quantity of starch per acre obtained from the three different sources furnishes an accurate basis for estimating the relative value of each crop to the starch manufacturer. When maize is 45 cents per bushel in Chicago, then the crude starch from that source is 1½ cents per pound. With potatoes at 50 cents per bushel the unmanufactured starch is 5 cents per pound, while cassava grown on a basis of 8 or 10 tons per acre (as at Lake Mary, Florida, where the only complete cassava-starch factory in the world is situate) costs half a cent per pound in the unmanufactured state. It is quite evident, then, that cassava is the cheapest known source of starch, costing, at the above market values and existing methods of planting, one-fourth as much as maize starch.

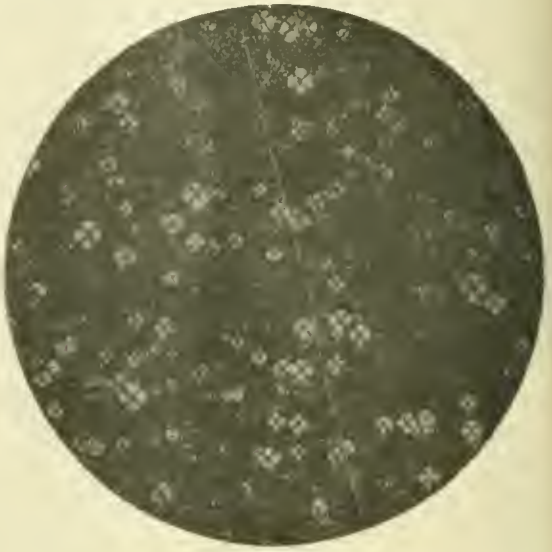


Fig. 1.—Cassava Starch. × 150.

The following table shows the leading microscopic characters of six of the most important starches:—

Name.	Outline.	Measurement	Surface.	Hilum.	Markings.
(1) Potato	Oval or elliptical	mm. 1 25 long diam.; 1 37 short diam.	Uniformly but slightly convex.	Dark spot near the narrow end.	Concentric rings closed or almost closed, curves.
(2) Rice	Rectilinear and polygonal.	1,250	Flat	None	None.
(3) Maize	Rectilinear and polygonal.	1 70	Uneven and slightly concave.	Stellate or irregular large central.	None.
(4) Cassava	Rectilinear and polygonal.	1,70	Uneven and slightly concave.	Stellate or irregular large central.	None.
(5) Wheat	Circular or nearly so.	1/50	Convex.	Dark spot eccentric	Occasionally a few exceedingly faint concentric rings.
(6) Arrowroot (Bermuda)	Oval	1/28 long diam. 1,45 short diam.;	Uniformly but slightly convex.	Nearer broad end circular, crucial transverse line or slit.	Faint concentric rings, in few cases extending about 2/3 length of grain.

Fig. 2 shows the starch granules from cassava. In size they are practically the same as those of maize starch, of which the microphotograph is shown for comparison (Fig. 3). The difference in outline, however, is very marked: many of the maize granules have an irregular polygonal perimeter, whilst the cassava starch granules are mostly even and regular in outline. A few of the cassava starch granules are also found irregular in outline, due to being placed close together in the substance of the root, but this number is by no means so great as that of similar granules appearing in maize starch.

Prof. Wiley has stated that in general the cassava starch resembles that of maize, in its microscopic appearance, more closely than any other common variety of starch.

Characteristics of Commercial Starches.—Having briefly dealt with the chief starches as they appear under the microscope, I will now consider their appearance to the naked eye, as met with in commerce. All cereal starches are of a dead white colour, and in irregular lumps, erroneously called, in factory language, "crystals." Cassava starch is the only root starch which partakes of this property. Potato starch and arrowroot are either granular or in powder. Whilst arrowroot is of a dead white appearance, potato starch is of a glistening silky appearance; neither of these, when moulded in their damp state into cubes, dry like other starches, but fall into fine powder or assume a granular condition. As there is an increasing demand for lump starch in the market, cassava starch would easily take the place of "corn starch," or starch made from other cereals, such as wheat, rice, &c.

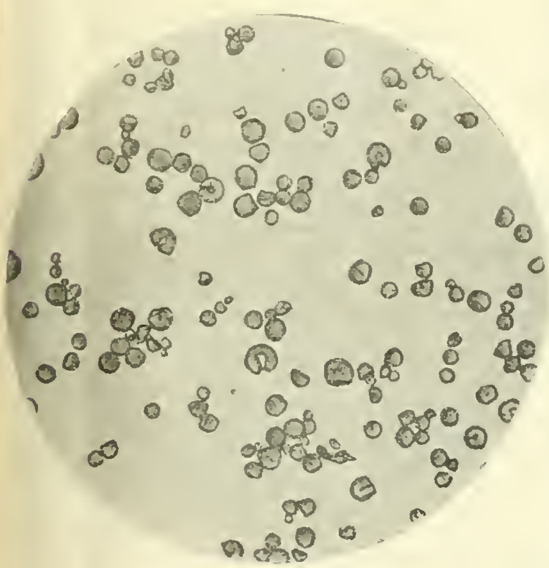


Fig. 2.—Cassava Starch. × 150.

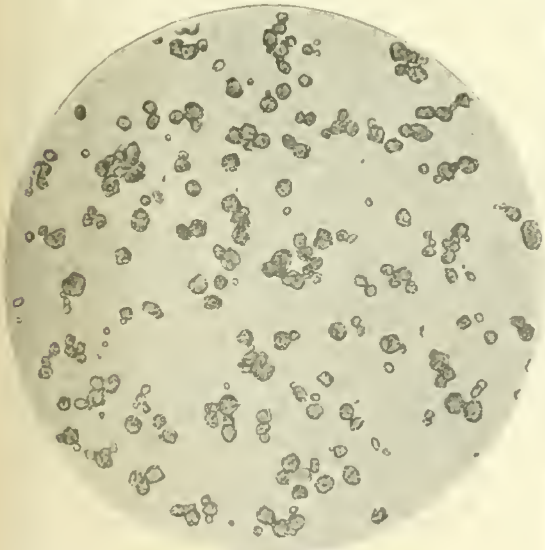


Fig. 3.—Maize Starch. × 150.

Process of manufacturing Cassava Starch.—Attempts have been made by three companies in Florida, in the manufacture of Cassava starch, one of which, "The Planters' Manufacturing Co.," is in successful operation, the process adopted being the same as that employed by potato-starch factories. It was first thought that all the machinery used in the latter factories could be used in the former; it has been found, however, that special machinery is required, adapted to the changed conditions, due to differences in the raw material used.

Mr. Perkins, president and manager of The Planters' Manufacturing Co., whose works turn out about 1,000 tons of starch per season of six months, in a granular form similar to arrowroot, has corresponded with me, with a view of overcoming the difficulties met with in the existing process, and manufacturing the starch in the same form as maize starch, and obtain the full percentage of high-grade merchantable starch, as never more than 20 per cent. is obtained from the fresh roots by the potato-starch machinery.

I have so far been successful in devising a plant, that the whole of the 25 per cent. of dry starch can be obtained, being equal to $27\frac{1}{2}$ per cent. of air-dry starch containing 10 per cent. of moisture and perfectly free from fibre and nitrogenous matter, and having, when dry, the same irregular form as the maize product. This improved plant can be worked 25 per cent. cheaper than the potato-starch plant, and the process is perfectly automatic and continuous, thereby effecting a great saving in skilled help. The problem, then, of the cassava-starch manufacture on a commercial basis may be considered solved. This plant is capable of working up 100 tons of root per 10-hour day. The entire process for the complete extraction of the starch, from the time the roots are laid down at the factory, until the starch is finished ready for the market, is only three days, while maize under the most favourable conditions requires from 12 to 14 days.

The first stage of the process is to free the roots from dirt, &c. by washing, and is accomplished in a very simple manner, the machine consisting of an Archimedean screw conveyer, working in an inclined trough. The roots are fed at the lower end, and are carried by the screw upwards against a descending stream of water to the highest end, escaping perfectly clean. A similar machine is sometimes used in beetroot-sugar factories for washing beets. The washed cassava roots are conveyed by an india-rubber belt to the rasper. This machine is simply a modification of that used in beet-sugar factories, known as "Champonnois Rasper," altered so as to meet the requirements of the cassava root. It consists of an upright revolving cylinder with three compartments, armed with saw-like teeth inside. The roots are fed into the upper end, and the pulp falls through the lower end to the mill. This mill is so constructed that it receives the pulp and levigates the same into a uniform condition, disintegrating the cellular structure and so rupturing it that the starch may be washed out with a small amount of adhering tissue. In this condition it falls to the "separator," which is a conical iron vessel, in principle similar to "Lockhart's separator," used for the dressing and preparation of ores, described by J. W. Hinchley in this Journal, 1902, page 10. The soft, pulpy magma, as it falls down a tube in the centre of this conical vessel, is met by an upward current of water, which carries the starch particles upward through a wire-gauze diaphragm, in the upper portion of the cone, a few inches below the outlet. When the pulp is exhausted it is discharged by an automatic arrangement at the bottom of the cone to the press room to be freed from its water, by dropping on to a wire belt and passing between rubber rollers.

The impure starch milk flows at 3° B. to the settling cones. These vessels consist of two iron cylinders, 9 ft. by 12 ft. diameter, the bottom terminating as a cone of 50° angle, 7 ft. slant, with a 2-in. gate valve at the bottom as outlet. In the centre of the cone is a cylinder of 20-oz. copper, 10 ins. diameter, brought within 18 ins. of the bottom. The impure starch liquid is allowed to flow down the tube to the bottom of the cone. It then ascends in the increasing sectional area of the cone, in which it suffers reduction of velocity. The downward motion of the starch particles caused by gravity overcomes the motion of the fluid, which continually flows away as dirty water through the pipe in the upper portion of the vessel, whilst the starch, in a highly concentrated state (generally 8° B.) is continually drawn off from the valve in the bottom of the cone to the mixing vats below, to be treated with alkali or other chemical means and pumped up to the "regulators" on the upper floor, and from thence to the floor by gravity through the "shakers" on the floor below, and run to the last purifying cones. (The shakers are identical with those described for maize starch in this Journal, 1902, pages 8, 9.) The use of shakers for separating the starch from the pulp is entirely dispensed with; owing to the nature of the pulp, it is impossible to effect a complete separation with them, as is evidenced from the fact that in Florida, where they are used, at least 6 per cent. of the starch passes into the feed and waste waters, &c., and in order to recover the 20 per cent. of starch, 25 per cent. more time is required than the above-described separator takes to recover the whole of the starch in the pulp The starch milk, having passed through the shaker, is freed from all adhering fibre before passing to the purifying cones. These vessels are of the same form and size as the former, so arranged, however, that the starch can be completely purified and all objectionable matters removed. In the centre is suspended a conical pipe within a larger conical pipe; at the bottom of the cone is a conical deflector, and an acute conical addition to the main cone containing the necessary agitating apparatus to prevent the starch setting hard.

The starch milk, as it passes through the shaker, flows down a pipe of increasing section, and afterwards is deflected radially by means of the conical arrangement; the liquid then ascends in the increasing sectional area of the cone, in which it suffers such reduction in velocity that the downward motion of the pure starch particles caused by gravity overcomes the motion of the fluid, which continually flows away through the pipe in the upper portion of the vessel. The starch milk, now pure, and at any desired gravity, is drawn off from the lower part of the cone, and is pumped up to the boxing tanks on an upper floor. These tanks are vats made of cypress wood, 10 ft. by 10 ft., with the necessary gearing and agitators, which hold the concentrated and purified starch milk in readiness for the boxes, which are 7 ins. by 7 ins. by 5 ft. 7½ ins. long, inside measurement, with perforated bottom and lined with muslin. These boxes are placed side by side on a table provided with a vacuum chamber, and the starch milk flows from the above tanks into these boxes, the water being extracted by means of the vacuum pump. Here the starch is deprived of 75 per cent. of its water, and becomes a long block of solid starch, which is cut up into 7-in. cubes, wrapped in paper and placed in the kiln, as in the case of maize starch, fully described in my paper already referred to. No tiling, crusting, or scraping is required by this method, the starch during the latter stages having been deprived of all its impurities, whereby a very great saving of time and starch is effected, and the cost of manufacture is considerably reduced.

Furthermore, maize starch can be manufactured by this process with equal success, and at 15 per cent. less cost than existing methods. In the case of maize one would commence at the separator, thereby abolishing the tedious and expensive shaker system and collecting of the impure starch over tables or runs; moreover, the starch is not exposed to a germ-laden atmosphere in its production, requires no "doctoring" at every stage to prevent souring or fermenting. The atmosphere of an ordinary starch factory contains as many as 200 to 50,000 per cubic centimetre of living germs or ferments, varying according to the season of the year. Looking at these figures, it is not to be wondered that the starch in its various stages of manufacture, exposed to such an atmosphere, becomes invaded by millions of these organisms and becomes sour. Hence so much treatment with free alkali, while the starch made as above is free from all such objections. The product is equal in purity to the best Bermuda arrowroot, and at the same time has all the characteristics of pure "corn starch" in all its various commercial forms.

Tapioca.—The starch from the boxes, containing 25 per cent. of water, can be broken up, and converted into tapioca—a product of considerable commercial importance. It is allowed to pass into a revolving steam-jacketed cylinder, and steam is applied. The heat displaces the moisture as steam, which bursts a portion of the granules of starch, causing it to assume the granular semi-lucid form so well known as tapioca. The cylinder has interior revolving scrapers.

Glucose.—When the factory is situated in the neighbourhood of the growing product, the pulp is taken direct from the mills, and pumped to the glucose department, direct into the open converter, a vat of proper dimensions to receive it, and heated with a copper steam-coil. In this vat the pulp is reduced with water, and the proper amount of hydrochloric acid added. Then it is raised to the boiling point, and the starch and much of the fibre are rendered soluble. From thence it is run into the closed copper converter, and subjected to a steam pressure of 30 lb. to the square inch for 10 minutes, or until the proper degree of conversion is attained, which is controlled by means of iodine colour tests. These are made by adding a definite number of drops of standard iodine solution to a test-tube of the cooled glucose liquor. The tint at which the conversion is considered complete is that corresponding to the polariscope reading of 135. The proper degree of conversion having been reached, the liquor is now run into the "neutraliser," where it is nearly neutralised with carbonate of soda, after which it is run through any of the standard filter presses, and the nearly neutral solution of glucose, at 15° B., passed over charcoal in the charcoal filter; from thence to the triple-effect evaporator, where it is boiled down to a gravity of 28° B., and again passed over charcoal; then to the final evaporation to 45° B. in the vacuum pan, and thence to the coolers ready to be barrelled.

This is a brief outline of the process, and is practically the same as carried out from maize starch.

By referring to my paper in the Society's Journal, 1902, pp. 4—9, a complete description of the various pieces of machinery will be found.

By-Products.—The fibrous and glutenous matter which has been left in the filter presses is mixed with the exhausted and pressed magma from the starch separator, and dried and sold as cattle food, and contains 25 per cent. of protein, besides phosphates, &c. A sample of 45° glucose made by this process from cassava pulp, and one for comparison from corn starch of the same grade, and made by the Edwardsburgh Starch Co., the largest makers of glucose, and I may say the best, in Canada; the samples, in my opinion, are equal to the best American make, and the cassava product compares favourably with it in appearance.

I have endeavoured to show that in cassava, when properly cultivated, we have a formidable competitor of maize, owing to its higher yield of starch and glucose per acre, and as not only is its starch and sugar, but also a considerable portion of the fibre, obtained as glucose, thereby producing a much sweeter and finer-flavoured product, and better adapted for confectionery, &c., fully 30 per cent. of the fresh root being obtained as glucose.

In conclusion, I desire to express my thanks to Prof. Wiley, of Washington, for promptly placing in my hands such information he had in relation to the plant in Florida, and to Dr. Campbell Arnott for valuable information regarding the Jamaica product. I also desire to thank Mr. Benson, of the Edwardsburgh Starch Co., for his courtesy in allowing me to go through his works while in operation, and obtaining samples of his products as they were being shipped. This gentleman is to be congratulated in having advanced, in a true scientific manner, the technical working of his factories, by having technically educated men at the head of each department.

It is to be hoped that others will follow in the steps of the gentleman referred to; then the future of our technical student will be assured, and the manufactures of the Dominion equal those abroad.

A short discussion followed, in which Dr. Millar, Dr. Stuart, Dr. Kenrick, Mr. Bowman, Mr. Murray, and the Chairman took part.

London Section.

Meeting held at Burlington House, on Thursday, January 8th, 1903.

MR. WALTER F. REID IN THE CHAIR.

HYDROLYSIS OF FATS AND OILS BY MEANS OF DILUTE ACIDS, AND SOME NOTES ON FAT-SPLITTING ENZYMES.

BY DR. J. LEWKOWITSCH.

My reason for bringing somewhat prematurely the following observations before your notice is to be found in the publication of the first instalment of a paper by Herbig (Chem. Rev., 1902, 275). He hints therein at some experiments which may perhaps be analogous to those I have been carrying out for some time in connection with an extended enquiry into the methods of saponification of fats and oils. Part of this work relates to the saponifying action of dilute acids. The enquiry was taken up chiefly with a view to studying processes practicable on a large scale; hence only technically employed fats were used.

A few preliminary experiments on cotton-seed, whale, and rape oils, and also on lard, showed that dilute sulphuric acid is practically without any action whatever. Experiments with dilute hydrochloric acid indicated that some slight hydrolysis did take place. This pointed to the possibility of obtaining better results with concentrated hydrochloric acid.

The experiments detailed in Table I were carried out by heating 100 grms. of fat with hydrochloric acid of sp. gr. 1·16 for two periods of 12 hours each, over a Bunsen burner, the flasks being provided with air condensers. The figures in the third column denote acid values, *i.e.*, the number of milligrams of KOH required to neutralise the free fatty acids contained in 1 grm. of the sample. It may be taken as a very rough approximation that half of the acid value found represents the free fatty acids in percentages, with the exception of cocoanut oil. To make the comparison easier there is added in the last column the highest obtainable acid value, which would, of course, be found in the case of complete hydrolysis. In the second column are given the acid values of the original oils and fats.

TABLE 1.

Hydrolysis of Oils and Fats by Means of Hydrochloric Acid, Sp. Gr. 1·16.

100 grms. of Oil or Fat boiled with 100 c.c. of Acid.

Oil or Fat.	Original Acid Value.	Acid Value after 24 hours' Boiling.	Acid Value of completely Hydrolysed Oil or Fat.
Cotton seed...........	0·35	143·9	202
Whale.................	6·01	157·3	195
Rape..................	2·16	131·7	185
Lard..................	1·25	140·3	201
Tallow................	11·15	150·0	200
Cocoanut..............	18·75	204·9	260
Castor................	1·22	49·14	190

The experiments being distinctly encouraging, another series was carried out, in which a fresh amount of acid was used after each sample had been taken, since a certain quantity of hydrochloric acid escaped as gas. The figures so obtained are set out in Table 2.

TABLE 2.

Hydrolysis of Oils and Fats by Means of Hydrochloric Acid, Sp. Gr. 1·16.

100 grms. of Oil or Fat and 100 c.c. of Acid; fresh acid used after each sample had been taken.

Oil or Fat.	Original Acid Value.	Acid Values after										Acid Value of completely Hydrolysed Oil or Fat.
		2 hrs.	7 hrs.	9 hrs.	12 hrs.	14 hrs.	16 hrs.	18 hrs.	20 hrs.	22 hrs.	24 hrs.	
Cotton seed....................	0·35	18·42	79·6	95·51	116·2	136·4	144·9	155·7	164·8	168·2	175·8	202
Whale..........................	6·01	26·69	101·3	120·3	142·7	155·4	162·3	170·0	172·0	..	..	195
Rape...........................	2·16	19·66	75·06	89 57	107·2	120·1	127·3	134·2	140·3	144·0	151·8	185
Lard...........................	1·25	14·51	84·78	116·8	139·8	149·4	152·1	162·7	168·0	173·0	177·0	201
Tallow.........................	11·15	43·39	112·5	131·7	153·2	167·0	173·3	178·9	183·3	185·2	186·8	200
Cocoanut.......................	18·75	79·73	184·2	210·5	221·4	230·8	233·4	239·8	241·1	246·1	250·1	260
Castor.........................	1·22	44·4	47·3	49·0	51·4	51·4	47·9	49·2	46·8	44·4	41·64	190

In order to assist the hydrolytic action, it was thought advisable to add, at the outset, to the fats and oils a few per cent. of their fatty acids—a procedure which is known to accelerate saponification in an autoclave and in other processes. The experiments carried out are detailed in Table 3.

TABLE 3.

Hydrolysis of Oils and Fats by Means of Hydrochloric Acid, Sp. Gr. 1·16.

100 grms. of Oil or Fat, containing Free Fatty Acids, and 100 c.c. of Acid; fresh acid used after each sample had been taken.

Oil.	Original Acid Value.	Acid Values after										
		2 hrs.	4 hrs.	7 hrs.	9 hrs.	12 hrs.	14 hrs.	16 hrs.	18 hrs.	20 hrs.	22 hrs.	24 hrs.
Cotton-seed......................	10·51	37·69	71·1	88·73	94·85	103·9	113·6	117·1	119·7	125·6	132·1	140·3
Whale............................	15·16	41·44	85·84	105·0	123·2	147·3	158·6	164·3	173·9	175·3	..	..
Rape.............................	9·17	32·1	61·31	75·36	78·09	92·55	101·4	110·1	128·9	132·6	139·6	145·2
Lard.............................	11·3	14·52	49·58	71·46	86·36	101·2	116·8	128·5	138·0	147·3	148·7	155·0
Tallow...........................	20·14	49·41	114·9	140·7	154·5	167·6	175·8	178·6	182·9	183·3	189·0	189·4
Castor...........................	10·98	46·8	50·9	46·8	47·4	47·9	48·5	48·4	46·8	45·3	47·11	48·31

Cocoanut oil is not included in this table, as the sample taken for the preceding experiments contained already a sufficient quantity of free fatty acids. It will be seen that cocoanut oil reached the highest degree of hydrolysis, and this is sufficiently accounted for by its high proportion of glycerides of volatile fatty acids. It will be remembered in this connection that Geitel has shown how easily triacetin is saponified in dilute solution containing hydrochloric acid. I may further point to the experiments by Zeisel and Fanto, who have demonstrated that triacetin is completely saponified by boiling hydriodic acid of sp. gr. 1·7.

It is remarkable that castor oil differs entirely from the other fats. This exceptional behaviour can only find its explanation in the different constitution of its fatty acids and the ready formation of polymerisation products. Judging from the ease with which castor oil is saponified by caustic soda, one might have expected a greater amount of hydrolysis than is shown in the table. However, it is quite possible that considerable hydrolysis did set in, but that the free fatty acids linked themselves together to form polymerised ricinolic acids. This corresponds with a number of other observations made on castor oil which are still under investigation.

Hydrochloric acid acts here, of course, like a catalytic agent, and it was thought possible, nay, even likely, in the light of modern views, that the action of the acid might be accelerated by adding suitable catalytic substances which would assist the action. Those agents would naturally be the most effective ones which could produce a thorough intermixing of the reacting products. A number of substances were tried, the selection having been made on very crude, empirical lines. The experiments were carried out on lard only, both on the neutral fat as also on the lard containing 5 per cent. of its own fatty acids. None, however, of the substances employed produced the desired effect, as will be seen from the figures given in Tables 4 and 5.

TABLE 4.

Lard boiled with Hydrochloric Acid and 1 per Cent. of the Substances.

—	Original Acid Value.	Acid Values after 2 hrs.	4 hrs.	7 hrs.	9 hrs.	12 hrs.	14 hrs.	16 hrs.	18 hrs.	20 hrs.	22 hrs.	24 hrs.
Mercury	1·25	12·32	35·24	63·34	96·44	133·5	145·5	154·0	164·4	169·1	174·0	174·6
Copper sulphate	1·25	19·68	53·06	82·45	89·81	131·8	146·7	153·1	156·9	164·6	171·3	175·4
Mercuric oxide	1·25	29·47	66·74	88·48	129·1	149·3	156·0	160·2	167·4	178·0	178·1	182·9
Zinc	1·25	17·88	85·94	127·3	146·0	163·7	168·0	172·7	178·5	182·0	183·1	185·7
Zinc-dust	1·25	17·07	58·83	88·23	98·13	118·1	129·7	136·7	144·0	150·8	156·0	163·0
Aluminium chloride	1·25	16·88	46·91	78·65	100·7	125·4	136·8	138·9	152·7	159·4	166·7	166·8
Nitrobenzene	1·25	56·77	103·5	120·6	129·3	147·1	152·3	158·9	163·2	166·9	168·7	171·1
Aniline	1·25	18·16	49·56	86·3	96·44	119·4	131·1	134·8	135·6	142·1	150·4	152·1

TABLE 5.

Lard containing Free Fatty Acids boiled with Hydrochloric Acid and 1 per Cent. of the Substances.

—	Original Acid Value.	Acid Values after 2 hrs.	4 hrs.	7 hrs.	9 hrs.	12 hrs.	14 hrs.	16 hrs.	18 hrs.	20 hrs.	22 hrs.	24 hrs.
Mercury	11·3	21·64	48·82	80·0	102·2	119·4	134·0	141·0	151·3	156·4	160·4	161·6
Copper sulphate	11·3	56·91	99·97	115·0	142·0	159·9	169·0	175·6	178·7	181·1	183·4	186·2
Mercuric oxide	11·3	32·24	67·47	99·9	108·5	113·8	144·8	150·3	153·0	154·5	157·4	161·2
Zinc	11·3	42·01	74·65	86·39	117·6	134·8	146·8	155·6	158·3	165·8	169·4	174·6
Zinc-dust	11·3	16·96	33·0	56·05	72·6	88·49	100·0	106·4	109·6	118·1	123·9	134·2
Aluminium chloride	11·3	62·15	90·56	121·0	127·3	138·5	145·3	145·6	151·4	156·2	159·2	161·9
Nitrobenzene	11·3	32·45	76·74	111·0	122·3	129·9	134·0	139·0	143·6	150·0	156·3	161·2
Aniline	11·3	34·51	74·1	74·76	93·26	106·9	119·3	124·7	128·9	133·9	138·2	141·0

From a practical point of view, my experiments, so far, do not afford much hope of a process of saponification on technical lines. The chief drawback would appear to be that a very long time would be required to complete saponification. In this connection I may point to experiments of Zeisel and Fanto, who found that lard and butter fat are not completely hydrolysed by boiling hydriodic acid, and that consequently their process of determining glycerin could not be applied to the triglycerides themselves. Besides, hitherto I have not been able to ascertain whether the glycerin formed is fully recovered, that is, whether the hydrochloric acid exercises any destructive action on the glycerin formed.

These experiments will be continued in the hope that a technical process may be worked out; of course, a suitable emulsifying agent must first be found. Trials with saponin as an emulsifier have not proved promising so far. Still, my hope does not appear unjustified, considering the rapidity with which, in the so-called acid saponification process, hydrolysis is brought about by means of concentrated sulphuric acid. It is well known that, on treating fats and oils with concentrated sulphuric acid, sulpho compounds are formed, which, emulsifying, as they do, the mass on boiling with steam, effect practically complete saponification. Undoubtedly it was a view of this kind which led Twitchell to devise his process of saponification by means of an oleo-aromatic-sulpho compound, which, even in as low a proportion as 1 per cent., saponifies fats and oils on prolonged boiling with steam. A complete emulsion takes place, and, as I am inclined to explain the action, sulphuric acid is split off, as it were, *in statu nascendi*, and thus effects saponification.

The necessity of having a complete emulsion is brought out still more prominently in the latest process of saponification, of Connstein, Hoyer, and Wartenberg (this Journal, 1902, 1541), by means of the enzyme contained in castor oil seeds. Hydrolysis will set in and proceed only if a most intimate intermixture is produced.

I shall have to say more on this process on some future occasion; for the foregoing lines should only be looked upon as a preliminary note. But I may just as well mention that I have been carrying out a number of experiments with the enzyme contained in pig's liver, the so-called lipase, which has been shown by the experiments of Kastle and Loevenhart (Amer. Chem. J., 1900, [24], 49) to hydrolise ethyl butyrate somewhat rapidly. As was to be expected, these experiments have been fully confirmed (O. Mohr, Zeits. f. Spiritusind., 1902, 520).

I have no hope that a technical process can be based thereon, since, leaving aside all questions of cost and expediency, I am afraid that the saponification will not proceed very far, or, at any rate, not to its completion. Moreover, Kastle and Loevenhart have shown that the lipase is also able to perform the reverse reaction, *viz.*, to synthesise the ester from acid and alcohol, and in an older observation by Hanriot (Comptes Rend. Soc. Biolog., 1901, 70) it is stated that lipase is able to synthesise monobutyrin from butyric acid and glycerin.

My experiments were carried out on cotton seed oil, but hitherto I have not been able to obtain hydrolysis exceeding 3 per cent. It is, however, quite possible that under different conditions, especially if I succeed in keeping the oil completely emulsified for some time, a more favourable result may be obtained; but, so far, my observations point to the conclusion that it is not admissible to apply to glycerides what has been proved to hold good for ethyl butyrate as regards the enzymic action of lipase. I mention this especially, as, in his last paper, Loevenhart (Amer. J. of Physiol., 1902, 331) appears to me to look upon all his experiments made on ethyl butyrate as being practically applicable, *mutatis mutandis*, to the hydrolysis of fats in the organism. Caution is all the more necessary, as Connstein, Hoyer, and Wartenberg have shown that there is a most remarkable difference in the behaviour of glycerides on the one hand, and monovalent esters on the other hand, when acted on by the enzyme contained in castor seed. Whereas the glycerides reached a remarkably high degree of hydrolysis, the simpler esters, such as ethyl acetate, amyl acetate, underwent slight hydrolysis only. Furthermore, the same experimenters have shown that triacetin was hardly hydrolysed at all by the castor seed ferment, and that even tributyrin was saponified to the extent of 10 per cent. only.

Of course, my failure to obtain, up to the present, more pronounced hydrolysis of oils and fats with lipase from pig's liver should only be looked upon as due to my having failed, so far, to produce complete and permanent emulsions.

I am afraid I have ventured already too far from the dry lands of fats and oils into the luxuriant domain of physiology, and I ought to take especial care not to touch upon the latest phase of modern chemistry, which claims enzymic action as falling within the laws governing catalytic reactions. This has become possible, because enzymes have been proved capable of exerting a reversible action, as has been demonstrated, first by A. Croft Hill (Chem. Soc. Trans., 1898, 657), then by the chemists named above, and, finally, by Emmerling (Ber., 1901, 3810). "A general theory of the action of certain enzymes" has already been given by V. Henri (this Journal, 1902, 1546).

The important chemical industries which are based on enzymic processes have long since forced the specialist to study this branch of physiological chemistry—a course that has become imperative since zymase has been discovered. It would appear that also the oil expert will have to devote considerable attention to what may have been thought lying altogether outside his province of technology.

The undoubted existence of fat-splitting enzymes is bound to influence our views regarding the rancidity of fats and oils. The first stage of rancidity is the formation of free fatty acids. In the light of enzyme action it is now easily explained why, *e.g.*, olive oil expressed from exposed marc contains up to 75 per cent. of free fatty acids, and why palm oil is so exceedingly rich in free fatty acids. Furthermore, one can now readily understand why even the freshest vegetable oils contain small percentages of free fatty acids, whereas freshly rendered animal fats are practically free from fatty acids.

My thanks are due to my assistants, Messrs. C. D. Robertshaw and G. Warburton, who have assisted me in carrying out the experimental work.

Discussion.

Dr. Le Sueur asked whether the author had taken into account the possible formation of lactones by the action of the sulphuric acid on the β-γ-unsaturated acids which might be present; as, if these compounds had been formed, then the actual amount of hydrolysis was greater than that recorded in the paper.

Dr. Rideal said Dr. Lewkowitsch had not referred to the process which was in use some years ago for the determination of volatile fatty acids by their hydrolysis from butter with sulphuric acid. When that process came out, he (Dr. Rideal) made a great number of determinations, but it was not a satisfactory process from an analyst's point of view, owing to secondary products being formed from the glycerin liberated. The second part of the paper was at the present time more interesting to him, inasmuch as the problem of the hydrolysis of fats in sewage effluents was of considerable practical importance. There was certainly evidence now that a hydrolytic change did take place when sewage underwent anaerobic or septic treatment. He had determined very carefully the quantity of free fatty acids passing in and out of septic tanks, and was convinced that a hydrolytic change did take place, causing an increase in their amount. Whether the change was due to enzymes existing in the sewage and derived from animal secretions, or whether it was brought about by enzymes secreted by the bacteria in the tank itself, was not properly worked out at present. In order to obtain a complete hydrolysis of fat it was necessary that the fat should be in a very fine state of division or emulsion. In most sewages, of course, there was a certain quantity of soap, which seemed to act as an emulsifier of the oil or free fats, and it was probably, therefore, due to this factor that the fats in sewage were in a state favourable for hydrolytic change.

The Chairman said it was curious that Dr. Lewkowitsch should disclaim any practical outcome for his paper. It seemed to be the fashion nowadays for other people to see a practical outcome of a paper which the author disclaimed. He did not think a hydrolysis of 75 per cent. was at all bad, from a practical point of view, for a new process. The new reagents for saponification seemed to have a future before them. From their earliest infancy they had been accustomed to products derived from the castor-oil seed to promote metabolism in the human frame. Now they were being used outside, and there was no reason why they should not be effectual. Although such reagents were collective substances to start with, they would isolate in time the active substances, which would produce effects that they little dreamt of at the present moment. It was interesting to hear from Dr. Rideal the effect of these enzymes on the fat contained in sewage. Those results hardly agreed with former views on the subject.

Dr. Lewkowitsch, in reply to Dr. Le Sueur, said he was afraid there would be no formation of lactones in the dilute acid solution he worked with, though if concentrated sulphuric acid were used lactones would ultimately be obtained. In reply to Dr. Rideal, the process of butter analysis was, of course, included under the process of saponification by means of concentrated sulphuric acid, to which he had referred explicitly. He need therefore only state that the Kreis method of butter analysis was unsatisfactory, as he (the speaker) had shown elsewhere (Chemical Analysis of Oils, &c., 2nd edition, p. 635). There was no doubt that the presence of fatty acids in sewage was due to bacteria, and not to enzymes. He remembered a paper published in 1889 by Lüdy, which showed conclusively that bacteria produced a large amount of hydrolysis of fats. On the Continent endeavours had been made to recover on a large scale the fatty matter contained in sewage. Thus, at Cassel, fat had been obtained containing 70 per cent. of free fatty acids, and a large engineering firm had taken out a patent for plant for recovering fat from sewage. The raw fatty refuse was treated with mineral acid, the fatty matter filter-pressed, dried, and extracted with solvents. The solvent was distilled off, and the product thus obtained contained 70 per cent. of free fatty acids, about 18 per cent. of neutral fat, and 12 per cent. of unsaponifiable matter. He did not at present see how a process of this kind was going to pay. Although the castor-oil seed enzyme did exert its action in a very dilute acid solution, still the acid should not exceed the concentration of one-third or one-fifth of a normal solution. The presence of salt seemed to weaken the action considerably. It was pretty certain, considering the chemical mixture to be found in sewage, that enzymes had no chance of exerting any action. With reference to the remarks of the Chairman, Dr. Lewkowitsch said that although, in his experiments with lipase, he obtained slight hydrolysis only, still, notwithstanding all experiments to the contrary, it may play an important part in our internal economy in so far as it split up and helped to digest the fats. He would continue his experiments with the fat-digesting ferment in the intestines in steapsin, in the hope of obtaining larger amounts of hydrolysis.

ERRATA.

THE INFLUENCE OF IMPURITIES ON THE SPECIFIC GRAVITY OF SULPHURIC ACID.

BY ARTHUR MARSHALL, F.I.C., F.C.S.

(This Journal, Dec. 31, 1903, 1508—1510.)

In Table III., pp. 1509—1510, the first column gives the specific gravities, and the figures in the top line, from 1 to 6 inclusive, corresponding to sp. gr. 1·00, have been corrected to read as follows:—0·14, 0·28, 0·43, 0·57, 0·71, and 0·86. The figure in col. 9 corresponding to sp. gr. 1·06 should be 10·03; the figure in col. 0 corresponding to sp. gr. 1·07 should be 10·17; and that in col. 8 corresponding to sp. gr. 1·65 should be 73·60.

THE DETERMINATION OF THE STRENGTH OF SULPHURIC ACID.

BY ARTHUR MARSHALL, F.I.C., F.C.S.

(*Ibid.*, 1511—1512.)

In the table on p. 1512 the figures in the second and fourth columns represent c.c.

Manchester Section.

Meeting held on Friday, January 9th, 1903.

DR. G. H. BAILEY IN THE CHAIR.

The CHAIRMAN announced that Dr. B. W. Gerland, one of the most active and indefatigable members of the Manchester Section, had received from the University of Marburg a document in honour of the jubilee of his graduation at that University. It was therefore their desire, as the Manchester Section, to offer to Dr. Gerland—not merely because he had received recognition on the Continent, but on their own behalf—their hearty congratulations on the Jubilee of his graduation at Marburg. He had therefore great pleasure in submitting the following resolution:—

"That the members of the Manchester Section of the Society of Chemical Industry offer their hearty congratulations to Dr. B. W. Gerland on the jubilee of his graduation at Marburg, and desire to record their high appreciation of the services he has rendered to chemical science, and particularly of the contributions which from time to time he has made at the meetings of the Society."

The resolution having been seconded by Mr. JONES, and supported by Dr. ANGEL, Dr. GROSSMANN, and Mr. LANGDON, it was put to the meeting, and carried with acclamation.

It was further resolved that an illuminated copy should be presented to Dr. Gerland.

Dr. GERLAND warmly thanked the meeting.

INFLUENCE OF CERTAIN REAGENTS ON THE TENSILE STRENGTH AND ON THE DYEING PROPERTIES OF COTTON YARN.

BY JULIUS HÜBNER AND WILLIAM J. POPE, F.R.S.

Contribution from the Department of Pure and Applied Chemistry, Municipal School of Technology, Manchester.

Although an exact knowledge of the changes in the tensile strength of cotton yarn which result from treating the latter with various reagents would undoubtedly be of great importance in connection with the textile industries, very little has as yet been done towards obtaining such knowledge; further, the information which is available upon this subject is practically entirely of a qualitative nature, and few results of a really quantitative character have been published, even on so old and important a technical process as that of mercerisation. In view of the lack of data capable of guiding investigation upon the subject, we have thought it desirable to make a preliminary study more particularly of the way in which the tensile strength of a raw cotton yarn is affected by treatment with solutions of a number of inorganic salts and with caustic soda solution in order to ascertain in which direction we may most profitably push a more extended enquiry we have in contemplation.

For the purpose of obtaining a measure of the strength of yarn for practical purposes, it seems to be the most generally adopted practice to stretch a lea of the yarn between two steel hooks or arms, and then to ascertain the weight required to draw the arms apart and break the lea. This method is, however, open to the objection that it must be practically impossible so to spread the lea out between the two arms as to ensure an equal distribution of the strain amongst all the threads; some of the latter will necessarily receive more of the pull than others, and, since the lea will then be gradually torn, owing to some threads breaking before others, the breaking load registered will be less than the sum of the breaking loads of the individual threads. As it was desirable to have experimental data, obtained with a machine of this type, for comparison with the results given by the method we ultimately adopted for ascertaining the tensile strength of yarns, Mr. W. Myers, of this school, kindly reeled a portion of the raw Egyptian yarn described below into leas, which were then broken in a Nesbitt tearing machine; the counts and the breaking loads of the 18 leas thus prepared are given in Table I.

TABLE I.

Hanks to the Pound.	Breaking Load in Pounds.	Hanks to the Pound.	Breaking Load in Pounds.	Hanks to the Pound.	Breaking Load in Pounds.
26·3	90·2	26·3	90·2	26·0	110·4
26·0	92·8	26·0	105·2	25·6	111·9
26·7	90·5	26·0	77·5	26·0	108·1
26·3	83·5	26·0	100·0	26·3	102·2
26·3	96·0	26·3	105·3	26·0	106·9
26·7	87·0	26·3	109·4	27·0	98·4

It will be seen that the breaking load varies from 77·0 to 111·9 lbs., which, when reduced to a basis of 100 for the convenience of future comparison, indicates a variation of from 100 to 145·2; the mean breaking load is 99·0 lbs., and as the tension is borne by 160 threads, each thread carries an average of 277·9 grms. at the breaking load. The lea does not, however, break as a whole, but, as the load is increased, individual threads break one after the other, until so many have broken that the remainder slip and the arms of the machine move easily apart; the number 277·9 grms. cannot therefore be regarded as the mean breaking load of a single thread, and, as we show in Table II., it is far below the true mean tensile strength of a single thread. The uncertainty which exists as to the proper interpretation to be given to the numerical values obtained by this method is intensified by the machine being driven by hand and therefore not at a constant speed.

Dividing the numbers given in Table I. into a first and second set of nine each, the first nine give a mean of 90·3 lbs., and the second nine a mean of 105·7 lbs., as the breaking load; the great increase in the mean is due to the natural tendency to work the machine more rapidly as the observations accumulate. As no definite meaning could be attached to the results obtained with this machine, we have discontinued its use.

For the tests described in the following pages we used the tearing machine made by Louis Schopper and described by Dalén (Mitt. k. tech. Versuchsanstalt, 1901), in which a single thread, loaded with a weight of 2 grms. in order to keep it straight, is held between clips fixed at a definite distance apart, and in which, by a simple hydraulic device to ensure the load being increased at a uniform speed, the clips are pulled apart gradually, and without any sudden jerk. The load under which the thread snaps is indicated on one scale, and the extension at the moment of breaking is shown on a second scale. The machine which we have used carries a maximum load of 1 kilo. and reads to 5 grms.

Although those who have previously published upon the influence of chemical treatment on the tensile strength of yarn have, as a rule, been content to determine the breaking strength of the yarn as the mean of ten or a dozen tearing trials, it seemed to us very improbable that a mean result of satisfactory accuracy could be obtained by such a method of working. Cotton yarn being a product obtained by twisting together a number of fibres of different lengths and thicknesses by a mechanical process incapable of insuring absolute uniformity of count and twist, it seemed likely that the recorded breaking strains of individual threads of the most uniformly spun yarn obtainable would differ so considerably that perhaps 100 threads would have to be broken before data capable of yielding the mean tensile strength of the yarn with any degree of accuracy could be obtained. This preliminary view of the nature and number of the determinations to be made led us to lay in a considerable stock of the most uniformly spun raw twofold 50 Egyptian yarn which we could select.

A lea was then reeled off from the raw yarn, cut across into short threads, each of which was then broken in the tearing machine, the tensile strength and the extension at the breaking load being noted. The results obtained are given in Table II., in which column 2 states the number of threads breaking at the load indicated in column 1.

Table II.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
330	2	370	11	410	6
335	2	375	1	415	2
340	2	380	5	420	2
345	3	385	9	425	1
350	5	390	5	430	2
355	7	395	6	435	1
360	12	400	5	440	1
365	6	405	3		

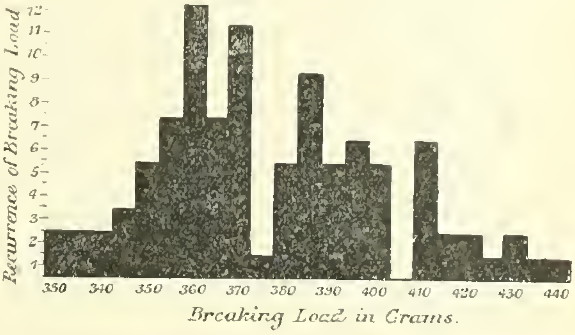
Mean tensile strength, 378·0 ± 1·7 grms. Number of observations, 99. Length broken, 10 cm. Limits of observed breaking loads, 330 and 440 grms. Ratio of same, 100 to 133·3.

An inspection of this table shows that the 99 threads from the same lea varied in breaking stress from 330 to 440 grms. (or from 100 to 133·3), and conclusively proves the correctness of our view that no accurate mean value for this constant can be derived from the examination of a few threads. The mean breaking strength of the raw yarn, deduced from the table, is 378·0 grms., and since it is necessary to obtain some knowledge of the extent to which this mean result can be relied upon, we apply to the determinations the method of least squares; taking the number of determinations as n, the n observed breaking strains as $S_1, S_2, S_3, \ldots\ldots\ldots S_n$, and the mean breaking strain as M, the deviations $\Delta_1, \Delta_2, \ldots\ldots\ldots \Delta_n$, of the individual determinations from the mean value, are $M - S_1, M - S_2, \ldots\ldots\ldots M - S_n$, and in the equation—

$$r = \pm 0{\cdot}6745 \sqrt{\frac{\text{Sum of the } \Delta^2}{n\,(n-1)}}$$

the value r represents the probable mean squared error of the mean value. Since, in Table II., $r = \pm 1{\cdot}7$ grms, it follows that it is just as likely that the true mean value of the breaking strength of the yarn lies between the values 376·3 and 379·7 grms., as that it lies outside these limits; the mean value deduced from the above 99 determinations is therefore probably accurate to within 0·45 per cent.

In applying the method of least squares as a criterion of the accuracy of the mean tensile strength ultimately calculated, it should be pointed out that, in the present set of tests, all the conditions requisite to the legitimate application of the mathematical method are not fulfilled. Thus it will be noted that the greatest frequency with which a particular breaking load is observed amongst any one set of our determinations is not, as a rule, that nearest to the mean tensile strength, whilst the curve obtained by plotting the recurrence of the particular breaking loads against the breaking load is not a curve showing only one point of inflection. In Table II., the breaking load 360 is observed the greatest number of times, *viz.*, 11, whilst breaking loads 375 and 380, those nearest the mean of 378·0, only occur once and five times respectively; further the curve shows the existence of several points of inflection, more particularly at the loads 360, 370, and 385. These and other peculiarities to be noted in the tables—as for instance the occurrence of the load 370 eleven times and of 375 only once—might be attributed to faults in the machine, such as a tendency to register 370 more readily than 375; we have, however, proved that the machine possesses no such bias, by adding up from all the tables the frequencies with which the different breaking loads recur. After arguments, such as the foregoing, against the application of the method of least squares have been considered, it must still be agreed that the method constitutes a perfectly reliable one for obtaining a comparative measure of the degree of accuracy attained by such series of tests as those now put forward.



It should be pointed out that experimental determinations of a constant are of no value for comparative purposes unless the probable degree of accuracy of the measurement can be stated; the mean values of the tensile strengths of yarn treated in various ways deduced from 10 or a dozen observations, and accompanied by no discussion of their probable accuracy, hence have very little bearing on the problems they are intended to elucidate.

Having now obtained a satisfactory method of determining the mean tensile strength of a cotton yarn within very narrow limits of error, and knowing that Egyptian yarn is only with difficulty wetted out, the main stock of the raw yarn was boiled for two hours in water, left in steep for two days, boiled for one hour in a 1 per cent. sodium carbonate solution, and washed in distilled water until free from soda; the yarn was not treated with caustic soda for the purpose of cleaning it, as it was desirable as far as possible to avoid any chemical action upon the yarn. After the yarn had been air-dried, Prof. T. W. Fox, of this School, was good enough to have it reeled into leas of 120 threads, one of which was used in each of the determinations described below. Table III. refers to the examination of a lea of this material (which we may conveniently name A) after it had been scalded in boiling water for two minutes and dried one day in the air. It should be stated that all the tearing trials recorded in the present paper were made whilst the hygrometer indicated 55 to 65, and after the yarn had been exposed for at least 24 hours to the air.

Table III.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
285	1	390	3	440	3
335	1	395	6	445	5
350	1	400	11	450	7
355	1	405	6	455	7
360	1	410	3	460	5
365	1	415	11	465	1
370	3	420	11	470	1
375	3	425	5	475	1
380	5	430	6	480	1
385	3	435	2	510	1

Mean tensile strength, 417·4 ± 2·1 grms. Number of observations, 119. Length broken, 10 cm. Limits of observed breaking loads, 285 and 510 grms. Ratio of same, 100 to 179.

It will be seen that the tensile strength of the yarn has been increased by this cleansing treatment to 417·4 ± 2·1 grms., and from the magnitudes of the probable mean squared errors to which the sets II. and III. are liable, it cannot be doubted that we are justified in concluding that during the boiling and steeping in water, and the boiling in a 1 per cent. sodium carbonate solution, the tensile strength of a raw cotton yarn increases considerably. This increase in strength would seem to be attributable to the boiling in water, and not to the action of the sodium carbonate, which only serves the purpose of removing greasy matters; this is indicated by a third set of determinations (Table IV.) made upon a lea of the material A after it had been scalded, left for six days in a 15 per cent. sodium carbonate solution, and washed and dried.

Table IV.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
325	1	390	2	445	6
330	1	395	9	450	6
340	1	400	5	455	6
345	2	405	4	460	1
350	2	410	10	465	3
360	1	415	3	470	4
365	1	420	5	475	4
370	1	425	7	490	1
375	3	430	8	495	1
380	3	435	5	505	1
385	5	440	6		

Mean tensile strength, 419·7 ± 2·2 grms. Number of observations, 118. Length broken, 10 cm. Limits of observed breaking loads, 325 and 505 grms. Ratio of same, 100 to 155·4.

The mean tensile strength, 419·7 ± 2·2 grms., is numerically identical with that deduced from Table III., *viz.*, 417·4 ± 2·1 grms., and it therefore seems that a 15 per cent. solution of sodium carbonate has no more action on the tensile strength of the yarn than a 1 per cent. solution.

No satisfactory explanation, based on experimentally determined facts, has yet been offered for the considerable changes in the tensile strength of cotton yarn which result from chemical treatment of the yarn; further, no quantitative explanation of the variation in tensile strength of different threads from the same lea has yet been given. Now, however, that we have determinations of the tensile strength of yarn possessing a known and high degree of accuracy, we are able to put forward tentatively conclusions concerning the points mentioned, reserving, for a later date, a more complete experimental study of the conditions than is possible in this preliminary paper. A little consideration will show that the tensile strength of a yarn which contains *n* fibres in the cross section is but remotely connected with the tensile strength of the *n* individual fibres, for, on breaking a thread by the application of a certain load, the mean effect of the load is to pull the fibres apart, a much smaller number than *n* being broken, and being broken at different times. So long as the tensile strength of the yarn is less than *n* times the tensile strength of a single fibre, the strength of the fibres is of quite subordinate importance, and the main factor determining the strength of the yarn is the closeness of the twist, and, perhaps also, a specific adhesion or "cling" exerted between the fibres; it would be expected, therefore, that variations in the twist would show themselves in variations in the tensile strength of the yarn. Mr. W. Myers kindly made a series of 58 determinations of the twist on 10-in. lengths of the raw Egyptian yarn used in the present work, from which it appears that the twist varies from 22·0 to 30·3 turns per in., the mean being 25·66 turns per in. The twist being the main factor in determining the tensile strength of a cotton yarn, it is interesting to notice that the above three figures relating to the twist of the yarn, *viz.*, 22·0, 30·3, and 25·66 are in the ratio, 324 : 446 : 378, which is practically the same as the ratio, 330 : 440 : 378, of the lowest, highest, and mean values of the tensile strength taken from Table II. This would indicate that for one and the same yarn the tensile strength is directly proportional to the twist.

On making a count of the fibres in the yarn with which we have worked it was found to contain an average of 100 fibres in the cross section. If the above reasoning is correct, each fibre of the raw yarn has a tensile strength greater than 387/100, or 3·87 grms.; and further, if a series of tests be made under conditions which interpose a resistance to the drawing apart of the fibres, and which increase the number of fibres which have to be broken before the yarn breaks, a great increase in the tensile strength of the yarn should be observed. These conditions would be attained by making the length of thread to be broken less than the average staple of the yarn. Table V. gives determinations of the tensile strength of the raw yarn made by diminishing the distance between the clips in the tearing machine to 1 mm., so that the yarn is broken in lengths of 1 mm. instead of 100 mm. as in the trials given in Table II.

Table V.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
360	1	440	2	510	2
365	1	445	6	515	4
370	1	450	1	520	4
380	1	455	4	525	5
385	1	460	1	530	2
390	1	465	5	535	2
400	3	470	6	540	3
405	1	475	2	545	4
410	1	480	1	550	2
415	2	485	7	555	2
420	1	490	3	565	5
425	5	495	5	575	1
430	1	500	1	590	1
435	7	505	2		

Mean tensile strength, 479·4 ± 3·4 grms. Number of observations, 110. Limits of observed breaking loads, 360 and 590 grms. Ratio of same, 100 to 163·9.

The tensile strength determined on a length of 1 mm. is 479·4 ± 3·4 grms., whilst that made on a length of 100 mm. is 378·0 ± 1·7 grms., so that, as was to be anticipated, the very short length gives a very much higher tensile strength. Determinations of the tensile strength of single fibres, as also an investigation of the relation between the length of thread broken and the mean tensile strength, are now in progress.

In order to study the influence of mercerisation upon the tensile strength of yarn, leas of material A, were scalded for two minutes in boiling water and left for 24 hours in caustic soda solution of sp. gr. 1·342; after exhaustively washing and drying in the air, the tensile strength was ascertained as before, with the results given in Table VI.

A parallel trial was also carried out, in which the lea was left for six days in the caustic soda solution, with the results stated in Table VII., for the purpose of ascertaining whether the action of the soda is greater in six days than in one.

Table VI.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
355	2	505	6	580	2
400	1	510	7	585	3
405	1	515	3	595	8
410	1	520	1	600	3
425	1	525	4	605	1
435	2	530	1	610	2
440	2	535	7	615	2
445	1	540	2	625	1
450	1	545	4	630	1
460	2	550	2	635	1
470	2	555	5	650	1
475	5	560	1	655	1
485	4	565	3	665	1
490	3	570	5		
495	7	575	5		

Mean tensile strength, 530·9 ± 3·8 grms. Number of observations, 118. Length broken, 5 cm. Limits of observed breaking loads, 355 and 665 grms. Ratio of same, 100 to 187·3.

Table VII.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
400	1	500	2	585	2
415	1	505	7	590	1
420	1	510	3	595	2
425	1	515	3	600	1
430	1	520	3	605	3
435	2	525	3	610	2
440	5	530	6	615	3
450	1	535	2	625	2
455	3	540	3	630	1
460	2	545	4	640	1
465	2	550	1	645	2
470	3	555	3	660	1
475	5	560	2	665	1
480	5	565	5	670	1
485	2	570	1	675	1
490	5	575	1		
495	4	580	3		

Mean tensile strength, 526·3 ± 3·8 grms. Number of observations, 120. Length broken, 5 cm. Limits of observed breaking loads, 400 and 675 grms. Ratio of same, 100 to 168·8.

Since the mean tensile strengths, 530·9 ± 3·8 grms. (1·342 NaHO for 24 hours) and 526·3 ± 3·8 grms. (1·342 NaHO for six days), are numerically equal, it has to be concluded that if 1·342 caustic soda has any effect on the yarn after one day's action, that effect is but small and involves an alteration in the tensile strength of less than 1 per cent.

Since it is important that further experimental evidence should be obtained in justification of the application of the method of least squares as a means of ascertaining the degree of accuracy to which the mean tensile strength of yarn had been determined, we made a second series of experiments similar to those summarised in Table VII., immersing a new lea of the yarn A in fresh 1·342 caustic soda, at a subsequent date, for six days; the results are given in Table VIII.

The fact that the mean tensile strengths, 526·3 ± 3·8 grms. (Table VII.) and 523·9 ± 3·1 grms. (Table VIII.), are numerically identical, affords further confirmation of the legitimacy of our method of dealing with the experimental results.

The action of concentrated caustic soda upon yarn constitutes practically the only mild chemical action upon cotton to which attention has been directed; we have observed, however, that potassium iodide has superficially much the same effect upon cotton as has caustic soda. On pouring saturated potassium iodide solution upon reeled yarn the hank "wets out" immediately, just as with caustic soda, the fibres becoming at once transparent and assuming a glassy appearance; this rapid penetration of the solution is accompanied by appreciable shrinkage. After washing the yarn several times with absolute alcohol and drying, it retains about 15 per cent. of potassium iodide; yarn thus impregnated soon turns brown on exposure to air and light, but only colours slowly if sealed up in a glass tube with air and exposed to light. No discoloration occurs on exposing the impregnated yarn to sunlight in a vacuum. By treatment with water the potassium iodide may be rapidly washed out. Further, on agitating filter paper with potassium iodide solution, it rapidly disintegrates and forms a pulp just as if caustic soda is used.

Table VIII.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
355	1	490	3	565	5
375	1	495	1	570	4
395	1	500	3	575	3
400	1	505	8	580	3
430	1	510	1	585	4
435	1	515	6	590	1
440	2	520	6	595	3
445	2	525	1	600	2
455	2	530	3	615	1
460	3	535	10	620	3
465	2	540	2	635	1
470	5	545	8	660	1
475	3	550	2	700	1
480	3	555	1		
485	3	560	1		

Mean tensile strength, 523·9 ± 3·5 grms. Number of observations, 119. Length broken, 5 cm. Limits of observed breaking loads, 355 and 700 grms. Ratio of same, 100 to 197·2.

In view of the great similarity of action of caustic soda and potassium iodide upon cellulose, it seemed desirable to attempt to isolate a compound of cellulose and potassium iodide analogous to the compound of cellulose and caustic soda which Gladstone (Journ. Chem. Soc., 1852, **5**, 17) obtained by washing mercerised cotton with absolute alcohol until the washings contained no more soda; we found, however, that absolute alcohol slowly but completely extracted all the potassium iodide from a hank of cotton yarn which had been soaked in saturated potassium iodide solution for 24 hours. This fact indicates that the combination between cellulose and potassium iodide is of a less stable character than that between cellulose and the caustic alkali, because Gladstone found (*loc. cit.*) that the compound of potash and cellulose is not decomposed by absolute alcohol, although the latter solvent dissolves caustic potash. The similarity between mercerisation and treatment with potassium iodide solution is intensified by our observation that cotton yarn which has been soaked in saturated potassium iodide solution for 24 hours and washed in distilled water until free from iodine, has a far greater affinity for direct cotton colours, such as benzopurpurine 4 B, than has the untreated yarn; it is also to be noted that, after treatment with potassium iodide solution and washing, the yarn burns in the peculiar way which Gladstone first called attention to in connection with mercerised cotton.

A further similarity between the action of caustic soda and potassium iodide upon cotton is found in that both reactions result in an increase of the tensile strength of the yarn. Table IX. gives the results of a trial made upon material A. after scalding for two minutes, immersing for 24 hours in saturated potassium iodide solution, washing until free from iodine in distilled water and drying in the air. Table X. states the result of an otherwise similar trial, in which the yarn remained for six days in the saturated iodide solution.

The tensile strength of the original yarn, *viz.*, 417·4 ± 2·1 grms., is increased to 431·6 ± 2·3 grms. by 24 hours immersion in saturated potassium iodide and to 420·4 ± 2·1 grms. when the immersion is prolonged for six days; it is therefore not to be doubted that a considerable increase in tensile strength results from 24 hours action of the potassium iodide solution whilst six days action causes the higher tensile strength to diminish to practically the original value, 417·4 ± 2·1 grms. being numerically identical with 420·4 ± 2·3 grms. If potassium iodide be left in the bank, rapid tendering ensues and a brown colour is developed on exposure to the air, but the diminution in tensile strength after six days treatment is not attributable to the liberation of iodine as the solution, which was kept in the dark, remained colourless.

TABLE IX.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
305	1	410	3	465	2
340	1	415	5	470	6
350	1	420	4	475	2
365	1	425	6	480	1
375	1	430	9	485	2
380	4	435	8	490	2
385	4	440	7	495	2
390	6	445	6	500	1
395	1	450	7	505	3
400	5	455	4	520	1
405	7	460	5		

Mean tensile strength, 431·6 ± 3·8 grms. Number of observations, 118. Length broken, 10 cm. Limits of observed breaking loads, 305 and 520 grms. Ratio of same, 100 to 170·5.

TABLE X.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
315	1	395	2	450	4
330	2	400	7	455	1
345	1	405	7	460	8
350	1	410	8	470	2
355	1	415	19	475	2
365	1	420	8	480	3
370	1	425	8	490	1
375	2	430	7	495	1
380	3	435	3	500	1
385	1	440	3		
390	3	445	6		

Mean tensile strength, 420·4 ± 2·1 grms. Number of observations, 118. Length broken, 10 cm. Limits of observed breaking loads, 315 and 500 grms. Ratio of same, 100 to 158·7.

For the purpose of determining whether the action of potassium iodide is a specific one, or whether it can be caused by solutions of other soluble iodides, we repeated the above experiments, using solutions of barium iodide, potassium mercuric iodide, and barium mecuric iodide.

A bank of the material A, after scalding for two minutes in boiling water, was immersed for 24 hours in a saturated aqueous solution of barium iodide and, after washing till free from barium and iodine, was allowed to dry in the air; the results obtained on determining its tensile strength are given in Table XI.

TABLE XI.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
310	1	395	4	460	4
315	1	400	7	470	6
320	1	410	10	475	2
335	1	415	3	480	4
340	1	420	4	485	3
350	1	425	4	490	3
360	1	430	4	495	3
370	2	435	2	500	1
375	1	440	8	510	2
380	1	445	7	530	2
385	5	450	7	555	1
390	3	455	4	570	2

Mean tensile strength, 433·4 ± 3·0 grms. Number of observations, 119. Length broken, 5 cm. Limits of observed breaking loads, 310 and 570 grms. Ratio of same, 100 to 183·9.

The table indicates that treatment with barium iodide solution causes an increase in the tensile strength of the yarn from 417·4 ± 2·1 to 433·4 ± 3·0 grms.

On immersing cotton yarn in a saturated aqueous solution of potassium mercuric iodide, it wets out instantaneously and assumes the gelatinous appearance presented by the yarn on treatment with caustic soda. On washing with a large bulk of water, mercuric iodide is precipitated in the fibres, but slowly dissolves when the bank is left in contact with the washing liquor. This indicates that both potassium and mercuric iodide combine with the cellulose, but that the potassium iodide compound is dissociated, on the subsequent addition of water, more rapidly than the mercuric iodide compound; mercuric iodide being subsequently liberated by the dissociating action of the water, and being insoluble in water, does not dissolve unless left in contact with the washing water containing potassium iodide. If, however, the two iodides were retained by the fibre by capillary action, the same behaviour might be anticipated, as Trevor has shown (Zeits. f. phys. Chem., **7**, 468), that that constituent of a double salt which has the higher molecular weight diffuses the more slowly. On treating the yarn with potassium mercuric iodide solution, and subsequently washing till free from iodides, it is found to have an increased affinity for benzopurpurine 4B; further, on passing the solution of the double iodide through a filter paper, the latter swells greatly and becomes gelatinous, and on shaking filter paper in a test tube with potassium mercuric iodide solution, a pulp is formed, owing to disintegration of the paper.

The numbers given in Table XII. were obtained with a lea of material A, scalded for two minutes in boiling water, immersed for twenty-four hours in a saturated potassium mercuric iodide solution, washed until free from iodine and mercury, and dried in the air; Table XIII. shows the result of a similar course of treatment, but in which the bank was left immersed for six days in the iodide solution. During the action of the double iodides, the yarn shrinks very considerably.

TABLE XII.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
330	2	420	3	485	1
350	2	425	2	495	1
360	1	430	6	500	1
370	1	435	5	510	2
375	1	440	5	520	2
380	2	445	4	525	1
385	1	450	7	530	2
390	5	455	11	535	1
395	2	460	6	545	1
400	6	465	2	550	2
405	1	470	5	570	1
410	3	475	5	590	1
415	8	480	7		

Mean tensile strength, 444·9 ± 2·9 grms. Number of observations, 119. Length broken, 5 cm. Limits of observed breaking loads, 330 and 590 grms. Ratio of same, 100 to 178·8.

An inspection of Tables VIII. and IX. and XII. and XIII. shows that the increase in the tensile strength of cotton yarn due to the action of potassium mercuric iodide is much greater than that caused by potassium iodide alone, although the effect of both these reagents is much less than that of caustic soda. On immersing leas of the material A in saturated aqueous barium mercuric iodide the same rapid "wetting out," and the same parchment-like appearance are noted, but after washing the leas free from iodide they are found to have shrunk much more than when the other iodides are used. Tables XIV. and XV. give the results of tests made upon leas of material A, scalded for two minutes in boiling water, immersed for one and six days respectively in a saturated aqueous solution of barium mercuric iodide, and subsequently washed free from iodides and air dried.

It is evident that the action of barium mercuric iodide solution in increasing the tensile strength of the yarn is as

Table XIII.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
325	1	425	7	490	2
355	1	430	4	495	1
365	1	435	2	500	2
375	2	440	7	505	2
380	2	445	2	510	2
385	3	450	7	515	2
390	3	455	2	520	1
395	2	460	10	525	2
400	8	465	5	530	1
405	3	470	3	540	1
410	5	475	7	575	1
415	6	480	2		
420	3	485	3		

Mean tensile strength, 443·4 ± 2·7 grms. Number of observations, 18. Length broken, 5 cm. Limits of observed breaking loads, 25 and 575 grms. Ratio of same, 100 to 176·9.

Table XIV.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
395	1	495	3	575	1
405	1	500	2	580	2
420	1	505	2	585	1
425	2	510	3	590	1
440	1	515	5	595	3
445	1	520	9	600	5
450	1	525	1	605	2
455	1	530	5	610	2
460	1	535	3	615	1
465	1	540	4	620	2
470	1	545	6	625	1
475	3	550	2	640	3
480	4	555	4	650	2
485	2	560	1	670	1
490	3	565	2		

Mean tensile strength, 534·3 ± 3·9 grms. Number of observations, 103. Length broken, 5 cm. Limits of observed breaking loads, 395 and 670 grms. Ratio of same, 100 to 169·6.

Table XV.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
425	1	500	3	565	3
430	2	505	4	570	2
440	1	510	3	575	2
445	4	515	3	580	3
450	3	520	7	585	4
455	1	525	3	590	1
460	4	530	5	595	4
465	3	535	8	610	1
470	3	540	6	620	1
475	5	545	5	635	2
480	1	550	5	640	1
490	2	555	3	650	1
495	3	560	3	715	1

Mean tensile strength, 526·6 ± 3·3 grms. Number of observations, 117. Length broken, 5 cm. Limits of observed breaking loads, 425 and 715 grms. Ratio of same, 100 to 168·2.

great as that of caustic soda, and further, just as with other iodides, the increase in tensile strength is less after six days' action than after one day. It has also to be noted that cotton yarn dyes much more strongly with benzopurpurine 4B after treatment with barium mercuric iodide than before. In connection with the peculiar action of the double mercuric iodides to which we now call attention, it should be noted that Vignon (Comptes Rend., **116**, 517 and 645) finds that very dilute mercuric chloride solution acts on cellulose; he considers that oxy-cellulose is produced as the result of an oxidising action represented by the equation—

$$HgCl_2 + HgO = Hg_2Cl_2 + O.$$

No explanation of this kind is applicable to the facts we now bring forward, because the treatment with iodides does not give rise to the formation of oxycellulose; if oxycellulose were produced the yarn would dye more strongly with basic colours than before the action of the iodide, whilst we find that the treated cotton has practically the same affinity for methylene blue as has the untreated yarn.

In view of the similarity in behaviour of cotton yarn towards caustic soda and iodides, it seemed desirable to ascertain the effect upon the tensile strength of treating mercerised yarn with saturated potassium iodide solution. For this purpose a lea of the material treated with 1·342 caustic soda for 24 hours, and subsequently washed and dried, was steeped in saturated potassium iodide solution for one day, and after washing and drying, was torn in the usual way. The results are summarised in Table XVI.

Table XVI.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
370	1	455	1	525	6
390	1	460	2	530	3
395	2	465	5	535	5
400	1	475	3	540	3
410	1	480	3	545	2
415	3	485	5	555	6
420	1	490	3	560	1
425	1	495	7	565	5
430	2	500	2	570	2
435	3	505	8	575	3
440	1	510	2	580	1
445	3	515	4	585	6
450	4	520	4	625	2

Mean tensile strength, 503·1 ± 3·3 grms. Number of observations, 118. Length broken, 5 cm. Limits of observed breaking loads, 370 and 625 grms. Ratio of same, 100 to 168·9.

The yarn, after mercerisation, had the tensile strength stated in Tables VI. and VII., *viz.*, 524·8 ± 2·3 grms., but this, after the treatment with potassium iodide, had become reduced to 503·0 ± 3·4 grms. Although potassium iodide causes a considerable increase in the tensile strength of raw cotton yarn, it effects an appreciable reduction in that of mercerised yarn.

The change in the tensile strength of yarn induced by mercerisation may be, therefore, partially reversed by subsequent treatment with an iodide; and it seemed interesting to enquire whether a diminution in the tensile strength of mercerised yarn can be also brought about by other kinds of treatment. We find that the tensile strength of mercerised yarn is considerably diminished by boiling with water. Table XVII. gives the breaking tests of a lea of material, A, which was mercerised in the same way as the hanks discussed in Tables VI. and VII., but which, after washing and drying, was boiled for six hours in a Jena glass beaker with distilled water, and dried in the air.

Table XVII.

Breaking Load in Grms.	No.	Breaking Load in Grms.	No.	Breaking Load in Grms.	No.
370	2	475	5	545	4
375	1	480	7	550	3
385	2	485	1	555	1
395	1	490	2	560	1
420	2	495	5	565	4
425	1	500	9	570	6
430	1	505	3	575	4
435	6	510	3	585	1
440	2	515	2	590	2
445	1	520	9	600	1
450	3	525	2	610	2
455	1	530	2	645	1
460	3	535	5	650	1
465	4	540	3		

Mean tensile strength, 505·0 ± 3·5 grms. Number of observations, 119. Length broken, 5 cm. Limits of observed breaking loads, 370 and 650 grms. Ratio of same, 100 to 175·7.

The treatment with soda gave the yarn a tensile strength of 524·8 ± 2·3 grms., and this by the boiling with water became decreased to 505·0 ± 3·5 grms. It is interesting to note that whilst boiling with water increases the tensile strength of raw cotton yarn by about 10 per cent. (Tables II. and III.) boiling with water for six hours effects a material decrease in the tensile strength of mercerised yarn.

Since the increased tensile strength resulting from mercerisation and treatment with iodides is accompanied by an increased affinity for direct colours, but with no appreciable change in the affinity for basic dyestuffs such as methylene blue, it seemed interesting to ascertain whether the tensile strength and the affinity for colouring matters changed similarly as a result of boiling the yarn with water; this is, however, not altogether the case, as is shown by the following dyeing trials made with a bleached cotton yarn, which gave scarcely any oxycellulose reaction with Fehling's solution. After boiling the bleached yarn for 12 hours with distilled water in a Jena glass vessel it was found to dye much more strongly with benzopurpurine 4B, and much less strongly with methylene blue, than before; similar, but greater, changes in affinity for the direct and the basic dyestuffs were caused by heating the bleached yarn in a sealed Jena glass tube with water at 150° for two hours. On mercerising the yarn and then boiling it with water for 12, 24, 36 and 48 hours, the affinity for the direct colour was continuously increased, and that for the basic colour continuously decreased; the mercerised yarn was found to dye a least twice as strongly with benzopurpurine 4B after 4 hours' boiling with water than before boiling.

Although cotton yarn treated with iodide solutions i many respects resembles mercerised yarn, importan differences are observed between the degree of lustr produced on immersing yarn under tension in caustic sod and iodide solutions. Yarn under tension develops a ver slightly increased lustre on treatment with iodide and subsequent washing, although the same sample of yarn ma become highly lustrous when mercerised under tension The causes of this difference will be discussed in a late communication, together with the chemical behaviour o various technically important fibres towards iodides.

The quantitative results given in the previous pages ma be conveniently summarised as in Table XVIII., in whic the table from which the results are taken is given in th first, and the tensile strength, t, in the third column. Th tensile strength reduced to that of the material A, as basis of 100, is stated in column 4, and the limits o measurement of t, and the ratio of those limits, are state in columns 5 and 6.

TABLE XVIII.

—	Treatment of Yarn.	Tensile Strength t.	t reduced to III. as 100.	Limits of Observed Tensile Strength.	Ratio of Limits. 100 to—
II.	Raw yarn	378·0 ± 1·7	90·6 ± 0·40	330 and 410	133·3
III.	1 per cent. Na_2CO_3 solution	417·4 ± 2·1	100·0 ± 0·50	285 „ 510	179·0
IV.	15 „ „ „	419·7 ± 2·2	100·6 ± 0·53	325 „ 505	155·4
V.	NaHO solution, 1 day	530·9 ± 3·8	127·2 ± 0·90	355 „ 665	187·3
VI.	„ „ 6 days	526·3 ± 3·8	126·1 ± 0·90	400 „ 675	168·7
VII.	„ „ „	523·9 ± 3·5	125·5 ± 0.84	355 „ 700	197·2
VIII.	Raw yarn, 1 mm.	479·4 ± 3·4	114·9 ± 0·81	360 „ 590	163·8
IX.	KI solution, 1 day	431·6 ± 2·3	103·4 ± 0·56	305 „ 520	170·5
X.	„ „ 6 days	420·4 ± 2·1	100·7 ± 0·50	315 „ 500	158·7
XI.	BaI_2 solution, 1 day	433·4 ± 3·0	103·8 ± 0·72	310 „ 570	183·9
XII.	KI, HgI_2 solution, 1 day	444·9 ± 2·9	106·6 ± 0·71	330 „ 590	178·7
XIII.	„ „ 6 days	443·3 ± 2·7	106·2 ± 0·65	325 „ 575	176·9
XIV.	BaI_2, HgI_2 solution, 1 day	534·3 ± 3·9	128·0 ± 0·92	395 „ 670	169·6
XV.	„ „ 6 days	526·6 ± 3·3	126·1 ± 0·79	425 „ 715	168·2
XVI.	VII. with KI solution	503·0 ± 3·3	120·5 ± 0·80	370 „ 625	168·9
XVII.	VII. boiled with water	505·0 ± 3·5	121·0 ± 0·84	370 „ 650	175·7

It is interesting to note that the widening of the limits of the observed tensile strengths is accompanied by a comparatively slight increase in the probable mean squared error of the mean, and that in spite of the wide limits between which the observed tensile strengths lie in many cases the probable error is never more than 0·7 per cent.

It is further important to notice that when the mean tensil strength is greatly increased by the application of an chemical treatment which we have studied, considerabl disturbances in the structure of the yarn take place, as i indicated by the great widening of the limits of the observe tensile strength in such cases.

TABLE XIX.

—	Treatment of Yarn.	Mean Tensile Strength $= t$.	Length in Cms. $= l$.	Elongation at Breaking Load.	Length at Breaking Point $= l_1$.	$t \times l$.	$t \times l$ to III. as 100.	$t \times l_1$.	$t \times l_1$ to II as 100.
				Per Cent.					
III.	1 per cent. Na_2CO_3	417·4	66·0	9·29	72·1	2755	100·0	3011	100·0
IV.	15 „ „	419·7	65·6	9·56	71·9	2753	99·9	3016	100·2
V.	NaHO, 1 day	530·9	45·2	28·24	58·0	2400	86·9	3077	102·2
VI.	„ 6 days	526·3	44·8	27·12	57·0	2358	85·6	2997	99·6
IX.	KI, 1 day	431·6	65·0	9·83	71·4	2805	101·8	3081	102·3
X.	„ 6 days	420·4	64·6	9·86	71·0	2716	98·6	2984	99·1
XII.	KI, HgI_2, 1 day	444·9	65·2	10·00	71·7	2901	105·3	3191	106·0
XIII.	„ 6 days	443·3	57·3	16·35	66·7	2540	92·2	2955	98·2
XIV.	BaI_2, HgI_2, 1 day	534·3	52·3	20·52	63·0	2794	101·4	3368	111·9
XV.	„ 6 days	526·6	48·9	24·62	60·9	2575	93·5	3209	106·6

In the previous pages we have not yet discussed the shrinkage which results from the subjection of the standard yarn A to treatment; the length of the leas of yarn A before and after treatment were ascertained by hanging the lea on a hook, suspending a weight of 25 grms. from it, and measuring the length of the lea as accurately as possible with a millimetre scale. The lengths (l) in centimetres are given in column 4 of Table XIX. During the determinations of the tensile strength of the various treate yarns, observations were made of the elongation at th breaking load of each thread; these elongations vary ver considerably amongst threads from the same hank, and fo our present purpose it suffices to state the mean percentag elongation of the yarn at the breaking load. These numbe are stated in column 5 of Table XIX., and from the lengt of the hanks and the elongations we have calculated t an lengths (l_1) to which the hanks will stretch on appli- ion of the breaking load; a comparison of the values of nd l_1 shows clearly that after a yarn has been shrunk mercerisation or other treatment and washed and dried, cannot be stretched to its original length without eaking.

Thus 66·0 cm. of raw yarn is shrunk to 45·2 cm. mercerising without tension, washing, and drying, and afterwards stretching the mercerised thread to the eaking point it only attains a length of 58·0 cm.; this is esult of peculiar interest in view of the fact that the ·0 cm. thread of raw yarn could be mercerised and washed der tension, and caused to retain that length after drying mercerised cotton.

We have indicated above (page 72), the great proba- lity that the twist is the controlling factor in determining e strength of a yarn and have given evidence suggesting at for one and the same sample of yarn the tensile strength directly proportional to the twist. The twist in the mples of yarn produced by the various kinds of treatment entioned is naturally inversely proportional to the length of the lea, so that if the law just suggested is also appli- able to a yarn, independently of the chemical treatment hich has been applied, the product of t and l should be onstant throughout the series of trials now discussed; the alues of $t \times l$ are given in col. 7 of Table XIX. and in ol. 8 are stated the values of $t \times l$ reduced to the $t \times l$ alue of the material A (from III.) as a basis of 100. The alues in these two columns show a considerable tendency owards constancy.

But it is not quite legitimate to expect constancy in the values of $t \times l$, because at the breaking point the load t is not being applied to the length l but to the length l_1; and the product $t \times l_1$ would be more likely to be the constant quantity. This value is given in col. 9, and in col. 10 is reduced to the $t \times l_1$ value of the standard yarn A as 100; with the exceptions of the hanks treated with potassium or barium mercuric iodides, all the $t \times l_1$ values lie between 99·1 and 102·3, that is to say they are identical within the limits of the experimental error incurred.

It may thus be safely concluded that although during mercerisation a yarn shrinks by about one-third, its tensile strength remains directly proportional to the twist.

It should be noted that if, on chemical treatment, the cotton fibre preserves an unaltered volume but merely changes in length, the length l is inversely proportional to the cross sectional area a of the fibre, so that $l \times a$ is equal to the constant volume. But if a given volume of material be made up into rods of different lengths and uniform thicknesses, the breaking loads of the rods will be directly proportional to the cross sectional area and inversely proportional to the length. This result is of the same form as that obtained in the present investigation.

The value of a yarn for manufacturing purposes must be to a considerable extent dependent upon the uniformity of its twist, that is to say, a yarn which will withstand the various operations of bleaching, mercerisation, dyeing, weaving, &c., without giving great trouble owing to frequent breakages must be one in which the limits of the observed tensile strengths measured on about a hundred separate threads do not lie too far apart. The limits of the observed tensile strength for the leas of differently treated yarn which we have examined are given in Table XVIII. and are conveniently discussed after reducing them to the basis of the lowest observed breaking load as 100; the quantities thus deduced, which may be termed the "ratios of the tensile strength limits," are also given in the table and will be seen to vary widely for leas which have been subjected to different treatment. Yarn No. II., in which the ratio of the limits is as 100 to 133·3, must obviously give far less trouble during weaving owing to broken threads than that numbered III., in which the ratio is as 100 to 179·0. It seems therefore that the manufacturer would derive very reliable information as to the behaviour of a yarn during the subsequent manufacturing processes from the determination of this ratio of the limits of the observed tensile strengths, or by the comparison of the mean tensile strength with the tensile strength observations lying below the mean value. The data obtained in the way which we now describe, treated by the method which we have used, affords specific information as to the strength and the variation in strength of a yarn, whilst the figures given by the lea testing machine ordinarily used are meaningless in so far as the tensile strength of the yarn is concerned.

Discussion.

Prof. **Knecht** said they were indebted to the authors for the interesting paper, which had evidently involved a large amount of work. The method which they advocated for the testing of cotton yarns by taking the average breaking strain of a number of threads, was much more reliable than the rough-and ready method of testing whole hanks or leas. That cotton was stronger after bleaching than before, had been shown many years ago by the late Mr. Chas. O'Neill. He had on several occasions confirmed this statement, and had ventured an explanation of the strengthening effect on the assumption that the cotton wax with which each fibre is coated in the untreated state acted as a lubricant, and as such would have a tendency to cause the fibres to slip when the yarn was stretched. In the bleaching process the wax was removed, and the friction between the individual fibres being increased, the yarn would become stronger. In this connection, he asked whether the authors had tried the effect on its strength of extracting the yarn with organic solvents. The authors' discovery of the mercerising action of potassium iodide on cotton was one of the most remarkable which had been made in connection with the chemistry of cellulose for a number of years. He asked whether the authors could give any explanation of their interesting observations. The substances which were known to mercerise cotton were the caustic alkalis, zinc chloride solution (200° Tw.), sulphuric acid, and phosphoric acid. Some years ago he had studied the effect of nitric acid (83° Tw.) on cotton, and had found that it produced a similar result to that obtained with caustic soda. It was, perhaps, not a matter of coincidence that these substances were all dehydrating agents, and although potassium iodide was not known to act as such, he would ask whether, in steeping the cotton in its saturated solution, the surface of the liquid was exposed, so that evaporation could take place. The effect of boiling water in further increasing the affinity of mercerised cotton for colouring matters was also of great interest. A similar effect was produced by steaming mohair yarns, and in the steaming of worsted or union piece goods in the crabbing process. It was well known to dyers of such goods that pieces were frequently "ended" in consequence of one end of the piece being steamed for a longer period than the other, and in consequence acquiring a deeper shade in the dyeing process.

Prof. **Pope**, in reply to Dr. Knecht, said they had not used an organic solvent for the purpose of removing the wax from the yarn. The treatment by sodium carbonate was merely to clean the yarn. They had a certain amount of evidence for supposing that the action of these iodide solutions was not the same as the action of caustic soda, but this matter was still under examination.

Mr. J. **Hübner**, in further explanation of Prof. Pope's remarks, said that the dyeing property of cotton treated with iodides, especially with barium mercuric iodide, was in every respect similar to the dyeing of mercerised cotton. It took up direct cotton colours quite as readily as cotton treated with caustic soda. He thought it would be rather misleading to offer any explanation for this peculiar behaviour, especially as up to the present time no satisfactory explanation had been given which would explain this peculiar behaviour, towards colouring matters, of the mercerised cotton. He thought he would be right in going even further, and stating that the whole process of mercerising, as far as the change which takes place in the fibre was concerned, had not yet been explained in a satisfactory manner. His colleague (Prof. Pope) and himself hoped very soon to be in a position to bring before them another communication, which might help to further explain the interesting points which has been raised.

FERMENTATION OF SUGAR-CANE JUICE.

BY CHAS. H. G. SPRANKLING.

When the sugar cane is crushed, a dirty yellowish-green liquid is obtained, from which is prepared the ordinary "muscovado" brown sugar of the West Indies.

In addition to cane sugar or saccharose, this juice contains a certain proportion of glucose, some other carbohydrates of the character of the dextrans or gums, and finally a small amount of mineral matter, the two latter constituents being classed together under the term "non-sugars."

A good juice should have essentially a high saccharine content, and small amounts of glucose and "non-sugars."

[In the West Indies it is always the custom to speak of the sugar, glucose, &c. content of the juice in pounds per gallon, and this will be adhered to in the present paper.]

A freshly-ground juice undergoes very rapid fermentation, with, as will be shown, the formation of large amounts of alcohol and acetic acid. It will also be seen that this rapid change is only arrested by rendering the liquid alkaline by some means. The rate of the change may be diminished by the addition of such bodies as phenol, cresol, &c., but the fermentation is only retarded for a time.

As this fermentation is so rapid, it can be easily imagined that the planter has to take care to render the juice alkaline as soon as possible. This is done by the addition of lime in suspension in water, and the process is known as "tempering."

In addition to thus rendering the liquid alkaline, the lime also carries down with it nearly the whole of the "non-sugars," thus immediately purifying the juice. A juice thus treated can be kept for two or three days without a very great loss in the sugar content.

This rapid fermentation of cane juice is taken advantage of in the West Indies to obtain a native vinegar. By allowing barrels of cane juice to remain exposed to the air for some weeks, and finally filtering the liquid thus obtained, a very fair vinegar is produced. A certain amount of the "non-sugars" yield alcohol and acetic acid during this time, and any remaining impurities in suspension are removed by the filtration.

Before proceeding to describe the actual experiments carried out in this investigation, it will be desirable to give a short sketch of the methods used in the estimation of the chief constituents of cane juice.

Chemists in the West Indies nowadays usually determine only *three* factors of the juice, *viz.*, (1) the total solids, (2) the saccharose, (3) the glucose. The difference between the sum of the two latter constituents and the first is taken to represent the "non-sugars."

The *Total Solids* content is determined from the specific gravity. A Westphal balance is employed for this purpose, using a glass plummet calibrated for the temperature, 17·5°/30° C. 30° C. is taken as being the average temperature in a tropical laboratory.

A correction of ± 0·0003 per degree is made according as the observed temperature is above or below 30° C.

[The density of a sugar juice varies between the limits 1·0400—1·0900 on the average.]

From the corrected density the total solids, in pounds per gallon, is read directly from a table of densities, which is a slight modification of the tables of Gerlach and Scheibler.

The *Saccharose* is determined by adding exactly 2 c.c. of basic lead acetate solution to 100 c.c. of the juice, filtering, and polarising the clear filtrate. The polariscope used was a Schmidt and Haensch triple-shadow instrument corrected for tropical climates. In this instrument a solution of 26·048 grms. of pure sugar in 100 c.c. of water read exactly 100. A correction for the additional 2 c.c. of liquid is made, and the reading calculated to pounds per gallon. A good juice should contain about 1·9—2·2 lb. of cane sugar per gallon.

The *Glucose* is determined on 10 c.c. of Fehling's solution (10 c.c. = 0·05 gr. of glucose), using potassium ferrocyanide on filter paper as the indicator.

A good juice should not contain more than 0·08 l glucose per gallon. Above that quantity is distinct detrimental to the manufacture of good sugar, especial if the saccharose content is low, as it renders the crysta small and gummy, thereby retarding the flow of molass from them.

An analysis of a typical cane juice will be somewhat follows :—

Density, 17·5°/30°	1·0738
Total solids	2·011 lb. per gallon.
Saccharose	1·902 „ „
Glucose	0·033 „ „
Non-sugar	0·076 „ „

From these figures it is usual to calculate two others (1) The purity, which is equivalent to $\frac{100 \times \text{saccharose}}{\text{total solids}}$, a (2) the glucose ratio = $\frac{100 \times \text{glucose}}{\text{saccharose}}$. The figures in th case are 94·5 and 1·7 respectively, and it is the desire the planter to obtain juices having the former figure high as possible, while the latter is low.

The experiments actually carried out on the fermentatio of sugar-cane juice naturally fall under two heads, *viz* those on "untempered" or raw juice and those on t tempered juice. Several series of analyses were made i each case.

A. *Untempered Juice*: (1) *Raw Juice direct from t Mill.*—A sample of juice was obtained early in t morning, and analysed at intervals of an hour, the sacch rose being the only factor determined.

The actual figures obtained were 1·958, 1·926, 1·89 1·846, 1·738, and 1·677 lb. per gallon It will thus l seen that there is a loss of 11·3 per cent. in six hours f fresh juice.

(2) *Raw Juice in an Atmosphere of Carbon Dioxide.*— A Winchester quart bottle of juice direct from the mi was obtained, and immediately upon its arrival at th laboratory was placed under an atmosphere of carbo dioxide in such a manner that quantities of juice could b drawn off without admitting air to the liquid. The juic was analysed at the same hour each day, and the resul are shown in the following table :—

TABLE I.

Density.	Total Solids.	Saccharose.	Glucose.	Non-Sugar.	Purity.
1·0806	2·199	1·958	0·095	0·146	89·1
1·0776	2·117	1·561	0·186	0·370	73·7
1·0570	1·580	Solution could not be filtered.	0·102	..	..
1·0069	0·265		0·086	..	..
1·0048	0·208		0·052	..	..
1·0027	0·142		0·031	..	..
1·0024	0·135		0·030	..	..
1·0021	0·128		0·021	..	..

At the end of a week a portion of the liquid wa examined for alcohol and acetic acid. Both were foun to be present in large amount.

10 c.c. of the liquid required 7·3 c.c. of N/5 NaO (factor, 0·99) to exactly neutralise it. This gives 0·85 pe cent. of acetic acid. For the estimation of the alcoho 50 c.c. of the liquid were neutralised with sodium ca bonate, and the alcohol distilled off, and the density of th distillate taken. Considerable difficulty was experienced i the adjustment of the temperatures, and large correctio had to be made in the calculations. Hence the result ca only be taken to be approximate. The percentage o alcohol was found to be 9·2.

These estimations were continued at intervals of a week and finally after a month the percentage of acetic acid ha risen to 1·92, and that of the alcohol had fallen to 7·4.

No doubt all the acid estimated was not acetic, bu propionic, butyric, and other acids. In fact, as the juic got staler the smell became more and more offensive. Th characteristic odour of fusel oil was also at times ver noticeable.

(3) *Raw Juice in the Presence of Air after the Additio of ½ per cent. of Phenol to it.*—The experiments wer

c dncted as usual. As will be seen from the accompanying table, the change is very distinct, but not by any means s marked as in the case where the phenol is omitted:—

TABLE II.

ensity.	Total Solids.	Saccharose.	Glucose.	Non-Sugar.	Purity.
1·0763	2·083	1·868	6·090	0·125	89·7
1·0764	2·086	1·849	0·102	0·135	88·7
1·0760	2·077	1·812	0·089	0·176	87·2
1·0760	2·077	1·791	0·086	0·200	86·2
1·0758	2·071	1·769	0·081	0·221	85·4
1·0758	2·071	1·748	0·081	0·242	84·3
1·0757	2·068	1·706	0·086	6·274	82·5
1·0756	2·065	1·722	0·086	0·257	83·4
1·0755	2·063	1·692	0·086	0·285	82·0
1·0751	2·053	1·641	0·082	0·330	79·9
1·0751	2·053	1·631	0·090	0·332	79·8
1·0751	2·053	1·610	0·099	0·344	78·4
1·0750	2·050	1·597	0·104	0·349	77·9
1·0750	2·050	1·567	0·143	0·340	76·5

Qualitative examination showed the presence of alcohol small quantity after the expiration of three days, but no ace of acetic acid could be found at the end of the xperiment.

There is evidently a partial hydrolysis going on in the olution, as evidenced by the rise in both glucose and nonugar, especially in the latter.

B. *Tempered Juice:* (1) *Tempered Juice without Carolic Acid in the Presence of Air.*—The results obtained in is case are shown in Table III.

TABLE III.

Density.	Total Solids.	Saccharose.	Glucose.	Non-Sugar.	Purity.
1·0760	2·077	1·605	0·266	0·206	77·3
1·0761	2·079	1·599	0·232	0·247	76·9
1·0764	2·086	1·483	0·296	0·307	71·1
1·0470	1·316	Polarised negative.	0·601	..	..
1·0172	0·534		0·650	..	..
1·0031	0·165		0·506	..	..

At the end of a fortnight the density of this juice was ·9900, and the glucose content 0·013 lb per gallon.

The fermentation in this case was entirely alcoholic, large uantities of yeast being found at the bottom of the vessel at the end of the experiment.

(2) *Tempered Juice in the presence of Air with Carbolic Acid* (0·5 *per cent.*).—The figures obtained are shown in Table IV.

TABLE IV.

Density.	Total Solids.	Saccharose.	Glucose.	Non-Sugar.	Purity.
1·0720	1·970	1·666	0·121	0·183	84·6
1·0720	1·976	1·658	0·116	0·197	84·1
1·0719	1·968	1·658	0·113	0·197	84·2
1·0718	1·965	1·653	0·124	0·188	84·1
1·0717	1·963	1·655	0·139	0·178	84·2
1·0718	1·965	1·650	0·122	0·195	83·9
1·0717	1·963	1·655	0·127	0·182	84·2
1·0716	1·961	1·655	0·130	0·176	84·4
1·0715	1·958	1·655	0·127	0·176	84·4
1·0715	1·958	1·655	0·130	0·173	84·4

No trace of either alcohol or acetic acid was to he found in this liquid, and evidently the fermentation had been retarded to its maximum degree.

At the end of 24 days the saccharose content was found to be 1·650 lb. per gallon, and the purity 84·3.

Conclusions.—An examination of the figures in these tables will reveal the following facts:—

(1) Cane juice in the raw state is an exceedingly unstable substance, fermentation of an alcoholic and acetic nature setting in as soon as the juice comes from the mill. This would seem to point to the presence of yeast and *Mycoderma aceti* organisms being present in the tissue of the cane itself.

(2) The addition of phenol to the raw juice checks the alcoholic fermentation very considerably; and apparently there is a considerable amount of hydrolysis going on, as shown by the rise in the glucose content and also of the non-sugars.

(3) Tempered juice made alkaline with lime remains with only a little change for a few days, and then rapidly undergoes hydrolysis. In this case, as the saccharose cannot be determined, it is impossible to estimate the non-sugars. [Attempts were made to use Clerget's inversion method for estimating the sucrose, but the results were not concordant, and the method was abandoned.]

(4) Tempered juice with the addition of phenol is a practically stable substance. This is especially shown by the constancy of the purity coefficient.

The means at my disposal in the West Indies did not admit of any further experiments with regard to other preservatives in place of phenol. The general conclusion seems to be that to render the juice alkaline is the only means of preserving it even for a day or two. Of course, the addition of phenol renders the juice unfit to work into sugar for human consumption.

DISCUSSION.

The CHAIRMAN asked if any investigations had been made with a view to ascertaining what organisms were at work to bring about the changes referred to.

Mr. SPRANKLING, in reply, said he had not investigated the point raised by the Chairman, except that the fermentation was no doubt due to yeast and *Mycoderma aceti.*

Newcastle Section.

Meeting held at the Durham College of Science, on Thursday, October 30th, 1902.

MR. W. L. RENNOLDSON IN THE CHAIR.

FORMATION OF SULPHUR TRIOXIDE BY THE CONTACT ACTION OF FERRIC OXIDE.

BY PROF. G. LUNGE, PH.D., AND GEORGE P. POLLITT, B.SC., PH.D.

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Although a good deal of light has already been thrown, especially by the researches of Knietsch* (Berl. Ber., **34**, 4093), on the conditions governing the contact action of platinum on a mixture of sulphur dioxide and oxygen or air, nothing definite has, so far, been published on the subject of the corresponding conditions in the case of the use of oxide of iron as contact substance in the same reaction. The Verein Chemischer Fabriken in Mannheim has, as is well known, worked out the oxide of iron method, and has embodied its results in a series of patents, some of which were granted to them in conjunction with A. Clemm. (Eng. Pats. 17,266 (1898), 1859 (1899), 3185 (1899), 15,151 (1899), 24,748 (1899) 4610 (1901); U.S. Pat. 690,133; Ger. Pats. 106,715, 107,995, 108,445, 108,446.)

The experiments described in this paper were devoted to the consideration of the following conditions governing the contact action of oxide of iron in the formation of sulphur trioxide :—

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* Other chemists engaged in the working out of industrial contact processes have of course made investigations in the same direction, but their results have hitherto not been made public. Our experiments, moreover were made before the appearance of Knietsch's work

(1) Degree of dilution of the gases with air.
(2) Influence of moisture.
(3) Quantitative reacting power of the contact substance in bringing about the combination of the gases.
(4) Influence of temperature.
(5) Influence of different additions to or impurities in the contact substance.

A short description of the method of conducting the experiments may be given here. The sulphur dioxide was prepared from copper and sulphuric acid, well washed and dried, and condensed to a liquid in a strong U-shaped glass tube closed at both ends with high-pressure rubber tubing and screw stopcocks, so that a current of any desired strength could be readily obtained. The loss of gas by this method of closing the tube was very small even after several weeks' use.

The air was led from a large iron air-holder into a correctly graduated gas clock, washed with water and dried with concentrated sulphuric acid,[*] and was then mixed with the sulphur dioxide by means of a Y-shaped tube. The mixture was made of uniform composition by leading it down to the bottom of a bottle filled with glass beads, and it passed from there into the contact tube. This was a glass tube, 15 mm. diameter, lying in an ordinary combustion furnace, and it contained the contact substance (of which 60 grms. were taken in each case), occupying a space 60 cm. long. The exit gases were passed through a first (Drechsel) wash bottle, a 10-bulb tube, and a second wash-bottle. The first bottle contained 50 c.c. N/10 iodine solution, the bulb tube 25 c.c. of the same solution, and the second wash-bottle simply water, this being found amply sufficient to arrest any iodine mechanically carried over. The fumes of sulphur trioxide were absorbed much more quickly and completely if they were still warm on reaching the iodine solution. If they were previously cooled or moistened in the connecting tube, white fumes were formed, which proved difficult to get rid of in the absorption apparatus. Obviously, by titrating back the iodine solution, we obtained the amount of unchanged SO_2, and by estimating the sulphuric acid in the absorbing solutions the total sulphur coming over was also given, so that the proportion of SO_2 changed to SO_3 could be readily calculated.

At the commencement of each experiment the mixed gases were passed through the contact tube at least 45 minutes before connecting on the absorption apparatus. This was done till it could be assumed that the excess of air had been driven out, and that the concentration of the mixture of air and SO_2 in the tube was constant. After a certain time, of course considerably before the iodine solution was used up, the vessels were disconnected, the contact tube tightly closed, and the contents of the absorption apparatus examined.

The measurement of the temperature was carried out by means of a Le Chatelier pyrometer made in a form convenient for tube experiments (maker, W. C. Heraeus, Hanau). The thermo-element lies in a porcelain capillary tube, which is placed inside the empty combustion tube. By means of a series of experiments it can be then fixed what height of flame corresponds to what temperature, and a table drawn up, by reference to which any desired temperature can be obtained. Of course, such a table is only valid for the one particular furnace and gas originally used; besides which the height of flame must always be measured under the same conditions, either immediately the gas is lit or after the furnace has become quite warm, and the results must be checked every now and then with the pyrometer. If all these points be observed, one can rely on obtaining measurements correct to within ± 10° C.

In our first experiments pure oxide of iron was used. It was prepared as follows :—Pure ferrous sulphate was dissolved in water, oxidised with HNO_3, and precipitated with ammonia; the precipitate was well washed by decantation, filtered off, dried for two days at 100° C., and the dehydration completed by very gradual heating in the combustion furnace. The brick-red hygroscopic oxide was separated by a sieve into powder (which was not used) and pea-sized lumps, with which the contact tube was filled.

A. *Influence of the Degree of Dilution of the Gases.*—It may be deduced, both from the results obtained on the industrial scale and also theoretically by consideration of the law of mass action, that it is necessary to have an excess of oxygen in order to get the highest possible conversion of sulphur dioxide to sulphur trioxide. On the large scale the gases employed (obtained by the burning of sulphur, pyrites and blendes) contain atmospheric nitrogen as well. On this point the discussion of Knietsch's paper by Sackur (Zeits. f. Electrochem., **8**, 47) may be consulted. It is there pointed out that the presence of nitrogen is in itself a drawback, which, however, is counteracted by the influence of the excess of oxygen. According to patent No. 3185 (1899) of the Mannheim Company, the dilution of the gas from the burners to a strength of 2—3 per cent. of SO_2 has a directly beneficial influence on the yield of SO_3. In order to make the conditions clear, however, we had to work, not only with this minimum, but also with the maximum amount of SO_2, as well as with the percentages lying between these two extremes.

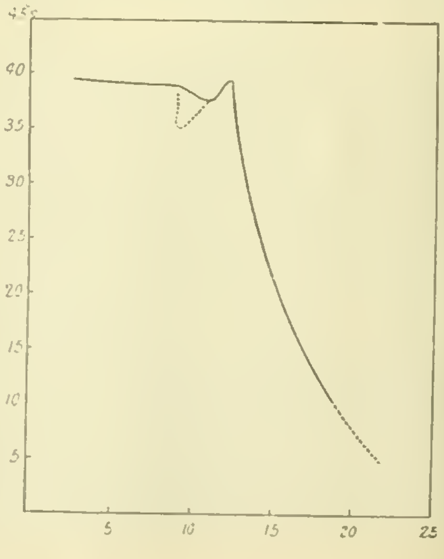
Series I.

Temperature of the tube, 680—700° C.; quantity of gas per minute, 25 c.c.

—	Percentage of SO_2 in the Gases on entering the Tube.	Percentage of SO_2 changed to SO_3.
1	2·5	38·1
2	2·5	40·5
3	4·4	38·0
4	9·0	38·3
5	9·3	35·2
6	11·3	37·9
7	11·9	38·4
8	12·8	39·2
9	13·9	27·5
10	15·5	21·2
11	16·6	18·2
12	19·5	10·6

These results are graphically represented by the curve in Fig. 1.

Fig. 1.



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[*] An absolute drying by means of phosphorous pentoxide not only seemed unnecessary for our experiments, but would also, according to the experiments of E. J. Russell and Norman Smith (J. Chem. Soc., 77, 340), have been a direct drawback.

We see from this that with our mode of operation, with nditions otherwise the same, the dilution of the SO_2 with has no sensible effect on the percentage changed to SO_3 ween the limits of 2·5—12·3 per cent. of SO_2. It is not a higher concentration is reached that more SO_2 begins go through unchanged. Besides this, on working with gas ntaining more than 12·3 per cent. of SO_2, the catalytic power the contact substance is lowered, and it only reaches its ximum again after prolonged treatment with diluter ses. This is shown by the following experiments, which re made with a view to re-checking the results obtained ith dilute gases :—

—	Percentage of SO_2 in the Gas on entering the Tube.	Percentage of SO_2 changed to SO_3.
13	2·4	22·8
14	2·9	31·2
15	2·4	38·6

This point having been settled, all subsequent experiments ere made with a gaseous mixture containing 2—5 per nt. of SO_2.

B. *Influence of the Moisture of the Gases.*—The temerature and the speed of the stream of gases were as in A, ut in this series the air was not dried, so that the usual tmospheric moisture was present.

Series II.—The gases contained 2—5 per cent. of SO_2. n three experiments in succession the results obtained ere : (1) 34·0 per cent. changed ; (2) 27·9 per cent. hanged ; (3) 22·7 per cent. changed.

That the effect of the moisture was to gradually weaken he contact action was so clearly shown by these results hat the necessity for keeping out all moisture, which s emphasised in Eng. Pat. 1859 (1899), was taken as ompletely proved, and further experiments in this direction were considered superfluous.

Moisture is, therefore, under ordinary conditions a "poison" for this catalysis, and this agrees with all later series of experiments. This can be reconciled with the above-mentioned work of Russell and Smith, according to which the absolute drying of the materials by means of the prolonged action of phosphorus pentoxide causes the action to cease, if we assume that the amount of water necessary to commence and keep up the catalysis very quickly reaches the amount required for its maximum effect, and that by increasing the quantity of water above this critical point the curve representing its effect suddenly and quickly sinks, and soon reaches a point where it has a negative value. The critical point for the beneficial effect of water would then be between the absolute dryness obtained by using P_2O_5 and the condition obtainable by drying with a sulphuric acid wash-bottle and drying tower, in which traces of moisture are always retained.

C. *Influence of the Speed of the Stream of Gases, the Amount of the Contact Substance remaining the same.*—The same tube, containing the same contact mass as in Series II. (1—3) was here employed.

Series III.

—	Quantity of Gas per Minute.	Percentage of SO_2 changed.
	c.c.	
1	8	21·8
2	8	25·0
3	8	29·0
4	8	34·2
5	8	39·1
6	8	37·4
7	20	38·9
8	36	38·5
9	48	32·6

The first experiments show clearly how the contact mass "poisoned" in Series II. gradually reaches its maximum, *i.e.*, about 40 per cent. There is therefore no apparent difference between speeds of 8, 20, and 36 c.c. per minute, and it is not till 48 c.c. per minute is reached that a distinct lessening of the contact action can be noted.

The most important result here was really the fact that the contact action steadily increased on the oxide being treated again with dried gases till it reached its former fixed maximum. It can make no difference whether the "poisoning" of the contact mass be brought about by passing moist gases through it or by allowing it to take up atmospheric moisture We can therefore understand why the Mannheim Company should make a point of the fact that the burnt pyrites to be used as contact substance should be taken fresh and hot from the furnace, and not be allowed to be adversely affected by exposure to the air.

It was of course obvious that for a certain composition, length of contact layer, and temperature, a certain speed of gases might not be exceeded. The results above had as their primary object the determining of the speed which could be used with safety in our special case.

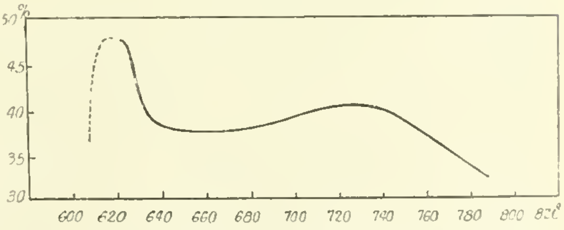
D. *Influence of Temperature.*—So far, no data as to the best temperature for the contact action of ferric oxide, beyond such indefinite ones as "good red heat," &c., have been made public. For platinised asbestos, Knietsch has fixed 400°—420° C. as giving a maximum change. At the same time he gives 550° C. as the best temperature for oxide of iron containing copper (burnt pyrites). He reaches a maximum change of 47 per cent. of SO_2 to SO_3 (Berl. Ber., **34**, 4095). In our experiments, *i.e.*, with the same contact material as in the former series (pure oxide of iron), and with the same degree of dilution and speed of stream, we obtained below 600° C. only very small quantities of SO_3, so that we leave the results out of the table altogether.

Series IV.

—	Temperature.	Percentage of SO_2 changed.
	° C.	
1	620	46·7
2	620	47·5
3	635	38·4
4	690	38·0
5	730	40·1
6	750	38·5
7	790	30·9
8	790	31·6
9	790	32·7

Fig. 2 gives these results graphically.

Fig 2.



The degree of change rises very quickly to a maximum of 47 per cent. at 620° C., then sinks quickly to 38 per cent., where it remains constant till a temperature of 750° C. is reached, when it begins to fall quickly. This may perhaps be explained as follows :—Below 600°, SO_2 and O are taken up by the Fe_2O_3 to form ferrisulphate, of which only a small amount is decomposed to Fe_2O_3 and SO_3. Part of the SO_3 thus liberated is further decomposed to SO_2 and O. At 620° the conditions are such that almost all the SO_3 is given off from the sulphate, and at this temperature the greater part remains as such. Above 620° the dissociation of the SO_3 to SO_2 and O increases more quickly than the formation of SO_3, and the curve for this formation of SO_3 must sink. This curve would continue to sink regularly were it not for the fact that between 650° and 750° the reactions take place by which SO_2 is oxidised at the expense of Fe_2O_3, and the Fe_3O_4 so formed is reoxidised to Fe_2O_3 by the oxygen of the air. At 750° there is an equilibrium between the SO_3 so formed and the SO_3 decomposed to SO_2 and O at this temperature, and it is not till above 750° that the decomposing reaction gets the upper hand.

In order to throw further light on this subject the following experiments were made. The contact substance used hitherto was heated to 550°, and a mixture of SO_2 and air passed over it for some hours. Only a small amount of SO_3 fumes issued from the tube. The SO_2 was then shut off, and the temperature gradually raised, dry air being passed through till no more white fumes came over. The temperature at which the fumes were densest was slightly below 620°, but distinctly above 600°. Two experiments performed thus gave the following percentages of SO_2 changed to SO_3: (1) 44·9; (2) 57·3. This last is the highest degree of change obtained by us with this contact substance, and indicates that under 600° ferrisulphate is chiefly formed, but that slightly over that temperature this is decomposed to Fe_2O_3 and SO_3, less of this SO_3 being decomposed to SO_2 and O than at 620°. It is hardly necessary to say that the conditions obtaining on the industrial scale may make it necessary to employ a temperature differing to some extent from the most desirable temperature in the laboratory. This may or may not be so, but in any case the difference so caused could scarcely be a large one.

E. *Influence of Impurities other than Moisture.*—On the large scale the source of oxide of iron for SO_3 manufacture is quite sure to be always pyrites cinders. This substance is mostly not even approximately pure oxide of iron, containing, as it does, other metallic oxides. (Aguas Teñidas pyrites cinders come nearest to purity.) Apart from this, in the course of the process, flue dust must accumulate in the contact substance. This flue dust consists chiefly of oxide of iron, but also contains arsenic, which is known to be, in the case of platinised asbestos contact substances, one of the worst "catalysis poisons." It was necessary, therefore, to study the effect of such impurities, of which only silica could be expected to have no effect on the reaction.

Series V.: Pyrites Cinders, consisting of, as nearly as possible, pure Oxide of Iron.—The contact substance employed in this series was cinders from Aguas Teñidas pyrites. It was obtained from a chemical works, and had been exposed for some time to the air, which always causes a certain amount of moisture to be absorbed either mechanically or by incipient formation of hydrate.

The results obtained with these cinders showed clearly that pyrites cinders that have been exposed to the air form a very bad catalytic agent, but that by prolonged use they attain the same maximum of contact action as was reached by the pure ferric oxide in the previous series. It can hardly be supposed that by long continued heating a partial increase in the density of the oxide can have increased its catalytic action; the probabilities all point to the opposite change having taken place. However, the improvement in the catalytic effect can be attributed to one of the two following factors:—Either the oxide of iron stubbornly retains a little hydrate water, which acts as a contact poison, and the improvement consists in the gradual driving out of this water; or, the surface of the oxide might be gradually rendered more and more porous and reactive by the continually repeated formation and decomposition of ferric sulphate. In order to test this the experiments of Series VI. were made.

Series VI.—Pea-sized lumps of Aguas Teñidas pyrites cinders were slowly heated with concentrated sulphuric acid till the excess of sulphuric acid was driven off, and the oxide was covered with a layer of sulphate, yellow when hot, and white when cold. The mass was then heated in the combustion tube for a long time in the usual stream of gas at a temperature of 650°. As the oxide was formed again the colour became brick red, quite different from the original cinders, but similar to the artificial Fe_2O_3 of the first series. The percentages of SO_2 changed with this contact substance were:—(1) 27·0; (2) 25·1; (3) 28·4; (4) 26·1; (5) 24·2. The method used had therefore an entirely unfavourable result. By using an oxide obtained by long heating of ferrous sulphate we obtained also a maximum change of 28 per cent.

At present, therefore, the only explanation we can give of the great difference between the reactive power of fresh oxide, or of such that has been exposed to the air and has taken up moisture, and of oxide which has been heated for a long time, is that in the former case the moisture takes a very long time to drive out, and that in the meantime it acts as a "contact poison."

F. *Influence of Arsenic.*—Arsenic occurs in practically all pyrites, although in some it is only present in traces. The cinders sometimes contain this body, and on their being used as contact substance arsenic trioxide from the burning pyrites is bound to be collected in them, so that the proportion of arsenic will continually rise. Patent No. 17,266 (1898), of the Verein Chemischer Fabriken, in Mannheim, mentions that all the arsenic coming out of the pyrites burners is taken up by the first layers of the contact mass, and can therefore exercise no further influence on the process. We are, however, able to show that the presence of arsenic trioxide in the oxide of iron not only has no ill effect on the contact action but that it directly benefits it.

Series VII.—The method of fixation of the arsenic must first be mentioned. That it is not already fixed in the pyrites furnace is not surprising. In the upper layers where the arsenical pyrites burns there is only a little oxide of iron and the stream of gases takes the arsenic trioxide away too quickly to allow of absorption; the oxide of iron in the lower parts of the furnace does not come into contact with it, besides which, as shown below, the temperature is too low there to cause the fixation.

(1) The Aguas Teñidas pyrites cinders employed in series V. and VI. were put into a combustion tube in the front part of which was introduced 1 gr. As_2O_3, which was heated in a slow stream of gas, the cinders being kept at 450°. The absorption was not good, the fumes of arsenic spreading through the whole tube, and condensing partly in the cool part at the other end.

(2) In the same tube a second 1 gr. was sublimed in a stream of gas, but this time at a temperature of 700°. Complete absorption took place, most of the arsenic being already absorbed in the front part of the oxide.

The analysis of the oxide so treated showed in the first 5 cm. 3·48 per cent. As, and in the last 5 cm. 0·51 per cent. As, which latter had obviously been deposited there in experiment 1.

The oxide of iron thus charged with arsenic was now heated at 620° in a stream of air containing SO_2, after which the following experiments were made, with an interval of four hours' treatment with the gaseous mixture between each two experiments. (3) 44·1, (4), 52·7 per cent. of SO_2 changed to SO_3. Dry air was now passed through without SO_2 and the products collected as usual till no more fumes came off. (5) 63·5, (6) 59·4, (7) 57·2 per cent. of SO_2 changed to SO_3.

0·5 gr. of As_2O_3 was again sublimed in, and experiments continued at four-hour intervals at 620°:—(8) 39·1, (9) 51·4, (10) 48·1, (11) 56·5, (12) 60·7, (13) 62·1 per cent. of SO_2 changed to SO_3.

Entirely contrary to our expectations, therefore, the maximum of 45—47 per cent. previously reached under the same conditions, was very much exceeded after the fixation of the arsenic. This result was immediately checked by another series of experiments.

Series VIII.—Fresh Aguas Teñidas pyrites were put into a new tube and the stream passed through at 620° Experiments every four hours showed:—(1) 22·0, (2) 27·4 (3) 38·2, (4) 42·1, (5) 46·4, (6) 46·4 per cent. of SO_2 changed to SO_3.

Up to this point a complete corroboration of Series V. was given, *viz.*, gradual increase of the effect up to a maximum of 46·4 per cent. changed.

1·5 gr. of As_2O_3 were now sublimed into this tube at about 690°, during which operation no appreciable amount of As_2O_3 came through the tube. Experiments were then continued as before with the following results:—(1) 37·0, (2) 26·8, (3) 41·3, (4) 46·1, (5) 42·1, (6) 43·8, (7) 45·4, per cent. of SO_2 changed to SO_3.

These results are somewhat irregular, but never rise above he maximum obtained with oxide of iron free from arsenic. This apparently contradicts Series VII.

The explanation of this contradiction is given by the analysis of the contact mass. The first 5 cm. contained 3·43 per cent. of As; 5 cm. taken from the middle only, 0·39 per cent.; and the last 5 cm., none at all. The arsenic had therefore been completely absorbed in the first layers of oxide, which fact agrees with Series VII., 1 and 2, but the layer of this improved contact substance was too short to affect the maximum change at the speed employed

Series IX.—It was thus shown to be necessary to spread the arsenic more uniformly through the tube. This was attempted in different ways, and a series of experiments were made with an oxide showing, on subsequent analysis, 0·14 per cent. of As. This series gave a maximum of 49 per cent. change.

Series X.—The desired result was obtained as follows:—The mixture of As_2O_3 and pyrites cinders was heated in a sealed tube in a bomb furnace for 30 minutes at 550—600°, a previous experiment having shown that a temperature of 450°—500° was not high enough. Even then a large amount of As_2O_3 mixed with As_2S_3 could be seen to be uncombined. The whole was heated up to 650 in the combustion furnace in a stream of air till no more fumes of As_2O_3 came over, and then samples were taken from different parts of the tube and analysed. They showed percentages of arsenic varying from 2·69—2·73, and therefore it might be assumed that the arsenic was distributed with almost complete regularity throughout the tube.

The results obtained as before with this contact substance were as follows:—(1) 17·9, (2) 28·1, (3) 40·4, (4) 62·9 per cent. of SO_2 changed to SO_3.

After this experiment the tube was accidentally broken, and the oxide had to be put into a fresh one. This short exposure to the air caused a sudden drop in the catalytic action of the tube, which could only be counteracted by prolonged treatment with the dry gas mixture: (5) 21·3, (6) 38·7, (7) 42·6, (8) 48·2, (9) 52·6, (10) 56·8, (11) 59·7, (12) 67·9, (13) 62·8, (14) 61·8, (15) 75·8, (16) 68·8, (17) 74·4, (18) 74·9 per cent. of SO_2 changed to SO_3.

This gave, therefore, the final proof in support of Series VII., that under otherwise exactly similar conditions the catalytic action of the oxide of iron is very considerably increased by charging with arsenic. A conversion of 75 per cent. of SO_2 was brought about instead of one of 47 per cent.—an increase in the proportion of 163 : 100.

Experiments with an oxide charged with 30 per cent. of arsenic gave no better results, so that we can for the present assume that $2\frac{3}{4}$ per cent. of As is a sufficient amount.

The explanation of this behaviour is probably that the arsenate of iron acts as an oxygen carrier by giving up oxygen to SO_2, the arsenite so formed being immediately reoxidised to arsenate.

Series XI.—This series of experiments, which confirmed Series X., was made with an oxide used in Series VI., charged with As_2O_3 by subliming it in from both ends alternately with different speeds of gas. This method also gave a uniformly-charged oxide, the percentages of arsenic in different parts of the tube varying from 4·54 to 5·26.

G. *Influence of Copper Oxide.*—Copper oxide, which is mentioned in the patents of the Mannheim Company, as well as in several earlier patents, as a catalytic agent, occurs in many of the pyrites used in SO_2 production. The cinders from cuprous pyrites, therefore, come into consideration as a contact substance. The following experiments were made with Rio Tinto pyrites cinders, showing on analysis 3·1 per cent. of Cu.

Series XII.—Experiments carried out as before gave: (1) 18·1, (2) 24·2, (3) 32·9, (4) 46·4, (5) 52·4, (6) 53·2, (7) 43·0 per cent. of SO_2 changed to SO_3. This fall was caused by a drop of water accidentally finding its way into the mixing bottle. (8) 47·8, (9) 60·9, (10) 67·8. This high result must also be attributed to accidental circumstances, as the rate of change immediately became lower again. (11) 62·5, (12) 61·7, (13) 61·5.

Series XIII.—Sufficient As_2O_3 was now sublimed into this tube at about 700° to give it a charge of about 5 per cent., and the experiments were continued:—(1) 55·5, (2) 48·4, (3) 53·1, (4) 63·1, (5) 65·8, (6) 67·4, (7) 66·7 per cent. of SO_2 changed to SO_3.

Here also the arsenic also exercises a beneficial influence which, however, is not so strong as in pyrites free from copper. The experiments on this point, as well as on others, are being continued in this laboratory.

Conclusions.—(1) The degree of change of $SO_2 + O$ to SO_3 is not sensibly affected by changes in dilution from 2—12 per cent. of SO_2 by volume. A still greater dilution would probably act equally well (*vide* the above-mentioned theoretical observations by Sackur). Above 12 per cent. the percentage change is not only lowered, apparently because of the too small excess of oxygen, but also the contact action of the oxide is made worse for more dilute mixtures.

(2) The mixture of gases to be changed to SO_3 must be as dry as can be obtained by a thorough treatment with sulphuric acid. The neglect of this precaution not only causes the contact action to be at once much lessened, but, in addition to this, the contact mass has to be treated for a long time with the dry mixture before it recovers from the "poisoning" action of the moisture.

(3) Exactly the same results are obtained as by treating with moist gases when oxide of iron (pure or containing copper) which has been exposed to the air, and has therefore absorbed some moisture, is used. Only after long treatment with the gases at red heat (lasting 30 hours or more) does the oxide of iron reach its maximum contact action, which, however, immediately sinks again if the oxide after cooling is even for a short time exposed to the air.

(4) An improvement of the contact action by methods of treatment having for their object the loosening of the surface of the oxide of iron, was not achieved. Oxides obtained by heating ferri- or ferrosulphate gave a much lower contact action than that obtained with an oxide, prepared by igniting precipitated hydroxide, or in the form of pyrites cinders. Doubtless the physical formation of the oxide has a large influence on its catalytic action, but we have not so far succeeded in clearing up this point.

(5) An addition of copper oxide to the iron oxide (using the cinders from pyrites containing copper) is favourable to the formation of SO_3.

(6) Arsenious acid is completely taken up and retained by oxide of iron at a high temperature. (The best temperature seems to be not less than about 700° C.) The oxide of iron can be thus charged with arsenic up to considerable quantities. An oxide thus charged, if it contains $2\frac{3}{4}$ per cent. of arsenic (reckoned as As), shows a very considerably increased contact action (over 60 per cent.) in comparison with the pure oxide.

(7) Oxide of iron containing copper also shows a distinct increase of contact action on being charged with arsenic.

(8) The best temperature for the catalytic action of ferric oxide in the formation of SO_3 lies between 600°—620° C. Below 600° the action is very small; above 620° the catalytic action falls quickly to a certain point and remains constant till 750°, when it again begins to fall The fall on raising the temperature must be attributed to the fact that the system $SO_2 + O \rightleftarrows SO_3$ tends to alter its condition of equilibrium, in the direction from right to left, on raising the temperature. The fact that there is no appreciable change between the temperatures of 635 and 750° can perhaps be best explained by assuming that two kinds of intermediate reactions come into play, *viz.*, first, the formation and decomposition of ferrisulphate; and, secondly, the alternating reduction of Fe_2O_3 and oxidation of the Fe_3O_4 so formed, and that these reactions have different temperature optima.

Obituary.

HENRY EDWARD SCHUNCK, Ph.D., D.Sc., F.R.S.

Original Member of the Society of Chemical Industry; Chairman of the Manchester Section of the Society of Chemical Industry (1888–89); President of the Society of Chemical Industry (1896–97); and Medallist of the Society in 1900.

Henry Edward Schunck was born in 1820, in Manchester. His father, Mr. Martin Schunck, was one of the foremost Manchester merchants of his day. On leaving school, Edward Schunck was sent to Germany for instruction in chemistry, as it was intended that he should undertake the management of his father's calico-printing works, near Rochdale. He studied first at Berlin, under Rose and Magnus, and then at Giessen, under Liebig, where he took his degree of Ph.D. After a few years' experience of an industrial career, Dr. Schunck decided to devote himself entirely to research work. Nevertheless, there can be no doubt that the influences of his early life determined the bent of his scientific investigations, which was almost entirely in the direction of the chemistry of dyestuffs and colouring matters. Dr. Schunck's first research, "On the Action of Nitric Acid on Aloes," was carried out in Germany, and resulted in the discovery of a new and remarkable nitro acid, *viz.*, chrysammic acid (tetranitrochrysazin). By the action of reducing agents on this acid, a substance is obtained resembling Indigo blue, and known as hydrochrysamide (tetra-aminochrysazin).

During the first year of the existence of the Chemical Society (1841), he read a paper before it. This paper is typical of much of the work he subsequently accomplished. "Our knowledge," it begins, concerning the department of "organic chemistry which embraces the colouring matters, is of the most imperfect kind." Into this field, at that time but little explored, Schunck penetrated, and his explorations were made with a perseverance and an experimental skill which rapidly won for him a foremost place among chemists. It was in Liebig's laboratory that Schunck made investigations on the colouring matters contained in lichens of the *Lecanora* and *Variolaria* families, from which archil and cudbear were prepared, and lecanorin was isolated; he also discovered orsellic or lecanoric acid. In 1846, he published his earliest work on the colouring matter of madder, a subject on which he worked for many years, and he was the first to isolate pure alizarin from the madder root. In 1848, he proved that the colouring matter of madder does not exist in the fresh madder root, but is only formed by a subsequent decomposition of certain glucosides. In 1867, partly in conjunction with Roemer, Schunck discovered, in commercial artificial alizarin, three new isomerides, *viz.*, anthraflavic and iso-anthraflavic acid, and anthrarufin, none of which have dyeing properties; and in 1874 he read a paper on "Methyl- and Ethyl-alizarin." He cultivated the plant for several years, and finally demonstrated that the colouring principle only appears at maturity, and that indican is in every case the parent substance of indigotin. He showed that this indican, under the influence of acids or a ferment in the plant, is susceptible of yielding Indigo blue and glucose. (See also page 89.) If the action of acids were prolonged, Indigo purple was obtained, and was termed by Schunck, Indirubin. His researches showed that under the influence of the ferment, indican is first converted into glucose and indigo white. In 1854, Schunck read a paper "On the Action of the Ferment of Madder on Sugar," and he discovered that by the action of this ferment succinic acid is formed.

One of his most interesting researches was communicated to the Chemical Society in 1879, "On the Purple of the Ancients." This colour in ancient times was extracted from various kinds of sea shell-fish, and applied to the dyeing of linen and woollen fabrics.

Dr. Schunck also studied the constitution of chlorophyll, explaining its function in the assimilation of carbon by the plant by the ingenious suggestion that it might act as a carrier of carbon dioxide just as hæmoglobin serves to convey oxygen in the animal economy. In the chemistry of dyeing and printing, Dr. Schunck ranked as one of the highest living authorities.

He was a governor of the Owens College, and took a deep interest in the welfare of its Chemical School, to which he made an important benefaction.

Dr. Schunck collected a large and valuable library at his house at Kersal, where he also built a fine laboratory. He was elected a Fellow of the Chemical Society in 1841, and Fellow of the Royal Society in 1850, and in 1887 was made President of the Chemical Section of the British Association (Manchester). In 1896–97 he was President of the Society of Chemical Industry. The Literary and Philosophical Society of Manchester awarded Dr. Schunck its Dalton Medal in 1898, and in 1899 the Davy Gold Medal was awarded him by the Royal Society, whilst in the same year the Victoria University conferred on him the honorary degree of D.Sc. In 1900, Prof. Chandler, for the Society of Chemical Industry as its President, presented him with the medal awarded for conspicuous services in applied chemistry.

Dr. Schunck, whilst first of all a man of science, had wide sympathies in both literature and art. He was of a singularly retiring and modest disposition, yet his uniform courtesy and his kindly counsel ever at the service of those who sought it, endeared him to a wide circle of the younger chemists.

There was much pathos in his words of acknowledgment of the Medal of the Society of Chemical Industry in July 1900, for they were also words of farewell:—

"Dr. Johnson said on one occasion that it induces a feeling of sadness if you know that you are doing a thing for the last time. This feeling of sadness comes over me now, for it is very improbable that I shall ever be with you again on an occasion like this. If it is to be, all well and good; if not, I wish the Society an affectionate farewell."

Dr. Schunck died on Tuesday, January the 13th.

GUSTAV BISCHOF, Ph.D.

Formerly Professor of Applied Chemistry in Anderson's College, Glasgow; Member of the Society of Chemical Industry.

Gustav Bischof was born at Bonn in 1834, and was the son of the eminent geologist, Geheimrath Gustav Bischof. After leaving Berlin University, he went to assist his father in his geological researches and literary work. In 1871, he accepted the chair of Applied Chemistry at Anderson's College, Glasgow, and, on coming to London in 1875, he commenced practice as an analytical and consulting chemist, principally in connection with water, and he was the inventor of the spongy iron filter. His later years have been entirely devoted to the invention and development of a new process for the manufacture of white lead. He died on Tuesday, January 13th.

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I.—PLANT, APPARATUS, AND MACHINERY.

Boilers; Injuries to ——, through Overheating. Stromeyer. Mitt. a. d. Prax. d. Dampfkessel- u. Dampfmasch.-Betr., **25**, 430; through Zeits. angew. Chem., 1903, **16**, [1], 15.

The paper is chiefly concerned with the injurious effects of oil contained in the water. This is often the cause (through coking and subsequent overheating) of the blistering and ripping of plates and water-tubes, as well as of the leakage of rivets and fire-tubes. The effects are more marked on clean plates than on those which have a coating of scale; and the danger of damage arising from this cause is greater when the boiler is worked harder and when forced draught is used. Blisters and other damages from oil usually form gradually and very slowly; usually a number of fire-tubes will give way almost simultaneously from this cause—rarely a single one.—J. T. D.

English Patents.

Gases with Liquids; Apparatus for the Treatment of ——. R. Robertson and W. Rintoul, Waltham Abbey, Essex. Eng Pat. 25,993, Dec. 19, 1901.

The chamber or tower of the apparatus is provided with a large number of parallel strands of wool, cotton, asbestos, or other suitable material, on which the liquid is carried, the strands being hung vertically, interlaced or zigzagged with other strands, &c., so that they present a large contact surface, while offering comparatively small resistance to the flow of the gas. In one arrangement, the strands are wound on removable frames. Suitable feed troughs are provided for supplying the liquid to the strands.—R. A.

Filtering or Separating Liquids from Solids [Gold-Ore Slimes, &c.]; Apparatus for Use in ——. C. W. Thompson, London. Eng. Pat. 1562, Jan. 20, 1902.

See U.S. Pat. 713,717 of 1902; this Journal, 1902, 1524.
—R. A.

Vaporisation at High Temperatures; Process and Apparatus for ——. V. Taboulevitch, St. Petersburg. Eng. Pat. 7278, March 25, 1902.

A previously heated mixture of water with a small quantity (0·5 to 2 per cent.) of oil is sprayed into the interior of a boiler having very thick walls, and heated to a temperature of 300° to 400° C. The heated mixture of water and oil is fed into the generator by way of a siphon-tube. The siphon-tube is provided with a branch-pipe so adapted as to prevent the accumulation of water at the bottom of the boiler. Such water is forced by the steam pressure into a pipe which feeds the engine after having described several turns in the fire-box round the boiler. Thus, as water accumulates it is immediately driven by the steam pressure through the pipe in the fire-box and round the boiler, and returned as steam. Another branch of this siphon-tube is utilised as an index of the existence of any accumulated water in the boiler.
—J. F. B.

United States Patents.

Filter. J. Kostalek, Prague, Assignor to Soc. Maschinenbau Act.-Ges., vormals Breitfeld, Danek und Co., Bohemia, Austria-Hungary. U.S. Pat. 715,275, Dec. 9, 1902.

A series of horizontal tubes, having openings along their length, are arranged centrally in the filtering reservoir in one of a number of compartments formed by parallel sieves, the filtering medium being packed around the tubes and filling the compartments of the reservoir. The liquid is forced through the tubes and the filtering medium from a fluid chamber opening into the ends of the tubes. The outlets lead from free spaces, which are cut off from the filtering medium by vertical sieves. A plugged sewer-tube at the bottom of the reservoir enables the filtering material to be withdrawn. (See also Eng. Pats. 7693 and 9331 of 1902; this Journal, 1902, 982 and 1146.)—R. A.

Gas; Process of Purifying ——. E. Zahm and J. A. Just, Syracuse, N.Y. U.S. Pat. 716,803, Dec. 23, 1902.

The gas to be purified is forced, under pressure, through a hollow core of porous material submerged in an antiseptic or purifying liquid, whereby it is brought into intimate contact with this liquid.—A. S.

French Patent.

Distillation Apparatus, &c. F. Calmant. Fr. Pat. 320,197, April 4, 1902.

See Eng. Pat. 20,356 of 1902; this Journal, 1902, 1523.
—F. S. S.

II.—FUEL, GAS, AND LIGHT.

Coal; Gases enclosed in ——. Broockmann. Glückauf, 1899, **35**, 269—274. Trans. N. Engl. Inst. of Mining and Mech. Eng., 1902, **52**, [1], 16—24.

The author throws doubt on the accuracy of the results obtained by Bedson and McConnell in the examination of gases enclosed in coal (see this Journal, 1892, 882; 1894, 25), and states that, inasmuch as india-rubber stoppers were used, which, at reduced pressures, are extremely permeable to gases, the authors named, collected and investigated, not the pure gases enclosed in coals, but atmospheric air from which the heated coal had absorbed a greater or lesser quantity of oxygen, and which was more or less contaminated with the occluded gases and the products of the heating of coal. He points out also that when coal is heated in the presence of air, which corresponds to the actual conditions in coal mines, quite different products are obtained from those when the coal is heated in a vacuum.

The main factor in a coal-dust explosion is the fine state of division of the dust; the second condition is the heating of the dust; whilst the chemical properties of the coal are stated only to occupy the third place. All coals can produce dust explosions, even coke which is perfectly free from enclosed gas. Some coals give off gas at lower, others at higher temperatures; some are dry, others moist; some produce a very finely-divided, others a coarse-grained dust, &c. With the former conditions, coal-dust explosions are produced by a lighter charge of explosive than with the latter conditions.
—A. S.

Coal and Coal Dust; Gases enclosed in ——. P. P. Bedson. Trans. N. Engl. Inst. of Mining and Mech. Eng., 1902, **52**, [1], 25—38.

The author replies to the criticisms of Broockmann (see preceding abstract), and states that in the experiments specially referred to by the latter, the coal was contained in flasks sealed on to an air-pump of the Geissler type; and that although india-rubber stoppers were used in other experiments, these stoppers were first rendered practically impermeable (as shown by direct tests) by coating them with Faraday cement. He then discusses the results previously obtained by McConnell and himself (see this Journal, 1892, 882; 1894, 25), giving explanations of some of the differences observed, and finally he describes a further series of experiments made with a view of confirming the conclusion arrived at previously, and corroborated by the Austrian Fire-damp Commission, *viz.*, "that the content of dense, easily inflammable hydrocarbon gases increases both the sensitiveness and the dangerous character of a coal dust."

Previous experience has shown the combustible constituents of the gas evolved to be almost entirely members of the methane series, and as carbon monoxide and olefines have been proved to be absent, or present only in minimum quantities, these gases have been disregarded. The results of analyses of the gases have been interpreted in terms of a possible mixture of marsh gas and ethane, or ethane and propane, according as the analytical data appeared to warrant, but this form of statement is only intended to indicate that the combustible gases are not pure marsh gas, but that other gaseous members of the series are present.

In certain cases the gas was found to contain an amount of oxygen, in relation to the nitrogen, in excess of that present in air. This can be explained, however, by the fact that the coal used, was taken from a sample which had been kept in an open tube in the laboratory for several months, and under these conditions it was proved by direct experiment that the coal would not only lose gas, but would absorb gases from the air—and preferentially oxygen rather than nitrogen. With regard to the application of the existence of hydrocarbon gases enclosed in coal-dust to explain the part played by the latter in an explosion, the author states that it has never been maintained that the presence of these gases is the only factor determining the sensibility to ignition of the dust, nor as pre-eminently more important in this respect than the fineness of subdivision or the dryness of the dust; but practical experience, at the colliery, of the ready inflammability of the dust of the Hutton-seam coal, together with the results of the examination of the enclosed gases of other coal-dusts, justify the conclusion previously advanced and given in the earlier part of the abstract. (See also this Journal, 1890, 183; 1899, 568; and 1901, 789.)—A. S.

English Patents.

Fuel, Artificial; Manufacture of ——. A. J. Boult, London. From W. A. Koneman, Chicago. Eng. Pat. 20,670, Sept. 22, 1902.

See U.S. Pat. 711,166 of 1902; this Journal, 1902, 1323.
—H. B.

Furnaces; Improvements in Effecting the Combustion of Carbonaceous Fuel in ——. J. Y. Johnson, London. From W. C. Hullett, Philadelphia. Eng. Pat. 18,171, Aug. 18, 1902.

The combustion gases are caused to pass from an incandescent portion of the fuel through a non-incandescent portion, and then over the green fuel to heat its surface. This is effected by providing an air blast, which is introduced at the back of the furnace, and directs the blast downwards through the fuel. The gas produced, enters the ash-pit, where it mingles with fresh air, and the mixture rises up through the fuel at the front of the furnace, and enters the combustion chamber above the fuel, igniting the surface of the fresh green fuel at the back of the furnace. The air blast is preferably preheated.—R. S.

Blast-Furnace Gases; Method of and Apparatus for Purifying and Enriching ——. G. J. Snelus, Frizington, Cumberland. Eng. Pat. 25,604, Dec. 14, 1901.

A method of removing dust from blast-furnace gases and increasing the proportion of combustible gases. A small blast-furnace is charged with fuel and a flux, such as ground brick, soda ash, or the like, capable of forming a highly-fusible slag with the dust in the gas to be purified. Air is forced in through tuyères, as usual, and above these tuyères, through larger tuyères, the blast-furnace gas is forced in, the dust which it contains being caught by the slag, and the carbon dioxide being converted into carbon monoxide. At a higher level, steam is injected for the production of carbon monoxide and hydrogen.—H. B.

Gas-cleaning Machines, and Apparatus for Purifying Gas obtained from Gas Producers and the like. J. S. and F. L. Daniels, Stroud, Gloucestershire. Eng. Pat. 4918, Feb. 26, 1902.

A pair of fan-shaped agitators, mounted on a common spindle, revolve within a casing, which is divided into two portions, one for each fan, by a central partition, circumferentially-arranged openings being made in the latter for the gas to pass from the first portion to the second. Each half of the casing is provided with pockets, &c. for the collection of dust and condensible matter. It is claimed that as the gas is freed by the centrifugal action of the fan in the first compartment from the bulk of the foreign matter, it can be still further purified in the second compartment because it has comparatively little opportunity to take up the impurities again.—F. H. L.

Smoke and Gas charged with Dust and the like; Apparatus for Purifying ——. F. F. C. M. Backeljau, Antwerp. Eng. Pat. 21,586, Oct. 3, 1902.

A drum, in the shape of an inverted truncated cone, is mounted on the lower part of a vertical hollow shaft, which has vertical apertures, between which curved or straight blades are arranged radially. The drum is open at the bottom, and is closed at the top by a cover, so as to leave a narrow, circumferential, annular aperture for the escape of gases and liquid. The drum rotates in an outer casing, which is filled to a suitable height with water or other desired liquid. When the drum revolves, the gases to be purified are sucked down the hollow shaft into it, and, owing to its centrifugal force and form, the liquid and gases are forced upwards together through the annular opening of the drum, the liquid then falling into the outer casing and the washed gases passing away by a convenient outlet.
—H. B.

Generator-Gas; Production of ——, and Provision of Hot Air therefor. J. E. Dowson, London. Eng. Pat. 1990, Jan. 24, 1902.

When a fuel-gas generator is used to feed a gas-engine, the combustion products of the latter are employed to heat the air which is supplied to the producer. After being heated in this fashion, the air may be raised to a still higher temperature by being brought into contact with the generator-gas itself. The air-heater described in Eng. Pat. 23,134 of 1901 may be adopted.—F. H. L.

Gas suitable for Heating and Illuminating Purposes; Means or Apparatus for the Manufacture of ——. C. B. Tully, Sligo, and V. B Lewes, Greenwich. Eng. Pat. 26,461, Dec. 27, 1901.

The object is to utilise tar and the like in making gas, the tar being decomposed into (1) gas, which mixes with water-gas simultaneously produced, and (2) carbon, which is either collected as lampblack or burned in the generator. To do this, the incandescent fuel is maintained at a constant height in the generator, steam is injected through the same openings as the air blast (whereby also the clinker is broken up and firebars are rendered unnecessary), and gas outlets are provided both from the middle and from the top of the generator, these outlets being connected by an external vertical tube, so that gases can be withdrawn from either part of the generator. The heavy hydrocarbons are injected into the generator at points above the air- and steam-inlets, and just beneath a contracted portion of the generator. (See also this Journal, 1902, 1178.)—R. S.

Gas and Combustible Vapours; Obtaining ——, and Apparatus [a Lamp] for their Practical Use. J. Imbert and A. Morel, Paris. Eng. Pat. 13,104, June 9, 1902.

The general feature of the invention is the use of a conduit for the combustible material, composed of incombustible and non-heat-conducting substance, so that the heat of combustion may be concentrated on a small prepared portion of such substance, to obtain a maximum intensity of "heat or light." The apparatus consists "of a porcelain tube in which embrasures are formed at its upper end, into which is fitted a metallic piece which fills up the embrasure spaces, and is pierced axially by a hole of very small diameter; this opens beneath a metallic cup which rests on the extremities of the porcelain tube, and in this hole the vaporisation of the combustible liquid takes place, the porcelain tube being provided at its lower end with a flange secured to a tube, which serves as a passage for the combustible liquid, and this supply tube is furnished with a junction to which is fitted an india-rubber pipe through which the liquid to be vaporised is conducted; a shallow metal cup is fastened to the porcelain tube for the purpose of holding several drops of spirits for lighting purposes; a chimney fitted in the shallow cup draws the air for combustion along the sides of the tube to the flame."—E. S.

Acetylene and other Gases; Generators for the Manufacture of ——. [Carbide Holders.] S. G. Watson, Birmingham. Eng. Pat. 1742, Jan. 22, 1902.

Relates to carbide-holders for acetylene generators of the contact pattern. Each receptacle is made in the usual form of a circular sieve, with its circumference projecting downwards a short distance below the grid, where it is provided with a number of holes, beneath which is a solid bottom. To this bottom is riveted an inverted dish, larger in diameter than the receptacle, and of such depth as to reach the level of the similar holes in the next lower receptacle when several such are superposed in the decomposing chamber, this dish acting as a gas-tight, water-sealed lid to the basket beneath. By this arrangement, the water entering at the base of the decomposing vessel, passes through the holes in the lowest basket first, and attacks the carbide, whilst the gas is forced to return in an opposite direction, and to bubble through the water before it can enter the annular space left in the generator. The containers are also made as large as possible in comparison with the size of the decomposing chamber, in order that air space may be reduced to a minimum.—F. H. L.

Acetylene Gas Generators. L. Montel, New York. Eng. Pat. 15,730, July 15, 1902.

See U.S. Pat. 705,272; this Journal, 1902, 1069.—F. H. L.

Acetylene Gas; Generators for ——. F. Schmitt, Mannheim. Eng. Pat. 16,388, July 23, 1902.

A water-holding chamber is divided into two parts by a horizontal partition having a circular central opening, through which a generating chamber passes into the lower part. The generating chamber is open at the bottom, and contains a cylindrical receptacle for the carbide. The receptacle is divided by vertical walls into compartments, from the bottom of which vertical pipes rise, to permit the water to ascend and overflow upon the carbide. The pipes are of different lengths, so that the compartments become exhausted in succession, the pressure of gas within the apparatus controlling the admission of the water. From the purifying chamber, situated above the generating chamber, the gas passes by way of a water-sealed U-tube and a rubber bag to the gas main.—H. B.

Incandescent Lighting Purposes; Apparatus for Mixing [Compressed] Air and Gas for ——. G. Tresenreuter, Berlin. Eng. Pat. 18,310, Aug. 20, 1902.

A device to be inserted into the gas-pipe at any point—say just after the gas meter. The gas enters a globular shell or drum, centrally within which is fixed a pipe having slots at its lower portion. A pipe, terminating in a nozzle, admits compressed air at the lower portion of the central pipe, and the injector action draws in gas through the slots. The mixture of gas and air passes out into the gas pipe. An automatic valve within the drum prevents the air from passing back into the gas-supply pipe when the gaseous mixture is shut off.—H. B.

United States Patents.

Peat Fuel; Method of Manufacturing ——. R. A. Kellond, Assignor to C. C. Bartlett, Chicago, Ill. U.S. Pat. 715,271, Dec. 9, 1902.

Fuel blocks, cakes, or briquettes are made as follows:—Excess of water is removed from the peat, and the latter is reduced to a finely-divided state at a temperature of about 65° F. The material is then compresed to form hard, dense blocks, which are subsequently exposed to an intense heat so as to sear the block, or impart to it an outer coating or crust of the fixed carbon and tarry and oily constituents of the peat. (See also U.S. Pat. 713,110; this Journal, 1902, 1526.)—R. S.

Oil-Burners; Asphaltum Collector for ——. G. W. Arper, Oakland, Cal. U.S. Pat. 715,234, Dec. 9, 1902.

A removable oil-burner for heating purposes, adapted to burn crude or bituminous oil, is provided with a chamber, into which the residuum of the oil flows, and from which it may be collected.—R. S.

Carburetter. G. L. Harvey, Evanston, Ill., Assignor to the Acme Gas Co., Chicago, Ill. U.S. Pat. 716,227, Dec. 16, 1902.

Several series of closed carburetting vessels are provided, each vessel being connected to the hydrocarbon-supply tube, and placed in series with one another, the last having a return pipe to the first of the series. Each vessel has a drain pipe communicating with the return pipe, and also a series of pipes for discharging air or gas into the liquid, while the last carburetter of each series has also a gas-outlet pipe leading to a common main. A pump circulates the hydrocarbon. The air or gas is initially heated, and the hydrocarbon is heated during one part of its circulation.—R. S.

Gas-Producer. M. van B. Smith, Philadelphia, Pa., Assignor to American Stoker Co., New York. U.S. Pat. 715,310, Dec. 9, 1902.

The fuel is fed by an under-feed stoker to the lower part of the producer. On each side of the chamber there is a refuse-discharge leg for continuously discharging the ash into a water basin forming a liquid seal. On either side of the feeding device is a blast tuyère. Two gas outlets are provided at the top of the producer, leading to a gas main. —R. S.

Producer-Gas; Process of Generating ——. M. van B. Smith, New York, Assignor to American Stoker Co., New York. U.S. Pat. 715,311, Dec. 9, 1902.

This invention consists simply of the method of producing gas by employing the apparatus described in U.S. Pat. 715,310 (see previous abstract) or any equivalent apparatus. —R. S.

Gas from Peat; Method of Producing ——. L. L. Merrifield, Assignor to E. J. Cheekley and Economical Gas Apparatus Construction Co, Toronto, Canada. U.S. Pat. 716,455, Dec. 23, 1902.

See Eng. Pat. 12,959 of 1901; this Journal, 1902, 1021. Compare Eng. Pat. 12,958 of 1901; this Journal, 1902, 1020.—A. S.

Acetylene Gas Burner. S. P. Watt, Morgan Park, Ill., Assignor to Hine-Watt Manufacturing Co., Chicago. U.S. Pat. 716,153, Dec. 16, 1902.

An acetylene gas-burner of the usual injector type, made in two portions, the one screwing into the other.—F. H. L.

French Patents.

Arc-Lamp Electrodes [having Metallic Additions]. R. Hopfelt. Fr. Pat. 320,238, April 5, 1902.

To overcome the fluctuations in the luminous arc, which occur on using electrodes containing metallic oxides, &c., the patentee adds salts of chromium to the electrodes. —H. B.

Mantles or Filaments of Rare Earths; Manufacture of ——, *with a Metallic Skeleton, for Incandescence Gas or Electric Lighting.* R. Langhans. Fr. Pat. 320,620, April 23, 1902.

A combustible thread is impregnated with a salt of the platinum group of metals, which is capable of leaving the metal in the form of a filament when the thread is burned away. Round this thread is wound another, which has been impregnated with salts of the rare earths, and the composite thread is then given the desired shape. On burning out the combustible and volatile matters there are obtained filaments or mantles consisting of a metallic skeleton supporting a covering of rare earths. (See also Eng. Pat. 430 of 1901; this Journal, 1902, 123.)—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Lignite Tar; Occurrence of α-Picoline in ——. H. Frese. Zeits. angew. Chem., 1903, 16, [1], 11—12.

Pyridine is the only base of the series which has hitherto been separated from lignite tar in a pure state. By treating a very large quantity of tar, however, for extraction of these bases, distilling fractionally the bases obtained (14 kilos.), and forming the double chloride of mercury and base from the fraction distilling between 128° and 134° C., the author has separated pure α-picoline, recognised by its physical characters and by the analysis of its mercuric chloride and platinic chloride. The 14 kilos. of mixed bases contained only about 25 grms. of α-picoline.—J. T. D.

Catechol [Pyrocatechin] from Coal. E. Bornstein. Ber., 35, [20], 4324—4325.

On decomposing a number of Silesian and Westphalian coals at the lowest possible temperatures, a series of tar liquors were obtained, which gave an emerald-green coloration with ferric chloride. The substance giving this reaction was proved, by analysis and by its reactions, to consist of catechol, $C_6H_4(OH)_2$. Catechol has hitherto been regarded as a component or derivative of vegetable substances, either fresh or fossilised. As it has now been shown to occur even in such a highly-altered plant product as coal, the author suggests it should be regarded as characteristic of vegetable products, and that its presence, even in fossil remains, can serve as proof of their vegetable origin. —H. B.

English Patents.

Water-Gas Tar, Carburetted; Separation of Undesirable Matter from ——. P. Davies and The Hydroleum Co., Ltd., both of London. Eng. Pat. 484, Jan. 7, 1902.

For the removal of water, lampblack or carbon, fuel ash, and other matter in suspension, when the tar is required for liquid fuel, it is subjected, before undergoing any pumping operation, to a process of mechanical separation, such as allowing it to run over one or more sieves of suitable mesh disposed at a suitable inclination.—D. B.

Pitch Compounds or Substitutes; Manufacture of ——. G. Wilton, Beckton. Eng. Pat. 2292, Jan. 28, 1902.

The compound is prepared by mixing with tar which has been distilled or not, or with tar oils, such as creosote or anthracene oils, or with soft pitch, petroleum oils or residues, or oil-gas tar, a suitable quantity of coal dust, bituminous coal dust, or bitumen, and distilling the mixture, or heating or digesting the same to the required extent. —D. B.

United States Patent.

Mineral Oils, or the Distillates or Residuals thereof; Treating ——. J. S. Stewart-Wallace, Knock, Ireland, and W. B. Cowell, London. U.S. Pat. 716,132, Dec. 16, 1902.

See Eng. Pat. 10,629 of 1901; this Journal, 1902, 699. —C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Anthragallol; Formation of Alkyl Derivatives of ——. F. Bock. Monatsh. f. Chem., 1902, 23, [9], 1008—1021.

A dimethyl ester of anthragallol crystallising in orange needles, and melting at 159°—160° C., is obtained by the action of dimethyl sulphate upon anthragallol in the presence of sodium carbonate and nitrobenzene. Its acetyl derivative, melting at 167° C., and its sodium and lithium salts were prepared by the author. By partial hydrolysis of this ester with concentrated sulphuric acid at 100° C., a monomethyl ester of anthragallol is produced. This melts at 233° C., and yields a diacetyl derivative melting (not sharply) at 184° C. At higher temperatures the dimethyl ester is reconverted by sulphuric acid into anthragallol. On treating the sodium salt of the dimethyl ester with a large excess of dimethyl sulphate at 180° C., there results a lemon-yellow compound, which melts at 168° C., and must be regarded as the trimethyl ester of anthragallol.—C. A. M.

Diphenylamines; A Process for the Formation of ——. R. Vidal. Monit. Scient., 1902, 16, [732], 870.

The formation of diphenylamine by heating together aniline and aniline hydrochloride in a closed vessel can only be effected at a relatively high temperature, and only a limited yield is obtained. Substituted diphenylamines can, however, readily be prepared in this way; for example, dihydroxydiphenylamine from *p*-aminophenol and its hydrochloride, aminohydroxydiphenylamine from *p*-phenylenediamine and *p*-aminophenol hydrochloride, and diaminodiphenylamine from *p*-phenylenediamine and its hydrochloride. In the second case the *p*-phenylenediamine may be replaced by *p*-aminophenol and the *p*-aminophenol hydrochloride by *p*-phenylenediamine hydrochloride. The reaction is, in each case, effected by heating the mixture for four hours in a closed vessel on the oil-bath at 200° C. Reaction takes place much more readily and a better yield is obtained if an amount of water about 3—4 times that of the mixture of the two compounds be used. The yield is almost theoretical. The reaction product contains a small quantity of liquid, but consists mainly of a white crystalline mass, which blackens rapidly in the air; it is difficult to obtain a white final product even by drying *in vacuo*. Mono-substituted diphenylamines can be prepared by this method by heating the hydrochlorides of aromatic amines, hydroxyamines, or diamines with aromatic hydroxyamines, diamines, or amines. —A. S.

Aromatic Metadiamines; Condensation of ——, with Chloroform. A. Weinschenk. Chem.-Zeit., 1903, **27**, [2], 13.

An attempt was made to condense 2 molecules of an aromatic metadiamine with chloroform, and so obtain Acridine Yellow. Reaction, however, only takes place in this sense to a very limited extent. When the free diamine base was heated with excess of chloroform in an autoclave at 190°—200° C. for some hours, a dark fused mass was obtained, which was extracted with hot dilute hydrochloric acid. On adding sodium chloride a dark-coloured substance separated. In the dry state this possesses a green metallic lustre and is easily soluble in water. From its aqueous solution, alkalis or sodium carbonate precipitate a brown base. It dyes wool directly a brown shade which is fast to light, acids, and alkalis.—J. McC.

Sulphur Dyestuffs [Red-Brown and Purple]. C. L. Batillet. Rev. Gén. des Mat. Col., 1903, **7**, [1], 6—10.

In view of the fact that, when fused with sodium sulphide and sulphur, aromatic compounds of the most diverse groups yield dyestuff derivatives, and that these in dyeing give widely different colours, namely black, brown, yellow, green, and blue, it is remarkable that red dyestuffs of this class should not as yet have been discovered. Reddish dyestuffs have, indeed, been obtained from the following compounds: α naphthylamine-azo-α-hydroxynaphthoic acid, azoxybenzene, isonitroso-($\alpha_1\alpha_4$)-dihydroxynaphthalene-($\alpha_2\beta_2$)-disulphonic acid, trinitro-*p*-amino-diphenylamine, trinitro-*p*-hydroxydiphenylamine sulphonic acid, dinitro-*p*-hydroxyphenyltolylamine carboxylic acid, hydroxyaminophenazine, naphthazine, safranol, ethosafranol, and safraninone; but their formation furnishes no clue as to the class of compounds which should be selected for the manufacture of red dyestuffs. As *p*-nitraniline is known to give a black, whilst its acetyl derivative gives a brownish-yellow sulphur dyestuff, the influence of other substituting groups attached to the imino radicle on the colour of the dyestuffs produced, was investigated. It was found that the formyl and benzoyl derivatives of *p*-nitraniline yield a green and a yellow-green respectively; blacks are formed from both formyl- and benzoyl-*m*-nitraniline, as also from benzoyl-*p*-nitrodiphenylamine; a brown from acetyl-*m*-nitraniline and a yellowish-brown from acetyl-*o*-nitraniline. Although they do not offer any elucidation of the problem in question, these results show the influence of the acetamino group in the production of brown dyestuffs. To test this further, 1.4-diacetamino, 1.4-diacetamino-2-nitro, and 1.2.4-triacetaminobenzene were fused with sodium polysulphides. Browns of similar shade and intensity were obtained in all three cases. Similarly, Thionine gives a black, and its acetyl derivative a brown, but the acetyl derivative of Safranine yields a purple, while Safranine itself gives a black dyestuff.—E. B.

Dyestuffs; Some Natural ——. L. Marchlewski. Ber., 1902, **35**, [20], 4338—4344.

1. *Dyestuffs obtained by reacting with Isatin on Extracts of isatis tinctoria Plants.*—E. Schunck has shown that the natural product yielding indigo is a glucoside, which under certain conditions decomposes into sugar and indigo. The author also suggested, and his view has since been confirmed, that vegetable indican is a glucoside of indoxyl, which on air-oxidation yields indigotin. According to Beijerinck all indigo-yielding plants do not contain an indoxyl glucoside. *Isatis tinctoria* contains indoxyl in a free state, since by treating a hot aqueous extract of the fresh leaves of this plant with isatin, a reddish-brown precipitate is obtained, which is identical with indirubin, the red substance accompanying natural indigo. Schunck, however, pointed out that woad extract does not yield indigo on air-oxidation, which it ought to do if it contained free indoxyl. If, however, an alcoholic extract of the dried woad leaves, after distilling off the alcohol, be treated with isatin, a different product is obtained, which the author terms isatocyanin. It dissolves in glacial acetic acid with a blue colour which is fugitive, whilst indirubin gives a Magenta-coloured solution. The chemical nature of the isatocyanin has not been determined, but the substance appears to possess a certain relation to the product obtained by the action of isatin on pyrrol in presence of sulphuric acid, and to the product obtained by condensing isatin and piperidine with acetic anhydride.

2. *Mesoporphyrin and Phylloporphyrin.*—The close chemical relationship of the dyestuff of the blood and of chlorophyll is testified to by a number of observations, such as the empirical composition, the absorption spectra, and the behaviour to bromine and nitric acid. Moreover, a base, $C_8H_{13}N$, can be obtained from derivatives of both dyestuffs, and on oxidation both hæmatoporphyrin and phylloporphyrin yield the same acid, $C_8H_8O_5$, the anhydride of the tribasic hæmatinic acid. Further proof is afforded by comparing phylloporphyrin with mesoporphyrin. The latter differs from hæmatoporphyrin in containing less oxygen. As might be expected, these two substances exhibit still closer similarities, as an examination of their spectra in neutral and acid solution, and of their behaviour towards bromine, shows.

3. *Absorption of the Ultra-violet Rays by Bile Dyestuffs and Proteïnchrom.*—All the blood dyestuff and chlorophyll derivatives are distinguished by the property of possessing absorption bands in the extreme visible violet or the ultra-violet, and the relation of these to the bile dyestuffs by the conversion of hæmatoporphyrin and phyllocyanin through hæmopyrrol into urobilin having been established, it might have been expected that the bile dyestuffs would show similar absorption bands in the highly refrangible portion of the spectrum. Experiment, however, shows that the bile dyestuffs (bilirubin, urobilin) and proteïnchrom, which stands in close relationship to proteïnchromogen, the presumable parent substance of the blood dyestuff, behave quite differently from the latter and from chlorophyll. —T. A. L.

Diazo Compounds; The Rate of Decomposition of ——. Part II. Diazo Compounds of the Naphthalene Series. J. C. Cain and F. Nicoll. Proc. Chem. Soc., **18**, [258], 244—245.

The authors have extended their researches on the decomposition of diazo salts (Trans. Chem. Soc., 1902, **81**, 1412) to those of the naphthalene series, and find that the reaction is a unimolecular one in the case of the soluble diazo salts prepared from the following amines:—

1. α-Naphthylamine.
2. β-Naphthylamine.
3. Naphthylaminosulphonic acid, $NH_2:SO_3H = 1:3$.
4. „ „ „ $= 2:6$.
5. „ „ „ $= 2:7$.
6. „ disulphonic acid, $NH_2:SO_3H:SO_3H = 2:6:8$.
7. „ „ $NH_2:SO_3H:SO_3H = 2:3:6$.
8. Aminonaphtholdisulphonic acid, $NH_2:OH:SO_3H:SO_3H = 1:8:3:6$.

The unimolecular reaction, however, except in the case of Nos. 1, 2, 4, 5, 7, 8, is hindered, after a considerable amount of decomposition has taken place, by the formation of azo-dyestuffs, which is clearly shown by the rapid diminution of the values of C, calculated according to the equation $\frac{1}{t}\log\frac{A}{A-x} = C$ (a constant).

The measurements were made at 60° C., except in the case of No. 8, when the temperature was 80°. The diazo salts are thus very stable.

In the case of the insoluble diazo salts obtained from the following amines:—

9. Naphthylaminesulphonic acid, $NH_2:SO_3H = 1:2$.
10. „ „ „ $= 1:4$.
11. „ „ „ $= 1:5$.
12. Amidonaphtholsulphonic acid, $NH_2:OH:SO_3H = 2:8:6$.

the rate of decomposition is expressed by the equation $\frac{x}{t} = K$ (a constant), x being the observed volume of nitrogen evolved in the time t.

In each case, an azo dyestuff is formed towards the end of the reaction, shown again by the rapid diminution of the values of K.

These diazo salts are very stable, the experiments being made at 70° or 80° C.

In each case where an azo dyestuff is formed, the value of C or K is constant for a considerable period, showing that, although both naphtholsulphonic acid and diazo salt are present, no combination takes place during this period.

The authors suggest that this interesting fact may be explained by assuming that hydrolytic dissociation of the diazo salt is necessary before combination takes place; in the above experiments, the diazo salt is not dissociated (especially in the presence of the free mineral acid, which has a retarding effect on the formation of an azo dyestuff) until its concentration becomes considerably less. When this point is reached, the formation of an azo dyestuff can proceed.

Purpurogallin. A. G. Perkin and A. B. Steven. Proc. Chem. Soc., **18**, [258], 253—254.

The discovery of Nietzki and Steinmann (Ber., 1887, **20**, 1277), that purpurogallin, on distillation with zinc dust, yields naphthalene, has been confirmed. On methylation, purpurogallin gives a *trimethyl ether*, $C_{11}H_5O_2(OCH_3)_3$, orange-yellow needles, m. pt. 171°—177° C., which forms a *monoacetyl* derivative, $C_{11}H_4O_2(OCH_3)_3.C_2H_3O$, needles, m. pt. 140°—143°, and by the action of alcoholic potash at 170° yields a crystalline acid, m. pt. 197°—199°. The latter, on distillation, is converted into an anhydride, m. pt. 164°—166°. By digestion with 50 per cent. potassium hydroxide solution, purpurogallin is converted into two isomeric compounds possessing almost identical reactions, to which the names *purpurogallone* and iso-*purpurogallone* have been given.

Aniline Oil; Analysis of ——, by the Volumetric Bromination Method. W. Schaposchnikoff and B. Sachnovsky.

See under XXIII., *page* 114.

Nitroso Group; Determination of the ——. C. Clauser and G. Schweitzer.

See under XXIII., *page* 113.

English Patents.

Monobrom- and Dibromindigo, as well as Sulphonated Monobromindigo; Method of Preparing ——. A. Rahtjen, Hamburg. Eng. Pat. 21,040, Sept. 27, 1902.

In addition to the methods already described in Eng. Pat. 11,022 of 1901 (this Journal, 1901, 1205), the patentee now finds that mono- and dibromindigo, as well as sulphonated bromindigo, are obtainable by acting with bromine or hydrobromic acid on Indigo or sulphonated Indigo in presence of chlorine. The reaction may take place with or without the addition of a solvent or distributing medium. Sulphonated bromindigo, when heated with sulphuric acid and water, is converted into bromindigo.—T. A. L.

Indoxyl and its Derivatives; Improved Manufacture of ——. O. Imray. From The Basle Chemical Works, Basle. Eng. Pat. 18,127, Aug. 18, 1902.

An alkali salt of phenylglycin, its homologues or derivatives, is heated to 200° C., out of contact with the air, with caustic alkalis and sodium oxide. The melt, after cooling, is dissolved in water, and yields Indigo on oxidation by means of a current of air. (See also Fr. Pat. 319,670; this Journal, 1902, 1528.)—T. A. L.

Acridine Dyestuffs; Manufacture of ——. O. Imray. From The Society of Chem. Ind. in Basle. Eng. Pat. 15,659, July 14, 1902.

See supplements to Fr. Pat. 241,916; this Journal, 1902, 1528 and 1529.—T. A. L.

p-Amidotolyl-p-Oxyphenylamine [Sulphide Dyestuffs], and Dyestuffs therefrom; Manufacture of ——. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Maine. Eng. Pat. 58, Jan. 1, 1902.

The patentees find that although the manufacture of *p*-amino-*p*-hydroxydiphenylamine is a matter of some difficulty, its hitherto unknown homologue, *p*-aminotolyl-*p*-hydroxyphenylamine—

$$1.2.4\ NH_2(CH_3)C_6H_3.NH.C_6H_4.OH\ 1.4,$$

can be readily obtained by oxidising equimolecular proportions of *p*-aminophenol and *o*-toluidine, and reducing the resulting product with sodium sulphide. The new base separates, in greyish-white needles, from benzene, and melts at 160° C. When fused with sulphur and an alkali sulphide at about 120° C., it yields the leuco compound of a dyestuff which is precipitated from its solution by a current of air. The product is soluble in a solution of sodium sulphide, and gives indigo-blue shades on unmordanted cotton. —T. A. L.

Sulphide Colours from Nitrosotoluylenediamine; Manufacture of ——. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Maine. Eng. Pat. 2149, Jan. 27, 1902.

See Fr. Pat. 317,936; this Journal, 1902, 1392. —T. A. L.

New Azo Colouring Matters and Colour Lakes; Production of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 4280, Feb. 19, 1902.

See Fr. Pat. 315,573 (suppl.); this Journal, 1902, 1451. —T. A. L.

United States Patents.

Yellow Acridine Dye, and Process of Making Same. O. Nastvogel, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 716,084, Dec. 16, 1902.

Acridine Yellow base is treated with an aqueous solution of formic acid, yielding, after drying, an easily soluble yellowish-brown powder, which dyes silk and tannined cotton greenish-yellow shades. It gives off formic acid when heated with sulphuric acid.—T. A. L.

Disazo Dye, and Process of Making Same. P. Julins, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 716,242, Dec. 16, 1902.

Salicylic acid is chlorinated, nitrated, and reduced. The resulting *p*-chloro-*o*-amino-salicylic acid is diazotised and combined with 1.6 naphthylamine sulphonic acid (Clève's acid). The product so formed is then diazotised and combined with β-naphthol, giving a dyestuff for wool which, on treatment with potassium bichromate, forms deep black shades. (See Eng. Pats. 12,021 and 17,356 of 1901; this Journal, 1902, 609 and 1024.)—T. A. L.

Acridine Dye. C. L. Müller and E. Schmid, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 716,264, Dec. 16, 1902.

Dyestuffs of the acridine series are obtained by heating together a *m*-diamine with phthalic anhydride in presence of a condensing agent. The product from *m*-tolylene diamine and phthalic anhydride dyes tannined cotton yellow shades. On heating with hydrochloric acid it is decomposed into *m*-tolylenediamine and diaminodimethylphenyl acridine carboxylic acid.—T. A. L.

Azo Dye. C. Schraube and others, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 716,289, Dec. 16, 1902.

Diazotised aniline is combined in acid solution with 1.8.4-amino-naphthol sulphonic acid, and the product is subsequently combined in alkaline solution with diazotised sulphurous acid ester of 1.8-amino-naphthol. The dyestuff gives black shades on wool, and when treated in the cold with dilute sulphuric acid (5 per cent. H_2SO_4), does not give off sulphurous acid. If, however, the product be iled with an excess of sodium carbonate and subsequently idified, sulphur dioxide is evolved. The sulphurous acid ter is the product obtained by acting with sodium bisulite on an aromatic diamine such as 1.8- or 1.5-naphylene diamine, or a sulphonic acid of the same, or on tolylene diamine. (See Eng. Pat. 13,564 of 1900: this urnal, 1901, 117.)—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

ordanting Wool with Chrome; Relative Values of Various Assistants for —— S Kapff. Färber-Zeit., 1902, **13**, [20], 313—318, and [21], 330—333.

EPARATE lots of wool were mordanted with (i) 1·5 per nt. (of the weight of the wool) of potassium bichromate id 3 per cent. of lactolin; (ii) as in (i), with the addition the mordanting bath, after one hour's boiling, of 1 per nt. of sulphuric acid; (iii) 1·5 per cent. of potassium chromate, 3 per cent. of vegetalin, and 3 per cent. of etic acid; and (iv) 1·25 per cent. of potassium bichroate, 3 per cent. of lignorosin, and 1 per cent. of lphuric acid (see this Journal, 1900, 659; 1902, 339, 12, 769, and 1132). Each lot was next boiled for an hour ith 3 per cent. of its weight of lactic acid, and 1 per cent. f sulphuric acid, to secure the reduction of the chromic cid present in it. All four lots were then dyed, and the yeings compared. That obtained upon the wool mordanted ccording to formula (ii) was the deepest, the next in order eing given by (iii), and the palest by (iv). A determinaion of the chromium left in the mordanting baths showed hat this had been absorbed to the following extents:— n the case of (i) 80, (ii) 100, and (iii and iv) 90 per cent., orresponding respectively with consumptions of 1·2, 1·5, ·35, and 1·125 per cent. of potassium bichromate. Lacolin, when employed along with sulphuric acid, reduces the hromic acid better than lignorosin, which, in turn, reduces nore effectively than vegetalin. The last is superior, howver, to tartar in this respect.

Approximately the same amount of chromium is depoited upon wool mordanted by means of (*a*) 1·0 per cent. f potassium bichromate, 2 per cent. of lactolin and 0·75 er cent. of sulphuric acid; (*b*) 1·25 per cent. of potassium bichromate, 3 per cent. of lignorosin, and 1 per cent. of ulphuric acid: and (*c*) 1·5 per cent. of potassium bichromate, and 3 per cent. of lactolin. The cost of mordanting with (*a*) and (*b*) is nearly the same, but as the mordant produced by the former of these is more completely reduced, he use of this is to be preferred.

Influence of Oil on the Tenacity of Woollen Yarns and Tissues.—The presence of oil in woollen yarns and tissues s attended by an increase in their tenacity; thus, a worsted yarn, which in the condition in which it was spun, required a load of 3·84 kilos. (mean of 20 tests) to break 20 threads f it, after extraction with ether, broke with 3·67 kilos., but, when re-oiled, resisted up to 4·10 kilos. Similarly a issue which, taken directly from the loom, showed a enacity of 45·4 kilos., for a certain length and width, had his reduced, when scoured, to 37·4 kilos. for the same ength and width.

Effect of Boiling on the Tenacity of Woollen Tissues.—This was determined by the use of a specially woven tissue, onsisting of stripes of 140 threads of worsted yarn in the warp separated from one another by threads of cotton. The tissue was washed, strongly "decatised," to prevent hrinkage as much as possible, mordanted and dyed in various ways. It was then divided into strips of 140 threads, which vere tested in a Schopper's dynamometer Although elting was not apparent in the strips which had been ubmitted to prolonged boiling, the increase in tenacity which resulted during this can be explained only on the ssumption that it occurred; thus, while an unmordanted nd undyed strip of the tissue broke with a load of 31·2 ilos., a strip of the same dimensions, after being mordanted or $1\frac{1}{2}$ hours, at a temperature of 100° C., with 1·5 per ent. of potassium bichromate and 3 per cent. of lactolin, and then being dyed for $1\frac{1}{2}$ hours at the same temperature, with 5 per cent. of Anthracene Brown in powder, and 10 per cent. of acetic acid, had a tensile strength equal to 33·7 kilos.

The Testing of Chrome-mordanting Assistants.—Three pairs of hanks of woollen yarn should be mordanted, three hanks by the method and materials in use, and three by those which it is proposed to substitute for them. One pair of these should be treated with lactic acid and sulphuric acid, and then dyed with Cochineal (20 per cent.). This will serve for a quantitative estimation of the chromium fixed. Another pair should be dyed with Hæmateïn or Hæmatoxylin for a qualitative test. The remaining pair can be dyed with a combination of Alizarin dyestuffs and used for tests by rubbing, milling, acid, light-exposure, &c.

—E. B.

India-Rubber Thread. C. O. Weber.

See under XIII. C., *page* 104.

English Patents.

Silk; Preparation of Collodion for Manufacture of Artificial ——. J. Douge, Besançon, France. Eng. Pat. 2476, Jan. 30, 1902.

See U.S. Pat. 699,155; this Journal, 1902, 771.

—J. F. B.

Bleaching certain Textile Fabrics and Fibrous Material; Process of, and Apparatus for ——. J. W. W. Shaw, Rochdale. Eng. Pat. 25,338, Dec. 12, 1901.

Textile materials containing wool or other animal fibres, after being scoured and washed in the usual way, and being freed from excess of moisture with more than usual care, are packed or wrapped round a perforated cylinder, and are thus brought into a closed chamber connected by means of a pipe with a vacuum pump. Here they are treated with sulphur dioxide. A gas-forming or gas-expanding chamber is interposed between the cylinder containing the liquid sulphurous acid and the vessel containing the material to be treated. The air is exhausted from such chamber, then the sulphur dioxide is allowed to pass into it till a pressure of about one atmosphere is attained, and the gas is finally led into the bleaching chamber, which has previously been deprived of air. "The complete bleaching process" consists in passing the textile materials through a dilute solution of sodium sulphate, to which a little Acid Violet N or "solution of Indigo" is added, before treating them as described.

—E. B.

Producing Patterns [by Carbonising] on Fabrics. T. Jegler, Offingen-on-the-Danube, Germany. Eng. Pat. 2163, Jan. 27, 1902.

See Fr. Pat. 318,427 of 1902; this Journal, 1902, 1531.

—E. B.

Sizing and Finishing Cotton, Linen, and the like Fabrics. T. Aspinall, Bolton. Eng. Pat. 2447, Jan. 30, 1902.

Starch or flour is suspended in water and gelatinised with caustic soda or potash. An acid or suitable salt, *e.g.*, sulphuric acid or magnesium sulphate, is then added to neutralise the alkali, followed by an addition of soap, oil, or tallow. Magnesium chloride, zinc chloride, and china clay may also be added. The mixture is employed in the usual manner in sizing or finishing cotton and linen fabrics.

—E. B.

Printing on Fabrics, &c.; Preparation and Use of Colours for Chemical ——. P. Jochum, Karlsruhe, Germany. Eng. Pat. 25,608, Dec. 14, 1902.

Agar-agar and animal size hardened with a little formalin are used for thickening colours for printing as the resulting jellies do not give up their colours to cold water, so, if printed on a textile fabric and steamed, the colour is absorbed by the fibre. Such jellies are mixed with a fatty substance like boiled linseed oil before being printed, and, after the steaming, the fatty matter can be removed by suitable solvents. A method of using the new thickening material for obtaining a colour reserve is given.—L. G. R.

Dyeing and Finishing Processes [Employment of Caseïn]: Impts. in ——. R. S., J. H., and F. R. Carmichael, Paris. Eng. Pat. 22,095, Oct. 10, 1902, 1531.

Raw, spun, or woven textile materials are dyed, finished, and, if desired, also weighted, in a single operation, by the application to them of neutral or acid solutions of casein, with which soluble or insoluble colouring matters, and, when weighting is to be accomplished, kaolin, &c. are mixed. For example, for a silk finish, casein in the form of powder is soaked in a 2 per cent. solution of glycerin, 2—5 per cent. of lactic acid is added, then a suitable proportion of a weighting agent, and, finally, a dyestuff, *e.g.*, one that can be used in an acid bath. A reaction takes place, it is stated, between the ingredients of the finishing mixture, which enables after-treatment with such compounds as formaldehyde, tannic acid, and alum, &c. to be dispensed with.
—E. B.

Casein [for Calico Printing]; Insoluble ——, and Process of Producing same. H. V. Dunham, New York. Eng. Pat. 19,090, Aug. 30, 1902. Under Internat. Conv., Sept. 28, 1901.

See U.S. Pat. 695,198; this Journal, 1902, 547.—J. F. B.

United States Patents.

Fibrous Material; Method of Spinning or Twisting Artificial ——. R. W. Strehlenert, Djursholm, Sweden. U.S. Pat. 716,138, Dec. 16, 1902.

Artificial textile fibres are twisted by injecting a solution of the material into a coagulating liquid, which is rotated continuously whilst travelling with gradually increasing speed in the same direction as the fibres. The discharge orifices of the material are situated in the conical portion of a circulating vessel. A jet of fresh coagulating liquid is fed tangentially into the conical portion above the discharge orifices, restoring the exhausted liquid and setting up a rotation in the vessel, the liquid then traverses the tubular portion of the vessel together with the filaments, and the excess is drawn off whilst the remainder is returned.
—J. F. B.

Cellulose: Manufacture of Filaments from —— [Viscose]. C. H. Stearn, London. U.S. Pat. 716,778, Dec. 23, 1902.

The initial solution of viscose (see this Journal, 1899, 136) is aged to a suitable extent, in order to obtain a substantial predominance of the cellulose ingredient remaining in combination. The product is then dissolved in an alkaline solution, and the fluid is spun into filaments in the usual way.—J. F. B.

Dyeing: Apparatus for ——. J. A. Willard, Chattanooga, Tenn., Assignor to Vacuum Dyeing Machine Co. U.S. Pat. 715,719, Dec. 9, 1902.

Improvements in apparatus are claimed for dyeing yarns, hosiery, &c., in such a manner as to prevent the material coming in contact with the air until the colour is completely fixed. The fabric or yarn is placed in a cylinder and the dye liquor is forced through it; after dyeing, the material is washed in the same manner. The process is useful for sulphide dyestuffs.—L. G. R.

French Patents.

Cotton and Cotton Goods [Fireproofing]: Treatment of ——, to render them less Inflammable. W. H. Perkin, Jr., and Whipp Bros., and Todd, Limited. Addition dated April 1, 1902, to Fr. Pat. 316,300, Nov. 27, 1901.

An extension of patent giving a list of substances which may be used either alone or in conjunction with tungstate of soda to render cotton less inflammable. (See also Eng. Pats. 9,695, 23,556, and 23,557, 1901; this Journal, 1902, 857 1531.)—L. G. R.

Dyeing Machine. E. Rolland. Addition, dated March 29, 1902, to Fr. Pat 316,512, Dec. 3, 1901.

A more detailed claim for the use of the previously patented machine; this Journal, 1902 1 23.—L. G. R.

Hydrosulphite Vat. Badische Anilin und Soda Fabrik. Fr. Pat. 320,509, April 19, 1902.

The vat is applicable to dyeing indigo on wool and avoids the destructive action of fixed alkalis upon animal fibres. A solution of solid hydrosulphite is made with the addition of a given quantity of caustic soda, the indigo is then added, together with starch, glue, gum, or the like. The woollen material is now entered and a quantity of ammonium chloride added, the dyeing operation then proceeding as usual.—L. G. R.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture; The Fan in ——. G. Petschow. Zeits. angew. Chem., 1903, **16**, [1], 12—14

With regard to the use of the fan in the chamber process (this Journal, 1902, 1026), the author points out that experiments with an earthenware fan were actually made as far back as 1898, at Davidsohn's works at Dantsic, at the suggestion of Fr. Bode of Dresden-Blasewitz. The outside measurements of the fan were 1·32 by 0·75 m. in height, 1·3 m. The inlet and outlet pipes were 20 cm. in diameter, the diameter of the fan was 60 cm., and its speed 1200 revolutions per minute; its free delivery being estimated as 112 cb. m. per minute. The steel axle was protected from corrosion by earthenware coverings. The fan was placed between the Glover and the first chamber; it stood in a leaden plate to catch any acid drainings, and the pipes from the Glover and to the chamber were not rigidly connected to it, but by acid seals, so that the vibration of the fan was not communicated to them. By a system of valves, the working of the chambers could be carried on either through the fan or by direct connexion from Glover to chamber. The fan was hopelessly inadequate: while it was in use there was continual pressure in the pyrites burners, and the working of the chambers went down for want of oxygen. Moreover, the fan suffered severely; many of the blades broke, and other damage was done, chiefly on the Glover side, where the hot gases come in contact with it. This high temperature of the gases also worked disadvantageously in the case of a lead fan in the same position in another system, from which the author obtained results, better indeed than those from the earthenware fan, but far from satisfactory. For this reason it seems impracticable to place a fan (especially an earthenware fan) between the burners and the Glover, or even between the Glover and the first chamber: and yet the further away from the burners the fan is, the less use is it for the gases should be driven, not sucked, through the chambers.—J. T. D.

Bleaching Powder; The Formation of ——. F. Winteler Chem.-Zeit., 1902, **26**, [101], Rep. 353. Zeits. anorg Chem., 1902, **33**, 161.

The results of the research are stated as follows:—1. Dry chlorine has no action on dry calcium hydroxide. 2. Any bleaching powder formed, is due to chlorine water being obtained as an intermediate product. 3. Chlorine wate consists of hypochlorous acid and hydrochloric acid, which in the sense of the law of mass action, balance one another 4. Bleaching powder has not a simple formula, but is a mixture of substances. The excess of one or the othe depends upon the conditions of chlorination, *viz.*, on the temperature, amount of water present, and the speed of the current of chlorine. 5. Bleaching powder contains basic calcium chloride and basic calcium hypochlorite as stable constituents. 6. The decomposition of bleaching powde into chloride and oxygen depends upon the amount o hydroxyl present. The decomposition into chlorate an chloride takes place in the presence of hydrogen ions.
—F. S. S.

English Patents.

Sulphuric Acid and Sulphuric Anhydride; Improve Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Hoch a/M., Germany. Eng. Pat. 3161, Feb. 7, 1902.

See Fr. Pat. 318,932, Feb. 21, 1902; this Journal, 190 1151.—E. S.

latinum used in Catalytic Processes [Sulphuric Anhydride Manufacture]; Method of Restoring the Activity of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. Eng. Pat. 4026, Feb. 17, 1902.

SE Fr. Pat. 318,861 of 1902; this Journal, 1902, 1454. —R. A.

Iydrocyanic Acid from Ferrocyanides; Process and Apparatus for Obtaining ——. G. Craig, Glasgow. Eng. Pat. 24,456, Dec. 2, 1901.

N alkali or alkaline-earth ferrocyanide (*e.g.*, sodium rrocyanide or its equivalent), 1 part, is distilled with lphuric or hydrochloric acid, 6 to 10 parts of real acid, nd 50 to 60 parts of water, the temperature of the reflux ondenser being kept at about 40° C.—J. F. B.

Iydrocyanic Acid; Production of ——. W. Feld. Linz a/Rhein, Germany. Eng. Pat. 24,920, Dec. 6, 1901.

ATERIALS containing insoluble iron-cyanogen compounds re made alkaline by treatment with an alkali or alkaline arth, the excess of alkali is neutralised by the addition of n excess of salts of such metals as magnesium, aluminium, inc, or manganese, the oxides or carbonates of which do ot precipitate mercuric salts. The solution so obtained is hen boiled with a mercuric salt, and the mercuric cyanide s decomposed by distillation with an acid. The residual nercury compound is then regenerated by treatment with n oxidising agent such as bleaching powder, the iron ompounds being precipitated by means of lime. (See lso Eng. Pat. 24,904, 1901; this Journal, 1902, 1553.) —J. F. B.

Caustic Soda; Manufacture of ——, *and Treatment of Lime Sludge produced in such Manufacture.* J. T. A. Walker, London, and J. T. Steele, Addiscombe, Surrey. Eng. Pat. 25,880, Dec. 18, 1901.

THE lime mixer is combined with a column having a series of progressively finer gauze screens, through which the milk of lime passes upwards, agitators being arranged in each compartment. From near the top of the straining column the milk of lime passes into the causticising vessel, charged with sodium carbonate solution. After the causticised soda solution and washings are run off, carbon dioxide gas is introduced, and then calcium chloride solution, from the vessel in which the carbon dioxide was generated, and the solid matter of the sludge (essentially calcium carbonate) is separated from the liquid portion by a hydro-extractor Magnesium chloride, or aluminium sulphate, may replace the calcium chloride used in the process. A modified form of the straining column is described, in which a jigger movement is imparted to an elastic material connected to the screens, by the vertical movements of a non-rotatable shaft, agitators being dispensed with.—E. S.

Sodium Sulphate and Hydrochloric Acid; Manufacture of ——. H. H. Lake, London. From K. Oehler, Offenbach-on-Maine, Germany. Eng. Pat. 2856, Feb. 4, 1902.

SEE Fr. Pat. 318,386, Feb. 4, 1902; this Journal, 1902, 1454.—E. S.

UNITED STATES PATENTS.

Sulphuric Acid; Method of Manufacturing ——. N. P. Pratt, Atlanta, Ga. U.S. Pat. 715,142, Dec. 2, 1902.

IN the manufacture of sulphuric acid by the chamber process, the gases in the chambers, the towers, or any of the flues or conduits are cooled by surrounding these chambers, flues, &c., with a cooling medium, whereby the gases are cooled without coming directly in contact with that cooling medium. The hot uncombined gases, after leaving the chamber, are also cooled, and are then passed again into the chamber, together with freshly generated gases. —A. S.

Caustic Soda; Apparatus for Producing ——, *by Electrolysis.* E. A. Allen and H. K. Moore. U.S. Pat. 716,804, 1902.

See under XI. A., *page* 99.

Gases [containing Sulphur Dioxide]; Concentrating ——. H. A. Frasch, New York. U.S. Pat. 715,778, Dec. 16, 1902.

THE object of the invention is to obtain sulphur dioxide in a concentrated condition, suitable for the manufacture of sulphuric acid or anhydride by the contact process. The gases, as they come from the pyrites burner, are washed and cooled, and subjected to pressure in contact with water already saturated with sulphur dioxide at atmospheric pressure; the gases are then washed under pressure with fresh water, and the surcharged solution is reduced to atmospheric pressure, the gas evolved being stored, or at once utilised. The surplus solution of SO_2 is taken to an evaporating apparatus, where it is heated, and the SO_2 evolved, is returned to the absorber.—E. S.

Sulphite Compounds; Process of Making ——. H. H. Wing, New York. U.S. Pat. 716,330, Dec. 16, 1902.

THE hydrate of an alkaline earth is subjected in presence of water to the action of gases containing sulphur dioxide whereby a normal sulphite is produced, which is then freed from the water accompanying it. Subsequently the normal sulphite is suspended in water and again treated with sulphur dioxide to form the acid sulphite. The first part of the operation is performed wherever waste sulphur gases are available, whilst the monosulphite is treated at the pulp mill at which it is to be used. (See U.S. Pats. 690,502, 690,503, 712,225, 712,226, 714,984; this Journal, 1902, 254, 1534, and 1903, 26.)—J. F. B.

Sodium Cyanide; Method of Making ——. F. Roessler, Frankfort-on-the-Maine, Germany, Assignor to The Roessler and Hasslacher Chemical Co., New York. U.S. Pat. 716,350, Dec. 16, 1902.

THIS is a divided patent; see U.S. Pat. 711,910, Oct. 21, 1902; this Journal, 1902, 1534. Hydrocyanic acid gas is passed into an absorber containing a concentrated solution of caustic soda, at a temperature exceeding 33° C., at or above which temperature, when a certain proportion of the gas has been absorbed, anhydrous sodium cyanide falls as a crystalline powder. (See also U.S. Pat. 708,079; this Journal, 1902, 1232.)—E. S.

FRENCH PATENTS.

Nitric Acid; Manufacture of ——. W. Ostwald. Addition, dated April 9, 1902, to Fr. Pat. 317,544, Jan. 4, 1902.

THE process for the manufacture of nitric acid by passing a mixture of ammonia and air through heated contact material, described in the main patent, (see Eng. Pat. 698, 1902; this Journal, 1902, 548), receives the following additions:—The air must be in considerable excess; the temperature of reaction must exceed 300° C.; the passage of the gaseous mixture must be as rapid as possible, and the gases are previously heated by means of the hot gases emerging from passage through the contact material. The apparatus consists of an open tube, charged at one end with the contact material (preferably a combination of platinum with platinum sponge), fixed air-tight in a cylinder with its open end projecting; the cylinder has an aperture close to the exit end for admission of the gaseous mixture, which thus passes along the sides of the tube before entry through the end containing the contact material; the gases, strongly heated by the reaction, heat the tube on their passage outwards, such heat being in part taken up by the entering gases.—E. S.

Ferric Sulphate and Metal Sulphates; Process for obtaining ——, *from Iron Pyrites and other Sulphide Ores.* O. Meurer. Addition, dated March 24, 1902, to Fr. Pat. 295,379, of Dec. 18, 1899.

THE process given in the main patent (see Eng. Pat. 23,664, 1899; this Journal, 1900, 901), is modified by the use of partially roasted instead of fully roasted ores, and by the substitution of alkaline-earth sulphides (which may be obtained by heating the corresponding sulphates with carbon), for alkali sulphides.—E. S.

Reducing Product [Hydrosulphite]: Preparation of a "New" ——. L. Descamps. Fr. Pat. 320,227, April 5, 1902.

See Eng. Pat. 8304, April 9, 1902; this Journal, 1902, 1533.—E. S.

Substances: Treatment of ——, by means of Nascent Carbon Dioxide, to produce a Chemical Reaction [Borax and Boric Acid]. The Smethurst Furnace and Ore Treatment Syndicate, Ltd. Fr. Pat. 320,249, April 7, 1902.

See Eng. Pat. 16,506, 1901; this Journal, 1902, 970.

—E. S.

Solutions; Process of Simultaneous Concentration and Decomposition of —— into their Constituents. C. Schmitz. Fr. Pat. 320,606, April 23, 1902.

The solution, such as for example, an aqueous saline solution, is cooled to nearly its freezing point, and is then sprayed into a current of air, cooled considerably below the temperature of congelation of the solution in question, the finely-divided particles being carried forward by the air current over a series of vessels arranged in successive order, which vessels receive the falling particles according to their specific gravity, the heavier crystals or liquor falling into the nearer vessels, and the lighter into those beyond.

—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Decolorising ——. C. Jung. Sprechsaal, **35**, [43], 1630, and [45], 1709.

It has recently been proposed to add arsenic in powder to the charge of glass metal; but the author points out that, in such event, the whole of the arsenic would be volatilised by the time the charge had fused, whereas in the ordinary practice of throwing a lump of arsenic into the molten mass, the ensuing volatilisation produces ebullition and a thorough admixture of the arsenic with the glass, without any risk of contamination from the iron blowing-tool, otherwise necessary. It is further remarked that the pots containing an admixture of arsenious acid do not immediately attain the volatilisation temperature of the latter (218° C.) when placed in the furnace and, therefore, the arsenic subsequently volatilised from the central portion of the charge must pass through the already molten stratum and facilitate fusion, at the same time exerting a favourable influence on the colour of the glass. That this liberation of arsenic is protracted, is evident from the continued escape of the bluish-grey vapour of arsenic from the furnace.—C. S.

English Patent.

Glass; Producing Pure Gold-ruby ——, for Pressed, Blown, and Moulded Glasswares. R. Zsigmondy, Jena, Germany. Eng. Pat. 5242, March 3, 1902.

See U.S. Pat. 703,512; this Journal, 1902, 1027.

—J. W. H.

United States Patent.

Enamels and Glazings, White and Coloured ——. R. Rickmann, Kalk, Germany. U.S. Pat. 716,106, Dec. 16, 1902.

Antimony is added to the glaze in the form of sodium antimoniate, 7 to 10 per cent. being added for a good and durable white enamel.—J. W. H.

French Patents.

Glass; Process and Apparatus for the Manufacture of ——, by Drawing. E. Fourcault. Fr. Pat. 320,631, April 24, 1902.

The glass melting-pot is formed with a fore-hearth, with a suitable float resting upon the surface of the liquid glass in it. This float has an aperture corresponding in shape to that of the article to be produced, the aperture only allowing the passage of glass when the float is slightly depressed. An iron plate or ring, &c. (according to the shape of object to be made) is lowered into contact with the glass flowing through the aperture. The iron is then raised steadily in a vertical direction, whereupon the viscous glass adhering to the iron will be drawn out to any desired length, having in transverse section the shape of the iron support, and that of the corresponding aperture in the float. A current of air is directed on the glass as it is raised from the pot, so as to cool and solidify it. An arrangement is also described for drawing the glass horizontally to an indefinite length.

—W. G. M.

Tiles Laminated with Different Colours or Substances; Manufacture of ——. Soc. Anon. des Carreaux et Produits Céramiques de Chimay. Fr. Pat. 320,099, April 1, 1902.

A mould with a movable bottom is made to slide along a flat plate with the aid of guide rails. At a certain point it passes over a perforation through which a plunger capable of accurate adjustment of stroke is passed. With its aid the bottom is raised to any desired height, and a given thickness of any material may be moulded; the plunger may then be lowered by a pre-determined amount, and a second layer of the required thickness is moulded on the top of the first, and so on, until the laminæ are completed, when a closely-fitted plug is placed on the top, and the mould with its contents is slid along the table to a press.

—W. G. M.

Cast or Moulded Objects; Manufacture of ——. Brown. Fr. Pat. 320,141, April 2, 1902.

See Eng. Pat. 8431, 1901: this Journal, 1902, 973.

—W. G. M.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Bricks of Lime and Sand: Testing ——. H. Seger and E. Cramer. Thonind.-Zeit., **26**, [131], 1757.

Tests made with a view to ascertain whether any relation exists between the two methods of performing the compression strength tests on lime-sand bricks, *i.e.*, on half brick and cubes respectively, furnished negative results, the ratios found, fluctuating between 100:59 and 100:88. These results compared with the actual porosity (total cavities) of the bricks, appear to confirm Gary's opinion that the strength of these bricks is chiefly due to closeness of texture. The authors, however, believe that this solidity is acquired chiefly through the action of the steam pressure applied and the time of exposure thereto.—C. S.

Hydraulic Cements; Constitution of ——. S. B. Newberry and M. M. Smith. Cement and Engineering News (Chicago), 1902.

Further experiments have been made in continuation of previous work by W. B. and S. B. Newberry (this Journal 1897, 887—893). The results obtained are summarised as follows:—

Tricalcium silicate, $3CaO.SiO_2$, prepared by calcining at a white heat, an intimate mixture of extremely finely divided calcium carbonate and silica, is of "constan volume," has the specific gravity, 3·055, and is free from uncombined lime and silica. It shows imperfect hardening properties, probably owing to its porosity and the large amount of water required to produce a plastic paste When fused by means of the oxy-hydrogen flame, it form a doubly-refractive mass with rectangular cleavage, o specific gravity 3·022. The fused substance when ground to powder and mixed with water, sets slowly, is of constan volume, and hardens as well as the best Portland cement.

When mixtures of calcium carbonate and silica are heated for two hours at a red heat, basic compounds are formed, and some of the silica remains uncombined, unless at least $2\frac{1}{2}$ molecules of lime are present to one of silica For example—

$CaO + SiO_2$ gives di-silicate and free silica.

$2CaO + SiO_2$ gives a substance containing $2{\cdot}7\ CaO$ t $1SiO_2$ and free silica.

$2\frac{1}{2}CaO + SiO_2$ and $3CaO + SiO_2$ give free lime an no uncombined silica.

At a white heat, the mono-, di-, and tri-silicate mixture become completely combined.

The amount of water with which a given cement will ter into chemical combination in a given time, depends on mechanical conditions, and varies with the porosity the mass. In a dense briquette, the amount may be as w as 10 per cent. after one year in water, or, in the case of e same cement suspended in a large excess of water, it ay reach 27 per cent. Apparently, therefore, but little ght on the nature of the reactions which take place in rdening can be obtained by determinations of water sorption.

On suspending finely-divided calcium silicates in sufficient ater to dissolve all the lime present, the residues are mewhat indefinite in composition, and continue to lose me on prolonged action; they have, however, approximately e following composition:—

Tri-silicate, not fused, 23 and 93 days, $3CaO.2SiO_2.3H_2O$.
Tri-silicate, fused, 35 and 228 days, $2CaO.SiO_2.H_2O$.
Di-silicate, quenched and dusted: Residue of same composition as original substance, and only slightly hydrated.

The fused tri-silicate when treated for 30 days with an mount of water insufficient to dissolve all the lime present 100 c.c. to 5 grms.), and then treated with sugar solution or 29 and 186 days, gives residues, the composition of which is approximately $3CaO.2SiO_2.3H_2O$ and $3 CaO.2SiO_2.6H_2O$, respectively.—A. S.

Lime in Mixtures of Lime and Sand: Determination of ——.

See under XXIII., *page* 111.

English Patents.

Wood Preserving and Fireproofing. T. L. Ferrell, Philadelphia, Pa. Eng. Pat. 830, Jan. 11, 1902.

See U.S. Pats. 695,679, 695,678, and 695,450; this Journal, 1902, 615.—J. W. H.

Magnesite Goods; Method of Treating Magnesite in the Manufacture of Bricks and the like ——. L. Williams, Stockton-on-Tees. Eng. Pat. 1998, Jan. 25, 1902.

The raw material is moulded direct into bricks, which are then kilned at a high temperature. They may then be used in places where they will not be exposed to heavy pressures. If for other purposes, they are crushed, the powder then either being used for furnace-bottoms, or for making stoppers, nozzles, &c., or for magnesite paint or moulding, &c., or the crushed brick is mixed with a special setting or binding agent, consisting of finely-ground crude or semi-calcined magnesite, clay, water, hydrochloric acid, and fluorspar, with or without a resinous or adhesive vegetable substance, and the mixture is then burnt.—W. G. M.

Bricks; Manufacture of Artificial Stone Building Blocks, —— and the like. G. C. Marks, London. From C. Frerichs, Berlin. Eng. Pat. 3364, Feb. 10, 1902.

Glazed facing-stones are made by steam-hardening calcareous stones, or a moulded mixture of lime and sand, adding the glaze and then firing. Or the mixture of lime and sand is only treated with steam sufficiently to allow of the mass being worked by hand, whereupon the stones or forms are glazed and burnt. Or again, after steam-hardening, the stones may be baked, then glazed and re-baked at a suitable temperature.—W. G. M.

Bricks, Fire-proof; Manufacture of ——. G. C. Marks, London. From C. Frerichs, Berlin. Eng. Pat. 4917, Feb. 26, 1902.

Masses of Dinas-stone or fire-bricks, after moulding, are treated by steam in suitable vessels until they are so far hardened that they can be readily transported to the kiln for burning without danger of injury to their structure.
—W. G. M.

Kilns for Burning Portland Cement, Lime, Marl, Magnesite, and the Like. C. F. Theurer and H. C. Hansen, Wiener-Neustadt, Austria. Eng. Pat. 26,214, Dec. 23, 1901.

The kiln has three superposed parts:—a pre-heating chamber above, leading directly to a sintering chamber in the middle which, in turn, leads to a wider cooling chamber at the bottom. Gas producers are arranged within the masonry of the kiln, around the sintering chamber, the producer gas from them being delivered downwards through flues into the domed space at the top of the cooling chamber; here it mixes with air and burns. The waste heat from the sintering chamber assists the action of the producers, and the gas is delivered at a high temperature.—W. G. M.

United States Patent.

Brick-Drier. J. Starkey, Minerva, Ohio. U.S. Pat. 715,314, Dec. 9, 1902.

The bricks are carried upon trucks run upon lines into a series of parallel tunnels, each capable of being closed on all sides. Below the tunnels are flues forming separate channels connecting a horizontal furnace flue in front of the series of tunnels and at right angles to their principal axes, with a similar chimney flue parallel to it at the back of the tunnels. The connecting flues are parallel with the main axes of the tunnel, and are placed (say three in number) beneath each tunnel, each one connected with the tunnel by a number of apertures so capped that smoke cannot gain access to the bricks from the flues. The several flues are controlled by dampers, so that any set may be disconnected.
—W. G. M.

French Patents.

Lime, Cement, Plasters, &c.; [Electric] Process and Apparatus for the Manufacture of ——. F. Clerc and M. Koechlin. Fr. Pat. 320,256, April 7, 1902.

A kiln is heated electrically by a grid of iron bars making connection between two transverse copper conductors joined up to an alternating current circuit. The furnace may consist of superposed stages, each with an electric grid forming the floor, or of an inclined channel divided into compartments with a fan-shaped grid on the floor of each, so arranged with the narrower part at the higher level that the particles of the charge do not tend to clog the grid; or, a furnace of the latter type may have the grid only in the centre compartment, whilst the floors of the uppermost and lowest are formed of pipes communicating, so that the waste heat from the charge (heated electrically in the middle compartment) is conveyed from the lowest to the uppermost compartment, and is thus available for pre-heating the charge.—W. G. M.

Slag Cement; Manufacture of ——. Riisager. Fr. Pat. 320,310, April 5, 1902.

The slag is granulated and, without drying, is crushed with water to the consistency of a thick paste. It is mixed with limestone or lime either before or after crushing, and the mixture is dried, kilned, and powdered as usual.—W. G. M.

X.—METALLURGY.

Cupriferous Gold Ores; Treatment of ——, by Cyanide of Potassium. L. Janin, Jr. Eng. and Mining J., 1902, **74**, [25], 816.

The author discusses the merits of three methods of treating cupriferous gold ores:—

1. Leaching by sulphuric acid preparatory to cyanide treatment. This method is, really, one of three stages; leaching with dilute sulphuric acid; neutralisation with caustic alkali; cyanide treatment.

2. Scrymgeour's method of dissolving copper minerals in a solution of cupro-cyanide of potassium containing no free potassium cyanide. The ore is heated with cyanide solution, and when the cupro-cyanide formed has dissolved its maximum of copper in the form of a sub-cyanide, the excess of copper is separated electrolytically. The ore is then treated in the usual manner with cyanide solution.

3. Hunt's method of leaching with an ammoniacal cyanide solution (see U.S. Pat. 699,108; this Journal, 1902, 776). This is essentially a one-stage process, the ammonia and cyanide being employed in the same solution. An ammonium salt may be used if lime or other alkali be added to the ore. The copper and gold may be separated from the solution by

any of the usual methods, but the author recommends electro-deposition with peroxidised lead anodes and aluminium cathodes, the two metals being separated in the form of sludge. Hunt's process is stated to possess the following advantages:—It is extremely simple and may be applied to many ores hitherto considered unsuitable for cyanide treatment. The cost of reagents is not high when compared with that of cyanide. There is no limit to the copper contents of ores which can be treated economically, provided that, with extremely high grade copper ores, arrangements be made for ammonia recovery.—A. S.

Metals; Reduction of ——, by Calcium Carbide. B. Neumann. Zeits. f. Elektrochem., 1902, 8, [52], 939.

The author maintains that carbon monoxide is primarily formed during the reduction of metals by calcium carbide in opposition to the statements of von Kügelgen (this Journal, 1902, 1332).—J. S.

[Iron and Steel] Carbon; Rapid Determination of ——, by Combustion. G. Auchy.

See under XXIII., *page* 112.

Iron and Steel; Determination of Manganese in ——. J. V. R. Stehman.

See under XXIII., *page* 112.

English Patents.

Iron and Steel; Manufacture of ——. O. Thiel, Kaiserslautern. Eng. Pat. 3344, Feb. 10, 1902.

See Fr. Pat. 318,535; this Journal, 1902, 1457.—J. H. C.

Cast Steel: Manufacture of [Prevention of Blow Holes] ——. M. Meslans and C. Poulenc, Paris. Eng. Pat. 14,693, July 1, 1902.

The invention consists in employing an alloy of aluminium with calcium, barium, strontium, or lithium, as an addition to cast steel, in place of aluminium, as usually employed, in order to obtain the steel free from bubbles. To obtain the alloy of aluminium with calcium, for instance, the metal is melted, covered with calcium chloride, and constituted the cathode, a carbon anode being used, and an electric current is passed for as long as may be necessary to obtain the desired alloy, which may contain, as a maximum, as much as 95 per cent. of calcium.—E. S.

Steel: Manufacture of ——. H. Knoth, Birmingham, Ala. Eng. Pat. 21,750, Oct 6, 1902.

See U.S. Pat. 712,389, Oct. 28, 1902; this Journal, 1902, 1537.—E. S.

Blow Holes or Cavities in Steel and other Metal Castings; Process and Apparatus for Preventing the Formation of ——. J. Riemer, Düsseldorf, Germany. Eng. Pat. 21,449, Oct. 2, 1902.

The process "consists in forcing a supply of gaseous or liquid fuel and of air through a hood mounted on the mould, and preheating the said air or the air and the fuel gas, or preheating the air and evaporating the fuel, either by a separate heating appliance, or by the waste gases arising from the mould, in order to produce and maintain in the upper part of the mould a temperature high enough to keep the cast metal liquid as long as desired."—E. S.

Gold Solutions from Slimes; Separation of ——. J. Penhale, Johannesburg, S. Africa. Eng. Pat. 7841, April 3, 1902.

The apparatus consists of a vertical filtering vessel provided with filtering media at the top and bottom. The cyanide solution of gold containing the exhausted slimes in suspension is fed into the filter until it is full. Water is then admitted through the bottom filtering surface which causes the filtration of the gold solution through the upper filter by upward displacement.—J. F. B.

Zinc Ores; Improvements in the Treatment of ——. F. Ellershausen and R. W. Western, London. Eng. Pat. 26,166, Dec. 21, 1901.

See U.S. Pat. 715,771 under United States Pats. following. —J. H. C.

United States Patents.

Furnace for Smelting Iron. H. A. Jones, New York, Assignor to Jones Direct Process Steel Co., Jersey City, N.J. U.S. Pat. 715,269, Dec. 9, 1902.

This consists of a blast furnace having a crucible for molten metal, a "flaring fusion chamber" above the crucible, and a cylindrical chamber above the fusion-chamber, a series of equally spaced, vertical recesses in the furnace wall containing zig-zag deoxidising "ore-retorts" and heating flues supplied with air and gas by burners. The retorts are provided with covers, and receiving hoppers for the granular ore are arranged beneath them. The deoxidised ore is delivered from the receiving hoppers to supply hoppers, and from the latter into the molten metal, the delivery being regulated by suitable valves. Platforms are arranged around the furnace, and means are provided for inspecting the interior of the retorts.—R. A.

Cast Metal; Process for Making Welded ——. W. Kent, Covington, Ky. U.S. Pat. 715,584, Dec. 9, 1902.

Sheets or pieces of wrought iron are arranged in an ingot mould, and high carbon "cast" iron is poured round them. The ingot is subsequently heated to a welding temperature and rolled and worked, the object being to produce a metal for armour plate and other purposes, which shall combine the hardness of cast metal with the tough fibrous structure of wrought iron.—J. H. C.

Matter [Cast Iron and Lead]; Composition of ——, and Process of Manufacturing same. A. Ramsdell, Chicago, Ill. U.S. Pat. 716,276, Dec. 16, 1902.

From nine to 15 oz. of lead are stirred into 100 lb. of molten cast iron, after the latter is cooled to a "reddish colour" and is ready for pouring into the moulds. The composition is stated to be well adapted for the manufacture of agricultural implements, &c.—E. S.

Blast Furnace Gases; Washing Appliance and Automatic Seal for ——. R. S. Steese and E. L. Ford, Youngstown, Ohio. U.S. Pat. 715,519, Dec. 9, 1902.

The "downcomer pipe" of the blast furnace is connected with a series of inverted U-shaped pipes each having at one end an open funnel, through which passes the small end of the next preceding pipe, and dipping into an open tank of water, provided with pockets and sludge-valves at the bottom. The open end of the U-pipe inside the funnel just touches the surface of the water, but does not dip into it deeply like the surrounding funnel of the next tube, so that the gases, after impinging upon the surface of the water and depositing a proportion of the dust in the pockets, pass along freely to the next pocket. The water acts ordinarily as a seal to prevent escape of gas, but in case of sudden increase of pressure, each water seal acts as an automatic relief-valve, the level of water in the tanks being restored by suitable inlet valves as soon as the pressure becomes normal, so restoring the seal.—J. H. C.

Slag-Casting Machine. C. H. Rhood, Assignor to Heyl and Patterson, Pittsburg, Pa. U.S. Pat. 715,868, Dec. 16, 1902.

The combination of a receiving reservoir, (formed in sections and provided with a central depression), and a spout connected thereto, having a discharge opening, and provided with an outer inclined end wall, which, as well as its side walls, has surrounding water compartments. A water pad or box within the spout is supported (by an adjustment which can be raised or lowered in guides) above and over the discharge opening, the box having a curved forward opening to direct the flow of the slag.—E. S.

icious Metals; Treatment of Ores containing ——. . W. Martino, Sheffield. U.S. Pat. 716,847, Dec. 23, 902.

: Eng. Pat. 9501, 1902; this Journal, 1902, 1141. —J. H. C.

algamator. W. F. Bedell, Assignor to D. McPhail and T. F. Adams, Kaslo, Canada. U.S. Pat. 715,538, Dec. 9, 1902.

us amalgamator consists of a tank containing mercury, ving a central cone in its lower part, with outlets, for the ape of sand and water which, fed from above down a ntral revolving axis with forked arms, embracing the ed cone and extending downwards and outwards following e curvature of the bottom of the tank, is distributed roughout the mass of mercury, and so brought into timate contact with the amalgamating surface.—J. H. C.

inc and Lead Fume; Process of Refining ——. F. N. Bartlett, Canon City, Col., Assignor to the United States Smelting Co. U.S. Pat. 715,238, Dec. 9, 1902.

he refining operation consists simply in heating the raw eposit of the fumes upon the hearth of a reverberatory urnace without separate access of air, by which means the ulphites and sulphates in the deposit are reduced to oxides; he carbonaceous matter is burnt off and the oxides are artly converted into carbonates by the products of combustion of the fuel. The hot refined fume-deposit is drawn into a closed iron wagon in which it remains for four hours, uring which period the conversion of oxides into carbonates by means of carbon dioxide entangled between the solid particles proceeds further and the quality and "body" of the pigment are much improved.—J. H. C.

Zinc Ores; Treatment of ——. F. Ellershausen and R. W. Western, London, England. U.S. Pat. 715,771, Dec. 16, 1902. (Compare U.S. Pat. 700,311, May 30, 1902; this Journal, 1902, 978.)

The ores, raw or calcined, according to circumstances, are heated with a dilute solution of ammonium sulphate with addition of sufficient sulphuric acid to dissolve the zinc compound, &c. The liquor is drawn off and the residue washed with ammonium sulphate solution; the liquor and washings are filtered through calcium carbonate, and, if cadmium be present, it is precipitated by zinc-dust. Ammonia water, obtained by addition of slaked lime to a portion of the stock solution of ammonium sulphate, is used to separate zinc hydroxide from the cleared liquor. The filtrate from the zinc hydroxide, consisting of ammonium sulphate solution, is returned to the stock reservoir kept for that solution, thus maintaining an approximately constant quantity of fluid circulating in the system.—E. S.

Spent Acid from Galvanising Works; Treatment of ——. H. E. Howard and G. Hadley, Halesowen, near Birmingham. U.S. Pat. 715,804, Dec. 16, 1902.

The spent acid is neutralised with zinc or crude zinc oxide, and steam is then blown through. Bleaching powder is added to oxidise ferrous salts, and ferric hydroxide is precipitated by lime or an alkali, more of the latter being afterwards used to precipitate zinc hydroxide from the cleared solution.—E. S.

French Patents.

Iron or Steel; Expulsion of Sulphur from ——. Joukoffsky and de Strouve. Fr. Pat. 320,105, April 1, 1902.

Common salt is added to the molten metal in a Bessemer converter by means of a long iron rod in some form of cartridge which is plunged below the surface of the metal. In the basic process the salt is mixed with the original lining material in the proportion of one part to six of dolomite. The sulphur is partly volatilised in combination with chlorine, and partly enters the slag as sulphide of sodium.—J. H. C.

Steel; Nickel-chrome. Cie. des Forges de Chatillon, Commentry et Neuves-Maisons. Fr. Pat. 320,316, April 9, 1902.

The nickel-chrome steel already patented (see Eng. Pat. 13,364, 1901; this Journal, 1902, 618) as regards its application to armour plates is now patented as regards all other uses for which a specially tough and hard material is required, as in the manufacture of bicycles, automobiles, gear-wheels, &c.—J. H. C.

Gold from Sea Water; Extracting ——. E. Bouchaud Praceiq. Fr. Pat. 320,217, April 4, 1902.

Precipitation is effected by means of any cheap material containing ferrous oxide which is claimed to carry down the gold in a precipitate of ferric hydrate. Separation of the precipitate containing the gold is effected by passing the seawater after addition of the precipitant into long tanks or channels with permeable sand bottoms, through which the water percolates, leaving the precipitate in the form of mud on the surface of the filter-bed.—J. H. C.

Fine Gold; Sluice for Catching ——. Rose Gold Reclamation Co. Fr. Pat. 320,397, April 14, 1902.

See Eng. Pat. 8774, 1902; this Journal, 1902, 915. —J. H. C.

Silver-plating; A new Mixture for ——. Mdlc. Schiele. Fr. Pat. 320,154, April 3, 1902.

This paste for plating articles of copper, bronze, nickel, white-metal, &c., is composed of silver chloride, 50 parts; potassium cyanide, 150 parts; aluminum nitrate, 15 parts; thorium nitrate, 50 parts; potassium bitartrate, 100 parts; distilled water, 309 parts; and powdered chalk, 350 parts. —J. H. C.

Lead and Zinc; Treatment of Complex Ores of ——. Armstrong. Addition, dated March 26, 1902, to Fr. Pat. 303,211, Aug. 23, 1900.

Complex ores of lead and zinc containing silver are, after roasting, smelted in a water-jacketed blast furnace provided with two transverse partitions reaching down to the tops of the jackets and dividing the furnace into three compartments, each provided with independent cup and cone charging arrangement. Into the centre compartment is fed the ore, together with the necessary fluxes, while coke alone is fed into the outer compartments. Each fuel compartment is provided with a pipe leading to a surface condenser in which the furnace gases, after passing through the incandescent fuel, deposit their metallic contents in the form of a spongy powder which can be compressed into blocks.

The zinc slags from the water-jacketed furnace are mixed with fuel and fluxes and blown up in a convertor to volatilize their zinc contents, which after passage through a chamber of cupola form, containing incandescent fuel are passed into a condenser similar to that employed for the lead fume.—J. H. C.

Sulphide Ores; Calcination of ——. A. D. Carmichael. Fr. Pat. 320,492, April 18, 1902.

See Eng. Pat. 17,580, 1901; this Journal 1902, 349. —J. H. C.

Castings; New Method of Making Small Solid ——. A. Watzl and L. Frankenschwert. Fr. Pat. 320,246, April 7, 1902.

In order to avoid the absorption of oxygen and other gases by silver, copper, nickel and the alloys of these two latter metals when in a fused condition, very thick moulds are prepared with an open cup or crucible in their upper portion to receive the broken pieces of metal to be melted, and runners communicating with the interior of the mould. The whole mould with its charge of broken metal is then enclosed in a refractory crucible and completely covered with a mixture of sand and powdered charcoal, to exclude air. The crucibles are afterwards stacked in a furnace the temperature of which is raised to just 50 above the melting point of the metal or alloy in question. The moulds are thus filled automatically and completely, and the resulting castings are free from blow-holes.—J. H. C.

Furnace-Bottom of Dolomite or other Refractory Material for Metallurgical Furnaces. W. Oswald. Fr. Pat. 320,626, April 24, 1902.

The furnace-bottom is composed of shaped bricks or stones, resting upon a curved base. The bricks are formed of truncated pyramids, of which the common apex would coincide with the centre of curvature of the base.

—W. G. M.

Aluminium: Solders for ——. Société Galy et Rain. Fr. Pat. 320,635, April 25, 1902.

The solder for ordinary purposes is a mixture of zinc and tin containing in 100 parts from 18 to 19 parts of tin when a hard solder is required and 66 to 67 parts of that metal for a soft solder. An extra white solder contains in 1,000 parts 637 of tin, 260 of copper, 100 of zinc, 3 of cadmium, and an extra-soft solder contains 10 per cent. of bismuth, with zinc in place of copper.

To make these solders the metal possessing the highest melting point is first melted, and from 0·5 to 3 or 4 per cent. of phosphide of zinc is dissolved in it before adding the other constituents.

The mixed alloy is cast in moulds, then remelted at a temperature but slightly in excess of its fusing point (400° C.), and again cast in moulds, which are cooled in water as quickly as possible to avoid liquation.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electrodes; Bipolar ——, with Soluble Anode. A. Brochet and C. L. Barillet. Comptes Rend., 1902, **135**, [23], 1049—1051.

In a previous note (Comptes Rend., **135**, 854) the authors described the action observed in the case of a bipolar electrode, with insoluble anode, immersed in copper sulphate. By using a bipolar electrode, consisting of two sheets of copper placed back to back, in which case the anode was of course soluble (and the amount of copper deposited or dissolved could be ascertained), it was found that the amount of current passing through the electrode was considerably less than would have been the case if the current flow had been regular. Hence a larger proportion passed through the solution surrounding the electrode, the discrepancy becoming greater as the current density was diminished. The edges of the bipolar electrode showed no trace of action, either of solution on the anode side or of deposit on the cathode face. The width of the margin of no action varied with the intensity of the current. It is therefore evident that there is a counter E.M.F. of polarisation, which may be studied by determining the P.D. of a system with and without bipolar electrodes between the terminals. The following conclusions may be drawn from the authors researches:—Bipolar electrodes deform the flux of current by reason of polarisation phenomena; to be utilised satisfactorily they should form water-tight partitions with as limited a space as possible for the circulation of liquid, in order to minimise losses which otherwise would be considerable, even with soluble anodes. If the apparatus requires an agitation so energetic that it can only be obtained by a transverse circulation of the electrolyte between the electrodes in all the cells at the same time, the electrodes should be enclosed in large frames. Metallic objects not communicating with the electrodes may be employed, whether the metal is soluble or not, but no precise rules can be laid down, except by trial.—W. G. M.

Anodic Decomposition Points of Aqueous Caustic Soda Solution. F. Plzák. Zeits. anorg. Chem., **32**, 385—403. Chem. Centr., 1902, **2**, [24], 1397.

The author's experiments relate to the influence of different experimental conditions, particularly the nature of the electrodes, on the decomposition points of pure caustic soda solution, which have been given by Nernst, Glaser, Bose, and Wohlwill (this Journal, 1897, 921; 1898, 462) as 1·08 (for O″) and 1·67 volts (for OH′) opposed to the hydrogen electrode. As cathode a polished or platinised platinum plate was used, and as anode a polished or platinised platinum wire. The cathode was always charged with hydrogen; the anode was sometimes surrounded by hydrogen, sometimes not. Most of the experiments were carried out in Bose's apparatus (this Journal, 1898, 1053).

With polished anodes, a curve was obtained with one break; with platinised anodes, one with two breaks. In the first case, a polished cathode gave a decomposition point of 1·08 volts, and a platinised one, 1·67—1·68 volts, the difference corresponding to the difference of potential between polished and platinised platinum; the break in the curve at 1·67 volts, therefore, notwithstanding its coincidence with the OH′-point given by Nernst, probably represents the O″-point. The author considers that the most satisfactory results are obtained when both electrodes are platinised. Of the two decomposition points observed under these conditions, the first, 1·08 volts, is the discharge potential of the O″-ions, and the second, at 1·53 (not 1·67) volts, that of the OH′-ions.—A. S.

Electrical Conductivity of Oxides and Sulphides of Metals. F. Streintz. Ann. der Physik, **9**, [4], 854—885. Chem. Centr., 1902, **2**, [26], 1493.

In accordance with the requirements of the electro-magnetic theory of light, bright-coloured—white, yellow, red, grey—powders are conductors at the ordinary temperature; dark-coloured—black, brown, dark gray—powders are, in part, non-conductors at the ordinary temperature. The compounds examined were PbO_2, MnO_2, $PbO_2.4MnO_2$, Ag_2O_2, Mn_2O_7, CuO, Fe_3O_4, Ni_2O_3, Co_2O_3, U_3O_8, Mo_2O_3, MnO, Mn_2O_3, CdO, CoS, Sb_2S_3, NiS, FeS, PbS (amorphous and crystalline), Cu_2S, CuS, MoS_2, HgS, Ag_2S. Of dark-coloured powders, only those which, under great pressure, will form coherent blocks without the use of a binding agent, are conductors at the ordinary temperature. Substances which are good conductors at the ordinary temperature, have small positive temperature co-efficients. On the other hand, the temperature co-efficients of substances such as PbS, HgS, Ag_2S, MnO_2, which are bad conductors at the ordinary temperature, are very large. At a definite temperature, characteristic for each compound, the conductivity shows a great increase. In general the higher oxygen or sulphur compound of a metal proves to be a better conductor than the lower.—A. S.

English Patent.

Paper Pulp; [Electrolytic] Treatment of Vegetable Matters for obtaining ——. J. R. Desmarest and J. P. M. Geyer. Eng. Pat. 26,260, Dec. 23, 1901.

See under XIX., *page* 109.

United States Patents.

Accumulator [Aluminium]. F. N. Blanc, Paris. U.S. Pat. 715,343, Dec. 9, 1902.

See Eng. Pat. 26,337 of 1901; this Journal, 1901, 1402.

—G. H. R.

Battery; Storage ——. L. Paget, Assignor to C. Coster, both of New York. U.S. Pat. 715,412, Dec. 9, 1902.

An absorbent body of silicated tufa is employed to contain the sulphuric acid electrolyte, and it forms a support for the face of the active material.—G. H. R.

Battery; Gravity Electric ——. A. M. Friend, Denver, Col. U.S. Pat. 715,651, Dec. 9, 1902.

The jar is divided horizontally by a porous partition, forming a filter, placed between the positive and negative elements, fitting the sides of the jar, and closing its circular cross-sectional area, so as to prevent communication between the two compartments around the disc, but permitting its vertical movement.—G. H. R.

Compound; Electric Battery ——. G. Bastedo, Brooklyn, N.Y. U.S. Pat. 716,656, Dec. 23, 1902.

HE compound is formed of a mixture of 15 lb. of dilute ulphuric acid, 50 drs. of nitric acid, and 1 oz. of bisulphate f mercury.—G. H. R.

Battery; Electric ——. G. Rosset, Paris. U.S. Pat. 716,762, Dec. 23, 1902.

EE Eng. Pat. 2587 of 1901; this Journal 1901, 125. —G. H. R.

Plates; Process of Preparing Storage Battery ——. R. C. Browne and F. Balch, Salem, Mass. U.S. Pat. 716,663, Dec. 23, 1902.

THE plates are prepared by heating them in a prescribed quantity of an acid (sulphuric acid) which is a solvent of he metal of the plate, to a predetermined temperature, at which is added a prescribed quantity of an acid (potassium nitrate) which is a non-solvent of the metal. A quantity of water and a small amount of ammonium sulphate are mixed at a low temperature, and the raw plates are steeped in the solution at a still lower temperature.—G. H. R.

Anode. F. McDonald, Johnsonburg, Pa. U.S. Pat. 715,684, Dec. 9, 1902.

THE anode, which is to be employed in the electrolytic apparatus described in U.S. Pat. 697,157 of 1902 (this Journal, 1902, 710), comprises a tube or cup closed at one end and sealed at the opposite one, and containing mercury, in contact with which several thin strips of platinum foil are sealed within the tube, and project from it in the form of independent linear strands. A conducting wire passes through the closed end of the tube, and is electrically connected with the strips by the mercury.—G. H. R.

Electric Battery [*Electrode*]. D. H. Wilson, Chicago, Ill. U.S. Pat. 715,920, Dec. 16, 1902.

THE electrode consists of two carbon cups or receptacles, fitting into each other, and opening in opposite directions, which are separated by a space in which is located a second electrode opposed to the faces of the others. A connecting piece between the cups, and connected with both, serves as a support for the electrode.—G. H. R.

Electric Furnace. [*Dry Electrolytes.*] H. N. Potter, New Rochelle, N.Y., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 715,505, Dec. 9, 1902.

THE specification deals with improvements in an electric furnace described in a former patent, No. 652,640 of 1900, in which the main source of heat is an electrolytic tube composed of a mixture of dry electrolytes, and supplied with terminals for conveying electric current to the tube, which is kept in a state of incandescence by it after a preliminary heating by external means. A jacket of some relatively poor conducting material may be one of the components of the tube. The improvements consist in various arrangements for preventing the current from flowing unevenly owing to differences in specific resistance of the tube. —G. H. R.

Electric Furnace. [*Carbon Tube.*] H. N. Potter, New Rochelle, N.Y., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 715,506, Dec. 9, 1902.

THE main body of the furnace consists of a carbon tube with conical ends, on which fit flaring carbon terminals with a sloping outer surface, surrounded by metallic ring terminals, adapted to fit the slope of the former. The joint between the metallic and carbon terminals is tightened by means of a metallic ring on the opposite side of the slope from the metallic terminal, through which two or more screws or bolts pass into the ring. The tube is lined and coated with magnesia, and has a jacket of calcium oxide surrounded by a glazed stoneware tube interposed between the exposed portion of the terminal and the carbon tube, and a removable hygroscopic stuffing ring is provided to take up atmospheric moisture before it reaches the jacket. —G. H. R.

Furnace; Tubular Electric ——. [*Carbon Collars.*] H. N. Potter, New Rochelle, N.Y., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 715,507, Dec. 9, 1902.

THE furnace has a conducting tube of carbon, surrounded at intervals along its length by supporting collars extending at right angles to it, and formed alternately of jacketing material, such as magnesia, and of carbon, the latter extending through the former, and the whole being surrounded by a finishing tube.—G. H. R.

Electric Furnace. [*Rotating Carbon Tube.*] H. N. Potter, New Rochelle, N.Y., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 715,508, Dec. 9, 1902.

THE furnace has a main fixed tube within which is an inner rotatable carbon one, lined with magnesia or the like, the space between the tubes being filled with a stationary inert gas. A number of supporting collars surround the tube, which is supplied with water-cooling devices.—G. H. R.

Carbon-Tube Furnaces; End Support and Circuit Terminal for ——. H. N. Potter, New Rochelle, N.Y., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 715,509, Dec. 9, 1902.

EACH end of the carbon tube, which forms the main portion of the furnace, is surrounded by a terminal carbon ring, the outer surface of which slopes in opposite directions, and is surrounded by metallic ring terminals clamped against it by bolts passing through a metallic diaphragm clamped between an outer casing and a front plate, an insulation being interposed between the casing and the diaphragm, and an elastic support is thus provided for the furnace as a whole. A perforated end plate gives access to the furnace. —G. H. R.

Carbophosphide of Calcium. C. S. Bradley, Avon, N.Y., and R. H. Read and C. B. Jacobs, East Orange, N.J., Assignors to the Ampere Electro-Chemical Co., East Orange, N.J. U.S. Pat. 716,182, Dec. 16, 1902.

QUICKLIME, calcium phosphate, and carbon are mixed together and heated in an electric furnace, when a reaction proceeds on the following lines:—

$$2CaO + Ca_3(PO_4)_2 + 16C = Ca_5C_6P_2 + 10CO.$$

The product is a homogeneous, stable, fused mass, which yields a spontaneously inflammable mixture of acetylene, and gaseous and liquid phosphine, when treated with water.—F. H. L.

Chlorates; Manufacturing ——. R. Threlfall, Birmingham. U.S. Pat. 716,789, Dec. 23, 1902.

THE electrolyte from which the chlorates and perchlorates of the alkali metals are to be derived, is subjected to unequal electrolytic action at the anode and main cathode respectively, the action at the former being the greater. The excess quantity of current is diverted to a subsidiary vessel containing a cathode and an electrolyte, and an alkaline solution is produced there simultaneously with a corresponding amount of chlorine in the main electrolyte. —G. H. R.

Caustic Soda; Apparatus for Producing ——, *by Electrolysis.* E. A. Allen, Rumford Falls, Mo., and H. K. Moore, Lynn, Mass., Assignors to Moore Electrolytic Co. U.S. Pat. 716,804, Dec. 23, 1902. (See Eng. Pat. 4269 of 1900; this Journal, 1900, 1111.)

THE covered cell comprises a receptacle forming the anode compartment, and having end walls, which are connected at their upper portions by longitudinal side strips, leaving the sides open. A porous diaphragm is stretched across each of the open sides. A cathode, formed of a layer of metal having pores to receive and hold a considerable body of liquid by capillary action, is outside the diaphragm, and has its lower edge folded under the bottom of the receptacle, which rests on an inclined flat metallic plate in electrical connection with it and the folded part of the cathode. The various parts are so arranged that the whole of the undecomposed electrolyte is confined within the receptacle, percolates through the diaphragm, and is decomposed, and the caustic soda solution formed, gravitates down the cathode to the plate and flows off it.—G. H. R.

Insulating Metallic Surfaces or Wires. J. A. Heany, Philadelphia, Pa., Assignor to the Teter-Heany Developing Co. U.S. Pat. 715,798, Dec. 16, 1902.

See Eng. Pat. 17,741, 1902; this Journal, 1902, 1282.
—J. W. H.

French Patents.

Batteries; Primary ——. Bazin. Fr. Pat. 320,066, March 29, 1902.

Within a cylindrical cell is a lining of zinc, and at some distance concentrically within this a smaller cylinder of zinc. Within the annular space between the two zinc cylinders are four carbon plates disposed symmetrically, and within the inner cylinder is another similar carbon plate. The space around the carbons, in both the annular and the centre compartments, is filled with a depolarising mixture (preferably of graphite, manganese dioxide, and powdered gas-carbon), enclosed within a suitable fabric, and prevented by elastic bands from touching the zincs. The exciting liquid consists of manganous chloride, hydrochloric acid, ammonium carbonate, and ammonium chloride, preferably in the proportions 350:15:100:100. The two zincs are connected, as are also, but independently, all the carbons.—W. G. M.

Dry Piles; Prevention of Movement of Exciting Liquids in ——. E. Mors. Fr. Pat. 320,098, April 1, 1902.

The exciting liquid is mixed with dried cellulose (desiccated sawdust, wood- or paper-pulp, or the like) and plaster.
—W. G. M.

Lime, Cement, Plasters, &c.: [Electric] Process and Apparatus for the Manufacture of ——. F. Clerc and M. Koechlin. Fr. Pat. 320,256, April 7, 1902.

See under IX., *page* 95.

Carbon Chlorides; Decomposition of ——, *into Chlorine, Carbon, and other Chlorides of Carbon.* Soc. Anon. d'Études Électro-chimiques. Fr. Pat. 320,269, April 8, 1902.

Tetrachloride of carbon, either liquid or gaseous, is led into a glass or porcelain vessel, where it is subjected to the action of the electric arc playing between platin-iridium terminals. The result is the formation of chlorine, and a mixture of different chlorides of carbon carrying carbon in suspension. This liquid, after cooling, is filtered, and may then be re-treated.—W. G. M.

(B.)—ELECTRO-METALLURGY.

Calcium; Production of Metallic ——. W. Borchers and L. Stockem. Zeits. f. Elektrochem., 1902, 8, [52], 938.

The authors point out that the processes described by Ruff and Plato (this Journal, 1902, 1458), and by Arndt (this Journal, 1902, 1459), are inferior to their own (this Journal, 1902, 1284), inasmuch as the high temperature of the fused bath employed by the former allows the metallic calcium which is formed to pass into solution as subchloride, thereby diminishing the current output, since the lower chloride, formed in solution in this way, is subsequently chlorinated at the anode.—J. S.

Metals; Etching of ——, *by Aid of the Electric Current.* A. H. Sirks. Koninklijke Akad. van Wetenschappen te Amsterdam, 1902, 219—225. Chem. Centr., 1902, 2, [24], 1431.

In the examination of metals and alloys, it is, in many cases, advantageous to prepare etched surfaces by aid of the electric current, characteristic patterns being frequently obtained. The object to be etched serves as anode and a piece of copper plate as cathode, whilst as electrolyte, water faintly acidified with sulphuric acid or, in the case of alloys containing lead, with nitric acid, is used.—A. S.

English Patent.

Zinc; Electrolytic Separation, Deposit, and Refining of ——. H. Paweck, Vienna. Eng. Pat. 1688, Jan. 21, 1902.

See Fr. Pat. 318,163 this Journal, 1902, 1403.
—W. G. M.

United States Patents.

Apparatus: Electrolytic ——. [*Stripping Tin from Scrap Metal.*] J. Matthews, King's Heath, and W. Davies, Selby Park, England. U.S. Pat. 715,281, Dec. 9, 1902.

See Eng. Pat. 21,533 of 1900; this Journal, 1901, 590.
—G. H. R.

Metallic Aluminium or other Metals by Electrolysis; Process of Obtaining ——. G. Taddei, Assignor to the Società Italiana di Applicazioni Elettriche, both of Turin, Italy. U.S. Pat. 715,625, Dec. 9, 1902.

See Eng. Pat. 13,379 of 1901; this Journal, 1901, 1121.
—G. H. R.

Metals by Electrolysis; Apparatus for Obtaining ——. G. Taddei, Assignor to the Società Italiana di Applicazioni Elettriche, Turin, Italy. U.S. Pat. 715,626, Dec. 9, 1902.

The process described in the preceding patent is carried out in an apparatus which comprises three sections, the first, or electrolysing one, of which consists of a vessel into which depend separate tubes fixed at their upper ends in an inner cover, and containing carbon anodes depending from an outer and upper cover. Iron cathodes are arranged between the anodes, and the electrolyte is introduced from an auxiliary vessel. There is a heater beneath the vessel, and a pipe for drawing off the metallic aluminium. From the space between the two covers, two pipes lead to the second or chlorinating section, which is also connected with the first section by a pipe leading from its interior. The vessel is placed over a heater, and is divided transversely into two covered chambers, each having a perforated bottom some distance above the imperforate one, and pipes entering into the interspace. A hopper supplies material to the two chambers, and pipes lead from their upper parts to the third or substituting section, which is also divided transversely into two covered chambers, each with a horizontal partition extending part way across it. Pipes connect it with the other two vessels, and at the bottom of the chambers are draining outlets, and a pipe which carries off the gases to the heaters of the two other chambers.
—G. H. R.

Zinc and Substances Containing Silicic Acid; Working ——, *in Electric Furnaces.* A. Dorsemagen, Wesel, Germany. U.S. Pat. 716,008, Dec. 16, 1902.

See Eng. Pat. 16,122, April 7, 1901; this Journal, 1902, 917.—G. H. R.

Metals and Alloys for Lithographic Purposes; Process of Electrolytically Preparing ——. O. C. Strecker, Cologne, Germany. U.S. Pat. 716,366, Dec. 16, 1902.

The plate is prepared by a preliminary grinding, rinsing and subjecting to the action of an acidulated watery solution. It is then washed and dried, and the negative fixed on the surface thus prepared, and coated with gum arabic. When the latter is dry, the plate is treated with "lithopine" to dissolve the greasy substance, after which the gum arabic is washed off with water, and the plate dusted with "colophane," which is afterwards washed off, and the plate is submitted as an electrode to electrolytic action in a solution of salts and gum arabic. (See also Eng. Pat. 2224 of 1902; this Journal, 1902, 775.)—G. H. R.

French Patents.

Steel; Direct Production of ——, *in the Electric Furnace.* Electric Furnace Co. Fr. Pat. 320,112, April 1, 1902.

See Eng. Pat. 7660, 1902; this Journal, 1902, 915.
—J. H. C.

Lead and Lead Alloys; Electrolytic Refining of ——.
A. G. Betts. Fr. Pat. 320,097, April 1, 1902.

See Eng. Pat. 7661 of 1902; this Journal, 1902, 980.
—W. G. M.

Electrolytic Deposits; Apparatus for the Production of ——.
P. Hubert. Fr. Pat. 320,351, April 11, 1902.

An axially-mounted metallic barrel (preferably made of the metal to be deposited) closed at each end with a perforated plate of wood, forms the cathode. The anode, the surface of which may be extended by means of ribs, or otherwise, is attached concentrically upon one of the wooden end-plates, and makes electrical connection through the axial shaft. The electrodes are prevented by a porous non-conducting fabric from short-circuiting through the objects which are being coated. A door is provided for the introduction of the goods to be plated. The electrical connection with the cathode is outside the cylinder. In another form the rotating vessel is made conical or cylindrical, and rotates upon an inclined axis, the anode being stationary within it, held by a support admitted through the upper end of the inclined drum, which is left open. The containing vessel may be used as the anode, in which case it is of perforated wood, lined with plates of the metal undergoing deposition.—W. G. M.

Electrolysis; Deposition of very Dense, very Adherent, and very Homogeneous Metal by ——.
Soc. G. Langbein et Cie. Fr. Pat. 320,553, April 10, 1902.

See Eng. Pat. 7995, 1902; this Journal, 1902, 917.
—W. G. M.

Calcium Phosphates; Treating [Electrical] —— to obtain Iron Phosphide and the Phosphides of similar Metals.
G. Gin. Fr. Pat. 320,258, April 7, 1902.

Calcium phosphate, tribasic or otherwise, is heated in an electric furnace with iron and carbon, and with an agent, such as silica, or the sulphur supplied by iron pyrites, capable of forming a compound with the calcium, stable at the temperature of the furnace, in order to produce an iron phosphide ("ferro-phosphore"). The same process is applicable for obtaining phosphides of other metals of the iron group, as well as that of copper. (See also Fr. Pat. 316,772; this Journal, 1902, 1541.)—E. S.

XII.—FATS, OILS, AND SOAP.

Olive Oil; Mixed Glycerides in ——. *III.* D. Holde.
Ber., 1902, **35**, [20], 4306—4310.

In previous communications (this Journal, 1901, 1003; 1902, 126) the author gave an account of the mixed glyceride $(C_{15}H_{33}O_2).C_3H_5(C_{17}H_{33}O_2)_2$ which he had isolated from olive oil. He has since prepared a crystalline chloriodo addition compound which crystallises in white bunches and melts at 24°—25° C., or 20° lower than Henriques and Künne's chloriodo-distearin (this Journal, 1899, 377,693). The chlorine and iodine determined by Carius' method agreed with the formula $(C_{17}H_{33}O_2)_2.C_3H_5(C_{18}H_{33}IClO_2)$.

The amount of oleodimargarin (m. pt. 30° C.) separated by chilling different olive oils was only trifling, and no other solid glycerides could be separated even by cooling an ethereal solution of the oil to a very low temperature. Various authorities, however, have stated that olive oil contains more than 20 per cent. of solid fatty acids, and the author has also separated considerable quantities by treatment of the lead salts with ether. Hence it would appear that the solid fatty acids are present not as triglycerides but as mixed glycerides, fluid at the ordinary temperature, and containing 1 mol. of solid fatty acid and 2 mols. of oleic acid. This conclusion was supported by experiment. Thus on cooling an ethereal solution of olive oil to −50° C. to separate all solid glycerides, only 1·5 per cent. of a white crystalline deposit (m. pt. 30° C.) was obtained. Since tripalmitin melts at 55° C. and trimargarin would have a melting-point of at least 50° C., both of these, if present, would have separated before the oleodimargarin. On continuing the cooling of the solution to −60° C., a large quantity of a gelatinous deposit was obtained, which liquefied again on the filter far below 0° C. It was found to contain 15·6 per cent. of solid fatty acids, and was judged to consist of a mixture of triolein with a glyceride containing 2 mols. of oleic and 1 mol. of a saturated fatty acid.

On purifying the impure oleodimargarin separated, by repeated crystallisation from an ethereal solution at −40° C., and evaporating the nearly colourless final mother liquor, a viscous oil resembling castor oil was obtained, two samples of which gave iodine values of 64 and 59. (Theory for margarodiolein = 58·3, and for palmitodiolein = 59·2.) Further examination of these compounds gave results corresponding with a compound containing 1 part of solid to 2 parts of liquid acids. The chloro-iodo compound of this glyceride was oily at the ordinary temperature, and could not be obtained in crystalline form. On exposure to the light, traces of iodine were split off from it, as was also the case with the similar compound of oleodimargarin. The mother liquor from the first recrystallisation of the oleodimargarin contained triolein with iodine value 83·1. (Theory = 86·2.)

The solid fatty acids of oleodimargarin were further compared with daturic and synthetic margaric acid. From the latter an ethyl ester (m. pt. 24°—25° C.) was prepared, whilst according to Gérard the ethyl ester of daturic acid melts at 27° C. The ester prepared from the solid fatty acids in the oleodimargarin melted at 24° C. When fractionally crystallised from dilute alcohol, most of the fractions melted at 23°—24° C. or 24°—25° C. The first fraction, however, about $\frac{1}{10}$th of the whole, melted at 30° C. Hence the author considers it possible that a small part of the oleodimargarin may contain another solid fatty acid with the same formula, $C_{17}H_{34}O_2$.

Henriques (Zeits. angew. Chem., 1897, 368) asserted that errors were caused in the determination of the molecular weight of higher fatty acids through the formation of esters on merely boiling their alcoholic solution. The author, however, has never found this to be the case, and describes an experiment with palmitic acid to prove that such esters are not formed on evaporating an alcoholic solution of fatty acids.—C. A. M.

Cotton-seed Oil; Halphen's Test for ——. E. Fulmer.
See under XXIII., *page* 113.

Sesamé Oil; Iodine Value of ——. J. J. A. Wijs.
See under XXIII., *page* 114.

Oil of Sambucus Racemosa. J. Zellner.
Monatsh. f. Chem., 1902, **23**, [9], 937—941.

The ripe berries of *Sambucus racemosa* contain a small proportion of oil which is used as a food in many places, *e.g.*, Obersteiermark. This oil is obtained by first crushing the berries in the hand and expressing the juice in a small press, then boiling the juice and removing the fat that rises to the surface. As thus obtained, the oil is of a deep reddish-yellow colour, but the colouring matter can be partially removed by treatment with animal charcoal. The solidification point is 3° to 4° C., whilst if left for a long time at 15° C. the oil yields a crystalline deposit, probably consisting of tripalmitin. It is a non-drying oil. A sample prepared by the author in the manner described above had the following physical and chemical characteristics:—Sp. gr. at 15° C., 0·9171; refractive index at 20° C. with sodium light, 1·472; acid value, 3·15; saponification value, 196·8; acid value of fatty acids, 204·8; mean molecular weight of fatty acids, 273·4; melting point of fatty acids, 43° C.; Reichert-Meissl value, 1·8; Hehner value, 95·0; acetyl-acid value, 195·7; acetyl value, 15·5; mean molec. weight of acetylated acids, 286; melting-point of acetylated acids, 47°—49° C.; iodine value (Hübl), 89·5; iodine value of fatty acids, 93·0.

When treated with sodium hydroxide, the oil yielded a light yellow soap. With nitric acid (1·33 sp. gr.) it gave a green coloration and then became colourless; and with sulphuric acid (sp. gr. 1·635) it gave a green colour, changing to brown.

The liquid fatty acids separated in the usual way amounted to about 71 per cent. of the total insoluble fatty acids. They had a saponification value of 188·2 and an iodine value of 120·4. Examined by Hazura's oxidation method, they were judged to consist of about two-thirds of oleic acid, with (probably) linoleic acid. Linusic or isolinusic acid were not identified.

The solid fatty acids melted at 65° to 70° C., and had a saponification value of 220 and an iodine value of 2·65. By fractional precipitation with magnesium acetate they were separated into 14 fractions, of which the first two (m. pt., 70° C.) consisted, in the main, of arachidic acid. The fractions 6—10 melted between 59 and 63° C., and when united and re-precipitated were found to consist principally of palmitic acid. The presence of stearic acid was not definitely ascertained. The last fractions contained traces of liquid fatty acids and a small quantity of a fatty acid of lower molecular weight, which was not identified.

From the high acetyl value the author inferred the presence of hydroxy acids.—C. A. M.

Lemon Pips: The Fatty Oil of ——, *and Limonin.* W. Peters and G. Frerichs. Archiv der Pharm., 1902, **240**, [9], 659—662.

When dried and ground lemon pips are extracted with light petroleum spirit, a pale yellow, fatty oil is obtained, with a bland flavour, like that of almond oil. The chemical constants of this oil are as follows:—Iodine value, 109·2; saponification value, 188·35; acetyl-acid value, 195·8; acetyl value, 13·65.

The investigation of this oil and the oxidation of the fatty acids by permanganate showed it to be composed of the glyceryl esters of palmitic, stearic, oleic, linolic, linolenic, and isolinolenic acids.

Limonin, $C_{22}H_{26}O_7$, the bitter principle of lemon pips, is obtained by boiling the residue, after the extraction of the oil, with alcohol. The limonin is obtained from the alcoholic filtrate, and is purified by dissolving the crude product in hot alcoholic potash and re-precipitating by acid. Limonin crystallises in colourless lustrous scales, melting at 275° C. It dissolves in concentrated sulphuric acid with a blood-red coloration. Limonin is extremely indifferent to reagents; it contains no methoxyl or phenolic groups; it is not decomposed by aqueous or alcoholic potash, and shows considerable resistance to the action of ordinary oxidising agents.—J. F. B.

English Patents.

Fats and Oils, particularly Cocoa-nut Oil; Purification of ——. C. Fresenius, Offenbach a M., Germany. Eng. Pat. 19,171, Sept. 1, 1902.

The free fatty acids are removed by treating the fats with alkalis or alkaline earths under a slight pressure (say 2 to 3 atmos.), which causes a rapid separation of the soap emulsion. A small proportion of pure fresh carbon or of a body with similar properties is added with the alkali to protect the fat from the effect of heat, oxidation, or decomposition products formed by the alkalis.—C. A. M.

Cleansing Compound for Removing Sulphurous and Carbon Deposits from Painted, Varnished, and Polished Wood Surfaces: New and Improved ——. J. C. Matthew, London. Eng. Pat. 21,107, Sept. 27, 1902.

One part of white dextrin and one part of sucrose are added to a mixture of 6 parts by volume of a 5 per cent. solution of antimony chloride, and 5 parts by volume of methylic alcohol. Then 8 parts of yellow rosin are melted, and to it are added 33 parts by volume of linseed or other vegetable oil, and 7½ parts by volume of 5½ per cent. acetic acid, and the whole is boiled and stirred for eight minutes. This mixture is allowed to cool, the former mixture is added to it gradually, and the whole is stirred until a uniform thick brown emulsion is obtained.—M. J. S.

French Patent.

Oil from Olive Marcs and Oleaginous Grains: Apparatus for Extracting ——. J. P. de Gracia. Fr. Pat. 320,311, April 9, 1902.

The apparatus consists of a vertical iron cylinder divided into two compartments horizontally by means of a diaphragm. The material is extracted in the lower compartment by means of a suitable solvent heated by steam under pressure. The solvent is then forced into the upper compartment, where it is evaporated from the oil by means of steam pipes, the evaporation being accelerated by a special arrangement of pipes communicating with the lower compartment through openings in the diaphragm.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

English Patents.

White Lead; Improved Method of Manufacturing ——. G. T. Hyde, London. From The Union Lead and Oil Co., New York. Eng. Pat. 19,979, Sept. 12, 1902.

See U.S. Pats. 709,954 and 709,955, Sept. 30, 1902; this Journal, 1902, 1337.—M. J. S.

White Lead; Improved Method for Producing ——. G. T. Hyde, London. From The Union Lead and Oil Co., New York. Eng. Pat. 19,980, Sept. 12, 1902.

See U.S. Pats. 709,956 and 709,957, Sept. 30, 1902; this Journal, 1902, 1337.—M. J. S.

United States Patents.

Antifouling Paint. T. H. Denney, Cape Charles, Va., Assignor to J. Whitehead and J. B. Jones, Cape Charles, Va., and J. F. Bussells, Irvington, Va. U.S. Pat. 715,763, Dec. 16, 1902.

Seventeen lb. of mercury are mixed with 25 lb. of melted tallow, and the cooled mixture is added to a blend of 128 lb. of ochre, 8 galls. of linseed oil, and 2 galls. of Japan driers. The resulting thick paste requires the addition of 25 lb. of red lead just before use.—M. J. S.

Coating Ships' Bottoms and other Objects; Method of ——. A. P. Cuthriell, Assignor to C. A. McLean and H. L. Maynard, Portsmouth, Va. U.S. Pat. 716,678, Dec. 23, 1902.

An anticorrosive composition of ferric oxide, zinc oxide, shellac varnish, linseed oil, turpentine, and oil of pine-tar is applied, which coating is thoroughly dried and then followed by an antifouling composition of Venetian red, shellac varnish, linseed oil, red precipitate of mercury, and arsenious acid.—M. J. S.

French Patent.

Lead Pigments; Manufacture of ——. A. C. J. Charlier. Fr. Pat. 320,585, April 22, 1902.

See Eng. Pat. 5637, March 7, 1902; this Journal, 1902, 1285. —M. J. S.

(*B.*)—RESINS, VARNISHES.

English Patent.

Varnishes; Impts. in ——. G. Tüschel, Odessa. Eng. Pat. 20,933, Sept. 25, 1902.

The following compositions for special purposes are claimed. They are of similar nature to those already described in Eng. Pats. 9983 (1899), 14,308 (1899), 23,155 (1901); this Journal, 1902, 263.

(1) *Furniture Varnish or Polish.*—20 grms. of Sumatra gum benzoin, 12 grms. of lump camphor, 10 grms. of sulphuric ether, 800 grms. of methylated spirit of 95 .

(2) *White Rapid Polish.*—180 grms. of bleached shellac, 20 grms. of Sumatra gum benzoin, 12 grms. of camphor, 10 grms. of ether, 800 grms. of methylated spirit.

(3) *Varnish for Pianos and Billiard Tables.*—120 grms. of ruby shellac, 120 grms. of sandarac, 50 grms. of Venice turpentine, 30 grms. of gum mastic, 10 grms. of lavender oil, 12 grms. of camphor, 5 grms. of ether, 700 grms. of methylated spirit.

(4) *Varnish for Wood Carvings.*—200 grms. of sandarac, 20 grms. of French colophony, 80 grms. of bleached shellac,

grms. of French gallipot, 20 grms. of gum benzoin, grms. of camphor, 30 grms. of ether, 580 grms. of ethylated spirit.

(5) *Varnish for Oil Paintings.*—125 grms. of ground hite shellac, 130 grms. of sandarac, 45 grms. of Venice rpentine, 25 grms. of gum benzoin, 20 grms. of French allipot, 15 grms. of camphor, 10 grms. of lavender oil, 50 grms. of methylated spirit.

(6) *Varnish for Mirrors.*—200 grms. of sandarac, 00 grms. of gum mastic, 200 grms. of ether, 140 grms. of benzin," 50 grms. of ochre.

(7) *Gilders' Varnish.*—75 grms. of ruby shellac, 75 grms. f sandarac, 5 grms. of sandal wood extract alcholic solution, 40 grms. of dissolved rubber, 5 grms. of dragon's lood, 800 grms. of methylated spirit.

(8) *Rapid Polish for Carriages.*—180 grms. of ruby hellac, 15 grms. of Sumatra gum benzoin, 12 grms. of amphor, 10 grms. of ether, 800 grms. of methylated spirit.

The dry materials are ground together; the ether and pirit are mixed and added to the solids; the mixture is llowed to stand for five or six hours, then filtered, let stand or three days, and bottled for use.—M. J. S.

United States Patent.

Printers' Varnish and Ink; Manufacture of ——. A. G. Wass. London. U.S. Pat. 716,318, Dec. 16, 1902.

See Eng. Pat. 6061, March 22, 1901; this Journal, 1902, 1032.—M. J. S.

French Patents.

Varnish; Waterproof and Antiseptic ——. F. Dubalen. Fr. Pat. 320,486, April 18, 1902.

Stockholm tar neutralised partially or completely with an alkali and mixed with ordinary rosin forms a kind of soap soluble in oil of turpentine or petroleum. This solution serves as a varnish which may either be employed alone or mixed with pigments.—M. J. S.

Varnishes; Manufacture of ——. E. H. Strange, E. Graham, and E. R. Burrell. Fr. Pat. 320,630, April 24, 1902.

See U.S. Pat. 708,935, Sept. 9, 1902; this Journal, 1902, 1239.—M. J. S.

(*C.*)—INDIA-RUBBER, &c.

Para Caoutchouc; Chemistry of ——. *II.* C. Harries. Ber., 1902, **35**, [20], 1429—1431.

In his former research on this subject (this Journal, 1901, 1123; 1902, 1404) the author found that by the action of nitrous acid upon caoutchouc, a substance termed "Nitrosite c" was formed. He has now definitely ascertained that this has the formula $(C_{10}H_{15}N_3O_7)_2$ and not $(C_{10}H_{16}N_3O_7)_2$.

He now prepares this substance by covering 5 grms. of purified caoutchouc with 200 c.c. of benzene, and introducing a rapid current of nitrous acid gas the next day. After standing for yet another day, the resulting yellow product becomes turbid and soluble in acetic ether. It is pressed, washed with benzene, taken up with 50 c.c. of acetic ether, and the solution saturated with nitrous acid gas, the reaction being usually complete in a day. The liquid is then evaporated on the water bath at 30 C. and the residue poured into about 400 c.c. of absolute ether. In this way preparations (8 to 9 grms.) of constant composition are obtained. The molecular weight was found to be 561·5 as against the theoretical value 578. The molecular weights formerly found are stated to be too high.

It was also stated in the former paper that during the reaction with the nitrous acid gas, an insoluble normal nitrosite $(C_{10}H_{16}N_2O_3)_x$ was formed, and that on long contact with excess of nitrous acid this was decomposed into $\frac{x}{2}$ $(C_{10}H_{15}N_3O_8)_2$. Further experiments have shown, however, that this "Nitrosite b" was probably formed by the oxidation of the compound $C_{10}H_{15}N_3O_7$ by means of nitrosyl chloride produced by drying the nitrous acid with calcium chloride and phosphorus pentoxide.

In fact it has now been established that Para caoutchouc $(C_{10}H_{16})$ under definite conditions forms only one nitro-compound,—$\frac{x}{2}(C_{10}H_{15}N_3O_7)_2$, which is probably a derivative of a diterpene (dimyrcene).—C. A. M.

India-Rubber in Cape Colony, South Africa. C. F. Juritz. Report of the Senior Analyst, Cape of Good Hope, for the year 1901, 61.

A small sample of latex, stated to have been derived from the "Untombe" tree, was found to have a sp. gr. of 1·012. A part of the sample had already coagulated, but the liquid portion contained 19·07 per cent. of rubber.
—A. S.

India-Rubber Latex; Coagulation of ——. C. O. Weber. Gummi-Zeit., 1902, **17**, [12], 252.

H. Lecomte observes that the latex of *Landolphia Heudolotii* is not coagulated by mercuric chloride. (Bull. de la Soc. d'Et., Col., 1902, 677.) As this would indicate the absence of albuminous bodies, the author discredits the observation.

The aliphatic alcohols precipitate rubber in inverse proportion to their molecular weights. Thus taking the amount precipitated by methyl alcohol as 100, ethyl alcohol precipitates 48 parts, propyl alcohol 23 parts, isobutyl alcohol 16, and amyl alcohol 9 parts.—R. L. J.

Hot Vulcanisation; Influence of Litharge upon ——, C. O. Weber. Gummi-Zeit., 1903, **17**, [14], 296.

It is known that certain varieties of caoutchouc do not become properly vulcanised from the technical point of view when treated with sulphur only, but do so readily if a considerable proportion of litharge is present during the process. Yet analysis shows that the former materials have taken up as much, and sometimes more, sulphur than the latter. Moreover, if caoutchouc is rolled hot with a quantity of litharge larger than is generally used in practice, the material behaves normally at first, but soon becomes so hard and brittle that the operation must be discontinued for fear of accident to the machine. However, the action of the litharge is only to make the rubber brittle; its elasticity, indifference to changes in temperature, and behaviour to solvents is not altered. Specimens of rubber which do not yield useful products when treated with sulphur only are said to vulcanise badly or not at all in the trade, but these expressions must be understood from the practical standpoint alone.

The action of litharge upon caoutchouc is not a chemical one, for a product hardened with litharge only can be separated into its constituents by treatment with solvents. Normal compounds of lead do not produce a similar effect; but other basic oxides, zinc oxide, magnesium oxide, calcium oxide and hydroxide in particular, resemble lead oxide in yielding materials of special hardness when heated with rubber and sulphur. The phenomenon is probably one of polymerisation. Rubber is a substance which is very prone to break down into bodies of lower molecular weight, even under the influence of weak chemical reagents; for instance, the fact that long-continued rolling gives a material deficient in permanency may be explained by the assumption that the molecule has decreased in size. Conversely, therefore, the litharge present during hot vulcanisation may determine polymerisation, and so add to the practical utility of the goods. The suspended particles in the crude rubber milk are not caoutchouc in the ordinary sense of the term, for they are liquid; but when polymerised, either by chemical or physical means, they change into the substance which is usually denominated "caoutchouc."—F. H. L.

Recovered India-Rubber. C. O. Weber. The India-Rubber J., 1902, **24**, [12], 565.

The author has previously pointed out that the value of recovered rubber depends entirely upon the restitution to the waste rubber of a more or less perfect plastic condition. This condition is brought about by, and is dependent upon, the presence of oils in the recovered product. Recovered rubber made plastic by the presence of these oils, however, is not a suitable material for many purposes, and this is especially the case in the manufacture of spread rubber goods. When recovered rubber is treated with an organic solvent capable of removing the oil, the rubber at once reverts to a condition, very little, if any, different from that of ground rubber waste, and consequently when such rubber is employed in mixings to be used on spreading machines, these mixings, after being run on the gauges for some time, always become "crumby," the plasticity of the recovered rubber having been destroyed owing to the solution of the oil by the action of the rubber solvents of the "dough." To obtain a product capable of giving satisfaction when employed for "proofing" purposes, it would therefore appear to be necessary to discover either an oil, or a substitute for oil, which is insoluble in the ordinary technical rubber solvents, or a recovery process in which oils are not used.—A. S.

India-Rubber Thread. C. O. Weber. The India-Rubber J., 1902, **24**, [11], 517.

The author recently observed a sample of india-rubber thread, obtained from a piece of elastic web, to be covered with a fine whitish deposit, the latter consisting of somewhat irregular, semi-transparent flakes, melting at about 40° C. By extracting a fairly large quantity of the threads with acetone for several hours, a considerable amount of this deposit was obtained (12 per cent. of the weight of the thread) and it was found to consist of pure paraffin wax.

The author concludes that the paraffin wax is used as a protective coating for the rubber thread which forms the warp of the elastic web If rubber threads be extracted from elastic web, especially if the latter has been in wear for a considerable time, they will frequently show very ragged edges, as if they had been subjected to a series of small lateral cuts or tears. This phenomenon, which is due to the shearing action of the silk or cotton weft on the rubber threads, eventually leads to a number of ruptures of the latter.

By coating the rubber thread or the textile weft, or both, with a lubricant, such as paraffin wax, the friction between the two kinds of threads is considerably lessened, the liability to injury reduced to a minimum, and the life of the web materially lengthened.—A. S.

United States Patents.

Elastic Goods; Method of Moulding ——. F. Daubitz, Rixdorf, and A. Loewy, Berlin. U.S. Pat. 715,462, Dec. 9, 1902.

A mixture of a fatty oil with a sulphur compound, such as sulphur chloride, is cast into moulds immediately before the mass becomes consistent. As there is no appreciable shrinkage, the article retains the exact shape of the mould. (Ger. Pat. 15,985, June 10, 1901.)—C. A. M.

Tyre-Repairing Compound, and Process of Preparing Same. M. McWhorter, Assignor to J. U. Hastings, E. McGary, and F. L. Davies, all of San Francisco. U.S. Pat. 716,083, Dec. 16, 1902.

A "self-sealing" composition for pneumatic tyres. 100 gallons of "asphaltic petroleum," from which all matter volatile at 177° C. has been removed by distillation, is mixed with 2 lb. of crude rubber dissolved in the minimum of carbon bisulphide, the solvent is driven off, the whole cooled to 15° C., and 6 fluid oz. of the essential oil of sassafras added. The latter ingredient is claimed to preserve the fluidity of the composition by preventing the oxidation of the petroleum, so that the rubber is permanently held in solution.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Horn; Hydrolysis of ——. E. Fischer and T. Dorpinghaus.

See under XXIV., *page* 118.

Tanning Materials; Analysis of ——. *New Rules and Alterations in existing Rules of the International Assoc. of Leather Trades Chemists.*

See under XXIII., *page* 114.

United States Patent.

[Japanned] Leather; Imitation ——. G. Youngwitz, New York, U.S.A. U.S. Pat, 715,928, Dec. 16, 1902.

Imitation japanned leather is made by coating linoleum with a mixture of boiled linseed oil (10 lb.), lamp black (10 lb.), naphtha (12 lb.), and suitable driers. This is dried for about 12 hours at 180° F., and a second coating is applied of the same materials, but in such proportions that a more fluid paint is obtained, and when dry is followed by one or more coats of black varnish and naphtha mixed with blacking or other pigment, and finished off with a coat of varnish.—R. L. J.

French Patent.

Shell, Horn, Bone, and Ivory, &c.: Substitute for ——. Soc. Anon. L'oyonnaxienne, Paris. Fr. Pat. 320,133, April 2, 1902.

Commercial gelatin is allowed to digest at the ordinary temperature for 15—18 hours in water containing 4—5 per cent. of formaldehyde, and the insoluble mass thus obtained is washed free of water by means of alcohol, acetone, or ether. It is then incorporated with nitrocellulose (100 kilos.), dissolved in alcohol (100 kilos.) containing 30—50 per cent. of camphor, and after addition of colouring agents, if desired, the homogeneous mixture is made into plates or films, heated and compressed, and finally chilled whilst still under pressure.—R. L. J.

XV.—MANURES, Etc.

Atmospheric Nitrogen: Fixation of ——, *by Alfalfa on ordinary Prairie Soil under various Treatments.* C. G. Hopkins. J. Amer. Chem. Soc., 1902, **24**, [12], 1155—1170.

In order to ascertain why the culture of alfalfa on the prairie soils of Illinois and adjoining states has, in general, been a failure, in spite of the facts that it is capable of drawing upon the soil to great depths for its mineral requirements, and that, as a leguminous plant, it has the power of assimilating nitrogen from the air, the author has carried out experiments on the growth of alfalfa under various conditions. In one series of these a number of pots of prairie soil were sown with equal numbers of seeds, and were treated with manures containing one or more of the following food materials:—lime, nitrogen, phosphorus, and potassium. An exactly similar series of pots was arranged, with the addition that each pot was treated with alfalfa bacteria obtained by shaking up soil from an old alfalfa field in Kansas with water. The results obtained were as follows: The cultures of the uninoculated pots to which no nitrogenous manure had been applied, made comparatively small growth, and indicated, by their appearance, an insufficient supply of nitrogen; the corresponding pots treated with the bacteria gave yields ranging from two and a half to seventeen times the yields from the uninoculated pots. The application of nitrogen produced a very marked increase in the yields, which were still further augmented by the bacteria. Phosphorus or potassium without bacteria or nitrogen are of no value to the plant, but under the most favourable conditions the yields in pounds per acre were increased from 1,760 without, and 2,080 with bacteria, to 2,560 and 3,520 respectively, by the addition of phosphorus. The application of potassium increased the greatest yield from 3,040 to 3,520 pounds per acre. There is evidence that part of the value of the phosphorus and potassium is due to the increased growth of bacteria which they give rise to.—T. H. P.

XVI.—SUGAR, STARCH, GUM, Etc.

Bone Charcoal; Determination of Calcium Sulphide in ——. A. Rossing.

See under XXIII., *page* 112.

Sugars; Importance of the β-Naphthylhydrazones of the ——, *for their Detection and Separation.* A. Hilger and S. Rothenfusser.

See under XXIV., *page* 117.

English Patents.

efined Sugar; Impts. relating to the Treatment of ——. H. Passburg, Moscow. Eng. Pat. 17,175, Aug. 2, 1902.

E U.S. Pat. 713,916; this Journal, 1902, 1546.

—T. H. P.

overing and Drying of Sugar in Moulds; Impts. in and relating to the ——. H. Passburg, Moscow. Eng. Pat. 17,178, Aug. 2, 1902.

this process the sugar moulds are secured to a rotating llow shaft so that they either hang from, or rest upon, it. This tube is connected with a suction pump, and troughs, placed under the moulds, allow the liquor used as covering material to be drawn off. One form of the apparatus is shown in longitudinal section in Fig. 1 and in cross section in Fig. 2, and is used in the following manner:—The filled moulds are suspended from the rotating pipe *a* (Fig. 1), and the trough *m* (Fig. 2), containing the covering liquor, placed below them. The suction pump connected with *a* is then set in action, the covering juice being thus drawn into the moulds; the yellow discharge syrup is expelled into the tube *a*, from which it is led to a reservoir. When all the covering liquor has been removed in this way from the troughs *m*, these are removed, and the moulds rotated until they occupy the position shown by the dotted outline. In a short time the liquoring is complete, and the pipe *a* is then rotated until the moulds occupy their original position. The suction pump being kept in action, hot air is forced through the pipe *n*, and so drawn up through the sugar. When the sugar is dry, cold air may, if necessary, be passed through it.—T. H. P.

Fig. 1.

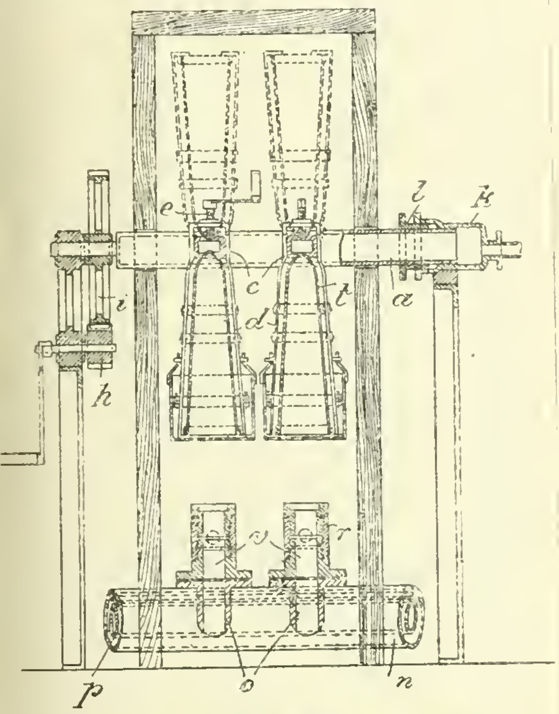
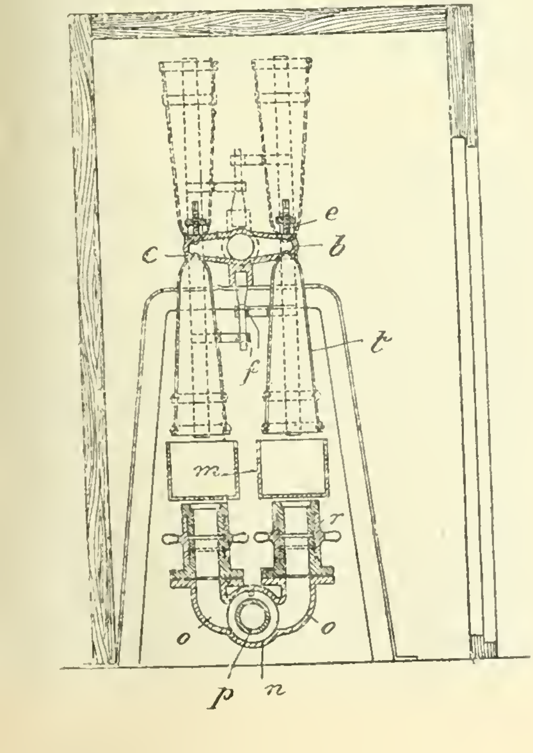


Fig. 2.



French Patents.

Filter giving a High Yield [*Sugar Juices*]. Société Maschinenbau - Actiengesellschaft vormals Breitfeld, Danek und Co. Fr. Pat. 319,539, March 13, 1902.

An apparatus for filtering liquids, especially sugar juices, in which the filtering vessel is provided with a series of horizontal pipes, 7, arranged a small distance apart in a vertical plane (see Figs. 1 and 3) passing down the middle of the vessel. Each tube has in it a longitudinal slot or opening 14, (Fig. 1), preferably at the bottom, and receives by either one or both of its open ends the liquid to be filtered, which is then distributed, by means of the slots, at a low, uniform speed on to the filtering layers supported by the

Fig. 1.

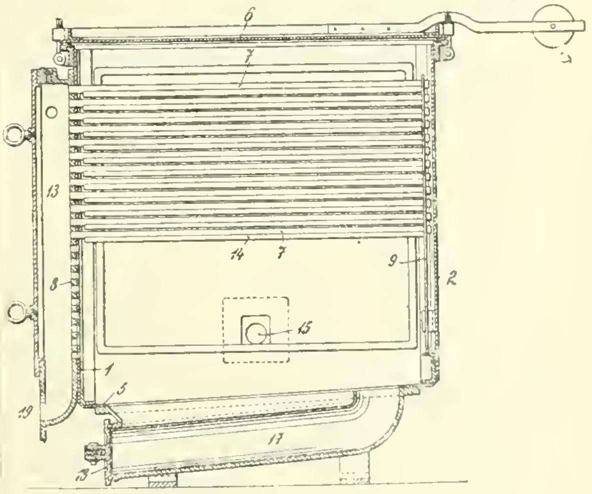
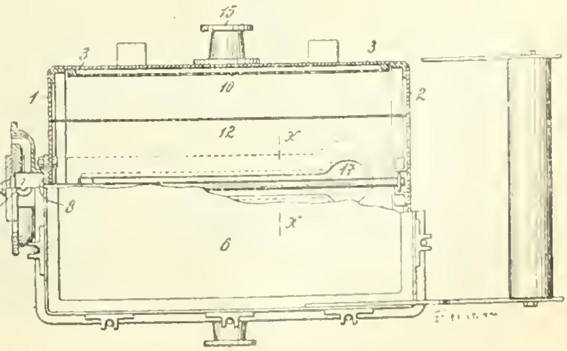
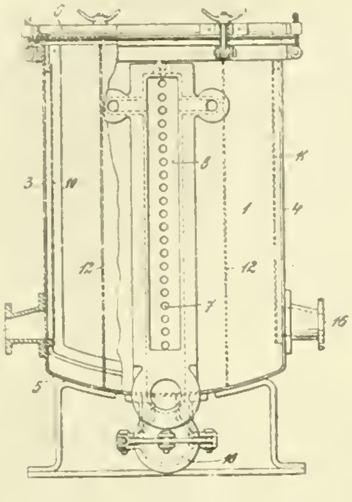


Fig. 2.



perforated plates 12, 10, and 11 (Figs. 2 and 3). The filtered liquid flows away through the apertures, 15 and 16,

FIG. 3.



and the sand or other filtering material may be removed, when necessary, by way of the pipe 17 (Figs. 1 and 2).
—T. H. P.

Sugar-Refining; Process of ——. Federal Refining Company. Fr. Pat. 320,274, April 8, 1902.

ESSENTIAL oils, resins, &c., are treated with sulphuric acid; the sulpho-bodies thus obtained have the power of removing impurities from sugar solutions, and of still separating easily after agitating with them.—F. S. S.

Separation of Starch from surrounding Liquids: Automatic ——. Morel. Addition, dated March 25, 1902, to Fr. Pat. 300,237 of May 11, 1900.

A CENTRIFUGAL machine is described by means of which starch may be separated from any liquid present.—F. S. S.

XVII.—BREWING, WINES, SPIRITS, Etc.

Pressed Yeast; Validity of Bau's Method for the Detection of Bottom Fermentation Yeast in Stored ——. O. Saare and G. Bode. Zeits. Spiritusind., 1903, **26**, [1], 1—3.

OWING to the fact that some samples of top fermentation pressed [bakers'] yeast were found apparently to contain bottom fermentation [beer] yeast, in spite of assurances to the contrary, the question arose as to whether Bau's method (this Journal, 1895, 289) for the detection of such contamination, based on the different behaviour of the two types of yeast towards raffinose, gives reliable indications in yeast which has suffered by long keeping. The authors undertook a series of determinations by Bau's process on fresh samples of the yeasts in question, and on pure cultures and known mixtures, testing the yeasts from time to time during storage, until they were decomposed. The results showed that there was a slight alteration in the behaviour of the yeasts towards raffinose during storage, in the shape of a small apparent increase in the proportion of bottom yeast. The cause of the change has not been determined, but it might be due to the production of enzymes capable of hydrolysing melibiose either by infecting bacteria or in the process of "auto-digestion" of the decomposing yeast itself. In practice, however, in the detection of adulteration, the slight alteration which takes place has no influence on the validity of Bau's test even if the sample of yeast be fully decomposed, provided that no definite conclusions as to contamination be drawn unless the apparent proportion of bottom fermentation yeast exceed 10 per cent.—J. F. B.

Polysaccharides; Hydrolysis of ——, *by Soluble Ferments.* E. Bourquelot. J. Pharm. Chim., 1902, **16**, [12], 578—584.

THE author refers to his previous paper (see this Journal, 1902, 1251) on the hydrolysis of gentianose and gentiobiose by enzymes. The trisaccharide gentianose consists of one fructose residue combined with two glucose residues. Invertase, as present in top-fermentation beer yeast, splits off the fructose, leaving the two glucose residues still combined in the form of gentiobiose, on which the ferment has no further action. The mixture of ferments from almonds, termed collectively emulsin, has practically no action on gentianose, but completely hydrolyses gentiobiose to glucose. When a mixture of invertase and emulsin is allowed to act upon gentianose, the sugar is hydrolysed to its ultimate components, but the two hydrolyses proceed simultaneously, without any separate stages being discernible, the two ferments acting to all appearances as one enzyme capable of hydrolysing gentianose completely. From this observation the author suggests that all the natural ferments which are capable of hydrolysing complex carbohydrates are mixtures of two or more enzymes complementary to each other, each one acting upon the products of the action of the one before it, the presence of all being necessary for a complete hydrolysis. On this theory the progressive modification of malt-diastase by heating it at temperatures above 63° C. may be explained. Assuming a mixture of several enzymes, the heat at different temperatures above 63° C. successively destroys the enzymes which perform the hydrolysis. The author then proceeds to discuss the theory of "kinases," which have been described as ferments influencing the ordinary known ferments, accelerating and intensifying their action. In view, however, of the above combined relation of invertase and emulsin towards gentianose, it is important, before adopting this view of "kinases," to be absolutely certain that the substance added as a "kinase" does not contain an enzyme which is complementary to the one under investigation, towards the substance to be hydrolysed. A similar instance of complementary ferments is found in the case of the hydrolysis of starch by saliva. The latter contains only amylase by which the starch is hydrolysed to maltose and dextrin, and no further. But if intestinal juice be added together with the saliva, the hydrolysis is far more complete, because this juice contains the enzyme maltase complementary to amylase and capable of converting the maltose produced by the latter into glucose. Similarly, the liquid from cultures of *Aspergillus* contains all the necessary amylo-hydrolytic enzymes, and, in addition, maltase, and is thus able to bring about the complete hydrolysis of starch paste.
—J. F. B.

Lactic Acid Bacteria; Industrial ——. M. W. Beijerinck. Zeits. Spiritusind., 1902, **25**, [50—52], 530—533, 541—544, and 550—553.

THE "active" lactic acid bacteria, *i.e.*, those which produce sufficient acid to render them of any importance in industrial operations, may be dealt with in two classes lactococcus and lactobacillus. The *lactococci* comprise those which produce lactic acid in milk at temperatures below 30° C., those used in cream making and the slime bacteria of whey. To the class of *lactobacilli* belong those which ferment milk at temperatures above 30° C., which play the principal part in the preparation of such beverages as kefyr and koumiss and those used for ripening cheese. The most important members of this class are the bacteria used for acidifying the seed-yeast mash in distilleries. Undesirable effects of lactobacilli are found in the "turning" of beer and the destruction of bakers' yeast.

Lactobacillus caucasicus is the ferment of kefyr grains; it occurs in small quantities in the acid yeast mashes of distilleries and is the only organism, besides the usual ferment, which produces sufficient acid to be capable of replacing the latter. Unlike the true acidifying ferment of distillery mashes, it ferments milk-sugar, and maltose; it also grows well at a temperature of 23° C., an undesirable property which would allow it to remain active during coholic fermentation and would cause it to appear in the essed yeast which it has the power of destroying.

General Properties.—"Active" lactic bacteria are disnguished by their high acidifying power, non-motility, nd small colonies; an important characteristic of these rganisms lies in the fact that they do not secrete the nzyme catalase and are the only known organisms which o not split up hydrogen peroxide. From fructose they roduce the same degree of acidity as from glucose, but hey convert the former sugar into mannitol, whereas the esidual glucose is unaltered. They can only derive their nourishment from peptones and have not the slightest roteolytic power. The specific action of lactic bacteria annot be traced to the action of an enzyme.

Lactic Acidification of Distillery Mashes.—According o the Vienna method, the lactic fermentation is conducted n a semi-solid mash of malt and rye flour, whereas, by the "Lufthefe" method, the acidification takes place in a iltered wort; the active bacteria are the same in both cases. The author deals here only with the Vienna method. The mash is saccharified at a temperature of 63° C., and is infected at this temperature with acid mash from a previous operation. The whole is left, absolutely at rest, under such conditions that it cools from 63° C. to 40°—37° C. in three days, acidification taking place at a temperature above that most favourable for the production of acid. Even under the most constant conditions, the acidity of the mash may vary considerably; the bacilli form no spores and do not exist in the "wild" state. The acid mash frequently contains a "wild" yeast, *S. fragans*, capable of resisting these high temperatures; this yeast can be eliminated by heating the mash at 65° C. for 15 minutes, without injuring the lactic ferment. This purification by heat is termed "lactisation" and is a necessary preliminary for experimental cultures at 37° C. and under. The acidifying power of the mash when sown in wort varies considerably according to the part of the vat from which the sample was taken; samples from the outer portions which had cooled soonest produced more acid than samples from the inside which had remained hot for a longer time. Average samples from different vats varied considerably in acid-producing powers. This shows the extreme sensitiveness of the ferment to conditions of temperature, and the modifications so produced are hereditary. Rather more acid is produced in absence of air than with exposure.

Pure Cultures.—When the acid mash is sown on wort-agar plates, a series of bacilli, closely allied, morphologically, but differing in the degrees of acid produced in presence or absence of air, are easily separated in the form of irregular opaque colonies. To this group is given the name *Lactobacillus Delbrucki.* A satisfactory acidification of industrial mash cannot be effected by pure cultures of this organism; it produces more acid in absence of air than when exposed, but the acidity is low and variable and the bacillus degenerates. The true undegenerated acidifying agent of distillery mash is *Lactobacillus fermentum.* Although it is present in the acid mash, the conditions of ripening of the latter are such as to deprive the bacillus of the power of growing in presence of air. If, however, a sample of the mash be taken when it is only 36 hours old, *L. fermentum* can be isolated on wort-agar at 37° C., in the form of transparent colonies, which must be propagated whilst still young in the form of stab-cultures below 41° C., otherwise they will degenerate into some form of *L. Delbrucki*. *L. fermentum* produces some carbon dioxide when grown in wort with restricted air supply. The most favourable temperature for the production of acid is 41° C., none is produced below 25° C., nor above 50° C.; exposure of wort cultures to air is slightly favourable to the production of acid; the pure cultures produce far more acid than does the acid mash containing predominating quantities of the less active *L. Delbrucki*. When cultivated in wort with free access of air at a temperature of 48° C., *L. fermentum* is more or less converted into *L. Delbrucki*, whilst the residue loses its power of growing on solid media in presence of air. This transformation takes place on the industrial scale and is advantageous owing to the fact that *L. fermentum* possesses a certain activity at the temperatures of alcoholic fermentation, whereas *L. Delbrucki* does not. *L. Delbrucki* can be regenerated into *L. fermentum* by repeated cultivation in wort at 37° C. in complete absence of air.

—J. F. B.

Malt Extracts; Dry ——. A. Wolff. Woch. f. Brau., 1902, **19**, [52], 801—802.

In place of the usual syrupy malt extracts, a German firm has recently introduced extracts of malt in the dry form. The malt is mashed in the ordinary way and the filtered wort is evaporated in special vacuum pans under a pressure of 50–60 mm. at a temperature not exceeding 45° C. to a thick syrup containing about 25 per cent. of water. The syrup is then transferred to shallow evaporating trays and is dried in a vacuum chamber at a temperature of 60° C. under a pressure of 20 mm. for about three hours. The product is a voluminous, crystalline mass, which is powdered for sale, having the composition:—Moisture, 0·55; mineral matter, 1·60; nitrogenous matter, 4·94; maltose, 76·32; and dextrin, 16·59 per cent.

By the rapid and careful evaporation of the malt wort, caramelisation is entirely avoided and the product has a yellow colour with a pure, sweet, malty flavour. The preparations have a high nutritive value and will keep indefinitely. They contain the malt enzymes still in the active state and can be mixed with drugs if desired.

—J. F. B.

Malt Liquors; Identification and Composition of ——. C. L. Parsons. J. Amer. Chem. Soc., 1902, **24**, [12], 1170—1178.

A problem which is sometimes met with in two of the north-eastern of the United States where the sale of "malt liquors" of any kind is prohibited by law, and which as yet has not been completely solved, is to determine whether any quantity of malt, no matter how small, has been employed in the preparation of a given sample of a beer. If the proportion of malt made use of is fairly large, it can readily be detected by analysing the liquor, but in cases where only a small proportion of malt has been employed, all that can be said of the beer is that it shows no evidence of malt. The following table gives the results of analysis of 76 samples of American malt liquors, some of which were, however, not in very good condition, as may be seen from the high percentage of free acid.

——	Average.	Maximum	Minimum.
Specific gravity	1·0100	1·0210	1·0047
Alcohol (by volume)	5·61	7·85	0·35
Extract	4·61	7·61	3·15
Albuminoids (N × 6·25)	0·470	0·614	0·299
Phosphoric acid	0·061	0·095	0·045
Ash	0·209	0·296	0·147
Sulphates in ash	6·34	12·67	2·44
Free acid	0·26	0·87	0·10

The author is of opinion that no true lager or ale contains less than 0·04 per cent. of phosphoric acid and 0·25 per cent. of albuminoids.

The results are also given of the analyses of five beers which could not be certified to be malt liquors. In these the percentage of albuminoids varies from 0·031 to 0·215 and that of the phosphoric acid from 0·010 to 0·023.

The composition of the ash of "no malt" beer also differs considerably from that of an ordinary malt liquor.

The methods of analysis are briefly described.—T. H. P.

Beer-Haze caused by Chill. A. Fernbach. Ann. de la Brass., **5**, [22], 505—506.

Apart from the risk of chill during transport, beer kept in storage casks in the brewery is often subjected to fluctuations of temperature, in the absence of efficient methods of attemperation. At such times the presence of a little yeast is beneficial, the fermentative activity of the latter generating heat and helping to maintain a uniform temperature; and hence filtered beers are more liable to chill, especially when filled into trade casks, owing to the greater superficial area exposed to the air.—C. S.

Beer; Retention of Head on ——. J. E. Siebel. Hantke's Letters on Brewing. Zeits. ges. Brauw., **25**, [45], 677.

With regard to the "head" producing constituents of malt and other grains, experiments conducted at the Zymotechnic Institute show that the gliadin of wheat, the hordein of barley, and the bynin (modified hordein) of malt, all soluble in alcohol, exhibit the aforesaid faculty in a high degree, bynin in particular being more soluble in dilute alcohol (and therefore in beer) than the others. The author also inclines to attribute to this faculty the benefits known to result from dressing the fermented beer with malt flour, the principal advantage of which was hitherto considered to reside in its hydrolytic action on unsaccharified starch, erythrodextrin, &c.—C. S.

Pentosans; Determination of ——. R. Jäger and E. Unger.

See under XXIII., *page* 114.

English Patent.

Beer: Fermentation of ——. V. Lapp, Leipzig, Germany. Eng. Pat. 21,643, Oct. 4, 1902.

Beer is fermented in a single operation by carrying out the fermentation from beginning to end under pressure at a temperature above 10° C., until the greater part of the sugar is converted, compressed air or carbon dioxide being used at the beginning of the fermentation as a pressure medium, while during the latter part of the fermentation, compressed air or liquid air is used.—J. F. B.

United States Patents.

Grain; Process of Steeping ——. W. P. Rice, Chicago, Ill., U.S.A. U.S. Pat. 715,605, Dec. 9, 1902.

This is a process of steeping grain, the objects of which are to shorten the time necessary for the germination of the grain on the malt-floor, to reduce the loss occasioned by ungerminated corns, and further, to brighten the corns. The grain is mixed with water in the usual manner, and during the process of steeping, aerated or gas-charged water is passed in through the grain in the steep tank. The gas used may be air or nearly pure oxygen. (See also U.S. Pat. 713,349; this Journal, 1902, 1547.)—F. S. S.

Malt; Apparatus for Drying ——. W. P. Rice, Chicago, Ill., U.S.A. U.S. Pat. 715,606, Dec. 9, 1902.

The apparatus consists of an outer drum revolving on a horizontal axis. This outer shell is provided with air passages. There is an inner conduit extending practically throughout the length of the drum, which is provided with a perforated wall. The hot air is drawn in at one end of the drum and the exhaust is from the other end. The drum is provided with a number of segmental compartments running radially. The malt is placed in these compartments and by this means matting is prevented to a great extent.—F. S. S.

Malting-Drum. J. F. Dornfield, Chicago, Ill. U.S. Pat. 715,165, Dec. 9, 1902.

A new form of malting-drum in which it is said that cool, dry and fresh air from the stationary room or chamber, is drawn in through a series of longitudinal perforated tubes, placed a short distance inside the case of the rotatable drum. To this end, claim is made for the combination of a stationary room or chamber, a rotatable malting-drum, a series of tubes with apertures extending longitudinally with respect to the drum and open at "opposite ends to the exterior of the drum, into the stationary chamber." An exterior cylinder (or cylinders) unconnected with the drum, but communicating with the interior cylinder, is also claimed, as likewise another room or chamber with which the exterior cylinder (or cylinders) communicates.—F. S. S.

French Patents.

Yeast; Preparation of ——. M. P. Davis and E. Widing. Fr. Pat. 320,26[illegible], April 7, 1902.

See Eng. Pat. 8777, 1901; this Journal, 1902, 786.—F. S. S.

Brewing; A New Process of ——. V. Lapp. Fr. Pat. 320,315, April 9, 1902.

See Eng. Pat. 21,731, 1902; this Journal, 1903, 40.
—F. S. S.

Denaturing Alcohol; A Process for ——. G. Hache. Fr. Pat. 320,592, April 22, 1902.

Coal tar is mixed with its own volume of alcohol in th cold and agitated for some time; the mixture is the allowed to stand and the alcohol which separates decante off. It is said to contain a large number of the hydrocarbo originally in the coal tar, and is suitable for heating motive purposes and for denaturing further quantities o alcohol.—F. S. S.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

English Patents.

Phosphorus Compound contained in Vegetable Food Stuf Process of Obtaining the ——. S. Posternak, Meudo France. Eng. Pat. 18,910, Aug. 28, 1902. Under Inte nat. Conv., Feb. 3, 1902.

See Fr. Pat. 318,311; this Journal, 1902, 1461.—W. P. S.

Heaters of Liquids, especially Milk, and Gases an Apparatus for Automatically Regulating the Tempera ture of the Liquid or Gas. J. Fliegel, Mallmit Germany. Eng. Pat. 11,877, May 24, 1902.

The apparatus consists of a pipe with a movable air-tigh piston. The part of the pipe below the piston is in th form of a spiral and is filled with mercury. Connection made, by a series of levers, between the piston and th valves controlling the supply of liquid to be heated or th heating medium. The apparatus may be placed in vessel outside, but connected by pipes to the heatin vessel. (See also U.S. Pat. 705,745; this Journal, 190 1149.)—W. P. S.

Maize or Indian Corn; Treatment of ——, *for th Production of Corn Milling Products.* A. J. Boul London. From T. T. Gaff, Barnstaple, Mass., U.S. Eng. Pat. 16,559, July 25, 1902.

See U.S. Pat. 707,059; this Journal, 1902, 1149.
—C. A. M.

United States Patents.

Froth-Condenser for Centrifugal Machines [*Milk*]. J. L. Bergh, Assignor to The Bergh Clarified Milk Co New York. U.S. Pat. 715,947, Dec. 16, 1902.

The froth-condenser is particularly applicable to machin for removing dirt and refuse from milk without separatin the milk and cream. It consists of an annular vess surrounding the drum and just under the exit from th latter. The clarified milk passes through perforations the bottom of this annular vessel and runs off int receptacles, whilst froth and air leave by an opening at th top.—W. P. S.

Milk or Cream; Apparatus for Cooling ——. E. G. S Salenius, Assignor to Salenius' Werkstader Manufacturin Firm, Stockholm. U.S. Pat. 716,112, Dec. 16, 1902.

A cooling compartment is placed above the separat drum and rotates therewith. The cream rises into th compartment and is cooled by jets of water sprayed the external walls of the latter.—W. P. S.

French Patents.

Malt Flour; Hydrolysis of ——. V. Lapp. Fr. Pat. 320,339, April 10, 1902.

To obviate the difficulty, usually found in the hydrolysis malt flour, of impregnating the flour with water, th inventor carries out the hydrolysis under pressure. In th same apparatus the process may be carried out with th vessel hermetically closed; finally, the product is forced b the pressure in the apparatus through a sieve.—F. S. S.

Farina and the like; Apparatus for Sterilising ——. Société Daverio Henrici and Co. Fr. Pat. 320,473, April 18, 1902.

The substance is placed in a cylindrical steam-jacketed vessel and is thoroughly agitated during the heating by a system of stirrers. Hot air is passed into the vessel during the process to remove moisture.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Gases in Liquids; Solution of ——. J. A. Wanklyn.

See under XXIV., *page* 116.

English Patent.

Water Purifying and Softening Apparatus. S. Hodgkin and the Pulsometer Engineering Co., Limited, both of London. Eng. Pat. 81, Jan. 1, 1902.

A lime water tank and a mixing vessel are arranged side by side and connected by a pipe at their upper ends. An automatic water-flushing apparatus, through which the hard water enters, is placed above the lime water tank and discharges into the mixing vessel. The rise and fall of a float in the flushing apparatus works a displacer, or a short siphon, in the lime water tank, and causes a definite quantity of lime water to pass into the mixing vessel. A float in the latter controls the supply of hard water to the flushing apparatus.—W. P. S.

(*C.*)—DISINFECTANTS.

English Patent.

Antiseptic Compounds, and Methods for Producing same. R. H. Page, Detroit, U.S.A. Eng. Pat. 5360, March 4, 1902.

See Fr. Pat. 319,248; this Journal, 1902, 1466.—J. F. B.

French Patents.

Insecticide and Disinfectant. L. Picard. Fr. Pat. 320,581, April 22, 1902.

The compound consists of a mixture of dry resin soap with crude phenol and cresol and heavy tar oil.—W. P. S.

Sulphur, Pulverulent; Treatment of ——, *to render it miscible* (*mouillable*) [*e.g., with Copper Salts as Bactericide*]. M. and A. Campagne. Fr. Pat. 320,627, April 24, 1902.

Sulphur in a finely-divided state is incorporated with a resinous substance, or with an alkali or soap, or with these together. The mixture may contain, for instance, flowers of sulphur, 70 parts; sodium carbonate, 20 parts; and powdered resin, 10 parts. This may be mixed with water to any desired consistency. To form a bactericidal compound, a mixture is made of the composition with cupric acetate or sulphate, which, if prepared as a solid, may be subsequently dissolved or diffused in water for use.

—E. S.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Straw Pulp for making Straw Boards and Paper; Manufacture of ——. J. Goode, Peterborough. Eng. Pat. 18,157, Sept. 11, 1901.

Straw is first cut and cleaned, and then boiled with water in a revolving boiler under suitable pressure to a pulpy condition. The pulp is then reduced in edge runners, whence it passes to the beating engines.—J. F. B.

Paper Pulp; Electrolytic Treatment of Vegetable Matters for obtaining ——. J. R. Desmarest, Vanves, France, and J. P. M. Geyer, Tunis. Eng. Pat. 26,260, Dec. 23, 1901.

Vegetable matters are cut up into shreds or shavings and purified, if necessary, by "dusting." They are then placed in a closed boiler with sufficient water or acidulated water to cover them, and boiled at a pressure of 6 to 8 atmospheres. During the boiling an electric current is passed through the mass by means of insulated metal or carbon electrodes inside the boiler. The electrolysis materially assists the solution of the non fibrous matters, and the mass is then triturated by suitable appliances to separate the fibres and convert them into pulp.—J. F. B.

Paper Pulp; Bleaching ——. R. C. Menzies, Edinburgh. Eng. Pat. 28, Jan. 1, 1902.

See U.S. Pat. 714,216; this Journal, 1903, 42.—J. F. B.

United States Patents.

Paper-making Machine. C. J. Bradbury, Boston, Assignor to J. W. Horne and Sons, Mass. U.S. Pat. 715,749, Dec. 16, 1902.

In a Fourdrinier paper-making machine, having a number of table rolls supporting the making wire, at least one of these table rolls is perforated in its circumference, the perforations leading to drainage passages through which the water which tends to accumulate between the roll and the wire may drain by gravity, the adjustment being such that one of the drainage passages shall be operative in every position of the roll.—J. F. B.

Sulphite Compounds; Process of Making ——. H. H. Wing. U.S. Pat. 716,330, 1902.

See under VII., *page* 93.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Thallium Oxalates. W. O. Rabe and H. Steinmetz. Ber., 1902, **35**, [20], 4447—4453.

The authors did not succeed in preparing a normal (neutral) oxalate of thallium, but only acid oxalates. In this respect thallium resembles other trivalent elements, chromium and aluminium being the only ones of which normal oxalates have been obtained. On treating moist thallium hydroxide with the calculated quantity of oxalic acid in aqueous solution, unchanged oxide and a white acid oxalate were obtained. A product of constant composition could only be obtained by treating the freshly precipitated hydroxide at 25° C. with a large excess of a cold saturated solution of oxalic acid. The oxide first dissolved, and then a fine crystalline precipitate appeared, which, when washed with water, alcohol, and ether, and dried in the air, had the composition $Tl(CO_2)_3CO_2H.3H_2O$.

A salt containing the same ratio of thallium to carbon (1:4), but with different proportions of water, was obtained by precipitating an acid solution of thallium sulphate with the calculated amount of oxalic acid. When less oxalic acid was employed, acid oxalates with 3 to 4 mols. of water were still obtained.

Oxalates in which the ratio of thallium to carbon was 1:5 were prepared by adding oxalic acid in excess to acidified solutions of thallium salts. The precipitates obtained, approximated to the composition $Tl(CO_2)_3(CO_2H)_2.3H_2O$.

On boiling the hydroxide or any thallium oxalate with aqueous oxalic acid, part of the oxalate was reduced, and a heavy finely-crystalline precipitate was deposited. This usually had the composition $Tl_2(CO_2)_4.3H_2O$.

$Tl(CO_2)_4(NH_4)(NH_3)_2$ was prepared by suspending the mono-acid oxalate in a non-dissociating medium (*e.g.*, absolute alcohol) cooled with ice and treating it with a dried current of ammonia. By allowing the ammonia to act at 45° C. for 1—2 hours, a normal ammonium salt $Tl(CO_2)_4NH_4$ was obtained.

When pyridine was used in place of ammonia, a salt containing more pyridine than the normal salt was obtained. The normal salt, $Tl(CO_2)_4HC_5H_5N$, was prepared in a manner similar to that of the ammonium salt.

The salts $Tl(CO_2)_4HC_5H_5N$ and $Tl(CO_2)_6.(NH_4)_3$ were also obtained.—C. A. M.

Meta-amino-para-hydroxybenzoic Acid Methyl Ester (Orthoform new). A. Einhorn and E. Ruppert. Annalen, 1902, **325**, [3], 305—339.

m-AMINO-*p*-HYDROXYBENZOIC acid methyl ester (orthoform new) generally crystallises in slender needles, melting at 142° C., but from aqueous solutions, to which a few drops of ethylenediamine have been added, a modification crystallises in lustrous scales, melting at 110°—111° C. Orthoform (new), gives with concentrated nitric acid an intensely red-coloured solution, the coloration disappearing on dilution, whereas orthoform (*p*-amino-*m*-hydroxybenzoic acid methyl ester) gives a dark green solution with nitric acid. For the characterisation of orthoform (new), the authors have prepared a large number of salts and double salts. Both the orthoforms yield splendidly crystallised compounds with antipyrine, tolylpyrine, and pyramidone, attributed to the contiguous position of the hydroxy and amino groups, since the ester of *p*-aminosalicylic acid does not combine with antipyrine. The antipyrine-orthoforms are split up by mineral acids, but with salicylic acid they form triple compounds. A large number of reactions with orthoform new have been studied. When treated in pyridine solution with acid chlorides, the acyl group enters the amino group. Mono and dimethylated derivatives in the amino group have been prepared on the one hand and the methyl derivative of the phenolic group on the other hand. Monochloracetic acid reacts with orthoform (new) in various ways, according to the conditions.—J. F. B.

Strophanthin, Choline, and Trigonellin in the Root of Strophanthus Hispidus. W. Karsten. Ber. deutsch. pharm. Ges., **12**, 241—245. Chem. Centr., 1902, **2**, [26], 1514.

THE author has examined a sample of the root of *Strophanthus hispidus* (De Candolle), according to Thoms' method (this Journal, 1898, 369), and finds that it contains, besides small quantities of strophanthin (0·6 to 0·7 per 1,000), a considerable amount of trigonellin (1 per 1,000) and choline. The strophanthin agreed in its properties with that prepared by Thoms from the seeds. On decomposing the glucoside with 10 per cent. hydrochloric acid, however, although the strophanthidin formed was identical with that obtained by Thoms, the sugar formed at the same time was different. From the strophanthin of the root, the sugar obtained is crystalline (laminæ melting at 106° C., probably rhamnose), but from the strophanthin of the seeds, an amorphous carbohydrate is obtained, which reduces Fehling's solution, but does not form an oxime or a hydrazone.—A. S.

Dregea Rubicunda; The Active Principle of the Seeds of ——. W. Karsten. Ber. deutsch. pharm. Ges., **12**, 245—250. Chem. Centr., 1902, **2**, [26], 1514.

THE seeds were examined by the method used by Thoms for strophanthus seeds (this Journal, 1898, 369). About 2·5 per cent of a glucoside, $C_{19}H_{30}O_{10}$ or $C_{23}H_{38}O_{12}$, was isolated, in the form of an amorphous, faint greenish-yellow, neutral, hygroscopic, but not deliquescent powder, which on exposure to the air becomes of a lemon-yellow colour. The product containing water melts at about 85° C.; after drying over sulphuric acid, at 107° C. It is easily soluble in water, alcohol, benzene, chloroform, and glacial acetic acid, slightly soluble in ether, and insoluble in petroleum spirit. It dissolves in concentrated sulphuric acid to a brown solution, which changes gradually to violet. It does not reduce Fehling's solution, even on warming. The glucoside, which is completely decomposed by 2 per cent. sulphuric acid at 60° C., has a similar physiological action to strophanthin, but the latter is about five times more poisonous than the new compound.—A. S.

Nitrous Group: Quantitative Determination of ——. C. Clauser and G. Schweitzer.

See under XXIII., *page* 113.

Lemon Pips; The Fatty Oil of ——, and Limonin. W. Peters and G. Frerichs.

See under XII., *page* 102.

Essential Oils; Examination and Valuation of ——. J. Walther.

See under XXIII., *page* 115.

ENGLISH PATENT.

Acetic Acid; Manufacture of Concentrated ——. A. Behrens, jun., Göttingen, Hanover. Eng. Pat. 22,096, Oct. 10, 1902.

CALCIUM acetate is dissolved in concentrated acetic acid previously saturated with sulphurous acid, the calcium sulphite produced being separated by filtration.—J. F. B.

UNITED STATES PATENTS.

Sulphuryl Chloride; Process of making ——. R. Knietsch and M. Scharff, Assignor to Badische Anilin und Soda Fab., all of Ludwigshafen, Germany. U.S. Pat. 716,248, Dec. 16, 1902.

LIQUID chlorine and liquid sulphur dioxide are caused to combine in presence of bodies which promote their union. For instance, camphor is dissolved in liquid sulphur dioxide in a closed vessel, and a stream of liquid chlorine in calculated quantity is introduced, preferably while cooling.
—J. F. B.

Acetic Acid; Process of Making ——. P. Boessneck, Glauchau, Germany. U.S. Pat. 715,748, Dec. 16, 1902.

ACETIC acid is obtained by a continuous process from a liquid mixture of calcium pyrolignite and hydrochloric acid. The mixture is supplied to the first and uppermost of a series of receptacles forming a column still, at the same time steam being caused to ascend through the series in contact with the descending liquid, so as to absorb the acetic acid in a systematic manner. The steam thus charged with the acetic acid vapours it has absorbed, at length escapes from the topmost vessel of the series, when it is led off into a condenser, in which the acetic acid is recovered.—J. F. B.

Ionone: Process of making ——. A. Strebel, Frankfort a Main, Assignor to Haarmann & Reimer, Holzminden Germany. U.S. Pat. 715,896, Dec. 16, 1902.

SEE Eng. Pat. 23,251 of 1898; this Journal, 1899, 945.
—J. F. B.

Methylenedisalicylic Acid; Alkali Salts of ——. Proces of making same. S. L. Summers, Philadelphia. U.S. Pat. 716,591, Dec. 23, 1902.

METHYLENEDISALICYLIC acid (see this Journal, 1902, 1154 is suspended in water, treated with a monovalent alkali, an the solution evaporated to dryness; salts soluble in wate and in alcohol, insoluble in benzene or ether, and havin the formula $C_{15}H_{10}O_6R_2'$ are produced.—J. F. B.

Methylenedisalicylic Acid; Alkaline Earth Salts of —— and Process of Making same. S. L. Summers, Philadelphia. U.S. Pat. 716,592, Dec. 23, 1902.

AN alkali salt of methylenedisalicylic acid is decompose in solution by a salt of an alkaline earth, the product bein nearly insoluble in water and alcohol.—J. F. B.

Methylenedisalicylic Acid; Metallic Salts of ——, an Process of Making same. S. L. Summers, Philadelphia U.S. Pat. 716,593, Dec. 23, 1902.

SALTS of methylenedisalicylic acid with the heavy metal are obtained by precipitating a solution of an alkali salt the acid by a salt of a heavy metal, the product bein insoluble in water.—J. F. B.

Yohimbine: Salt of ——. L. Spiegel, Berlin, Assignor t Chem. Fab. Guestrow, Germany. U.S. Pat. 716,77 Dec. 23, 1902.

A SALT of yohimbine, soluble in water, and possessing th properties of the alkaloid is claimed, more particularly th hydrochloride $C_{22}H_{28}N_2O_3.HCl$, crystallising in small wh needles melting at about 300° C.—J. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

lphur in Gunpowder; Determination of ——, by Means of Hydrogen Peroxide. J. Petersen.

See under XXIII., *page* 112.

English Patent.

ifety Explosives; Improvements in and relating to the Manufacture of ——. F. Schachtebeck, Westphalia, Germany. Eng. Pat. 11,325, May 16, 1902.

: order to increase the durability or stability of safety plosives containing hygroscopic substances, such as nmonium nitrate, semi-solids made of glue, dextrin, &c., e added so that the explosive contains more water than ie ammonium nitrate would naturally absorb from the air. lycerin is added to form a gelatinous mass and prevent aporation of water.—G. W. McD.

French Patents.

ulminate Compositions [Non-Sensitive]; Manufacture and Use of ——. Hirtenberger Patronen Zündhütchen und Metallwaaren-Fabrik vormals Keller and Co. Addition, dated April 17, 1902, to Fr. Pat. 318,286, Feb. 1, 1902.

A special form of detonator is claimed and illustrated, in which the ordinary, sensitive fulminate is contained in a apsule, lying in immediate contact with the non-sensitive omposition. See also Fr. Pat. 318,286, 1902; this Journal, 1902, 1472.—G. W. McD.

Percussion Caps and Detonators; Composition for ——. Westfälisch-Anhaltische-Sprengstoff-Actien-Gesellschaft. Fr. Pat. 320,199, April 4, 1902.

The compositions claimed as a substitute for fulminate of mercury consist of—

Potassium chlorate	15	28	35	35
Mononitrocresol	85	..	..	..
Dinitrocresol	..	72	..	..
Trinitrocresol	..	..	65	..
Trinitroresorcinol	..	..	..	65

—G. W. McD.

Explosive Materials; Process for Producing easily Ignitible ——. C. Duttenhofer. Fr. Pat. 320,435, April 16, 1902.

See Eng. Pat. 8776, 1902; this Journal, 1902, 927.
—G. W. McD.

Explosives of High Disruptive Force; Process for the Manufacture of ——. R. Escales. Fr. Pat. 320,464, April 17, 1902.

In order to increase the power of explosives, it is proposed to add to them, in conjunction with oxygen-yielding bodies, such elements as form oxides reducible with difficulty. Boron and the metals of the cerium group are given as examples, as well as their carbides, phosphides, and alloys with magnesium and aluminium.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

English Patent.

Apparatus for showing the Relation between Volumes of certain Reacting Gases and the Volumes of Gases produced by these Reactions. J. Wilson, London. Eng. Pat. 10,937, May 13, 1902.

An elongated or tubular glass vessel is constricted at a suitable point in its length, and provided at the constricted part with a stop-cock, forming two chambers, both of which are graduated. The upper chamber has a cock at the top, and the lower chamber has a lateral supply tube provided with a three-way cock. The lower chamber is connected at the lower end by a flexible tube to a glass mercury-cup, which is capable of vertical movement to adjust the pressure to that of the atmosphere when measuring the gases in the chambers. The whole apparatus is filled with mercury, the gases being measured successively in the lower chamber and passed into the upper chamber, where the reaction takes place; or, one of the gases may be measured directly in the upper chamber and the other gas admitted to it from the second chamber. After the reaction, the resultant gases are measured by adjusting the mercury-cup until the mercury levels are equal. The upper chamber is fitted with platinum terminals for sparking purposes, and may be enclosed in a steam jacket.
—R. A.

INORGANIC—QUALITATIVE.

Arsenic, Antimony, and Tin; Qualitative Separation of ——. J. Walker. Proc. Chem. Soc., **18**, [258], 246.

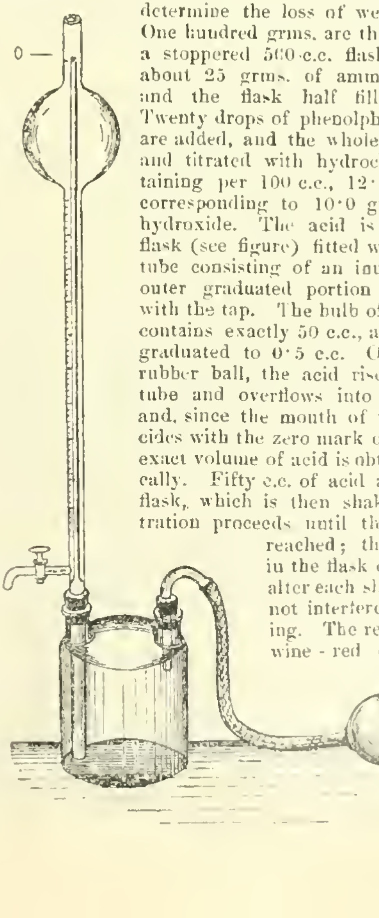
When a solution of the sodium thio-salts of arsenic, antimony, and tin is boiled with sodium peroxide, these salts are converted into sodium arsenate, antimoniate, and stannate respectively. Any mercury which may have been dissolved from the copper group on warming with sodium hydroxide, is, by this treatment, reprecipitated as sulphide. The tin may be separated from the arsenic and antimony by boiling with excess of ammonium chloride, which precipitates stannic hydroxide, leaving the antimony and arsenic in solution. On addition of excess of acid, these may be separated by means of sulphuretted hydrogen in the cold, the antimony being at once precipitated as sulphide, whilst the arsenic remains dissolved.

INORGANIC—QUANTITATIVE.

Lime; Determination of ——, *in Mixtures of Lime and Sand.* Thonind. Zeit., **26**, [128], 1719—1720.

Lunge's method of titrating with hydrochloric acid and phenolphthalein is said to be too tedious for use in works, but this defect is obviated by Frühling's modification (addition of ammonium chloride) when performed in the following manner:—

About 100 grms. of the damp mass from the mixer are brushed through a sieve and dried in a fire-brick oven, to determine the loss of weight on drying. One hundred grms. are then weighed into a stoppered 500-c.c. flask, treated with about 25 grms. of ammonium chloride, and the flask half filled with water. Twenty drops of phenolphthalein solution are added, and the whole well shaken up and titrated with hydrochloric acid, containing per 100 c.c., 12·8 grms. of HCl, corresponding to 10·0 grms. of calcium hydroxide. The acid is contained in a flask (see figure) fitted with a measuring tube consisting of an inner tube and an outer graduated portion communicating with the tap. The bulb of the outer tube contains exactly 50 c.c., and the stem is graduated to 0·5 c.c. On pressing the rubber ball, the acid rises in the inner tube and overflows into the outer one; and, since the mouth of the former coincides with the zero mark on the scale, the exact volume of acid is obtained automatically. Fifty c.c. of acid are run into the flask, which is then shaken up, and titration proceeds until the end point is reached; the sandy residue in the flask quickly subsides after each shaking, and does not interfere with the reading. The reappearance of a wine-red coloration after



standing five minutes may be disregarded. On dividing the consumed volume (c.c.) of acid by 10, the percentage of lime is obtained. The entire operation takes only a few minutes, and the results are concordant with those of gravimetric determinations, within the limits of experimental error.—C. S.

Zinc; A Simplification in the Sulphide Method for the Determination of ——. A. Thiel. Chem.-Zeit., **26**, [104], Rep. 355. Zeits. anorg. Chem., 1902, **32**, 362.

In the determination of zinc by precipitation with sulphuretted hydrogen, great difficulty is usually experienced in filtering the zinc sulphide. To obviate this the author proposes the following method: The zinc solution is placed in a round-bottomed flask, excess of ammonium acetate solution added, and sulphuretted hydrogen passed through until the liquid is saturated. It is then heated for two minutes over a naked flame, when the zinc sulphide separates as a thick floccular precipitate. The supernatant liquid is poured through a filter-paper, the residue being washed into a 50-c.c. Erlenmeyer flask of Jena glass. The flask is placed on a water-bath to remove as much water as possible, the ash from the filter-paper is added, and the whole dried at 120° C. for a short time. The flask is fitted with a Rose's lid and tube, and heated strongly, first in a stream of sulphuretted hydrogen and then in a stream of hydrogen. It is allowed to cool in an atmosphere of hydrogen and weighed as usual.—F. S. S.

Selenium in Organic Compounds; Determination of ——. H. Frerichs. Arch. der Pharm., 1902, **240**, [9], 656—658.

About 0·2—0·3 grm. of the substance is decomposed in a sealed tube with nitric acid, sp. gr. 1·4, in presence of about 0·5 grm. of silver nitrate under the conditions employed for the estimation of halogens by the Carius method. The selenium is thus converted into silver selenite. The contents of the tube are washed out into a porcelain dish and evaporated to dryness. The residue is triturated with a few drops of water and treated with alcohol; it is then transferred to a filter and washed with alcohol until the filtrate is free from silver. The filter and its contents are then placed in a beaker and boiled with a mixture of 20 c.c. of nitric acid and 80 c.c. of water until the residue is completely dissolved. The solution is then diluted with 100 c.c. of water and the silver is titrated with decinormal potassium thiocyanate in presence of iron alum. When halogens are present, the separation of the silver haloid from the silver selenite is rather difficult, and the halogen result is liable to be too high.—J. F. B.

Manganese; Determination of ——, *in Iron and Steel.* J. V. R. Stehman. J. Amer. Chem. Soc., 1902, **24**, [12], 1204—1206.

The method recommended by the author for determining manganese in iron and steel is as follows:—Weigh out into a 6-inch test-tube 0·2 grm. of the sample, add 10 c.c. of nitric acid of sp. gr. 1·20, heat to boiling on the water-bath until dissolved, and free the liquid from nitrous fumes. Filter through a small filter into a 10 by 1 inch test-tube, wash the filter twice with hot water containing a little nitric acid, and add through the filter to the contents of the tube 15 c.c. of a solution of silver nitrate (1·33 grms. to the litre). One gram of ammonium persulphate is now added and the solution brought to the boiling point over a naked flame, the heating being then continued for about a minute after oxidation begins. The tube and contents are now cooled rapidly under the tap, the liquid poured into a No. 2 beaker, and the tube washed out with 30 or 40 c.c. of water. 5 c.c. of a saturated sodium chloride solution are now added, and titration with standard sodium arsenite solution carried out immediately. The sodium arsenite solution is standardised against either standard permanganate or an iron in which the manganese has been accurately determined. The ammonium persulphate should be moistened the day before use with "10 c.c. of water per pound of salt." A series of test analyses shows that the method gives good results.—T. H. P.

Carbon; Rapid Determination of —— [*in Iron and Steel*], *by Combustion.* G. Auchy. J. Amer. Chem. Soc., 1902, **24**, [12], 1206—1210.

The author describes a modification of Shimer's method for determining carbon in iron or steel, the copper oxide being in the crucible instead of in a tube. A new form of large size crucible is employed, and into this is placed, after being dried for half an hour at 90° C., the asbestos felt and carbon residue, the latter upwards. The asbestos together with the wad previously used for cleaning out the funnel are pressed evenly on the bottom of the crucible with a glass rod having a flattened end, and finely-ground carbon-free copper oxide added so as to nearly reach the inlet tube of the stopper when in position; the copper oxide tube is omitted. The blast lamp is used for ignition and purified air used at a "four- or five-bubble rate," allowing 10 minutes for the combustion. The potash bulb may be weighed filled with oxygen.

Comparative tests, using the ordinary combustion method ("one-bubble rate"), and the above modified method show that the two give identical results.—T. H. P.

Calcium Sulphide in Bone Charcoal: Determination of ——. A. Rossing. Zeits. anorg. Chem., **41**, 610—614. Chem. Centr., 1902, **2**, [26], 1525.

In the usual method of determining calcium sulphide in bone charcoal by oxidising it to calcium sulphate with potassium chlorate and hydrochloric acid, there is a danger, if somewhat large amounts of calcium sulphide be present, of hydrogen sulphide being expelled by the acid before the sulphur is oxidised. In order to avoid this, the author oxidises in alkaline solution by means of bromine. 10—25 grms of the sample are mixed with 10 c.c of water and 10 c.c. of a 25 per cent. solution of caustic potash, and first, strong bromine water and then bromine, in excess, added. The mixture is heated to boiling, slowly acidified with hydrochloric acid, made up to a definite volume and in an aliquot portion, the sulphuric acid determined as barium sulphate. A correction must be made for the amount of sulphates originally present in the charcoal.

—A. S.

Sulphur in Gunpowder; Determination of ——, *by means of Hydrogen Peroxide.* G. Petersen. Chem.-Zeit., 1902, **26**, [104], Rep. 355. Oversigt over Videnskabernes Selskabs Forhandlinger, 1902, **5**, 191.

The author has found the method described below quicker and more accurate than most methods used for the determination of sulphur in gunpowder. The powder is boiled with an alkali, thus bringing all the sulphur into solution as sulphide; hydrogen peroxide is added, the whole warmed, acidified with hydrochloric acid, and precipitated with barium chloride. If special accuracy is required, the acid filtrate from the above is evaporated to dryness, to remove nitric acid, again dissolved in water, acidified and precipitated. The method may be used for many organic sulphur-compounds, as thiourea, allylthiourea, thiocarbanilide, carbon bisulphide, &c. If the compound be insoluble in water, alcohol may be used, but must be removed by evaporation before precipitation. The method, however, cannot be employed for such organic compounds as thiophen, ethyl sulphide, thiophenol, &c.

—F. S. S.

ORGANIC—QUALITATIVE.

Carbamide; Reagent for the Identification of ——, *and of certain other Nitrogen Compounds.* H. J. H. Fenton. Proc. Chem. Soc., **18**, [258], 243—244.

In previous communications (Fenton and Gostling, Trans. Chem. Soc., 1899, **77**, 423; 1901, **81**, 807; this Journal, 1901, 757; 1899, 404) various derivatives of methyl-furfural have been described which are obtained from ketohexoses, or substances which produce these on hydrolysis, and from cellulose. Amongst these derivatives, a crystalline condensation product was mentioned having the formula $C_{11}H_8O_4$, the constitution of which is still under investigation; the evidence obtained so far indicates that it is either methyl-furil,

$$C_4H_3O.CO.CO.C_4H_2O.CH_3,$$

: the ketone-aldehyde, $CHO.C_4H_2O.CO.C_4H_2O.CH_3$, y means of an improved method of preparation, this roduct can now be easily obtained in quantity. If a nall quantity of it be mixed with urea and the mixture eated with a trace of phosphorus oxychloride, acetyl hloride or dry hydrogen chloride—dissolved in any appropriate solvent—a very brilliant blue colour is obtained. 'he reaction is one of extreme delicacy. 0·1 mgrm. of rea giving a strongly marked colour, and with care it is uite easy to detect 0·01 mgrm. or less.

This effect is due to a colourless base of which the salts ave a blue colour. The intensity of the colour of these alts in aqueous solution varies markedly with the nature nd concentration of the acid.

The production of a blue colour in the manner here lescribed is characteristic of carbamide and of monoubstituted carbamides, $NH_2.CO.NHR$, in which the ubstituting radicle is an alkyl group or one of a similar haracter; acidyl substituted carbamides give no such reaction. Urethane gives a similar reaction, but the colour s red by transmitted light.

This compound also reacts with primary amines in acetic acid solution to give very brilliant green compounds; this change is produced at once on simply mixing the solutions without any condensing agent, and appears to be quite characteristic of primary amines.

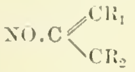
Cottonseed Oil; Halphen's Test for ——. F. Fulmer. J. Amer. Chem. Soc., 1902, **24**, [12], 1148—1155.

The results of experiments made to ascertain the suitability of Halphen's reaction as a test for the presence of cottonseed oil lead to the following conclusions:—Cottonseed oil is rendered inactive towards Halphen's reagent by heating it to 260°—270° C., whilst heating to a temperature of 220°—240° greatly diminishes the intensity of the reaction. It is probable that heating the oil to 220°—240° C., or even higher, does not unfit the oil for use as food, either alone or mixed with other material. As it is found that lard from animals fed on cottonseed meal may respond to Halphen's reaction with an intensity of coloration equivalent to several per cent. of unheated cottonseed oil, a mixture of fats or oils may be prepared containing at least 25 per cent. of cottonseed oil previously heated to 220°—240° C., or a larger proportion if heated to 250°—260°, which will give a coloration with Halphen's reagent not more intense than that obtained with the lard from hogs fed on cottonseed meal. The value of the test for the detection of added cottonseed oil in lard, is hence questionable.—T. H. P.

ORGANIC—QUANTITATIVE.

Nitroso Group; Quantitative Determination of the ——. R. Clauser and G. Schweitzer. Ber., 1902, **35**, [20], 4280—4284.

The method already described (Ber., **34**, 889; this Journal, 1901, 622) has now been further examined and improved. It is found that in general only compounds of the type—



$$NO.C\begin{cases}CR_1\\CR_2\end{cases}$$

(R_1 and R_2 representing any radicles or molecular groups) react according to the method given (evolution of nitrogen on boiling with phenylhydrazine in acetic acid solution), whilst nitrous esters $NOO.R$ require the previous addition of a substance (dimethylaniline or phenol) which is readily converted into a nitroso compound. Aliphatic and certain aromatic nitrosamines do not react, although those of the diphenylnitrosamine type do, whilst isonitroso compounds (oximes) which cannot exist in a tautomeric form do not give the reaction. It is also not known whether certain aliphatic nitroso compounds not readily obtainable do or do not react.

The improved form of flask shown, into which the gas tube and dropping funnel are fused, is employed. The phenylhydrazine acetate solution is forced in by means of an india-rubber ball, and for collecting the nitrogen an absorption apparatus is employed in which, instead of a three-way tap, one provided with two parallel passages is used in order to facilitate the transference of the nitrogen to the eudiometer. It is also important to employ an efficient condenser in order to prevent acetic acid being carried over into the potash absorption apparatus. The analysis of nitrites (other than very volatile nitrites (ethyl nitrite) to which the method is not applicable) is carried out, as follows: About 0·1—0·3 grm. of the nitrous ester dissolved in glacial acetic acid is placed in the flask of the apparatus together with 3 grms. of an acetic acid solution of dimethylaniline, followed by 10—12 c.c. of concentrated hydrochloric acid. After heating for four hours on the water bath, crystallised sodium acetate is added to the nitroso-dimethylaniline hydrochloride formed. The air is then expelled by carbon dioxide and the reaction carried out in the ordinary manner.

Fig. 1.

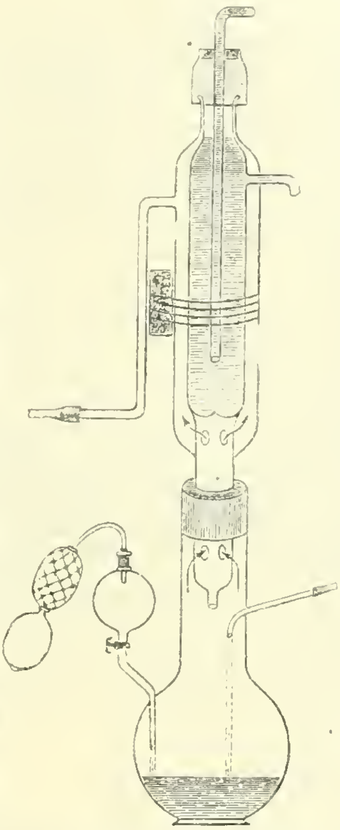
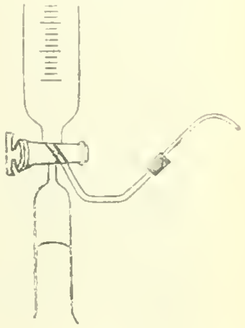


Fig. 2.



The results are calculated by means of the formula—

$$P = K\frac{Vt\,(b-w)}{g\,(1+\alpha t)} \qquad K = \frac{3000 \times 0{\cdot}0012562}{28 \cdot 760} = 0{\cdot}00017709$$

where g = weight of substance in grms., P = per cent. NO, Vt = c.c. of nitrogen, b = barometric height in mm., t = temperature, and w = tension of water and benzene vapour in mm.—T. A. L.

Hydroxylamine; Volumetric Determination of ——. M. L. J. Simon. Comptes Rend., **135**, [26], 1339—1342.

Potassium permanganate reacts on hydroxylamine oxalate in neutral solution according to the equation—

$$2KMnO_4 + 4\left((NH_2OH)_2.H_2C_2O_4\right) = \\ 2MnC_2O_4 + 2KHC_2O_4 + N_2O + 3N_2 + 15H_2O$$

and if the solution be now made acid with sulphuric acid, additional permanganate will react on the oxalates in the usual way. The action of permanganate on other salts (sulphate or chloride) of hydroxylamine is different; it is represented in neutral solution by the equation—

$$4KMnO_4 + 5\left((NH_2OH)_2.H_2SO_4\right) = 4MnSO_4 + K_2SO_4 + 2KNO_2 + 2N_2O + 2N_2 + 20H_2O,$$

and after addition of sulphuric acid, additional permanganate oxidises the nitrite formed. The author finds that any salt of hydroxylamine, to which excess of sodium oxalate has been added, behaves towards permanganate as though the solution contained hydroxylamine oxalate; the amount of permanganate decolorised (in neutral solution) depends only on the amount of hydroxylamine present (1 mol. $KMnO_4$ to 4 mols. NH_2OH) and not on the excess of oxalate. Accordingly, the process of titration consists in rendering the solution perfectly neutral to methyl orange and phenolphthalein, adding a sufficient excess of di-sodium oxalate, and running in N/10 potassium permanganate till a permanent coloration appears.—J. T. D.

Aniline Oil; Analysis of ——, by the Volumetric Bromination Method. W. Schaposchnikoff and B. Sachnovsky. Zeits. f. Farb. Text. Chem., 1903, **2**, [1], 7—9.

Reinhardt devised a method for estimating aniline by bromination with a hydrobromic acid solution of potassium bromate, but his method of preparing the solution by dissolving bromine in hot alkali is unsatisfactory. Good results can be obtained by using recrystallised potassium bromate. The solution is standardised by estimating the amount of iodine which it liberates from an acid solution of potassium iodide. In the actual analysis, potassium iodide and starch paper is not required, because the tribromoaniline or dibromotoluidines settle well and the iodine liberated in the solution can easily be recognised, so that the final reaction is quite sharp. If p is the weight of aniline oil taken, n the number of c.c. of potassium bromate used, Ti the iodine titre of the solution, Ta (= Ti × 0·12231) its aniline titre, and Tt (= Ti × 0·14061) its toluidine titre, then the percentage of aniline is:—

$$\mathrm{Ta}.(100\ p).(n\mathrm{Tt} - p)/(\mathrm{Tt} - \mathrm{Ta}),$$

and the percentage of toluidine is:—

$$\mathrm{Tt}.(100\ p).(p - n\mathrm{Ta})\ (\mathrm{Tt} - \mathrm{Ta}).$$

Results obtained with artificial mixtures show that the method is correct to within 0·3 per cent.—J. McC.

Sesamé Oil; Iodine Value of ——. J. J. A. Wijs. Zeits. Unters. Nahr.- u. Genussm., 1902, **5**, [23], 1150—1155.

The iodine value of sesamé oil, as determined by various experimenters, has been found to lie between 102·7 and 115, with Hübl's solution. The author gives the results of the analyses of 37 samples of sesamé oil, by his iodine-chloride method. Oils obtained from the "first pressings" of the seeds have values between 106·1 and 116·8. The "second pressings" gave values from 105·2 to 110·3, and the "third pressings" from 103·9 to 109·8.—W. P. S.

Tanning Materials; Analysis of ——. New Rules and Alterations in existing Rules of the International Association of Leather Trades Chemists. Collegium, 1902, **1**, [11], 327—329.

The following alterations, passed by the Leeds Conference of the I.A.L.T.C. come into force on Jan. 1, 1903:—

1. Hide-powder used for analysis of tanning materials must fulfil the following conditions:—

(*a*) The percentage of nitrogen must not be less than 11·5 per cent., calculated on a basis of 18 per cent. of moisture, and only pure cellulose may be added to the hide-powder.

(*b*) The amount of soluble hide-substance obtained in a blank test with distilled water must not exceed 5 mgrms. per 50 c.c. of filtrate.

(*c*) The "non-tannin" filtrate must give no turbidity with a salt gelatin solution.

[The following is recommended: gelatin (8—9 grms.), and pure sodium chloride (100 grms.) dissolved in hot water (500 c.c.), cooled to 20°—25° C. and filtered. Use not more than 1 drop per 5 c.c.]

Certain tanning materials, *e.g.*, mangrove, cutch, cannot be fully detannised under the official conditions, a larger filter or weaker liquor must then be used, and the fact notified in the report.

2. *Filtration of the Tanning Solutions.*—(*a*) Perfectly clear solutions need not be filtered.

(*b*) Solutions may be filtered with any paper considered most suitable, and kaolin may be used. A correction for the amount of tannin absorbed by the filter paper selected for use shall be made as follows:—

500 c.c. of the tannin solution to be analysed are filtered until perfectly clear, preferably by the method of filtration for which the correction is to be made. 50 c.c. of this clear solution are evaporated to dryness, dried, and weighed to determine "total soluble No. 1."

A second portion of the same clear solution is filtered exactly in the manner for which correction is to be made, and 50 c.c. of the filtrate are evaporated, dried, and weighed to determine "total soluble No. 2." Subtraction of No. 2 from No. 1 gives the correction which it is necessary to add to the "total soluble found in analysis."

It is advisable not only in the analysis, but also in filtering the liquor for determining No. 2, to discard the first 150 c.c. that passes (or in the case of an analysis, to use it for detannisation) and evaporate the next 50 c.c., and also to keep the filter as full as possible during filtration.

If kaolin is used, the same quantity should be weighed in each case (1—2 grms. are recommended), washed by decantation with about 75 c.c. of tannin solution, and then washed on to the filter-paper with more of the tannin solution of which 200 c.c. are filtered as above.

3. *The Determination of Non-Tannins.*—This shall be conducted by the filter-method until next conference, but members may use the chromed hide-powder method of the Association of Official Agricultural Chemists, 1901 (see Collegium, 1902, 72; this Journal, 1901, 1246; 1902, 1100), if it is stated in the report that the A.O.A.C. method has been substituted for the I.A.L.T.C. method.

For the analysis of used tanning liquors, the A.O.A.C. method must be employed.

4. *Analysis of used Tanning Materials.*—If these materials (spent tans) fail to give by the I.A.L.T.C. method of extraction a solution of the prescribed strength, the whole solution may be concentrated by boiling, either under reduced pressure or in a flask in the neck of which a funnel is placed, until the solution attains the required strength.—R. L. J.

Pentosans; Determination of ——. R. Jäger and E. Unger. Ber., 1902, **35**, [20], 4440—4443.

The authors confirm the observation of Fraps, that, when bodies containing pentosans are distilled with hydrochloric acid, the distillate often contains, in addition to furfural, certain furaloid substances which resemble furfural in that they are precipitated by phloroglucinol. It is also found, when working under the standard conditions of distillation originally given by Tollens, that it is necessary to distil more than 400 c.c. of liquid in order to be quite certain that all the furfural has passed over: the recommendation is therefore made that the distillation be continued until the distillate shows no reaction when tested for furfural.

To ascertain whether the phloroglucides obtained from different substances containing pentosans have the same composition, distillations with 12 per cent. hydrochloric acid have been made with pure arabinose, gum from linseed, shavings of pine wood, and a mixture of black and white pepper. The carbon and hydrogen contents of the various phloroglucinol precipitates, and of that yielded by pure furfural, are given in the accompanying table.

The values obtained with furfural indicate that the reaction with phloroglucinol takes place according to the equation: $C_6H_6O_3 + C_5H_4O_2 = C_{11}H_8O_4 + H_2O$.

Phloroglucide from	Per Cent. of Carbon.		Per Cent. of Hydrogen.		Mean per Cent.	
					Carbon.	Hydrogen.
urfural	64·40	64·17	3·85	4·09	64·28	3·98
rabinose	61·73	61·40	4·33	4·58	61·57	4·45
um	62·83	63·13	4·74	4·57	62·98	4·65
inewood	62·18	62·15	4·34	4·5	62·16	4·42
epper	60·62	60·27	4·63	4·45	60·45	4·54

In view of the inaccuracies which the above method of etermining pentosans gives rise to, the authors propose to ake use of the condensation product of furfural and arbituric acid,

$$C_4H_3O \cdot CH : C\begin{matrix}\diagup CO \cdot NH \diagdown \\ \diagdown CO \cdot NH \diagup\end{matrix}CO,$$

hich is an amorphous powder very resistant to the action f all solvents, and but slightly dissolved by 12 per cent. ydrochloric acid. The investigations in this direction are eing continued.—T. H. P.

Essential Oils; Examination and Valuation of ——. J. Walther. Farmaz. Jour., 1902, **41**, 751; Chem.-Zeit., 1902, **26**, [102], Rep. 344—345.

Oil of Anise.—For the valuation of this oil the sp. gr., the solidifying point, and the solubility in alcohol are sufficient. The presence of paraffin or spermaceti in oil of anise or in anethol is best shown by the solubility in alcohol and the melting point; stearic acid is recognised by shaking the oil with light petroleum and a solution of cupric acetate.

Oil of Bergamot.—The determination of the physical constants is not sufficient: the value of the oil depends on the esters of linalool and geraniol, which should be determined by saponification by Kottstorfer's method; the esters in oil of good quality should not be less than 32 per cent. The sp. gr. of the oil should be 0·880—0·886, the optical rotation should be from +8° to +20°. The oil should give a clear, or nearly clear, solution with its own volume of 90 per cent. alcohol, which should not change on he further addition of alcohol; the residue on evaporation should be 6 per cent.

Oil of Lavender.—The esters, determined in the same way as in oil of bergamot, should not be less than 30 per cent. Oils which have been freed from terpenes will have a lower percentage of esters owing to the decomposition of geranyl esters during fractional distillation. French oil of avender has a sp. gr. of 0·883—0·895; it is soluble in three times its volume of 70 per cent. alcohol and has a otation of from −3° to −9°. With oils containing phenols, the method of Kremers and Schreiner gives atisfactory results. Eugenol, the main constituent of *oil of cloves*, may be estimated by conversion into its sparingly oluble benzoic ester. The estimation of carvone in *oils of caraway* and *mint* by the hydroxylamine method of Kremers and Schreiner does not give good results owing to he formation of a double compound. By the author's itrimetric method with hydroxylamine hydrochloride and odium bicarbonate, no destruction of the oxime occurs and very good results are obtained. The dextro-carvone rom caraway and the lævo-carvone from mint yield the ame oxime, m. pt. 71° C., and optically inactive. The percentage of carvone in these oils is very variable, but in a good oil it should reach 50 per cent.

Oil of Lemon.—The most important factor in the aluation of this oil is the optical rotation in connection with fractional distillation. In the estimation of the ldehydes by conversion into oximes and titration of the xcess of hydroxylamine, a slight modification of the method is necessary, since an excess of hydrochloric acid eadily decomposes the oximes; the iodometric titration of he hydroxylamine is useful in this case. The normal proportion of aldehydes in oil of lemon is 5 per cent.

Oil of Sandalwood.—The santalol must be determined uantitatively. Parry's method as modified by Schimmel requires correction, since on the saponification of the products of acetylation, traces of acetic acid may easily remain undetermined. The physical constants should also be observed.—J. F. B.

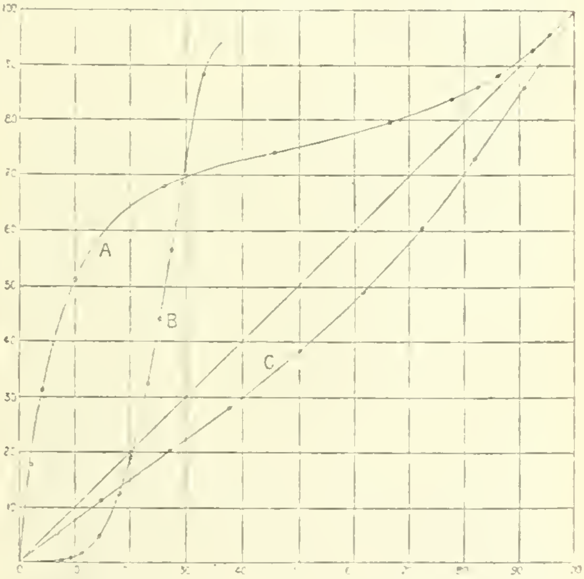
XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Distillation of Binary Mixtures. Lord Rayleigh. Phil. Mag., 1902, **4**, [23], 521—537.

In the theoretical portion of the paper, the author discusses the distillation of a pure liquid and of mixtures of immiscible and miscible liquids, and shows that Konowalow's theorem, viz., that any mixture which corresponds to a maximum or minimum of vapour-pressure, has (at the temperature in question) the same composition as its vapour, follows as a necessary consequence of the second law of thermodynamics. The importance of the converse of Konowalow's theorem is pointed out. The author also shows how to deduce a formula for calculating the residue from the curves exhibiting the relative compositions of liquid and vapour.

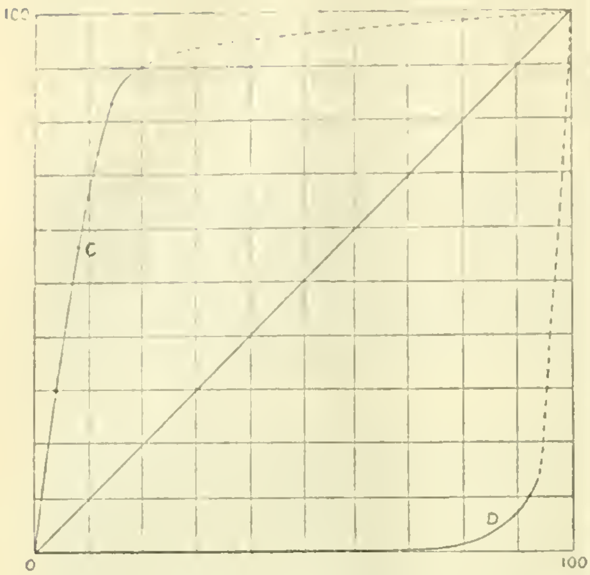
The latter portion of the paper relates to distillation experiments with mixtures of water and alcohol, water and hydrochloric acid, water and acetic acid, water and ammonia, and water and sulphuric acid, the object being to determine the relation between the strengths of liquid and vapour which are in equilibrium during the course of distillation. In order to avoid too rapid a change of the composition of the liquid, somewhat large quantities were used, whilst to prevent premature condensation, the upper part of the retort was kept at a distinctly higher temperature than the liquid. The results obtained are shown graphically in the form of curves upon square diagrams (see Figs. 1 and 2), the abscissa of any point on the curve representing the composition of the liquid, and the ordinate representing the composition of the vapour in equilibrium with it. If the curve crosses the diagonal of the square, the point of intersection corresponds to a maximum or minimum boiling point, and represents a state of things in which the liquid and vapour have the same composition, so that distillation ceases to produce any effect. Noyes and Warfel (this Journal, 1901, 928) have shown that the mixture of water and alcohol containing 96 per cent. of alcohol has a minimum boiling point, and consequently the curve there crosses the diagonal, but the deviation from the diagonal between this point and the end of the curve is probably

Fig. 1.



A. Alcohol and Water. B. Hydrochloric Acid and Water. C. Acetic Acid and Water.

Fig. 2



C. Ammonia and Water. D. Sulphuric Acid and Water.

extremely small. The experiments with water and hydrochloric acid were confined to mixtures containing not more than 35 per cent. of the acid. In the case of mixtures of water and ammonia and water and sulphuric acid, only enough results were obtained to construct a portion of the curve, the dotted part being conjecturally added to indicate the progress towards the corner of the square.

The separation of the whole of the two components of a mixture in, as nearly as possible, a state of purity, may be effected in one operation, but for this purpose the mixture must be fed into the distilling apparatus continuously and not at the place of highest or lowest temperature.

In the ordinary method of fractional distillation, the stock of mixture in the retort is constantly changing its composition as the distillation and partial condensation proceed, and no uniform *régime* can be established. The author has devised a new form of apparatus; and the following description relating to the apparatus as applied to the separation of mixtures of water and alcohol. The usual retort and still-head were replaced by a long length (12 m.) of copper tubing, 15 mm. in diameter. This was divided into two parts, arranged in spirals, and mounted in separate iron pails. The lower and longer spiral was surrounded with water, which was kept boiling; the water surrounding the upper spiral was also maintained at a constant temperature, usually 77° C. The two spirals were connected by a straight length of glass or brass tubing of somewhat greater bore, and provided with a lateral junction through which the material to be distilled could be supplied. The system of tubing was so arranged that the entire length was on a slight and nearly uniform gradient, rising from near the bottom of the lower pail to the top of the upper pail. On leaving the latter, the tube turned downwards and was connected with an ordinary Liebig's condenser, capable of condensing the whole of the vapour which entered it. At the lower end of the system of tubing, the watery constituent was collected. In strictness, the receiver should be connected air-tight, and be maintained at 100° C., and in distilling the stronger mixtures (60 or 75 per cent. alcohol), this precaution was found advisable or necessary, but in the case of the weaker ones, the water could be allowed to discharge itself through a short length of pipe, the end of which was either exposed to the atmosphere or slightly sealed by the liquid in the receiver. The feed of the mixture was arranged as a visible and rather rapid succession of drops, and was maintained at a uniform rate. In the case of the stronger mixtures, heat was applied to the feed so that a good proportion was evaporated before reaching the main tube. In experiments with mixtures of four different strengths—20, 40, 60, and 75 per cent. alcohol—the water was collected nearly pure in all cases, never containing more than 0·5 per cent. of alcohol. The alcoholic part condensed from the upper end varied in strength from 89 per cent. (from the 20 per cent. mixture) to 90·3 per cent.

The author considers that the results may be regarded as satisfactory, and states that when once the conditions as to preliminary heating (if necessary) and as to rate of feed have been found for a particular mixture, the continued working of the apparatus can be made self-acting without much difficulty; and it is probable that separations, otherwise very troublesome, could be readily effected by use of it.
—A. S.

Gases in Liquids; Solution of ——. J. A. Wanklyn. Phil. Mag., 1902, March, 346—348; May, 498—500.

Carbon dioxide is absorbed by water without agitation, the rate of absorption being about 0·375 c.c. per hour for each sq. cm. of surface. If, however, carbon dioxide be placed over its saturated solution, and strong potash solution be carefully placed below the aqueous layer, the volume of gas remains constant during 48 hours. The rate of diffusion of carbon dioxide in aqueous solution must therefore be exceedingly slow. In similar experiments with ammonia, a column of the gas (38·2 c.c.) was separated from a column of water (5·5 c.c.) by means of a column of a saturated aqueous solution of ammonia (7·5 c.c.). After three hours, the volume of gas had decreased to 23·1 c.c.; after 10 hours, to 7·13 c.c. In this case also, therefore, the gas diffuses with great slowness in solution. In view of these results, the author suggests that a layer of still water 4 ins. thick would protect organic matter from the oxidising action of the atmosphere for more than a month.
—A. S.

Phosphorus Suboxide and the Reputed Solubility of Red Phosphorus in Aqueous-Alcoholic Alkali. A. Michaelis and K. V. Arend. Annalen, 1902, **325**, [3], 361—367.

The authors conclude that red phosphorus, both the ordinary crystalline variety and the amorphous variety obtained by heating phosphorous acid with phosphorus trichloride, is insoluble in aqueous-alcoholic alkali. When red phosphorus is triturated with water for a long time, one very small portion of it is oxidised to the sub-oxide and another similar portion is oxidised to acids of phosphorus. In absence of water, a portion of the red phosphorus is converted by rubbing into ordinary phosphorus which is soluble in aqueous-alcoholic alkali.—J. F. B.

Sulph-hydrated Hydrates; Composition and Constitution of ——. De Forcrand. Comptes Rend., **135**, [26], 1344—1346.

In 1882 the author described a series of mixed hydrates of the general formula $M + 2H_2S + 23H_2O$, where M is an organic halogen compound. He has lately shewn that the hydrate of hydrogen sulphide has the formula $H_2S + 6H_2O$; and in the present paper, from an examination of the vapour pressure and the thermal constants of the mixed hydrate in which M is $CHCl_3$, he concludes that the empirical formula of the compound is—

$$CHCl_3 + 2H_2S + 19 \text{ or } 20\ H_2O.$$

The constitution of the compound is therefore probably ($CHCl_3$ + 7 or 8 H_2O) and $2(H_2S + 6H_2O)$; so that there should be a hydrate of chloroform containing 7 or 8 H_2O. Chancel and Parmentier have described one containing 9 H_2O; no doubt this contained a certain amount of moisture. The general formula above no doubt attributes to these hydrates (through excess of moisture —— mother liquor retained by the crystals) 3 or 4 mols. of water too much. Probably the general formula should be (M + 7 or 8 H_2O) + 2 $(H_2S + 6H_2O)$. If this be so, the existence of hydrates of all these haloid compounds may be predicted, containing 7 or 8 H_2O. The author has already shown that $CH_3Cl.7H_2O$ exists.
—J. T. D.

-Naphthylhydrazones of the Sugars; Importance of the ——, for their Detection and Separation. A. Hilger and S. Rothenfusser. Ber., 1902, 35, [20], 4141—4147.

The authors have prepared the β-naphthylhydrazones of xylose and levulose, which, unlike the corresponding compounds of galactose, arabinose, and dextrose, are readily soluble in 96 per cent. alcohol; a means of separation of either of the first two sugars from any one or more of the last three is thus obtained.

Xylose β-naphthylhydrazone separates from a mixture of methyl alcohol with amyl alcohol, benzene, or chloroform in crystals which are white with a very faint yellowish-grey fringe; it melts at 123°—124° C. and is readily soluble in methyl or ethyl alcohol or acetone.

Levulose β-naphthylhydrazone is deposited from a mixture of alcohol with either chloroform or benzene in yellow crystals melting at 161°—162° C. and is more soluble in the above-named solvents than the xylose derivative.

A solution of 0·8 grm. of xylose and 2 grms. of arabinose in 3 c.c. of water, when treated with 2·8 grms. of β-naphthylhydrazine dissolved in 60 c.c. of 96 per cent. alcohol, and allowed to stand for a few days with repeated shaking, deposited a precipitate which, when washed with a little ether and crystallised from 96 per cent. alcohol, gave the exact melting point of arabinose β-naphthylhydrazone; from the residual liquid the xylose compound was obtained pure by evaporating to dryness in a vacuum over sulphuric acid and crystallising the residue from chloroform.

Equal quantities of dextrose and levulose were separated in a similar manner.

Van Ekenstein and de Bruyn have found differences in the melting points of the β-naphthylhydrazones of a sugar obtained by different methods, and have ascribed these discrepancies to the formation of stereoisomeric compounds brought about by the presence of acetic acid. The authors have carried out experiments the results of which show that no such formation of stereoisomeric β-naphthylhydrazones takes place.—T. H. P.

Oxydases; The ——. Neumann Wender. Chem.-Zeit., 1902, 26, [102—103], 1217—1218 and 1221—1222.

The author gives a complete historical summary of the work done in connection with the oxydases and allied oxidising enzymes. He concludes that these enzymes play an important part in the life of the cell. As to the combined action of the oxidising enzymes, the following theory may be put forward:—The oxygen which penetrates into the cells is utilised by the aëro-oxydases [ordinary oxydases] for the oxidation of readily oxidisable bodies, in the course of which process intermediate peroxides are formed. These peroxides are decomposed by the catalase (see this Journal, 1901, 598), and the oxygen set free is "activified" by the anaero-oxydases [peroxydases] and utilised for the combustion of the substances oxidisable with difficulty. The oxidation processes serve for the conversion of chemical energy into vital energy on the one hand and for the destruction of plasmic poisons on the other, and protect the normal functions of the living cell. —J. F. B.

Oxidising Enzymes in Plants. K. Aso. Bull. Coll. Agric. Tokio, 5, 207—235. Chem. Centr., 1902, 2, [24], 1418.

The author describes a series of experiments, in which the behaviour of sections and juices of various plants towards different reagents (guaiacum tincture, guaiacum tincture and hydrogen peroxide, guaiacol and hydrogen peroxide, paraphenylenediamine and hydrogen peroxide, and tetramethylparaphenylenediamine with hydrogen peroxide), and also the action of foreign substances and the influence of higher temperatures for longer or shorter periods, on the reactions were examined. It was also sought to ascertain whether "zymogens," which effect the regeneration of the oxydases, could be detected and whether the different enzymes could be separated one from another. From the results obtained the following conclusions are drawn:—Various vegetable materials that give the reaction for oxydase and peroxydase with guaiacum, also give the red reaction with guaiacol and hydrogen peroxide. The Storch reaction of milk with paraphenylenediamine and hydrogen peroxide is also obtained with many vegetable substances; in general, a green colour is produced at first, changing at times rapidly, but mostly very slowly, to violet. A new reaction for oxidising enzymes is the deep violet coloration obtained with tetramethylparaphenylenediamine and hydrogen peroxide; this reaction can also be used for distinguishing raw milk from boiled milk. The spermase reaction discovered by Grüss was obtained with various quiescent and germinated seeds; with quiescent seeds only the embryo gave the reaction. The red guaiacol reaction is produced by a special enzyme, which is of a more stable character than peroxydase. Sodium fluoride and sodium silicofluoride hinder all the reactions; oxydase is destroyed more rapidly than the other enzymes. The green and violet reaction (with paraphenylenediamine and hydrogen peroxide) is produced by enzymes which are distinguished from oxydase and peroxydase by their behaviour towards injurious substances, and by the fact that the temperature at which they are killed lies between those at which oxydase and peroxydase respectively are destroyed. Sugar, soluble albumin, and peptone have no influence on the reactions, but tannin interferes to a considerable extent. The presence of "zymogens" of the oxidising enzymes is very probable. The peroxydases can be separated from the oxydases by adding to one volume of the vegetable juice, two volumes of absolute alcohol. The oxydases are retained wholly in the precipitate, whilst the greater portion of the other enzymes passes into the filtrate. Oxidising enzymes possess properties similar to those of the albumoses. —A. S.

Alkali Phenolates; Influence of Substituent Radicles in the Nucleus on the Stability of ——, towards Carbon Dioxide at Ordinary Temperatures. P. N. Raikow and J. N. Momtschilow. Chem.-Zeit., 1902, 26, [105], 1237—1240.

Taking the behaviour of the alkali salts of the phenols in aqueous solution when treated with a current of carbon dioxide at the ordinary temperature as a comparative measure of the strength of the acid function of the OH group, the authors find that this is increased or diminished according to the nature of the radicles substituted for one or more of the hydrogen atoms of the ring. The increase of the acidity under the influence of the negative radicles may be so great that the alkali salts are not decomposed by carbon dioxide, whilst the weakening of the acid function by the introduction of positive radicles is never so great as to suppress the property of the phenols of combining with alkalis. Of all the substituents the nitro group had the strongest action in increasing the acid function. The aldehyde [formyl] group, although devoid of definite electrochemical character, had an influence very nearly as powerful as that of the nitro group. The alkali salts of phenols containing alkyl groups, other phenolic groups, and carboxylic ester groups in the nucleus were all readily decomposed by carbon dioxide. The halogens, in spite of their strong electro-negative character, did not increase the acidity of phenols to any great extent, even tribromphenol being liberated from its alkaline solution by carbon dioxide. The presence of one nitro group had not sufficient influence to prevent the liberation of the nitrophenol by carbon dioxide, although it retarded and restricted it, but the combined influence of a nitro and an aldehyde group, as in nitrovanillin, rendered the alkali salt stable towards carbon dioxide. The dinitro- and trinitro-phenols, including picramic acid, are stronger acids than carbonic acid, and their alkali salts are not decomposed by the latter. The naphthols behaved similarly to the phenols. As regards the position of the substituent groups, the meta position differs somewhat from the ortho and para. For instance, *m*-nitrophenol is liberated far more rapidly and completely than *o*- or *p*-nitrophenol. In the naphthols the second benzene ring has a stronger acidifying influence in *α*-naphthol than in β-naphthol.—J. F. B.

Formaldehyde; Separation of the Amino and Acid Functions by means of ——. H. Schiff. Annalen, 1902, **325**, [3], 348—354.

It has been shown that the addition of formaldehyde to amino-acids, in which the amino group may be regarded as being neutralised by the carboxyl group, upsets this neutrality, with formation of methylene derivatives to a greater or less extent, and allows a corresponding proportion of free acid to be detected by titration. The extent of the separation of free acidity depends largely on the dilution of the liquid, being less the greater the dilution. A similar liberation of free acid occurs when formaldehyde is added to solutions of ammonium salts and salts of amines, and in these cases the separation is more frequently complete. With ammonium chloride, ammonium sulphate, hydrazine hydrochloride, and hydroxylamine hydrochloride, the results of titration are complete and independent of the dilution. A process for the estimation of formaldehyde is being worked out, based on its action on ammonium chloride, the ammonia being converted into hexamethylenetetramine and the acid being liberated. The separation of acid from salts of the aliphatic primary amines is not complete, and more acid can be detected by phenolphthalein than by litmus. In the case of di-isoamylamine hydrobromide, titration in presence of phenolphthalein gives 97 per cent. of the theoretical result, whereas in presence of litmus, the product of the reaction is quite neutral. Hydrazine salts yield complete results with both indicators, but the reaction proceeds in two stages if the titration be made first without formaldehyde and subsequently with formaldehyde, as :—

$$N_2H_4 2HCl + KOH = N_2H_4HCl + KCl + H_2O$$

$$N_2H_4HCl + 2CH_2O + KOH = N_2(CH_2)_2 + KCl + 3H_2O.$$

Litmus shows an accurate separation of these two stages, but phenolphthaleïn gives almost the full result without formaldehyde, the small balance being shown after the addition of formaldehyde.—J. F. B.

Horn; Hydrolysis of ——. E. Fischer and T. Dörpinghaus. Zeits. physiol. Chem., **36**, 462—486. Chem. Centr., 1902, **2**, [24], 1424.

Besides the previously known decomposition products of horn (leucine, tyrosine, asparagine, glutaminic acid, cystine, arginine, and lysin), the authors have identified glycocoll, alanine, *d*-aminovaleric acid, *d*-pyrrolidinecarbonic acid, serine, and phenylalanine. Apart from tyrosine and cystine, the authors obtained by the "ester method" 40·02 per cent. (on the dried horn) of mono-amino acids, composed of :—glycocoll, 0·34; alanine, 1·20; *a*-aminovaleric acid, 5·70; leucine, 18·30; *a*-pyrrolidinecarbonic acid, 3·60; serine, 0·68; phenylalanine, 3·00; asparagine, 2·50; glutaminic acid, 3·00; and pyrrolidinecarbonic acid, 1·70 per cent.—A. S.

New Books.

The Analysis of Oils and Allied Substances. By A. C. Wright, M.A., B.Sc. Crosby Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London, E.C. 1903. Price 9*s.* nett.

8vo volume, with preface, table of contents and subject-matter filling 236 pages, followed by an alphabetical index. There are five illustrations. The leading subjects are :—I. The Occurrence and Composition of Oils, Fats, and Waxes. II. The Physical Properties of Oils, Fats, and Waxes, and their Determination. III. Chemical Properties of Oils, Fats, and Waxes from the Analytical Standpoint. IV. Detection and Determination of Non-Fatty Constituents. V. Methods for Estimating the Constituents of Oils and Fats. VI. Description and Properties of the More Important Oils, Fats and Waxes, with the Methods for their Investigation. VII. The Examination of Certain Commercial Products.

Secondary Batteries: Their Theory, Construction, and Use. By E. J. Wade. "The Electrician" Printing and Publishing Co., Ltd., Salisbury Court, Fleet Street, London, E.C. 1902. Price 10*s.* 6*d.* nett.

8vo volume, containing preface, table of contents and 483 pages of subject-matter, illustrated with 265 engravings, and concluded with an alphabetical index of subjects and authors. The various chapters are devoted to the following main subjects :—I. Introductory. II. Lead Cells. III. Storage Cells other than Lead. IV. Properties and Behaviour of Lead Cells. V. Chemistry of Lead Cells. VI. Design of Lead Cells. VII. Manufacture of Lead Cells. VIII. Treatment and Testing of Lead Cells. IX. Erection, Connecting Up, and Regulation of Lead Cells. X. Present-Day Cells.

A Text-Book of Quantitative Chemical Analysis. By Frank Julian. The Ramsey Publishing Co., St. Paul, Minn., U.S. America. 1902. Price 6 dols. nett.

Large 8vo volume, with alchemical quotation, table of contents, preface, and subject-matter filling 597 pages, concluded by an alphabetical index. The text is illustrated with 185 engravings. The subject-matter is subdivided as follows :—I. Sampling and Weighing Operations. Operations of Analysis. Volumetric Analysis. Gasometry, &c. II. Reagents. Exercises, &c. III. Special Methods and Technical Analysis. IV. Notes on the Methods of Analysis. Appendix. Technical and Industrial Analysis. Tables, &c.

Theoretical Organic Chemistry. By Julius B. Cohen, Ph.D., Lecturer on Organic Chemistry, The Yorkshire College, Lecturer of the Victoria University, &c. Macmillan and Co., Ltd., London. 1902. Price 6*s.* The Macmillan Co., New York.

Small 8vo volume, containing preface, table of contents, and subject-matter filling 560 pages, a page of answers to questions propounded at the close of each chapter, and the alphabetical index. The text is illustrated with 77 engravings. The subject is treated as follows :—Introductory :—(i) Purification of Solids and Liquids. (ii) Analysis of Organic Compounds. (iii) Empirical and Molecular Formulæ. (iv) Classification, pages 1—50. Part I. Aliphatic Compounds, pages 51—358. Part II. Aromatic Compounds, pages 359—560.

Mines and Quarries: General Report and Statistics for 1902. Darling and Son, Ltd., 34-40, Bacon Street, London, E. 1903.

Tables of Fatal Accidents and Deaths in and about the Mines and Quarries of the United Kingdom during the Year 1902.

Trade Report.

I. GENERAL.

Bolivia, Trade of, through Antofagasta.

Bd. of Trade J., Jan. 1, 1903.

Exports during 1901.

Articles.	Value.
	Pesos.
Tin	6,865,391
Sulphide of silver	826,433
Bismuth	723,751
Copper	457,521
Borate of lime	410,524
Argentiferous lead	365,457
Antimony	102,157
Tungsten	10,477

JAMAICA, EXPORTS OF.

Bd. of Trade J., Jan. 8, 1903.

The following table shows the quantity, value, and prices of some of the exports of Jamaica produce in the years 900–01 and 1901–02 :—

—	Quantity.		Value.		Price.	
	1900–01.	1901–02.	1900–01.	1901–02.	1900–01.	1901–02.
	Tons.	Tons.	£	£	*s.* *d.*	*s.* *d.*
ogwood	34,006	41,107	98,618	103,796	58 0 per ton	50 6 per ton.
	Galls.	Galls.				
um	1,494,405	1,422,010	152,244	124,426	2 2 per gall.	1 9 per gall.
	Cwt.	Cwt.				
ugar	295,007	321,659	165,941	136,705	11 0 per cwt.	6 per cwt.

TRANSVAAL; IMPORTS INTO.

Transvaal Government Gazette, Dec. 5, 1902.

Transvaal, Imports into, 10 *Months ended Oct.* 1902.

—	1901.	1902.
	£	£
Drugs and chemicals	59,000	321,000
Soap and candles	68,000	144,000
Ale, spirits, wine, &c.	84,000	372,000

II.—FUEL, GAS, AND LIGHT.

COAL IN BRITISH COLUMBIA.

Canadian Manufacturer, 1902, **45**, [12], 33.

Coal from the Similkameen region of British Columbia, where mining is now being carried on with considerable activity, is stated to be an excellent steam coal. On analysis it gives the following figures : carbon (fixed), 50 ; volatile matter, 35 ; water, 10 ; and ash, 5 per cent.—A. S.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM, DUTY ON EGYPTIAN: CUSTOMS DECISION.

Bd. of Trade J., Jan. 8, 1903.

The following Tariff of Valuations is in use by the Egyptian Customs for the purpose of assessing duty on imported petroleum. The tariff came into force on the 16th ult., and will remain in operation for a period of six months :—

Article.	Unit.	Valuation.*
		Milliemes.†
American petroleum	Per case	205
"Safety" "	"	255
Russian "	Per case containing 2 cans.	155
" "	Per can (not in case).	62½
" " in bulk	Per every 66 lb.	80

* Duty is charged on these valuations at the rate of 8 per cent.
† 1,000 milliemes = 1*l.* 0*s.* 6¼*d.*

PETROLEUM FOR FUEL IN INDIA.

Bd. of Trade J., Jan. 1, 1903.

A Customs circular (No. 17 of 1902) has been issued by the Government of India, under which the import duty in India on petroleum, having its flashing point at or above 150° F., is reduced to 5 per cent. *ad val.*, provided it is proved to the satisfaction of the Customs collector that it is intended to be used exclusively as fuel.

IV.—COLOURING MATTERS AND DYESTUFFS.

INDIGO IN JAVA.

Chem. Trade J., Jan. 10, 1903.

The following are the figures of imports, deliveries, and stocks of Java indigo in Holland during the last eight years :—

—	1895.	1896.	1897.	1898.
	Chests.	Chests.	Chests.	Chests.
Imports	5,192	5,998	9,242	9,503
Deliveries	5,314	4,402	8,032	8,417
Stock, 31st December	914	2,510	3,720	4,806

—	1899.	1900.	1901.	1902
	Chests.	Chests.	Chests.	Chests
Imports	4,079	3,872	3,335	3,059
Deliveries	7,751	3,597	4,637	2,967
Stock, 31st December	1,134	1,409	107	198

The production of the last crop was about 495 tons, against 498 tons in 1901, 595 tons in 1900, 660 tons in 1899, 904 tons in 1898, 811 tons in 1897, 680 tons in 1896, 604 tons in 1895, and 495 tons in 1894.

VII.—ACIDS, ALKALIS, Etc.

NITRATE OF SODA STATISTICS.

W. Montgomery & Co., 31st December 1902. *Shipments, Consumption, Stocks, and Prices for Three Years.*

—	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Shipments from South American Ports to all parts for the six months ended 31st December	897,000	633,000	756,000
Shipments from South American Ports for the 12 months ended 31st December	1,429,000	1,238,000	1,351,000
Afloat for Europe on 31st December	573,000	374,000	397,000
Stocks in United Kingdom ports :—	35,000	25,000	26,000

—	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Liverpool	10,000	5,000	6,500
London	4,000	2,000	3,600
Out ports	21,000	18,000	15,900

—	1900.	1901.	1902.
Stocks in Continental ports on 31st December	186,000	218,000	237,000
Consumption in United Kingdom for the six months ended 31st December	45,000	35,000	35,000
Consumption in Continent for the six months ended 31st December	235,000	229,000	249,000
Consumption in United Kingdom for the 12 months ended 31st December	135,000	118,000	111,000

—	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Consumption in Continent for the 12 months ended 31st December	991,000	1,036,000	917,000
Consumption in United States for the 12 months ended 31st December....	175,000	192,000	220,000
Consumption in other Countries for the 12 months ended 31st December	23,000	18,000	17,000
Consumption in the World for the 12 months ended 31st December. .. .	1,324,000	1,364,000	1,265,000
Visible supply on 31st December (including the quantity afloat for Europe and Stocks in United Kingdom and Continent)	794,000	617,000	660,000
Price on 31st December .....per Cwt.	8s. 6d.	9s. 6d.	9s. 1½d.

Glauber Salts Spring near the Caspian Sea.

Chem. and Druggist, Jan. 3, 1903.

An expedition sent out to explore Kara Bughaz, the "Black Gulf," on the east of the Caspian Sea, has ascertained the existence of a salt spring yielding large quantities of pure sulphate of soda. The locality is within easy distance of Baku.

Pearl Hardening: U.S. Customs Decision.

Dec. 15, 1902.

Artificial sulphate of lime was held to be properly dutiable as pearl hardening at 20 per cent. *ad val.* under paragraph 91 of the Tariff of 1897.

IX.—BUILDING MATERIALS, Etc.

Ground Plaster of Paris: U.S. Customs Decision.

Dec. 17, 1901.

Ground plaster of Paris was held to be dutiable at 2·25 dols. per ton under paragraph 91 of the Tariff Act of 1897.

X.—METALLURGY.

Copper in Sweden.

Bd. of Trade J., Jan. 8, 1903.

Attention has recently been called to the existence of rich veins of copper at Nietsapkibacken near Gellivara. According to Swedish journals the veins extend over a length of 10 kiloms., and their value is enhanced by the fact that the quartz is also auriferous.

Zinc Skimmings and Zinc Dross or Ashes: U.S. Customs Decision.

Dec. 17, 1902.

The Board considered certain zinc skimmings which ha been assessed for duty at 1 and 1½ cents per pound as zinc in blocks, under paragraph 192 of the Tariff Act of 1897.

The article described as zinc dross was in the form of ashes, consisting of impure zinc, with traces only of ammonium chloride. Not being in blocks or any simila form, the Board held it to be dutiable as a mineral substance in a crude state at 20 per cent. *ad valorem*, as claimed by the importer, and overruled the action of the collector.

XII.—FATS, OILS, Etc.

Asphodelus Tenuifolius.

Imp. Inst. J., Nov. 1902.

Mr. A. Ghose has recently examined the seeds of th plant *Asphodelus tenuifolius*, belonging to the natura order *Liliaceæ* and indigenous to Northern India, wher it is widely distributed. (*Agricultural Ledger*, 7, 1902.) The seeds have been eaten by the natives in famine times The specimen of seeds analysed contained approximately 26 per cent. of albuminoids, 17 per cent. of carbohydrates and 25 per cent. of oil, the remainder being water, ash, and fibre. No alkaloid could be detected. The oil was foun to have a saponification number of 108·7, and to posses drying properties, which were improved by admixture wit metallic oxides. The seeds are employed medicinally b the natives, and are known to exert a diuretic action.

XIV.—TANNING; LEATHER; GLUE, Etc.

Agar-Agar.

Chem. and Druggist, Jan. 3, 1903.

Last year 1,961,975 lb. of agar agar, valued at 116,260*l.* were shipped from Kobe and Osaka, against 1,784,542 lb valued at 91,762*l.*, in 1900. The bulk of the export goe to Hong Kong and China, but in 1900 over 57,000 lb. wer sent to the United Kingdom, and over 75,000 lb. to Germany. In Japan this article is known as "kanten" or "coll vegetale," and is the gelatin of an alga called "tengusa" (*Gelidium corneum*). It is found in considerable abundance along many parts of the coast of Japan. After bein gathered it is bleached, dried, and packed in bundles.

The following tables relate to the exports of agar-aga from Japan to various countries from 1899 to 1901 :—

—	1899.		1900.		1901.	
	Quantities.	Value.	Quantities.	Value.	Quantities.	Value.
	Kin.	Yen.	Kin.	Yen.	Kin.	Yen.
Australia	152	80·20	3,417	2,809·30	2,746	2,706·0
Belgium.....................	29,800	20,630·00	3,500	3,489·08	..	..
British India...............	35,131	20,575·33	33,810	22,280·37	19,136	26,127·19
China	531,769	228,896·30	579,680	395,213·75	823,242	672,013·40
Dutch Indies	..	.	5,519	4,780·50	3,700	2,851·00
France.......................	7,500	4,835·00	3,628	3,115·25	1,965	1,835·00
Germany	20,850	14,581·40	55,038	48,047·62	50,274	10,172·50
Great Britain	6,825	1,905·00	13,099	36,132·00	17,402	17,404·30
Hong Kong	569,875	316,848·54	700,004	436,827·01	613,102	418,923·98
Russian Asia	1,200	543·65	3,511	2,535·50	2,117	1,596·07
U.S.A........................	1,941	1,294·54	10,330	7,698·60	14,142	13,819·08
Other countries	2,233	1,215·00	2,343	1,674·35	6,532	1,724·79
Total	1,207,276	674,434·96	1,444,459	961,321·76	1,781,718	1,217,494·70

Kin = 1·3 lb. avoir. Yen = 2s. 0½d.

XVI.—SUGAR, STARCH, Etc.

Sugar from Barbadoes.

Chamber of Com. J., Jan. 1903.

The principal exports of Barbadoes are sugar and molasses, the bulk of the sugar, both Muscovado and Dry, being taken by the United States. Molasses are chiefly sent to Canada. The exports of sugar and molasses during the last three years were as follows :—

Sugar.		1899.	1900.	1901.
Muscovado	Hhds.	43,907	48,573	61,074
Dry	..	2,312	1,998	3,936
Molasses....................	Puns.	29,131	37,234	46,012

Of other exports last year, mention may be made of th following : — Manjak, 9,394*l.*; lime, 2,960*l.*; chemica manufactures and products, 2,088*l.*; and rum, 1,153*l.*

Sugar Production of Italy.

Bolletino Ufficiale, Dec. 3, 1902.

The number of beet-sugar factories in Italy in the year 01–02 was 33, an increase of five over the previous ar. These factories produced in 1901–02 74,208,920 kilos. sugar, valued at 49,951,607 lire, as compared with .125,409 kilos., valued at 40,194,257 lire in 1900–01.

Wheat and Potato Starch and Rice Flour: U.S. Customs Decision.

Dec. 15, 1902

Potato starch was decided to be dutiable at $1\frac{1}{2}$ cents per . under paragraph 285 of the Tariff of 1897. The claim the importers that duty should be assessed at 20 per nt. *ad valorem* under section 6, as a manufactured article enumerated, was overruled. On the same day the Board ld that rice flour was dutiable at $\frac{1}{4}$ cent. per lb. under aragraph 232, providing for rice in various forms, cluding rice flour.

Wheat starch was also held to be dutiable at $1\frac{1}{2}$ cents r lb. under paragraph 285.

Sugar from Holland: Indian Duty on.

Bd. of Trade J., Jan. 8, 1903.

The rates of *additional* duty imposed on bounty-fed igar imported into India from Holland, with effect from ec. 6, 1902, are as follows:—

Kinds of Sugar.	Additional Duties Levied.	
	Old Rate.	New Rate.
	Per Cwt. R. A. P.	Per Cwt. R. A. P.
aw sugar produced in Holland from beet-roots.	0 14 0	0 11 9
ugar refined from beet-root raw sugar produced in Holland.	0 15 11	0 13 3
ugar refined from imported raw sugar ..	0 1 11*	0 1 6*

* In addition to countervailing duty, if any, on the raw sugar.

XX.—*FINE CHEMICALS, Etc.*

Cinchona Plantations in India.

Chem. Trade J., Jan. 10, 1903.

The quantity of quinine distributed during 1902 was the irgest on record, *viz.*, $11,978\frac{3}{4}$ lb. By means of new achinery the bark is dealt with by the shale-oil process istead of with the fusel-oil in use before. The total area nder cultivation is $1,071\frac{1}{2}$ acres, of which $831\frac{1}{2}$ acres are ld, the remainder being composed of three extensions, he expenditure on the total acreage working out at . 47·10 per acre. The year's crop amounted to 54,044 lb. of crown and hybrid bark, but the annual yield equired from the existing plantations has been fixed, for he present, at 3,000 lb. of manufactured quinine, and this mount is represented by 85,750 lb. of bark of $3\frac{1}{2}$ per cent. uality. Some important scientific experiments were made a the Doddabetta estate during the past year. Samples f bark were taken from 38 trees, selected at random, but arge and well-grown ones, and their bark was analysed. he results in some cases were extraordinary, some samples iving as much as 13·90 per cent. of sulphate of quinine— percentage which is probably unequalled by *Cinchona fficinalis* anywhere.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 75. Güttner and Baeger. Centrifugal separators. Jan. 1.
,, 90. Muir. Furnaces. Jan. 2.
,, 118. Wray and Canham. Funnels. Jan. 2.
,, 135. Stumpf. Steam turbines.* Jan. 2.
,, 176. Haarmann. Cooling apparatus.* Jan. 3. U.S. Application, Jan. 8, 1902.
,, 214. Scott. Refractory wash for furnace linings, firebricks, &c. Jan. 5.
,, 361. Normandy. Apparatus for evaporating or distilling liquids. Jan. 6.
,, 493. Milner. Automatic mercury vacuum pump.* Jan. 8.
,, 512. Morgan Crucible Co. and Speirs. Apparatus for mixing mineral and other dry substances. Jan. 8.
,, 693. Güttner. Centrifugal separators.* Jan. 10.
,, 886. Kneuper. Filters.* Jan. 13.
,, 1011. Reeves. Filtering apparatus. Jan. 15.
,, 1076. Hardy. Separation of colloidal matters from solution. Jan. 15.
,, 1165. Wright. Concentrators or separators. Jan. 16.
[C.S.] 840 (1902). Parsons. Condensers working in conjunction with air-pumps. Jan. 7.
,, 2226 (1902). Bowler. Fire-bricks and fire-lumps. Jan. 14.
,, 2898 (1902). Hargreaves. Furnaces. Jan. 21.
,, 11,886 (1902). Koch. Blast-furnaces, and apparatus for catching the dust and heating the blast of blast-furnaces. Jan. 14.
,, 13,547 (1902). Hampl. Centrifugal separators. Jan. 21.
,, 13,956 (1902). Winship (Antoine Heinz et Cie.) Temperature indicator. Jan. 21.
,, 14,903 (1902). Pudenz. Separating oil from water. Jan. 21.
,, 19,895 (1902). Pfoser. Calcining or smelting furnaces. Jan. 14.
,, 20,147 (1902). Ordway. Vacuum evaporating apparatus. Jan. 14.
,, 21,782 (1902). James. Filter-press. Jan. 7.
,, 23,950 (1902). Herrmann. Furnaces. Jan. 21.
,, 24,612 (1902). Longden. Respirators for firemen, miners, &c. Jan. 14.
,, 25,790 (1902). Bate and Orme. Condensers for acids. Jan. 21.
,, 25,967 (1902). Lammus. Distilling apparatus. Jan. 14.

II.—FUEL, GAS, AND LIGHT.

[A.] 84. Boistelle. Apparatus for measuring and mixing gas.* Jan. 1. French Application, Jan. 14, 1902.
,, 109. Brown. Mantles and burners used in incandescent gas lighting. Jan. 2.
113. Higham. Fuel economisers.* Jan. 2

[A.] 197. Donkin and Rodgerson. Generating pressure by combustion of air and gas or liquid fuel. Jan. 3.

„ 301. Webster. Automatic carbide feeder for acetylene generators. Jan. 6.

„ 501. Custodis. Manufacture of coke.* Jan. 8.

„ 536. Wilcox. Manufacture of coke in retort ovens.* Jan. 8.

„ 549. Alexander. Fuel. Jan. 9.

„ 629. Stanley. Regulating the quantities of a mixture of hydrocarbon and air. Jan. 9.

„ 782. Clapham. Manufacture of inflammable gas from volatile hydrocarbons. Jan. 12.

„ 887. Grote. Manufacture of artificial fuel. Jan. 13.

„ 936. Noad. Manufacture of fuel blocks. Jan. 14.

„ 1085. Robert. Manufacture of fuel balls, briquettes, &c.* Jan. 15.

„ 1090. Clauss. Generation of water-gas. Jan. 15.

„ 1091. Clauss. Generation of water-gas. Jan. 15.

[C.S.] 186 (1902). Waddell. Furnaces for gas retorts and the like. Jan. 7.

„ 1040 (1902). Kennedy. Manufacturing coke. Jan. 21.

„ 1923 (1902). Mehling. Incombustible lighter for igniting coals. Jan. 7.

„ 2015 (1902). Gardner. Liquid fuel burners. Jan. 14.

„ 2071 (1902). Marchant. Apparatus for heating, straining, and regulating liquid fuels. Jan. 14.

„ 2307 (1902). De Vulitch. Binding medium for coal and other substances. Jan. 14.

„ 2358 (1902). Livingstone and Vandercook. Composition to economise fuel. Jan. 21.

„ 5326 (1902). Stock and Putnam. Treatment of gases for furnace combustion. Jan. 21.

„ 20,225 (1902). Mitchell and Copeland. Utilising the heat of hot slag. Jan. 21.

„ 20,669 (1902). Boult (Köneman). Artificial fuel briquettes. Jan. 14.

„ 20,718 (1902). Johnson. Manufacture of gas from gasoline. Jan. 21.

„ 21,104 (1902). Elb. Manufacture of porous coked charcoal bricks. Jan. 14.

„ 23,503 (1902). Loewenthal. Composition for making coal-dust bricks. Jan. 7.

„ 24,661 (1902). Simons. Fuel briquettes. Jan. 7.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 36. Grossmann. Manufacture of cyanides and recovery of by-products. Jan. 1.

„ 100. Ricklefs. Carbonisation of animal and vegetable substances.* Jan. 2.

„ 951. Wise (von May). Treatment of petroleum and other hydrocarbons, and of their distillates and derivatives.* Jan. 14.

[C.S.] 9322 (1902). Lake (Warren). Manufacture of coal tar compositions and pitches. Jan. 14.

„ 23,884 (1902). Fourcy and Huire. Crystallisation and immediate separation of product from liquors, especially naphthalene and anthracene. Jan. 21.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 633. Imray (Meister, Lucius und Brüning). Monazo dye-stuffs for wool. Jan. 9.

„ 953. Imray (Meister, Lucius und Bruning). Azo dyestuffs from 1 . 8-azimido-naphthalene-4-sulphonic acid. Jan. 14.

„ 1235. Abel (Act.-Ges. f. Anilin-fabr.). Manufacture of red lakes. Jan. 17.

[C.S.] 4028 (1902). Abel (Act.-Ges. für Anilin-fabr.). Manufacture of mordant monazo dyestuffs and of intermediate products for use therein. Jan. 14.

„ 4653 (1902). Ransford (Cassella). Manufacture of sulphur colours. Jan. 21.

„ 4708 (1902). Thompson and Vlies. Manufacture of sulphurised dyestuffs. Jan. 21.

„ 7849 (1902). Lake (Chem. Fabr. vorm. Sandoz). Manufacture of sulphur dyes. Jan. 14.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 1. Caux. Dyeing fibres and fabrics.* Jan 1.

„ 369. Haddan (Elosegin). Fulling and dyeing of pure and mixed woollen fabrics.* Jan. 6.

„ 371. Haddan (Elosegin). Fulling or milling and dyeing of pure or mixed woollen fabrics.* Jan. 6

„ 429. Garchey and Pabion. Manufacture of textil fibres, yarns, &c.* Jan. 7.

„ 444. Read Holliday and Sons and Cooper. Appa ratus relating to dyeing. Jan. 7.

„ 894. Edlich. Imparting a silk- or wool-like appear ance to cotton fabric. Jan. 13.

[C.S.] 244 (1902). Van Steenkiste. Expeditious retting o flax, hemp, ramie, and the like. Jan. 14.

„ 922 (1902). Playne and Macdonald. Indigo va dyeing. Jan. 7.

„ 2524 (1902). Schneider. Apparatus for treatin warp-yarns, tapes, and other narrow goods wit mercerising, dyeing, bleaching, or other liquor Jan. 7.

„ 4175 (1902). Johnson (Badische Anilin und Sod Fabrik). Treatment of animal fibres intended t be dyed. Jan. 14.

„ 5998 (1902). Carmichael. Oiling and finishin textile materials. Jan. 14.

„ 18,684 (1962). Leuscher. Thread or fabric wit metallic or metallically glittering coating. Jan. 1

„ 24,631 (1902). Siegel and Schütze. Dyeing app ratus. Jan. 11.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 36. Grossmann. *See under* III.

„ 72. Paul. Manufacture of hydrocyanic acid and cyanide salts therefrom. Jan. 1.

„ 260. Benker and Hartmann. Furnaces for roasti pyrites and other substances. Jan. 5.

„ 423. Hemingway. Treatment of waste pickle liqu for the removal or utilisation of free acid contain therein. Jan. 7.

„ 519. Stinville. Manufacture of sulphuric ac Jan. 8.

„ 691. Kennedy. Coolers for sulphuric acid. Jan 1

„ 739. Piffard. Manufacture of cyanides. Jan. 12.

„ 967. Reisert. Production of lime-water. Jan. 14.

„ 979. Benker. Manufacture of sulphuric ac Jan. 15.

[C.S.] 1758 (1902). Salinen-Direction Luneburg and Sach Manufacture of common salt. Jan. 14.

„ 2402 (1902). Lake. Roasting of pyritous mater Jan. 7.

„ 3045 (1902). Wheelwright. Manufacture of co pounds of phosphorus and sulphur. Jan. 21.

„ 4892 (1902). Clayton. Generation of hot or co sulphurous acid gas. Jan. 21.

„ 7463 (1902). Meurer. Obtaining metallic sulpha from mattes. Jan. 21.

„ 22,710 (1902). Carpenter. Manufacture of sulpl cyanide of calcium. Jan. 14.

VIII.—POTTERY, GLASS, AND ENAMELS.

A] 354. Harrison, Wharton, and Wightman. Process and apparatus for making glass.* Jan. 6.

„ 776. Graham-Simpson, Simpson, and Reynolds. Making glass-surfaced tiles, slabs, &c. Jan. 12.

.S.] 19,829 (1902) Heal. Manufacture of sheet or plate glass. Jan. 14.

„ 23,968 (1902). Schuler. Manufacture of painted and burnt glass. Jan. 14.

.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

A.] 325. Griffiths. Concrete mixers. Jan. 6.

„ 759. Korff. Construction of bricks. Jan. 12.

„ 776. Graham-Simpson, Simpson, and Reynolds. *See under* VIII.

„ 853. Vane and The De Vere Seyssel Asphalte Co. Manufacture of asphalte. Jan. 13.

.S.] 4604 (1902). Ferrell. Wood preserving and fireproofing. Jan. 21.

„ 19,493 (1902). Imray (Carborundum Co.). Manufacture of refractory bricks, &c. Jan. 21.

„ 20,492 (1902). Birkbeck (Mielck's Stone and Terra-Cotta Co.). Artificial stone, and process of making same. Jan. 14.

X.—METALLURGY.

A.] 184. Elmore. Concentrating ores. Jan. 3.

„ 466. Worsey and Hoal. Treatment of ores containing gold, copper, and other metals. Jan. 8.

„ 569. Dawes. Magnetic separators for ores, &c. Jan. 9.

„ 606. Martin. Manufacture of steel. Jan. 9.

, 704. Mills (Lecarme). Cementation of iron, steel, and cast iron. Jan. 10.

, 784. Herrenschmidt. Treating vanadiferous ores and products. Jan. 12.

. 964. Gin. Electrolytic production of aluminium. Jan. 14.

. 980. Duke. Aluminium alloys. Jan. 14.

, 1019. Stavenow. Manufacture of stereotype metal.* Jan. 15.

, 1028. Platner. Precipitating gold from its cyanide solutions. Jan. 15.

S.] 179 (1902). Thwaite. Decarbonising cast-iron articles. Jan. 14.

. 234 (1902). Lake (Rabezzana). Kilns for the treatment of ores and the like. Jan. 14.

, 1947 (1902). Phillips and Blundstone. Dephosphorisation of metals and metallic mixtures. Jan. 21.

, 5877 (1902). Campbell. Ore concentrators. Jan. 21.

, 6752 (1902). Bermont. Production of hydrated sulphide of zinc from zinc ores. Jan. 14.

, 24,360 (1902). Cooper and von Gernet. Extraction of copper from its ores. Jan. 14.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

.] 266. Finlay. Electrolytic cells. Jan. 5.

273. Müller. Electrodes for secondary batteries. Jan. 5.

322. Edison. Storage batteries.* Jan. 6.

334. Newton. Storage battery plate.* Jan. 6.

415. Roderbourg. Negative electrodes for secondary batteries. Jan. 7.

552. Birtwisle. Electrolysis. Jan. 9.

[A.] 582. Lauer. Accumulators or storage batteries. Jan. 9.

„ 813. Csányi and Báreczay. Electrical batteries.* Jan. 13.

„ 870. Madigin. Storage or secondary batteries.* Jan. 13.

„ 964. Gin. *See under* X.

„ 1088. Roderbourg. Positive electrodes for secondary batteries. Jan. 15.

[C.S.] 2376 (1902). Lake (Rambaldini). Electrolysis. Jan. 21.

„ 3912 (1902). Heroult. Electric furnaces. Jan. 21.

„ 4274 (1902). Lake (Soc. Anon. "La Carbone"). Electric cells or batteries. Jan. 7.

„ 5018 (1902). Mackenzie (Société Anon. l'Eclairage Electrique sans Moteur). Two-fluid electric batteries. Jan. 21.

„ 12,857 (1902). Winship. Storage batteries. Jan. 21.

„ 13,749 (1902). Graham, Bonton, and Amwake. Electro-chemical generators. Jan. 14.

XII.—FATS, OILS, AND SOAP.

[A.] 110. Wallach and Sonneborn. Lubricators. Jan. 2.

„ 467. MacDonald. Seed kettles for use in extracting oil from seeds. Jan. 8.

„ 687. Hunt. Treatment of crude cotton-seed and other oils to obtain oil, soap, and resinous colouring matter. Jan. 10.

„ 1238. Barbet. Extraction and purification of glycerin. Jan. 17.

[C.S.] 385 (1902). Fresenius. Treatment of inferior oil residues from the manufacture of vegetable oils. Jan. 7.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

C.—India-rubber, &c.

[A.] 661. Markus and Whitelow. Manufacture of insulating material. Jan. 10.

„ 1049. Arledter. Adhesives. Jan. 15.

[C.S.] 17,431 (1902). Blundell. Liquid cement for rubber, &c. Jan. 21.

„ 20,910 (1902). Prampolini. India-rubber substitute. (International Application, Feb. 6, 1902.) Jan. 14.

XIV.—TANNING, LEATHER, GLUE, AND SIZE

[A.] 531. Johnson (Föelsing). Extraction of gums and resins. Jan. 6.

[C.S.] 22,738 (1902). Chemische Düngerfabr. Vogtmann & Cie. Manufacture of glue and gelatin from leather and leather waste. Jan. 21.

„ 24,763 (1902). Walter. Leaching and tanning apparatus. Jan. 21.

XV.—MANURES.

[C.S.] 2853 (1902). Holmes. Apparatus for soil sterilisation. Jan. 14.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 319. Murdoch and The Improved Process Manufacturing Co. Manufacture of starch. Jan. 6.

„ 885. Haake. Preparation of an adhesive or cement from starch. Jan. 13.

[C.S.] 24,569 (1901). Spreckels and Kern. Purification of sugar-bearing materials. Jan. 14.

„ 14,432 (1902). Lichtenstein. Manufacture of caramel. Jan. 7.

„ 17,177 (1902). Passburg. Sugar moulds. Jan. 14.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 655. Wardle. Treatment of excess mixture contained by spent brewers' or distillers' grains. Jan. 10.

" 1073. Hoffmann. Continuous process for purifying beer wort. Jan. 15.

[C.S.] 2381 (1902). Hobson. Brewing. Jan. 14.

" 4008 (1902) Thierry. Treatment of distillers' spent residues or wash. Jan. 14.

" 5794 (1902). Guillaume. Process and apparatus for purifying dilute alcoholic liquors. Jan. 14.

" 9990 (1902). Lefebvre. Apparatus for continuous brewing. Jan. 14.

" 17,951 (1902). West, Chew, and Rogerson. Production of non-deposit beer. Jan. 14.

" 19,354 (1902). Effront. Fermentation of molasses, &c. for production of alcohol and yeast. Jan. 14.

" 25,350 (1902). Weber. Vats or vessels for fermenting. Jan. 21.

" 26,588 (1902). Boult (Wahl and Henius). Non-intoxicating beverage. Jan. 21.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 194. Boult. Artificial food.* Jan. 3.

[C.S.] 1328 (1902). Schultz. Method of preserving eggs. Jan. 7.

" 5598 (1902). Bunker. Production of tea, coffee, &c. extracts. Jan. 21.

" 7066 (1902). Grünfeld. Substitute for coffee extract. Jan. 14.

" 19,183 (1902). Hult and Hult. Separation of milk and other liquids. Jan. 14.

" 23,972 (1902). Prinz. Method of preserving cheese. Jan. 7.

" 21,619 (1962). Howorth (Liddle). Production of a light-coloured meat extract. Jan. 14.

B.—Sanitation; Water Purification.

[A.] 158. Howard. Sewage distributors. Jan. 3.

" 274. Wormald. Purifying and softening feed-water. Jan. 5.

" 309. Oram. Disposing of the liquid bye-products of works, factories, &c. Jan. 6.

" 498. Davidson. Water purifiers.* (U.S. Application, July 2, 1902.)

" 615. Candy. Filtration drainage and filter beds. Jan. 9.

" 656. Allen. Continuous process for separation of heavy matter from works effluents.* Jan. 10.

" 667. Booth. Bacteriological treatment of sewage. Jan. 10.

" 762. Baum. Clarifying waste liquid. Jan. 12.

" 1044. Stewart. Deodorisation of sewer air. Jan. 15.

[C.S.] 805 (1902). Lovell. Apparatus for taking and testing samples of air. Jan. 14.

[C.S.] 3516 (1902). Farrell. Apparatus for softening wat Jan. 7.

" 13,508 (1902). Delmouly. Water purifier. Jan. 21

C.—Disinfectants.

[A.] 173. Burn. Apparatus for generating ozone. Jan.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 412. Toone. Manufacture of pasteboard. Jan. 7.

[C.S.] 2713 (1902). Memecek. Manufacture of pap Jan. 14.

" 4886 (1902). Landsberg. Production of acetyl derivatives of cellulose and oxy-cellulose. Jan. 21.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 540. Bloxam. Manufacture of a new odorifero substance and of perfumes therefrom. Jan. 8.

" 543. Imray (Meister, Lucius und Brüning). Man facture of para-para'-diamidoacidyldiphenylamin and of para-para'-diamidodiphenylamine therefro Jan. 8.

" 705. Lake (Naef, Chuit, and Co.). Preparation hydrolysed pseudo-ionone and its homologu and for its transformation into cyclic keton Jan. 10.

" 848. Barge and Givaudin. Separation of orth and para-toluene sulphamide. Jan. 13.

[C.S.] 3152 (1902). Gaess. Preparation of monoform α_1-α_2-naphthylene diamine β_3- or β_4-mono-sulpho acid. Jan. 14.

XXI.—PHOTOGRAPHY.

[A.] 128. South. Colour photography.* Jan. 2.

" 1129. Edwards. Photographic films for tra parencies. Jan. 16.

[C.S.] 5108 (1902). Ogilvie. Solution for intensifyi photographic negatives. Jan. 21.

" 26,148 (1902). Cuff. Sensitised paper for tak copies of documents. Jan. 14.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 103. Le Mesurier. Explosives. Jan. 2.

" 456. Kynoch and Ashley. Kneading machines u in manufacture of explosives. Jan. 7.

" 457. Kynoch and Cocking. Manufacture of exp sives. Jan. 7.

[C.S.] 984 (1902). Petavel and Kingsmill. Pressure ga for explosives. Jan. 14.

" 3334 (1902). Wetter. Safety explosive. Jan. 1

" 3391 (1902). Bennett. Manufacture of safety fu for mining purposes. Jan. 7.

" 22,645 (1902). Schachtebeck. Safety explosi Jan. 14.

XXIII.—GENERAL ANALYTICAL CHEMISTR

[C.S.] 21,985 (1902). Tallquist. Means for determin the proportion of hæmoglobin in blood. Jan.

* * *

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Notices.

PATENTS RULES, 1903.

COMPULSORY LICENSES AND REVOCATION OF PATENTS.

1. A petition to the Board of Trade for an order under Section 3 of the Patents Act, 1902, shall show clearly the nature of the petitioner's interest and the ground or grounds upon which he claims to be entitled to relief, and shall state in detail the circumstances of the case, the terms upon which he asks that an order may be made, and the purport of such order, and the name and address of the patentee and any other person who is alleged in the petition to have made default.

2. The petition and an examined copy thereof shall be left at the Patent Office, accompanied by affidavits or statutory declarations in proof of the allegations contained in the petition, together with any other documentary evidence in support; and the petitioner shall, simultaneously with, or as soon as may be after the leaving of such petition, deliver to the patentee and any other person who is alleged in the petition to have made default, copies of the petition and of such affidavits or statutory declarations and other documentary evidence in support.

3. The persons to whom such copies are delivered by the petitioner may, within 14 days after being invited to do so by the Board of Trade, leave at the Patent Office their affidavits or statutory declarations in answer, and, if they do so, shall deliver copies thereof to the petitioner; and the petitioner may, within 14 days from such last-mentioned delivery, leave at the Patent Office his affidavits or statutory declarations in reply, and, if he does so, shall deliver copies thereof to the patentee or any other person alleged in the petition to have made default, such last-mentioned affidavits or statutory declarations being confined to matters strictly in reply.

The times prescribed by this rule may be altered or enlarged by the Board of Trade, if they think fit, upon such notice to parties interested and upon such terms, if any, as they may direct.

4. No further evidence than as aforesaid may be left by either side at the Patent Office except by leave or on requisition of the Board of Trade, and upon such terms, if any, as the Board may think fit.

5. The Board of Trade shall consider the petition and the evidence, with a view to satisfying themselves whether a *primâ facie* case has been made out for proceeding further with the petition, and if they are not so satisfied they shall dismiss the petition.

6. If they are so satisfied, they shall consider whether there is any probability of an arrangement being come to between the parties, and if it appears to them that there is any reasonable probability that such an arrangement can be come to, they may take such steps as they consider desirable to bring it about, and in the meanwhile may defer the reference of the petition to the Judicial Committee of the Privy Council.

7. If the Board are not of opinion that there is a reasonable probability of any arrangement being come to between the parties, and are satisfied that a *primâ facie* case has been made out by the petitioner, they shall refer the petition to the Judicial Committee, with copies of any affidavits, statutory declarations, or other documentary evidence which may have been furnished under the foregoing Rules, and with certified copies of all entries in the Register of Patents relating to the patent in question, and any other information in the possession of the Board which it appears to them may be of service to the Judicial Committee in ascertaining what persons should be made parties to the proceedings before the Committee, and the Board shall give written notice to the parties that the petition has been referred to the Judicial Committee.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to h rejected by the Publication Committee, or ordered to b abstracted for the Journal, in which case no reprints ca be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The attention of Members of the Society is called to th fact that the International Congress of Applied Chemistr will meet in Berlin, during Whitsuntide week of this yea A committee of this Society has been formed to co-operat with the other British Chemical Societies in endeavourin to secure an adequate representation of British Chemic Industry, and it is requested that the names of those pr posing to attend the Congress be forwarded to the Genera Secretary, in order that a formal invitation from th Organising Committee in Berlin may be sent to them.

The Congress will be opened on June 2nd, 1903. O Wednesday, June 3rd, Friday the 5th, and Monday th 8th, meetings will be held for the reading and discussio of papers. The subjects to be treated are classified a follows :—

I. Analytical Chemistry. Apparatus and Instru ments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products :—
  Subsection A.—Organic Preparations, includin Tar Products.
  Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharma ceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected wit Chemical Industry.

The *Verein Deutscher Chemiker*, the *Deutscher Bunsen gesellschaft* for Applied Chemical Physics, and the *Verein Deutscher Zuckertechniker*, have already decided to hol their respective annual meetings for 1903 in connectio with the Congress.

The programme for the entertainment of visitors is on large and liberal scale, and offers many attractions, parti culars of which will shortly be published in this Journal.

As formal invitations are now being sent out, application to join the Congress, accompanied by a remittance of 1*l* should be sent in to the General Secretary without delay.

INTERNATIONAL ATOMIC WEIGHTS.

Copies on cardboard, similar in size and style to thos enclosed in the previous number of this Journal, fo laboratory use, can be obtained by application to Messrs Eyre and Spottiswoode, East Harding Street, London, E.C Price, post free, 4*d*. each, or 3*s*. per dozen.

With forther reference to the sheet inserted in the las number, an abstract of the report of the Atomic Weight Committee will be found on page 169.

Changes of Address.

When notifying new addresses, members are requested t write them distinctly, and state whether they are temporar or permanent. Multiplication of addresses is also to b avoided as tending to create confusion. When sendin subscriptions, the use of the form attached to the applicatio helps in the verification of addresses, on which the saf delivery of the Journal depends.

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London Section.

Meeting held at Burlington House, on Monday, January 5th, 1903.

MR. WALTER F. REID IN THE CHAIR.

NOTE ON THE FLUORESCENCE OF NAPHTHALIC ANHYDRIDE.

BY J. T. HEWITT, M.A., D.Sc., PH.D.

The phenomenon of fluorescence is exhibited by a large number of organic dyestuffs; but since this property is not shared by all members of the class, whilst on the other hand it is exhibited by several substances, which, in the ordinary acceptation of the term, are uncoloured, it is but natural that attempts should be made to discover some general relationship between the constitution of substances and the fluorescence they exhibit.

Two theories have been advanced. Richard Meyer connects the fluorescence of dyestuffs, and related organic compounds with certain atomic groupings contained in their molecules; these groupings (pyrone, pyridine, azine rings, &c.) he terms fluorophors (Zeits. phys. Chem., 1897, **24**, 468).

The author of this communication developed an entirely different theory three years ago, viz., that the fluorescence of organic compounds depended on the possibility of tautomerism of a certain nature, a molecule of a fluorescent substance in one of its configurations being capable of passing into the other configuration by equal displacements of an atom or atoms in its molecules in opposite directions. Supposing the molecule to possess less potential energy when it had the first structure than in the second case, it would vibrate about a mean position in the same way that a pendulum, if plucked aside, vibrates about its lowest point. Radiant energy taken up by the molecule would be given out again with a different wave length (Proc. Chem. Soc., **16**, 3, and Zeits. phys. Chem., 1900, **34**, 1).

By means of this theory the non-fluorescence of xanthydrol and fluoran in neutral solvents is explained; both substances are incapable of tautomerism. When dissolved in strong sulphuric acid, both substances fluoresce, and if it be assumed that salts of oxonium type are produced, it is seen that these latter may easily exhibit the peculiar sort of tautomerism referred to above.

Although considerable doubt was thrown on these assumptions (R. Meyer, Jahrbuch der Chemie, 1901, **10**, 438), the preparation of a considerable number of oxonium salts from xanthydrol and allied compounds (Werner, Ber., 1901, **34**, 3300; Hewitt, Ber., 1901, **34**, 3819) as well as from fluoran and its derivatives (Hewitt and Tervet, J. Chem. Soc., 1902, **81**, 663) demonstrates that salts of the type mentioned are not only capable of existence in solution, but may even be isolated in crystalline form.

A recent paper by L. Francesconi and G. Bargellini (Gazzetta chim. ital., 1902, **32**, [2], 73; see also this Journal, 1902, 1327) deals with naphthalic anhydride and a number of its substitution derivatives and the fluorescence these substances exhibit when dissolved in sulphuric acid.

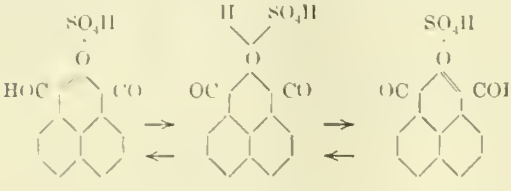
Naphthalic anhydride is, according to these authors, incapable of desmotropy, and, further, contains a six-membered ring, one member of which is an oxygen atom.

The conclusion arrived at is that the fluorescence exhibited by naphthalic anhydride is quite incompatible with the theory advanced by the present author, but harmonises with Richard Meyer's theory. In the case of substituted naphthalic anhydrides, Francesconi and Bargellini note that nitro groups inhibit the fluorescence entirely, but that in the case of halogenated derivatives the fluorescence is generally only weakened and not entirely destroyed.

The present author wishes to draw attention to the following facts, which appear to him sufficiently important to make one pause before giving too much weight to Francesconi and Bargellini's conclusions.

If naphthalic anhydride be dissolved in benzene or other neutral solvent, solutions are obtained which are not merely colourless, but also exhibit no fluorescence whatever. In acetic acid (glacial), solutions are obtained which, if they fluoresce at all, do so to such a slight extent as to escape detection on ordinary inspection. Strong sulphuric acid, however, dissolves naphthalic anhydride, giving solutions practically colourless to transmitted light, but exhibiting a strong bluish fluorescence.

The conclusion seems justified that the sulphuric acid acts in some other way than merely as a solvent, and it may be that very unstable oxonium salts are produced. If this be the case such salts could easily show the doubly symmetrical tautomerism which the present author has already shown to be characteristic of so many fluorescent substances—



So far it has not been found possible to isolate a sulphate in the solid condition; when naphthalic anhydride is ground up with glacial acetic and strong sulphuric acids and the resultant mass dried on porous earthenware, apparently unchanged naphthalic anhydride is recovered. The author hopes that this communication is merely of a preliminary nature, and that by modification of experimental conditions he may be able to isolate the salts he believes to exist in solution.

Discussion.

Dr. M. O. Foster said it would add a great deal to the interest that would be taken in Dr. Hewitt's theory, which was an exceedingly subtle one, if he would explain the difference between the left-hand formula and the right-hand formula. A casual observer would have some difficulty in understanding where the difference lay.

Dr. Power asked if the nature of the acid had any influence on the fluorescence. In connection with the views advanced respecting the conditions determining fluorescence, he was reminded of the peculiar behaviour of quinine salts. A solution of quinine shows a bluish fluorescence with sulphuric acid but not with hydrochloric acid, and in fact the addition of the latter acid to a fluorescent solution of a quinine salt will completely eliminate this character.

The Chairman said there were, no doubt, possible technical applications of this paper, though Dr. Hewitt had said he did not see any. The paper was on the border line between chemistry and physics, in fact it was to some extent a mixture of the two. The way in which substances acted upon light gave valuable indications as to their chemical constitution, and no doubt in course of time some connection would be found between all fluorescent substances. Papers of this nature would enable them to find out the cause of fluorescence. They had now a new physical indicator, as it were, in these formulæ, in the shape of the pendulum to which Dr. Hewitt had frequently referred in connection with the formulæ.

Dr. Hewitt, in reply to Dr. Foster, remarked that the chief point in his (Dr. Hewitt's) theory was that fluorescent substances exhibited tautomerism of such a nature that by equal displacements of an atom in opposite directions the same result was arrived at. The case was analogous t that of a pendulum, which could be plucked aside either t the left or to the right; it then oscillated about the positio of minimum potential energy in virtue of the kinetic energy it had acquired in falling from the position to which it ha been raised.

He had ventured to propound his theory of fluorescen organic compounds some two years ago on account of th large number of fluorescent substances exhibiting tautomerism.

With regard to Dr. Power's question about the relativ action of hydrochloric and sulphuric acids, no differenc in the production of fluorescence was observed in th majority of cases. The two acids, which both have o point in common, *viz.*, that they are strong acids, behav in the same manner in inducing a green fluorescence in th case of fluoran derivatives.

New York Section.

Meeting held at the Chemists' Club, on Friday, December 19th, 1902.

DR. VIRGIL COBLENTZ IN THE CHAIR.

ANALYSIS OF TANNING MATERIALS.
(FILTER-PAPERS AND DETERMINATION OF VOLATILE ACIDS.)

BY WM. H. TEAS.

The experimental work in connection with tannin, carrie out by members of the Association of Official Agricultura Chemists, U.S.A. (A.O.A.C.), during the year 1902, wa directed towards obtaining evidence (1) as to the be manner of filtering tan solutions before analysis, and (2) a to a standard method for determining the acid present i yard liquors. For investigation of the first point, tw extracts, a chestnut and a quebracho, were issued to th members; and for the second, a "union" liquor (mixed bar and hemlock).

In the present paper the general results thus obtained ar first recorded, amplified by some special work on the sam subjects by one of the members, Mr. H. C. Read, and at th end will be found the changes recommended by the A.O.A. Committee, in the "Official Methods" for conductin analyses.

A.O.A.C. Work for 1902.

Filter-Papers.—A recent communication to this Journa (see this Journal, 1902, 691—692) makes clear the necessit of this inquiry and the general conditions under which was carried out. It was shown that the amounts o "soluble solids" obtained in the analysis of a series 14 tannin solutions were greater when a single filter-pape was used instead of the official double paper (S. and S No. 590, 15 cm.), the average increase being 0·17 units pe cent., *i.e.*, excess of filter-paper causes loss of solubl solids. The results obtained with the two extracts issu by the Association (Table I.) show that the amount o soluble solids is greater by 0·23 units per cent. in the cas of the chestnut, and by 0·74 units per cent. in the quebrach when the single paper is used instead of a double one. Th analyses were contributed by some 12 different workers, an the individual results correspond closely with the averag whilst in only two instances (both chestnut) were th soluble solids found to be higher with a double than with single paper. The single paper requires a longer time fo filtration, and error may thus be introduced, unless ever possible precaution is taken to guard against evaporation.

Owing to the difficulty of obtaining quite clear filtrates i some instances, the Reporter on Tannin hesitates to recommend the official adoption of merely a single paper, despit greater accuracy in other cases. With a double paper d the use of kaolin as at present authorised, perfectly ar filtrates even of an unclarified quebracho can always secured. Yet it is questionable whether the analyses of ch extracts, even with these precautions, give a true timate of their value in the tanyard, considering how eatly the mode of dissolving them differs from laboratory ethods. The author therefore favours the trial of a single per for the generality of work, with the proviso that only rfectly clear filtrates shall be evaporated for determination solids, and most of the members who report on the bject share this opinion.

Table I.

"Soluble Solids" when Filtered through One r Two Filter-Papers—based on 26 Complete Analyses—by Members of the A.O.A.C.

—	Chestnut Extract. S. & S., No. 590 Paper.		Quebracho Extract. S. & S., No. 590 Paper.	
	Single.	Double.	Single.	Double.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
ean value	42·81	42·58	43·75	43·01
ighest value...	42·34	41·52	42·46	41·72
owest value....	43·52	43·73	46·23	46·05
reatest variation	0·71	1·16	2·48	3·04

Determination of Acid in Tan Liquors.—The union quor was examined by three different methods, its original omposition having been maintained by addition of formal-ehyde.

Distillation Method.—The directions issued for conducting this process were as follows:—Take 125 c.c. of original iquor, distil over 100 c.c., and titrate the distillate with N/10 NaOH, with phenolphthalein as indicator. Call the esult so obtained 80 per cent. of the total volatile acid in he liquor; *i.e.*, 80 per cent. of the acid in 100 c.c. of riginal liquor. This method was formerly used in the aboratories of the United States Leather Co., as the result f experiments made some years ago. It has been regarded s a fair comparative method for the determination of olatile acid, the lower results being attributable to the actic acid present in the liquor, and which is not estimated y this process. No distillation method returns the lactic cid, because it cannot be distilled unchanged, but becomes actic anhydride, and finally lactide. The results obtained y members of the A.O.A.C. appear in Table IV., but, at he suggestion of the Referee on Tannin, experiments were nade with known amounts of the acids concerned, and also vith a mixture, and these results appear in the following able:—

Table II.

Showing Amounts of Lactic and Acetic Acid recovered by Distillation.

—	Commercial Samples.		Pure Samples.	
	Strength of Solution used.	Found.	Strength of Solution used.	Found.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
cetic acid......	0·664	0·69	0·84	0·44
actic acid calculated as acetic.	0·58	0·019	0·88	0·011
actic and acetic acid (equal parts).	0·623	0·371	0·86	0·22

Kohnstein-Simand Method.—100 c.c. of the original liquor vere heated with 3·4 grms. of freshly ignited pure magnesia, iltered, and the magnesia determined gravimetrically in the iltrate. Theoretically, this is probably the best method, out it is too tedious, and requires too much care and time o be of practical use in a laboratory where many acid eterminations are made. The filtration of the liquor is slow, and, in the case of many heavy liquors from acid hemlock tanneries, is impossible unless the funnel is kept hot by means of a hot-water jacket.

Charcoal Methods.—For these methods, 100 c.c. of the original liquor were diluted to 500 c.c., and the diluted solution employed for methods (*a*) and (*b*). (*a*) To every 100 c.c. of diluted liquor add 2·5 grms. of animal charcoal, stir thoroughly every 15 minutes for two hours, throw on a filter, and titrate an aliquot part of the clear filtrate with N/10 NaOH, after the addition of about 200 c.c. of distilled water. (*b*) To 100 c.c. of diluted liquor add 2·5 grms. of charcoal, bring to boiling point with constant stirring, filter, and titrate.

For comparable results by the charcoal method the animal charcoal must be free from acids and carbonates. The sample issued by the Association is imported, and has given regular results for the last six months. Results by these methods are generally lower than the actual acid content, but the disparity with every lot of charcoal, if of the best quality, is constant, and by a suitable correction nearly absolute results are obtained. The results obtained from method (*a*) are invariably lower than those given by (*b*), probably because of the length of time during which the liquor is heated.

Mr. Read also applied the two methods to known quantities of acid, using two samples of charcoal, one furnished by the Referee (c), and the other an impure variety (*d*) purified by treatment with hydrochloric acid and water. Methods (*a*) and (*b*) were employed, the latter modified by using a flask with tube condenser.

The Referee also made similar experiments with the charcoal (R) issued in 1902.

Table III.

Showing Amounts of Acid recovered after Treatment with various Samples of Charcoal—40 c.c. of Solution neutralised:—

—	Charcoal.	Without treatment, c.c. of Alkali.	Method (*a*), c.c. of Alkali.	Modified Method (*b*), c.c. of Alkali.
Acetic acid......	(*c*)	8·85	6·95	7·1
	(*d*)	8·85	7·70	7·95
	R.	10·8	9·4	9·9
Lactic acid......	(*c*)	7·75	5·3	5·35
	(*d*)	7·75	7·55	7·65
	R.	10·2	8·8	9·15
Lactic and acetic acid.	(*c*)	8·30	5·90	5·95
	(*d*)	8·30	7·65	7·80
	R.	11·4	9·9	10·1

It will be noted that the charcoal furnished by the writer (*d*) gave almost theoretical results in the case of lactic acid solution, but with the acetic acid solution a considerable loss of acid was experienced. By treatment of the acetic acid

Table IV.

Showing Percentage Amounts of Volatile Acids in a Yard Liquor found by various Methods.

—	Distillation.	Kohnstein-Simand.	Charcoal (R).	
			Method (*a*).	Method (*b*).
H. T. Wilson....	0·355	0·350	0·397 0·393	0·426 0·420
H. C. Reed......	0·394	0·446	0·42	0·472
F. P. Veitch	0·38	0·60	0·41	0·45
J. H. Yocum....	0·40	0·41	0·34	0·35
F. H. Small	0·36	0·65	0·40	0·42
C. K. Brown	0·37	..	0·37	0·43
W. H. Alsop	0·37	0·48	0·36	0·42
F. Alden	0·438	..	0·44*	..
H. Gerber	0·37	0·67	0·39	0·44
C. C. Hildebrand	0·352 0·354	..	0·375 0·380	0·44 0·45
W. H. Teas	0·360	0·53	0·38	0·41
J. H. Morton ...	0·31	0·73	0·39	0·46

* Heated for three hours.

with various amounts of charcoal, and calculation of the corresponding loss, practically theoretical results were obtained. Accurate results were also obtained by the use of purified bone-black.

From the above table, the Kohnstein-Simand method appears to give least concordant results, owing, probably, to slow filtration and the amount of manipulation required. The distillation method has been criticised above. The results in Table IV. agree closely with the figures obtained by use of charcoal, but it has been the Referee's experience that many liquors showing a certain percentage by the distillation method give almost double the quantity when treated with charcoal. It seems to be the opinion of the majority of the collaborators that charcoal methods are sufficiently accurate for official adoption, though one member advocates the method in which tannin is first precipitated by gelatin, and the filtrate is titrated with alkali and litmus as indicator.

The information obtained during this experimental work was duly reported by the Referee to the Committee, and is embodied in the following:—

Changes in the "Official Methods" recommended by the Committee on Tannin (see this Journal, 1901, 1246—1249).

1. To omit the moisture determination in extracts.

2. To change (*b*) in para. III. so as to read:—

Evaporations shall take place under precisely the same conditions as to contact with steam or a metallic plate; all dryings called for after evaporation shall be done by one of the following methods, under precisely the same conditions, so that the different residues of each analysis may occupy the same shelves in the drying oven:—

(1) For eight hours at 100° C., at the temperature of boiling water in the steam oven.
(2) For six hours at 100° C. in air-bath.
(3) For five hours at 100° C. *in vacuo*.

3. Para. V. Soluble solids to read as follows:—

Single-pleated filter-paper (S. and S., No. 590, 15 cm.) shall be used. To 2 grms. of kaolin add 75 c.c. of the tanning solution, stir, let stand 15 minutes, and decant as much as possible (not on the filter), again add 75 c.c. of the solution, stir, and pour this liquor on the filter. Keep the filter full, reject the first 150 c.c. of the filtrate, collect, evaporate, and dry the next 100 c.c. The portion dried for determination shall be perfectly clear, and evaporation during filtration must be guarded against.

4. Para. VI. Non-tannins. Two grms. of kaolin to be used when filtering.

5. Omit para. VIII. on testing hide powder, and section (*b*) of para. IX.

6. Provisional method for the determination of total acidity in liquors:—Place 100 c.c. of the liquor in a 500 c.c. flask and make up to the mark with water. To 100 c.c. of the diluted liquor in a flask, fitted with tube condenser, add 2 grms. of chemically pure animal charcoal. Heat to boiling temperature with frequent shaking, cool, filter, and titrate an aliquot part with N/10 alkali.

Nottingham Section.

Meeting held on Wednesday, November 26th, 1902.

MR. L. ARCHBUTT IN THE CHAIR.

FACTORY COSTS.

BY H. S. GARRY.

(This Journal, 1902, 1439—1443.)

DISCUSSION.

Mr. **Paton** understood the author to say that engineers had gone in for costing and chemical manufacturers had not, the implied reason being that engineers' costing was comparatively easy, while the other kind was not. He did not agree with this view. When Mr. Garry said the remuneration of labour should be in direct ratio to the efficiency of its production, every employer would be with him. That was as it should be, but, unfortunately, labour combinations frequently prevented it. The paper stated that special difficulties arose in every industry. So they did, and consequently there were seldom two factories where exactly the same costing system would apply. Markets fixed selling prices, and did not take much notice of direct factory costs. Cost of raw material had really very little to do with the factory or process manager. He had to do with the raw material in the sense of turning it into the finished product, but its cost did not necessarily affect him. The factory manager and his foreman could not help it if the price of raw material went up a pound a ton. It was important to distinguish very clearly between factory costs and costs which occurred in various other directions. In all factory cost accounts there must be a number of divisions or sections. The question arose as to how far it was wise, or up to what point it paid, to divide and subdivide. It was a question how much ought to be expended upon keeping factory costs. In some cases it appeared to be overdone. Speaking of a standard on the basis of which costs were to be compared, Mr. Paton said he did not fully grasp the one which the author of the paper set up. It was a varying standard. If the standard of comparison were altered every few years it would make it rather a puzzle to compare costs over different periods. Why was a varying standard necessary? Another paragraph spoke of depreciation representing a secret plant reserve, but that needed a little more explanation. The author went on to say, "to the directorial mind it was a fund to be increased in good times, and reduced or omitted in bad times." The latter course was simply blinking at consequences, and would only put forward accounts which were not correct. If they allowed depreciation in what might be considered a rather liberal way in good times, that did not justify its omission altogether in bad times. In matters of depreciation he should like to lay some stress upon the factor to be brought in for what might be called "antiquation." Mr. Garry spoke of the life of the machine from the view of the process, but he (Mr. Paton) should speak of the machine as practically something which in the course of a few years might still be in very good condition, capable of doing as good service as ever, but might have become absolutely obsolete; and the manufacturer who did not allow something for "antiquation" was not costing or depreciating properly.

Mr. **Pentecost** said they all appreciated the manner in which Mr. Garry had brought the matter forward, and the intelligent suggestions he had made. From his own point of view, however, he felt there were several difficulties. The matter of the standard was one of the principal ones. In the industry with which he was connected the cost was affected by the weather, *e.g.*, humidity and temperature, and it would be necessary to vary the standard constantly if it were to be at all reliable, so that to some extent a standard prepared for one three months would not operate satisfactorily for the next three months. But they must recognise that Mr. Garry's paper was of distinct value to chemical manufacturers and manufacturers in general. With regard to chemical plant consumed, so to speak, in a fairly short space of time, the question had arisen as to whether it should be counted as depreciation of plant or included in current expenses. He thought the latter was preferable.

Mr. E. A. **Lewis** did not agree with Mr. Paton that chemists were not the proper persons to supervise an industrial process, because properly trained chemists ought to be able to supervise all purely chemical or metallurgical processes, after having experience in the management of men.

Mr. **Meggitt** said that the output was dependent on the department which could turn out the least work, and his method had been to take the department which could turn out least as a standard and call it 100. Some departments uld produce 30 per cent. more than they required, and e excess might be held over until another week when ere might be a deficiency. The question of standard was, t one of yielding, but really the percentage on the eoretical quantities they ought to produce considering the ndition of the plant.

Mr. **Ward** thought they all had different notions or efinitions of the word "standard." The paper dealt with e standard of cost. Mr. Patou spoke of the standard of ield, and now they had a standard of output before them. t seemed utterly impossible that one system of cost could over three such different quantities as that. They ought consider a system from the works point of view, rather han have a complicated system. Let them take the value f the materials produced, and, if they desired to compare hem with a standard and include the question of the cost f raw materials, vary the standard with the cost of the aw materials. One thing which struck him was that the ables appeared to imply that a reduction in the total uantity made would in some way or another affect the proportion between the various materials produced. Why a reduction in the output should affect the proportion of the materials produced he utterly failed to understand.

The **Chairman** suggested, in reply to some remarks by Mr. Paton, that if properly trained chemists were properly employed, they would be found of very material use. But the chemist must be allowed access to the same outside sources of information which every engineer obtained as a matter of course, and not be shut up in a box and expected to evolve everything out of his own inner consciousness. Chemists, as chemists, were, as a rule, paid such inadequate salaries that capable men of intellect and education had no inducement to become chemists; they found it paid them better to become process managers. This was not likely to be altered until scientific training and attainments came to be considered as important in men holding the chief positions in works as business capacity and the power of managing men.

Mr. **Garry**, in reply, said that he was very gratified that the subject had proved, by the discussion, to be one of general interest to the section. Most of the remarks made were, however, in agreement with his views. There were few experts, if any, in costing who would not rather prefer to deal with the engineering industry than that of chemicals, on account of the greater certainty of identification of individual units of production in their progress from raw material to finished product, for purposes of costing. The standard appeared be the point which attracted most attention, and although each speaker appeared to be under the impression that his own particular business was the one special business in which no standard could be fixed, they were all using a standard of output, consciously or unconsciously, and the use of such standard was having an effect on their minds in the problems of everyday costing, whether they were aware of it or not. They could not get away from it, and it was better to organise and make use of it than to work blindfold. The standards of efficiency which he advocated embraced both quantity, yield, and expenses, and would, in any progressive factory, "rise on stepping stones of their dead selves to higher things." Therefore it must rise (not vary) with the efficiency of the factory as the standard approached nearer the ideal.

With regard to the employment of chemists as process managers, it might be that the persecution of the chemists by way of miserable salaries might result, like the persecution of the Huguenots in the 16th century, to the benefit of the industrial world and the establishment of new improved methods of manufacturing in the chemical and allied industries.

Scottish Section.

Meeting held at Edinburgh, on Tuesday, January 27th, 1903.

MR. D. B. DOTT IN THE CHAIR.

IRON STAINS IN RELATION TO HYPOCHLORITES IN LINEN-BLEACHING.

BY LEONARD DOBBIN, PH.D., AND ALEX. D. WHITE, D.Sc.

The linen-bleacher is usually more familiar with iron stains than he cares to be, and he takes such measures as his experience has taught him to adopt in order to avoid their appearance in the fabrics undergoing treatment at his hands. Despite these measures, however, iron stains do appear from time to time, and it is not infrequently found that the places at which they occur in goods in process of bleaching are at least unduly tender if not actually showing holes. The occurrence of these stains is, as a rule, confined to the earlier stages of the bleaching, the stains generally making their appearance while the goods are still in a brown state.

There are two common kinds of these iron stains: the one consisting of patches which are very irregular in shape and in the intervals at which they appear on the web; the other consisting of narrow, and sometimes exceedingly sharply defined bars which cross the warp, at right angles or diagonally, at somewhat regular intervals. Both kinds have a dark-brown appearance, and show little resemblance to the familiar orange-yellow iron stains which are so much disliked in most households by those who are responsible for the domestic linen. The dark colour is due to the presence, in the stain, of organic colouring matter taken up during the process of lye-boiling, and attached to the iron, which here acts as a mordant.

When the stains of either kind are first observed, tendering at the stained parts has, in many instances, already taken place, and sometimes there are holes in the fabric sufficiently large to permit of the closed hand being easily passed through them. In other cases little or no indication of tendering is recognisable.

We may here state that we have now definitely ascertained the sources of both the kinds of stains referred to above; but tracing out and following the trains of circumstances which lead to their formation do not lie within the scope of this paper, in which we propose to consider only the relation of the stains themselves, when once produced, to the subsequent treatment of the stained goods with hypochlorites and, incidentally, with acids.

We have carried out numerous experiments with the stains, both in cases when they were accompanied by tendering or holes, and in cases when no appreciable tendering could be recognised, and we have made special examination of the question whether treatment of the stained fabrics with solutions of hypochlorites is to be regarded as dangerous treatment of untendered goods. In the course of the experiments it soon became apparent that the stains could not be got rid of either by treatment with dilute acids alone or by hypochlorite treatment alone. Dilute acids dissolve out the iron, but still leave brownish stains, due to the organic colouring matter towards which the iron has acted as a mordant; hypochlorites, on the other hand, destroy the organic colouring matter, but leave iron stains of the usual orange-yellow colour. The stains can be completely removed by successive treatment of the stained materials with dilute acid and with dilute hypochlorite solution, thorough washing with water being carried out after each of these operations; or the order of treatment may be reversed, with equally good results as regards the removal of the stains, the hypochlorite being used first, and then, after washing, the dilute acid.

It was of interest, however, and of no small importance in practice, to ascertain whether the treatment first with hypochlorite and afterwards with acid presented any element of danger to the strength of the fabric, which might be avoided by using these agents in the reverse order; and to the settlement of this question our experiments were directed.

An early set of experiments consisted in removing stains in cases where no tendering of the stained materials was noticeable, some by using hypochlorite first and acid afterwards, others by using acid first and hypochlorite afterwards. The samples treated by these two methods were not distinguishable from each other in respect to strength or any other feature that we were able to study, and as a consequence, we were disposed to think that, contrary to the common belief or tradition amongst bleachers, the treatment of an iron stain with a hypochlorite solution was an operation from which damage was not likely to result.

The matter stood in this condition when the investigation by one of us of the action of solutions of hypochlorites upon metals furnished some results which suggested that the treatment of ferric hydroxide with hypochlorite solutions might result in the liberation of oxygen, and that if this were so, the treatment of iron stains on linen with such solutions would most probably result in increased oxidation of the cellulose at the stained places to such an extent as to determine the premature appearance of holes at these places in the ordinary course of wear.

In order to investigate this point, freshly precipitated ferric hydroxide (obtained by adding ammonia to solutions of ferric chloride, filtering off the precipitate, and thoroughly washing it) was introduced into a 500 c.c. Bunsen mercury gas-holder, which was then completely filled up with bleaching powder solution, and in order to prevent any decomposition of the hypochlorite solution by light or heat, placed in a dark room the temperature of which did not rise above 15 C. Gas was evolved almost immediately, slowly at first, but with increasing rapidity. In 24 hours 300 c.c. of gas had collected in the apparatus. This gas, on analysis was found to contain 96·7 per cent. of oxygen and 3·3 per cent. of nitrogen, the presence of the latter being due doubtless to air dissolved in the bleaching powder solution.

In view of this striking result, the observation of which we believe to be novel, we were considerably shaken in our opinion that iron-stained linens might be subjected to hypochlorite treatment without risk of over-oxidation, with its accompanying tendering; and consequently we made some new experiments upon very badly stained linens. The latter were subjected to more severe treatment with hypochlorites than it is customary to give in any ordinary bleaching practice, but still we failed to obtain evidence of their having sustained any damage.

It is possible that conditions may arise in actual practice on the large scale which were not realised in our experiments; and it may also be that, without the ordinary test of prolonged wear, the defects of any portions of the material which had been to some extent tendered would not be sufficiently marked to be recognisable. At any rate, while the ferric hydroxide experiment shows that, on grounds of prudence, the bleacher would, perhaps, be well advised in avoiding the treatment of iron-stained linens with hypochlorites prior to their treatment with acid, we have not been able to establish by experiments involving conditions resembling those reasonab y likely to occur in practice, that any harm would result from his so treating them.

ACTION OF SOLUTIONS OF BLEACHING POWDER AND OF HYPOCHLOROUS ACID ON METALS.

BY ALEX. D. WHITE, D.Sc.

It had frequently come under notice in carrying out the ordinary operations associated with the bleaching of linen, that if particles of metallic iron, clean and free from oxide, were allowed to come into contact with linen in presence of the ordinary "dip," or hypochlorite solution, a vigorous reaction took place, and in a very short space of time complete "tendering" of the linen—with production of holes—took place at the spots where there had been contact with the iron.

Experiments, in which strips of polished iron wrapped round with as pure cellulose as could be obtained—thoroughly bleached linen being used in some cases, and pure filter-paper in others—were immersed in bleaching powder solution of 1·040 sp. gr., showed that, in addition to the disintegration of the fabric, ferric hydroxide was produced, and a gas evolved. The gas was examined, and found to be oxygen; the cellulose was thoroughly washed, treated with sodium bisulphite solution, and washed again, in order to remove all hypochlorite; and then dyed in solution of methylene blue ($\frac{1}{2000}$ in the cold) (Witz, Bull. Soc. Ind. Rouen, [10], 5, and [11], 2). The characteristic colour reaction round the holes and at the "tendered" spots showed that the tendering was due to the local production of oxycellulose.

Oxycellulose is then produced by the action on cellulose of nascent oxygen arising from the interaction of hypochlorite solution and iron.

Action of Bleaching Powder Solution on Metals.—A series of experiments was carried out to show the action of bleaching powder solution on metals. The results will be found in a table (page 133). The apparatus used in each case consisted of a Bunsen gasholder of 500 c.c. capacity, into which three strips of the metal under examination, each 100 mm. long, 10 mm. wide, and 1 mm. thick, were introduced. The vessel was then completely filled with a freshly prepared solution of bleaching powder of 1·040 sp. gr. and the stop-cock closed. From the lower opening of the gasholder a bent glass tube was led into a further quantity of the solution contained in a beaker; at its outer extremity, where it dipped into the solution, the tube had been drawn out almost to a capillary in order to prevent, as far as possible, diffusion backwards into the gasholder of solution richer in dissolved air or in hypochlorous acid than the solution in contact with the metal. The vessel, after being filled, was immediately transferred to a dark room, where the temperature varied between 12° C. and 15° C.

In the case of *Iron*, a brisk reaction began at once, with production of a copious brown precipitate and evolution of gas; about 500 c.c. of gas collected in 48 hours. The brown precipitate was found to be ferric hydroxide; the gas consisted of oxygen, mixed with a small quantity of nitrogen due to air dissolved in the hypochlorite solution, and swept out by the oxygen. No ferric compound was found in solution, nor was any chlorine set free.

Soubeiran (Annales de Chimie et de Physique, [48], 1831) investigated the action of hypochlorites on iron. He says: "The iron is transformed almost immediately into a red powder. The odour disappears, the liquor retains hardly any traces of iron, while the precipitate itself is only oxide of iron free from chlorine."

Balard (Annales de Chimie et de Physique, [57], 1834) only says "iron is very readily oxidised."

Tin.—According to Soubeiran (*loc. cit.*), oxychloride of tin is produced and oxygen evolved, "but the amount evolved is so small that I would not have hesitated to attribute it to spontaneous decomposition of the hypochlorite, had the same phenomenon not shown perfectly sharp in operating with copper." Balard says (*loc. cit.*): "as to tin, it becomes promptly enough oxychloride, while giving rise to a slight evolution of chlorine, mixed with oxygen."

In my experiments it was found that stannic acid and oxygen are the only products of the action, which goes on very slowly, only 40 c.c. of gas being evolved in 96 hours.

In order to ascertain the change in the amount of nitrogen produced during the reaction, the gas evolved at first was withdrawn, and the apparatus filled with the hypochlorite solution which has already been used.

Copper.—Soubeiran (*loc. cit.*) says: "A sheet of copper plunged into a solution of bleaching powder has formed little by little on its surface a blue layer of oxychloride. At the same time one sees small bubbles of oxygen evolved. The action proceeds slowly, and in order to hasten the production of the gas, I have had recourse to finely-divided copper, which has made the experiment less slow, but has modified the result, making the precipitate become green. The evolution of oxygen which is produced in these circumstances is a remarkable fact which I had thought at first be able to attribute to the spontaneous decomposition of : hypochlorite, but I have recognised that it belongs to particular circumstances of the experiment. In observ-, comparatively, one with hypochlorite by itself, the latter s not furnished a notable quantity of gas in the space of ie required for the reaction with copper."

Balard says (*loc. cit.*) : " as to copper, it becomes promptly ough oxychloride, while giving rise to a slight evolution chlorine mixed with oxygen."

Copper turnings were used in the present experiments. e action goes on slowly, and a green oxychloride of pper and oxygen are the products of the action. In hours, 60 c.c. of gas were evolved; in the following hours, 70 c.c. of gas were evolved; and in the following hours, 55 c.c.

Arsenic.—Soubeiran (*loc. cit.*) states "that calcium senate is produced and there is evolution of chlorine, iich disappears in turn if the arsenic is in excess." Balard c. *cit.*) simply states that calcium arsenate is the proct of the action, and repeats the observation of Soubeiran at "surfaces of arsenic which had become blackened by ntact with air rapidly regain a metallic lustre if dipped in pochlorite solution."

In a number of experiments made by me, in which small mps of arsenic, about 1 c.c. in size, were used, oxygen is always been obtained as a product of the action, in ldition to the calcium arsenate; no liberation of chlorine as obtained under any circumstances. 55 c.c. of gas were oduced in the first 72 hours, and 60 c.c. in the subsequent 2 hours.

Nickel.—Cubes of nickel about 1 c.c. in size were used. hese were rapidly attacked, with formation of nickel hydroxide and brisk evolution of oxygen In 12 hours 160 c.c. of gas, containing 97·9 per cent. of oxygen, had collected. This gas was all withdrawn and the apparatus refilled with the hypochlorite solution that had already been used. The evolution of gas then became much more rapid, and in the next 12 hours over 400 c.c. of gas had collected. This increased evolution of gas is doubtless due to decomposition of the bleaching powder solution by the nickel hydroxide produced.

Cobalt.—Cubes of cobalt about 1 c.c. in size were used. Action goes on more briskly even than in the case of nickel; cobalt hydroxide and oxygen are produced. In two hours 110 c.c. of gas were evolved, and in the first 12 hours 500 c.c.; in the following four hours 130 c c. of gas were evolved.

Aluminium.—Aluminium filings are rapidly attacked, with brisk solution of hydrogen; wire, even when flattened into the form of ribbon, is attacked only very slowly, five or six days being required for the collection of 40—50 c.c. of gas: calcium aluminite is also a product of the action.

Mixed with the hydrogen there is always a small quantity of oxygen and nitrogen from air dissolved in the solution.

Magnesium.—Either in the form of ribbon or small blocks, magnesium is attacked with great rapidity, brisk effervescence of hydrogen taking place, while magnesium hydroxide is precipitated. In 12 hours 500 c.c. of gas were obtained.

Antimony, Lead, Zinc, and Cadmium.—Antimony and cadmium are not attacked; lead is only attacked to a very minute extent after many days, owing to the presence of iron as impurity; and zinc is similarly only acted on because of the presence of arsenic.

Table showing the Composition of Gaseous Mixtures evolved by the Action of Bleaching Powder Solution on Metals.

Metal used	Iron.		Tin.			Copper.			Nickel.	
Quantity of Gas evolved	About 500 c.c. in 48 Hours.		40 c.c. in First 96 Hours.	55 c.c. in next 72 Hours.	55 c.c. in next 48 Hours.	60 c.c. in First 12 Hours.	70 c.c. in Second 12 Hours.	55 c.c. in Third 12 Hours.	55 c.c. in First 72 Hours.	60 c.c. in Second 72 Hours.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
xygen	98·0	98·1	96 47	97·6	98·1	94·3	96·86	98·85	93·6	97·5
itrogen	2·0	1·9	3·53	2·4	1·9	5·7	3·14	1·15	6·4	2·5
lydrogen	..	..	..	..	..	..	..	..	..	..

Metal used	Cobalt.			Aluminium.			Magnesium.	
Quantity of Gas evolved	110 c.c. in 2 Hours.	500 c.c. in 12 Hours.	130 c.c. in next 4 Hours.	About 50 c.c. collected in Five or Six Days.			500 c.c. in 12 Hours.	
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
xygen	96·4	..	99·1	2·20	1·1	2·1	0·14	0·4
itrogen	3·6	..	0·9	3·75	3·2	2·6	0·54	0·6
lydrogen	..	..	..	94·05	95·7	95·3	99·02	99·0

Action of Sunlight on Bleaching Powder Solution.—t has been mentioned that all the experiments were arried out in a dark room. This precaution was taken as had been observed in the course of some preliminary xperiments that if exposed to bright sunlight a solution of leaching powder gives off bubbles of gas.

Grouvelle (Ann. de Chim. et de Phys., [17], 1821) states hat "this gas is without doubt oxygen"; and Morin (*idem*, 37], 1828) states that "it is pure oxygen." Soubeiran too *idem*, [18], 1831) refers to the rate at which solution of ypochlorite gives off oxygen owing to spontaneous decomosition. No details are given of any analysis of the gas. unge and Landolt (Chem. Ind., 8) have determined the ss of strength of solutions of hypochlorites of calcium, luminium, zinc, and magnesium on exposure to diffused aylight for periods up to 33 days, but make no mention of aving noticed any evolution of gas.

To investigate the effect of sunlight, the following exeriment was made:—A 500-c.c. Bunsen gasholder was ompletely filled with freshly prepared bleaching powder solution of 1·060 sp. gr. The glass tube leading from the lower opening of the vessel was drawn out almost to a capillary and allowed to dip into bleaching powder solution in a beaker; the apparatus was then exposed where it would get the benefit of any sunlight that might come. The first seven days (it was in February) were persistently dull and cloudy, and no evolution of gas took place. On the eighth day there was bright sunshine, and gas began to come off steadily in very small bubbles and in very small quantity; the evolution had almost stopped by 4.0 p.m. The ninth day was cloudy, and gas was still being given off, though extremely slowly. The 10th day was wet, and evolution had entirely stopped. The 11th and 12th days were bright and sunny, and gas was given off briskly. Again, on the 13th day, which was cloudy, no gas was being given off, and the 50 c.c. of gas which had in this time collected were analysed: oxygen, 91·4 per cent.; nitrogen, 8·6 per cent.

The apparatus was refilled with the same solution and again exposed. During the following seven days, which were bright and sunny, the evolution of gas went on steadily, and 80 c.c. of gas were collected. Analysis of gas: oxygen, 96·3 per cent.; nitrogen, 3·7 per cent.

Action of Hypochlorous Acid on Metals.—The hypochlorous acid used was prepared for each experiment and used immediately, and was obtained free from chlorine and hydrochloric acid by the following method: Water holding freshly precipitated mercuric oxide in suspension was saturated with chlorine; after filtration, the liquid was distilled until one-fourth of its volume had passed over, the distillate shaken with precipitated calcium carbonate (to remove traces of chlorine or of hydrochloric acid arising from decomposition of the hypochlorous acid), and distilled again in presence of calcium carbonate.

All the experiments were carried out in a dark room at a temperature between 12° C. and 15° C.

Iron.—According to Balard (Ann. de Chim. et de Phys., [57], 1834) ferric oxide and ferric chloride are produced, with evolution of chlorine.

Under the conditions of the present experiments, hydrogen was also always found as a product of the action. At first oxidation of the iron takes place with formation of much ferric hydroxide, while hydrochloric acid, the reduction product of the hypochlorous acid, interacts with the ferric hydroxide, iron, and hypochlorous acid, yielding ferric chloride, hydrogen, and chlorine.

Tin.—According to Balard (*loc. cit.*) "tin filings may remain in presence of pure dilute hypochlorous acid for several days without making it undergo any decomposition and without losing its metallic lustre, but the presence of another acid makes the metal capable of bringing about decomposition. This acid must fulfil the condition of being able to form with the oxide of the metal a salt soluble in water. When one acts with hypochlorous and sulphuric acids on tin, the chlorine produced contains a small quantity of hydrogen. If concentrated hypochlorous acid be used, action takes place after some time owing to formation of chloric acid from spontaneous decomposition of the hypochlorous acid, the action being the same as takes place if sulphuric acid be present."

Freshly prepared, pure, dilute hypochlorous acid is found to act at once, though very slowly, on tin; a white precipitate of stannic acid made its appearance at once and went on slowly, steadily increasing in bulk. No evolution of gas was noticed, but free chlorine was present in the liquid, the slowness of the reaction no doubt enabling the water present to hold the chlorine in solution. The reaction seems to be a simple oxidation of the tin to stannic acid, with reduction of the hypochlorous acid to hydrochloric acid and consequent liberation of chlorine.

Copper and Arsenic.—Results were obtained agreeing with those of Balard (*loc. cit.*); in the case of copper, cupric chloride and an oxy-chloride are formed, and chlorine, mixed with a small quantity of oxygen, evolved; in the case of arsenic, arsenic acid, a small quantity of arsenious chloride, and chlorine are the products.

Nickel and Cobalt.—Action takes place quickly in both cases, with formation in the first instance of hydroxide of the metal and hydrochloric acid; the latter interacts with the hydroxide, producing chloride of the metal, and with the hypochlorous acid with evolution of chlorine. Interaction also takes place between hypochlorous acid and the hydroxide produced, and oxygen is evolved.

The products of the action thus are, in the case of nickel, nickel hydroxide, nickel chloride, chlorine, and oxygen; and, in the case of cobalt, cobaltic hydroxide, cobaltous chloride, chlorine, and oxygen.

Aluminium is acted on somewhat slowly. Hydrogen is evolved, and the liquid soon becomes cloudy from precipitation of aluminium hydroxide; chlorine is then evolved. If excess of aluminium be used, and, after evolution of gas has ceased, the hydroxide be filtered off, the filtrate, on exposure to air, or more rapidly on blowing carbonic anhydride through it, deposits aluminium hydroxide, pointing to the presence in solution of aluminium hypochlorite.

The first products are probably aluminium hypochlorite and hydrogen; the aluminium is also slowly oxidised with formation of hydroxide, while the hydrochloric acid so produced interacting with hypochlorous acid causes the evolution of chlorine. In all the analyses of the gas a small quantity (up to 2 per cent.) of oxygen was found mixed with the chlorine and hydrogen; it probably arose from spontaneous decomposition of aluminium hypochlorite

Magnesium dissolves with great readiness, with brisk evolution of hydrogen and formation of magnesium hypochlorite in solution, which is, for a hypochlorite, very stable on analysis the gas was found to be practically pur hydrogen.

Action of Hypochlorite Solution on Linen in presence o Metals.—The foregoing experiments having shown tha oxygen is evolved if iron, tin, copper, nickel, and cobalt com into contact with bleaching powder solution, experiment were made to ascertain if an effect, similar to that in the cas of iron, would be produced if tin, copper, nickel, and cobal were respectively placed in contact with linen undergoing hypochlorite treatment, the concentration of the hypochlorit and the duration of each experiment being such as ar customary in the ordinary bleaching operations.

In the case of nickel and cobalt, oxidation of the cellulose and complete disintegration of the fabric took plac very rapidly at the parts where the metals had been in contact; in a much less degree similar results were obtaine with copper; with tin, no evidence of the formation of oxy cellulose was obtained, nor was the strength of the line affected—a result doubtless due to the slowness of the interaction between tin and hypochlorite.

Experiments with aluminium and magnesium showe that their presence in contact with linen in the hypochlorit did not at all affect the fabric, a result quite in accordanc with the observed actions of these metals on bleachin powder solution.

It has been seen in these experiments that the ordinar alkaline solution of bleaching powder at ordinary temperatures attacks iron, tin, copper, arsenic, nickel, cobalt aluminium, and magnesium, mostly with great readiness, i all cases with evolution of a gas. Soubeiran and Balar have investigated the actions taking place with iron, ti copper, and arsenic, but do not remark having observed th evolution of oxygen in the case of iron and arsenic. O the four metals, the examination of the action of which i new, nickel and cobalt, in their behaviour, resemble iron forming a hydroxide of the metal and causing rapid evolutio of oxygen; while the action of aluminium and magnesium giving rise to evolution of hydrogen from so powerful a oxidising agent as a solution of bleaching powder, i distinctive and noteworthy.

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—PLANT, APPARATUS AND MACHINERY.

Compressed Gases; Avoidance of the Danger of Explosion in the Transport of ——. A. Lange. Zeits. angew. Chem., 1902, **15**, [51], 1307—1317.

MANY of the explosions of cylinders of compressed gases re due to the cylinders being "over-filled," *i.e.*, the quantity of material introduced into them exceeds the limit imposed by the international agreement of the railways. When an over-filled cylinder is exposed to any considerable ncrease of temperature, the internal pressure is liable to rise above the safety limit of the steel of which the cylinder s made. The author considers that it would be advisable o always re-check the weight of the filled cylinders before he latter are sent out from the factory, and also to verify occasionally the weights of the empty cylinders. If the cylinders be made of good material, well tested and annealed, and care be taken to avoid over-filling, explosions will only occur when the temperature is raised considerably, as in he case of a conflagration. To provide against such an occurrence, cylinders should be fitted with suitable safety-valves. The following are some of the valves which have been devised.

Hall's Valve (Zeits. für gesammte Kälteind., 1897, 43).—The construction of this valve is shown in the accompanyng diagram (see Fig. 1). Besides the ordinary passage for filling and emptying the cylinder, the valve is provided with a branch passage *b*, leading from the main passage at *a*, and closed at its outlet end by an arched copper plate *k* of suitable thickness and strength. The copper plate is kept in position by the metal ring *d* and the nut *e*. If the pressure in the closed cylinder become too high, the copper plate is torn, and the gas finds free exit through one or more passages in the nut *e*.

FIG. 1.

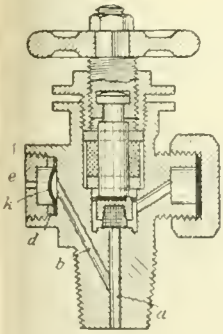


FIG. 2.

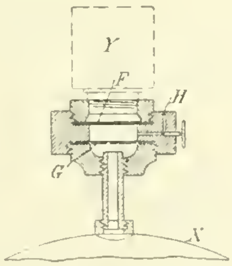


FIG. 3.

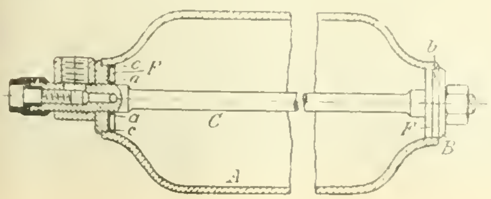


FIG. 4.

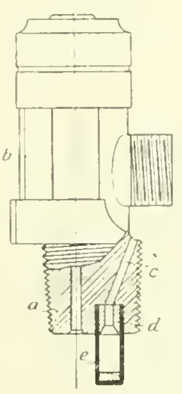
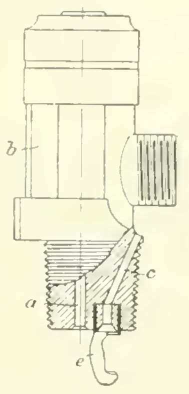


FIG. 5.



Henderson's Safety Valve (Ger. Pat. 91,750).—In order to avoid the loss of the whole of the contents of the cylinder, in the event of the pressure becoming too high, the valve (Fig. 2) is provided with two safety-plates, G and F. If the plate G be torn, the gas can escape through the fine opening H, and thus the pressure on F is relieved. A cock is provided for closing the opening H. In order to avoid too great a loss in the event of the pressure becoming great enough to break the second plate F, the apparatus can be connected to the chamber Y.

Holder Patented by Brin's Oxygen Co., Ltd. (Ger. Pat. 112,711).—This holder (see Fig. 3) is in the form of a tube, A, with narrow ends. By means of the rod C, which extends through the holder and one end of which forms a portion of the discharge valve, the holder can be closed gas-tight by the caps B, the narrow parts of which fit loosely in the ends of the holder. To prevent the entrance of gas into the space between the narrow parts of the caps and the ends of the holder, rings F, of white metal are used, the flanges *a*, *c* of which are forced by the gas-pressure against the rod C and the walls of the holder. The rod C is of such strength that if the pressure rises above a certain limit, it is stretched, and the caps B are lifted from the ends of the holder.

Kunheim and Co.'s Safety Valve (Ger. Pat. 129,118).—The valve *b* (Fig. 4) is provided with a second passage *c*, besides the usual passage at *a*. The end of *c*, which opens into the cylinder, is closed by the thin-walled metal cap *e*, which is soldered on to the valve. In the cap a conical brass ring *d* is introduced, the edge of which projects below the valve. If the pressure in the holder become excessive, the cap is compressed, and consequently a portion of the side-wall of the cap is torn by the sharp edge of the ring *d*, as shown in Fig. 5 at *e*, and thus an outlet for the gas is provided through *c*. The metal caps must be prepared with care as to their strength, and each one should be tested at a minimum pressure of about 10 atmospheres below the maximum pressure permitted for the holder.—A. S.

English Patents.

Gases; Method and Apparatus for Ascertaining the Quantity of Solid and Liquid Admixtures of ——. L. Martius, Kladno, Bohemia. Eng. Pat. 21,543, Oct. 3, 1902.

The gas is conducted through a paper filter, which retains the solids present, and the liquids are removed by absorbents contained in vessels through which the gas is afterwards passed.

The apparatus consists of a case surrounding a covered funnel containing a perforated support for the filter paper. The gas is admitted into the stem of the funnel and ascends through the filter, whence it is led away through a tube into a series of U-tubes (charged with the absorbents), and into a pressure-compensating vessel fitted with a manometer and exhaust. Any liquid deposited in the funnel is collected in a vessel attached to the stem of the latter.—C. S.

Filter-Press: Improved ——. A. James, London. Eng. Pat. 21,782, Oct. 7, 1902.

The port for admitting the liquid to be filtered, and that for admitting the liquid used for washing the pressed cakes, are both situated in continuous passages placed at the top on one side of each plate, the former port communicating with the frames interposed between the plates, and the latter, with the alternate plates only, which are also connected with an efflux port placed in a continuous channel situated at the top of the opposite side of such plates, with an outlet orifice formed at the bottom of the intermediate filtering plates only, on the opposite side to that on which the entrance ports are situated. The path of least resistance is thus from the rear, left-hand, top corner of one plate, to the front, right-hand bottom corner of the next plate, which ensures perfect washing of the cake.—E. S.

United States Patents.

Condensing or Cooling Fluids; Apparatus for ——. W. S. Colwell, Chicago, Ill. U.S. Pat. 716,383, Dec. 23, 1902.

See Eng. Pat. 23,439, Nov. 19, 1901. This Journal, 1902, 326. (Refers to spray driven through tubes, used for cooling purposes.)

Centrifugal Apparatus. A. Holland, Madgeburg, Germany. U.S. Pat. 716,711, Dec. 23, 1902.

The outer casing of an ordinary centrifugal machine is provided at its base with annular openings (evenly spaced and provided with covers) for the removal of the liquid into annular chambers under the base.—J. W. H.

Centrifugal Liquid Separator. C. A. and O. W. Hult, Stockholm. U.S. Pat. 718,461, Jan. 13, 1903.

The rotating drum of the separator is driven from a shaft turned by a hand crank, which also actuates a pump adapted to deliver the liquid (through a graduated vessel) into the drum, the liquid supply being thus kept proportional to the velocity of the drum.—R. A.

Portable [Water] Distilling Apparatus. J. Kirkaldy, London. U.S. Pat. 718,209, Jan. 13, 1903.

This apparatus comprises a steam generator, an evaporator, and a condenser, with suitable conduits leading from the generator, through the evaporator and condenser successively, and thence back to the generator. A separate conduit leads from the interior of the evaporator through the condenser, the water condensed in this conduit being discharged into a tank arranged to receive it. Means are provided for circulating a cooling medium around the conduits in the condenser, and for automatically regulating the quantity of water in the evaporator.—R. A.

Filter Press. W. Sommer, Fürth, Germany, Assignor to Filter- und Brau-Technische Maschinen-Fabrik Act.-Ges., formerly L. A. Enzinger, Worms, Germany. U.S. Pat. 718,397, Jan. 13, 1903.

See Eng. Pat. 19,221 of 1900; this Journal, 1901, 106.
—R. A.

Liquefaction of Air or other Aëriform Fluids; Apparatus for the ——. C. Joly, London, Assignor to E. J. Richardson, B. Graves, and B. A. Spaull, London. U.S. Pat. 718,572, Jan. 13, 1903.

See Eng. Pat. 15,511 of 1901; this Journal, 1901, 1095.
—R. A.

French Patents.

Filtration; Means and Method of ——. Soc. Simoneton Frères. Addition, dated April 12, 1902, to Fr. Pat. 259,862, Sept. 19, 1896.

Discs of filtering material are supported centrally round a perforated tube, which acts as the delivery; the liquid to be filtered passes through the discs radially. The addition relates to the simplification of the apparatus described in the principal patent.—J. W. H.

Filter; Improved ——. A. Teel. Addition, dated Jan. 28, 1902, to Fr. Pat. 309,805 of April 9, 1901.

The body of the filter is supported on trunnions, and may be rotated; the liquor to be filtered enters through one hollow supporting trunnion, and leaves by the other. The filtering medium is used in the form of tubes supported on frames; similar frames near these filtering pockets serve, by their movement, to detach the precipitate during the rotation of the filter.—J. W. H.

Filters; Impt. in ——. A. Teel. Addition, dated April 23, 1902, to Fr. Pat. 309,805, April 9, 1901.

A tube is fixed into the inner receptacle and jointed through the jacket of the filter by an external joint, so that the unfiltered liquid cannot mingle with that filtered.
—J. W. H.

Distillation, Rectification, and Concentration in Multiple Effect and under Reduced Pressure; Apparatus for ——. J. Savary. Addition, dated April 29, 1902, to Fr. Pat. 315,646, Nov. 5, 1901.

The rectifying column described in the original patent is made to work under pressure or with a very feeble vacuum.
—J. W. H.

Plate Columns for Rectifying Stills. E. Guillaume. Fr. Pat. 320,850, May 2, 1902.

Annular orifices are formed in each plate of the column so that the rising vapour must pass through thin streams of condensed liquid.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Acetylene, Incandescent and Carburetted, and Air Gas; Properties of ——. N. Caro. Zeits. Calciumcarbid Fabrikat., 1902, **6**, 271, 279, 287, and 295.

The high speed of propagation of the explosive wave in mixtures of air and acetylene, which may reach 10 m. per second, when the proportion of the hydrocarbon is 10 per cent. by volume (Le Chatelier), the wide range over which such mixtures are explosive, and more especially the high upper limit (52·3 per cent. of acetylene in a 19 mm. tube, Eitner) of explosibility, have made the construction of a satisfactory atmospheric acetylene burner very difficult. Trouble has generally arisen during the lighting and extinguishing of such burner, when the movement of the cock has checked the flow of acetylene until the rate of passage of the mixture of gas and air along the burner tube toward the point of ignition no longer exceeds the rate of propagation of the explosive wave backwards. By suitably arrowing the tube at one point, by employing several tubes f small bore communicating with a common place of gnition, or by only allowing the gas and air to mix in a pecial wide chamber at the head of the burner, protected rom the flame by several sheets of gauze, trustworthy tmospheric burners for acetylene have been designed. The emperature of an atmospheric acetylene flame containing ·4 per cent. of the hydrocarbon should be as high as 2,420° C.; the temperatures found in actual burners of different designs vary from 1,630° to 2,020° C. Acetylene, however, can only be consumed in atmospheric burners satisfactorily if it is well purified from phosphorus compounds; a crude gas will often destroy a mantle in two or three hours, whereas the normal life of a mantle fed with pure gas is 500 or 600 hours. The acetylene must be delivered to the burner at a constant pressure, and must also be free from air; even 0·5 per cent. of the latter is sufficient to upset the proper balance between gas and air in the burner tube, and is very likely to cause flashing back. To obtain the best results the mantle must be of a different composition from that which suits coal gas, it should be open in mesh and have a wide orifice at the top. Mantles of ramie, which possesses a thicker single fibre than cotton, give higher illumination values; but mantles knitted from thick threads of cotton—in which the individual fibres (not threads) are no thicker than usual—are not suited to acetylene. The author has examined a large number of incandescent burners of German and French construction, which consumed from 9·2 to 22·2 litres per hour at pressures from 60 to 120 mm. The illuminating power developed ranged from 16·8 to 104·5 Hefner Units, showing efficiency varying from 2·4 to 5·5 H.U. per litre hour; whence it appears that on an average burners of 10, 15, or 20 litres nominal hourly consumption show an efficiency of 1 H.U. (Hefner Unit) per 0·25 litre per hour. Modern self-luminous acetylene burners of under 1 cb. ft. per hour in size, according to Caro, develop 1 H.U. per 0·7 litre per hour. With some ramie mantles specially treated to render them fit for transport, the effect of long-continued use up to 400 hours has been to lower the illuminating power—(*a*) from 53·2 to 49·8 H.U.; (*b*) from 76·3 to 72·2 H.U.; and (*c*) from 73·1 to 68·6 H.U., the gas being supplied at a pressure of 100 mm.

Carburetted Acetylene.—The idea of "carburetting" acetylene by leading the gas through a suitable vessel charged with a volatile spirit was suggested by Heil, and at once simplifies the use of the gas in atmospheric burners by lowering the upper limit of explosibility—so that imperfect generators which add air to the acetylene during recharging, &c., are not so objectionable—and by reducing the speed of propagation of the explosive wave. According to the proportion of vaporised spirit added, the upper explosive limit and the self-luminous power of the acetylene are reduced, and its calorific power increased. The spirit employed may be alcohol (herein-after marked "Sp"), benzol ("B"), or light petroleum (unmarked). Three chief mixtures with petroleum spirit were examined: In I., 40 grms. of petroleum spirit were added to 100 litres of acetylene, and yielded 110 litres of carburetted gas; in II., 100 grms. were added, and produced 125 litres; in III., 200 grms. were added, and yielded 150 litres. One sample was made by mixing 360 grms. of benzol vapour with 100 litres of acetylene, and another by adding 210 grms. of 90 per cent. alcohol to the same volume of gas; both giving about 200 litres of product. In a 15-litre self-luminous Billwiller burner, I. gave 1·3 H.U.; II., 1·1 H.U.; III., 0·9 H.U. per litre; in a 15-litre incandescent burner the consumptions per H.U. were 0·28, 0·28, and 0·32 litre per hour respectively—average, 0·3 litre. The calorific powers were I., 15,500; II., 20,000; III., 24,000; B, 24,000; and Sp, 12,840 calories respectively; that of pure acetylene being 14,000 per cubic metre. The explosive limits were I., 2·5—30·2; II., 2·1—16·2; III., 2·0—12·6; B, 3·4—22·0; and Sp, 3·1—12·0 per cent. of combustible gas in admixture with air. The temperature of ignition ranged from 630° to 720° C., being about 150° higher than that of simple acetylene. The actual flame temperatures were I., 1,620°; II., 1,730°; B, 1,820°; and Sp, 1,610° C. In presence of 10 per cent. of air, the speed of propagation of the explosive wave was II., 5·3 metres per second; III., 3·2, with 90 per cent. of air, that of B was 1·3 m.; and with 80 per cent. of air, that of Sp, 1·1 m. The effect of cooling gases II. and I. will be seen by the annexed table:—

Temperature.	Calorific Power.	Illuminating Power.	
		H.U.s per Litre-Hour.	Litres per 1 H.U.-Hour.
		Luminous.	Incandescent.
° C.			
+ 15	20,000	3·7	0·6
0	17,300	3·9	1·2
− 15	15,100	4·2	1·6
+ 15	16,500	·8	1·2
0	15,300	4·1	1·52
− 15	14,800	4·2	1·68

Even a very small proportion of petroleum spirit vapour is a useful addition to acetylene in lowering the upper explosive limit and permitting the presence of traces of air. A product made by adding 10 grms. of petroleum spirit vapour to 100 litres of acetylene gave about 3 per cent. less light in self-luminous burners, but practically the same amount in incandescent burners, as the pure gas; yet its upper explosive limit had fallen to 40·3 per cent., and its calorific value was 14,800. Such a product will bear cooling in the main even to − 5° C. The author, therefore, suggests that some 5 kilos. of ordinary petroleum spirit might be put into the water of an acetylene generator per 50 cubic metres of gas made, especially if the product is to be led considerable distances. In a similar fashion the acetone vapour which remains in acetylene that has been compressed into porous matter in presence of that solvent lowers the upper explosive limit of the gas some 16 per cent. The amount of acetone so retained is 50—60 grms. (Caro) or 30—40 grms. (Wolff) per cubic metre.

Air-Gas.—Three materials were prepared from a carburine ("solin" or "hydririn") having a sp. gr. of 0·697 and boiling between 65° and 85° C. I. contained 580 grms.; II., 432 grms.; and III., 296 grms. of carburine per cubic metre; II. being essentially the type of air-gas supplied by various companies making it on a large scale. The explosive limits were I., 12·0—35·0; II., 15·0—50·0; III., 19·0—66·0 per cent. of hydrocarbon. The calorific powers were I., 6,275; II., 4,620; III., 3,160. The flame temperatures were I., 1,520°; II., 1,510° C. The mean illuminating powers in incandescent burners consuming between 120 and and 170 litres (according to quality) per hour were I., 2·0; II., 2·5; III., 2·8 litres per H.U.

The effect of cooling air-gas is more serious than that of treating carburetted acetylene similarly. For instance, the normal product II. cooled to 0° C. gave the following values:—Explosive limits, 29·0—87·0; calorific power, 2,310; consumption in incandescent burner at 150 mm. pressure, 6·8 litres per hour per H.U. Moreover, if the cooling is so thorough that the calorific power falls to 1,920, the consumption may reach 8·2 litres per H.U., and the upper explosive limit become 100 per cent., so that it is explosive of itself without further addition of air. The danger thus introduced, however, is not so great as might appear, because the speed of propagation of the explosive wave is lower than the rate at which the gas is usually being forced through the pipes. The explosive wave in II. mixed with 75 per cent. of air proceeds at a speed of 1·8 metres per second, and is therefore slower than the escape of gas from a burner jet fed at 150 mm. Naturally, if the gas is not in motion, the danger is more pronounced.—F. H. L.

English Patents.

Refuse; Method of Treating and Utilising [as Fuel] Town ——. W. P. Wrightson. Eng. Pat. 18,800, Sept. 20, 1901. XVIII. B., page 158.

Coal; Binding Agent for Low Grade ——, and for Carbonaceous and other Substances. D. de Vulitch, Paris. Eng. Pat. 2306, Jan. 28, 1902.

See Fr. Pat. 317,848; this Journal, 1902, 1446.—C. S.

Coal Dust Bricks; Compositions for Making ——. J. Lœwenthal, Heyrothsberge, Germany. Eng. Pat. 23,503, Oct. 28, 1902.

Ground coal dust or coal refuse is mixed with magnesia or magnesite, and a weak (9° B.) solution of magnesium chloride, in about the following proportions: coal, 60 lb.; magnesia, 3 lb.; magnesium chloride solution, 37 lb.; the whole being then pressed and dried.—C. S.

Fuel Briquettes. J. Simons, New York. Eng. Pat. 24,661, Nov. 11, 1902.

See U.S. Pat. 713,512; this Journal, 1902, 1526.—C. S.

Lighter for Igniting Coals; Incombustible ——. F. A. W. Mehling, Neuhaldensleben, Germany. Eng. Pat. 1923, Jan. 24, 1902.

The body of the igniter is a block of incombustible material (fire-brick, clay, or the like) fitted with a handle, and pierced by two parallel longitudinal borings and a number of transverse horizontal borings leading from the latter to the outer surface of the block. An incombustible wick (asbestos) is inserted in the longitudinal borings. To use the igniter, it is dipped into a case containing some combustible liquid, and is then placed under the fuel to be ignited. The lighted wick will burn sufficiently long to start combustion in the fuel, and the igniter may then be withdrawn.—C. S.

Gas Retorts; Improvements in the Working of ——. W. L. Wise, London. From Cie. Parisienne d'Eclairage et de Chauffage par le Gaz, Paris. Eng. Pat. 852, Jan. 11, 1902.

Apparatus is arranged for simultaneously discharging a horizontal retort, for quenching and conveying away the coke, and for charging another retort. (See also Eng. Pats. 791, 368, and 586 of 1902.)—R. S.

Hydrocyanic Acid from Gases (Coal Gas); Recovery of ——. W. Feld. Eng. Pat. 26,396, Dec. 24, 1901. VII., page 145.

United States Patents.

Hydrocarbons, Volatile, Alcohol, &c.: Solidifying ——. A. H. Cronemeyer, New York. U.S. Pat. 718,318, Jan. 13, 1903.

A solution of 1 part of caustic soda in 1·5 parts of water is heated to 100° C. on the water-bath, and added to 5 parts of hot alcohol. This solution is intimately mixed with a heated mixture of 5 parts of stearin and 2·5 parts of colophony. The product thus obtained is poured, with continued stirring, into 50 parts of the hydrocarbon or alcohol to be solidified, this having been also heated to about the temperature of the water-bath.—T. F. B.

Furnace; Regenerative ——. J. A. Drake, Halifax. U.S. Pat. 717,177, Dec. 30, 1902.

A regenerative furnace chamber having primary air-inlets on each side and secondary air-inlets on either side of the primary air-inlets, is provided with a main air-supply pipe placed transversely to the furnace by means of which air is supplied through separate valved branch pipes. (See also Eng. Pat. 22,891 of 1901; this Journal, 1902, 1388.)
—W. G. M.

Furnace; Heating ——. F. H. Daniels, Worcester, Mass. U.S. Pat. 718,433, Jan. 13, 1903.

A furnace of the continuous type, comprising intercommunicating sections one superposed upon the other, the short upper section for hot billets, and the long lower section for cold billets, the sections having billet guides or supports leading from the charging ends to the delivery ends.—H. B.

Limekiln [Furnace]. S. W. Shoop, Front Royal, Va. U.S. Pat. 717,459, Dec. 30, 1902.

The gases from a limekiln-furnace are forced, by the aid of a blast fan, through a chamber containing water, whereby, it is stated, the combustible gases are separated from the non-combustible, the former being returned to the fire-box of the furnace.—E. S.

Gas Producer. R. C. Peabody, Brooklyn, N.Y. U.S. Pat. 717,266, Dec. 30, 1902.

A gas producer having a hollow pier or pedestal inside the chamber and communicating with the exterior, having an opening leading from its interior to the interior of the chamber, and having a series of stokers within the chamber near its lower end radiating from said pier.—F. H. L.

Gas; Apparatus for Purifying ——. H. A. Humphrey, London. U.S. Pat. 709,772, Sept. 23, 1902.

See Eng. Pat. 21,720 of 1902; this Journal, 1902, 1226.
—H. B.

Acetylene Gas Generator. A. S. Phelps, Chicago. U.S. Pat. 716,933, Dec. 30, 1902.

A carbide-to-water apparatus with a central conical hopper, the mouth of which is closed or opened by a disc capable of revolution from an outside source.—F. H. L.

Electric-Light Carbons; Method of Manufacturing Electrolytic or ——. H. H. Dow, Midland, Mich. U.S. Pat. 718,437, Jan. 13, 1903.

A process of manufacturing carbons, which consists in mingling comminuted carbonaceous material with a binder in the form of a vapour or gas, and having a temperature greater than that of said carbonaceous material, permitting such material to settle, and moulding and baking the product.—H. B.

Electric-Light Carbons; Method of Manufacturing Electrolytic or ——. H. H. Dow, Midland, Mich. U.S. Pat. 718,438, Jan. 13, 1903.

A process of manufacturing carbons, which consists in agitating or grinding together powdered carbonaceous material, a suitable binder, and a liquid in which the binder is not readily soluble, whereby a mixture of the carbonaceous material with an emulsion of the liquid and the binder is produced, and subsequently eliminating the liquid from the mixture.—H. B.

French Patents.

Coke from Peat; Manufacture of ——. G. Baume and A. Kahl. Fr. Pat. 320,818, April 17, 1902.

Apparatus is described in which peat is carbonised as it slides down an inclined plane in a furnace heated partly by the gas produced. At a certain spot in the furnace deflectors are placed so that every portion of the peat is brought into intimate conduct with the heated floor before it finally escapes from the lower end of the plant. Two furnaces are erected in the same setting, and can be worked together or separately. Charging apparatus and hydraulic main stand on the top of the brick setting. (See also Eng. Pat. 8287 of 1902; this Journal, 1902, 960.)
—F. H. L.

Escaping Vapours; Means of Utilisation of Heat contained in ——. Chenhalls. Fr. Pat. 321,012, May 9, 1902.

The escaping vapours are made to pre-heat hydrocarbons before being burnt in a suitable burner. The hydrocarbon is mixed with the escaping vapour and made to pass through one or more worms, heated externally by the flame of the burner.—J. W. H.

Gas Furnaces. E. Hovine. Fr. Pat. 320,845, May 2, 1902.

The secondary air supply is pre-heated and made to pass downwards for some metres before entering the furnace. The brickwork of the furnace is arranged for this pre-heating.—J. W. H.

Electrical Furnace for Lime Burning. F. Le Roy. Fr. Pat. 320,659, April 25, 1902.

R is admitted to the furnace through perforations in its ing near its base; this air is heated by passing near bars metallic silicides (forming electrical resistances) raised a high temperature by means of an electric current. —J. W. H.

as (Carburetted Air); Process and Apparatus for the Manufacture of ——. Addition, dated April 17, 1902, by L. Blanc, to Fr. Pat. 315,742, dated Nov. 8, 1901, by P. Zeitz, H. Resser, and O. Pissarreck.

RECTANGULAR vessel is divided by two horizontal par- ions into three compartments. A drum (similar to those wet gasmeters) driven by clockwork, gives a continuous ipply of air which becomes carburetted in the middle com- irtment; the upper compartment provides a supply of ydrocarbon; arrangements are described for mixing in iitable proportion with air, &c.—J. W. H.

Gas Scrubber. A. Fichet and R. Heurtey. Fr. Pat. 320,951, April 22, 1902.

HE gas is led into a cylindrical vessel divided into several ompartments by means of perforated partitions and fitted ith numerous baffles. If the gas be hot, steam is intro- uced into the scrubber near the spot where the gas also nters; but if the gas is comparatively cold, water is sprayed n under high pressure, when the condensation of the steam, r the cooling of the moistened gas, causes sufficient water o be deposited in the liquid state among the gas and on he baffles for the dust, &c. to be precipitated.—F. H. L.

Acetylene Generator; applicable also to the Evolution of any Gas produced by the Action of a Solid upon a Liquid. L. M. Bullier. Fr. Pat. 320,744, April 28, 1902.

A FLOODED-compartment apparatus. The holder bell carries a plunger, which, when the bell falls, descends into a water tank, and causes the liquid to overflow through a side tube, whence it enters a "Tantalus cup," and then reaches the carbide vessel. The "Tantalus cup" is closed against the atmosphere, but its upper part is in communication with the decomposing chamber through a gas tube. The carbide vessel is upright, and contains the usual superposed boxes of carbide.—F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Ammonia, Liquid; Manufacture of —— [from Gas Liquor]. O. Pfeiffer. VII., page 142.

Petroleum; Conversion of ——, into Acids and Fatty Substances. N. Zelinsky. XII., page 149.

French Patent.

Tar Compositions; Making ——. F. J. Warren. Fr. Pat. 320,828, April 22, 1902.

LAMP black is added to coal tar or tar oils in varying proportions, according to the use to which the resulting composition is to be put.

The proportions claimed are as follows:—

	Per Cent.
For tarring felt	20 to 25
For tarring wood, &c.	35 to 40
For paving	about 50

The addition of lamp-black is said to raise the softening point of the composition, and also to render it less brittle at low temperatures.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

m-Tolidine. G. Schultz and G. Rohde. Zeits. f. Farben- u. Textil-Chem., 1902, **1**, [21], 567—568.

Preparation of m-Nitrotoluene.—Although this compound is now an article of commerce, the authors preferred, for the purpose of their investigation, to prepare it from *p* toluidine by acetylation and nitration, as described by Noelting and Collin (this Journal, 1885, 359), hydrolysis of the nitro-derivative, diazotisation of the *m* nitro-*p*-toluidine produced, and decomposition of the diazo compound by boiling with alcohol. After purifying it from the cresol which is simultaneously formed, the greater part of the product thus obtained distils between 226° and 230° C.; after solidifying it by freezing, this fraction of the distillate melts at 16° C.

Preparation of m-Tolidine.—The nitrotoluene (200 grms.) obtained as described was dissolved in alcohol (200 grms.) and treated with zinc dust (150 grms.), a mixture of a 35 per cent. solution of caustic soda (30 grms.) and alcohol (30 grms.) being gradually added, followed by a further quantity (150 grms.) of zinc dust. The whole was then boiled for some time. Hydrochloric acid was afterwards added until all the zinc was dissolved. The *m*-tolidine hydrochloride which was formed and which separated out, was dissolved in boiling water, and reprecipitated with concentrated hydrochloric acid, an 80 per cent. yield of the base being obtained.

Properties of m-Tolidine.—From the descriptions given by previous observers (A. Goldschmidt, Ber. 1878, **11**, 1626; K. Buchka and F. Schachtebeck, this Journal, 1889, 388; P. Jacobson and O. Fabian, Ber., 1895, **28**, 2553), it would seem that the preparations of the base used by them were impure. To purify it, the base precipitated by caustic soda from an aqueous solution of the hydrochloride was extracted with ether, the ethereal solution dried over caustic potash, filtered, and the ether removed by distillation. The m. pt. of the residual base, namely, 87°—88° C., was not altered by recrystallising from water, alcohol, or light petroleum. The base does not, as has previously been stated, give a blue coloration with ferric chloride. In other respects its properties are as they have already been described (*loc. cit.*). To further characterise it, there were prepared the picrate, which forms yellow needles (m. pt. 225°) soluble with difficulty in water; the zinc chloride and platinum chloride double salts, the former crystallising in long, colourless needles, the latter in yellow prisms which are insoluble in water. The dicresol formed in small quantity by diazotising and boiling the base with water, crystallises from benzene in needles, melting at 114° C. The diacetyl derivative of the base melts at 75° C., the dibenzoyl derivative at 127° C. The tetrazo derivative gives, when combined with naphthionic acid, an orange-yellow, and with 1.4-naphthol sulphonic acid, a red dyestuff. Both of these exhibit very little affinity for cotton; this is in conformity with Schultz's rule that only those diphenyl bases which give red derivatives with naphthionic acid and violet or blue derivatives with naphtholsulphonic acid, are suitable for use in the manufacture of cotton-substantitive dyestuffs, while wool dyestuffs of value are obtained alone from those diphenyl bases which yield orange-yellow compounds with naphthionic acid and blue compounds with naphtholsulphonic acid.—E. B.

Para- and Ortho-Nitrobenzene Sulphonic Acids. T. Wohlfahrt. J. prakt. Chem., 1902, **66**, [23—24], 555—557.

A COMPARATIVELY simple method for preparing the above acids is based on Blanksma's reaction (this Journal, 1902, 816). Sodium disulphide is prepared by dissolving 36 grms. of the crystalline sodium sulphide in 150 c.c. of hot alcohol, and dissolving therein 4·8 grms. of sulphur. The solution is then slowly added to a hot solution of 32 grms. of *o*- or *p*-chlornitrobenzene in 50 c.c. of alcohol. The corresponding dinitrodiphenyldisulphide is thus produced.

For the oxidation of *p*-dinitrodiphenyldisulphide to *p*-nitrobenzene sulphonic acid, 40 grms. of the former are treated with 100—120 c.c. of fuming nitric acid. After the first violent reaction has subsided, the mixture is heated over a small flame for one hour until solution is complete. It is then diluted with five times its volume of water, and the un-oxidised disulphide (about 30—40 per cent. of the whole) is removed by filtration. The liquid is evaporated several times until the nitric acid is removed, and the *p*-nitrobenzene sulphonic acid is converted into potassium salt and recrystallised from water. The oxidation of the ortho body is effected in the same way, and is more complete than in the case of the para, the ortho potassium salt is crystallised from a mixture of one part of water with four parts of alcohol.

Para-nitrobenzene sulphonic acid is reduced by the electric current in alkaline solution to *p*-azo-benzene disulphonic acid, the potassium salt of which occurs as red crystals with $2\frac{1}{4}H_2O$. On further reduction, the salt of *p*-hydrazobenzene disulphonic acid is produced, crystallising in colourless needles, the solution of which is oxidised to the azo-compound in contact with air. When *p*-hydrazobenzene disulphonic acid is heated with concentrated hydrochloric acid, *p*-azo-benzene disulphonic acid and sulphanilic acid are produced.

By the electrolytic reduction of *o-nitrobenzene sulphonic acid* neither an azo nor a hydrazo compound could be isolated, but when the solution was reduced to the latter stage and then acidified with hydrochloric acid, the liquid soon solidified to a voluminous dark green mass, which dissolved in water, giving a green concentrated solution, turning blue on dilution, and which was probably a thiazine dyestuff.—J. F. B.

Benzidine Derivatives; Certain ——. K. Elbs and T. Wohlfahrt. J. prakt. Chem., 1902, **66**, [23—24], 558—575.

The authors have investigated the properties of *benzidine-m-disulphonic acid*, *o-tolidine-m-disulphonic acid*, and *m-diaminobenzidine*. The two first are prepared by the electrolytic reduction of *m*-nitrobenzene sulphonic acid and *o*-nitrotoluene *m*-sulphonic acid respectively, and the isomerisation of the resulting hydrazodisulphonic acids by boiling with dilute sulphuric acid (1 : 2). *m*-Diaminobenzidine is prepared by reducing *m*-nitraniline electrolytically to diaminohydrazobenzene, which is then isomerised by pouring its hot solution in acetic acid into fuming sulphuric acid. *m-Diaminobenzidine* is readily acetylated by boiling with acetic acid, the tetracetyl derivative, melting at 284° C., being produced. The same *tetracetyl derivative* may be prepared by boiling *m*-diaminohydrazobenzene with a mixture of acetic acid and anhydride. *m*-Diaminobenzidine, as a derivate of *m*-phenylenediamine, yields on diazotisation derivatives of Bismarck Brown.

o-Tolidine-m-disulphonic acid is readily diazotised, and the bidiazo compound is precipitated by acids in the pure crystalline state. The authors have combined this with phenols and amines, obtaining dyestuffs which do not dye unmordanted cotton satisfactorily, the colours are reds and browns. *o*-Tolidine-*m*-disulphonic acid is not acetylated either by acetic acid or acetic anhydride; its sodium salt, however, readily reacts with acetic anhydride, one or both of the hydrogen atoms of the two amino groups being replaced by the acetyl group. The replacement of the diazo groups of the bidiazo derivative of tolidine disulphonic acid by halogens, &c. does not take place satisfactorily, but the *dichloro derivative* has been prepared. The properties of *benzidine-m-disulphonic acid* and its derivatives have also been studied, and are in every way analogous to those of the tolidine compound.—J. F. B.

English Patent.

Anthracene Series; New Derivatives of the ——. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 3362, Feb. 10, 1902.

See Fr. Pat. 318,496; this Journal, 1902, 1151.—T. A. L.

United States Patents.

Blue [Azo] Dye, and Process of Making Same. A. Weinberg and F. Klingemann, Assignors to L. Cassella and Co., Frankfort-on-the-Main. U.S. Pat. 709,186, Sept. 16, 1902.

One molecular proportion of aminoacetnaphthalide sulphonic acid is diazotised and combined successively with two molecular proportions of Cleve acid, the product is again diazotised, and combined with one molecular proportion of 2.5.7-amino-naphthol sulphonic acid.—T. A. L.

Yellow Acridine Dye, and Process of Making Same. A. Weinberg, Assignor to L. Cassella and Co., Frankfort-on-the-Main. U.S. Pat. 709,187, Sept. 16, 1902.

Acridine compounds of the formula $C_{15}H_{11}N(NX)_2$, where X represents hydrogen or alkyl groups, are heated with aromatic amines and formaldehyde. The resulting products from Acridine Yellow, formaldehyde and an aromatic amine, dissolve in water to yellow solutions, show a green fluorescence in alcoholic solutions, and dye tannined cotton fast yellow shades.—T. A. L.

Cyan-methyl Derivatives of Aromatic Amides; Process of making ——. Otto J. Graul, Ludwigshafen-on-Rhine, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 718,340, Jan. 13, 1903.

This process for making omega-cyan-methyl derivatives of aromatic amino substances consists in treating the latter with formaldehyde and an alkali bisulphite, and acting on the product thus formed with a cyanide.

For instance, omega-cyan-methylaniline may be synthesised by adding 93 parts of aniline gradually, with stirring, to a mixture of 300 parts of 40 per cent. sodium bisulphite solution and 80 parts of 38 per cent. formaldehyde. This mixture is heated to about 50° C. for some time, when 150 parts of 4 per cent. caustic soda solution are added and then 70 parts of potassium cyanide dissolved in 300 parts of water; the mixture is now heated for two hours at 40°—50° C. and then allowed to cool, the omega-cyanmethylaniline separating out of the oily layer in a nearly pure state.—T. F. B.

Blue Wool-Dye [Azo-Dyestuffs], and Process of Making Same. A. Weinberg, Assignor to L. Cassella and Co., Frankfort-on-the-Main. U.S. Pat. 718,181, Jan. 13, 1903.

Diazotised *p*-amino-acetylalkylaniline is combined with a disulphonic acid of 1.8-dihydroxy-naphthalene, the resulting product being subsequently hydrolysed. (See Eng. Pat. 25,781 of 1901; this Journal, 1902, 1451.)—T. A. L.

Black Polyazo Dyes [Azo Dyestuffs]; Process of Making ——. J. Dedichen, Assignor to Actien-Gesellschaft fur Anilin Fabrikation, Berlin. U.S. Pat. 717,550, Jan. 6, 1903.

A diazo compound is allowed to react on the mixed disazo dyestuff, obtained by combining the tetrazo compound from a *p*-diamine in acid solution with 1.8.3.6 aminonaphthol disulphonic acid and subsequently coupling the resulting intermediate compound in alkaline solution, with a *m*-diamine. —T. A. L.

Mixed Disazo Dye [Azo Dyestuff], and Process of Making Same. C. Schraube and W. Voigtländer-Tetzner, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 718,028, Jan. 16, 1903.

One molecular proportion of tetrazotised 1.5-naphthylene diamine is combined with one molecular proportion of salicylic acid, and the intermediate compound formed is then combined with 2.3.6-naphthol disulphonic acid. The resulting product dyes chrome-mordanted wool, shades which are fast to fulling. See Eng. Pat. 9287 of 1900; this Journal, 1901, 168.—T. A. L.

Azo Dye, and Process of Making Same. W. Voigtländer-Tetzner, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 718,032, Jan. 6, 1903.

Diazotised *m*-aminobenzene-azo-salicylic acid is combined in alkaline solution with 1.4-naphthol sulphonic acid in alkaline solution, whereby an azo dyestuff is obtained. This azo dyestuff, on treatment with zinc-dust, caustic soda, and hydrochloric acid, yields metaphenylene-diamine and *p*-amino-salicylic acid, and on suitable treatment with stannous chloride and hydrochloric acid, yields 2-amino-1-naphthol-4-sulphonic acid.—T. A. L.

lphurised Cotton-Dye [Sulphide Dyestuff], and Process f Making Same. L. Haas, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 718,342, Jan. 13, 1903.

E sodium salt of dinitrobenzene sulphonic acid is treated h sodium sulphide and sulphur, yielding a dyestuff giving wn to yellow shades on unmordanted cotton. The shades practically unaffected by potassium bichromate and tic acid, and become reddish on suitable treatment with rous acid and β-naphthol. The product is insoluble in old 10 per cent. sodium carbonate solution and is not olly dissolved within one hour by a sodium sulphide ution containing 50 grms. of crystallised sodium sulphide 100 c.c. of the solution. (See Eng. Pat. 25,809 of 1901; s Journal, 1902, 1328.)—T. A. L.

d Azo Dye. P. Julius, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 718,356, Jan. 13, 1903.

E product claimed is the mono-azo dyestuff which, on uction with hydrochloric acid and stannous chloride, lds α-amino-β-naphthol and 2.1.5-naphthylamine ulphonic acid. (See Fr. Pat. 319,989; this Journal, 02, 1529.)—T. A. L.

d Azo Dye. C. Schraube and W. Voigtländer-Tetzner, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen. U.S. Pat. 718,389, Jan. 13, 1902.

trazotised benzidine is combined with *p*-cresol and 6.8-naphthol disulphonic acid. (See Eng. Pat. 3375 of 02; this Journal, 1903, 22.)—T. A. L.

French Patents.

digo White and Indigo [Indigo Dyestuffs]; Manufacture of Brominated ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 321,002, May 7, 1902.

digo white in paste form is treated with bromine. The ominated compound so formed is converted on oxidation o a brominated Indigo.—T. A. L.

ethylanthranilic Esters; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 321,121, May 14, 1902.

rmylmethylanthranilic acid (Fr. Pat. 317,122; this urnal, 1902, 957) is heated with methyl or ethyl alcohol d sulphuric acid, yielding the corresponding esters of thylanthranilic acid. The methyl ester so obtained lts at 22° C. and boils at 132° C. under 14 mm. pressure, ilst the ethyl ester melts at 36° C. Both products form lourless crystals having a blue fluorescence.—T. A. L.

o Dyestuffs; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 320,879, May 3, 1902.

E monazo dyestuffs obtained by combining a diazotised ino sulphonic acid (naphthionic acid) with 1.8.4-naphylenediamine sulphonic acid, are converted by the action mineral acids into compounds which appear to be derived m 1.8.4-aminonaphthol sulphonic acids. These products ll then combine with another molecular proportion of a zo compound, yielding new disazo dyestuffs.—T. A. L.

lphide Derivatives Dyeing Unmordanted Cotton Blue-Black and Black Shades [Sulphide Dyestuffs]; Conversion of Indophenols into ——. Soc. pour l'Ind. Chim. à Bâle. Supplement, dated April 29, 1902, to Fr. Pat. 284,387, Dec. 26, 1898.

dophenols are heated with polysulphides at temperatures ove 100° C., in a closed vessel or under a reflux condenser. —T. A. L.

lphide Derivatives of Indophenols in a Pure State [Sulphide Dyestuffs]; Manufacture of ——. Soc. pour l'Ind. Chim. à Bâle. Supplement, dated April 29, 1902, to Fr. Pat. 298,075, March 12, 1900.

E residue, obtained in the manufacture of indophenol lphide derivatives according to the chief patent, after tilling off the alcohol, is mixed with dry metallic salts, eferably alkali salts, or else the residue is dissolved in ter and the indophenol sulphide derivative is precipitated by air or other weak oxidiser, such as hydrogen peroxide or hypochlorites, with or without the addition of metallic salts.—T. A. L.

Blue Anthracene Dyestuff; Manufacture of a ——. Badische Anilin und Soda Fabrik. Supplement, dated April 26, 1902, to Fr. Pat. 309,503, March 29, 1901.

The yellow dyestuff formed by fusing β-amino-anthraquinone with aluminium chloride is only obtained in poor yield. The yield is much increased by heating together β-amino-anthraquinone with antimony pentachloride in presence of an indifferent organic solvent, such as nitrobenzene.—T. A. L.

Sulphide Dyestuffs; Manufacture of Green ——. Kalle and Co. Fr. Pat. 320,701, April 26, 1902.

Green dyestuffs for cotton are obtained by the action of sulphur and sodium sulphide on *p*-hydroxyphenyl-thiourea or on *p*-hydroxythiocarbanilide. A subsequent treatment with chromium salts renders the shade bluer.—T. A. L.

Anthracene Series; New Products of the [Anthracene Dyestuffs] ——. Soc. Anon. des Prod. F. Bayer and Co. Fr. Pat. 320,821, April 19, 1902.

Anthraquinone-β-sulphonic acid is heated with primary aromatic amines yielding new condensation products suitable for the production of dyestuffs.—T. A. L.

Sulphide Dyestuffs from m-Tolylene Diamine; Manufacture of Direct Cotton Yellow ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 321,122, May 14, 1902.

When *m*-tolylene diamine is heated with about twice its weight of sulphur to a temperature not exceeding 220° C., it is converted into a brownish-yellow mass insoluble in most solvents. In order to transform it into a dyestuff, this product is heated with a concentrated solution of caustic soda or of sodium sulphide at 110°—120° C., until completely dissolved, when, after dilution with water, it is precipitated with hydrochloric acid. The dyestuff so formed is readily soluble in water in presence of alkali sulphides, and gives yellow shades on unmordanted cotton, fast to washing, fulling, and acids. It is almost insoluble in concentrated sulphuric acid.—T. A. L.

Sulphide Dyestuffs; Manufacture of Brownish-Orange ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 321,183, May 15, 1902.

On heating *m*-tolylene diamine with $2\frac{1}{2}$ times its weight of sulphur to about 250° C., a rapid evolution of sulphuretted hydrogen takes place, and the melt becomes solid and brittle. After grinding, it is fused with crystallised sodium sulphide at 110°—120° C., and subsequently heated under pressure at 120° C. until soluble in water. The dyestuff gives brownish-orange shades on unmordanted cotton, which are not altered by treatment with chromates, but become brighter by the action of hydrogen peroxide.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

English Patents.

Indigo Vat Dyeing. A. W. Playne, Stroud, and L. W. Macdonald, Skeabost. Eng. Pat. 922, Jan. 13, 1902.

See Fr. Pat. 318,678 of 1902; this Journal, 1902, 1532. —E. B.

Treating Warp-Yarns, Tapes, and other Narrow Goods with Mercerising, Dyeing, Bleaching, or other Liquors; Apparatus for ——. J. Schneider, Galashiels. Eng. Pat. 2524, Jan. 31, 1902.

Tapes, &c., are treated in a continuous manner with mercerising or other liquors in an apparatus consisting of two tanks in combination with feeding, squeezing, and flanged guide rollers. One of the tanks serves for the treatment with, *e.g.*, caustic soda-lye, the other for washing purposes. —E. B.

United States Patent.

Dyeing Apparatus. J. O. Obermaier. U.S. Pat. 716,926, Dec. 30, 1902.

The apparatus consists of a dye-vat fed by a water-supply pipe, a reservoir for the dye-liquor considerably above the level of the vat, a pipe connecting this reservoir with the vat, and a discharge pipe through which the liquor is sucked back into the reservoir after use. (See also Eng. Pat. 15,191 of 1900; this Journal, 1901, 1207.)—T. F. B.

Dyeing Process. O. Jaeck, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 717,749, Jan. 6, 1903.

Textile fabrics, dyed with sulphur dyestuffs, are treated with a solution of a neutral sulphite, thus rendering them fast to light, washing, &c., and at the same time rendering the shade brighter.

The fabric may be treated with a 0·2 per cent. solution of sodium sulphite for half an hour at 80° C., or with a 1 to 2 per cent. solution at the ordinary temperature for a few minutes.—T. F. B.

Casein Compound. H. V. Dunham, New York. U.S. Pat. 717,085, Dec. 30, 1902.

A casein compound is formed by adding about 2 parts of a soluble salt of oxalic acid (such as potassium oxalate) and about 15 parts of a salt with an alkaline reaction (*e.g.* borax) to about 100 parts of dry commercial casein; and for the process for producing a casein compound adapted to form a thin solution, with a comparatively small amount of water, salts of oxalic acid are incorporated with the casein to be used in the casein solution.—T. H. P.

French Patents.

Cellulose [in Fibres, Paper, &c.]; Superficial Acetylation of ——. L. Lederer. Fr. Pat. 320,885, May 5, 1902. XIX., page 160.

Wool and other Animal Fibres; Treatment of ——, by Volatile Solvents. E. Maertens. Fr. Pat. 320,813, April 15, 1902.

See U.S. Pats. 698,207, 698,208, 698,209, 698,210, and 698,211; this Journal, 1902, 858.—T. F. B.

Cotton and other Fabrics; Process for Rendering —— Incombustible. W. H. Perkin, jun., and Whipp Bros. and Todd, Ltd. Fr. Pat. 321,063, May 12, 1902.

The fabric is treated with a solution of a salt derived from an acid metallic oxide (*e.g.*, sodium stannate) in conjunction with an acid, or an ammonium salt, or a mixture of an acid or alkali with an ammonium salt.

For example—

(*a*) The fabric is treated in a bath containing sodium stannate solution of 19° B., 5 parts; sodium tungstate of 35° B., 5 parts; ammonium chloride of 4° B., 2 parts; ammonia, sp. gr. 0·880, 1 part; or

(*b*) It may be first treated with a solution of sodium stannate of 14° B., dried, and subjected to further treatment with a bath of sodium tungstate of 35° B., 5 parts; acetic acid of 7° B., 3 parts, and dried.—T. F. B.

Indigo Shades on Vegetable Fibres; Process for Increasing the Fastness of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 320,888, May 5, 1902.

The fabric, after dyeing, is treated with Turkey-Red oil, either alone or (preferably) in conjunction with aluminium salts.

For example, the fabric is thoroughly soaked in a bath containing 10 parts of Turkey-Red oil to 90 parts of water. It is then wrung out, dried for 12 hours at 50°—70° C., passed through a solution of acetate of alumina (6° B.), wrung out, and dried, the process being repeated if additional fastness is desired.

The above treatment is said to render the shades much faster to washing, and to the action of chlorine, &c.

—T. F. B.

Vegetable Juices; Process for Sterilising ——, and Utilisation [Mordant] of the same. W. Beckers. Fr. Pat. 321,073, May 12, 1902. XVIII. A., page 158.

Cloth; A Machine for Printing on ——. Kien. Fr. Pat. 320,086, March 22, 1902.

The material is conveyed on an endless travelling band, having an intermittent action, and is brought in contact with an engraved surface. The engraved plate is mounted on a car which is subjected to an alternating movement, rising above the material in order to receive the colouring material, and then descending till in contact with the material, whereby the colour or colours are printed on the latter.—L. G. R.

Waterproof Coating for Fabrics. A. Molino. Fr. Pat. 321,135, March 22, 1902.

Four successive coats are given to the fabric, the first three consisting of linseed oil boiled with 3½ per cent. of flake litharge, and mixed with 10 per cent. of ground paint of the tint desired. The fourth coat is composed of 22 per cent. of gum lac dissolved in 78 per cent. of methylated spirit and 2 per cent. of an aniline dyestuff of the required shade. Each coat is allowed to dry complete before the application of the next.—M. J. S.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

French Patent.

Leather: Process of Dyeing ——. R. Rieder. Addition dated April 12, 1902, to Fr. Pat. 291,355, Aug. 1, 1899.

See Eng. Pat. 9373, 1902; this Journal, 1902, 1533.

—L. G. R

Marble; Imitation of ——. A. Terribilini. Fr. Pat. 320,852, May 2, 1902.

The feature of the method consists in projecting upon th surface of water suitable colours for giving the marble-effe desired, and transferring this layer of pigment, by mean paper, to the object or material, prepared by paint to rece it.—J. W. H.

Marble: Producing Appearance of ——, on Glass, Woo &c. S. Guinet. Fr. Pat. 320,964, May 3, 1902.

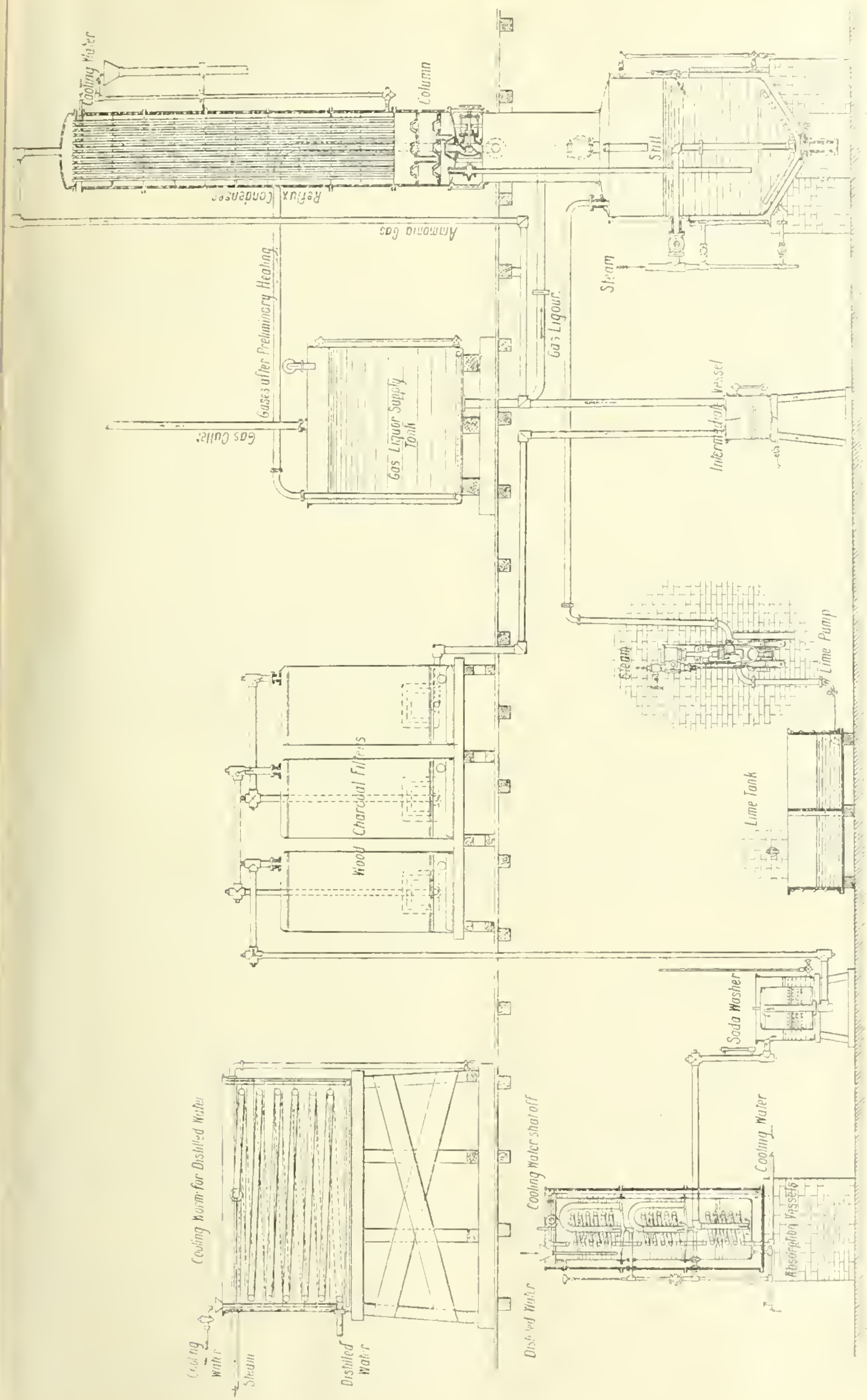
A coating of paint is formed by brushing on the surfac the marble-effect being produced by hand. A speci medium is used to carry the pigments, dyestuffs, &c., em ployed, and consists of sodium silicate, 750 to 500 grms water, 250 to 500 grms.; gold size, 1 to 10 grms.: to eve kilo. of pigment.—J. W. H.

VII.—ACIDS, ALKALIS, AND SALTS.

Ammonia, Liquid; Manufacture of ——. O. Pfeiffer J. f. Gasbeleucht., 46, [1], 1—4.

The annexed figure illustrates the apparatus for the produ tion of liquid ammonia from gas liquor, in operation at t Magdeburg gas works. The still is provided with refl condenser, and with an arrangement for absorbing the a monia. It had previously been found that by boiling g liquor with lime in a reflux apparatus it was possible obtain ammonia absolutely free from hydrogen sulphide.

The still is capable of working off a charge of 4 cb. of gas liquor. It is supplied from a store tank at a high level, the contents of which are enriched in ammonia fro a previous boiling. Steam is admitted through the coil the bottom of the still, and when, later on, crusts of li appear, the steam jacket is put into operation. Until t contents begin to boil, the valve in connection with t condenser is closed, so that the expelled vapours pass in the supply tank, the gas liquor retaining ammonia, whi carbonic anhydride and hydrogen sulphide escape into t chimney. This preliminary heating process is complet in about two hours, and when the liquor in the still h


Cooling Water
Column
Reflux Condenser
Ammonia Gas
Still
Steam
Gas Liquor
Gases after Preliminary Heating
Gas Outlet
Gas Liquor Supply Tank
Intermediate Vessel
Steam
Lime Pump
Wood Charcoal Filters
Lime Tank
Soda Washer
Cooling Worm for Distilled Water
Cooling Water shutoff
Cooling Water
Absorption Vessels
Cooling Water
Steam
Distilled Water
Distilled Water

reached the boiling point, the inlet to the supply tank is closed, and the requisite amount of milk of lime pumped into the still. The valve communicating with the condenser is then opened, and the distillation proceeded with. The separation of water and hydrogen sulphide is effected in the reflux condenser, aided by a column containing three compartments inserted between the still and the condenser. The latter contains 81 tubes, 51 mm. in diameter, and its flow of water is broken by partitions and checks. Its cooling effect is stated to be so perfect, that the ammonia passes away in an almost dry condition. On its way to the filters, any liquid which may separate is collected in a receiver described as "Intermediate vessel" in the figure. For the separation of empyreumatic substances, three charcoal filters are employed, the contents of which are replaced every six weeks, the charcoal being revivified in gas retorts. Before removing the charcoal, the ammonia absorbed thereby is recovered by blowing steam into the filters and driving the vapours into the gas-liquor still. A soda washer (this Journal, 1900, 244) is inserted between the filters and the absorption vessels to retain traces of hydrogen sulphide, and simultaneously act as pressure gauge during the distillation and as aspirator when the charge has been worked off. The absorption is effected in a vessel divided into three compartments, surrounded by a water jacket and cooled inside by a cold water worm. The ammonia is introduced into the bottom compartment, and passes into the other compartments by means of inverted U-shaped dip pipes. When the liquid in the lowest vessel has been brought to full strength, the contents are emptied and the vessel is re-charged with the liquor contained in the middle compartment. The charge in the top vessel is then transferred to the middle vessel and the top vessel refilled with distilled water. Each distillation, including the preliminary heating, takes from 7 to 7½ hours, so that 10 cb. m. of gas liquor can be worked off in two shifts, producing about 700 kilos. of ammonia of 0·91 sp. gr. (25 per cent. NH_3). The amount of lime required is 200 kilos., distilled water 530 kilos., and steam 5,700 kilos.—D. B.

Halogens on Alkalis; Theory of the Action of ——. F. Foerster and E. Müller. Zeits. f. Elektrochem., 1902, **8**, [51], 921—926.

This theory represents the action of halogens on solutions of alkalis as the passage of halogen ions into the solutions, while a corresponding number of the hydroxyl ions lose their charges and disappear.

In the case of cathions a well-known and analogous action is the displacement of copper from its solution by means of zinc. According to the electrolytic dissociation theory, this is represented as follows:—

$$Zn + Cu'' \rightarrow Cu + Zn''.$$

The corresponding action of the halogens, X, on alkali solutions is thus—

$$X_2 + 2OH' \rightarrow 2X' + (OH)_2$$

or—

$$X_2 + 2OH' \rightarrow 2X' + H_2O + O.$$

Fluorine, however, is the only halogen which acts in this way. There is an intermediate stage of the reaction, applicable to the other halogens, and according to which only one half of the halogen molecule passes over into the ionic condition, while the other half unites with the discharged hydroxyl to form an electrically neutral compound. With chlorine, for instance, the action is—

$$Cl_2 + OH' \rightarrow Cl' + HOCl,$$

and when the hypochlorous acid formed in this way, comes into contact with more hydroxyl ions, the next action may be represented thus:—

$$HOCl + OH' \rightarrow OCl' + H_2O.$$

By the action, therefore, of the halogens, chlorine, bromine and iodine, in a solution of an alkali, two interdependent actions occur, *viz.*, $X_2 + OH' \rightleftarrows X' + HOX$ and $HOX + OH' \rightleftarrows OX' + H_2O$.

On completion of the reaction, and if the halogen be chlorine, there will be, for any given concentrations of chlorine and hydroxyl, certain definite concentrations of fre chlorine, hypochlorous acid, and the salt of hypochlorou acid, all in equilibrium. Only in the particular case i which the concentrations of the chlorine and of the hypochlorous acid can be neglected does the ordinary text-book equation, $X_2 + 2MOH = MX + MOX + H_2O$, apply.

A peculiarity of the above two sets of substances i equilibrium is that an unlimited amount of, *e.g.*, the hypochlorous acid and metallic hypochlorite cannot exist sid by side. A further reaction takes place between the two whereby a metallic chlorate is formed (compare thi Journal, 1899, 272). This formation of chlorate can b represented by the equations—

$$2HOX + OX' = OX'_3 + 2X' + 2H^{\cdot}$$

and—

$$2X' + 2H^{\cdot} + 2OX' = 2HOX + 2X'.$$

The remainder of the paper contains an application o the law of mass action to these particular cases, and of discussion thereon, with special reference to the haloge chlorine.—J. S.

Iodine; Action of ——, *on Alkalis.* F. Foerster an K. Gyr. Zeits. f. Elektrochem., 1903, **9**, [1], 1—10.

The authors describe a number of experiments, the result of which show that, in general, the action of iodine i similar to the action of chlorine and bromine on alkali and is in agreement with the theory of the action of th halogens on alkalis given by Foerster and Müller. (Se previous abstract. See also R. L. Taylor, this Journa 1900, 385: J. Chem. Soc., 1900, 725.)—J. S.

Calcium Phosphates; Decomposition of —— *by Ammoniu Citrate Solutions.* K. Zulkowski and F. Cedivod Chem. Ind., **26**, [2], 27—33.

The solution of these phosphates depends on the formatio of normal or acid calcium ammonium citrates, of whic only the acid salts are stable. The normal dicalciu ammonium dicitrate is but slightly soluble, and its solutio soon deposits tricalcium dicitrate, triammonium citra remaining. Calcium tetrammonium dicitrate is ver soluble, but in solution gradually dissociates, first formin dicalcium ammonium dicitrate, and ultimately tricalciu and triammonium citrates.

Dicalcium Phosphate.—Triammonium citrate dissolv this salt, forming an acid ammonium phosphate an calcium tetrammonium dicitrate. The reaction is reve sible, so that a large excess of the ammonium citrate needed for complete decomposition. Diammonium citra dissolves dicalcium phosphate, forming an acid ammoniu phosphate, and an acid calcium ammonium dicitra Monammonium citrate also dissolves it, converting it in the soluble monocalcium phosphate ("superphosphate, and forming an acid calcium ammonium dicitrate. excess of the acid ammonium citrates is needed; soluti of the dicalcium phosphate is complete when the theoreti amount has been added.

Tricalcium Phosphate.—This salt is dissolved by ammonium citrate, with formation of triammonium pho phate and calcium tetrammonium dicitrate. The reaction reversible, and needs for completion a large excess of t ammonium citrate. Tricalcium phosphate is also dissolv by diammonium citrate, forming acid ammonium phospha and acid calcium ammonium dicitrate, and by monammoni citrate, forming "superphosphate" and acid calcium a monium dicitrate. It is attacked with difficulty by any these citrates, and even with the acid salts a large excess necessary. Its solubility is too great, however, to allow its separation from dicalcium phosphate by means of a of the ammonium citrates.

Tetracalcium Phosphate.—This salt is rapidly and co pletely dissolved by diammonium citrate, forming an ac ammonium phosphate and an acid calcium ammoniu dicitrate, and less rapidly, but completely, by monammoni citrate, to "superphosphate" and an acid calcium ammoni dicitrate.

It seems probable, from the great solvent power diammonium citrate, that this substance might with adva tage be substituted for citric acid in the valuation omas meal. The greater solubility of di- and tetra- lcium phosphates than of tricalcium phosphate in acid bstances (carbonic acid, vegetable acids, &c.) is probably e to differences in constitution, the calcium in the calcium salt forming the nucleus of the molecule, and ing thus less exposed to the attacks of solvent agencies. e conversion of tricalcium phosphate into more easily similable phosphates, usually effected by sulphuric acid, n also be effected by heating with lime; the preference be given to one or the other method depends entirely on st and convenience.—J. T. D.

on; Nitrogen-carrying Action of —— [*Synthesis of Cyanides*]. E. Tauber. Chem. Ind., **26**, [2]. 26—27.

TROGEN, calcined soda, or potash, and finely-divided iron, heated to redness in an iron gun-barrel. The best yield cyanide was obtained from nine parts of sawdust soaked th a solution of three parts of calcined soda in water and en thoroughly charred, and one part of commercial duced iron. The best temperatures were found between dull and medium red-heat. On the average, 10 per cent. the soda used was converted into sodium cyanide; but some cases the yield was as high as 25 per cent.—J. T. D.

English Patents.

hlorine and other Chemical Products [*Sulphuric Anhydride*]; *Apparatus and Process for the Manufacture of* ——. O. Dieffenbach, Darmstadt, Germany. Eng. Pat. 26,537, Dec. 28, 1901.

this modification of the Deacon process, the air only, or a art of it, is heated, and is then mixed with the hydrochloric cid gas before its introduction into the apparatus. The action is carried on "in an apparatus or system of pparatus so arranged that the region of highest reaction d maximum temperature which travels onward in the irection of the gaseous current, shall always travel in the me direction in a closed cycle, and so continually return the initial point of departure." The mixture of chlorine d steam is only allowed to pass out of the apparatus at laces where it has become so cool that it no longer contains y volatilised copper salt. Similarly acting apparatus is aimed for use in the contact process for manufacturing lphuric anhydride.—E. S.

ydrocyanic Acid from Gases; Recovery of ——. W. Feld, Honningen-on-Rhine. Eng. Pat. 26,396, Dec. 24, 1901.

HE gases containing hydrogen or ammonium cyanide are ssed into water holding in solution or suspension, bases alkaline salts, which solution is afterwards acidified and istilled. An iron salt or oxide can only be used when ydrogen sulphide is not present.—T. F. B.

yritous Minerals; Roasting ——. H. H. Lake, London. From G. Rambaldini, Grosseto, Italy. Eng. Pat. 2402, Jan. 29, 1902.

HE temperature is kept down during the roasting of the yrites in columns, so that the copper remains as sulphate, early free from iron sulphate, and the sulphur dioxide is iluted as little as possible with atmospheric gases.—E. S.

United States Patents.

ulphuric Anhydride; Making ——. A. Clemm, Mannheim, Germany. U.S. Pat. 716,985, Dec. 30, 1902.

EE Eng. Pat. 15,151, July 22, 1899; this Journal, 1900, 42.—E. S.

etal; Reducing ——, *and Making Metallic Hydroxides.* H. S. Blackmore, Mount Vernon, N.Y. U.S. Pat. 717,328, Dec. 30, 1902.

IXTURES or compounds, such as sodium plumbate, are eated with hydrogen or other reducing gas, whereby the ore electro-negative metal is reduced and the hydroxide f the alkali-metal is formed. A continuous process for the production of sodium hydroxide is described, in which, when the one charge of hydroxide is removed, sodium carbonate is added, and a stream of oxygen passed through the mixture. Sodium plumbate is thus re-formed and more sodium hydroxide may then be produced.—W. G. M.

Cobalt Ammonium Salt; Process of Making ——. H. A. Frasch, Hamilton, Canada, U.S. Pat. 717,183, Dec. 30, 1902.

See Eng. Pat. 19,038, Sept. 24, 1901; this Journal, 1902, 862. Also Eng. Pat. 19,035, Sept. 24, 1901; this Journal, 1902, 253.—E. S.

Hydrogen Sulphide; Method of Making Pure ——, *from Furnace Gases.* W. G. Waring, Tyrone, Pa., U.S.A. U.S. Pat. 718,556, Jan. 13, 1903.

Sulphur dioxide is absorbed from the gases by "a strong solution of sodium sulphite," and the resulting sodium hydrogen sulphite solution is treated with barium carbonate. The carbon dioxide evolved, is stored, and the barium sulphite obtained, "is reduced to barium sulphide by calcination with coal," which is then decomposed by the carbon dioxide from the previous reaction, so as to produce hydrogen sulphide.—M. J. S.

French Patents.

Hydrochloric Acid; Making ——. General Chemical Co. Fr. Pat. 320,771, April 29, 1902.

See U.S. Pat. 698,704, April 29, 1902; this Journal, 1902, 772.—E. S.

Cyanides; Manufacture of Alkali ——. J. D. Darling and C. L. Harrison. Fr. Pat. 320,667, April 25, 1902.

See Eng. Pat. 9605, April 25, 1902; and U.S. Pats. 698,462-3-4, April 29, 1902; this Journal, 1902, 1077 and 773.—E. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

English Patent.

Stone; Improved Artificial ——. K. S. Dhondy, Bombay. Eng. Pat. 17,369, Aug. 7, 1902.

Sand, and stone moistened with dilute sulphuric acid, are mixed, and subjected to a bath of farina digested with caustic potash solution. To the mixture, about 2 per cent. of its weight of plaster of Paris is added and the mass is stirred in water, and laid down in a plastic state, or made into tiles or bricks.—E. S.

United States Patents.

Fireproof Composition for Use on Wood. G. Blenio, New York. U.S. Pat. 716,660, Dec. 23, 1902.

The mixture consists of alum, $\frac{1}{2}$ lb.; potash, $\frac{1}{2}$ lb.; "liquid glass," $\frac{1}{2}$ pint; whiting, 2 lb.; water, 1 gall.—J. W. H.

Artificial Stone; Process of Finishing ——. W. Black and H. S. Richards, Chicago, Ill. U.S. Pat. 716,371, Dec. 23, 1902.

Artificial stone, composed of cement and particles of natural stone, is treated with a solution of hydrochloric or other acid, washed, immersed in carbonate of soda solution, and again washed.—J. W. H.

Stone, Artificial, &c.; Method of Manuf[illegible] *R*[illegible] *Aggregates for Use as* ——. H. W. C. K. D[illegible], London. U.S. Pat. 716,689, Dec. 23, 1902.

See Eng. Pat. 17,540 of 1901; this Journal, 1902, [illegible].—A. S.

French Patent.

Tar Compositions [*for Coating Wood, &c., and for Paving*]; *Making* ——. F. G. Warren. Fr. Pat. 320,828, April 23, 1902. III., page 139.

X.—METALLURGY.

Iron; Influence of the Chemical Composition on the Strength of ——. J. A. Brinell and A. Wahlberg. Stahl u. Eisen, **23**, 1295—1297. Chem. Centr., 1903, **1**, [2], 99.

The authors made experiments to determine the power of iron and steel to resist shocks at the ordinary and at a lower temperature (+ 20 C. and −24 to −26 C.). The test pieces of ingot-iron, some of which were notched, were rolled hot, and afterwards some were heated to redness and others were quenched. The power to resist shock decreased greatly with increasing carbon-content, even with the tempered samples. Material rich in silicon is much more resistant in the untempered condition than material poor in silicon, especially at the low temperature; with the tempered material, the reverse is the case. Samples containing manganese, when in the untempered condition, show a decrease in the power to resist shock, with increasing content of manganese, whilst in the tempered condition, the power of resistance increases. A sulphur content of 0·15 and 0·56 respectively, had no injurious influence on the power to resist shock, owing, probably, to the high content of manganese of the samples in question. Cooling to from −24 to −26 C., caused a strong decrease in the power of resistance (about 62 per cent. in the case of the notched samples, and about 24 per cent. in the case of the others). The injurious influence of cooling diminishes with increasing carbon-content. The strength of the untempered material is affected by cooling much more than that of the tempered material. In all cases, the metal was rendered more capable of resisting shock by quenching it and then allowing it to stand in the quenching liquid (at 550 C.). (See also this Journal, 1902, 1330.)—A. S.

Cast Iron; Strength of ——. B. Osann and Outerbridge. Stahl u. Eisen, 1902, **22**, 1237. Chem.-Zeit., 1903, **27**, [3], Rep. 14.

The strongest cast iron is cold-blast charcoal pig-iron containing the maximum of carbon and the minimum of silicon, manganese, phosphorus, and sulphur. Iron cast direct from the blast-furnace is superior to that which has been remelted in the cupola, because it takes up oxygen in the latter process. Manganese, however, is useful as a deoxidising agent. Grey iron is weakened by heating; it is never so treated to improve its strength, but rather to remove internal strains. White and mottled iron tend to give a dull grey fracture after heating.—W. G. M.

Nickel-Iron and Nickel-Iron-Carbon Alloys; Properties of ——. Stahl u. Eisen, **23**, 1287—1292. Chem. Centr., 1902, **1**, [2], 100.

Examination of Nickel (Wedding).—Wrought and cast nickel of varying purity show no appreciable difference with respect to its coefficient of linear expansion. The electrical conductivity of cast nickel is not altered by forging. Cast nickel containing 1·22 per cent. of manganese shows greater tensile strength and extensibility than pure nickel. On forging, the tensile strength and extensibility increase in both cases, but to a greater degree with the pure nickel, so that eventually the two materials have approximately the same mechanical properties.

Nickel-Iron Alloys (Rudeloff).—The alloys (of the calculated composition, 0, 0·5, 1, 2, 3, 4, 5, 8, 16, 30, 60, 95, and 100 per cent. of nickel) were prepared by fusing together nickel free from manganese and very pure iron (99·71 per cent. Fe), with the addition of some magnesium or aluminium. With amounts of nickel up to 16 per cent., the coefficient of linear expansion of the cast specimens decreases, but with greater amounts of nickel, again increases, till, with 98 per cent. of nickel, it is greater than that of iron. The strength at first increases nearly proportionately with the amount of nickel, whilst the malleability decreases. The alloy with 8 per cent. of nickel shows the greatest tensile strength. The resistance to compression and the shearing strength are highest, and the malleability lowest, in the case of the alloy with 16 per cent. of nickel. The allo with 30 per cent. of nickel cannot be forged.

Nickel-Iron-Carbon Alloys.—On fusing together nicke the purest possible iron, steel rich in carbon (2·33 per cen of C and 0·227 per cent. of Mn), and suitable amounts c wood charcoal, it was found that loss of carbon durin fusion and casting only occurred when the amount prese exceeded 1 per cent. With increasing amounts of nicke the power of taking up carbon decreases, whilst th tendency for the carbon to separate as graphite, increases this tendency is noticeable with very small proportior of carbon. With a constant percentage of nickel, th strength of the alloy becomes greater with increasin amounts of carbon up to a definite limit (about 1 per cec of carbon), and then becomes smaller again. The amou of graphite is of importance; when this increases, th extensibility of the alloy becomes greater, but the strengt smaller. With a constant proportion of carbon (entirel chemically combined), the strength increases and th malleability decreases with increasing amounts of nick up to 8 per cent. of the latter; with greater amounts nickel, the reverse is the case. (See also this Journa 1894, 955; 1896, 905; 1899, 48; 1901, 127 and 1217.)

—A. S.

Pig Iron for Casting Purposes; Selection of ——. Dillner. Oesterr.-Zeits. f. Berg- u. Huttenw., 1902, 5 670. Chem.-Zeit., 1903, **27**, [3], Rep. 14.

The danger of judging a pig-iron by fracture only is point out, and the work of Simmersbach, Muller, and Keep referred to. The pig-iron which best resists acids conta 1 per cent. of Si, 0·5 per cent. of P, 0·05 per cent. of and 3 per cent. of C. The strongest pig-iron, break with a load of 28 kilos. per sq. mm. [17·8 tons per sq. in. contained 0·9 per cent. of Si, 0·3 per cent. of Mn, 2·5 p cent. of graphite, and 0·65 per cent. of carbon (combined)

—W. G. M.

Manganese Ore as a Desulphur[illegible] Agent in the Mart Process. A. Riemer. Stahl u. Eisen, 1902, **22**, 135 Chem.-Zeit., 1903, **27**, [3], Rep. 14.

A diversity of opinion exists as to desulphurisation in t Martin furnace, and it is usual, therefore, to employ a p iron containing less than 0·1 per cent. of S. Carbon, metal manganese, and slags containing lime and ferrous oxide a as desulphurising agents. The author, working two charg similar to one another, excepting that one contained ma ganese ore and the other did not, found that the eliminati of sulphur was far greater in the case in which the mangane ore was used. A reduction of manganese was observ The lime and ferrous oxide slags act only slightly, or wi the assistance of carbon and manganese: moreover, they not expel the sulphur, but only store it up, so that it retur to the bath again when the manganese and carbon are longer present in sufficient quantity. It is shown that und certain conditions a pig-iron containing 1 per cent. sulphur may be made to yield an excellent steel.

—W. G. M.

Slag; Constitution of Blast Furnace ——. K. Zulkow Oesterr. Berg- u. Hüttenw., 1902, **50**, 647, 667. Che Zeit., 1903, **27**, [3], Rep. 14.

Silicic acid has the tendency to form metasilicat Alumina and other sesquioxides have the power to act acids. In classifying slags, it is advisable to determine t degree of saturation, which is expressed by the quoti obtained by dividing the number of acid molecules by t of basic molecules.—W. G. M.

Bronze Rich in Tin; Specific Gravity of a ——. Stahl. Berg- u. Hüttenm.-Zeit., **41**, 613. Chem. Cen 1903, **1**, [2], 99.

A bronze, smelted from waste scrap rich in copper and t had the following composition:—Copper, 65·0; tin, 33· lead, 0·7; and zinc and iron, 0·4 per cent. It was wh and brittle, and had the sp. gr. at 21·5 C., of 8·896. T calculated specific gravity is 8·404.—A. S.

English Patent.

opper Ore; Methods of Treating ——. G. Westinghouse, London. From W. J. Knox, Allegheny, Pa., U.S.A. Eng. Pat. 2805, Feb. 4, 1902.

E Fr. Pat. 318,348, Feb. 4, 1902; this Journal, 1902, 57.—E. S.

United States Patents.

Ore-leaching Apparatus. J. Brown, Tonopah, Nev. U.S. Pat. 709,135, Sept. 16, 1902.

HE apparatus comprises a tank for containing water or her liquid, to which is connected a vertical column surounted by a hopper to receive the ore pulp. The column as a series of chambers, one above the other, with a ooded valved outlet to each, the ball valves being conolled by electro-magnets, suitably connected, in such ise as to simultaneously effect the closure of one valve nd the opening of the next one, and *vice versâ*, alternately. —E. S.

Ores; Treating ——. E. Theisen, Baden, Germany. U.S. Pat. 709,527, Sept. 23, 1902.

EE Eng. Pat. 12,693, June 21, 1901; this Journal, 1902, 04. Compare also U.S. Pat. 704,593, July 15, 1902; his Journal, 1902, 1322.—E. S.

Ores; Treating ——. J. T. Jones, Iron Mountain, Mich. U.S. Pat. 717,864, Jan. 6, 1903.

The ore in the condition of pulp is placed in a closed cylinder, which can be rotated, and has curved extensions from its inner sides. A "leaching fluid of lesser specific gravity is superimposed upon" the ore, so that on rotating the cylinder, portions of the ore are carried upward and released above the body of leaching fluid, which latter is simultaneously conveyed below the surface of the mass of ore. —E. S.

Ores [of Precious Metals]; Method of Reducing ——. S. C. C. Currie, Assignor to W. Courtenay, both of New York. U.S. Pat. 718,099, Jan. 13, 1903.

The powdered ore is subjected in a closed vessel to the action of hot air, or of a "hot gaseous compound containing oxygen," with or without steam, at such a temperature as to render some of the salts in the ore soluble in water; the soluble matter is then washed away with water, and the process is repeated at a higher temperature, with or without an intermediate treatment with caustic alkali solution, washing, and roasting. Compare U.S. Pat. 690,361; this Journal, 1902, 350.—E. S.

Gold and Silver; Apparatus for Treating Pulverised Ores of ——. D. C. Boley, Chicago, Ill., Assignor to H. Block, Pekin, Ill. U.S. Pat. 709,593, Sept. 23, 1902.

The finely-divided ores are "treated by filtration" in a rotating barrel, having around its inside surface a series of chambers separated from the interior of the barrel by filtering fabric. Means are provided for automatically inducing a vacuum in the chambers during a portion of the rotation, and for producing an air-pressure backward through the filter fabric at a different time. Each chamber has two outlet pipes, so that the liquid contents will flow out, whatever position in the vacuum zone the chamber may occupy during the rotation of the barrel.—E. S.

Precious Metals; Separating ——, *from their Ores.* F. R. Carpenter, Deadwood, S.D., Assignor to J. H. Berry, Detroit, Mich. U.S. Pat. 718,087, Jan. 13, 1903.

Dry gold- and silver-bearing ores, composed mainly of earthy elements, are smelted without the addition of lead- or matte-forming material, but with sufficient basic material to form a slag, and with insufficient fuel to effect any material reduction of the contained metals. The fluid mass is then brought into contact with a molten bath of lead. —E. S.

Metals; Separating Precious ——, *from Ores.* F. R. Carpenter, Denver, Col., Assignor to J. H. Berry, Detroit, Mich. U.S. Pat. 718,088, Jan. 13, 1903. (See preceding abstract.)

The iron matte containing precious metals is brought into contact with molten lead, and subjected to an oxidising atmosphere; or to an agent capable of reducing a portion of the contained iron sulphide.—E. S.

Precious Metals; Recovering ——, *from Mattes containing them.* F. R. Carpenter, Denver, Col., Assignor to J. H. Berry, Detroit, Mich. U.S. Pat. 718,089, Jan. 13, 1903.

Iron is dissolved in the molten mattes containing precious metals, obtained as described in the two preceding abstracts, and the mixture is subjected to a bath of molten lead. —E. S.

Aluminium; Purifying of ——. E. L. Anderson, Assignor to J. A. Gilliam, both of St. Louis, Mo. U.S. Pat. 716,977, Dec. 30, 1902.

The aluminium is treated with hydrofluoric acid, and the gas generated on the surface continuously removed therefrom, or the metal is treated with a mixture of calcium fluoride, nitric acid, and a chromate.—W. G. M.

Copper; Extracting ——, *from its Ores.* A. von Gernet, London. U.S. Pat. 717,565, Jan. 6, 1903.

The process consists in continually passing the ore (oxides and carbonates) in the form of pulp through a trapped inlet to a covered launder inclined at such an angle to the horizontal that the pulp will travel slowly downwards. The launder is provided with trapped outlets and gas inlet and exhaust valves. A current of sulphur dioxide gas, mixed with air, or of the gas in solution, is continuously passed through the launder, in a direction contrary to the flow of the pulp, and the copper sulphite solution produced, is received in settling tanks.—E. S.

Zinc; Reducing ——, *from its Oxides, &c.* W. Schulte, Limburg, Belgium. U.S. Pat. 718,222, Jan. 13, 1903.

See Fr. Pat 318,265; this Journal, 1902, 1457.—E. S.

Zinc; Method of Extracting [as Zinc Sulphide] ——. W. G. Waring, Tyrone, Pa., U.S.A. U.S. Pat. 718,554, Jan. 13, 1903.

Zinciferous ores or products (natural mine waters, &c.) are leached with water containing 1·5 per cent. of sulphuric acid or other mineral acid, in which iron salts may be present. Ores may be treated *in situ*, and the solution be pumped from the mine. The solution is stirred with zinc sulphide or a soluble sulphide to precipitate metals of the silver and copper groups, and the clarified liquid is then treated with hydrogen sulphide and heated to 150 —180° F. The zinc separates as sulphide, and the regenerated mineral acid can be used again.—M. J. S.

Cementation; Process of ——. A. Frank, Charlottenburg, Germany. U.S. Pat. 718,335, Jan. 13, 1903.

The metal to be cemented is subjected to the action of a mixture of acetylene and an oxide of carbon, heated to a temperature sufficiently high to separate the carbon from the mixture.—E. S.

Soldering Sticks; Composition for Making ——. O. J. Flanigan, Boston, Mass. U.S. Pat. 717,833, Jan. 6, 1903.

The composition is a mixture of $\frac{3}{4}$ lb. of spermaceti, $\frac{1}{4}$ lb. of mutton tallow, and $\frac{3}{4}$ oz. of acetic acid.—E. S.

Enamelled Metal Plates; Manufacture of ——. D. Wieser, Assignor to H. Sulzbach and Co., Zurich, Switzerland. U.S. Pat. 709,530, Sept. 23, 1902.

Smooth rolled metal plates are coated with a mixture of zinc-white and oil-varnish, dried, coated with greasy lacquer colour, and again dried. They are then ground dull by pumice and water, and are printed with permanent colours, and when dry are re-coated with greasy copal lacquer, and finally dried.—E. S.

Furnace; Oxidising ——. J. E. Greenawalt, Denver, Col. U.S. 717,093, Dec. 30, 1902.

In a stack oxidising furnace, two or more shaft-compartments and a dust-chamber compartment are provided with means to elevate the ore from the bottom of the former and the dust from the bottom of the latter, and to distribute them at the top of one of the shaft-compartments. Horizontal conveyors and external elevators are used for the purpose. A combustion chamber and air-heating chamber with dampers and valves are also provided.—W. G. M.

French Patents.

Steel; Process for Deoxidation and Decarburisation of Liquid ——. Soc. Électrométall. Française. Fr. Pat. 320,682, April 25, 1902.

An agglomeration of carbon and iron or other metal filings, termed by the patentee "carburite" is added to the liquid steel. The mixture may be agglomerated with resin and then boiled: it must be sufficiently dense to sink through any slag there may be on the steel bath, and remain in contact with the metal.—W. G. M.

Iron, Steel, and other Metals: Silvering or Gilding of ——. Miss J. Schiele. Fr. Pat. 320,696, April 26, 1902.

See Eng. Pat. 9438 of 1902; this Journal, 1902, 917.
—W. G. M.

Blast Furnace. W. F. Hannes. Fr. Pat. 321,087, May 13, 1902.

See Eng. Pat. 10,929, of 1902; U.S. Pat. 712,374 of 1902; this Journal, 1902, 1141.—W. G. M.

Furnaces; Metallurgical ——. J. A. Hunter. Fr. Pat. 321,170, May 12, 1902.

See Eng. Pat. 10,353 of 1902; U.S. Pat. 699,759 of 1902; this Journal, 1902, 977.—W. G. M.

Bronze Colours: Granulation of Metals or Alloys for the Manufacture of ——. Bronze Farbwerke Act. Ges. vorm. C. Schlenk. Addition to Fr. Pat. 289,827 of June 12, 1899. XIII. A., page 150.

Sheet Metal; Producing Multicolour Impressions on ——, *with "Moirée Métallique" Effects in Parts.* F. Krokert et Cie. Fr. Pat. 320,733, April 28, 1902.

Those parts not needing a "moirée" effect are printed first, and thus protected from the action of the acid bath used later.—J. W. H.

Alkali Metals; Preparation of ——. Chem. Fabr. Griesheim-Elektron. Fr. Pat. 320,815, April 15, 1902.

A mixture of alkali fluoride and aluminium is heated in a suitable vessel, from which the reduced alkali metal is distilled off. The residual double fluoride of aluminium and alkali metal is treated with caustic alkali or alkali carbonate, whereby alkali metal fluoride is regenerated for further treatment. (See also U.S. Pat. 710,493; this Journal, 1902, 1333.)—W. G. M.

Washing Apparatus [Gold, &c.] for Analytical Purposes. G. de Krivochapkine. Fr. Pat. 321,019, May 19, 1902. XXIII., page 165.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Electrolytic Bleach for Paper Pulp. A. Neuberger. XIX., page 159.

Electrolytic Bleaching of Paper Pulp. L. J. Dorenfeldt. XIX., page 160.

Lead from Manganese; Separation of ——, *by Electrolysis* A. F. Linn. XXIII., page 166.

Mercury; Electrolytic Determination of ——. F. Glaser XXIII., page 165.

Cobalt and Nickel Solutions; Behaviour of ——, *at the Anode during Electrolysis.* A. Coehn and M. Gläser. XXIII., page 166.

English Patent.

Insulating Material; Improved ——, *and Mode of Manufacture of same.* V. Karavodine, Paris. Eng. Pat. 26.363, Dec. 24, 1901.

See Fr. Pat. 319,261; this Journal, 1902, 1539.—M. J. S.

United States Patents.

Secondary Battery. W. Morrison, Assignor to K. Upton, Chicago. U.S. Pats. 717,107 and 717,108, Dec. 30, 1902.

A battery is claimed in which fluorine, as hydrofluoric acid, is present, either as an ingredient of the paste formed on one of the elements, or as a component of the electrolyte. (See also U.S. Pat. 711,997; this Journal, 1902, 1540.)—F. H. L.

Battery: Electric ——. H. Halsey, New York, Assignor to Halsey Electric Generator Co., Jersey City, N.J. U.S. Pat. 717,394, Dec. 30, 1902.

One or both elements of a battery are continuously brushed by means of brushes travelling at variable speed. The electrolyte is freed from precipitates by circulating the solution so that it comes in contact with a collector.
—W. G. M.

Electrode for Storage Batteries. [*Lead Crystals.*] L. Paget, Assignor to C. Coster, both of New York, N.Y. U.S. Pat. 717,607, Jan. 6, 1903.

The electrode consists of a series of small interspaced plates, each consisting of a thin corrugated plate of compressed finely-divided lead, or of compressed arborescent crystals of metallic lead on which is deposited a thin sheet of peroxide of lead, each plate being surrounded by a frame of elastic non-conducting material.—G. H. R.

Electrodes; Method of Preparing Storage Battery —— L. Paget, Assignor to C. Coster, both of New York U.S. Pat. 717,608, Jan. 6, 1903.

The plate described in the preceding patent is prepared by pressing finely-divided lead, or arborescent crystals of lead, into a thin corrugated plate, and depositing on it a thin shell of peroxide of lead, after which the plate is formed electrically into a storage battery oxygen electrode.
—G. H. R.

Electrode; Storage Battery ——. [*Bi-Polar.*] L. Paget Assignor to C. Coster, both of New York. U.S. Pat 717,609, Jan. 6, 1903.

The electrode consists of a thin lead plate, coated on opposite sides with successive thin layers or films of finely-divided lead, compressed approximately to the density of sheet lead, the density of the coatings increasing from the surface inwards.—G. H. R.

Battery; Storage ——, *and Method of Preparing Electrodes therefor.* [*Bi-Polar Electrode.*] L. Paget, Assignor to C. Coster, both of New York. U.S. Pat. 717,610, Jan. 6, 1903.

The bi-polar electrode described in the preceding specification, is formed by compressing finely-divided lead to a density substantially that of sheet lead, and passing a forming or charging current from one face to the other through the plate thus formed, and through a suitable electrolyte on the opposite faces of the plate, the compressed lead constituting the sole conducting connection between the opposite sides of the electrode.—G. H. R.

French Patents.

nsulating Electrical Bodies with a Brittle and Pulverised Insulating Material and a Bituminous Substance; Process of Manufacturing ——. La Société Pyrisolith, Paris. Fr. Pat. 320,675, April 25, 1902.

ee Eng. Pat. 10,083 of 1902; this Journal, 1902, 1282.
—G. H. R.

ement; New Depolarising ——, for Electric Batteries. E. Mors and A. Nobécourt, Paris. Fr. Pat. 320,966, May 5, 1902.

'he cement is composed of carbon, a solid depolariser, and soluble silicate. The silicate in the cement is decomposed in ny known manner, whereby gelatinous silica is produced, ogether with a soluble salt, which is removed by washing.)n drying, the gelatinous silica is reduced in volume, nd the mass is rendered porous. The cement may form a art of the positive pole, if desired.—G. H. B.

(*B*.)—ELECTRO-METALLURGY.

English Patent.

Steel and other Metals; Improved Process and Apparatus for the Smelting of ——, Direct from their Ores by Aid of Heat and Electricity. W. P. Thompson, London. From Le Syndicat de l'Acier Gerard, Paris. Eng. Pat. 26,170, Dec. 27, 1901.

The ore, mixed with carbon and a flux, is heated to a comparatively low temperature in a blast furnace, which is connected by a siphon channel below its base, with the sole of a horizontal, gas-heated refining furnace. Electrodes, connected to a source of electricity of low tension and high ampèrage, are arranged at the junction of the blast furnace and siphon channel, to fuse the charge. The slag overflows by a side opening in the channel, at the bottom of which a negative electrode (for the refining process) is fixed; whilst the positive electrode is movably fitted in the arch of the refining furnace, so that it can be pushed into contact with the fluid metal, whereby "an abundant number of little drops are caused to be thrown forward from the surface," accelerating the refining process. These electrodes convey a current of high voltage and relatively low amperage. The molten metal can be tapped off through a side opening at the bottom of the siphon channel. A steam injector regulates the current of gases in the furnace, connected with which are heat-regenerating chambers, and there is interchange of gases between the blast and refining furnaces.
—E. S.

XII.—FATS, FATTY OILS, AND SOAP.

Aluminium; Use of ——, in the Stearine Industry. P. Pastrovich. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [12], 278—279.

Donath (this Journal, 1895, 276) has already published the results of laboratory experiments upon aluminium, showing that that metal offers remarkable resistance to the action of fats and fatty acids even when assisted by heat and the presence of air. The author has made a series of experiments on a manufacturing scale, using aluminium plates instead of the usual copper or copper alloy plates in the stearine press. The usual life of the latter plates is 7 to 8 years, after which they are completely eaten through. A comparative test in which copper and aluminium plates of equal dimensions were kept in a hot hydraulic press charged on the average 11 times daily, showed that after two years the copper had lost 15·75 per cent. in weight, whilst the aluminium had only lost 1·77 per cent. Moreover, the copper plate had expanded 10 mm. in length and 5 mm. in breadth, whereas the aluminium plate showed no alteration in dimensions. A hot hydraulic press containing 28 aluminium plates was in continual use for two years, after which the loss in weight of the plates only amounted to 1·37 cent., whilst they had retained their shape perfectly. According to these data the life of aluminium plates in the press would be about 66 years, whilst they would cost 23 per cent. less than copper plates.

Although aluminium cannot be used as a material for autoclaves, since it is attacked by the small amount of alkalis in the alkaline earths used, and also on account of its behaviour with boiling water and high-pressure steam, it is, in the author's opinion, the most suitable metal for the ordinary operations of the stearine industry.—C. A. M.

Almonds; Presence of Saccharose in ——, and its Part in the Formation of the Oil. C. Vallée. Comptes Rend., 1903, **136**, [2], 114—117.

The author has demonstrated the constant presence of saccharose (about 3 per cent.) in ripe almonds, by extracting them with alcohol and determining the optical rotation and cupric reducing power of the boiled down or concentrated extract, before and after inversion by means of invertase.

Determinations were then made of the proportions of saccharose, reducing sugars and oil, in the pericarp and in the almond, at intervals, from the first appearance of the fruit to the time of ripening. During this period (about six months) the proportions of saccharose and reducing sugars in the pericarp remained more or less constant and only traces of oil were formed in this portion. In the almond, on the other hand, the percentage of reducing sugars decreased progressively as the saccharose and the fatty oil made their appearance. The saccharose went on increasing until the oil began to be formed and then decreased gradually, increasing again towards the end, when the production of oil slackened. The above remarks apply both to the fresh almonds and the dried.

It would seem that in the pericarp there is a constant supply of reducing sugars and saccharose, and that these carbohydrates accumulate in the seed where they take part in the production of the oil, though it is doubtful which of them is the immediate precursor of the oil.—J. F. B.

Oil from Water-Melon Seeds. S. Woinarowskaja and S. Naumowa. J. russ. phys.-chem. Ges., **34**, 695—697. Chem. Centr., 1903, **1**, [1], 41.

The oil from water-melon seeds (yield, 21·4 per cent.) solidifies at −20° C. It belongs to the class of semi-drying oils, and has the following constants:—Sp. gr. at 15° C., 0·925; Hehner value, 96·1; Köttstorfer (saponification) value, 198; Reichert value, 0·4; iodine value (Hübl), 111·5; "free oxygen," 0·4; acetyl value, 4·7; Maumené's test, 50·4°; Livache's test, 2·7 per cent.—A. S.

Petroleum; Conversion of ——, into Acids and Fatty Substances. N. Zelinsky. Russ. phys.-chem. Ges. Zeits. angew. Chem., 1903, **16**, [2], 37.

By chlorinating different fractions of petroleum, treating the products obtained with magnesium, subjecting the magnesium compounds to the action of carbon dioxide, and decomposing the complex substances formed, with water and sulphuric acid, the author obtained good yields (up to 60 per cent.) of organic acids. In this way, the following compounds were prepared from Caucasian petroleum:—

From the fraction distilling between—

25° and 45° C., two acids, $C_6H_{12}O_2$ and $C_7H_{14}O_2$.
72° and 74° C., a mixture of methylpentamethylene- and hexamethylene carbonic acid.
80° and 85° C., hexahydrobenzoic acid.
100° and 105° C., an acid, $C_{18}H_{14}O_2$.
115° and 120° C., an acid, $C_9H_{18}O_2$, and a cyclic acid, $C_9H_{16}O_2$.
133° and 145° C., a cyclic acid, $C_{10}H_{18}O_2$.

On heating with glycerin to 250° C., the acid $C_8H_{14}O_2$ formed a di- and a tri-octin, the latter being a compound having the properties of a fat.—A. S.

Candles, Ointments, Lubricants, &c.; Manufacture of ——. O. Liebreich, Berlin. Ger. Pat. 136,[illegible]17, Nov. 9, 1900.

As substitutes for or additions to natural fats and oils and their derived acids, the acidyl derivatives of aromatic bases (aniline, naphthylamine, their alkyl derivatives and homologues) are used. These have the advantage of raising the melting points of fats or fatty acids with which they are mixed; they also enable them to take up larger amounts of water.—J. T. D.

English Patents.

Oil-Seed Cakes and other Residues from the Manufacture of Vegetable Oils; Process of Rendering ——, suitable for Use as Cattle Food. C. Fresenius. Eng. Pat. 385, Jan. 6, 1902. XVIII A., page 158.

Glycerin; Process and Apparatus for Recovery of ——. E. B. Bousfield, London. From M. Flandrak, Paris. Eng. Pat. 2668, Feb. 1, 1902.

See Fr. Pat. 318,279; this Journal, 1902, 1460.
—R. L. J.

United States Patents.

Oil Filter. C. A. Conn, Pittsburg, Pa. U.S. Pat. 718,428, Jan. 13, 1903.

The outer wall of the filter has a double bottom, forming a heating chamber, which is in communication with a second heating chamber, formed by two inner walls extending upwards through the filter. A removable cover, formed with an aperture, is fitted on the outer of the two inner walls, and the walls of the bottom chamber are also provided with apertures so as to establish communication between the heating chambers and the atmosphere.—R. A.

Soldering Sticks; Composition for Making ——. O. J. Flanigan. U.S. Pat. 717,833, 1903. X., page 147.

French Patents.

Oils; Method for the Extraction, Purification, and Decolorisation of ——. H. F. Rossollin, S. C. J. Demarteau and M. G. Herente. Fr. Pat. 320,817, April 17, 1902.

Oleaginous matter (especially olive marcs) is digested with petroleum spirit distilling below 60 C., and the extract treated with an acid solution of permanganate. It is then decanted, filtered if necessary, and the solvent distilled off. The residual colourless oil in the distillation apparatus is termed "permanganate oil."—C. A. M.

Oils (Fatty and Ethereal) and other Chemical Products ordinarily Liquid; Dry and Pulverised Preparations of ——. The Firm Sicco med. Chem. Institut Fr. G. Sauer. Fr. Pat. 320,839, May 1, 1902.

An emulsion of the oils, &c. with gum arabic and water, is treated with a suitable proportion of calcined magnesia or magnesium carbonate, and the resulting solid mass pulverised.—C. A. M.

Fats and Esters of Fatty Acids; Manufacture of Bromine and Iodine Derivatives of ——. W. Majert. Fr. Pat. 320,993, May 7, 1902. XX., page 164.

Soaps containing Petroleum; Manufacture of ——. Soc. Daum Co. Fr. Pat. 320,825, April 22, 1902.

Solid petroleum is incorporated with the finished soap, or is added in the form of an aqueous emulsion to the materials used in the manufacture of the soap.—C. A. M.

Soap; Manufacture of ——. C. Dreymann. Fr. Pat. 320,886, May 5, 1902.

The soap, after being separated and purified in the usual way, is again boiled with brine, the density of which depends upon the nature of the final product required. By this treatment granulations are removed, water eliminated, and a soap of any desired hardness obtained. Iron salts and organic impurities are precipitated from the spent lye by the addition of a sulphide and an acid, thus enabling the lye to be used again.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

English Patents.

Lead Oxide; Production of ——, and Treatment of Rough Litharge and Residues from the Precipitation White Lead Process. Runcorn White Lead Co., Ltd., G. V. Barton, T. Jones, all of Runcorn, and C. W. S. Crawley, London. Eng. Pat. 4660, Feb. 24, 1902.

In earlier patents (17,178 and 21,830, 1898; this Journa, 1899, 1033, 1134) an opening was provided in the side of the lead-melting pan, above the level of the metal, for the conveyance of the product to the collecting chambers; but it is found in practice that a large proportion of metallic lead is carried over with the oxide, and has to be restored to the melting pot. According to the present specification, a vertical or inclined tube is provided, connected with the melting pot by an opening in the cover, and carried to such a height before descending to the collecting chambers that the metallic lead falls back into the pot. Means are provided for regulating the level at which the oxide is allowed to pass from the rising tube.—M. J. S.

Rust-proof and Fire-proof Composition for preventing Radiation of Heat; applicable also as a Substitute for Glazier's Putty. W. P. Thompson, Liverpool. From Giovanni and Guisippe Bevilacqua, Genoa, Italy. Eng. Pat. 4137, Feb. 18, 1902.

A mixture of 7 parts of partially ground slag-wool, 45 parts of silicate of potash solution, 37 parts of powdered asbestos, 4½ parts of calcined magnesia, 2½ parts of graphite or other retractory pigment, 2 parts of powdered cork, and 2 parts of powdered puzzolana, to which may be added a binding material, such as lime, in any proportion up to 25 per cent.—M. J. S.

United States Patents.

Zinc; Method of Extracting [as Zinc Sulphide] ——. W. G. Waring. U.S. Pat. 718,554, Jan. 13, 1903. X page 147.

White Pigment; Method of Producing Pure —— W. G. Waring, Tyrone, Pa., U.S.A. U.S. Pat. 718,555 Jan. 13, 1903.

A white pigment, consisting of zinc oxide and barium sulphate, is obtained by precipitating a solution containing both zinc sulphate and zinc chloride by one of barium chloride in which magnesia is suspended.—M. J. S.

French Patents.

Bronze Colours; Granulation of Metals or Metallic Alloys for Manufacture of ——. Bronzefarbenwerk A.-G. vorm. C. Schlenk. Addition, dated May 13, 1902, t Fr. Pat. 289,827 of June 12, 1899.

The metal is cast on the surface (preferably the inne surface) of a rotating hollow cylinder. It thus forms thi sheets, which, after cleansing, can be crushed directly t powder. Or the metal may be cast in the space betwee rotating cylinders, which roll it to the required degree o fineness.—W. G. M.

Zinc-White Paint; Process of Manufacturing —— applicable also to other Metallic Oxides. G. H. Petit Fr. Pat. 321,017, May 10, 1902.

During the operation of mixing in a pug-mill zinc whit or other metallic oxide with a drying oil which has bee previously oxidised, a certain quantity of water is adde The addition of any other substance to the paint so obtained is also claimed.—M. J. S.

(B.)—RESINS, VARNISHES.

Manganese Borate [Drier]. H. Endemann and J. W Paisley. Amer. Chem. J., 1903, **29**, [1], 68—73.

The commercial article varies widely in composition. Th precipitate obtained with aqueous solutions of borax and manganous salt, is partially soluble in the secondary products of the reaction, and dissociates during washing. The most stable compound is $MnB_4O_7 . 5H_2O$, which, however, can only be obtained by adding boric acid to the washed precipitate from manganous chloride and sodium metaborate, and drying without heat. It is rose-white, amorphous, and hygroscopic, and when added to heated oils produces quick-drying varnishes.—M. J. S.

French Patent.

Colophony [*Rosin*] ; *Mineralisation of* ——. A. Nodon. Fr. Pat. 320,806, April 1, 1902.

Colophony is distilled over an excess of quicklime, being first allowed to flow in a melted state into a retort filled with lime and heated to an incipient red heat. The vapours are conducted through two successive retorts, also filled with lime and heated to a dull-red and cherry-red respectively.

The products are 15 per cent. of gaseous hydrocarbons, 10 per cent. of light oils, 2 per cent. of acetone, 13 per cent. of burning oils, 51 per cent. of fluid lubricating oils, 5 per cent. of vaselines, and 4 per cent. of black tar.
—M. J. S.

(C.)—INDIA-RUBBER.

Rubber Trees ; The Latex Canals of ——. H. Lecomte. J. d'Agric. trop. ; through Gummi-Zeit., 1903, **17**, [17], 375.

In the *Landolphia hendelotii* the canals bearing the latex are tubes having a diameter between 0·03 and 0·045 mm. For the most part they extend in a vertical direction, but they have branches, some of which are bent. If, then, a horizontal incision of known length, such as that represented by the line *a b* in Fig. 1, be made in the bark, more of the latex vessels are cut, and consequently more of the juice escapes, than if the incision be vertical and of equal length, as *c d*. Similarly, if a piece of bark be broken in a horizontal direction, *i.e.*, transversely to the longer axis of the tree, as shown in Fig. 2, the two fragments are held together by a large number of latex threads ; while, as indicated at the upper part of Fig. 3, if the fracture be vertical, there are far fewer threads between the two horizontal fragments than between two vertically adjacent portions of the bark. The author holds that there is no evidence of a circulation of the latex in the canals, as there is of a circulation of the tree sap in its vessels ; if the latex were in a state of circulation, it would be difficult to understand why it should flow the more freely the lower the incision made in the bark. Since the bark of the tree does not grow as the tree itself expands in girth, the bark is in a condition of tension horizontally or circumferentially, and for this reason the latex canals are in a state of compression. Thus, if the incision made in the bark be vertical, the tension is removed, and the compression of the canal walls disappears, so that the latex tends to remain within the canals by capillary attraction ; on the contrary, if the incision be not vertical, more latex flows out, not merely because a larger number of canals are ruptured, but because the natural pressure is not interfered with. After the bark has been cut, the wounds heal by deposition of new vegetable matter, and the canals, originally continuous, become disconnected ; when, therefore, later incisions are made, the yield is smaller. The author accordingly recommends that the trees should be first tapped by making several oblique incisions all at the one height of some 3 m. from the ground, afterwards making a second row lower down, and so on till the ground is reached. When, in at least a year's time, new canals have grown in the interior portion of the bark, a fresh series of incisions can be cut in the same positions and in the same descending order as before. Complete circular incisions should never be made, and wide cuts only cause the healing process to be slower and more difficult.—F. H. L.

Fig. 1.

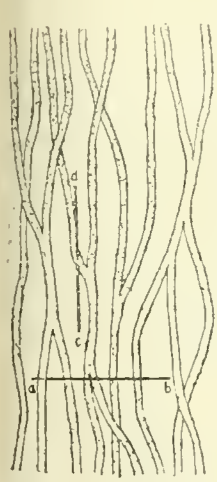


Fig. 2.

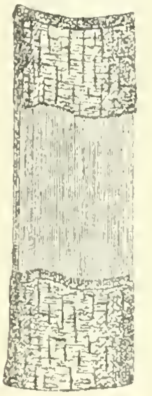
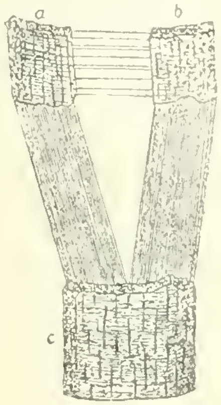


Fig. 3.



India-Rubber Latex ; Coagulation of ——. C. O. Weber. India Rubber J., 1903, **25**, 19.

H. Lecomte has stated that a solution of mercuric chloride does not coagulate the latex of *Landolphia hendelotii*, and that where coagulation is alleged to have occurred, it has been determined by the water of the solution. If this assertion should prove correct, the said latex can contain no albumin. The same author has observed that the quantities of different alcohols required to coagulate a given weight of india-rubber varies roughly with their molecular weights. For instance, calling the precipitating capacity of methyl alcohol 100, that of ethyl alcohol is 48, that of propyl alcohol 23, that of isobutyl alcohol 16, and that of amyl alcohol is 9. In the latex of *Hevea braziliensis*, *Castilloa elastica*, *Manihot glaziovii*, and of various species of *Landolphia* and *Marsdenia*, Lecomte has noted the presence of an oxydase which colours guaiacum tincture first blue and then green, and he suggests that this oxydase may be the cause of the formation of india-rubber in the trees, owing to its oxidising action upon the carbohydrates. The author (Weber), however, holds an oxidation of the carbohydrates with the formation of hydrocarbons to be highly improbable, especially when it is remembered that none of the carbohydrates of the plant world possesses the iso-pentosan structure, which would be required to produce the configuration of the carbon chain that is now known to be characteristic of india-rubber.—F. H. L.

India-Rubber ; Improvement of the Quality of Raw ——. C. O. Weber. Gummi-Zeit., 1903, **17**, [16], 345.

According to general opinion the high quality of Para rubber is chiefly due to the method of coagulating it, rather than to its chemical composition.

The author contends that the reverse is the true case, and that the nature of the hydrocarbons in the Hevea milk emulsion is the cause of the superior quality of the resulting rubber.

The smoke method of coagulation prevents the introduction of mechanical impurities, but only offers the advantage over other methods practised by the natives, that, being smoked in very thin layers, the albuminous constituents become sterilised, and their decomposition is thus hindered.

Formerly it was considered essential to use the Urukuri nut as a source of the smoke, but now it is known with certainty that any substance yielding a smoky flame, such as the shells of the coconnut, serve the purpose admirably.

By passing the Hevea milk through a centrifugal machine, rubber free from albuminous compounds is obtained, which, without being smoked, is undoubtedly superior to ordinary smoked Para rubber; and the author states that if it were possible to collect the Hevea milk in a central place and treat it in the rational manner already described, a great deal of waste would be prevented.—J. K. B.

Rubber; Deterioration of Congo ——. C. O. Weber. Gummi-Zeit., 1903, **17**, [16], 345.

The author considers the deterioration is due to the presence of albuminous substances primarily, and not so much to unsuitable conditions of transport and storage, &c.

The turning black of rubber exposed to the sun is probably due to the action of an oxydase contained in the latex on the albuminous constituents. If freed entirely from fermentable matter, the rubber will stand the bad conditions of transport without damage.

As moisture is absolutely essential to start the decomposition, the natives should be forced to bring the rubber in absolutely dry.

The presence of coagulated albumin not removed by the washing process, causes the finished goods to be more or less brittle or "short," according to the amount of albumin present.—J. K. B.

French Patent.

Plastic Material; Preparation of ——. A. Luft. Fr. Pat. 320,991, May 7, 1902.

See Eng. Pat. 10,218, May 3, 1902; this Journal, 1902, 1085.—M. J. S.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Cements for Leather Belting. Leather Trades Review, 1903, **36**, [878], 16.

1. Fish-glue is soaked in water for 24 hours, allowed to drain for a like period, boiled well, and 2 oz. of resin and ½ oz. of boiled linseed oil previously melted together are added to every 2 lb. of the glue solution.

2. Equal parts of fish-glue and isinglass are dissolved "in a like quantity of weak acetic acid."

3. ½ lb. of gutta-percha, 1 oz. of pitch, 1 oz. of shellac, and 1 oz. of sweet oil are melted together.

4. 1½ oz. of finely-cut india-rubber are dissolved in 6 oz. of carbon bisulphide, and to the hot solution 1 oz. of shellac and ½ oz. of turpentine are added, the mixture being heated till complete solution is effected. This cement is used cold, and allowed to dry, the joint being subsequently warmed and well pressed.—A. S.

[Gallo-] Tannic Acid: Quantitative Determination of —— *by Ferric Salts.* Ruoss. XXIII., page 166.

English Patent.

Tannin: Production of ——, *from Vegetable Tanning Materials.* C. Schmalfeldt, Berlin. Eng. Pat. 23,392, Oct. 27, 1902.

A mixture of oak-bark, pine-bark, quebracho wood, divi-divi, myrobalans, and valonia in about equal proportions (1,000 kilos.) is moistened with a liquor (350—400 litres) consisting of water (10 parts), fresh whey (1 part), and oxalic acid (0·02 per cent.), heated to about 45° C., and is then piled in heaps in a closed room with a moist atmosphere at about 35° C. After 8—10 hours the heaps are shovelled over. It is claimed that by the fermentation thus induced, immature non-soluble tannin is converted into soluble tannin.—R. L. J.

French Patent.

Glutinous Material from Seaweed; Extraction of ——, *by a Continuous Process.* L. Herrmann. Fr. Pat. 320,656, April 17, 1902.

Seaweed (*varech*) is dissolved in 10 times its weight of a 1 per cent. solution of sodium carbonate. The clarified solution of "sodium tangate" is treated with milk of lime, which precipitates calcium tangate, leaving sodium hydroxide in solution. The dried precipitate is pulverised with 20 per cent. of dry sodium carbonate. The sodium hydroxide solution is treated with carbon dioxide to precipitate any lime it may contain and carbonate the alkali, which can thus be used repeatedly.—M. J. S.

XV.—MANURES, Etc.

Potash Manuring Salts; Norwegian ——. E. Solberg. Biedermann's Centr.-Bl., 1903, **32**, [1], 67.

This substance, which frequently appears in the trade under the name "Norwegian kainite," is obtained as a by-product in the manufacture of iodine from kelp. Two samples gave the following figures on analysis:—Water, 6·32 and 15·61; matter insoluble in water, 0·57 and 0·32; potassium sulphate, 24·06 and 23·05; sodium chloride, 65·65 and 53·41; sodium sulphate, 2·58 and 6·28; magnesium sulphate, magnesium chloride, and calcium sulphate, traces; and other salts, 0·82 and 1·93 per cent.—A. S.

Phosphate Analysis; Simplification in ——. M. Passon. XXIII., page 166.

Phosphoric Acid: Volumetric Determination of ——. De Molinari. XXIII., page 166.

Calcium Phosphates; Decomposition of ——, *by Ammonium Citrate Solutions.* K. Zalkowski. VII., page 144.

Slag-Meal, [Basic] Thomas; Determination of Free Lime in ——. M. Bischoff. XXIII., page 166.

Perchlorates [in Sodium Nitrate]; Determination of ——. M. Hönig. XXIII., page 166.

French Patent.

Manure; Manufacture of ——, *from Sewage Liquors and Phosphate.* E. Fontenilles. Fr. Pat. 321.162, May 12, 1902.

The drainage from cess-pits is boiled in a closed vessel, and the ammoniacal vapours are passed into another cold portion of the drainage, to which sulphuric acid is added to saturation. The enriched portion is concentrated to a certain degree, and is then filtered, and the liquor is further concentrated to yield ammonium sulphate crystals on cooling, the mother-liquor being returned to the cycle of operations. A dry superphosphate is then prepared by agitation of powdered raw phosphates with sulphuric acid in a heated vessel, and the product is mixed with the ammonium salt, and with the solid matters separated in the former process, in any desired proportion to make the manure.—E. S.

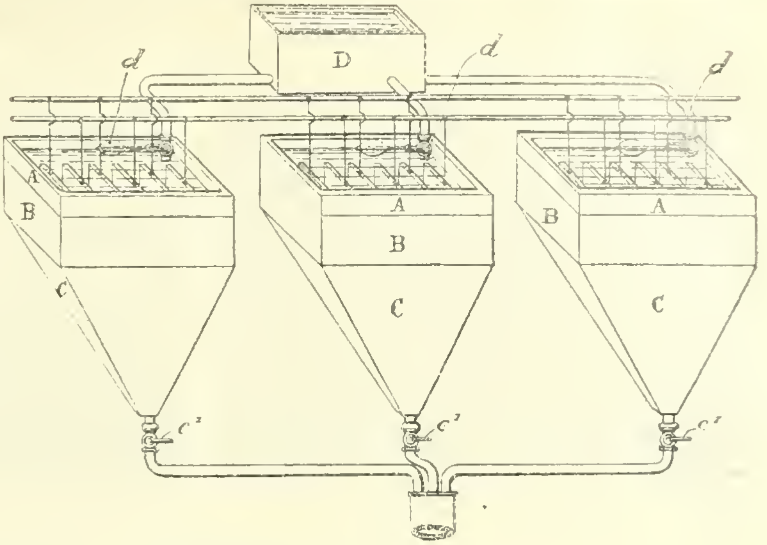
XVI.—SUGAR, STARCH, GUM, Etc.

Hydroxylamine in Oximes and Phenylhydrazine in Hydrazones and Osazones: Rapid Method for the Determination of ——. S. Grimaldi. XXIII., page 167.

English Patents.

Starch; Manufacture of —— *from Rice, Maize, and other Amylaceous Products.* Société des Produits amylacés, Paris. Eng. Pat. 3930, Feb. 15, 1902.

In this process the rice, maize, or other amylaceous substance, whole or broken, is steeped in sulphurous acid solution, then washed several times with water, and ground in contact with a jet of water. It is then sifted and the starch deposited and purified on inclined planes, collected, and "diluted"; the liquid is then subjected to electrolysis in the vessels shown in the figure. Each electrolyser consists of an upper part A, an intermediate part B, of ood, india-rubber, or other non-›nducting material, and a lower art C of inverted, truncated, yramidal form, provided at the ottom with a tap c^1. The elec-›odes of zinc, aluminium, or other uitable metal, are connected either ı parallel or in series. The mass › be treated is fed from a mixing essel D, above the electrolysers, › each of the latter through ball-ocks *d*, by which the level of the ıass is kept practically constant nd slightly above the electrodes. 'he mass descends slowly between he electrodes to the lower part of he electrolysers, from which it is ılowed to flow through the cocks ›n to very fine sieves, which receive he organic precipitate formed by he action of the current. The ›roduct is then again sifted, the ›tarch deposited and purified on ıclined planes, collected, and lluted to the consistency of cream, ınd then introduced into small vats, lried, and stoved.—T. H. P.



Caramel; Apparatus for the Manufacture of ——. T. D. Lichtenstein, Silvertown, Essex. Eng. Pat. 14,432, June 25, 1902.

The manufacture of the caramel is carried out at or near the ordinary atmospheric pressure in a vessel connected with a condenser or absorber (open at its outlet), where the evaporated substances usually lost, are recovered. The vessel is also provided with a cover, through which the vapours are conducted to the condenser, and which is so arranged (*e.g.*, by means of counterweights and water-sealed edges) as to rise when the pressure within the vessel becomes too great.—C. A. M.

United States Patents.

Sugar; Process of Converting Cellulose into ——. A. Classen, Aix-la-Chapelle, Germany. U.S. Pat. 712,069, Dec. 30, 1902. Reissue of U.S. Pat. 654,518, July 24, 1900.

See Eng. Pat. 12,588, June 20, 1901; this Journal, 1901, 1008.—T. H. P.

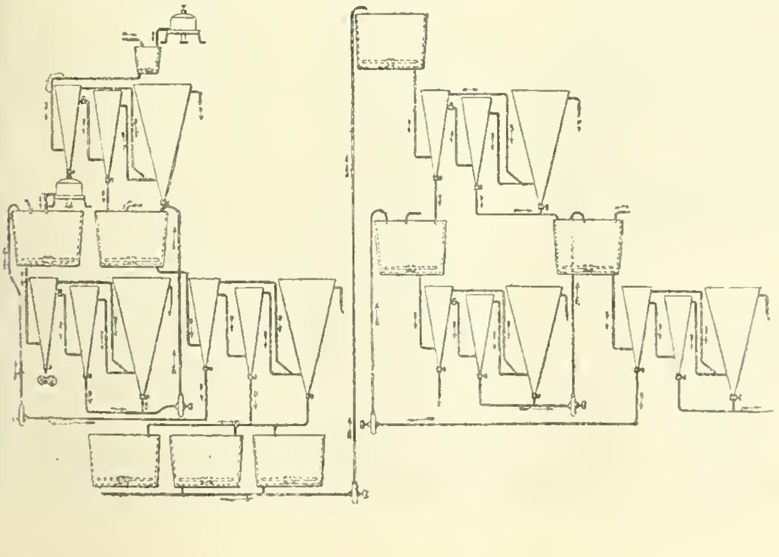
Starch; Apparatus for Manufacturing ——. A. P. Murdoch, Oswego, N.Y. U.S. Pat. 717,699, Jan. 6, 1903.

Claims are made for various combinations of an apparatus, such as a grinding mill, for macerating and liquefying the starch-containing material; a series of upright conical vats so connected that the starch liquor passes successively from one to the other by gravity, and having open apices at the bottom; means for feeding the starch-containing material to one of the vats; means for collecting the precipitate from the apex of one of the vats; a tank receiving the discharge from the apices of the remaining vats; a second series of similar vats similarly connected, and means for conducting the material from the tank to one of the vats of this second series; a third similar series and means for conveying the material to one of its vats, and also means for collecting the discharge from the vats of the second series.—T. H. P.

Starch; Process of Manufacturing ——. A. P. Murdoch, Oswego, N.Y. U.S. Pat. 717,700, Jan. 6, 1903.

This process consists in maceratiog and liquefying the starch-containing material, then causing it to flow continuously and successively through a series of inverted conical vats (see preceding abstract), collecting and macerating the precipitate from the first vat of the series, simultaneously collecting the precipitate from the remaining vats, and passing it continuously to a mixing tank, and there chemically treating and purifying it. The product is then washed and passed through one or more additional series of inverted conical vats, the starch from the last vat of the last series being finally collected and boxed.

—T. H. P.



Starch; Process of Making ——. H. A. Frasch, New York. U.S. Pat. 717,184, Dec. 30, 1902.

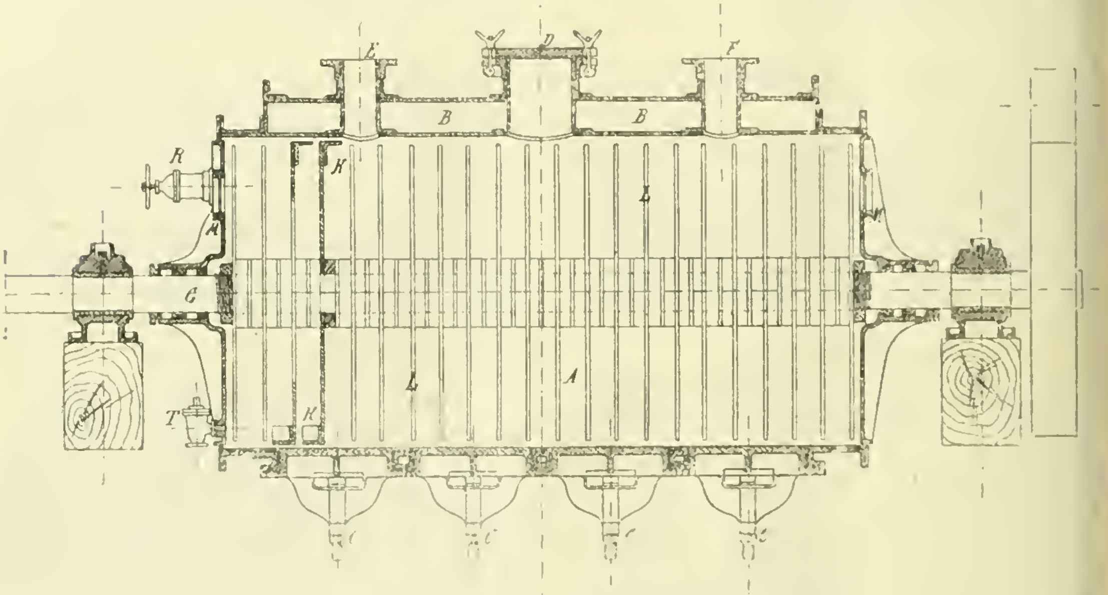
Claims are made, in the manufacture of starch and similar products, for subjecting the starch-bearing substance, *e.g.*, cereals, in the presence of a liquid, such as water, to a temperature equal to or below the freezing point of that liquid, then to a temperature above the freezing point, and afterwards separating the starch from the cellular membranous constituents.

—T. H. P.

French Patents.

Sugar Products; Apparatus for the Economical and Rapid Manufacture of Commercial Low ——. Roux. Fr. Pat. 320,683, April 26, 1902.

This apparatus is designed to obviate the repeated boiling of saccharine liquids and centrifugalising of the massecuites, and to convert the whole of the massecuite into a fine marketable product resembling centrifugalised sugar and containing all the molasses. The apparatus, of which a longitudinal section is shown in the figure, consists essentially of a horizontal cylinder, A, completely surrounded, except at its lower part, by a steam jacket, B. Four doors, C, in the bottom of the cylinder, allow of the complete and rapid removal of all the sugar. D is the aperture through which the charge is introduced, whilst E and F connect with the air-pump. Along the axis of the cylinder runs a shaft, G, furnished with knives, L, arranged in lines. The blades carry alternately-arranged angle-irons, K, which cover the whole of the lateral surface of the cylinder several times every minute. M M are glasses, R is an air tap, and T the exit tap for the water formed from steam introduced at the top of the cylinder for washing purposes. The apparatus is used in the following manner:—



The massecuite, containing about 9 per cent. of water, is run from the boiling pan, at 80°—85° C., into the cylinder, which it fills up to the central shaft. The door D is then shut, and the vessel evacuated as quickly as possible, steam being at the same time introduced into the jacket. The shaft being set in motion, rapid evaporation takes place, and the temperature of the sugar falls to 55°—45° C., at which it loses all cohesion and becomes pulpy. Air is now introduced into the cylinder, and the powdered sugar, containing in some cases less than 1 per cent. of moisture, removed. Further moisture goes off during cooling, after which the sugar, mixed, if necessary, in a mill, is ready for delivery.
— T. H. P.

Sugar; Process for the Complete Extraction of ——, from Beet Juice as First Products, with the Simultaneous Production of Ammoniacal and Saline Compounds. G. P. Guignard. Fr. Pat. 320,726, April 28, 1902.

This process consists of the four following operations:—(1) Defecation by means of a mixture of a salt of an alkaline earth and lime-water. (2) Total precipitation of the sugar as sucrate by lime and magnesia. (3) Carbonation of the sucrate, giving all the sugar present in the beet in the form of pure crystallisable sugar, without molasses. (4) Evaporation of the juices separated from the sucrate, mixed with the defecation precipitate after saturation with carbon dioxide followed by distillation to produce ammonia and saline material.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast Reproduction; Some Facts about ——. W. Delbrück. Woch. fur Brau., 1903, 20, [3], 25.

Under similar conditions, with mashes of similar composition, the number of cells in a given volume at the end of the reproductive period is the same. The number of cells produced is independent of the quantity of yeast sown: each cell requires a certain minimum amount of free space, and the yeast will go on multiplying until this minimum is reached. The reason for this lies in the prejudicial action of the excretion products on the cell itself and on its neighbours of the same species. Carbon dioxide is much more injurious to the reproduction of yeast than alcohol; the influence of the former is more in evidence in cool (lager beer) fermentations than in warmer ones. Different races present different degrees of susceptibility towards carbon dioxide and alcohol. The first fact mentioned above is only valid when the yeast is uniformly distributed throughout the liquid; if part of the yeas separate to the top or bottom, the reproduction of tha remaining in the body of the liquid, is favoured, but only until the maximum proportion of alcohol and carbo dioxide allowing further reproduction, has been reached.

If equal volumes of liquid be sown with increasing proportions of pressed yeast, it will be observed that with the smaller sowings each cell forms two or more new ones; wit larger sowings only the more vigorous cells reproduc and when the sowing reaches about 10 per cent. of the weight of the liquid, no buds are formed. In dilute medi the number of cells produced per volume, is less, owing t deficiency of nutrition, and the yeast crop increases with the proportion of available nutriment, until the production o about 4 per cent. of alcohol puts a limit to multiplication To obtain the highest yield of yeast this proportion o alcohol must not be approached; manufacturers of yeast who work with worts, use an initial gravity of abou 7 Balling. When air is supplied, the maximum number o yeast cells is reached before the inhibitive action of the alcohol comes into play. Motion in the earlier stages whether artificial or induced by the escape of the carbo dioxide, is favourable to reproduction, since it removes the mother cells away from the sphere of their excretion products For this reason too small a quantity of seed yeast i advantageous, owing to a deficiency of gas to induce tion. In practice the seed yeast is always added in a te of active fermentation and budding, and the medium is s set in motion from the start. The highest yeast crop is ained by the system of pitching only a small quantity of rt to begin with, adding the rest of the wort in small tions at intervals until the tun is full. The nature and ntity of the excretion products depend on the physiological condition of the yeast cells, and the reproduction, erefore, is dependent on the physiological condition of the d yeast.—J. F. B.

ast; The Nutrition of ——. Part IV. A. L. Stern. J. Fed. Inst. Brewing, 1902, **8**, 690—706. (Compare this Journal, 1899, 933; 1901, 600.)

) *The Influence of the Concentration of the Sugar.*—It s found that if worts of similar composition, except that e contained a larger amount of sugar than the other, ere both seeded with the same amount of yeast and rmented under identical conditions, then at the end of the rmentation, the yeast crop obtained from the wort conining the greater quantity of sugar would be larger and ntain more nitrogen. With worts containing a conderable amount of sugar, the increase in the weight of the east crop, when the quantity of sugar was increased, was ot so large as that produced by the same increase in the mount of sugar when the wort was initially weaker.

(ii.) *The Influence of Temperature.* — Experimental vidence is brought forward to show that there is no aterial difference in the weight or nitrogen content of the east crop when the fermentation terminates at any temperature between 55° and 77° F. At higher temperatures he yeast crop is smaller, and at 100° F. the yeast grows nd ferments feebly.

(iii.) *The Influence of the Amount of Seed Yeast.*—If the weight of the nitrogen contained in the seed yeast be subtracted from that contained in the yeast crop, the results will be the same for any one solution fermented under identical conditions, except when the amount of seed yeast is very small.

(iv.) *The Influence of Time; or, the Relationships between the Amount and Nitrogen Contents of the Yeast and the Percentage of Sugar fermented.*—The author finds that there is a progressive increase in the weight and nitrogen content of the yeast throughout the fermentation. With a small quantity of seed yeast the greatest reproductive activity occurs in the first portion of the fermentation, but with a large quantity of yeast the reverse is the case, the greatest reproductive activity occurring at the close of the fermentation. With a medium seeding the fermentative activity of the yeast is fairly constant throughout the fermentation.

(v.) *The Influence of Oxygen on the Amount of Yeast Crop.*—Yeast requires an unlimited supply of oxygen for sporulation. The author confirms C. Oppenheimer's statement that whilst free oxygen is necessary for yeast growth, such is not the case for fermentation.

The author deemed it necessary to repeat some of the experiments on which the above conclusions are based, with fermentable solutions which would yield relatively large crops of yeast, and the asparagine and inorganic salts previously employed were replaced by "yeast extract," the product of the auto-fermentation of yeast. The experiments were carried out under the same conditions, with the exception that half the quantity of fermentable solution was used.

(i.) *The Effect of Varying the Amount of Nitrogenous and Inorganic Yeast Food.*—When employing simple chemical compounds, it was found that any increase of nitrogenous or inorganic nutriment above a certain limit had no effect in increasing the weight or nitrogen content of the yeast crop, and that this limiting amount of food was but little in excess of the maximum the yeast was able to assimilate. When, however, a complex yeast food is used, the results conform to the first portion of the above conclusion, but not to the last. This result has been confirmed by P. Thomas (this Journal, 1901, 918).

(ii.) When the amount of seed yeast was varied in fermentable solutions containing "yeast extract," similar results were obtained as if solutions consisting of simple chemical substances had been used.

(iii.) With regard to the relation between the weight and the nitrogen content of the yeast and the amount of sugar employed, the deductions made from the first experiments are confirmed by those in which "yeast extract" was used.

—J. L. B.

Barley; Impt. of the Germinative Capacity of ——, by Kilning. F. Schönfeld. Woch. f. Brau., 1902, **19**, [49], 745—746.

The author has previously shown that the damp barley of the present season may be considerably improved for malting purposes by kilning. Experiments were carried out by drying barleys for periods of 24 hours on the upper and lower floors respectively at temperatures varying from 100° to 133° F., and keeping the barley at the latter temperature with a liberal supply of air until sufficiently dry. The moisture was reduced from 15 to 8 per cent. A determination of the germinative capacity, made immediately after kilning, gives unsatisfactory results, but if the dried barley be allowed to complete its maturation by storing in sacks for 4 to 10 days, nearly all the corns will germinate. The author concludes that the maturation is due to the equilibrium between the atmospheric pressure and that existing in the intracellular spaces in the grain. Storage brings about this result. The taking up of moisture during storage does not account for the improved germinative capacity; this was proved by taking samples from the kiln before the drying had been completed; moreover, during the 10 days of storage only about 1 per cent. of water is absorbed.—J. L. B.

Barley; Germination of ——, with Addition of Lime Water to the Steep. Jalowetz. Woch. f. Brau., 1903, **20**, [2], 22—23.

The favourable influence of limed steep water upon the germination of barley is well known, and this process is now becoming general. The author considers that the use of lime water is especially valuable with this season's crop, and to test the point he has conducted germination

	I.—Lower Austria.		II.—Holics, Hungary.		III.—Moravia.		IV.—Moravia.	
	With Lime-water.	Without Lime-water.	With Lime-water.	Without Lime-water.	With Lime-water.	Without Lime-water.	With Lime-water.	Without Lime-water.
	Percentage of Germinated Corns.							
24 hours	39·8	30·2	38·0	27·4	42·4	41·6	49·0	35·6
48 „	56·0	63·6	54·0	44·2	51·4	50·6	39·4	57·4
72 „	1·0	1·2	1·0	22·2	0·8	2·4	2·0	3·6
Germinative energy, per cent.	96·8	95·0	93·0	93·8	94·6	94·6	90·4	96·6
Germinative capacity, per cent.	97·6	96·4	95·4	96·0	96·0	97·2	94·6	91·6
Water	13·97		13·36		13·76		15·5[illegible]	
Protein calculated on dry substance, per cent.	10·42		13·36		10·56		12·03	

tests with four different barleys. The experiments were carried out by steeping one portion in ordinary water for 10 hours, and a second portion for four hours in water, three hours in lime-water, and three hours in water — a total period of 10 hours. The two portions were then placed in a germinating apparatus, with the results shown in the table on preceding page.

The effect of liming the steep water in the experiments I., II., and IV., is shown by a considerably larger percentage of corns germinated during the first 24 hours than in the parallel trial without lime. Barley III. exhibits no difference; according to the author it was a particularly fine sample.

It is urged that the lime-water should be prepared in a separate vessel, so as to avoid small pieces of lime coming into contact with the barley and causing discoloration in the mash. Lime is sludged up with water, allowed to stand two or three hours, and the clear decanted liquor added to the steep. The lime water was generally run in after the first change of steep, but it is better, especially with inferior barleys, to replace the ordinary steep water by lime water, allow to stand for two to four hours, and then add lime-water and ordinary water in equal quantities.

When a barley is steeped in lime-water, the husk and the steep liquor become coloured. This is due to the action of the alkaline water on certain constituents of the husk. During the supplementary steep in ordinary water, the barley becomes quite bright again.—J. L. B.

Cognac; Analyses of ——. F. Freyer. Zeits. landw. Vers. Wes. Öst., 5, 1266—1271. Chem. Centr., 1903, **1**, [1], 51.

The author has examined four genuine raw cognacs, which had been received at the testing station of the "Syndicat des Viticulteurs Charentes." The results are shown in the following table, together with the figures for a two-year old cognac (kept in cask for four months) distilled from an Italian wine (No. 5):—

—	1.	2.	3.	4.	5.
	Grms. per litre.	Grms. per litre.	Grms. per litre.	Grms. per litre.	Grms. per litre.
Alcohol...........	538·100	550·000	550·000	529·400	339·600
Extract...........	0·500	0·170	0·100	0·930	0·630
Acid (as acetic acid).	0·230	0·150	0·120	0·150	0·460
Esters (as ethyl acetate).	0·810	1·920	0·540	0·640	0·640
Furfural..........	0·020	0·015	0·020	0·006	0·000
Higher alcohols...	2·100	2·530	1·980	3·490	2·020
Aldehyde.........	0·010	0·130	0·025	0·130	0·130
Volume per cent. of alcohol.	67·8	69·3	69·3	66·7	42·8

—A. S.

Spirit: Neutralisation of Crude ——, before Rectification. Zeits. Spiritusind., 1903, **26**, [3], 25.

In the distillation and rectification of spirits a certain amount of decomposition of the alcohol always occurs, to a degree increasing with the working pressure and the acidity or alkalinity of the liquid. For this reason it is highly desirable to neutralise the crude spirit before rectification, except when dealing with spirits which are required to preserve a certain aroma depending on their origin, and even in these cases too high an acidity is undesirable. Since an alkaline reaction of the liquid under distillation also has an injurious effect upon the alcohol, the neutralisation must be effected with considerable accuracy. Any convenient form of soluble alkali may be employed. A portion of the crude spirit is heated almost to boiling to expel the carbon dioxide, and 100 c.c. are accurately neutralised by standard alkali in presence of phenolphthalein. From the result of the titration the quantity of alkali required to neutralise the charge of spirit in the rectifier can then be calculated.—J. F. B.

Glycogen in Yeast; Determination of ——. J. Gruss. XXIII., page 167.

Albumin: Formation of Strongly-flavoured Bodies by the Action of Yeast on ——. T. Bokorny. XVIII. A., page 157.

Malt Analysis. J. Heron. XXIII., page 167.

Salicylic Acid [in Wine, &c.]; Notes on the Determination of ——. S. Harvey. XXIII., page 167.

English Patent.

Brewing Beer; Impts. in ——, and in Apparatus therefor. A. G. Southby, Forest Gate. Eng. Pat. 2669, Feb. 1, 1902.

This specification relates to improvements on the process described in Eng. Pat. 8122 of 1901 (this Journal, 1902, 420) for producing beer from malt which has not been kiln-dried. The malt, either with the acrospires and rootlets, or after removal of the same, is crushed or ground to a paste, which must be mashed or covered with water immediately Mashing may be carried out in an ordinary mash-tun o in a special vessel (see later), the procedure being as follows:—After the mash has stood for a suitable time, part of the wort is removed, the mash heated to gelatinise the starch remaining, then cooled to the mashing temperature, and the removed wort replaced; the operations of heating, cooling, and mashing may be repeated one or more times. The goods are then drained and sparged in the same or a separate vessel, and the wort then subjected to superheating. The malt may be mashed and subsequently superheated in one and the same vessel, suitably of the form shown in sectional elevation in Fig. 1,

Fig. 1.

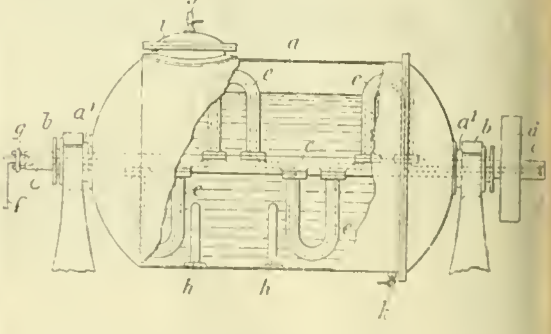
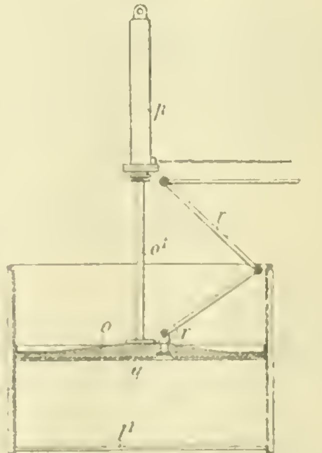


Fig. 2.



n which *a* is the cylindrical mashing vessel, rotatable by neans of trunnions *a′ a′*, supported in bearings *b b*; *c* is a ollow shaft passing through stuffing-boxes in the trunnions, nd is provided with a pulley *d*, for rotating it, and with a umber of hollow, U-shaped stirrers communicating with he interior of the shaft; *f f* are inlet and outlet pipes, nabling steam or cold water to be circulated through the haft and stirrers; *h h* are ribs to assist mashing; *i* a anhole for filling and emptying *a*; and *j*, *k*, air and sample ocks respectively.

Instead of sparging the goods in the mash-tun, they may e percolated under pressure in a vessel such as that shown n sectional elevation in Fig. 2. *l* is a mash-tun with arallel sides, and the false bottom *l′*, below which re the pipes, *m*, *m*, *m*, provided with cocks *m′* and connected to a common pipe *n*; *o* is a piston connected by he rod *o′* to the plunger of a hydraulic lifting-jack *p*, whereby it can be forced up and down. The under side of the piston *o* is formed with grooves *q*, communicating with an inlet or outlet pipe *r*, jointed, to permit of the piston moving; a strainer or filter cloth is placed below the piston. After the completion of the mashing, the piston is lowered into the vessel and forced on to the goods by producing a vacuum through the pipe *r*, much of the wort being thus expressed; the remainder is washed out by water passing through the pipe *r* and piston, and out through the false bottom, or in the reverse direction.

The processes described are applicable to malt which has been kiln-dried or not, or to mixtures of the two.

—T. H. P.

United States Patents.

Yeast; Preparation of ——. E. de Meulemeester, Brussels, Assignor to Force, Soc. Anon., Antwerp. U.S. Pat. 717,519, Dec. 30, 1902.

A mass of yeast is liquefied in a cold state, allowing the fermentation of the mass to be well established; fresh quantities of yeast are added thereto from time to time, each successive addition being effected after the fermentation of the mass is well established; the protoplasm of the yeast is thus continuously extracted.—J. F. B.

Fermented Beverages; Production of ——. M. Hahn, Munich. U.S. Pat. 717,744, Jan. 6, 1903.

This process is for the production of durable fermented beverages containing a high proportion of animal albumin in solution, and consists in adding blood to hopped and cooled beer-wort, fermenting the mixture at a low temperature, and treating the resulting beer with carbon dioxide.

—T. H. P.

Distillers' Residues; Apparatus for Evaporating ——. J. M. J. Thierry, Paris, Assignor to C. G. Sudre and C. V. Thierry, Paris. U.S. Pat. 717,054, Dec. 30, 1902.

See Eng. Pat. 7410, 1901; this Journal, 1902, 369.

—J. F. B.

French Patents.

Barley for Malting Purposes; Apparatus for Washing and Aërating ——. R. Hort and L. Marxsohn. Fr. Pat. 320,968, May 6, 1902.

See Eng. Pat. 10,350, 1902; this Journal, 1902, 984.

—J. F. B.

Malt Extracts rich in Diastase; Manufacture of ——. G. Sobotka. Fr. Pat. 320,222, April 5, 1902.

Malt is crushed and the grist is separated from the flour and fine meal; the grist alone is first digested with water at a temperature of 12·5° to 25° C., and the extract, rich in diastase, is filtered, and concentrated *in vacuo* at a low temperature. The residue remaining in the mash tun is then mixed with the flour and fine meal resulting from the crushing of the malt, and the whole is mashed with water at a temperature of about 37·5° C.; the wort is run off clear, and then also concentrated *in vacuo*. The residues from this mashing process are treated with water at a temperature above 50° C., and submitted to a lactic fermentation in order to render soluble the nitrogenous constituents, the temperature subsequently being raised above 70° C. to kill the bacteria. Finally all the three extracts are mixed together *in vacuo* and concentrated to a suitable consistence. The presence of lactic acid in the product prevents the crystallisation of sugars, and, when the product is used for bakers' purposes, it exercises a favourable action on the proteids of the flour.—J. F. B.

Beer; Apparatus and Process for Manufacture of ——. G. Lefebvre. Addendum dated April 25, 1902, to Fr. Pat. 315,959, Oct. 21, 1901.

Malt is fed from a hopper into an apparatus, in which it is mixed with raw grain and water; the mixture is then passed on to specially constructed closed mash tuns, in which it can be mashed under high pressure. The mash tuns are provided with stirrers and false bottoms. The wort then passes through a refrigerating filter into a heating copper, and is subsequently raised by a pump back into the mash tuns, where it is boiled and hopped, afterwards being cooled, decanted, and aërated ready for fermentation. An air-compression plant is connected with the apparatus for aërating the wort in the mash tuns and elsewhere when required. The spent grains are mashed up again with water in a special vessel, and again pumped up to the mash tuns for further treatment.—J. F. B.

Beer; Process for the Fermentation, under Pressure, of Bottom-fermentation ——. M. V. Lapp. Fr. Pat. 320,264, April 7, 1902.

Bottom-fermentation beer is fermented in large quantities at a time by conducting the fermentation from beginning to end at a temperature above 10° C. and under gaseous pressure, until the greater part of the sugar is fermented. The pressure at the beginning of the fermentation is preferably obtained by compressed air or carbon dioxide, and in the subsequent stages either by compressed air or liquid air which is rich in oxygen.—J. F. B.

Wines and Ciders; Continuous Apparatus for Manufacture of Sparkling ——. G. Driancourt. Addendum, dated May 1, 1902, to Fr. Pat. 318,506, Feb. 8, 1902.

Alcoholic liquids are charged with carbon dioxide in a continuous manner by an apparatus consisting essentially of a reservoir, three chambers, each containing 15 litres of the liquid, a saturation vessel and receiver combined, a lower receiver, and filtering apparatus in communication with the same. The contents of the chambers, initially charged at a pressure of 3 atmospheres, are raised to a pressure of 9 atmospheres and passed through the saturator at this pressure; they are filtered under a counter pressure of 3 atmospheres, obtained by establishing a pressure of 6 atmospheres in the filtering vessel, and are finally bottled in the ordinary way.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Albumin; Formation of Strongly Flavoured Bodies by the Action of Yeast on ——. T. Bokorny. Chem.-Zeit., 1903, **27**, [1], 5—7.

It is well known that artificial meat extracts having the true flavour of real meat are prepared entirely from yeast (see Aubry, this Journal, 1901, 737). When pressed beer yeast is extracted with boiling water and the extract is concentrated to a small bulk and poured into 10 times its volume of 90 per cent. alcohol, a precipitate is formed consisting of tasteless albumoses and peptones, and the alcoholic filtrate, when evaporated to dryness, yields a deliquescent, pasty mass, which has the appearance and taste of meat-extract, but with a considerably sharper flavour. If pressed beer yeast be air-dried at 25° C. (an operation occupying about six days), subsequent extraction with boiling water and treatment of the extract as above affords a much larger yield than is obtained from fresh yeast, both of albumoses and peptones and of sharp-flavoured matter soluble in alcohol. This increased yield is due to auto-proteolysis during the process of drying. The auto proteolysis of yeast is considerably accelerated at a temperature of 35°—40° C., and in presence of acid. The author digested both fresh and dried pressed yeast for 24 hours at 35° C. with a 1 per cent. solution of each of the following acids: phosphoric, lactic, sulphuric, and hydrochloric acids. The extractive matter, both that precipitated by alcohol and that with a sharp sour flavour soluble in alcohol, was materially increased in the case of the first three acids, the highest yield being found with lactic acid, which does not injure the proteolytic enzyme. In presence of hydrochloric acid, however, no proteolysis took place, the yield of extractive matters corresponding with that obtained from the yeast directly. The proteolysis of other albumins, such as meat-fibrin and pea-proteids, by yeast in presence of acids at 35° C., gave slightly higher yields, confirming the fact that the proteolytic power of the yeast enzyme on other proteids is relatively feeble.

With regard to the alcohol-soluble extractive matter produced by proteolysis by means of yeast, two classes of flavours are to be distinguished. In the first place there is the pleasant flavour of real meat-extract, which is valuable for the preparation of artificial meat-extracts, and secondly there is a very sharp, sour flavour and odour, which, if allowed to develop in excess, would be unpleasant and detrimental. In small proportions the bodies producing this latter flavour might be useful as appetisers; their flavour would only seem excessive if the proteolytic enzyme were allowed to act for a long time at a temperature of 30°—45° C.—J. F. B.

Gluten, Moist, in Flour: Determination of the ——. M. Arpin. XXIII., page 168.

Cocoa; Determination of Theobromine in ——. J. Decker and P. Welmans. XXIII., page 168.

English Patents.

Oil Seed-Cakes (Inferior) and other Residues from the Manufacture of Vegetable Oils; Process of Rendering ——, *Suitable for Use as Cattle Food.* C. Fresenius, Termonde, Belgium. Eng. Pat. 385, Jan. 6, 1902.

See Fr. Pat. 317,578 of 1902; this Journal, 1902, 1403.
—C. A. M.

Eggs; Method of Preserving ——. R. Schultz, Charlottenburg, Germany. Eng. Pat. 1328, Jan. 17, 1902.

The eggs are coated with a gelatinous composition prepared by dissolving 25 to 30 parts of soluble starch in 100 parts of water, and cooling the solution.—C. A. M.

Evaporation Apparatus [Milk]; Rotary Drums for ——. M. Ekenberg, Stockholm. Eng. Pat. 23,770, Oct. 30, 1902.

The drum has double walls and dished or corrugated bottoms, as well as a perforated partition wall concentric with the drum shaft, so that the heating medium introduced through the shaft can circulate over the entire interior surface of the drum. The active metallic surface, on which the drying is effected, is composed of nickel or a nickel alloy, hardened by pressure so as to resist chemical action and prevent the contamination of the substances under treatment. (See also U.S. Pat. 711,719; this Journal, 1902, 1548.)—C. S.

United States Patents.

Milk or Cream Deodoriser. H. R. Howe, Assignor to H. W. Carmichael, Rockford, Ill. U.S. Pat. 709,093, Sept. 16, 1902.

The apparatus consists of a closed drum having an air inlet in one side, through which a strong current of air is blown, an outlet at the opposite side, and a milk inlet composed of a number of fine perforations, adjacent to the air inlet. The upper side of the drum is inclined upwards from the air inlet, and curved downwards at the back, forming an impinging surface for the liquid. An outlet for the latter is also provided.—W. P. S.

Milk or Cream; Process of Deodorising ——. H. R. Howe, Assignor to H. W. Carmichael, Rockford, Ill. U.S. Pat. 709,094, Sept. 16, 1902.

Milk or cream, heated to a temperature ranging from 135° to 140° F., is subjected to the action of a blast of pure air in the apparatus described in the preceding patent.
—W. P. S.

Milk: Process of Treating ——, *and Product thereof* J. H. Campbell, New York. U.S. Pat. 717,968, Jan. 6, 1903.

Milk is heated, diluted, rendered slightly alkaline, and mixed with oleaginous matter. Air is then blown into the mixture, the temperature of the latter being kept below the coagulating point of albumin, until it is concentrated to about one-half its original bulk.—W. P. S.

Desiccated Milk; Process of Making ——. J. H. Campbell, New York. U.S. Pat. 718,191, Jan. 13, 1903.

Air is blown through whole or skimmed milk until the latter is evaporated to the consistency of a batter. A desiccated powder, such as previously dried milk, is then added to form a stiff paste, which is finally completely dried in a current of air. The temperature throughout the operations is kept below the coagulating point of albumin. (See also Eng. Pat. 3561 of 1901; this Journal, 1902, 269.)
—W. P. S.

French Patents.

Alimentary Substances; Process for Sterilising ——. [*at a Low Temperature*]. C. C. L. G. Budde. Fr. Pat. 321,039, May 10, 1902.

Solid foods may be sterilised by soaking in water containing hydrogen peroxide and heating to a temperature not exceeding 50° C. The substances are stored in closed vessels containing hydrogen peroxide. Liquids are placed in ordinary siphons together with hydrogen peroxide. On heating, the latter is decomposed, and generates sufficient pressure to empty the siphon when its contents are required for use.—W. P. S.

Vegetable Juices: Process for Sterilising ——, *and Utilisation of the Same.* [*Mordant.*] W. Beckers. Fr. Pat. 321,073, May 12, 1902.

The solution obtained on boiling vegetables before canning is used, after fermentation, as a mordant in dye-works and tanneries, and may be prevented from putrefying by long boiling, the solution being at the same time concentrated. The solution may be neutralised with calcium carbonate, so that the fermentation proceeds further than otherwise, sugar and starch being also added.—W. P. S.

(*B.*)—SANITATION.

English Patents.

Town Refuse: Method of Treating and Utilising —— [*as Fuel*]. W. P. Wrightson, London. Eng. Pat. 18,800 Sept. 20, 1901.

The screened, ground refuse is mixed with coal dust, clay, or the like, and sprayed with crude petroleum. If necessary, a solution of alkali silicate, heated to 180° F., is also added. The resulting mixture is moulded and pressed into blocks or briquettes for fuel. The plant, consisting of a grinding machine, mixing hopper, moulding machine, and presses, is connected by a system of elevators and chutes rendering the process continuous and automatic.—W. P. S

Furnace for the Destruction of the Refuse of Towns W. Lees, Ashton-under-Lyne. Eng. Pat. 20,456, Sept. 13 1902.

The furnace consists of a vertical tube or fireplace surrounded by a boiler throughout its height. The refuse i fed in at the top, and is partially dried and burnt as i descends, complete burning taking place on a set of movabl fire-bars at the bottom. The products of combustion pas

ff through flues at the side of the furnace. The upper art of the furnace is closed by a cone-shaped valve immeiately above the side flues. After filling the part above is valve with refuse, the valve is lowered, and allows the arge to fall into the lower part of the furnace, a second lve at the same time closing the open top of the tube.
—W. P. S.

Water; Apparatus for Softening ——. F. J. Farrell. Battersea. Eng. Pat. 3516, Feb. 11, 1902.

wo tanks of equal size are connected, by means of threeay cocks, with an overhead reservoir tank containing the oftening reagent. Each of these has an outlet in the ottom, with plugs connected with a rocking lever so rranged that the cocks are opened and closed alternately, nd that when the outlets are opened, the connections with e reservoir tank are closed.

When an ordinary rocker is unsuitable owing to the olume of water passing through the tanks, a rocking-arm s fixed between them, having balls at the ends to form oats. On this arm is a flat box on which the water falls, nd is directed alternately into the two tanks, a movable all or weight within the box assisting the action of the ocking arm.—C. A. M.

Sewage; Distribution of Liquids, such as ——, on Filter Beds. J. E. Parker, Newcastle-on-Tyne. Eng. Pat. 23,750, Oct. 30, 1902.

THE claim is for the application of adjustable plates forming notched or perforated dams to regulate the supply of liquids o filter beds in distributors of the type of Stoddart's. (See this Journal, 1902, 184.)—W. P. S.

UNITED STATES PATENTS.

Water; Process of Softening ——. F. Breyer, Kogel, Austria-Hungary. U.S. Pat. 717,536, Jan. 6, 1903.

SEE Eng. Pat. 6217, 1901; this Journal, 1901, 1013.
—W. P. S.

Water; Method of Purifying ——. W. M. Jewell, Chicago, Ill. U.S. Pat. 718,165, Jan. 13, 1903.

A SUITABLE coagulant is added to the water, which is then passed through a granular filter bed. The coagulant is removed from the filter by a stream of water run through the filter in the opposite direction. Sulphurous acid is added to the wash-water to dissolve the coagulant, the solution being added to a fresh charge of water to be purified.
—W. P. S.

FRENCH PATENTS.

Air; Purification of —— [*Ozonising*]. J. Harris. Fr. Pat. 320,661, April 25, 1902.

AIR is driven, by means of a fan, into a box containing an sbestos filter or screen. After being filtered it passes through two insulated wirework screens provided with points on their opposite surfaces and connected with an apparatus for producing Tesla currents. The ozonised air finally leaves the box by a pipe leading into the room. The apparatus is suitable for placing in a window or ventilating opening in the wall of a room.—W. P. S.

Manure; Manufacture of ——, from Sewage Liquors and Phosphate. E. Fontenilles. Fr. Pat. 321,162, May 12, 1902. XV., page 152.

(C.)—DISINFECTANTS.

Micro-Organisms; Action of Ethyl Alcohol on ——. G. Wirgin. Zeits. Hyg., **40**, 307—359. Chem. Centr., 1903, **1**, [1], 50.

UNDER certain conditions the presence of 0·1 per cent. of alcohol had a prejudicial influence on the development of the bacteria (saphrophytes and parasites) examined. This injurious influence becomes greater as the amount of alcohol present increases. With some bacteria, the presence of 4 per cent. of alcohol caused no great injury; all the kinds examined were able to develop in the presence of 5 per cent. of alcohol, and the greater number even in the presence of 6·5 per cent. *Bac. pyogenes aur.* and some kinds of *sarcinæ* grew to some extent in the presence of 7·5 per cent. of alcohol. Several kinds of microbes derived from beer and wort developed in the presence of 7 per cent. of alcohol, *Bac. viscosus* in the presence of 8 per cent. and a yeast in the presence of 8·5 per cent. of alcohol. 10 per cent. of alcohol stopped the growth of all the micro-organisms examined. The conditions under which the bacteria are brought into contact with the alcohol are of importance. The action is greater when the bacteria are sown in a nutrient medium containing alcohol, than when alcohol is added to a growing colony of the bacteria. Alcohol has a greater injurious action on the germination of anthrax spores than on the growth of bacteria. Increase of temperature favours the prejudicial action of the alcohol, but not to the same extent with different kinds of microbes.

The presence of alcohol (5—7 per cent.) in wort had a favourable effect on the growth of acetic bacteria; 10 per cent. of alcohol, however, prevented growth. The micro-organisms did not appear to become acclimatised to the alcohol.—A. S.

UNITED STATES PATENTS.

Bordeaux Mixture; Making ——. F. J. Smith, Elizabeth, N.J., Assignor to W. H. Bowker, Boston, Mass. U.S. Pat. 718,537, Jan. 13, 1903.

A MIXTURE of milk of lime and rosin oil is dried, and then mixed with blue vitriol.—E. S.

Bordeaux Mixture; Preparing ——. F. J. Smith, Elizabeth, N.J., Assignor to W. H. Bowker, Boston, Mass. U.S. Pat. 718,538, Jan. 13, 1903.

BLUE vitriol is rendered anhydrous by heat, and mixed with powdered calcium carbide.—E. S.

FRENCH PATENT.

Acetylene; New Application of —— [*as Insecticide, &c.*]. J. Choulet. Fr. Pat. 321,088, May 13, 1902.

ACETYLENE, in solution or "pulverised" by projection with water, or a solution of cupric sulphate, or of other similarly acting agent, is used for the destruction of insect pests, for the treatment of diseases affecting plants, disinfection, &c. A strong, closed, portable vessel is provided in its upper part with a receptacle for calcium carbide, having a device whereby it may be emptied into water or a suitable solution contained in the vessel, out of a discharge pipe, in which the slush (*boullie*), carrying the "pulverised" acetylene, is forced by pressure of the gas, aided, if desired, by the introduction of carbon dioxide gas.—E. S.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Pulp; Electrolytic Bleach for ——. A. Neuberger. Papier-Zeit., 1903, **27**, [3], 70—71.

THE author enumerates the various advantages of electrolytic bleach liquor over the ordinary calcium hypochlorite solutions. These advantages have enabled the electrical process to supplant the old method to a considerable extent in spite of the fact that the earlier types of plant were not very efficient. An apparatus is now described in which the efficiency is largely increased, and which can be fitted to any continuous current installation. The liquor is electrolysed in the form of very fine streams, the oxygen or chlorine electrodes have an area 5—10 times as great as the hydrogen electrodes, and the working parts are constructed of the most resistant materials, the electrodes being platinum-iridium and the insulating parts being made of earthenware and paraffin. A 9 per cent. solution of common salt flows from an upper earthenware vessel in the form of a cascade over a series of plates arranged in steps. The electric mains run parallel to the steps on either side, and contact with the plates is made by means of bent platinum conductors. The plates are provided with several longitudinal narrow channels in which are situated specially shaped strips of platinum-iridium, which distribute the current to the liquid. At the bottom of the series the liquid falls into a collecting vessel, whence it is pumped back again to the top, the treatment being repeated until the "active chlorine" reaches the proper degree. The best efficiency is obtained when liquors containing not more than 2 per cent. of "active chlorine" are prepared, and these are diluted with 10 or 20 times their volume of water before use. Each plate requires about 1 h.p., but for large installations 6-h.p. plates are constructed, a series of 60 plates being used. Such a plant has a capacity of 1,600 kilos of "active chlorine" per 24 hours, using 8,000 kilos. of salt.—J. F. B.

Paper Pulp: Electrolytic Bleaching of ——. L. J. Dorenfeldt. Papier-Zeit., 1903, **28**, [7], 215.

Referring to the article by Neuberger (see preceding abstract) on the use of electrolytically prepared bleaching liquor for paper mills, the author points out that any process for preparing bleaching liquor (sodium hypochlorite) direct from brine must be far more costly than electrical processes, such as the Hargreaves-Bird, by which bleaching powder is made from the chlorine, whilst the soda is obtained as alkali. Leaving the question of power out of account and taking the figures for materials quoted by Neuberger as correct, *viz.*, 8,000 kilos. of salt required to produce a bleach-liquor equivalent to that obtained from 4,500 kilos. of bleaching powder, the author states that this quantity of bleaching powder can be prepared by the Hargreaves-Bird process from 3,000 kilos. of salt and 2,500 kilos. of quicklime, showing an advantage in favour of the latter of about 35 marks. In addition to this, there is obtained a concentrated solution containing 2,500 kilos. of sodium carbonate, valued at 175 marks, making a total advantage of 215 marks for materials on the day's work.

Consequently, except where brine is to be obtained almost free of cost, or where sodium carbonate is not worth more than quicklime, an electrically prepared bleaching liquor (sodium hypochlorite) cannot possibly compete with bleaching powder obtained by an electrical chlorine-soda process.—J. F. B.

Paper; Behaviour of Mineral Acids in ——, and their Action on the Fibres. O. Winkler. Zeits. angew. Chem., 1903, **16**, [2], 25—27.

As a test for free mineral acids in paper, Congo Red is useful if the quantity of acid be not too small, but in presence of alum, the reaction is apt to lose its sharpness, and may even be prevented altogether by the formation of aluminium compounds. Methyl Violet and Methyl Orange are satisfactory, and by extracting the paper with hot water, minute quantities of free acid can be estimated with the last-named indicator in presence of alum. Filter paper, several samples of German "normal" writing papers and printing papers were tested; of these, only the filter paper and one of the printing papers were perfectly free from acid: the others, like most rosin-sized papers, contained traces. In order to test the effect of free acid on paper, sheets were soaked in dilute solutions of sulphuric and hydrochloric acids, in strengths ranging from 1 per cent. to 1 in 50,000 and then dried; the subsequent observations extended over a period of 3½ years. After one month, the papers contained just as much acid as when freshly treated; subsequently the hydrochloric acid, especially in the highest dilutions, gradually disappeared to some extent, but the sulphuric acid remained practically constant all the time. Sulphuric acid was always more readily detectible with Congo Red than hydrochloric acid, the latter in weaker proportions requiring Methyl Orange for its detection. The presence of free acid, even in very great dillution, acts injuriously on the paper, reducing its resistance to rubbing and creasing, as well as the hardness of the sizing. In the greatest dilutions, the deterioration was scarcely or not at all discernible, but this is merely a matter of degree, depending on the lack of delicacy of the present methods of paper testing. Sulphuric acid acts more powerfully on paper than hydrochloric acid, hydrocellulose probably being formed. The acid is not used up in the process of decomposition which it causes, but goes on acting continuously, probably until the paper is destroyed. Paper containing free acid is highly injurious as a wrapping or ground for colour printed and metallic-coated goods. Paper for this purpose should be free from wood and should either not be sized, coloured, or bleached at all, or only very slightly; the pulp should not be beaten "wet," as cellulose so treated is more hygroscopic.
—J. F. B.

Millboards; Manufacture of ——. G. L. Papier-Zeit., 1903, **27**, [3], 71.

In order to obtain hard boards, it is necessary to run a thin sheet on the machine, and the cylinder must be provided with a fine outer wire, such as No. 70 or 75. A good help in obtaining hard and, at the same time, flexible boards, is the addition of 3 or 4 kilos. of "collodin" to the beater for every 50 kilos. of raw material charged. "Collodin" is a smooth paste prepared from 10 kilos. of potato-farina, 1 kilo. of caustic soda, and 45 litres of water: it tends to bind the short fibres, thus reducing the loss. In order to avoid irregularities in the boards, the sand traps must be kept clean, and great attention must be paid to the settling-laths and boards. The accumulation of clotted pulp on the stirrers of the stuff-chests must also be prevented. Hard millboards are apt to wrinkle during glazing more than soft ones. When the boards come from the drying rooms and are damped for rolling, they should be allowed to stand for one or two days. If they still wrinkle, the pressure on the front guard roll of the glazing press should be eased, as it is a great mistake to load this roll too heavily.—J. F. B.

United States Patent.

Viscose and Products derived therefrom: Method of Treating ——. C. F. Cross, E. J. Bevan, and C. Beadle, London, Assignors to Cellulose Products Company, Wilmington, Del. U.S. Pat. 717,355, Dec. 30, 1902.

See Fr. Pat. 309,548; this Journal, 1902, 67.—J. F. B.

French Patents.

Cellulose [in Fibres, Paper, &c.]; Superficial Acetylation of ——. L. Lederer. Fr. Pat. 320,885, May 5, 1902.

The cellulose, or tissue containing it, is immersed, at the ordinary temperature, in a bath of acetic anhydride containing a condensing agent, *e.g.*, about 0·5 per cent. of sulphuric acid, for 10 minutes, or more, according to the degree of acetylation desired. It is then withdrawn, pressed, and washed with water. (See also Eng. Pat. 11,749 of 1900; this Journal, 1901, 741.)—T. F. B.

Celluloid; Manufacture of Substitute for ——. C. Tissier and P. Magnier. Fr. Pat. 320,931, May 7, 1902.

A composition consisting of gelatin incorporated with celluloid may be prepared in an open vessel by first soaking gelatin in the cold in a mixture of 60 per cent. alcohol with 5—10 per cent. of glacial acetic acid. The swollen gelatin is then added, together with celluloid paste (camphor and nitrocellulose), to 90 per cent alcohol containing a little acetone. The mixture is warmed and kneaded hot in the ordinary way. The incorporation is best performed in a closed autoclave provided with a stirrer, and in this case the alcohol and acetic acid can be recovered by distillation.
—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Rare Earths: Microscopic Detection of the ——. R. J. Meyer. Zeits. anorg. Chem., **33**, 31—41; 113—116. Chem. Centr., 1903, **1**, [1], 56; [3], 196.

Behrens (see this Journal, 1902, 368) has proposed t control the progress of the separations and the purity o the preparations of rare earths by micro-crystallographi examination of the succinates. The author has repeate Behrens' experiments and gives in detail the results h has obtained. He finds that the crystalline forms of th succinates of the cerite earths depend to a considerabl extent upon the concentration of the solution. Fo example, the crystalline form of didymium succinat asses through different phases of development, of which ne or another predominates according to the concentration f the solution and the nature of the other elements present. Ioreover, the succinates of some of the rare earths, *e.g.*, raseodymium and neodymium and samarium and idymium crystallise in isomorphous forms.

The author concludes that the microscopic examination f the succinates cannot be regarded as a satisfactory nethod for judging as to the homogeneous or non-omogeneous nature of preparations of the cerite earths r as to the reliability of the usual methods of separation.
—A. S.

Cinnamylidene Chloride. E. Charon and E. Dugoujon. Comptes Rend., 1903, **136**, [2], 94—96.

Cinnamylidene chloride, $C_6H_5.CH:CH.CHCl_2$ is prepared in the following manner: A slight excess of phosphorus pentachloride is introduced into a small dry flask and cinnamic aldehyde is added drop by drop in the cold. When all is added, the flask is heated for a moment on the water-bath. The contents are then poured carefully on to crushed ice and a heavy oil separates, which soon solidifies. This product is purified by twice crystallising from ether; it is not easy to free it entirely from cinnamic aldehyde. The pure chloride crystallises in pearly white scales melting at 54° C.; it distils at 142°—143° C. under a pressure of 30 mm. This chloride is very unstable, decomposing in presence of water or moist air into hydrochloric acid and cinnamic aldehyde. It is impossible to keep it for long, it soon turns black and decomposes; the final products in presence of air being cinnamic acid and a black resin. The saturated chloro and bromo derivatives are perfectly stable; these are *tetrachlorophenylpropane*, m. pt. 66° C., and *dichlorodibromophenylpropane*, m. pt. 127° C.—J. F. B.

Helmitol. Pharm. Centr., 1902, 596. Pharm. J., 1903, **70**, [1697], 2.

Helmitol, a new compound of hexamethylene tetramine (urotropine) and anhydromethylene citric acid, forms colourless crystals, which decompose at 163° C., and are sparingly soluble in alcohol, insoluble in ether, and soluble in water to the extent of 7 per cent.—A. S.

Aristochin [*Di-quinine Carbonate*]. Pharm.-Zeit., 1902, 857. Pharm. J., 1903, **70**, [1697], 2.

Aristochin, or di-quinine carbonate, $CO(O.C_{20}H_{23}N_2O)_2$, forms a white tasteless powder, insoluble in water, easily soluble in chloroform and alcohol, and sparingly soluble in ether. It melts at 189° C., and with hydrochloric acid forms salts which are soluble in water.—A. S.

Aloïns of Natal Aloes. E. Léger. J. Pharm. Chim., 1903, **17**, [1], 13—17.

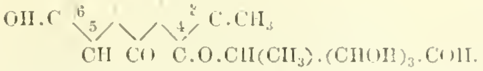
Natal aloes is found to contain two aloins, *Nataloïn*, $C_{23}H_{26}O_{10}$, and *Homonataloïn*, $C_{22}H_{24}O_{10}$. To isolate the crude aloins, Natal aloes is extracted with pure acetone to remove the resinoid impurities; the insoluble residue consists then of a mixture of the two aloins. These are separated by fractional crystallisation from methylic alcohol. Homonataloin first separates in the form of hard adherent crystalline crusts. From the mother liquors, nataloin is obtained, on concentration, in the form of short pale yellow lamellæ.

Nataloïn is less soluble in methylic alcohol than barbaloin. It is almost insoluble in water and in ether, but dissolves readily in acetic ether. It behaves as a phenol, dissolving in caustic alkalis, from which solutions it is precipitated by carbon dioxide. It evolves furfural when heated with dilute sulphuric acid. In acetic ether solution its specific rotation is $\alpha_D = -107 \cdot 7$. By the addition of benzoyl chloride to a pyridine solution of nataloïn, tetrabenzoylnataloïn, $C_{23}H_{22}(C_7H_5O)_4O_{10}$, is obtained as a yellow amorphous body, free from bitterness, which is readily soluble in alcohol and in ether. When this compound is heated in a sealed tube to 100° C. with excess of benzoyl chloride, it is converted into hexabenzoylnataloin $C_{23}H_{20}(C_7H_5O)_6O_{10}$, which is deposited from absolute alcohol in yellowish amorphous granules. When an alkaline solution of nataloin is heated with sodium dioxide, the methyl ester of a new emodin, nataloemodin, C [illegible], is obtained. This crystallises from methylic alcohol in pale orange yellow needles, m. pt., 228° C. It sublimes unaleterd. It gives an intense violet colour reaction with sulphuric acid, and an orange red solution with caustic soda. Heated with zinc-dust it affords a sublimate of delicate scales with a greenish reflection, probably a methyl anthracene. When heated in a sealed tube to 170° C. with strong hydrochloric acid, methylnataloemodin is converted into an emodin, m. pt., 220·5° C.

Homonataloin, separated as described above in the first crystallisations from methylic alcohol, is obtained in the form of yellow anhydrous lamellæ by recrystallising from acetone containing 20 per cent. of water or of acetic ether. Its composition is constant, whatever solvent be employed in its crystallisation, and the crystals are invariably anhydrous. Its acetic ether solution is slightly more markedly lævo-rotatory than that of nataloin, having the $\alpha_D = -112 \cdot 6°$. It agrees with nataloïn in general reactions, and gives the analogous benzoyl compounds, tetrabenzoylhomonataloin, $C_{22}H_{20}(C_7H_5O)_4O_{10}$, and hexabenzoylhomonataloïn, $C_{22}H_{18}(C_7H_5O)_6O_{10}$.—J. O. B.

Aloïns; Constitution of the ——. E. Léger. J. Pharm. Chim., 1903, **17**, [2], 52—54.

In a previous paper (this Journal, 1902, 1037) it was shown that barbaloïn and isobarbaloïn are glucoside-like compounds of methylisohydroxychrysazin with a methylaldopentose. The following diagram represents the structural formula of barbaloin :—



Barbaloïn, being the more stable compound, the sugar residue may be assumed to be attached at the position either 1 or 4, while in isobarbaloin it is probably attached at the position 6, the hydroxyls at 1 and 4 being free. This would explain the oxidation of isobarbaloin by laccase, only those phenols containing two hydroxyl groups either in ortho or para positions being affected by this enzyme. The position of an hydroxyl group at 1 is fixed by its presence in chrysazin, an aloïn derivative which can be prepared from anthracene. Another hydroxyl cannot occupy the position 2, because then methylisohydroxychrysazin would be an alizarin derivative, dyeing mordanted cotton, which is not the case. All 1·2 dihydroxy-derivatives of anthraquinone are dyestuffs without exception.

The above aloïns are not hydrolysed by dilute acids, and only give off vapours of furfural (or its homologues) when heated in a dry state. Nataloin and homonataloin, on the other hand, evolve furfural on boiling with dilute sulphuric acid, and the sugar residue is therefore less firmly attached to the aromatic residue in the case of the Natal aloins. These latter yield under the action of sodium peroxide a body corresponding with the methylic ester of an emodin (trihydroxymethylanthraquinone). In the Natal aloins the anthraquinone group appears to be in a latent state, only made evident under the action of sodium peroxide. These aloins when treated with nitric acid yield only a large quantity of oxalic acid and a little picric acid, whereas barbaloin under similar treatment yields a nitro-derivative of a hydroxyanthraquinone. The author assigns to nataloin the formula $C_{23}H_{26}O_{10}$ and to homonataloin $C_{22}H_{24}O_{10}$.
—J. F. B.

Scopolamine Derivatives. Schmidt. Apoth.-Zeit., 1902, 592. Chem. and Druggist, 1903, 62, [1197], 11.

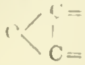
Scopolamine (hyoscine) is hydrolysed by baryta water, yielding atropic acid and scopoline, whereas atropine or hyoscyamine yields atropic acid and tropine.—

$$C_{17}H_{21}NO_4 = C_8H_{13}NO_2 + C_9H_8O_2.$$

Scopoline appears to be related to tropine in the sense that a CH_2 group of the latter is replaced by a CO group; it does not, however, give any reactions of a ketone. When heated in a sealed tube with hydrobromic acid, it is converted into the hydrobromide of bromo-scopoline—

$$C_8H_{12}BrN(OH)_2,HBr,$$

and a study of this reaction leads the author to conclude that scopoline contains the grouping :—



—A. S.

Alkaloids of Dicentra Cucullaria. R. Fischer and O. A Soell. Pharm. Arch., Milwaukee, **5**, 121. Pharm. J., 1903, **70**, [1699]. 61.

The authors have examined *Dicentra cucullaria* N. O Fumariaceæ, and in the plant collected during the early part of May they have detected three alkaloids, one of which is protopine. —A. S.

Alkaloids of Eschscholtzia Californica. R. Fischer and M. E. Tweeden. Pharm. Arch., Milwaukee, **5**, 117. Pharm. J., 1903, **70**, [1699], 61.

Bardet and Adrian have reported the presence of morphine in this plant, which is known as the Californian poppy. The authors find that the number of alkaloids present is probably seven :—Protopine, β- and γ-homochelidonine, sanguinarine, chelerythrine, and two others differing in properties from any previously known alkaloids.—A. S.

Orange Flowers; Oil of ——. *II.* A. Hesse and O. Zeitschel. J. prakt. Chem., 1902, **66**, [23 and 24], 481—516. (See this Journal, 1901, 1138.)

The harvest of orange flowers at Grasse lasts from the beginning of May to the first week of June. During the first week of the harvest the flowers, although strongly scented, do not yield much oil on distillation, and this period is devoted to the manufacture of pomades by the maceration process.

Neroli Oil.—A table is given showing the yields and constants of the oils distilled at different dates throughout the season. The variations from day to day were not important, they indicated a slightly lower ester-content at the beginning and a slight falling off of methyl anthranilate towards the end. The constants of a normal neroli oil are given as follows: Sp. gr. at 15° C. = 0·870—0·875; optical rotation + 2° 50′ to + 6°; saponification value, 35—45, corresponding to 12—15 per cent. of linalylacetate; acetyl value 160, equivalent to 35—38 per cent. of free alcohols; methyl anthranilate 0·5—0·7 per cent.; soluble in 1 to 2 volumes of 80 per cent. alcohol; most oils when mixed with 4—6 volumes of 80 per cent. alcohol become cloudy owing to the precipitation of paraffin. The following table shows the constituents and their approximate proportions as determined in neroli oil in the present investigation.

The *paraffin* crystallises in lustrous scales melting at 54° C., it is doubtless identical with neroli-camphor or aurade and is devoid of odour.

Alcohols: Linalool.—The authors regard linalool as a definite homogeneous body, optically active, which however occurs in nature in varying mixtures of the dextro- and laevo-modifications; they disagree with Barbier's view that linalool, as ordinarily known, is a mixture consisting largely of myrcenol. *Geraniol, &c.*—In the separation of the primary and secondary alcohols from the tertiary, by boiling with phthalic anhydride, the authors have determined that the esters of terpene alcohols remain unaffected by the treatment. No phenylethyl alcohol could be detected. Together with geraniol and geranyl acetate the authors have isolated a new alcohol, which they term *nerol*, and its acetate. Nerol is isomeric with geraniol, but does not combine with calcium chloride, it has an extremely fresh and delicate odour of roses, and its *diphenylurethane* crystallises in fine needles melting at 73°–75° C. *Nerolidol* is the name assigned to a new sesquiterpene alcohol, which, from its very low sp. gr. (0·880), is regarded as belonging to the aliphatic series; its optical rotation is + 13° 32′; boiling point under atmospheric pressure 276°—277° C.; it has a feeble but very permanent odour. The neroli oils investigated by the authors gave no *pyrrol* reaction.

Constituents.		Approximate percentages.
Hydrocarbons, 35 per cent.	Pinene Camphene Dipentene C_{27}-Paraffin	35 per cent.
Terpene alcohols and their acetates, 47 per cent.	*l*-Linalool	30 per cent.
	l-Linalyl acetate	7 „
	d-Terpineol	2 „
	Geraniol and nerol	4 „
	Geranyl acetate and neryl acetate	4 „
Sesquiterpene compounds, 6 per cent.	*d*-Nerolidol	6 per cent.
Nitrogenous bodies, 0·7 per cent.	Methyl anthranilate	0·6 per cent.
	Indole	below 0·1 °/。
Acids and phenols, 0·1 per cent.	Acetic acid	..
	Palmitic acid	..
Resinous and undetermined constituents and loss, 11·2 per cent.	Decylaldehyde(?) and esters of phenylacetic acid and benzoic acid(?), &c.	11·2 per cent.

Orange flower water oil.—About 30 tons of orange flower water yielded to extraction 10 kilos. of oil. This oil, except for the terpenes, is qualitatively almost identical with neroli oil; it contains, however, esters of phenylethyl alcohol and possibly phenylacetonitrile. Quantitatively, however, it differs greatly from neroli, according to the solubility of the constituents in water. The proportions of free alcohols and of methyl anthranilate are very much higher in the water oil than in neroli, but the esters of terpene alcohols are very much less.

In the ethereal oil from *orange flower pomade*, esters of salicylic acid have been detected.

By suitable treatment by rectification and extraction of the "*essence concrète*" of orange flowers, obtained by extracting the flowers with volatile solvents (light petroleum), a yield of 0·0646 per cent. of an essential "extract-oil" was obtained. This oil is undoubtedly the best as regards quality, and its perfume approaches most nearly to that of the flowers themselves. It is distinguished from the oil obtained by distillation by its high percentage of esters, leading to the conclusion that a far more considerable saponification of the esters must take place during the process of distillation than was hitherto supposed. Finally, the authors have established the fact that the nitrogenous constituents of orange flower oils, methyl anthranilate and indole, are primary constituents of the flowers themselves, and are not produced during the process of manufacture.

—J. F. B.

Citron Oil. S. Gulli. Chem. and Druggist, 1903, **62**, [1197], 22.

The author has previously (this Journal, 1902, 186) described a sample of citron oil the characters of which did not agree with those given by H. E. Burgess (this Journal, 1901, 1237), because the two oils were obtained from different varieties of citron. In order to determine the characters of pure citron oil made from "cedrini," the author prepared 450 grms. in his own laboratory by hand-pressure with a thin sponge. When first prepared, the oil contained a large amount of minute white crystals, which gave it a turbid and silky appearance. The sp. gr. at 15° C. was 0·851, and optical rotation at 15°, + 80° 50′. A sample of citron oil (from "cedrini") examined by Stavenhagen had the sp. gr. 0·850 and optical rotation, + 79°. These figures agree fairly well with those obtained by Burgess.

Most of the so-called citron oil which goes into trade at low price, is composed of a mixture of hand-pressed oils lemon and sweet orange. The author shows that mixtures these oils and of sweet lemon and sweet orange can be epared, which do not differ, so far as specific gravity and tical rotation are concerned, from pure citron oil.—A. S.

Citron Oil. Loudon Essence Company's Research Laboratory. Chem. and Druggist, 1903, 62, [1198], 57.

With reference to the preceding abstract, it is pointed out that any adulteration of the nature described therein can be easily detected by distilling *in vacuo* 100 c.c. of the oil, collecting two fractions of 10 c.c. and 80 c.c., respectively, and then obtaining a third fraction by steam-distillation of the residue, which should be carefully measured. The characters of the three fractions are then determined and in the third fraction the amount of aldehydes. In the above table are shown the results obtained with mixtures as described by Gulli and with a pure citron oil of the present season, which contained a large amount of the silky crystals observed by Gulli.—A. S.

Description of Oils.	Physical Constants.	No. c.c.	Rotations.	Degrees Butyro-refractometer.	Refractive Indices.	Alcohol Content 3rd fraction.
						Per Cent.
are citron oil, season 1902-03	Sp. gr. = 0·852	10·0	+ 85° 55′	71·0	1·4730	53
	Rotation = + 80° 5′	80·0	+ 86° 5′	71·9	1·4735	
	Ref. Index = 1·4749	7·0	+ 16° 30′	84·3	1·4806	
emon oil, 50 per cent.: sweet orange oil, 50 per cent. (mixture A. Gulli) ..	Sp. gr. = 0·854	10·0	+ 77° 6′	71·2	1·4723	51
	Rotation = + 80° 15′	80·0	+ 85° 10′	71·3	1·4733	
	Ref. Index = 1·4745	6·5	+ 47° 15′	76·3	1·4763	
ure citron oil, 30 per cent.; mixture A as above, 70 per cent.	Sp. gr. = 0·854	10·0	+ 78° 10′	71·1	1·4730	41
	Rotation = + 79° 30′	80·0	+ 86° 30′	71·6	1·4734	
	Ref. Index = 1·4744	6·5	+ 29° 30′	79·7	1·4783	

Rotations a_D in 100-mm. tubes; sp. gr. at 15° C.; refractive indices N_D and butyro-refractometer readings, corrected to 20° C.

Citronella Oil; Adulterated ——. E. J. Parry and C. T. Bennett. Chem. and Druggist, 1903, 62, [1199], 88.

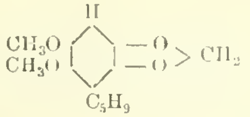
Very large quantities of citronella oil have recently appeared on the London, Liverpool, and American markets, which do not pass Schimmel's test (see this Journal, 1901, 930). Samples examined by the authors formed practically clear mixtures with equal volumes of 80 per cent. alcohol, but on further addition of the alcohol, oily drops separated. By careful fractionation it was found that the oils in question contained fairly pure resin spirit (light resin oil). A mixture of 15 parts of light resin oil (sp. gr. 0·8345) with 85 parts of pure citronella oil has physical characters very similar to those of the oils examined by the authors. It is stated that a citronella oil mixed with small proportions of well purified resin spirit may comply with Schimmel's test.—A. S.

Cassia Oil. E. Kremers. Pharm. Rev., **20**, 545. Pharm. J., 1903, **70**, [1699], 61.

Among the adulterants of cassia oil, cedar-wood oil (up to 30 per cent.), resin, and alcohol have been observed. An oil containing 10 per cent. of alcohol had the sp. gr. 1·037. A mixture of petroleum and resin may be added to the oil, without materially altering its specific gravity or rendering it insoluble in 80 per cent. alcohol. The author points out that an oil containing as much as 80 per cent. of cinnamic aldehyde may contain 10 per cent. of adulterants, and the residue, should therefore, be examined.—A. S.

Matico Oil. E. Framm and K. van Emster. Ber. **35**, [20], 4347.

The authors have examined a matico oil marked heavy fraction, sp. gr. 1·123 at 15°. It differed from all oils previously examined, consisting chiefly of a compound which the authors term Matico ether. This compound forms a clear yellow fluorescent liquid of sp. gr. 1·136 at 17° and b. pt. 282—285 C. On analysis figures corresponding to the formula, $C_{14}H_{18}O_4$, were obtained, and further examination showed the compound to contain two methoxy groups and probably a methylene ester group. Oxidation with a 5 per cent. solution of potassium permanganate, gave maticoic acid, $C_{10}H_{10}O_6$, m. pt. 138° C., and maticoic aldehyde, $C_{10}H_{10}A_5$, m. pt. 88° C. Both of these contain the two methoxy groups. Oxidation with a 2 per cent. solution of potassium permanganate with ice cooling gave homomaticoic acid, $C_{11}H_{12}O_6$, m. pt. 96° C., together with maticoic aldehyde. Bromine in ethereal solution gave a crystalline compound, $C_{11}H_{13}O_3Br_3$, m. pt. 116°. The authors assign the following formula to the matico ether.



E. C. S.

Quinine Bisulphate; Examination of ——. C. Belloni. XXIII., page 168.

Camphor in Camphorated Oil; Determination of ——. XXIII., page 168.

United States Patents.

Organic Peroxide [*Acetyl Hydrogen Peroxide*]. R. H. Page, Detroit, Mich. U.S. Pat. 717,016, Dec. 30, 1902.

See Fr. Pat. 319,248; this Journal, 1902, 1466.—J. F. B.

Caffeine; Process of Making ——. B. R. Faunce, Philadelphia. U.S. Pat. 716,873, Dec. 30, 1902.

Caffeïne is recovered from the deposit formed on the inside of the pipes and flues of coffee-roasters by heating the deposit, condensing the resultant vapours, placing the condensed matter in boiling water, separating out the oily matter, boiling in water the charred residuum from the first heating process, filtering the solutions, uniting the two caffeine solutions, and evaporating to the crystallising point. —J. F. B.

Theophylline; Process of Making ——. M. Engelmann. Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 716,994, Dec. 30, 1902.

The monoformyl derivative of 1.3-dimethyl-4.5-diamono-2.6-dihydroxy-pyrimidine is treated with an alkali, and the alkali salt of theophylline thus produced is treated with acids, liberating theophylline.—J. F. B.

Piperidine; Salt of ——, *and Process of Making same.* W. B. Bishop, A. Bishop, and F. W. Passmore, London. U.S. Pat. 717,066, Dec. 30, 1902.

Piperidine *p*-sulphonamino-benzoate—

$$C_6H_4.SO_2NH_2(COOH).C_5H_{11}N,$$

melting at about 228° C. is obtained by causing 1 part of piperidine to react with 2 parts of *p*-sulphonaminо-benzoic acid in hot aqueous solution and crystallising the product.
—J. F. B.

French Patents.

Rectification (Continuous) of Alcohols; Apparatus for —— E. Barbett Addition, dated April 17, 1902, to Fr. Pat. 296,750, Feb. 1, 1900.

Indicating tubes are arranged for showing the amount of liquid returning to the still in relation to that delivered.
—J. W. H.

Oils (Fatty and Ethereal) and other Chemical Products ordinarily liquid; Dry and Pulverised Preparations of ——. Sicco Med. Chem. Inst. F. G. Sauer. Fr. Pat. 320,831, May 1, 1902. XII., page 150.

Fats and Esters of Fatty Acids; Manufacture of Bromine and Iodine Derivatives of ——. W. Majert. Fr. Pat. 320,993, May 7, 1902.

Oils, fats, and methylic or ethylic esters of unsaturated fatty acids are treated with hydrobromic or hydriodic acid, either in the gaseous state or dissolved in water or glacial acetic acid; phosphorus bromide or iodide may likewise be used. If a solid fat be treated, it is first dissolved in a solvent such as ether, benzene, &c. In the case of hydriodic acid the action is complete in 3—5 days, but with hydrobromic acid the substances must be left in contact for 15—20 days. The product is finally washed with water, and solutions of sodium carbonate and sodium thiosulphate consecutively until pure. The addition compounds so obtained are remarkably stable.—J. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[*Photography*], *Theory of Chemical Sensitisers in* —— Lüppo-Cramer. Phot. Corr., 1902, **39**, 699. Chem.-Zeit., 1903, **27**, [3], Rep. 16.

Vogel's theory that sensitisers act by absorbing the halogen liberated during exposure is not altogether confirmed by the author's experiments. It was found that ammonia solution (sp. gr. 0·91) applied to dry plates during exposure lessened the sensitiveness, whilst if used before exposure it was without action, and this effect is more strongly marked in the case of collodion emulsion plates. A one per cent. sodium carbonate solution or a 10 per cent. potassium carbonate solution applied before exposure increases the sensitiveness, but the action is just as marked if the alkali is washed out again before exposing the plate. The same is the case if acid silver nitrate be used and then washed away before exposure. So also immersion in 1 per cent. hydroquinone solution increases the sensitiveness, the removal of the compound by washing before exposure having no effect upon the improvement produced.
—W. G. M.

Pyrogallol Developers with Caustic Alkalis. E. Valenta. Phot. Corresp., **39**, 703.

Caustic alkalis added to a pyrogallol-sodium sulphite solution in proportion just sufficient to form mono-alkali phenolates produced very effective developers; taking the rapidity of the pyro-soda developer as 1, the rapidities of the mono-alkali phenolate developers were:—sodium, 3·3; potassium, 3·6; lithium, 1. Di- and tri-phenolate developers were not satisfactory. The formula given for practical use is. A. Sodium sulphite, 160 grms.; pyrogallol, 25 grms.; water up to 1 litre. B. Caustic potash, 11·5 grms. (caustic soda, 8 grms.); water, 1 litre. For use take 1 part each of A, B, and water.—J. W. H.

Platinum (Platinum Toning). Conversion of the Silver Image of Bromide Prints into ——. C. W. Somerville. Phot. Jour., 1902, **42**, [11], 246—250.

The best working formula found by the author is potassium chloroplatinite, 1 grain; mercuric chloride, 1 grain; citric acid, 9 grains; water, 1 ounce. The tint produced is of a warm sepia, and may be varied by altering the proportions of mercuric chloride. The addition of a few drops of 10 per cent. solution of potassium bromide prevents any tendency to stain the gelatin and at the same time acts as an intensifier. If a print lacks depth, it may be bleached in: copper sulphate, 200 grains; potassium bromide, 200 grains; water, 20 ounces; re-developed and re-toned. The prints appear to stand most severe tests of permanency.—J. W. H.

English Patent.

Photographic Toning and Fixing Sheets of Absorbent Material. S. S. Bromhead, London. From Chem. Fab. Helfenberg Act. Ges. (formerly E. Dieterich, Helfenberg, Germany). Eng. Pat. 23,809, Oct. 31, 1902.

Unsized paper or other porous material is impregnated by repeated immersion in a solution of the combined constituents of the usual toning and fixing baths, and dried.

The sheets are placed in a dish containing water, together with the prints to be toned.

The solutions used for impregnating the materials are:—

		Parts by Weight.
(1)	Sodium thiosulphate	500
	Ammonium thiocyanate	55
	"Ammoniate of alumina"	15
	Citric acid	15
	Lead acetate	20
	Lead nitrate	20
	Gold chloride	15
	Water	400

or

(2)	Sodium thiosulphate	706
	Lead nitrate	160
	Gold chloride	2
	Water	600

—T. F. B.

United States Patents.

Photographic Plates for Use in Printing Presses: Manufacture of ——. S. Epstein, Paris. U.S. Pat. 717,369, Dec. 30, 1902.

A metal plate is roughened, heated to 50° C., covered with a mixture of hot water, gelatin, a bichromate, pure alcohol, and a suitable acid, heated further to 100°, cooled, exposed under a negative, washed with water, and treated with a mixture of glycerin and water. —F. H. L.

Photographic Films; Manufacture of ——. L. M. J. Armandy, Assignor to Soc. Anon. des Produits Photographiques. M. Y. Asnières, France. U.S. Pat 717,793, Jan. 6, 1903.

A stripping layer of a gummy nature (*e.g.*, gum-lac) i spread on a celluloid or other backing to produce polished surface, and to this a layer of gelatin and sensitised film are applied successively, the gelati employed being mixed with some adhesive soluble substanc to render it supple.—T. F. B.

Silver Bromide Gelatin: Process of Making ——. A Cobenzl, Bingen, Germany. U.S. Pat. 718,312, Jan. 13 1903.

A hot emulsion of silver bromide and gelatin is treate with alcohol and allowed to "ripen"; it is now cooled with agitation, so that the silver bromide gelatin i precipitated from the clear liquid containing the solubl salts as a fine-grained sandy powder, which is separate and washed.

The powder obtained is stated to be nearly panchromatic
—T. F. B.

Developing Photographic Pictures; Process of ——. A Eichengrün, Elberfeld, Germany, Assignor to Far fabriken of Elberfeld Co., New York. U.S. Pat. 716,39 Dec. 23, 1902.

A developing bath containing additive compounds fro ketones and bisulphites, is used.

See U.S. Pat. 707,403; this Journal, 1902, 1349.
—J. W. H.

French Patent.

tographic Plates and Films; Manufacture of ——. F. Bayer and Co. Fr. Pat. 320,694, April 26, 1902.

Eng. Pat. 22,727, 1901; this Journal, 1902, 1411. solution of a suitable developer, with or without one-sulphite, is thickened with starch or the like, and whole is painted on to the back of the plate or film. developers mentioned are amidol, edinol, and metol. he case of films, the latter should be prepared with a drops of glycerin to prevent curling.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

United States Patents

Explosive. L. McDaniel, Tabor, Iowa. U.S. Pat. 717,441, Dec. 30, 1902.

tassium chlorate and potassium nitrate are incorporated h a syrupy solution of sugar until a granulated powder produced, which is agitated in the presence of gasolene, make a "smokeless powder."—E. S.

okeless Powder; Apparatus for Evaporating Solvent from ——. P. F. A. Liedbeck, Stockholm. U.S. Pat. 718,484, Jan. 13, 1903.

ie apparatus consists of a horizontal drum having one end en, revolving in a steam-jacketed casing. By means of an justable nozzle the nitrocellulose solution can be fed on to e inner surface of the drum along its whole width. Hot is passed over the drum and the evaporated solvent rried to a condenser. By this means layers of explosive n be superimposed on each other to any desired thickness, rming a hollow cylinder which can be cut open and emoved from the surface of the drum, on detaching the ising.

See also this Journal, 1902, 1097, 1412, and 1556.
—G. W. McD.

French Patent.

Explosives for Mines. J. Luciani. Fr. Pat. 321,080, May 13, 1902.

xplosives of all kinds, having a suitable consistence, are rought into the form of thin leaves or ribbons, with umerous parallel transverse cuttings to form comb-like inges on either side, with an uncut breadth between; or e margins may be plain and the central portions divided. he ribbon can then be rolled for enclosure in a cartridge, ith a central space for the detonator. Thin leaves of a ducing metal, such as magnesium or aluminium, may be milarly formed and attached to the ribbon, or otherwise troduced, to serve as secondary detonator, with colloidal r other explosives. Or the explosives may be made into ne threads, mixed or not with a reducing metal, for ompression into the cartridge.—E. S.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

United States Patent.

Gas Analysis Apparatus. M. Arndt, Aix-la-Chapelle. U.S. Pat. 717,654, Jan. 6, 1903.

An apparatus for taking up samples of gas and transferring hem to a gas-absorption device, having in combination a eceptacle, partly filled with liquid, to receive the gaseous nixture; a sampling vessel within the receptacle, having n aperture at the bottom and a tube descending from the op and terminating above the level of said aperture; a essel filled with a gas-absorbing liquid, communicating with the sampling vessel; and means for indicating the hange in volume through absorption. (See also Eng. Pat. 18,931 of 1900; this Journal, 1901, 1025.)—H. B.

French Patent.

Washing Apparatus [Gold, &c.] for Analytical Purposes. G. de Krivochapkine. Fr. Pat. 321,019, May 9, 1902.

A series of V-shaped glass flasks with short narrow necks at the top and with the lower ends drawn to tubes and bent upwards, are so connected that water flows in at the bottom of one and out at the top through a rubber tube to the bottom of the next, and so on, the overflow from the last of the series leading to a large beaker. Three or more of the flasks, each larger than the preceding one, may be placed in series. The crushed ore (*e.g.*, alluvial gold) is placed in the first, and the pressure of water is so graduated that at the end of the operation only the gold will remain in it.—W. G. M.

INORGANIC—QUALITATIVE.

Hydrogen Peroxide; Use of ——, in Volumetric Analysis. Von Schlossberg. Zeits. anal. Chem., 1902, **41**, [12], 735—747.

The results of the author's experiments are given in the following statements:—

A.—(1) The amount of manganese in pure manganese salts can be volumetrically determined by converting the metal into the peroxide with alkaline hydrogen peroxide, reducing the latter with excess of acid hydrogen peroxide and titrating the excess with potassium permanganate.

(2) The presence of free hydrochloric acid is somewhat prejudicial, but if first entirely removed by evaporation, the above method can be applied.

B.—(1) The active oxygen in lead peroxide and in red lead can be volumetrically determined by hydrogen peroxide just as in the case of manganese dioxide.

(2) In the case of salts of lead, the metal must be converted to the peroxide by means of bromine and potassium hydroxide and then reduced by acid hydrogen peroxide.

(3) If copper salts are mixed with the lead salt, the latter is converted to peroxide as in B (2), separated, and then reduced.

(4) In all cases when lead occurs with salts of heavy metals, it may be separated as sulphate and subsequently oxidised and estimated as in B (2).—R. L. J.

INORGANIC—QUANTITATIVE.

Mercury; Electrolytic Determination of ——. [Platinum; Solubility of, in Potassium Cyanide.] [Mercury; Volatility of ——.] F. Glaser. Zeits. f. Elektrochem., 1903, **9**, [1], 11—17.

Bindschedler (Zeits. f. Elektrochem., 1902, **8**, 329) found that Neumann's method for the electrolytic determination of mercury in sulphuric or nitric acid solution gave satisfactory results, but that when the mercury was deposited from a potassium cyanide solution with a high current strength (0·6—1·0 ampère), the results obtained were invariably too low. The author has repeated and confirmed these results. No trace of the apparent deficit of about 20 mgrms. of mercury could be found in the electrolyte

Conditions.	Average decrease in weight per hour per sq. cm.	Remarks.
	Mgrms.	
I. Distilled mercury exposed to the air in a basin at ordinary room temperature	0·007	The basin containing the mercury was protected from draughts.
II. Film of electrolytically deposited mercury at ordinary temperature	0·002	Protected from draughts.
Do. do.	0·010	Exposed to a strong draught.
Do. at 30° C.	0·016	Exposed to the sun.
Do. at 35°—40	0·036	.. "
Do. at 40°	0·025	In drying chamber.
Do. at 50°	0·067	..
Do. at 60°	0·070	..
Do. at 80°	0·409	..
Do. at 100°	0·727	..
III. Film of electrolytically deposited mercury at ordinary temperature	0·0009	Exposed in desiccator over H_2SO_4.
IV. Distilled mercury exposed under water at 80° C.	0·0530	..
V. Film of electrolytically deposited mercury exposed under water at 80° C.	0·005	..

after electrolysis, and it was thought by Bindschedler that it must have been volatilised. Owing to the extensive use of mercury in technical processes and to the importance of the question at issue, further experiments on the rate of volatilisation of mercury under different conditions were undertaken. These showed clearly that although the rate of volatilisation of mercury was quite appreciable, it was altogether too insignificant to account for the apparent loss in the electrolytic determination.

The source of error was ultimately found to be in the solubility of platinum in the solution of potassium cyanide. Practically the whole of the mercury was deposited on the platinum cathode: the apparent deficit being due to the loss in weight of the electrode itself. At ordinary temperatures the solubility of platinum in potassium cyanide is very small. Increase of temperature promotes the solubility, as does also, to a very marked extent, the presence of potassium or sodium amalgam.

Gold and silver do not dissolve in cyanide solutions in an atmosphere of hydrogen or in the absence of oxygen, even in the presence of potassium amalgam. Platinum, on the other hand, not only dissolves under these conditions, but actually liberates hydrogen.

The accompanying table shows in condensed form the rate of volatilisation of mercury under different conditions.
—J. S.

Cobalt and Nickel Solutions: Behaviour of ——, at the Anode, during Electrolysis. [*Separation of Nickel and Cobalt*] A. Coehn and M. Gläser. Zeits. anorg. Chem., **33**, 9—24. Chem. Centr., 1903, **1**, [1], 2.

The author has examined the electrolytic decomposition of faintly alkaline, faintly acid, and strongly acid solutions of nickel and cobalt sulphates. Considerable differences are shown: in faintly acid solution, cobalt oxide is deposited at the anode at 1·52 volts, whilst nickel does not separate at all. A separation of the two metals is possible by this means, although the process does not appear to offer any advantages over the usual methods. The separation is expedited if potassium sulphate be added to the solution to increase its conductivity, and if the platinised platinum cathode be treated with a depolarising agent, *e.g.*, potassium bichromate. The solution is electrolysed hot, by the aid of a current kept within definite limits, till a new platinum gauze anode is not blackened by the separation of cobalt oxide. The anodes are frequently changed and are rinsed, and freed from cobalt in a solution of sulphuric acid containing sulphur dioxide. The cobalt sulphate solution obtained always contains some nickel, which has been carried down in the form of a solid solution by the cobalt oxide. By repeating the electrolysis, the cobalt can eventually be obtained free from nickel.

The method is suitable for the qualitative detection of cobalt in presence of nickel. The dilute solution of the neutral salts under examination is treated with potassium sulphate and some potassium bichromate, heated, and electrolysed between platinum wire electrodes for some minutes with a current of 2·3—2·4 volts. In presence of cobalt, a dark stain appears on the anode.—A. S.

Lead from Manganese: Separation of ——, by Electrolysis. A. F. Linn. Amer. Chem. J., 1903, **29**, [1], 82—84.

The metals are precipitated as phosphates; the precipitate is dissolved in an excess of phosphoric acid (sp. gr. 1·7), and the diluted solution electrolysed for 16—17 hours with a current of low density ($N.D._{100}$ = 0·003—0·006 ampère; E.M.F. 2·5—2·7 volts). There must not be more than 0·1 grm. of either metal present in 130 c.c. of the solution. The lead is deposited on the cathode as metal, which is then washed with water, absolute alcohol and ether, and dried at 110° C. A small quantity of manganic hydroxide is deposited on the anode.—M. J. S.

Perchlorates; Determination of ——. M. Honig. Chem.-Zeit., 1903, **27**, [4], 32—33.

Selckmann (this Journal, 1898, 275) has described a process for determining the perchlorate in sodium nitrate by reducing with lead and determining the chlorides before and after the reduction. The author has now tried oth metals, and finds that finely-divided iron (*ferrum limatun* is most to be recommended. From 5—10 grms. of th nitrate containing perchlorate (but not more than 5 p cent.) are melted in a nickel crucible placed over a sma flame. From 2—3 grms. of the iron are then introduced and stirred in with a glass rod. A watch-glass placed over the crucible to prevent loss by spirting, an the mixture is kept for half an hour, with occasion stirring, over a flame about 6 cm. high, which just touche the bottom of the crucible without bringing it to a appreciable red heat. After cooling, the mass is treate with water, the solution filtered, and the chlorine determined gravimetrically in the filtrate. Porcelain an platinum crucibles must not be used, the former becaus they are liable to crack, the latter because they ar attacked by the fused nitrate. The results quoted are goo If much more than 5 per cent. of perchlorate is pres in the nitrate, the mixture will glow on the addition of th iron. In this case the salt must be diluted with pur nitrate in sufficient quantity before commencing th analysis.—W. G. M.

Phosphoric Acid; Volumetric Determination of —— De Molinari. Ann. Chim. anal. appl., **7**, 405—407 Chem. Centr., 1903, **1**, [1], 56.

The solution, containing 0·1 grm. of substance, is heate to boiling with 10 c.c. of dilute nitric acid (1 of acid c sp. gr. 1·4 to 1 of water) and 10 c.c. of a saturate solution of ammonium nitrate diluted with its own volum of water. After 10 minutes, 20 c.c. of a 9 per cen solution of ammonium molybdate are added, and th precipitate filtered off and washed till free from acid. Th paper and precipitate are treated with an excess of standard solution of caustic potash, and the excess o alkali determined by titration with sulphuric acid, wit phenolphthalein as indicator.—A. S.

Phosphate Analysis; Simplification in ——. M. Passon. Zeits. angew. Chem., **16**, [3], 52—54.

In the analysis of Thomas meal and similar phosphat by standard methods, the author uses pipettes of 32 c.c and 64 c.c. capacity, where 5 grms. of substance are dissolve in 500 c.c. and 1,000 c.c. respectively. Each milligran of magnesium pyrophosphate weighed then corresponds t 0·1 per cent. of P_2O_5 in the substance examined, an calculation is avoided. The amounts of reagents, &c., use are of course altered in the same proportion as th quantity of substance taken by the pipette for analysis For greater accuracy of measurement, the author make the upper part of his pipettes of narrow-bore tube, th diameter of the bore, however, not being less than that o the lower opening of the pipette.—J. T. D.

Slag-Meal; Determination of Free Lime in [Basic Thomas ——. M. Bischoff. Chem.-Zeit., 1903, **27** [4], 33.

A discrepancy of nearly 100 per cent. between tw determinations of free lime in basic slag meal led to th discovery that when the slag is treated with a 10 per cent sugar solution by the Scheibler method, a quantity o carbonate passes into solution. It is therefore safer t extract the lime by shaking with water.—W. G. M.

ORGANIC—QUANTITATIVE.

[Gallo-] Tannic Acid; Quantitative Determination of —— by Ferric Salts. Ruoss. Zeits. anal. Chem., 1903, **41**, [12], 717—734.

After reviewing the methods for precipitating tannic acid especially those involving the use of metallic salts, the author gives a careful summary of the present knowledg of iron tannates in order to show that none of them hitherto described is sufficiently definite in composition t serve for the quantitative determination of tannic acid. By the use of a carefully prepared solution of ferric acetate, he has obtained a ferric tannate which is insoluble in hot o cold water, and in hot or cold normal acetic acid, has a pirical formula $(C_{14}H_7O_9)Fe$, and a definite iron content 14·9 per cent. (15 per cent. found). For quantitative poses the following solutions are required:—

1) Tannin solution, not stronger than 0·4 per cent.

2) One litre of N/2 sodium carbonate solution ·3625 grms. of crystallised carbonate).

3) One litre of N/2 iron solution made by dissolving e ferric sulphate (50 grms.) or the corresponding ount of ferric alum or ferric chloride.

4) One litre of acetic acid solution (sp. gr. 1·04) in ich 5 grms. of sodium tartrate are dissolved.

he relative strengths of (3) and (2) must be such that en equal volumes are mixed, the liquid is neutral to thyl Orange. The solutions should also answer the owing test. Mix 50 c.c. of water, 10 c.c. of the soda ation, and 10 c.c. of the iron liquor, and at once l 25 c.c. of the acetic acid. This mixture must remain ar and unchanged after boiling for five minutes.

pplication of the Method.—50 c.c. of the tannin solu- u, 10 c.c. of the soda, and 10 c.c. of the iron solution are xed in a 250-c.c. flask, and 25 c.c. of the acetic acid solu- u are at once added. The flask is vigorously shaken, the ntents boiled for one minute and filtered. The residue is shed with hot water until the washings are free from u (test with hydrochloric acid and potassium thio- nate), dried and ignited. Its weight, multiplied by $\frac{\cdot 22 \times 0\cdot7001}{56} = 4\cdot0243$, gives the weight of tannic acid m 50 c.c. of the solution.

Example.—Four grms. of air-dried tannic acid were ssolved in 1,000 c.c. of water. 50 c.c. gave 0·0432 grm. Fe_2O_3 = 86·91 per cent. of real tannic acid in the sample. By using different proportions of the above solutions, sic ferric tannates of varying composition were obtained, t if the directions given are adhered to, only a normal nnate is precipitated.—R. L. J.

ydroxylamine in Oximes and Phenylhydrazine in Hydrazones and Osazones; Rapid Method for the Determination of ——. S. Grimaldi. Staz. sperim. agrar. ital., **35**, 738—746. Chem. Centr., 1903, **1**, [2], 97.

HE method is based upon the fact that if an aqueous lution of an oxime, hydrazone, or osazone be heated with drochloric acid, one or more molecules of water are taken , and the aldehyde or ketone forming the basis of the mpound is re-formed, together with the corresponding droxylamine or phenylhydrazine, which latter neutralises equivalent amount of the acid. The oxime, &c., is ated in a flask having a long narrow neck, with 100 c.c. standard hydrochloric acid, warmed, and allowed to nd for about one hour on the water-bath, avoiding as far possible any loss of hydrochloric acid. The aldehyde ketone formed is separated, and may be weighed. The id solution is titrated with a very dilute (say N/100) lution of caustic soda, in order to determine the amount of id neutralised by the hydroxylamine and phenylhydrazine erated. In some cases, sulphuric acid may be used in ace of hydrochloric acid. The author has obtained good sults with this method in the case of methylnonylace- xime, benzoinoxime, quinonedioxime, piperonalhydrazone, ethylnonylphenylhydrazone, diamylphenylhydrazone, o- lylphenylhydrazone, phenylglucosazone, and phenyllac- sazone.—A. S.

Glycogen in Yeast; Determination of ——. J. Grüss. Woch. f. Brau., 1903, **20**, [1], 1—3.

HIS method, which is based on the absorption of iodine by ycogen, is carried out by weighing two lots of 2 to grms. of yeast into two stoppered flasks. To the contents one flask 100 c.c. of a 1 per cent. solution of iodine are lded, and after continued shaking, the volume is made up 175 c.c. The yeast in the second flask is kept for 24 urs at a temperature of 30° C. with a sufficiency of water. is then treated in a similar manner with 1 per cent. dine solution. When the yeast had settled in the flasks, to 20 c.c. of the supernatant liquid are titrated with dium thiosulphate of known strength, which is a measure the quantity of iodine absorbed by the glycogen of the ast. The difference between the amounts of iodine taken up corresponds to the content of glycogen. As a result of a series of determinations the author states that 1 per cent. of iodine is equivalent to 3·15 per cent. of glycogen. The control experiment of keeping the yeast at 30° C. for 24 hours is for the purpose of correcting for the absorption of iodine by bodies other than glycogen, the latter substance by this treatment being consumed by the yeast (starvation). If the amounts of glycogen are to be compared in several yeasts, the dry substance should be estimated, as the content of glycogen is influenced by moisture.—J. L. B.

Malt Analysis. Part I. J. Heron. J. Fed. Inst. Brewing, 1902, **8**, 666—677.

THE author discusses the objections which have from time to time been raised concerning the correction of 15 c.c. for the volume occupied by the grains in the determination of brewers' extract. With a malt, the grains of which occupy a volume of only 13 c.c., and giving also, say, an extract of 90 lb., the error will be − 0·34 lb. But as a matter of fact, he states that in the majority of cases the error does not amount to more than + or − 0·1 to 0·15—an amount which may be safely neglected. It is difficult to prevent the malt from "balling" when the wash is made in a flask; to avoid this and to obtain a more accurate figure for extract and specific rotatory power, the following process is suggested:—50 grms. of finely-ground malt are weighed into a suitably sized counterpoised copper beaker. 400 c.c. of water which has been heated to 72° C. is added so that the initial heat of the resulting mash may be 65° C. The mash is stirred and the temperature maintained at 65° to 66° C. for one hour. The beaker is removed from the water-bath, cooled to about 20° C., the contents well stirred, and washed into a flask graduated to 515 c.c., cooled to 15·5° C., made up to volume, shaken, and filtered. The specific gravity is taken at 15·5° C., and the extract is arrived at by subtracting 1,000 from the gravity and multiplying the remainder by 3·36.

The specific rotatory power of the mash is considered by the author to be a useful factor in the examination of a malt, as indicating the relative ratio of dextrin to maltose. A wort of $[\alpha]_D = 116$ shows a dextrin-maltose ratio of 1:3; such a value is usual for malts employed for pale and stock ales, whilst for mild and running ales, $[\alpha]_D$ is 110. When mixed grists are used, it will be found useful to make a preliminary mash with each of the malts, and to determine the specific rotatory power before using them in the brewery.

In determining the diastatic power, the temperature of the cold mash should be maintained at 15·5° C. for three hours. The colour of a malt is taken on the cold mash, using the Lovibond tintometer and the red and yellow series of glasses (510 and 200 series respectively).

The moisture is estimated on 3 to 5 grms. dried in a water-oven for three hours. The author considers a malt to be slack when it contains over 3 per cent. of water.—J. L. B.

Salicylic Acid [in Wines, &c.]; Notes on the Determination of ——. S. Harvey. Analyst, 1903, **28**, [322], 2—4.

THE author states that, after trying every published method, he has been compelled to fall back upon the well-known colorimetric process based upon the colour produced by persalts of iron in solutions of salicylic acid. Instead of the ferric chloride solution ordinarily employed, however, he uses a 1 per cent. solution of iron-alum, which is stated to possess the following advantages:—it is a much more delicate reagent than ferric chloride—aqueous solutions of salicylic acid containing 1 part per 1,000,000 giving a very distinct colour, which can be imitated—and the colour produced is purer and deeper, and much more permanent. The iron-alum solution if treated with a drop or two of dilute sulphuric acid per 100 c.c. will keep very well; 1 or 2 c.c. should be used for each test. For the separation of the salicylic acid, extraction with ether from a dilute sulphuric acid solution is preferable to distillation of an acid solution. Two successive extractions are sufficient. The ethereal solution is shaken out with two successive volumes of distilled water containing a known amount of N/10 or N/2 alkali; the aqueous solution is carefully neutralised and made up to 250 or 500 c.c. The liquid is very slightly coloured, if at all. The maximum amount of salicylic acid capable of being judged by the iron-alum test is a solution containing 1 mgrm. per 100 c.c. The presence of free alkali and of salts of the alkaline earths has a prejudical influence on the production of the colour. (See also this Journal, 1902, 1416.)—A. S.

Gluten, Moist, in Flour; Determination of the ——. M. Arpin. Ann. Chim. anal. appl., **7**, 416—420. Chem. Centr., 1903, **1**, [1], 61. (See this Journal, 1902, 1417 and 1560.)

The end point of the washing is of great importance. If the washing be continued after all the starch is removed, the loss, even after five minutes' further washing, amounts to 2·5 per cent. of moist or 0·9 per cent. of dry gluten.

The author concludes, from the results of his experiments, that the determination of the nitrogen-content is the only reliable method for the valuation of flour.—A. S.

Theobromine; Determination of ——, *in Cacao.* J. Decker. Pharm.-Zeit., **47**, [81], 798—799; and P. Welmans, *ibid.*, 858.

Decker states that the best solvents for theobromine are 95 per cent. alcohol, amylic alcohol, and especially boiling water. He proposes the following process for the determination of theobromine in "cocoa." Ten grms. of powdered cocoa are intimately mixed with 5 grms. of calcined magnesia and 300 c.c. of water. The mixture is boiled for an hour under a reflux condenser, filtered while hot, pressed, and the insoluble residue again boiled in the same manner with 150 c.c. of water. The mixed liquors are evaporated to dryness on the water-bath, the dry residue mixed with sand, and extracted three times in succession with 100 c.c. of chloroform in a reflux extractor: the chloroform is then distilled off, the residue dried at 100° C., and weighed. It consists of theobromine, caffeine, and a trace of inorganic impurity. The caffeine is removed by extraction with benzene, in which theobromine is insoluble; the residue is again weighed, and afterwards incinerated. The weight of ash thus found, deducted from that of the second weighing, gives the weight of theobromine. The mean yield of this is 1·7 per cent.

Welmans, in criticising the above process, points out that the extraction with water and with chloroform must be very thorough, since theobromine is only removed with difficulty, and the treatment must be repeated several times. Cocoa is frequently adulterated with powdered cacao husks; to detect the latter, it is necessary to determine the amount of pentosans present, and, in particular, that of the methylpentosans. The latter only exist in the integuments of the cacao beans, and are not present in the nucleus of the seed.

Basic Constituents of Cacao and Kola Leaves.—Decker finds that the fresh leaves of *Theobroma cacao* contain 0·55 per cent. of xanthine bases, chiefly theobromine. The dried leaves do not contain a trace of alkaloids. The leaves of *Sterculia kola* yield 0·15 per cent. of alkaloids, of which 0·101 per cent. is theobromine and 0·049 per cent. caffeine. In kola leaves, therefore, the amount of theobromine present is relatively greater than in the seeds.
—J. O. B.

Quinine Bisulphate; Examination of ——. C. Belloni. Boll. Chim. Farm., **41**, 748. Chem. Centr., 1903, **1**, [1], 62.

The author has simplified Carlinfanti's method (this Journal, 1901, 1031) in the following manner:—About 5 grms. of the quinine bisulphate are dissolved in 40—50 c.c. of alcohol at a temperature of 40°—50° C., and a small excess of a cold saturated solution of the purest barium hydroxide added, *viz.*, till the solution reacts faintly alkaline to litmus paper. After allowing to stand for some time at about 50° C., the solution is filtered, evaporated to dryness on the water-bath, and the residue treated according to Carlinfanti's process.—A. S.

Camphor in Camphorated Oil; Determination of —— Pharm. Centralh., 1902, 610. Pharm. J., 1903, **70** [1697], 2.

The amount of camphor in camphorated olive oil may b determined by means of the polarimeter. A 1 per cent. solution of camphor in olive oil gives a rotation of +1 in 200-mm. tube in a Schmidt and Haensch polarimeter, and th slight optical activity of the olive oil may be disregarded The method cannot be used with oils (*e.g.*, rape, sesamé, an mineral oils) which have a greater optical activity.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES

Rare Earth Metals: Activity of Salts of the ——, *i inducing Oxidation.* A. Job. Comptes Rend., **136**, [1 45—47.

The author has extended his experiments on this subje (this Journal, 1902, 795) to other salts of cerium than th carbonate. Cerous acetate, though very stable in solution *per se*, causes the oxidation of quinol (hydroquinone solution when the mixed solutions are shaken with air, eve more rapidly than Bertrand has shown to be the case wit manganese acetate, a less stable and more readily oxidisable salt. The analogous action of the two salts is explaine when it is remembered that both metals form peroxides and similar behaviour in the case of any other metal ma perhaps be taken as evidence of the existence of a peroxid of that metal, though such a peroxide may not have bee isolated. Lanthanous acetate behaves in this way; a though it is very doubtful whether the precipitate obtaine by Clève when hydrogen peroxide and ammonia were adde to a lanthanum salt is really a peroxide, the author experiments lend probability to the view that lanthanu peroxide will eventually be isolated.—J. T. D.

Manganese Silicides. P. Lebeau. Comptes Rend., 190 **136**, [2], 89—92.

The author has prepared and studied two silicides o manganese, $SiMn_2$ and SiMn. They are formed by the action of manganese upon copper silicide, and two method are available for their preparation. According to the first an alloy of copper and manganese is fused for a short tim in the electric furnace with silicon. The alternative proces consists in heating a mixture of potassium fluosilicate manganese oxide, Mn_3O_4, metallic copper, and sodium. Th relative proportions of manganese and silicon employe determine which of the two silicides is produced. Th latter are regarded as definite stages of chemical equilibrium in the elementary system, copper, manganese, an silicon. Both silicides are well-crystallised bodies; SiMn i harder than $SiMn_2$.

$SiMn_2$ is soluble in hydrochloric acid, but is not attacke by nitric acid; it is slowly decomposed by dilute alkalis.

SiMn is only very slightly attacked by boiling concentrated hydrochloric acid, but is readily decomposed b halogens and by gaseous hydracids. Carbon reacts wit the fused silicide, forming carbon silicide and manganese silicon yields a fused product consisting of a higher silicid containing free silicon in solution.—J. F. B.

Magnesia and Zinc Oxide; Determination of Solubilit of ——, *in Water, by the Electrical Conductivity Metho* Dupré and Bialas. Zeits. angew. Chem., **16**, [3], 54—55

The purest obtainable materials were shaken with air-fre distilled water for some time, and the conductivity of th solutions determined by the method of Kohlrausch an Holborn. The distance apart of the plates in the resistanc cell was regulated by a micrometer screw; and the cel was immersed in water (kept in motion by motor-drive vanes on a rotating shaft) contained in a double-walle vessel. The constants of the cell were determined with th help of a saturated solution of sodium chloride. The result (after allowing for the conductivity of the distilled water separately determined) gave as the concentrations of th solutions: Magnesia, 1 in 172,000; zinc oxide, 1 i 236,000. Gravimetric determination by precipitation a zinc sulphide gave for the solubility of zinc oxide 1 i 217,000 (all measurements at 18° C.).—J. T. D.

monia and Amines; Oxidation of ——, by Catalytic ction. A. Trillat. Comptes Rend., **136**, [1], 53—56.

MIXTURE of air, water vapour, and the vapour of the ine, containing about 5 per cent. of the latter, was sed over a red-hot platinum spiral, in the apparatus ich the author has previously used for similar experi- nts on alcohols (this Journal, 1901, 847). Ammonia lded nitrite, nitrate (probably through secondary oxida- n of the nitrite), and little or no free nitrogen. Fatty ines behaved as though they were first hydrolysed $.NH_2 + H.OH = R.OH + NH_3$), and the ammonia and ohol were then oxidised independently. Tertiary amines re much less readily acted on than primary or secondary. iline was unaffected, but dimethylaniline apparently arated a methyl group which oxidised to formaldehyde; s condensed with the residue of the amine and with other molecule of dimethylaniline to form a base of constitution $(CH_3)_2.N.C_6H_4.CH_2.C_6H_4.NHCH_3$.
—J. T. D.

emi-celluoses; A Contribution to the Knowledge of ——. E. Schulze and Castoro. Zeits. physiol. Chem., **37**, 40—53. Chem. Centr., 1903, **1**, [1], 18.

HE cotyledons of lupin seeds contain cell-wall constituents, hich are easily soluble in dilute mineral acids, and are nown as hemi-celluloses. The seeds of *Lupinus hirsutus* ontain a considerable quantity of such material. After emoval of the fat from the disintegrated seeds and eparation of the protein substances by means of caustic oda, a powder is obtained resembling starch flour, and ontaining about 90 per cent. of hemi-celluloses. It ontains 14·02 per cent. of araban and 53·34 per cent. f galactan. By hydrolysis with 2 per cent. sulphuric acid, *l*-galactose and *l*-arabinose are produced. By the action f gastric juice, reducing sugars are produced in quantities orresponding with the amount of hydrochloric acid ontained in the gastric juice. No carbohydrates are roduced by the action of ptyalin, pancreatin, diastase, and akadiastase, but from 15 to 40 per cent. of the hemi- elluloses are dissolved. In the germination process, the emi-celluloses play the part of a reserve carbohydrate, ust as starch does in the case of other plants.—A. S.

CARNEGIE RESEARCH.

THE IRON AND STEEL INSTITUTE.

Andrew Carnegie Research Scholarship.

A research scholarship or scholarships, of such value as nay appear expedient to the Council of the Iron and Steel nstitute from time to time, founded by Mr. Andrew Carnegie (President), will be awarded annually, irrespective of sex or nationality, on the recommendation of the Council of the Institute. Candidates, who must be under 35 years of age, must apply on a special form, before the end of February, to the Secretary of the Institute.

The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students, who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and allied subjects, with the view of aiding its advance or its application to industry. There is no restriction as to the place of research which may be selected, whether university, technical school, or works, provided it be properly equipped for the prosecution of metallurgical investigations.

The appointment to a scholarship shall be for one year, but the Council may at their discretion renew the scholarship for a further period instead of proceeding to a new election. The results of the research shall be communicated to the Iron and Steel Institute in the form of a paper to be submitted to the annual general meeting of members, and if the Council consider the paper to be of sufficient merit, the Andrew Carnegie gold medal shall be awarded to its author. Should the paper in any year not be of sufficient merit, the medal will not be awarded in that year.

INTERNATIONAL ATOMIC WEIGHTS.

ABSTRACT OF THE REPORT OF THE COMMITTEE.

Proc. Chem. Soc., **19**, [259], 2—4.

[*See Table enclosed in this Journal for Jan.* 15, 1903.]

The International Committee reports that, regarding the fact that opinion " seems to be somewhat evenly divided on the question of standards (oxygen or hydrogen), to force the adoption of either appears to be impossible, and for some time to come both are likely to be employed. Experience must be the final arbiter," that standard best serving to co-ordinate chemical and physical knowledge being ultimately chosen.

This table in most of its details, is identical with that which was reported on by the previous Committee at the beginning of 1902 (Ber., 1902, **35**, [1]). Some changes, however, have, in the judgment of the present Committee, become necessary, and these are briefly indicated.

Antimony.—The true number being in doubt, the Committee recommend the average number, Sb = 120·2 (O = 16).

Germanium.—72·5 is more nearly in accord with Winkler's determinations than the former number, 72.

Hydrogen.—The error in the former number, 1·01 (O = 16), being too large, 1·008 is adopted.

Lanthanum.—The average of the two numbers, 138·77 and 139·04, obtained by Jones and Brauner and Pavlicek respectively, *viz.* 138·9, is chosen.

Cerium.—This choice influences the Committee's judgment as regards cerium, and Brauner's number is adopted, Ce = 140.

Mercury.—Hardin's most recent measurements have had great weight attached to them, and, regarding other determinations also, the value Hg = 200 is adopted.

Palladium.—A mean value between those of the best determinations is Pd = 106·5, and is provisionally adopted.

Selenium.—79·1 probably too low. Giving weight to the newer measurements, the Committee writes Se = 79·2.

Tin.—Former value, 118·5, almost certainly too low. Determinations of Bongartz and Classen, which seem to be the best, make Sn = 119.

Uranium.—238·5 adopted (Richards and Merigold).

Zirconium.—Zr = 90·6 "apparently the most probable."

The table (enclosed in the pages of the previous number of this Journal) represents both standards of atomic weight. (*See page* 126.)

New Books.

EVAPORATING, CONDENSING, AND COOLING APPARATUS. EXPLANATIONS, FORMULÆ, AND TABLES FOR USE IN PRACTICE. By E. HAUSBRAND. Translated from the second revised German edition by A. C. WRIGHT, M.A., B.Sc., formerly Assistant-Lecturer and Demonstrator in Chemistry at the Yorkshire College, Leeds. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1903. Price 10*s.* 6*d.*; India and Colonies, 11*s.*; other countries, 12*s.* nett, post free.

THERE are in this work 21 illustrations and 76 tables. The general character of the subject and its method of treatment will be gathered from the following subdivisions of the text:—I. The Coefficients of Transmission of Heat, k, and the Mean Temperature Difference, θ_m. II. Parallel and Opposite Currents. III. Apparatus for Heating with Direct Fire. IV. The Injection of Saturated Steam. V. Superheated Steam. VI. Evaporation by Means of Hot Liquids. VII. The Transference of Heat in General and Transference by Means of Saturated Steam in Particular. VIII. Transference of Heat from Saturated Steam in Pipes (Coils) and Double Bottoms. IX. Evaporation in a Vacuum. X. The Multiple-Effect Evaporator. XI. Multiple-Effect Evaporators, from which Extra Steam is taken. XII. The Weight of Water which must be Evaporated from

100 kilos. of Liquor in order to bring its Original Percentage of Solids from 1 = 25 per cent. up to 20 = 70 per cent. XIII. The Relative Proportion of the Heating Surfaces in the Elements of the Multiple Evaporator and their Real Dimensions. XIV. The Pressure Exerted by Currents of Steam and Air upon Floating Drops of Water. XV. The Motion of Floating Drops of Water, upon which Press Currents of Steam. XVI. The Splashing of Evaporating Liquids. XVII. The Diameter of Pipes for Steam, Alcohol, Vapour, and Air. XVIII. The Diameter of Water Pipes. XIX. The Loss of Heat from Apparatus and Pipes to the Surrounding Air, and Means for Preventing the Escape. XX. Condensers. XXI. Heating Liquids by Means of Steam. XXII. The Cooling of Liquids. XXIII. The Volumes to be Exhausted from Condensers by the Air Pumps. XXIV. A Few Remarks on Air Pumps and the Vacua they Produce. XXV. The Volumetric Efficiency of Air Pumps. XXVI. The Volumes of Air which must be Exhausted from a Vessel in order to Reduce its Original Pressure to a Certain Lower Pressure.

The Principles of Leather Manufacture. By H. R. Procter, F.I.C., F.C.S.; Professor of Leather Industries at the Yorkshire College, Leeds; Past President of the International Association of Leather Trades Chemists. E. & F. N. Spon, Ltd., 125, Strand, London. 1903. Price 18s. nett. Spon and Chamberlain, 123, Liberty Street, New York.

The following is a synopsis of the leading subjects treated of in the work:—I. Early Methods of Leather Manufacture: Methods of Production of Leather; Vegetable and Combination Tannages, &c. II. Introductory Sketch of Leather Manufacture. III. The Living Cell. IV. Putrefaction and Fermentation. V. Antiseptics and Disinfectants. VI. Origin and Curing of Hides and Skins. VII. Structure and Growth of Skin. VIII. Chemical Constituents of Skin. IX. Physical Chemistry of the Hide-Fibre. X. Water as used in the Tannery. XI. Soaking and Softening of Hides and Skins. XII. Depilation. XIII. Deliming, Bating, Puering, and Drenching. XIV. Alum Tannage, or Tawing. XV. Iron and Chrome Tannages. XVI. Principles of the Vegetable Tanning Processes. XVII. Combination of Vegetable and Mineral Tannages. XVIII. Vegetable Tanning Materials. XIX. Chemistry of Tanning. XX. Sampling and Analysis of Tanning Materials. XXI. Grinding of Tanning Materials. XXII. Extraction of Tanning Materials and the Making of Extracts. XXIII. Fats, Soaps, Oils, and Waxes. XXIV. Oil Tannages, and the Use of Oils and Fats in Currying. XXV. Dyes and Dyeing. XXVI. Evaporation, Heating, and Drying. XXVII. Construction and Maintenance of Tanneries. XXVIII. Waste Products and their Disposal. Appendix A. Method of the International Association of Leather Trades Chemists for the Analysis of Tanning Materials. B. The Decimal System. C. Method of Analysis of Tanning Materials of the American Association of Official Agricultural Chemists. D. Lists of Coal Tar Dyes suitable for Dyeing and Staining Leather. There are 101 illustrations.

Patent Office Library Series, No. 11. Bibliographical Series, No. 8. Subject List of Works on General Science, Physics, Sound, Music, Light, Microscopy, and Philosophical Instruments in the Library of the Patent Office. Darling and Son, Ltd., 34—40, Bacon Street, London, E. Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1903. Price 6*d*.

The subject list consists of two parts: (*a*) A general alphabet of subject headings, with entries, in chronological order, of the works arranged under these headings; (*b*) a key or a summary of these headings shown in class order. Under each of these headings the searcher will find entries of all works in the Library which are exclusively devoted to the subject of that heading.

Trade Report.

I.—GENERAL.

Certificates of Origin in Turkey.

Bd. of Trade J., Jan. 27, 1903.

A telegram has been received from H.M. Embassy a Constantinople, stating that certificates of origin will b required by the Turkish Customs officials in respect of al foreign goods imported into Turkey after March 15.

British Trade in 1902.

Bd. of Trade J., Jan. 15, 1903.

The following table shows the value of some of th imports from foreign countries and British possessions, fo the 12 months ended the 31st Dec. last, as compared wit the corresponding periods of the two previous years:—

——	Metals.	Chemicals, Dyestuffs, and Tanning Substances.	Oils.
	£	£	£
12 months ended Dec. 31, 1900	33,195,391	5,560,793	11,033,8
„ „ 1901	30,788,008	6,129,498	11,019,677
„ „ 1902	30,361,902	6,123,062	11,442,373
Increase (+) or decrease (−) in 1902 as compared with 1901.	− 426,106	+ 3,561	+ 422,6
Increase (+) or decrease (−) in 1902 as compared with 1900.	−2,833,489	+ 572,269	+ 409,05

The value of the exports of chemical products durin the 12 months of 1902, as compared with like period of 1901 and 1900, is as shown in the subjoined table:—

	£
12 months ended Dec. 31, 1900	9,262,519
„ „ 1901	8,955,514
„ „ 1902	9,586,728

Algeria: Customs Regulations.

Dépêche Coloniale: through Bd. of Trade J., Jan. 15, 1903.

The following tariff of municipal "octroi-de-mer" dutie came into force in Algeria on the 1st Jan., and will remai in operation for the current year:—

Article.	Duty.			English Equivalents.	
		Frs.	Cts.		£ s. *d*
Glucose	100 kilos.	10	00	Cwt.	0 4 0
Sugar, raw, and "vergeoises"	100 „	15	00	„	0 6 1
„ refined	100 „	20	00	„	0 8 2
Mineral oils	100 „	5	00	„	0 2 0
Alcohol, pure, contained in alcoholic distilled waters, alcoholic perfumery, and all other products containing an admixture of alcohol.	Hectolitre	50	00	Gall.	0 1 10
Beers	„	5	00	„	0 0 2

III.—TAR PRODUCTS, PETROLEUM, Etc.

Asphalt Mastic: U.S. Customs Decision.

On Dec. 30, 1902, the Board of General Appraisers hel that asphalt mastic was properly dutiable at 3 dols. a ton a "asphaltum advanced in any manner" under paragraph 9 of the Tariff Act of 1897, and not at 50 cents a ton a "limestone rock asphalt, containing less than 25 per cent of bitumen."—R. W. M.

Crude Carbolic Acid: U.S. Customs Decision.

n Dec. 30, 1902, the Board of General Appraisers held crude carbolic acid, used only for the manufacture of bolic acid, was free of duty under paragraph 473 of Tariff Act of 1890, following a decision of the Court to effect.—R. W. M.

Petroleum Tar: U.S. Customs Decision.

he Board of General Appraisers in a published decision, . 15, 1903, held that certain crude petroleum tar from ada, obtained as a by-product in the manufacture of intsch gas," was dutiable at 5 cents a gallon, the rate posed by the Dominion of Canada on crude petroleum ported from the United States.

The claim of the importers that it was free of duty as osote oil under paragraph 524 of the Tariff of 1897 was rruled.—R. W. M.

IV.—COLOURING MATTERS, Etc.

Alizarine Lakes: U.S. Customs Decision.

Following a decision of the United States Circuit Court d a published decision of the Board, G.A., 5215, the Board General Appraisers, Jan. 15, 1903, held that Alizarine kes imported under the Tariff Act of 1894 and prior to t of 1897, were free of duty under paragraph 368, as zarine colours.

The present practice is governed by the provisions of the t of 1897, which levies a duty of 30 per cent. *ad valorem* lakes, and exempts from duty dips derived from zarine or anthracene.—R. W. M.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Imitation Silk Yarns: U.S. Customs Decision.

Imitation silk yarns produced from cotton by solution, awing into threads and precipitation, and used in the eaving of a fabric known as "nearsilk," were held by the oard of General Appraisers in a published decision . A. 5257), Jan. 13, 1903, to be dutiable by similitude at per cent. *ad valorem* under paragraph 385 of the Tariff 1897.

The claims of the importers that they were dutiable as tton were overruled on the grounds that they had, by the rocess of manufacture, lost their identity as cotton although ade from this material, and more closely resembled silk an any other textile.—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

"Barium Shades": U.S. Customs Decision.

On Dec. 29, 1902, the Board of General Appraisers held hat certain "barium shades" for use in connection with oentgen ray apparatus were dutiable at 2 and $1\frac{1}{2}$ cents er pound and 15 per cent. *ad valorem* under paragraph 398 f the Tariff Act of 1897, as surface-coated paper, and not t 35 per cent. *ad valorem* under paragraph 407.

This decision follows a published decision of the Board, . A. 5009, in which it was held that paper coated with arium platinum cyanide crystals was dutiable as above ecided.—R. W. M.

Review of the Market for Sulphate of Ammonia during 1902.

Bradbury and Hirsch.

The production of ammonia calculated as sulphate of mmonia (including that used in the ammonia-soda and ther chemical processes) from all sources in the United Kingdom during 1902, is shown in the following table, ogether with the corresponding figures for previous years.

Of the total production during 1902, it is estimated that England contributed 145,000; Scotland, 74,000; and Ireland, 2,500 tons.

—	1897.	1898.	1899.	1900.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Gas works	133,000	130,000	134,000	142,000	143,000	146,500
Iron works.....	18,000	17,700	18,000	17,000	16,500	17,500
Shale works....	37,000	37,300	38,500	37,000	40,000	38,000
Coke and carbonising and producer gas establishments.	10,000	11,500	15,000	17,000	18,000	19,500
	198,000	196,500	205,500	213,000	217,500	221,500

—A. S.

Phosphates; Algerian.

Dépêche Coloniale, Jan. 7, 1903; *through Board of Trade J., Jan.* 22, 1903.

From the phosphate workings of Tebessa, 274,980 tons of phosphates were exported in 1902, being an increase of more than 48,000 tons as compared with 1901, and of 18,500 tons compared with 1899, hitherto the most prosperous year.

X.—METALLURGY.

Copper and Tin Supplies.

Engineering, Jan. 23, 1902.

Merton's statistics show that during 1902 the supply of copper was unequal to the demand, hence the visible supply has diminished, and stands at 16,540 tons.

The figures of the supplies of copper during the last three years are as follows:—

Received from	1902.	1901.*	1900.
	Tons.	Tons.	Tons.
All sources............	258,551	227,921	280,337
U. S. only.............	168,114	94,670	161,209

* The abnormal figures of 1901 are due to the action of the American Copper Combine in restricting the output, so that they do not afford a fair comparison.

The tin trade has been somewhat similar to that in copper, as the supplies have been inadequate to the demands, the visible stock, as a consequence, having diminished.

The figures are:—

—	1902.	1901.	1900.
	Tons.	Tons.	Tons.
Supplies	73,889	72,635	66,911
Deliveries.............	75,805	69,508	68,948

—T. F. B.

Notes on an Iron Property near Tunis.

A. J. McInerny. Paper read before the Inst. of Mining and Metallurgy, Jan. 15, 1903.

This property, termed by the Arabs "The Mountains of Iron," is situated in Tunisia about 108 miles to the southwest of Tunis. The outcrops of iron ore cover an area of 50,000—60,000 sq. m., and a thickness of at least 14 m. has been proved in two places. The ore (limonite with a certain mixture of spathic ore) consists of crystallised brown iron ore containing a considerable amount of manganese. Two samples of the ore gave the following figures on analysis:—Peroxide of iron, 75·36 and 86·60; protoxide of manganese, 10·40 and 6·20; sulphur, 0·082 and *nil*; arsenic, 0·018 and trace; phosphorus, 0·034 and 0·109; silica, 2·90 and 1·10; and water and carbonic acid, undetermined and 5·85 per cent. The cost of winning the ore should not exceed Fr. 1 per ton. The mine permit or licence covers a superficies of about 2,000 acres. The author discusses the question of cost of carriage of the ore to the coast, and estimates that the total cost of the ore f.o.b. Tunis would be Fr. 8·34, whilst its value would be Fr. 11·34 per ton.—A. S.

THE CANADIAN NICKEL INDUSTRY.

Engineering, Jan. 9, 1903, 48.

The International Nickel Company, formed with a capital of 8,000,000*l.*, has acquired some of the large nickel-producing companies of Canada, and has also entered into an arrangement with regard to prices, production, and the division of markets, with the French Soc. de Nickel, who own the other extensive nickel producing mines in New Caledonia. Not more than one-fourth of the known deposits in the extensive Sudbury region of Canada has, however, passed into the possession of the new combination. The Canadian Copper Company, which has been consolidated with the International Nickel Company, opened up, last year, an extensive deposit of nickeliferous pyrrhotite and copper pyrites in the township of Snider, 12 miles from their main property at Copper Cliff, Ontario. At the present time the surface plant is producing 500—600 tons of ore daily, of which the average assay value is stated to be less than 2 per cent. of copper and over 7 per cent. of nickel. Of the companies outside the combination, the Mond Nickel Company at Victoria has made considerable progress during the past year, and at the present time 125 to 150 tons of ore are being treated daily. The matte produced contains about 80 per cent. of metallic contents, in equal proportions of nickel and copper. It is refined at the Swansea works of the company in Wales.

During the past 10 years 1,306,722 tons of nickel-copper and copper ore, yielding 26,606 tons of metallic nickel, and 28,070 tons of metallic copper, have been produced in Ontario, the value of the nickel being over 4,000,000*l.*, and that of the copper over 1,250,000*l.* The rate of development has been very much greater during the last five years than in the first half of the decade. Thus, between 1897 and 1901 the amount of ore raised per annum increased from 93,155 to 326,945 tons, whilst in the preceding five years the increase was only from 70,349 to 93,155 tons. In the following table is shown the progress of nickel-copper mining in Ontario during the period 1897 to 1901. The values given are based, not on the ultimate selling price of the material after it has been finally treated (except where such final treatment has taken place in Canada), but represents the value of the material in the condition in which it is exported :—

——	1897.	1898.	1899.	1900.	1901.
	Tons.	Tons.	Tons.	Tons.	Tons.
Ore raised	93,155	123,920	203,118	216,695	326,945
„ smelted..........	96,093	121,924	171,230	211,960	270,380
Ordinary matte produced.	13,706	21,101	19,109	23,336	295,588
High-grade matte produced.	328	..	106	112	15,516
Nickel contents......	1,999	2,783¾	2,872	3,540	4,441
Copper „	2,750	4,186¾	2,834	3,364	4,197
	Dols.	Dols.	Dols.	Dols.	Dols.
Value of nickel.......	359,651	514,220	526,104	756,626	1,859,970
„ copper	209,967	268,080	176,326	319,681	589,080
Wages paid	253,226	315,501	443,879	728,946	1,015,889
Men employed	[illegible]	637	839	1,444	2,284

—A. S.

XII.—FATS, OILS, Etc.

"DÉGRAS": U.S. CUSTOMS DECISION.

Certain merchandise classified for duty as "dégras," under paragraph 279 of the Tariff Act, 1897, was held by the Board of General Appraisers, Jan. 6, 1903, to have been properly assessed for duty at ½ cent per lb. The claim of the importer that it was free of duty under paragraph 568, as grease fit only for stuffing and dressing leather, was not supported by evidence, and a chemical analysis showed that it was in fact "dégras" made from wool grease.—R. W. M.

XIII. B.—RESINS, VARNISHES, Etc.

RESIN.

Paper Makers' Monthly Journal, Jan. 15, 1903.

Common resins are most in request by exporters. Papermakers' grades have ruled firmer, and values are likely to further advance. Soapmakers' fine and medium qualities have been steady but quiet. Stocks of all resins at the shipping ports in America show a decrease of over 14 per cent. as compared with last year's holdings, the port of Wilmington shipping only common resin, showing a holding of 26·934 barrels, as against 41,326 barrels in 1902, or about 32 per cent. decrease. During the past year all resins have gradually increased in values, owing to decrease in production in America and to continued heav consumptive demand. The stocks of resins by the en of the present season (31st March) will be much smalle than for many years past. There seems to be n likelihood of any serious stoppage of demand for some ti to come. Importations for the past three years of America resins to London were as follows: 115,401 barrels in 19 124,796 barrels in 1901, and 122,045 in 1900.

GUTTA-PERCHA FUSE: U.S. CUSTOMS DECISION.

Fuses composed mainly of gutta-percha were held by th Board of General Appraisers in a published decision (G 5258), Jan. 13, 1903, to be dutiable at 35 per cent. *ad* under paragraph 450 of the Tariff of 1897, providing manufactures of gutta-percha.

The claim of the importers that the goods were dutia at 30 per cent *ad val.* under paragraph 121 as fulminat fulminating powder, and like articles, was overruled.

—R. W. M.

VULCANISED RUBBER WASTE: U.S. CUSTOMS DECISIO

Turnings, shavings, and small unused pieces of vulcani rubber, the result of manufacturing various articles, w decided by the Board of General Appraisers, Jan. 10, 19 to be dutiable at 10 per cent. *ad val.* under paragraph of the Tariff of 1897, and not free of duty under paragr 579, as old scrap or refuse india-rubber, worn out by and fit only for remanufacture.—R. W. M.

GUTTA-PERCHA, SO-CALLED: U.S. CUSTOMS DECISIO

On Jan. 9, 1903, the Board of General Appraisers that a certain product obtained from the dichopsis-g tree containing resins and hydrocarbons and obtained the juice by solvents and subsequent purification, dutiable at 20 per cent. *ad val.* under section 6 of Tariff of 1897, as a manufactured article, unenumer The claim of the importers that it was free of duty u paragraph 548 as a crude gum, gum resin or drug, or crude gutta-percha, was overruled.—R. W. M.

XIV.—TANNING; LEATHER; GLUE, F

VALONIA; REPORT ON.

Robinson and Hadwen. Chem. Trade Jour., Jan. 17,

The 1902 crop will not exceed 55,000 to 60,000 The stocks in Smyrna and interior were reported at th of September to be about 10,000 tons, making a to about 65,000 to 70,000 tons, against the 1901 cr 65,000 tons, and 20,000 old 1899 and 1900 season's This shows a deficiency of about 15,000 tons. Th can be said proportionately of the Greek crop, althou quality of the latter is far superior to that of 1901. to the above position, shippers not only anticipate a re in present prices, but higher rates than those ruling the early part of 1902.

XVI.—SUGAR, STARCH, Etc.

SUGAR LAW; NEW ITALIAN.

Bd. of Trade J., Jan. 15, 1903.

In accordance with the terms of a Royal Decree, of the New Law which relates to the drawbacks of granted on products containing sugar when exported came into force on the 1st inst., and Article 4, whi vides that the molasses sent out by the manufactor exempt from the tax of manufacture on condition th have less than 63 per cent. of purity, and as such into consumption, and further, that the extraction o m the molasses is subject to the tax, will come into force the 1st July next. (See this Journal, 1902, pp. 1164—65.)

XVII.—BREWING, WINES, SPIRITS, Etc.

Alcohol; Duty on: French Customs Decision.

Bd. of Trade J., Jan. 22, 1903.

A French Presidential Decree has been issued, suppress-g, as from the 1st January, the sea-octroi duty leviable Algeria on denatured alcohol.

odifications in Internal Taxation of Alcohol.

Bd. of Trade J., Jan. 22, 1903.

The following Decrees affecting the internal taxation of ohol in Algeria came into force on Jan. 1st:—

1. The tax on denaturation of 2 francs 40 cents per ctolitre of pure alcohol is abolished and replaced by a tistical duty of 0 francs 25 cents per hectolitre.

2. The consumption tax is increased by 1 franc per hecto-re of pure alcohol.

3. A bonus of 9 francs per hectolitre of pure alcohol ll be granted on alcohol submitted for denaturation cording to the prescribed formula.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an erisk is affixed. The dates given are (i) in the case of Applica-ns for Patents, the dates of application, and (ii) in the case of mplete Specifications Accepted, those of the Official Journals which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to spection at the Patent Office immediately, and to opposition thin two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 1260. Sturgess. Filters. Jan. 19.
,, 1298. Stade. Apparatus for evaporating liquids. Jan. 19.
,, 1322. Imray (Act.-Ges., vorm. Oppenheim and Co., and Schlesinger and Co.). Grinding machines. Jan. 19.
,, 1336. Marks (Chapman). Filtering apparatus.* Jan. 19.
,, 1375. Brayshaw and Lehmann. Cooling of liquids. Jan. 20.
,, 1397. Stanton. Condensing apparatus.* Jan. 20.
,, 1607. Bom. Grinding and mixing mills. Jan. 22.
,, 1609. Southey. Apparatus for delivering measured quantities of fluid. Jan. 22.
,, 1810. Leslie. Recovery and utilisation of waste gases. Jan. 26.
,, 1922. Salomon and Meyer. Cleansing beer and like pipes.* Jan. 27.
,, 1982. Bates. Kilns, ovens, furnaces, &c. Jan. 27.
,, 2041. Revill. Funnels.* Jan. 28.
,, 2248. Westaway. Drawing off liquids from barrels, &c. Jan. 30.
C.S.] 2697 (1902). Hooper. Gas or vapour separators. Feb. 4.
,, 4190 (1902). Hook. Filters. Feb. 4.
,, 4470 (1902). Hird. Filters. Jan. 28.
,, 6285 (1902). Lüffler. Filters. Jan. 28.
,, 9705 (1902). Legg. Apparatus for mixing definite quantities of one liquid with another. Jan. 28.
[C.S.] 10,896 (1902). Junghans. Method of drying. Feb. 4.
,, 14,328 (1902). Marks (Blanc). Separating apparatus. Feb. 4.
,, 19,644 (1902). Elster. Filter. Feb. 4.
,, 20,271 (1902). Broadbent. Crushing apparatus. Feb. 4.
,, 20,742 (1902). Baughman. Drying apparatus. Jan. 28.
,, 24,780 (1902). Lake (United States Distillation Co.). Distillation process and apparatus. Jan. 28.
,, 25,553 (1902). Ohlsson. Centrifugal separators. Jan. 28.
,, 26,411 (1902). Timar. Storage of heat by means of liquefied salts. Feb. 4.

II.—FUEL, GAS, and LIGHT.

[A.] 1592. Meyer and Roeder. Converting peat or turf into artificial coal. Jan. 22.
,, 1602. Elworthy and Williamson. Manufacture of gas. Jan 22.
,, 1659. Johnston. Production of gas from coal tar, &c. Jan. 23.
,, 1994. Johns. Manufacture of producer gas. Jan. 27.
,, 2062. Hooker. Gas apparatus. Jan. 28.
,, 2267. Stacey and Matthews. Manufacture of gas.* Jan. 30.
,, 2283. Gaze. Illuminating gas.* Jan. 30.
[C.S.] 4779 (1902). Browning and Musgrove. Manufacture of briquettes. Feb. 14.
,, 5954 (1902). Lewis. Calcium carbide cartridges. Feb. 4.
,, 7618 (1902). Law and Law. Machines for producing acetylene gas. Feb. 4.
,, 11,268 (1902). Hartley. Incandescent gas mantle, fork, clip, and holder. Jan. 28.
,, 22,016 (1902). Reif and von Reibnitz. Manufacture of plastic objects from peat, &c. Feb. 4.
,, 25,425 (1902). Grzybowski. Carburetting of gas. Jan. 28.
,, 26,697 (1902). De Hoffmann. Lighting of combustible materials. Feb. 4.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 1536. Thomson. Purification of hydrocarbon oils. Jan. 22.
,, 1659. Johnston. *See under* II.
,, 2377. Lingner. Manufacture of useful products from wood tar. Jan. 31.
[C.S.] 28,595 (1902). Thompson (Glock). Purification and concentration of pyroligneous acid. Feb. 4.

IV.—COLOURING MATTERS and DYESTUFFS.

[A.] 1326. Imray (Meister, Lucius und Brüning). Manufacture of phenylglycine orthocarboxylic acid. Jan. 19.
,, 1327. Imray (Meister, Lucius und Brüning) Manufacture of sulphurised dyestuffs dyeing unmordanted cotton blue-black or blue. Jan. 19.
,, 1864. Johnson (Bad. Anil. und Sodafabrik). Production of colouring matter of the naphthalene series. Jan. 26.
,, 2302. Imray (Meister, Lucius und Brüning). Manufacture of anthranilic acid and its derivatives. Jan. 30.

[C.S.] 5277 (1902). Imray (Meister, Lucius und Brüning). Process for reducing indigo. Jan. 28.

,, 6615 (1902). Johnson (Bad. Anil. und Sodafabrik). Manufacture of azo colouring matters and intermediate products relating thereto. Jan. 28.

,, 6987 (1902). Johnson (Bad. Anil. und Sodafabrik). Production of colouring matters containing sulphur. Jan. 28.

,, 7387 (1902). Johnson (Bad. Anil. und Sodafabrik). Production of colouring matters of the anthraquinone series. Feb. 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 1747. Mycock. Production of figured indigo-dyed textile fabrics. Jan. 24.

,, 1853. Castle. Manufacture and waterproofing of animal and vegetable fabrics. Jan. 26.

,, 1866. Perkin and Whipp Bros. and Tod. Treatment of cotton and flax and cotton and woollen goods to reduce the inflammability thereof. Jan. 26.

,, 2331. Gleave. Preliminary treatment of cotton and other fibrous material. Jan. 31.

[C.S.] 2281 (1902). Lake (Soc. "Aimé Baboin"). Ornamentation of fabrics, paper, &c. Feb. 4.

,, 6016 (1902). British Uralite Co. and Friswell. Manufacture of flexible fire-resisting material. Feb. 4.

,, 6421 (1902). Perkin and Whipp Bros. and Tod. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. Feb. 4.

,, 6499 (1902). Imray (Fabriques de Produits Chimiques de Thann et de Mulhouse). Printing with sulphurised colouring matters. Feb. 4.

,, 7074 (1902). Imray (Meister, Lucius und Brüning). Mordant process for dyeing Turkey-red. Jan. 28.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 11,552 (1902). Krokert. Printing coloured impressions on tin plates with a partially clouded ground produced by etching. Feb. 4.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 1312. Vorwerk. Fire-extinguishing powder. Jan. 19.

,, 1648. Allen. Treatment of liquors obtained in the extraction of gold from ores, &c. Jan. 23.

,, 1755. Garroway. Manufacture of sulphuric anhydride.* Jan. 24.

,, 1835. Dreher. Manufacture of titanium compounds. Jan. 26.

,, 1844. Lennox and Defries. Manufacture of ozone. Jan. 26.

,, 2019. Craig. Obtaining hydrocyanic acid from ferrocyanides. Jan. 28.

,, 2200. Schlutius. Manufacture of ammonium formate or ammonia.* Jan. 29.

,, 2204. Johnson (Badische Anilin und Sodafabrik). Manufacture of hydrosulphite salts. Jan. 29.

,, 2211. Spence and Sons. Manufacture of potassium bichromate. Jan. 30.

[C.S.] 2987 (1902). Threlfall and Wilson. Production of chlorates and perchlorates of alkali metals. Jan. 28.

,, 4153 (1902). Sprauger. Fixing ozone in liquids. Feb. 4.

[C.S.] 5954 (1902). Lewis. *See under* II.

,, 28,595 (1902). Thompson (Glock). *See under* III.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 1987. Pilkington. Manufacture of wired glass. Jan. 27.

,, 2294. Union Plate Co. Prismatic glass. Jan. 30.

[C.S.] 1973 (1902). Hilde and Kogler. Manufacture of hollow glass wares of equal weight and capacity. Feb. 4.

,, 5866 (1902). Stidder. Making opal glass or other tile partitions. Feb. 4.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 1404. Mills (Edison). Manufacture of Portland cement.* Jan. 20.

,, 1643. Quinn and Groom. Manufacture of artificial stone slabs, tiles, &c. Jan. 23.

,, 1644. Quinn and Groom. Manufacture of artificial stone slabs, tiles, &c. Jan. 23.

,, 1645. Quinn and Groom. Manufacture of artificial stone slabs, tiles, &c. Jan. 23.

,, 1791. Goulton. Manufacture of bricks or artificial stone, &c. Jan. 24.

,, 1815. Thomann. Roofing tiles.* Jan. 26.

,, 1998. Mooney. Process for making mosaic tiling.* Jan. 28.

,, 2173. Vane. Manufacture of asphalte. Jan. 29.

,, 2252. Cheffins. Grinding mills for cement manufacture. Jan. 30.

,, 2370. Eaton. Apparatus for use in the manufacture of sand bricks, &c. Jan. 31.

,, 2371. Eaton, Pfeifer, and Briggs. Production of building blocks or bricks.* Jan. 31.

,, 2372. Eaton, Pfeifer, and Briggs. Production of building blocks or bricks.* Jan. 31.

[C.S.] 4561 (1902). Brock. Kilns for treating glass, earthenware, &c. Jan. 28.

,, 4914 (1902). Schwob. Colouring of stone to imitate marble. Jan. 28.

,, 6130 (1902). Dietrich. Manufacture of mosaic plates or structures. Feb. 4.

,, 6378 (1902). Wallis. Steaming chambers for the production of artificial stone. Feb. 4.

,, 12,355 (1902). Burton. Pottery kilns or ovens. Feb. 4.

,, 13,084 (1902). Masur. Fixing and stopping medium for dental purposes. Feb. 4.

,, 25,222 (1902). Jurschina. Manufacture of artificial stone. Jan. 28.

,, 26,758 (1902). Harrison (Black and Richards). Artificial stone. Jan. 28.

X.—METALLURGY.

[A.] 1309. Kendall. Separation of mineral substances by means of oil. Jan. 19.

,, 1519. Dobbelstein. Process for working off pulverulent or dust ores. Jan. 21.

,, 1562. De Alzugaray. Manufacture and refining of iron, steel, and their alloys. Jan. 22.

,, 1648. Allen. *See under* VII.

,, 1809. Rodda. Ore concentrators. Jan. 26.

,, 1852. Andersson, Alford, and Smythe. Amalgamating machines.* Jan. 26.

,, 1966. Vernon. Manufacture of steel. Jan. 27.

,, 2036. Gin. Extraction of copper from its sulphuretted ores.* Jan. 28.

[A.] 2086. Schwann. Production of aluminium.* Jan. 28.
,, 2105. Humbert (Graham). Recovery of gold from ores. Jan. 28.
[C.S.] 1961 (1902). Girlot. *See under* XI.
,, 2545 (1902). Raapke. Converter furnace. Feb. 4.
,, 4622 (1902). Pollacsek. Purifying furnace gases. Feb. 4.
,, 11,552 (1902). Krokert. *See under* VI.
,, 19,088 (1902). Sébillot. Apparatus for washing or concentrating ores. Jan. 28.
,, 20,930 (1902). Servais. Blast-furnace for smelting iron ores. Jan. 28.
,, 25,893 (1902). Allison (Knowles and others). Magnetic ore separator. Feb. 4.
,, 28,290 (1902). Mitchell. Conversion of copper matte into metallic copper. Jan. 28.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 1670. Reid. Method of generating electricity.* Jan. 23.
,, 1794. Turquand and Wakelin. Electrical secondary batteries. Jan. 26.
,, 2195. Peto and Cadett. Accumulators.* Jan. 29.
,, 2199. Schlutius. Treatment of gases, &c., by electric spark discharges.* Jan. 29.
[C.S.] 1961 (1902). Girlot. Heating metals in electric baths. Jan. 28.
,, 5538 (1902). Calico Printers' Association and Cotsworth. Electro-deposition of metals. Feb. 4.
,, 5812 (1902). Woolliscroft. Liquid resistances for electrical purposes. Jan. 28.
,, 15,735 (1902). Bailey. Electro-plating. Feb. 4.
,, 17,002 (1902). Löwendahl. Conducting materials for electricity. Jan. 28.

XII.—FATS, OILS, AND SOAP.

[A.] 1325. Barbe. Separation of fatty matters, &c., by means of a volatile solvent, and recovery of the solvent. Jan. 19.
,, 1515. Normann. Conversion of unsaturated fatty acids or their glycerides into saturated compounds. Jan. 21.
,, 1533. Wiley. Granulating paraffin wax, &c. Jan. 22.
,, 1570. Shukoff. Conversion of fatty acids of the oleic series and their derivatives into lactones. Jan. 22.
,, 1760. Borsbach and Becker. Manufacture of soft soap. Jan. 24.
,, 1788. Loeffler. Reducing oils or other fatty substances into a dry powder. Jan. 24.
,, 2202. Sandberg. Manufacture of an odourless, tallow-like product. Jan. 29.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 1582. Brasington. An improved paint.* Jan. 22.
,, 1836. Ambruster and Morton. Manufacture of pigments.* Jan. 26.
,, 1837. Ambruster and Morton. Composition to be used in making pigments. Jan. 26.

B.—Resins, Varnishes.

[C.S.] 3268 (1902). Thompson (Tedesco). Manufacture of varnishes. Feb. 4.
,, 5402 (1902). Strange, Graham, and Burrell. Manufacture of varnishes. Feb. 4.
[C.S.] 5403 (1902). Strange, Graham, and Burrell. Manufacture of varnishes. Feb. 4.
,, 5404 (1902). Strange, Graham, and Burrell. Manufacture of varnishes. Feb. 4.

C.—India-rubber, &c.

[A.] 2351. Markus and Whitelow. Manufacture of insulating material. Jan. 31.
[C.S.] 2264 (1902). British Thomson-Houston Co., Ltd. (Thomson and Callan). Electric insulating compounds. Jan. 28.
,, 5118 (1902). Maardt. Insulating material. Feb. 4.
,, 6455 (1902). Matthew. Calendering or friction-coating fabrics with rubber. Jan. 28.
,, 12,473 (1902). Lake (Straus). Manufacture of artificial sponge. Jan. 28.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 1306. James (The Casein Co.). Manufacture of milk powder.* Jan. 19.
,, 1357. Rigbey. Manufacture of leather, leather substitutes, and the like. Jan. 20.
,, 1605. Bierich. Treatment of horn and hoof. Jan. 22.
,, 1853. Castle. *See under* V.
,, 2050. Sochon. Leather substitute. Jan. 28.
[C.S.] 17,585 (1902). Karle. Production of substances resembling leather. Jan. 28.

XV.—MANURES.

[A.] 1688. Jorgensen. Manufacture of manure from bog earth, peat, and the like. Jan. 23.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 1290. Jolliffe. Apparatus for rousing, aërating, and attemperating brewers' wort during fermentation. Jan. 19.
,, 1428. Schneible. Manufacture of fermented liquors.* Jan. 20.
,, 1690. Stanley, The Farringdon Works and Pontifex and Sons. Treatment of beer for bottling. Jan. 23.
[C.S.] 11,734 (1902). Koenitzer. Brewing beer. (Post-dated, July 3, 1902.) Feb. 4.
,, 20,079 (1902). Lapp. Filtering and washing brewers' mash, and similar mixtures. Feb. 4.
,, 23,394 (1902). Klimek. Purifying the compressed air in beer-forcing apparatus, and preventing the beer becoming stale. Jan. 28.
,, 27,126 (1902). Vandam. Disinfecting apparatus for beer barrels, wine casks, &c. Jan. 28.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 1306. James. *See under* XIV.
,, 1937. Bamberg. Manufacture of foods. Jan. 27.
,, 1938. Bamberg. Beverage tablets. Jan. 27.
[C.S.] 16,310 (1902). Raabe. Manufacture of provender from wood waste. Feb. 4.

B.—Sanitation; Water Purification.

[A.] 1335. Marks (Chapman). Purification of liquids.* Jan. 19.
[C.S.] 2155 (1902). Willcox and Raikes. Distribution of sewage and other liquids. Jan. 28.
,, 3731 (1902). Henneberg. Preparation of drinking water. Jan. 28.
,, 4029 (1902). Alliot and Ransom. Distribution of sewage and other liquid. Jan. 28.

C.—Disinfectants.

[A.] 1585. De Alzugaray. Manufacture of disinfectants and antiseptics. Jan. 22.

,, 2118. Ghirelli. Disinfecting by means of formaldehyde. Jan. 29.

[C.S.] 3137 (1902). Defries. Disinfectors. Feb. 4.

,, 5238 (1902). Unsworth and Miller. Disinfecting and deodorising compositions. Feb. 4.

,, 27,126 (1902). Vandam. *See under* XVII.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 1479. Koenig. Manufacture of "compo-board." Jan. 21.

,, 1831. Dreher. Improving the colouring properties of paper and other fibrous cellulose products. Jan. 26.

[C.S.] 23,145 (1902). Zühl. Manufacture of a celluloid-like substance. Jan. 28.

,, 24,955 (1902). Lüttke. Manufacture of nitro-cellulose films and varnishes. Jan. 28.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 1579. Newton (Bayer and Co.). Production of methylene citric acid. Jan. 22.

[A.] 1664. Boehm (Fischer). Manufacture of γ-γ dialkyl barbituric acid. Jan. 23.

,, 1779. Southerden. Manufacture of ether. Jan. 24

,, 1877. Barge and Givaudan. Manufacture of toluen sulphonic chloride. Jan. 26.

,, 1944. Boehm (Fischer). Preparation of ureides o dialkyl acetic acids. Jan. 27.

,, 1945. Boehm (Fischer). Preparation of γ-γ-dialky barbituric acids from monoalkyl malonic esters Jan. 27.

,, 2054. Boehm (Fischer). Preparation of γ-γ dialkyl barbituric acids. Jan. 28.

[C.S.] 1790 (1902). Bishop, Bishop, and Passmore Manufacture of stable salts from piperidene an analogous bases, and of preparations therefrom Jan. 28.

,, 27,485 (1902). Johnson (Boehringer). Production of chlorine substitution products of 8-methy xanthines. Feb. 4.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 1438. Shepherd. Trichromatic photography Jan. 20.

,, 2375. Sandell Films and Plates, Ltd., and Smith Isochromatic photographic plates and films Jan. 31.

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Monday, March 16, 1903.—
Mr. H. Droop Richmond. "The Standardisation of Analytical Methods."
Mr. A. R. Ling. "The Standardisation of Commercial Methods of Analysis, especially those applied to Brewing Materials."

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Messrs. H. Grimshaw, W. Tong, and R. Barnes. "The Analysis of India-Rubber."
Messrs. B. Hart and G. H. Bailey. "Improvements in the Manufacture of Sulphuric Acid by the Chamber Process."

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IFTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, 1903.

The attention of Members of the Society is called to the ct that the International Congress of Applied Chemistry ill meet in Berlin, during Whitsuntide week of this year. committee of this Society has been formed to co-operate ith the other British Chemical Societies in endeavouring secure an adequate representation of British Chemical dustry, and it is requested that the names of those prosing to attend the Congress be forwarded to the General ecretary, in order that a formal invitation from the rganising Committee in Berlin may be sent to them.

The aim of the Congress is to introduce uniform standard ethods and rules throughout the world; to provide uniform ethods of commercial analysis, thus removing one of the ain causes of dispute; to throw light upon points which ay assist governments and others in framing regulations ncerning transport and duties; and to improve acquaintnce with Patent Law.

The Congress is also intended to provide opportunities r mutual exchange of ideas on different branches of hemical work.

The Congress will be opened on June 2nd, 1903. On Vednesday, June 3rd, Friday the 5th, and Monday the th, meetings will be held for the reading and discussion f papers. The subjects to be treated are classified as llows:—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products:—
  Subsection A.—Organic Preparations, including Tar Products.
  Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

PROGRAMME.

uesday, June 2.—Reception in the Palace of the Imperial Parliament.
8 p.m.—Address by the President of the Organising Committee in the Hall. Supper will be served in the galleries.

Vednesday, June 3.—10 a.m. First General Meeting.
Afternoon.—Sectional meetings.
7 p.m.—Banquet in the Restaurant of the Zoological Gardens. Members may bring ladies.

hursday, June 4.—Sectional meetings continued.
7.30 p.m.—Reception of the Congress in the Town Hall by the Municipal Authorities. (For gentlemen only.)
9.30 p.m.—"Commers" in the "Philharmonie" building. The boxes will be reserved for ladies.

Friday, June 5.—10 a.m. Second General Meeting. Address by the President of the fourth Congress, Prof. H. Moissan.
7 p.m.—Performance in the Royal Opera House.
7 p.m.—Reception of the German Chemical Society in the gardens of Prof. C. D. Harries at Charlottenburg, Berlinerstr. 36.

Saturday, June 6.—Sectional meetings continued.
Visits to various factories and museums.

Sunday, June 7.—Special trains from the Potsdamer Bahnhof at 9.55 a.m. and 10.15 a.m. to Wannsee, for a trip on the lakes.
Luncheon at Wannsee at 2 p.m.

Monday, June 8.—Sectional meetings concluded.
Afternoon.—Third General Meeting, for bringing the business of the Congress to a close.

Ladies tickets, price 15*s.* each, can be obtained on application to the Secretary of the Congress. A ladies' committee has been formed to provide entertainment for ladies during the business hours of the Congress.

TRAVELLING AND HOTEL ARRANGEMENTS.

Parties of 30 and over, travelling together, may obtain a reduction of 50 per cent. on fares on all lines of the Royal Prussian Railway, by application to the head office of the division in which the journey is commenced.

Karl Stangen's Reise-Bureau will arrange such parties. Information can also be obtained as to hotels in Berlin, also any information concerning the journey to Berlin, by enclosing amount for return postage to Karl Stangen's Reise-Bureau, 72, Friedrichstr., Berlin, W.

A Congress Daily Paper will be published by the Committee during the Congress week.

The number of tickets for the social arrangements is limited to:—Banquet, 1,500; Reception in Town Hall, 750; "Commers," 1,000 gentlemen, 200 ladies; Performance at Royal Opera, 900; Reception of German Chemical Society, 800; Excursion to Wannsee, 1,500.

Applications will be considered in order of priority.

As formal invitations are now being sent out, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

INTERNATIONAL ATOMIC WEIGHTS.

Copies on cardboard, similar in size and style to those enclosed in the previous number of this Journal, for laboratory use, can be obtained by application to Messrs. Eyre and Spottiswoode, East Harding Street, London, E.C. Price, post free, 4*d.* each, or 3*s.* per dozen.

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tkins, E. J., l/o Green Street; 38, Tudor Road, Upton Park, E.

Deaths.

nger, W. Harry, at 33, Ladbroke Grove, London, W. Feb. 13.

rd, Thos.; Wadebrook House, Northwich. Feb. 18.

London Section.

ERRATUM.

AMINATION OF METHODS EMPLOYED IN ESTIMATING THE TOTAL ACIDITY OF GASES ESCAPING FROM THE CHAMBER PROCESS FOR MANUFACTURE OF SULPHURIC ACID, WITH SUGGESTIONS ARISING FROM THE STUDY OF THE INTERACTION OF NITROUS AND SULPHUROUS ACIDS, OR THEIR SALTS, IN AQUEOUS SOLUTION.

R. FORBES CARPENTER, F.I.C., AND ERNEST LINDER, B.Sc.

(This Journal, Dec. 31, 1902, 1490—1508.)

In Mr. Forbes Carpenter's reply, p. 1507, col. 2, line 19 ., for "The hydroxylamine reaction was got at Griesheim," ., read :—"Evidence of traces of ammonia was got at riesheim and Berlin with certain samples of chamber id, and he should not be at all surprised if the hydroxylnine reaction could be obtained in certain places in r. Messel's chambers to-day," &c.

Manchester Section.

Meeting held on Friday, February 6th, 1903.

DR. G. H. BAILEY IN THE CHAIR.

RECENT DEVELOPMENTS IN THE IRON AND STEEL INDUSTRY CONSIDERED FROM AN ECONOMIC STANDPOINT.

BY W. A. BONE, D.Sc., PH.D.

The remarkable changes which, during the past 20 years, have occurred in the relative positions of the three leading iron and steel producing countries, Great Britain, Germany, and the United States, have been the subject of much recent discussion, both in the columns of the daily newspapers and in one or two of our technical journals.

The character of these changes is sufficiently indicated in the following tables, which show the production of pig iron and steel in the countries named, as well as the world's total output, for the years 1880, 1890, and 1901 respectively.

It is, therefore, undeniable that the British output of iron and steel has not increased in anything like the same ratio as either the world's requirements or the enterprise of our great rivals in Germany and America; and further, it must also be admitted that practically within the last dozen years or so we have lost our former pre-eminence in this great branch of industry.

It will, perhaps, not be out of place if I make a passing reference to some of the causes which contributed to this former pre-eminence of ours.

The English iron industry gradually assumed important proportions during the 17th century, towards the end of which our 300 furnaces were responsible for an annual output of probably not far short of 200,000 tons. This period of steady development was succeeded by half a century of extraordinary decline and depression, until in 1740 there remained but 59 furnaces in blast, yielding an annual output of a little more than 17,000 tons; in this year we were actually obliged to import some 30,000 tons to meet the national requirements. This, however, proved a low-water mark, for the successful application of coke as a blast furnace fuel by Abraham Darby in 1735, and the invention of the crucible process for the production of tool and cutlery steel by Huntsman of Sheffield in 1740, infused fresh vigour into the industry, and laid the foundations of that future independence and pre-eminence which Henry Cort established for us by his introduction of the puddling process in 1784.

Output of Pig Iron.

	1880.		1890.		1901.		Output, 1901. / Output, 1880.
	Million Tons.	World's Output.	Million Tons.	World's Output.	Million Tons.	World's Output.	
		Per Cent.		Per Cent.		Per Cent.	
reat Britain	7·80	43·3	7·90	29·3	8·90	23·0	1·14
ermany	2·68	14·9	4·58	17·0	8·30	21·3	3·10
nited States	3·83	21·3	9·20	34·0	14·00	36·0	3·66
e World	18·00	100·0	27·0	100·0	39·00	100·0	2·17

Output of Steel.

	1880.		1890.		1899.		Output, 1899. / Output, 1880.
	Million Tons.	World's Output.	Million Tons.	World's Output.	Million Tons.	World's Output.	
		Per Cent.		Per Cent.		Per Cent.	
reat Britain	1·375	32·75	3·68	31·0	5·00	19·0	1·36
ermany	0·728	17·3	2·13	18·0	6·2	23·2	2·91
nited States	1·247	29·7	4·28	36·0	10·6	40·5	2·22
he World	4·205	100·0	11·9	100·0	26·7	100·0	2·24

This year (1784), then, marks the commencement of a century during which the British output of iron and steel absolutely predominated over that of any other country, if not, indeed, over those of any two others put together. During the Napoleonic wars the continental industry, and particularly that of Germany, steadily declined to almost insignificant proportions, whilst ours as steadily advanced and developed. Neilson's introduction of hot blast in 1828 inaugurated a new era in blast furnace practice and further strengthened our already commanding position. Towards the middle of the century the opening up of the immense ore deposits in the Cleveland district, situated as they are in such close proximity to the Durham coalfield which yields probably the finest blast furnace coke in the world, immensely increased the potentialities of our industry.

The phenomenal developments of our foreign trade which followed the adoption of "free trade" as a commercial policy more than kept pace with the output capacities of our furnaces and forges, whilst the disturbed conditions of European politics between 1850 and 1870 kept foreign competition well in the background. The net result of all these favourable circumstances was that our exports of iron and steel increased in value something like eleven-fold between 1839 and 1873 (from 4,784,827*l.* in 1839 to 52,711,937*l.* in 1873[*]), and that in 1870 we were producing no less than 46 per cent. of the iron and over 40 per cent. of the steel required by the world. And, further, it is no exaggeration to say that practically all the important new developments either in blast furnace practice, or in steel making, during the century following Cort's invention, either originated with British ironmasters and engineers, or were first successfully worked out on British plants.

German Conditions. — The political and economic conditions which had so materially contributed to our pre-eminence in iron and steel industries could not, in the nature of things, be expected to continue for ever. For one thing, the great reduction in the price of steel which followed the adoption of Bessemer's invention[†] resulted in such rapidly increasing demands that it was impossible for the resources of one small island to keep pace with them, and the excess which British furnaces could not meet stimulated the industry in other and, at that time, less favourably situated countries. The united Germany which emerged from the struggle of 1870 at once applied itself to the building up and consolidation of its old metallurgical industries, and the existence of vast deposits of "minette" iron ores in her newly-recovered province of Lorraine, constituted a commercial asset of great potential value, the realisation of which very largely accounts for her present position as a producer of iron and steel.

These "minette" ores are oolitic brown hæmatites, containing from 28 to occasionally 48 per cent. Fe, and the supply may be said to be comparatively unlimited. It is estimated that the Lorraine supplies alone amount to over 3,000 million tons, sufficient to last for over 100 years at the present rate of exhaustion. The Luxemburg deposits are less extensive, but will probably be equal to all demands for nearly a century. The total ores raised in Luxemburg amount to over 3½ million tons per annum (of which 1¼ millions are smelted at home and 2¼ millions exported), and in Lorraine to 7½ million tons per annum (of which 4½ million tons are smelted within the supply area, 1 million tons in the Saar district, and nearly a million more tons in Westphalia). The cost of raising these ores is small, for the deposits are regular, and in many localities they can be quarried.

But it was only after the invention of the basic process by Thomas and Gilchrist in England, in the year 1878, that Germany was able to realise this big asset, a consideration which should never be lost sight of when we compare the expansion of German iron and steel industries with the relatively stationary condition of our own during the last 20 years. These Luxemburg-Lorraine ores contain from 0·5 to 2·0 per cent. of phosphorus, and but for the basic process they could never have been utilised for steel making. Consequently the basic process has been applied and developed in Germany to a far greater extent than in this country, and to-day quite 90 per cent. of German steel is produced either in the basic converter or by a basic open-hearth process.

Germany's present strong position, then, is largely due to the fact that she is almost independent of foreign or supplies, her own being both abundant and varied i character. In addition to the oolitic brown ores of Lorrain and Luxemburg, she possesses supplies of red hæmatite in Hesse-Nassau and the Lahn and Dill districts, and th Siegerland yields very valuable spathic ores. It would no be correct, however, to say that German furnaces smel nothing but native ores; but against the 4 million tons o hæmatite and magnetic ores imported from Spain an Sweden, to make up suitable mixtures for Westphalia furnaces, must be set the 3¼ million tons of "minette" ore exported to France and Belgium. The chief difficult which the German industry has to contend with is that th best fuel supplies are situated at some distance from th ore deposits; fortunately, however, for the German iron master, the State controls the railways, so that transpor rates compare favourably with those exacted by Brit s railways for similar distances. For example, the West phalian furnaces are situated in a coal district which yield coke nearly equal in quality to the Durham variety, but th ores are either drawn from home districts 90 to 200 mile away, or are imported from Spain. The Siegerlan calcined spathic ores are conveyed 90 miles at a cost 3*s.* per ton; red hæmatite (Fe = 48—52 per cent.) fro the Lahn and Dill districts, 130 miles, for about 4*s.* per ton "minette" ores from Lorraine, 200 miles, for 6*s.* per to These rates average about 0·35 to 0·4*d.* per ton-mile, a compared with the, approximately, 0·9 to 1·0*d.* per to mile rates of our enterprising railways.

With regard to imported ores, these have hitherto bee transhipped at Rotterdam (or other Dutch ports) to Rhi steamers (2,000 tons) which convey them to Ruhror whence they are railed to the furnaces. The total throug freight from the port of transhipment has been about 3*s.* 6 per ton. In 1899, however, the new Ems-Dortmund can was opened, and the Prussian Government has expende large sums on harbour works at Embden, which will probab soon become a great transhipment port for foreign ir ores. The canal will carry steamers of 1,000 tons, and th through rates from Embden to Dortmund, a distance 162 miles, are now about 2*s.* to 2*s.* 6*d.* per ton, and thi with a 6*s.* freight for ores from Bilbao to Embden, mea that Spanish hæmatite can be conveyed to the Westphali furnaces for 8*s.* 6*d.* per ton.

Before leaving the question of German conditions we ma appropriately indicate one or two directions in whic German enterprise has led the way during recent year It is to German technologists, for example, that we chie owe the introduction and development of improved coki methods in by-product ovens, methods which, despite th early prejudice against by-product coke, are now bei largely adopted in this country, but which, so far, ha hardly obtained a footing in America. Another importa German innovation is the cleaning and application of bla furnace gases for power purposes; the managers of Hoer and Diffendingen works have been the pioneers in th matter, and at any rate in Germany it is believed that engin driven by furnace gases will eventually supersede stea engines altogether on blast furnace plants. A modern bla furnace, making 300 tons per diem, gives about 1,000 cb. of gas per minute, the calorific value of which is abo 950—980 centigrade units per cubic metre; at Diffending five 600-h.p. engines use 9,000 cb. m. of this gas per ho The chief difficulty, of course, is the cleaning of this ga this has been successfully overcome by the introduction of fan and water-spray arrangement into the gas mains leadi from the furnace, and it has been demonstrated that gas can be effectually and economically cleaned, not on with a view to its utilisation in power engines, but also the heating of the blast in stoves. The Diffending horities are so far satisfied with the results of these perimental trials that they intend installing, if they have already done so, a cleaning plant capable of dealing h the 1,500,000 cb. m. of gas yielded by their four naces per diem. This quantity of gas, if applied to ver engines entirely, would give 20,800 h.p.; it is stated t a 100-h.p. electric motor will suffice to drive the fans, . to generate the current for this a gas engine of 150 h.p. l be necessary.*

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[*] These figures include iron and steel, hardware, cutlery, and machinery. The total value of all exports had increased from 115 to 625 million pounds during the same period.

[†] Thus, between 1870 and 1895, whilst the price of pig iron underwent little change, steel ship plates declined from 20*l.* to about 4*l.* 10*s.* per ton.

uring recent years German blast furnace managers have pted American methods and appliances to a greater ent than their English colleagues. American unloading liances for the conveyance of ores from the holds ships to the furnace yards have been installed on eral plants in Westphalia; aerial ropeways are in eral use, and are often employed to convey coke and l to the top of the furnace. One or two German furnace ats have achieved records in the way of outputs which roach the phenomenal performances of American naces. The Deutscher Kaiser Co. have a furnace which produced 518 tons of pig iron per diem from an ore taining 42 per cent. of iron, and the outputs of four er furnaces averaged 415 tons per diem. These records really very remarkable with a 42 per cent. ore. At the erde works the output averages about 230 tons per diem furnace, and the general average for the larger German naces to-day is probably about 200 tons per furnace per m.

The progress of Germany in iron and steel industries ce 1880 was splendidly demonstrated at the Düsseldorf hibition last summer; although the metallurgical, gineering, and mining exhibits were almost exclusively fined to the industries of Rhenish-Westphalia, the play of iron and steel products by common consent ite surpassed anything of the kind ever seen before, and ited the unqualified admiration of the many English perts who attended the recent Düsseldorf meeting of the n and Steel Institute. In particular, the examples of avy steel castings and forgings—work which requires eater skill and knowledge than almost any other branch the industry—showed that German establishments can n out finished products in no way inferior to anything ich either English or American shops are capable of.

merican Conditions.—So phenomenally rapid has been development of American iron and steel industries ring the past 15 years that there have not been wanting npetent observers who take a very pessimistic view of fate of the European industry in the struggle for the rld's markets. Such are the supposed economic advances enjoyed by American ironmasters, that it has been iously doubted whether European plants can effectively npete with them, and some alarmists have predicted the r approach of a "wave of invasion" which will flood markets with American iron and steel at prices far ow the cost of production in Europe, and thus practically omplish the extinction of our industry. Needless to say, here is any likelihood of such prediction being realised hin the next generation, we are face to face with a umercial catastrophe the effects of which would be nost too disastrous to contemplate.

ears as to the, possibly, serious results of American npetition in both home and foreign markets has loubtedly caused a certain amount of uneasiness among tish ironmasters. This was clearly indicated about two rs ago by the sending of a representative Commission oss the Atlantic under the auspices of the British Iron de Association to fully investigate "the more prominent, ential, and dominating influences that have enabled the ited States to reach this present status as an iron-pro- ing and iron-exporting country." Each of the four commissioners appointed undertook a special line of inquiry. . J. S. Jeans investigated "General Economic and lustrial Conditions." Mr. Axel Sahlin, of Millom, "Blast rnace Practice." Mr. Enoch James, of Wednesbury, eneral Steelworks Practice," and Mr. Ebenezer Parkes, P., of Birmingham, "Sheet and Bar-Mill Practice." The nmissioners spent the greater part of the autumn of 1 in the States, and were generally afforded the fullest opportunities of pursuing their inquiries. They found, as the Americans say, "the latch string on every door," and as an example of the readiness with which information was given, I may say that Mr. Schwab of the United States Steel Corporation sent letters to the heads of various departments and superintendents of the leading plants belonging to the Corporation directing that "all information should be afforded the members (*i.e.*, of the Commission) that had ever been given to anyone outside the Corporation's own officials." The Commissioners all wrote separate and independent reports on the results of their investigation, and these have been recently issued to the trade in a volume of nearly 600 pages,* which it may be assumed contains the latest and most reliable information as to the economic conditions of the American industry available. The facts and figures I shall now have the honour to submit to your consideration are largely based on these reports.

So far as it materially affected European interests the history of the States industry began about 15 years ago; during the five years 1885—1890 the output of pig-iron increased by 63 and of steel by 150 per cent. When the Iron and Steel Institute visited the States in 1890 the country was on the crest of a wave of exceptional, if not altogether unprecedented, wave of prosperity, and for the first time the output of pig-iron exceeded that of Great Britain. The Southern States had begun to produce iron, and a buoyant feeling of optimism as to the future of the industry everywhere prevailed. This led to the planning of vast enterprises which greatly increased the output capacity; the net result was that the thing was overdone, and the resources of production increased in a far greater ratio than demands. The period 1892—1896 was a difficult one for the iron trade all the world over, and owing to a combination of peculiar economic and political circumstances the depression was more acute in the States than in perhaps any other country. Prices fell to the lowest point ever known in the industry, and the opening up of the great ore deposits in the Mesaba range in 1892 further greatly accentuated the difficulties of the situation in the States.

American ironmasters very soon realised that considerably cheaper methods of production were an imperative necessity; henceforth old methods must be overhauled, there must be increased efficiency of labour and better works organisation. But, above all, the trasport system must be reorganised and cheapened. And so, out of a period of severe depression, there arose the remarkable developments of transport methods and labour-saving appliances so characteristic of American industry during the past seven or eight years.

There are two other outstanding features of the American industry which must not be overlooked. The one is that it has only attained its present colossal proportions under a rigid and, as it would seem, effective system of protection;† and further, it is significant that, with the exception of a section of New England manufacturers who complain that the tariff maintains their raw material at artificially high prices, American ironmasters are solid in their resistance to all proposals in the direction of lowering the duties on imported iron and steel, regarding the present high rate as essential to the prosperity of their undertakings.

The other feature referred to is that American furnaces and workshops have so far done little more than supply the home demands, so that whatever may be the future developments of an export trade in iron and steel, it is still, comparatively speaking, in its infancy, and only about one-third that of this country.‡ We may feel assured that

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See paper by F. W. Lürmann. Stahl und Eisen, May, 1901.

* "American Industrial Conditions and Competition." London, 1902.

† The present duty on imported pig iron is 4 dollars per ton, and on steel bars, billets, and ingots, from 21 to 30 per cent. *ad valorem.*

‡ For 1898 and 1899 the values of the exports of iron, steel, hardware, and machinery, of the three countries under review, were, respectively, as follows:—

—	1898.	1899.
	£	£
Great Britain	47,896,563	61,189,944
Germany	29,146,500	32,834,900
United States	16,551,500	21,140,000

so long as the American ironmaster can command, as by virtue of the protective system he does to-day, prices in the home markets higher than those maintaining in Europe, he will regard the foreign markets chiefly "as the slaughtering ground for a surplus, or as a means of reducing cost by enlarging business." And this view of the case derives support from the fact that most of the iron and steel plants in the States are 500 miles or more from an Atlantic port.

Ore and Fuel Supplies.—It is important to remember that in America ore and fuel supplies do not generally occur in the same, or even adjacent localities; indeed, with regard to most of the leading centres of production, the ores and fuel are separated by distances of from 800 to 1,000 miles. The only important smelting centre which enjoys the advantages of close proximity to both ore and fuel is Birmingham (Ala.), and even this centre is far removed from the principal home markets, and 200 miles away from the nearest port (Mobile). It will be readily understood, therefore, how vitally important cheap transport is for the American industry. Classified according to their geographical distribution, American iron ores fall into three groups, namely :—

(*a*) *Lake Superior Ores.*—Rich red hæmatites (Fe 50—60 per cent.) for the most part remarkably free from sulphur and phosphorus, and, therefore, eminently suited for Bessemer steel purposes. These are by far the most abundant and important of the American ores; they occur chiefly in the five mountain ranges of Marquette (opened up 1856), Menominee (1877), Gogebic (188), Vermilion (1884), and Mesaba (1892). The amount raised during 1901 was 20·5 million tons, and the supplies have been characterised as practically inexhaustible. This opinion is somewhat controverted in Mr. Jeans' recent report, which states that the supplies of the best Bessemer ores are already limited, and that the next 25 years will see other varieties approaching exhaustion; what he says about the already limited supplies of best Bessemer lake ores is in a measure confirmed by the fact that American steel makers are agreed that the basic process has a great future in the States, and that American engineers are already prepared to accept basic steel for all ordinary purposes.

(*b*) *Appalachian Ores* (Pennsylvania, New York, New Jersey).—These are for the most part magnetites with some brown and red hæmatites. About 1·66 million tons were raised in 1901.

(*c*) *Southern Ores* (Alabama, Virginia, Tennessee).—Chiefly red and brown hæmatites, containing from 40 to 56 per cent. of iron, with 0·1 to 0·3 per cent. of phosphorus, under 0·1 per cent. sulphur, and from 10—13 per cent. of silica. There is a remarkable vein of fossiliferous ore at Red Mountain, near Birmingham (Ala.). In 1901 about 4·25 million tons of these ores were raised (2·75 million tons in Alabama alone) and smelted locally.

Altogether something like 27·5 million tons of iron ores were raised during 1900 throughout the States, of a computed average value of 2·42 dollars, or 10*s.* per ton.

Fuel Supplies.—The coal resources of the States are doubtless enormous, but only a few regions yield really good blast furnace coke, the demands for which exceed 20·5 million tons per annum. The best coke is obtained from the Connelsville region (Penn.) and West Virginia. Connelsville coke is used throughout the great smelting areas of Pennsylvania, Ohio, and Illinois to the extent of 13·8 million tons per annum; it will support a burden of 92 feet in the furnace, and is probably equal in quality to the best Durham coke (ash = about 8 to 10 per cent., sulphur, 0·7 to 0·9 per cent.). The coal of the Southern States does not yield anything like so good a blast furnace coke; Alabama coke, as used in the Birmingham district, contains about 15 per cent. of ash, and will not support a greater burden than 70 feet in the furnace.

With regard to coking methods, the old beehive ovens are still almost exclusively used, though the by-product system is making progress; the output of by-product coke to-day probably does not, however, exceed 2 million tons per annum.

The average value of coke at the ovens in Pennsylvania and Alabama for the three years, 1898, 1899, and 1900, was something as follows :—

——	1898.	1899.	1900.
	s. *d.*	*s.* *d.*	*s.* *d.*
Pennsylvania	7 0	8 11½	10 5
Alabama	9 5	9 5	12 6

Location of Blast Furnace Plants.—Pittsburg is, o course, the greatest smelting centre in the States, o indeed in the world; its proximity to the Connelsvil coking regions and its own supplies of natural gas give a great advantage over other American centres as far a the home market is concerned. It is, however, 1,000 mil distant from its ore supplies.

A large number of furnaces dependent on lake ores ar grouped round centres such as Chicago, Cleveland, Buffal along the shores of the great lakes. They are, of cours nearer the ore supplies than is Pittsburg, but very mu further from the Connelsville district, whence they dra their coke. Thus whilst Pittsburg has a coke rate fro Connelsville (50 miles) of 3*s.* per ton, the Chicago iro master, 460 miles away, must pay 10*s.* 5*d.* per ton for th carriage of his fuel, and for Cleveland (Ohio), 150 mile the rate is 6*s.* 3*d.*

In 1901 there were 221 furnaces blowing in the States of these 93 were located in Pennsylvania (30 in th Pittsburg district alone), 35 in Ohio, 17 in Illinois, ar 48 in the Southern States (Alabama 22, Virginia 1 Tennessee 8).

American Transport Methods and Rates.—The vit importance of cheap transport for American iron and ste industries has already been clearly indicated, and probab in no other country are the facilities for transport so grea or the rates so low. This is partly owing to the sm capital cost of American as compared with Europe railways, and to much longer average hauls, as well as superior organisation.

The capital expenditure per mile of line opened up 1898 of the railways of the three countries under conside tion is as follows :—

	£
United Kingdom	52,400
Germany	19,927
United States	12,390

and the average haul on American, for mineral traffic probably four or five times that on English lines So naturally look for much lower rates in the States than th we are accustomed to pay in this country. Neverthel the great reductions in American rates which have b effected within the last 10 years must be set down superior organisation and methods. The following figu taken from Mr. Jeans' report for the Pennsylvania Railr show how much had been done between 1890 and 1899 cheapen transport :—

—	Average Gross Earnings.	Average Expenses.	Average Ne Earnings.
		Cents per Ton-Mile.	
1890	0·655	0·463	0·192
1899	0·473	0·344	0·129

As examples of American rates for coal, coke, iron and steel billets we may give the following :—

	Per Ton-M
	d.
Coal from Pittsburg to Buffalo (235 miles)	0·21
" " Chicago (460 miles)	0·16
Coke from Connelsville to Pittsburg (50—90 miles)	0·18
" " Buffalo (300 miles)	0·30
Iron ore from L. Erie Ports to Pittsburg (150 miles)	0·20
Steel billets from Pittsburg to Baltimore (334 miles)	0·2[illegible]
" " New York (444 miles)	0·23

The secret of these exceptionally low rates lies in the fact that American freight is moved in heavy trains with a small proportion of dead weight; the cars have a carrying capacity of 50 tons with a tare of less than 25 per cent. of the total weight, and some of the ore trains on the Pittsburg, Bessemer, and Lake Erie Railway shift upwards of 1,000 tons each journey.

Transport of Lake Ores.—More than 20 million tons of ores per annum have to be transported from the mountain ranges at the head of Lake Superior to the furnaces in Illinois, Ohio, and Pennsylvania, and the traffic is necessarily limited by climatic conditions to about seven months of the year. The arrangements for handling and conveying this enormous amount of material over distances of from 800 to 1,000 miles are a splendid illustration of American transport methods.

The ores have first of all to be railed from the mines to the lake docks over distances varying from 15 miles in the case of Marquette to 100 miles in the case of Vermilion ores. Mesaba ores, which constitute one-third of the total supplies, have a journey of 75 miles to the ore-dock. The ores are conveyed in 25 to 30 ton hopper cars down an easy gradient all the way to the dock, where the contents of each car are automatically discharged into large bins or pockets. These pockets are constructed at equidistant intervals corresponding to the distances between the hatchways of the lake steamers, so that when the vessel is brought alongside the dock the ore can be shot down inclined chutes into the holds. In this way vessels of 6,000 to 8,000 tons capacity can be loaded in from two to three hours, and as much as 220,000 tons of ore have been loaded at the various ore ports in a single day.

The steamers carry the ores to Lake Erie ports (or to Chicago) over distances varying between 600 and 800 miles at rates of from 2*s*. 6*d*. to 3*s*. 4*d*. per ton.* On arrival at the Lake Erie port the vessels are automatically unloaded in about 12 hours, so that a steamer may often make the round trip within eight days, and in a single season will carry upwards of 175,000 tons of ore.

The facilities for conveying the ore from Lake Erie ports to the Pittsburg furnaces have been wonderfully developed. The Pittsburg, Bessemer, and Lake Erie Railway, now largely under the control of the United States Steel Corporation, is a single track, specially constructed for the traffic, running from Conneaut (Ohio) to Pittsburg, a distance of 150 miles. From 12 to 14 trains, each carrying upwards of 1,000 tons, are run at regular intervals every day, and it is stated that the cost of transport, which was 0·2*d*. per ton-mile in 1900, has been as low as 1*s*. 8*d*. to 1*s*. 10*d*. for the whole distance, or about 0·125*d*. per ton-mile, a truly remarkable figure.

With regard to the total cost of transporting the ores from the lake mines to Pittsburg it is claimed that in 1898, a year of exceptionally low prices, it did not exceed 6*s*. 3*d*. per ton—a rate which may be fairly compared with the 4*s*. 6*d*. lowest recorded rate for Spanish ore from Bilbao to Middlesbrough. But this exceptionally low rate was not long maintained, it increased proportionally with prices during 1899 and 1900, so that in 1901, according to Mr. Jeans and his colleagues, it amounted to between 11*s*. and 12*s*. per ton.

American Blast Furnace Practice.—It does not fall within the scope of this paper to discuss in detail American blast furnace practice and conditions, but such points as concern the economic side of the question may be briefly referred to.

In the first place, it must be pointed out that all the furnaces in Pennsylvania, Ohio, and Illinois which depend on lake ores must be provided with storage capacity for the five winter months' ore requirements; this, for a modern furnace, would amount to 150,000 tons probably. Also it may be taken for granted that whatever is possible in the way of labour-saving appliances about a blast furnace is universally adopted in the States. The materials are all automatically handled, the furnaces are automatically charged by skip hoists, and in many cases the molten iron is cast by machinery also. In fact, the reduction in cost of labour per ton of metal effected by the adoption of automatic arrangements between 1887 and 1897 in the Pittsburg district has been estimated by Mr. C. Kirchoff at 16 per cent., and in the Southern States at over 50 per cent. Mr. Jeans gives 2*s*. per ton as the cost of labour at Pittsburg in 1901, a figure which we must compare with the from 3*s*. to 4*s*. per ton in this country.

The great feature which has hitherto distinguished American blast furnace practice from that in this country is the high pressures at which furnaces are worked and the corresponding big outputs obtained. The American ironmaster considers that a furnace lining to be good for so many, say a million, tons of iron, and that the sooner this quantity can be made the less, proportionately, will be the standing charges. And this increased output capacity is obtained, not by increasing the actual dimensions of the furnace, but by working it at higher blast pressures, so that materials can be put through faster.

Of course, this method entails more powerful blowing engines, more stove accommodation per furnace, more water cooling at the tuyères and boshes, and that furnaces must be relined every four or five years. Output records of the newer American plants are truly astounding; the four furnaces put up in 1896–97 at Duquesne to make basic pig for the steel works have achieved a wonderful performance. The first furnace, erected June 1896, had made 941,000 tons up to October 1901, and one furnace had made as much as 752 tons in a day and 4,690 tons in the same week, with lake ores containing 55 per cent. of iron. The weekly make of each of the two new furnaces of the Carrie plant of the Carnegie Company, near Homestead, averages 4,000 tons, and one of them produced 790 tons in 24 hours, a performance which has since been beaten by one of the Ohio Steel Company's furnaces. Since a weekly output of 1,000 to 1,200 tons would be considered a very good performance for a furnace working on hæmatite ores under English conditions, it would at first sight appear as though American practice must be proportionally much more economical. But there are one or two considerations which must be taken into account before any sure conclusion can be arrived at. It must be remembered that whereas the capital cost of an American furnace with its four stoves, engines and boilers, automatic charging and casting arrangements, pumping machinery, and all other accessories amount to, according to Mr. Sahlin's report, between 160,000*l*. and 200,000*l*., probably four furnaces and accessories on English lines, with an output capacity quite equal to the single American furnace, could be erected for the same capital outlay. And whereas the American furnace, having made its million tons, must be relined every five years or so, the English furnace linings would be good for probably two or three times that period. Moreover, when difficult times come, one or more of the English furnaces can be blown out without interfering in any way with the uniformity of working condition, whereas the American ironmaster has either to put out his furnace altogether, or to radically alter his working condition in order to reduce his output. So that although furnaces are being erected in this country on American lines, and presumably to be worked on the American system, it has yet to be demonstrated whether, under British conditions, they will be more successful than the older furnaces they are displacing.

The conditions of American industry demand that works managers and superintendents shall be men of high training and great initiative and energy. Consequently, an American board of directors selects young men as managers who have had a good college or technical school training. A prominent American ironmaster said to Mr. Sahlin: "We want young men who have not had time to wear themselves into a groove, young college men preferably, who are not too genteel to work their way up from the bottom; . . . . When a college graduate reaches the age of 25 or 30 years he is ready for a position of trust. When men get older they may have acquired wider experience, and, therefore, become more valuable as specialists, but for managers and executives we select young men with brains and education." And as a proof that this is a representative opinion, Mr. Sahlin states that out of 21 principal blast furnace plants he visited, no less than 18 were managed by college graduates, the majority of whom were young men.

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* These rates may be compared with the 6*s*. per ton charged for the transport of Spanish ores from Bilbao to Tees-side.

Ratio of Production Capacity to Outputs in the States.—One of the most significant features about the American industry is the great increase in productive capacity both in iron and steel during the past six or seven years, and the fact that the present capacity greatly exceeds either the present output or the probable needs of the home markets for many years to come.

The actual state of affairs is shown in the next table:—

——	Dec. 1895. Output Capacity.	Dec. 1901. Output Capacity.	1901. Actual Output.
	Million Tons.	Million Tons.	Million Tons.
Pig iron	17·3	24·8	15·8
Bessemer steel	9·5	13·0	8·7
Open-hearth steel..	2·4	8·3	4·66

Indeed the total capacity of American steel plants in 1901 was 21·3 million tons, an excess over actual output of about 60 per cent. So that even in a busy time an enormous amount of capital must be lying idle in the States. The question naturally arises, what will happen when the next period of difficulty arrives? When we remember that the maintenance of a high rate of production as a factor in reducing costs is a guiding principle in American policy, it is not difficult to see that the next trade depression will bring on a crisis either in the States or in Europe, according to whether or not the American ironmaster can place his products on the European market at lower prices than they can be produced in England or Germany.

Comparison of Costs of Production in Europe and the States.—It now remains to consider how the real economic position of British and German iron and steel industries, in the more favoured centres of production, compares with that of their great rival in the States; whether, indeed, there is any likelihood of American ironmasters being able to permanently undersell our own products on the European markets.

The enviable position of Germany as regards ore supplies has been already indicated; not even America, with her immense resources, can claim any real advantage in this particular, since the Lorraine deposits probably exceed in magnitude anything which, up to the present at any rate, has been discovered in the States. Our British industry, of course, largely depends on foreign ore supplies, which, indeed, are no further from our furnaces than are the Lake ores from Pittsburg. It is idle to speculate as to whether foreign ore supplies are likely to fail us or not; all one can say is that the Spanish mines have so far wonderfully responded to our demands, and that if efforts to apply magnetic separation to the abundant but lean magnetic ores of Scandinavia prove successful, the ore problem will probably be solved for the next generation or two. Assuming, then, that foreign supplies will not fail us, it may be fairly argued that such of our producing centres as are near both the sea coast and abundant fuel supplies (*e.g.*, the Cleveland District) will always be most favourably situated both as regards assembling materials at the furnaces and exporting the products to the world's markets.

We may now compare the costs of assembling materials necessary for the production of a ton of pig iron at Pittsburg, Middlesbrough, and a typical Westphalian centre such as Dortmund. With regard to Pittsburg and Middlesbrough, we may draw up two estimates, one for costs as ascertained for 1901, and the other as representing the lowest recorded transport rates for ores from Lake Superior and Bilbao respectively.

(*a*) *Estimated Cost of assembling Materials for a Ton of Iron at Pittsburg Furnaces using Lake Ores.*

——	1901. *s.*	1901. *d.*	Lowest.		
1·8 tons Lake ore at 11*s.* 6*d*	20	8⅖	At 6*s.* 3*d.* =	11	3
0·9 ton Connelsville coke at 3*s.* 1*d.* .	2	9	At 2*s.* 1*d.*	1	10½
0·4 ton limestone at 10*d.*	0	4	At 10*d.*	0	4
Totals	23	9⅖		13	5½

(*b*) *Estimated Cost of assembling Materials for a Ton of Iron at Middlesbrough for Furnaces using Spanish Ores.*

——	1901. *s.*	1901. *d.*	Lowest		
2·2 tons ore at 6*s*	13	2½	At 4*s.* 6*d.* =	9	10¾
1·0 ton Durham coke at 2*s.*..........	2	0	At 2*s.*	2	0
0·4 ton limestone at 3*s.*	1	2½	At 3*s.*	1	2½
Totals	16	5		13	1

It would, therefore, appear that as regards this most important item in the cost of production, Middlesbrough can claim some advantage over Pittsburg; this advantage is still more marked if we take the case of Cleveland furnaces smelting the native ores. The cost of conveying these to the various furnaces on Tees-side differs considerably, but on the average it can hardly exceed 1*s.* 6*d.* per ton. Taking this figure as an approximate rate, the cost of assembling the materials for a ton of Cleveland pig iron would be—

	s.	*d.*
3·5 tons Cleveland ore at 1*s.* 6*d.*..............	3	9
1·1 tons Durham coke at 2*s.*....................	2	2⅖
0·6 ton limestone at 3*s.*......................	1	10
Total........................	7	9½

(*c*) *Cost of assembling Materials for a ton of Iron at Dortmund.*—It is rather difficult to form an approximate estimate in this case, because the Westphalian furnaces are fed with mixtures of various ores, and there is little available information as to the cost of getting the fuel to the furnaces. Taking, however, a typical ore charge as composed of about equal proportions of Spanish hæmatite, Nassau ore, and Lorraine minette ores, the cost of assembling ores per ton of iron would be about 11*s.* 10*d.*, and if we allow 2*s.* for assembling the ton of coke, and 0·5 ton of limestone required, the total cost would amount to about 16*s.* 10*d.*

The foregoing figures do not pretend to be more than approximately correct, but they suffice to show that Pittsburg possesses no geographical advantages over either the Cleveland District or Westphalia. But when we consider the relative position of the Pittsburg ironmaster with regard to European markets, we must remember that he has to pay 8*s.* 6*d.* per ton to get his iron to Baltimore, the nearest Atlantic port, as well as an ocean freight of about 9*s.* per ton before he can place it on the threshold of any European country. Such considerations as these make the idea that we are in danger of being undersold on our own and European markets by our energetic trans-Atlantic rivals look rather ridiculous.

If we now consider the actual cost of materials at the furnaces, we find that the average ore prices at Pittsburg during the three years 1899—1901 amounted to about 16*s.* 4*d.* per ton for Mesaba ores. Spanish hæmatite has been delivered at Tees-side furnaces for, on the average, 16*s.* per ton, whilst Cleveland ironstone (Fe = about 30 per cent.) costs from 4*s.* 6*d.* to 5*s.* per ton at the mines. The Pittsburg smelter has probably paid less for his coke than his Middlesbrough rival; Connelsville coke has averaged 8*s.* 4*d.* per ton at the ovens over the three years in question, whereas Durham coke has been as high as 12*s.* to 14*s.* at the ovens. With regard to labour and standing charges, Mr. Jeans reports that at Pittsburg these have been as low as 2*s.* and 1*s.* 6*d.* per ton of pig iron respectively. It may be safely assumed that both these items are at present higher in this country, probably the two together would amount to about 6*s.* per ton. But with the more extensive adoption of labour-saving appliances, and increased furnace outputs, we may confidently expect these charges to be reduced to something approaching the present American figures.

It is of course almost impossible to obtain strictly comparable figures as to the cost of production at different nelting centres, since the prices of raw materials somemes fluctuate considerably within comparatively small me intervals. Nevertheless, the following figures will ve some idea of the position of affairs in the States during cent years.

In 1890 Sir Isaac Lowthian Bell computed the cost of roducing Bessemer iron at Pittsburg at 53*s.* 9*d.* per ton; ccording to Mr. C. Kirchoff this cost was reduced by mething like 36 per cent. during the next eight years, so at on the basis of Bell's estimate, the cost in 1898, a year f low prices, would be about 34*s.* per ton. According, owever, to the report of the U.S. Industrial Commission, e 1898 cost was 39*s.* per ton, with a selling price of from 0*s.* to 42*s.* per ton. During 1899—1901 costs and prices dvanced considerably; in 1900 the U.S. Commission eported a cost price of 61*s.* 6*d.* for Bessemer pig at ittsburg, whilst Mr. Jeaus gives figures which indicate an estimated normal cost" of about 40*s.* per ton. If to these rices we add 17*s.* 6*d.* we may form some idea of the actual ost of placing Pittsburg iron at a European port.

The Southern States appear to be in a somewhat better conomic position for producing iron. Mr. Jeans states hat in 1901 the cost of production was 8 dollars, or 33*s.* 4*d.* er ton at Birmingham (Ala.), but so far a transport rate of rom 7*s.* 3*d.* to 10*s.* 6*d*, per ton to Mobile, the nearest port, as prohibited the development of a large export trade. Nevertheless, there are many people in the States who elieve that whilst Pittsburg and the Northern centres ust of necessity look to the home markets for the bsorption of their products, the Southern centres will, in he near future, be able to build up a flourishing export usiness. Already schemes are in the air for connecting hese centres with Mobile by a canal-river route, whereby t is hoped to reduce the transport rate to 0·5 dollars per on. Should these schemes be realised, we may expect to ee Alabama iron in a position to permanently compete on fairly level terms with our own on European markets.

Newcastle Section.

Meeting held at Durham College of Science, on Thursday, January 29th, 1903.

MR. W. L. RENNOLDSON IN THE CHAIR.

AN IMPROVED APPARATUS FOR ACCURATE GAS ANALYSIS.

BY WILLIAM H. SODEAU, B.Sc., F.I.C., ELSWICK WORKS, NEWCASTLE-ON-TYNE.

Some time ago the author concluded that the gas analysis apparatus devised by Messrs. W. Macfarlane, F.I.C., and Peter Caldwell (J. West Scotland Iron and Steel Inst., No. 2, vol. I., 1892) might be adapted for gas analysis of the highest accuracy. Starting from this basis, various modifications and additions have been made until but little of the original arrangement now remains.

The Measuring Apparatus (see Fig. 1).—The original device for raising and lowering the mercury reservoir, by means of a cord passing over pullies and attached to a sliding block, is very convenient, as only one hand is employed in moving the reservoir, and it is very rarely necessary to use the clamping screw. In the present apparatus the height of the guides has been increased in order to correspond with other alterations.

The Macfarlane and Caldwell water jacket is too small to accommodate a correction tube (see next section), and is supported in a manner giving more play than is desirable for accurate work. That portion of the support which partially encircles the jacket very frequently renders the proper illumination of the meniscus a matter of considerable difficulty. To remedy these defects, a cylindrical glass water jacket of 4 inches internal diameter, and 16 inches in height, is rigidly fixed to one of the uprights which guide the mercury reservoir, being supported at the bottom on a perforated block of compressed cork, A, and clamped at a point about 2 inches below the top, against a more or less crescent-shaped wooden block, B, by means of a strip of brass about 1 inch wide passing round the jacket, and tightened by means of a butterfly nut. A vertical strip of brass, about $2\frac{1}{2}$ inches high and [illegible] inch wide, serves to keep the capillary tube of the measuring vessel in position. The top of the jacket is closed by means of a split cork, which keeps the four upper ends of the measuring apparatus in position. In order that the movements of the mercury may be properly followed it is important that the brass strip should not extend as high as the bottom of this cork. A glass tube, S, passes nearly to the bottom of the jacket, in order that the water may be readily siphoned off when desired, for example, if it is advisable to alter its temperature.

The level-tube, L, is straight, having its lower end drawn out so as to pass through the india-rubber stopper closing the neck of the jacket, and its upper end fitted with an india-rubber stopper bearing a stopcock. The side branch leading to the measuring tube has a downward slope at the point at which it leaves the level-tube, but is bent upwards slightly beyond this in order to facilitate connection with the measuring tube, M, by means of a short piece of india-rubber pressure tube. This arrangement prevents any air bubbles, accidentally entangled with the mercury, from reaching the measuring tube, and the indiarubber connection facilitates cleaning and simplifies the construction of the interchangeable measuring tubes. The measuring tube, (verified at the Reichsanstalt) employed for the analysis of chimney gases, has at the top a cylindrical bulb, of about 26 mm. internal diameter, joined to a capillary which passes through the large cork, and below this bulb a straight stem graduated from 35 c.c. to 50 c.c. in 1/10 c.c. divisions. The zero point of the graduation is situated at that side of the stopcock, N, which is furthest from M, as the gas is not expelled from the stopcock bore and inner part of the capiliary before measuring. The capillary leading from the bulb terminates in a three-way oblique bore stopcock arranged as in the Macfarlane and Caldwell apparatus, except that the plug is placed horizontally in order to avoid the difficuly of driving gas down the markedly sloping bore of an oblique stopcock having its plug placed vertically. For other classes of work similar graduated tubes, either straight or with larger or smaller bulbs, may be substituted for the one figured. A small U-tube (U, Fig. 1) having one end joined to a bent capillary tube, is partially filled with water, and connected to that branch of the stopcock, N, which cannot be placed in connection with the bulb of M. The lower end of the level-tube is connected to a T-piece, one limb of which is provided with a stopcock of about 3 mm. bore,* and connected to the mercury reservoir, whilst the other is prolonged across the table to a point near the reading telescope (which stands on the same table), where it is connected to a short length of stout indiarubber tubing of $\frac{1}{4}$-inch bore, capable of being compressed by means of a screw clip, having a plate 1 inch in diameter instead of the usual bar. The apparatus stands at the edge of the gas analysis table, with the graduations of course turned towards the reading telescope; the cross pieces of the stopcocks are therefore placed on the ungraduated side, *i.e.*, the side from which the apparatus is manipulated. This reversal of the more usual arrangement leads to greater compactness by avoiding the use of a separate stand for the reading telescope, and permits the ready employment of the fine adjustment for levelling the mercury as described below.

The gas having been introduced into the measuring vessel, the stopcock at the top of the level-tube is opened and the mercury roughly levelled. The stopcock leading to the mercury reservoir is then closed in order to prevent oscillation, and the levelling completed without taking one's eye from the reading telescope by gently turning the milled head of the screw clip so as to increase or diminish the capacity of the india-rubber tube referred to above.

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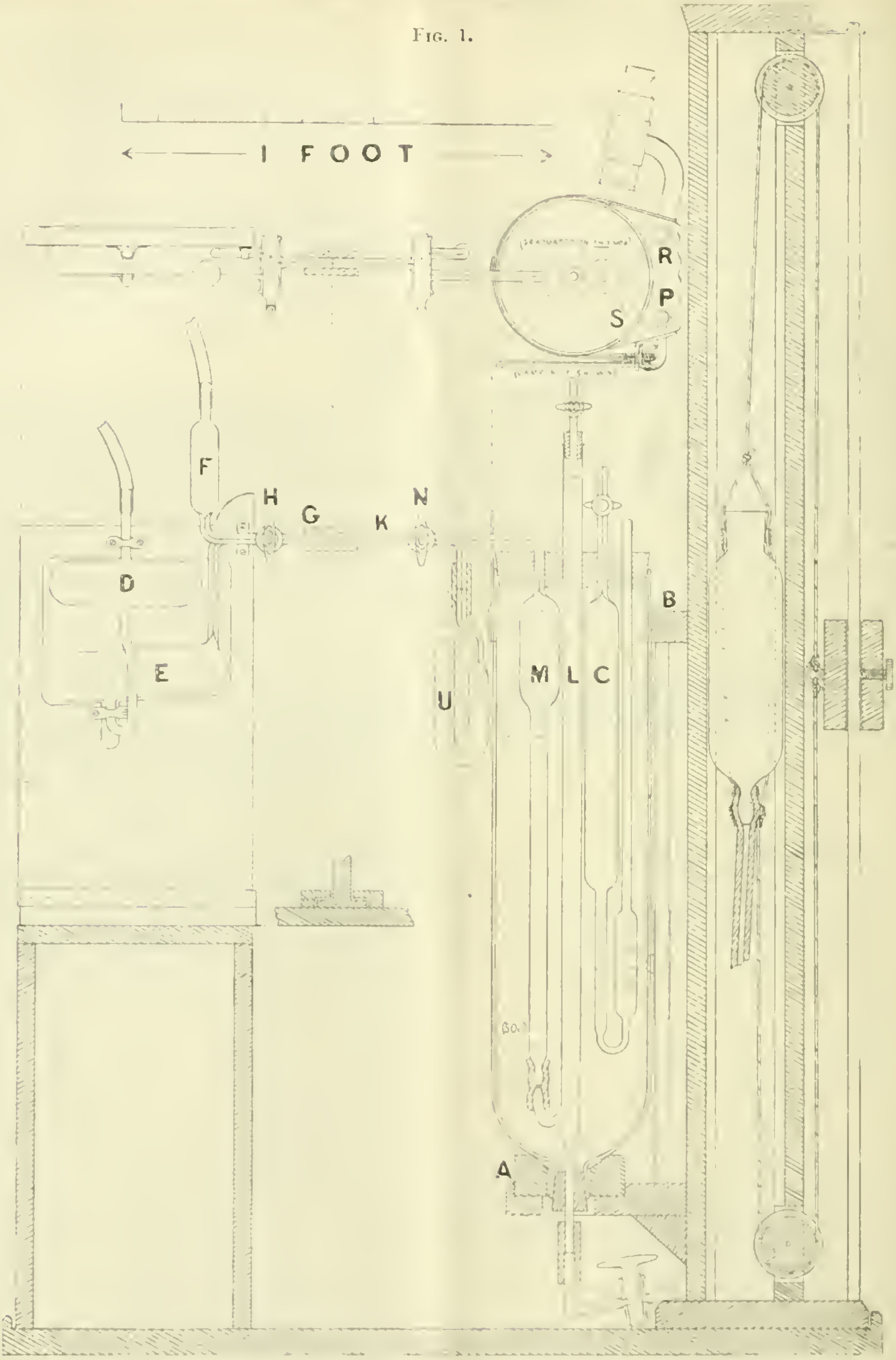
* The plug of this stopcock should taper but little, in order that it may not be forced out by the pressure of the mercury.

Fig. 1.



In order that the surfaces of the mercury may be well illuminated a quarter-plate "focussing screen" has its upper half covered with copper foil, and a 2 c.p. electric lamp (not shown in Fig. 1) fixed opposite the centre and about 5 inches behind it. A split tube attached to this arrangement is slid up or down the rod, P, until the lower edge of the opaque part is just above the level of the mercury, the lamp being brought into use as soon as daylight becomes too weak.

It seems strange that so many chemists still follow Bunsen in employing measuring tubes graduated in millimetres, although the original excellent reason for this system has long since ceased to exist in ordinary work. The troublesome necessity of constantly referring to a calibration table seems to be accompanied by no compensating advantage, and at the present time the errors of graduation in a good measuring tube are so small they can often be ignored, and always carried in one's head.

A "New Principle" Correction Tube (C, Fig. 1).—A cylindrical bulb of capacity markedly exceeding 50 c.c. (see below) is sealed at the upper end to a small stopcock, and at the lower to a U-tube, of which the descending limb is aduated in 1/20 c.c.,* whilst the ascending limb has a arked increase of diameter at a level corresponding to at occupied by the graduations of the other limb. After reful cleaning this apparatus is fixed in the water jacket ith both ends above the top of the large cork, and the oss-piece of the stopcock pointing towards the reading lescope in order that it may be practically impossible for to be turned by mistake during the analysis. This stopck is opened and water introduced until the lower part of e meniscus roughly coincides with the line which is taken s the zero point. The instrument then requires no further ttention until the water has been sensibly reduced by vaporation, except the momentary opening and closing of e stopcock immediately before an analysis is commenced, order that the water may be brought approximately to e zero line, and large correction numbers thus avoided. eadings of this instrument may be taken by means of the rdinary reading telescope, but it is convenient to employ reading lens similar to that sometimes attached to Stead's pparatus, consisting of a lens of, say, 5 ins. focus mounted bout 3 ins. beyond a disc having a small hole like the cap f a small eye-piece, the whole being attached to a split ube sliding on the rod R. The corrections can thus be ound as easily as a thermometer is read, and much trouble s saved by the use of this correction tube, although the sual form, in which it is necessary to level the mercury in he two limbs before reading, seems of all but doubtful tility, as it is more trouble to adjust one of these than to uccessively read a thermometer and a good barometer onstructed on the Kew principle.†

Let the capacity of the bulb, together with that of the ortion of the tube which is above the zero point = X c.c., nd let the atmospheric pressure be 750 mm., then if a hange which would lead to a 1 per cent. increase of volume s to give 0·5 c.c. displacement of water, and this results in disturbance of level amounting to N mm., it follows hat—

$$1{\cdot}01\,X = (X + 0{\cdot}5)\left(1 + \frac{N}{760 \times 13{\cdot}5}\right) \therefore X = \frac{10{,}260 + N}{205{\cdot}2 - 2N}$$

In a tube made by the author a movement of 0·5 c.c. isturbs the level to the extent of 16 mm.; hence X = 59·4 .c. With this capacity above the zero mark one division (1/20 c.c.) corresponds to a correction of 0·1 per cent., and ach of these divisions can be further subdivided into 10 by eye-estimation.

The above calculations are made on the assumption that the barometer is at 760 mm., but ordinary atmospheric variations do not cause a sensible error. Thus at 700 mm. the error introduced in correcting for 2° C., or 6 mm., amounts to only 0·01 per cent.

The correction tube can, of course, be used in nitrogen determinations, &c. if a reading is compared with the temperature and pressure at some time during the day.

Pipettes for Ordinary Absorbents.—The form shown in Fig. 1 differs from that of Macfarlane and Caldwell in two important points. Whilst the upper cylindrical bulb D, of about 60 c.c. capacity, retains its horizontal position, the lower cylindrical bulb E, of about 80 c.c. capacity, is slightly inclined, so that the end nearer the stopcock is about ¼ in. higher than the further end, in order that the unabsorbed gas may be returned to the measuring vessel without the troublesome necessity of tilting practically the whole of the apparatus, and then restoring it to its original position. Instead of a simple stopcock, the pipette is provided with the well-known device of a three-way oblique stopcock H, so arranged that the projecting capillary G can be placed in connection with either the bulb E, containing about 20 c.c. of the absorbent confined over mercury, or with the bulb F, of about 15 c.c. capacity, containing mercury. It seems probable that the pipette would be further improved by bringing the stopcock H nearly down to the level of the top of E, the vertical portion of the connecting capillary being thus considerably shortened. This would reduce the surface of contact between the mercury and glass wetted by the absorbent. The glass portion is mounted on a wooden support similar to that used by Macfarlane and Caldwell, the bottom of which slides freely into the groove of a wooden foot when in actual use. Whilst out of immediate use the bottom of each pipette is slid into a rack, which is inclined about 35° in order to relieve the pressure of the mercury, and thus prevent the absorbent from being forced through the stopcock. It is important that the end of the capillary G should be smooth, and at right angles to the axis of the tube, as any projecting pieces, either here or on the corresponding part of the measuring tube, will cause the introduction of an air bubble. The end of each capillary tube should therefore ordinarily be ground. It is also desirable that the external diameter of all capillary tubing used in the construction of this gas analysis apparatus should be about 6 mm., and that its bore should neither exceed 1·5 mm. nor be less than 1·0 mm. The tubes projecting upwards from D and F are each provided with a piece of india-rubber tube, about 6 ins. long, in order that the pressure therein may be varied by drawing or blowing as required—a process much easier than that of moving a mercury reservoir.

Mode of Manipulation.—After introducing the gas into the measuring tube, the stopcock N (Fig. 1) is turned so as to connect the capillary K with the U-tube U. The pipette having been placed on a stool of appropriate height and connected to the measuring apparatus by means of a short piece of *really good* red india-rubber tubing of ⅛ in. bore and ½ in. external diameter, the ends of the two wetted capillary tubes are made to meet. A little water is then sucked through the capillary tubes into F, some of the mercury contained therein allowed to run back, and H closed. In this way the capillaries leading from the measuring tube to the pipette are washed out and filled with mercury. After measurement the gas is sent over into the pipette, followed by sufficient mercury to clear the capillary tube, and the pipette shaken from side to side with the stopcocks closed, in case the tube should by any chance slip off, until absorption is complete. The construction of the apparatus allows of efficient agitation, and in the nearly horizontal bulb a considerable surface of absorbent is exposed, so that there is more chance of the absorption being as accurate as the measurement than is the case in some well-known forms of apparatus. When absorption is judged to be complete a little more mercury is run over in order to clear any absorbent from that part of the capillary which is sealed to the bulb E, and the mercury in this capillary, instead of being returned to the measuring tube, is forced into U, the water in the latter affording complete safety as regards loss of gas: for, if the stopcock N should not be turned at the right moment, any gas passing over can be drawn back again. When the gas reaches N the stopcock is reversed, and the gas passes into the measuring tube, the rate being controlled by means of H. The constriction caused by this stopcock (nearly closed) brings the absorbent almost to a standstill when the gas has passed through, so there is no difficulty in stopping the absorbent when it has just filled the bore of the stopcock. The capillary is cleared of gas by means of clean mercury from F, this being stopped as soon as it reaches the stopcock N. In this way, nothing but gas is ever intentionally allowed to enter the measuring tube. These manipulations are really very easy, although the description may perhaps seem a trifle complicated.

When, as in the estimation of carbon monoxide, it is necessary to subject the gas to more than one treatment with an absorbent, the first pipette is brought into direct connection with the second, and the gas thus transferred from pipette to pipette until absorption is complete, when the gas is finally returned to the measuring tube. The manipulation in transference from pipette to pipette is practically the same as that between pipette and measuring tube.

A slight deviation is made when fuming sulphuric acid is employed, no mercury being then permitted to enter the bulb E or the capillary in immediate connection therewith. A U tube containing pumice and strong sulphuric acid is attached to the bulb D in order to prevent access of moisture,

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[*] A piece cut from a 10-c.c. graduated pipette answers very well.

[†] It seems difficult to understand the continued popularity of the Fortin barometer for ordinary rough chemical work, now that good Kew-system instruments can be procured with the National Physical Laboratory's certificate.

and the mercury first used to clear the capillary should be driven into F before introducing the gas into the pipette.

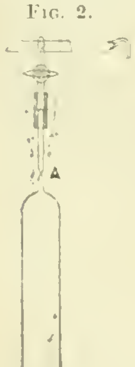
The Explosion Pipette resembles that of Dittmar, except that the stopcock and capillary U-tube are replaced by a three way stopcock and mercury bulb similar to those forming part of the absorption pipettes. It is convenient to mark rough graduations on a strip of paper fixed to the exterior of this pipette, in order that the gases may be expanded to the right extent before explosion. Oxygen is conveniently made in a Hoffmann's lecture voltameter, and stored over mercury in one of the "absorption pipettes," the ozone being thus removed.

A Convenient Phosphorus Pipette may be made by adding a horizontal capillary stopcock to an ordinary Orsat phosphorus pipette, and fixing it in a canister of water with two small holes in the lid, the one for the capillary bearing the stopcock and the other for a thermometer. This arrangement affords efficient protection from light, and one can easily avoid the snare of cold phosphorus, the temperature being so readily and certainly raised.

Other Appliances.—The construction of the measuring apparatus is such that almost any known absorption or combustion appliance can be used with it. For example, any Hempel pipette can be connected by means of an L-shaped capillary and a short piece of india-rubber tube; but it is usually better to replace the capillary U-tube by a horizontal stopcock, either three-way with mercury bulb, or plain two-way. It will thus be seen that the apparatus here described has a very wide application.

Adaptability for Rapid Technical Work.—The description given above applies to work of high accuracy, but the apparatus can readily be made to serve for an occasional series of analyses in which rapidity is of more consequence than high accuracy. In such cases the pipettes should be charged with the absorbents alone (the mercury being omitted), each one which contains a liquid liable to deterioration on exposure to air having an india-rubber balloon connected to the tube projecting upwards from the bulb D (Fig. 1, p. 188). Using water as the confining liquid in the measuring vessel, the apparatus becomes a kind of water-jacketed Hempel, with pipettes which expose a relatively larger surface of absorbent than do the ordinary Hempel pipettes. If the manipulation of a stopcock on the pipette is thought to be undesirable, a capillary U-tube having a right-angled bend near each end may be attached by means of india-rubber tubing wired on to the capillary G, the stopcock being left open and the absorbent brought over into the U-tube, as with Hempel's pipettes.

FIG. 2.



Convenient Arrangements for Collecting Gas Samples (Fig. 2).—It is occasionally necessary to seal up a sample of gas, although with a good lubricant* the ordinary tubes with two stopcocks will satisfactorily preserve a sample for a considerable period. The author devised the tube described below after failing to find any description of a tube which, after having been sealed, could *readily* be placed in connection with the gas measuring tube without risk of introducing air. It consists of a cylindrical bulb, of, say, 200 c.c. capacity, joined at the upper end to a narrow tube drawn down to a capillary for sealing at A, and at the lower end to a tube of about 7 mm. bore, drawn down for sealing at the point B, about 4 or 5 cm. below the bottom of the bulb. When it is desired to collect a sample, the lower end is connected to a mercury reservoir by means of india-rubber tubing, and the upper to the bent capillary side tube of a T-piece (see Fig. 2), this arrangement being adopted in order that any condensed moisture may pass straight to the aspirator instead of entering the sample tube. After the sample has been collected, the tube is sealed at A and B in the usual manner. In order to transfer the sample, the lower tube is nicked with a glass knife near its junction with the bulb. The end B can then be easily broken off with the fingers beneath the surface of mercury in an ordinary porcelain trough. A crucible is then slipped under the open end, and the tube transferred to a vertical mercury trough, when a capillary siphon, filled with mercury, can readily be passed up through the open end of the tube, and the required portion of gas drawn into the measuring tube.

A single cylindrical bulb can be used many times in succession by simply joining short pieces of tubing to either end and drawing them out for sealing. When it is desired to collect a sample during some definite period of time, the trouble of adjusting a stopcock so as to give the required rate of flow may be avoided by attaching a T-piece to the lower end of the sample tube and another to the india-rubber tube leading from the mercury reservoir. Two connections are then made (each capable of closure by means of a screw clip). The one utilised when filling the tube consists simply of a piece of pressure tube, whilst the other, used when collecting the sample, causes the mercury to pass through a drawn-out piece of capillary tube selected from a set of such pieces, which have been previously labelled, showing the time during which the mercury contained in the sample tube will run through under a given difference of level. The latter can, of course, be varied when some intermediate rate is desired.

The following seem to be the chief advantages of the present apparatus, as compared with that of Macfarlane and Caldwell, when used for work of high accuracy (for which the latter apparatus was, perhaps, not intended):—

An accurate correction tube, which really saves time and trouble.

A means of accurately adjusting the level of the mercury without taking one's eye from the reading telescope.

Still greater cleanliness of the mercury in the measuring tube at the end of an analysis.

The possibility of washing out the measuring tube, in case of accident, at any stage whilst the gas is in one of the pipettes.

Direct transference from pipette to pipette when desired.

The measuring tube constant in position.

A good illumination for reading always obtainable without trouble.

Explosion in a separate pipette.

Advantages, as compared with the Dittmar or similar apparatus:—

Transference *direct* from measuring tube to pipette instead of to and from an intermediate tube.

Easier manipulation and greater cleanliness, especially as regards the fatal introduction of absorbent into the measuring tube.

Pipettes giving more surface and better agitation.

A considerable reduction in the amount of mercury required.

An apparatus representing an intermediate stage in the development has been in use at King's College, London, for some time. The author is informed that it has given every satisfaction in the hands of the students there.

DISCUSSION.

Mr. RENNOLDSON remarked on the vast improvement in gas-analysis apparatus since he had done anything in that line. In his student days such an apparatus as Orsat's was not known. Now it was in common use in many works. Such apparatus added incalculably to the speed and curacy of gas analyses. He admired the use of the Kew-inciple correction tube for correction for variations in mperature and pressure, and the use of anything but a und number, in order to avoid calculations later.

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* The author employs a lubricant recommended by Mr. H. Jackson, of King's College, London. Six parts of black rubber (tubing), five parts of vaseline, and one part of solid paraffin should be heated together for some hours at a temperature sufficient to make the vaseline give off a fair amount of vapour. The process is complete when the whole of the rubber has dissolved. The heat employed must not be sufficient to burn the rubber.

Dr. Bedson expressed the pleasure he had had in stening to the paper. He had done a good deal of gas nalysis himself, and used a variety of apparatus, many of hich he had consigned to the lumber room. At present e was using the form devised by Dittmar, but, after seeing Ir. Sodeau's apparatus, thought the result would be that he ould adopt it. He appreciated the ingenious way in which Ir. Sodeau had made use of small things in the improvement of the apparatus; *e.g.*, the slope of the pipette to icilitate the complete removal of the gases, and the effective ianner in which he had used the double-bored tap. He onsidered that it was a very perfect piece of apparatus. Ie thought that the use of tubes graduated in millimetres t the present time was due to a conservatism among hemists, just as was the use of that objectionable reagent, ulphuretted hydrogen, in analysis, which might be replaced ithout disadvantage by other reagents. The use of the aillimetre graduation had one use, however, since, by aving to calibrate his tubes, the student obtained a great eal of valuable information. He proposed a vote of thanks o Mr. Sodeau.

Dr. Dunn admired the apparatus itself, and also the lear exposition of its working, and the way in which Mr. Sodeau had manipulated it. He emphasised Dr. Bedson's emark that the satisfactory working of the apparatus was lue to no new principle, but to the accumulation of improvements in small details. It appeared to be capable of giving esults of great accuracy and with great rapidity; it was 1 distinct advance in gas-analysis apparatus.

Mr. Garrett asked whether a scale graduated in c.c. vas more expensive than one graduated in mm., and uggested that adherence to the mm. scale might be due to he difficulty of purchasing a trustworthy tube graduated therwise. Mr. Sodeau's apparatus was certainly very convenient, and he hoped that some instrument maker would manufacture it before long. Had Mr. Sodeau any idea what its probable cost would be?

Mr. Collins asked whether there would not be a chance of getting a bubble of air into the apparatus at the rubber joint.

Mr. Sodeau replied that with really good india-rubber tubing the joint was so satisfactory that he had found no difficulty in exhausting an X-ray tube connected to the pump in a similar manner. The space between the capillaries would, presumably, contain water rather than air, as the capillaries were wetted before use. No measurable error could arise from the existence of this space, as its volume could not well exceed 0·01 c.c. except when the ends were very badly finished off. The pipette was pressed towards the measuring apparatus so that there should be a stress in the glass parts, forcing the ends of the capillaries together; even if the rubber tube were to slip right off during the shaking, the ends would be made to meet before retransferring, and any included air cleared out by the mercury passing through in advance of the gas. The making of a table of corrections for a tube graduated in c.c. should teach a student as much as the calibration of one having a mm. scale. He was not aware that graduation in c.c. involved any appreciable increase of cost. In the case of the tube which had its zero point wrongly placed, it was merely necessary to add 0·1 c.c. to the total volume when calculating percentages, a trivial detail compared with the trouble of continual reference to a calibration table. The saving was very real, in spite of the maker's carelessness. With regard to the cost of such apparatus, each pipette cost about twelve shillings, the measuring tube with certificate about a pound, and the cost of the whole apparatus, with pipettes and explosion tube, would probably not be more than 10*l*. One must also take into account the fact that but little mercury was required.

New York Section.

Meeting held at Chemists' Club, on Friday, December 19th, 1902.

DR. V. COBLENTZ IN THE CHAIR.

THE GUTZEIT MERCURIC CHLORIDE TEST FOR ARSENIC.

BY AUGUST GOTTHELF.

This paper is the outcome of work done in connection with the revision of the United States Pharmacopœia, for the purpose of finding a simple, reliable test for the detection of arsenic in medicinal chemicals. On consideration of the well-known tests for arsenic, several of which have been used in previous editions of the Pharmacopœia, Prof. Coblentz, in a preliminary report to the Revision Committee, came to the conclusion that that modification of the Gutzeit method in which mercuric chloride paper is used for testing the gas evolved is a simple one, and therefore the most suitable, provided it is sufficiently accurate. For this reason the work has been confined to this test; but comparisons have also been made with the Marsh-Berzelius method, which, while doubtless the most accurate of all, is rather too complicated for general use.

The numerous objections which apply to the original Gutzeit test, *e.g.*, using silver nitrate paper, are well known. The instability of silver nitrate, when in contact with organic matter, is the cause of almost all of them. In the first place, because of the influence of light, the test must be conducted in the dark; but even this does not prevent reduction, as Brunner (Jahresb. f. Chem., 1864, 124) has shown that the prolonged action of hydrogen gives black stains even when light is excluded. Acidifying the silver solution with nitric or sulphuric acid delays this action, but does not prevent it. Treadwell (Quantitative Analyse, p. 138) uses a saturated solution of potassium chlorate in which to dissolve the silver nitrate, and in the few experiments I have tried it has worked very well.

Gases occluded by the filter-paper used have also been mentioned as giving black stains with the silver salt. Several writers, notably Beckurts (Pharm. Centralh., 1884, 197), have denied this.

Another difficulty is the fact that water instantly decomposes the yellow compound forming the stain, with the separation of black metallic silver. When a slight brown or black spot is obtained, therefore, great uncertainty exists as to whether it is an arsenic stain decomposed by moisture, or is produced by some other cause.

The substitution of mercuric chloride for silver nitrate was first proposed by Merçeron and Bergeret (Comptes Rend., **79**, 118) in 1874. The action of arsine on mercuric chloride had already been studied by several chemists. Franceschi (L'Orosi, **13**, 289) found the yellow compound first produced to be $AsH(HgCl)_2$. If the passage of the gas is continued, the precipitate becomes reddish-brown. This compound was analysed by Heinrich Rose (Poggendorff's Annalen, 1840, **51**, 423), and found to be $AsHg_2Cl + HgCl_2$. More recently, Lohmann (Pharm. Zeit., 1891, **36**, 748 and 756) has repeated this work and confirmed Rose's results. He, however, prefers to write the formula as $As(HgCl)_3$. On examining these two compounds, it is seen that they are derived from arsine by the substitution of hydrogen by the group HgCl, the yellow compound having two hydrogen atoms substituted, and the reddish-brown one all three. Partheil and Amort (Ber., 1898, **31**, 594) tried to prepare the compound in which only one hydrogen atom is substituted, *i.e.*, $AsH_2(HgCl)$, but were unsuccessful.

In applying the test for arsenic it is the yellow compound alone which is ordinarily observed, and it is only with relatively large amounts of arsenic, that is, large considering the delicacy of the test, that the stain becomes orange, due to the formation of the reddish brown derivative.

After Meigeron and Bergeret, Flückiger (Archiv der Pharm., 1889, **27**, 1) was the next to use the reaction as a test for arsenic, and to make a more thorough study of it. He gives the limit of sensitiveness as about 0·002 mgrm. As_2O_3, and because the liability of coloration by other causes than the presence of arsine is much less than with silver nitrate, he recommends the test as more reliable than the Gutzeit. At the same time, the hydrides of sulphur, antimony, and phosphorus act on mercuric chloride as well as on silver nitrate, and sulphur, antimony, and phosphorus in easily reducible forms must therefore be absent. Oxidation of the sulphur and phosphorus compounds by bromine or iodine to sulphates and phosphates, which are not reduced by the hydrogen, was a method long in use before this with the Gutzeit silver test. Flückiger also tried mercuric sulphate, white precipitate, calomel, and the double chloride of mercury and potassium as substitutes for mercuric chloride, but found they possessed no advantages.

Since 1900 the arsenic tests, having suddenly gained in importance, are being investigated with much care. The test here under consideration has not been neglected. Paul and Cownley (Pharm. J., June 1900, 688) criticise the addition of iodine to oxidise sulphur and phosphorus compounds on the ground that unless the quantity necessary is known the iodine in excess may prove as objectionable as the sulphur. They therefore recommend the use of starch to avoid excess.

Dowzard (Chem. and Druggist, Dec. 1900, 921) used the method for the detection of arsenic in glucose, and introduced the improvement of placing a roll of filter paper moistened with lead acetate solution in the neck of the flask, which, he says, makes unnecessary the addition of iodine. He gives the limit of sensitiveness with glucose, which he found retarded the evolution of arsine, to be 0·05 mgrm. of As_2O_3.

Bird (Chem. and Druggist, June 1900, 1073) is the first author, so far as I have been able to find in the literature of both the Gutzeit silver nitrate and the mercuric chloride tests, who mentions that arsenic in the higher state of oxidation gives a coloration very different in depth from that given by the same amount of arsenic in the lower state, owing, of course, to its forming arsine much more slowly. This fact, lost sight of in the Marsh-Berzelius method, where large amounts of zinc and acid are used, becomes of great importance in this test, where only 2 to 3 grms. of zinc, and even less, are used with correspondingly small amounts of acid.

Bird states that it is essential to first reduce the arsenic to an arsenious compound if a true idea of the amount present is to be formed. He found, for instance, that when 0·05 mgrm. of sodium arsenate was tested beside arsenious acid containing the same amount of arsenic, the stain from the former, in 15 minutes, was only about one-quarter of the intensity of that from the latter. These statements have been confirmed by my own experiments.

Bird mentions the use of sulphur dioxide as a reducing agent, but the test recommended by him in his first paper for sodium phosphate is oxidation with iodine, using starch paste to avoid a large excess, and comparing the tints obtained with those given by known amounts of arsenate. Later, Allen mentions the addition of cuprous chloride in the Marsh-Berzelius test to reduce arsenic to arsenious acid.

Bird (Analyst, 1901, **26**, 181) in a later paper, and also Tyrer (Chem. and Druggist, March 1901, 194), Kirkby (Pharm. J., Jan. 1901, 80), and Dowzard (J. Chem. Soc., 1901, 715, and Chem. News, 1902, **86**, 3), have each designed new forms of apparatus for applying the test.

In both Tyrer's and Kirkby's method the gas is washed in lead acetate solution before being led to the mercuric chloride paper. In Dowzard's recent apparatus, of which he has brought out two forms, the gas is washed with either lead acetate or cuprous chloride solution, the latter being used to remove phosphoretted hydrogen. He also adds cuprous chloride to the solution being tested to reduce the arsenic to arsenious acid.

Bird's apparatus is radically different from all these, in that it is designed for carrying out the test in a boiling solution. It consists of a small flask, carrying a bulb condenser and an arrangement for passing the gas through lead acetate solution before leading it to the test-papers, which are fastened gas-tight over several openings in succession.

The acid is added through a side-funnel, drop by drop, in the course of 15 minutes.

These methods, requiring special apparatus, being unsuitable for our purpose, were not examined. The experiments were performed with a small flask of 60 c.c. capacity, in the rather long and narrow necks of which were placed two plugs of absorbent cotton, the upper one having first been washed in 25 per cent. lead acetate solution and dried.

Over the mouth of the flask was placed the test-paper, consisting of a piece of pure filter-paper moistened in one spot with several drops of a saturated alcoholic solution of mercuric chloride and dried.

Both granulated and rod zinc and sulphuric and hydrochloric acids were tried, and granulated zinc and 8 per cent. hydrochloric acid adopted as most suitable; 2 grms. of the metal and 20 c.c. of the acid being used for each test.

With these quantities it was found that as little as 0·001 mgrm. of As_2O_3 could be detected in one half-hour by a very faint tint. On applying the test to a sample of sodium phosphate, the arsenic in which had been determined by the Marsh-Berzelius method to be about 1 part in 40,000, it was found that as much as 1 grm. containing, therefore, about 0·027 mgrm. of As_2O_3 had to be taken before the presence of arsenic was distintly indicated.

On further examination it was found that the arsenic was not uniformly distributed in the salt, and that, therefore, the portion used may have contained less than supposed. This fact was, however, not sufficient to account for the apparent diminution in sensitiveness of the test, and it was only on reading the paper by Bird, already mentioned, that the cause was recognised in the fact that the arsenic was present as arsenic acid. This important point, *i.e.*, that the sensitiveness of the test towards arsenic acid is much less than toward arsenious, appears to be largely overlooked.

The fact that the arsenic in most salts is probably present as arsenic acid makes necessary, when an approximately quantitative estimation is desired by this method, either comparison with known amounts of arsenic acid, which has the disadvantage of making the test less sensitive, or else a preliminary reduction of the arsenic. For example, I found that arsenic acid equal in amount to 0·01 mgrm. of As_2O_3 gave in one half-hour a tint only about half as intense as that given by 0·005 mgrm. of As_2O_3. By applying the methods of reduction given below, however, the tints from equal amounts of both acids were identical.

The reducing agents tried were sulphurous acid, hydriodic acid, and cuprous chloride.

Sulphurous acid is the most generally useful, and has already been employed for this purpose by Bird. Hydriodic acid was found very efficient and easily applied in the case of sodium phosphate. Cuprous chloride was found to be less satisfactory than either of the others.

The sulphurous acid is applied as follows:—For 0·5 grm. of sodium phosphate in a small beaker, are added 1 c.c. of sulphuric acid (1 to 1), and 5 c.c. of a strong solution of sulphur dioxide. The whole is heated on a boiling water bath for 15 minutes. At the end of this time the excess of sulphur dioxide will have been removed. The solution is then transferred to a test flask, the beaker rinsed with 8 per cent. hydrochloric acid, using 20 c.c. in all, 2 grms. of granulated zinc added, and the test carried out as already described. The limit of sensitiveness under these conditions was found liable to vary somewhat depending probably on the temperature of the solution and the mechanical condition of the zinc, and, therefore an accurate estimate of the quantity of arsenic present is out of the question. The faintest discernible but still unmistakable tint* is usually given by 0·001 mgrm. of arsenic trioxide.

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* The test papers must always be examined by daylight.

Before applying this method to the detection of arsenic in dium hypophosphite a preliminary oxidation of the salt necessary, as hypophosphorous acid is easily reduced by scent hydrogen to phosphoretted hydrogen, which gives intense yellow stain on the test-paper. 0·5 grm. of salt is dissolved in 5 c.c. of nitric acid (1 to 1) and solution evaporated to dryness in a small beaker on the ter-bath, keeping the beaker covered until the first rather lent action is over; 5 c.c. of sulphur dioxide solution then added, the mixture heated on the water-bath for minutes, and proceeded with as in the case of sodium osphate.

Hydriodic acid, as already mentioned, was found con- nient to use with sodium phosphate.

0·5 grm. of the salt is placed in the test-flask and c.c. of 8 per cent. hydrochloric acid and 1 c.c. of rmal potassium iodide solution added. The mixture is ated on a boiling water-bath for five minutes, then quickly oled to room temperature, the zinc added, &c., as usual. periments to determine whether the iodine, which is vays set free in small amount during the heating, could use a coloration of the test-paper due to the formation of rcuric iodide, were tried with negative results in every se, even when three times the usual amount of iodide was ded. The five minutes' heating was found necessary to ect the reduction. This method cannot be used in the e of sodium hypophosphite, because the nitrate formed the necessary preliminary oxidation causes the liberation too much iodine.

. T. J. PARKER, CHAIRMAN OF THE NEW YORK SECTION)F THE AMERICAN CHEMICAL SOCIETY, IN THE CHAIR.

USE OF FIREPROOFING MATERIALS AS APPLIED TO WOOD.

BY DR. S. P. SADTLER.

Paper read before a Joint Meeting of the Four
'ew York Chemical Organisations, at the Chemical Club,
on Friday, January 9th, 1903.

The impregnation of wood with chemical solutions is not iew art, or one of recent development, but if we examine various treatises, &c. on this subject we shall find that st of the suggestions relate to the preservation of wood. e making wood fireproof, or, better, "fire-resistant," is ch rarer. There is a considerable literature on the fire- oofing of fabrics, which are relatively easy of saturation, surface treatment with the solutions used generally fficing to deposit upon the fibre enough of the salts to ve the fullest effect.

But the structure of wood makes its impregnation a ch more difficult problem, and both heat and pressure ve been invoked to accomplish in some moderate degree e desired end. Independent of this greater difficulty of pregnation, the fireproofing of fabrics, and the fireproof- g of wood are distinct problems, and the results obtained the one field are not applicable to the other with any iformity or certainty.

Turning attention now exclusively to treatment for the eproofing of wood, as distinguished from that of fabrics, find some references to early attempts in this direction, hough it is very probable that the treatment was a rface application, rather than an attempt at complete pregnation. In 1820, the Bavarian chemist Fuchs applied icate of soda to the fireproofing of wood, and employed it connection with the rebuilding of the Munich theatre for treatment of both woodwork and hangings. This was, wever, done exclusively by surface application to the od as well as to the fabrics (Die Wasserglas-gallerte, ihre iwendung und Nutzen; G.M. Orth-Weimar, 1857).

Gay-Lussac, in 1821, suggested the use of borax and the imonium salts. The salts of zinc and copper, and the lorides of the alkalis and of calcium and magnesium, ve been used upon wood, both by methods of surface plication and by the Boucherie method of inhibiting or idual sub-displacement.

In 1893 there appeared in Dingler's Polytechnisches 230, a very careful experimental study of the subject under the title "Ueber Flammenschutzmitteln," by Peter Löchtin, in which were reviewed the action of 20 water-soluble compounds and 17 substances insoluble in water. Löchtin, however, did not use wood in any of his experiments, but, instead, strips of heavy filter-paper, which, while it is made up of closely-matted cellulose fibres, does not possess the cellular structure of wood. For the tests with water-soluble substances the strips were saturated with solutions of definite percentage strength; for tests with substances insoluble in water the paper was saturated with a soluble compound, dried, and treated with the reagent producing the insoluble substance, dried, washed thoroughly, and again dried. He used several strengths of solution in each case, beginning with 20 per cent., and coming down in some instances to a solution of 1 per cent., strength. The results are then recorded for each strength, stating whether the test strip burned with flame or glowed merely, and in the latter case as to the extent measured in mm. to which the glow was propagated. The results are thus comparable in all necessary details, and allow of a very fair judgment as to the relative efficiency of action of the several substances used. We will refer to his summary of results later. Within the last decade several large works have been established in America, mainly in New York and neighbourhood, in which the fireproof treating of wood, as distinct from the treatment of fabrics, has been carried out on a commercial scale. As far as I am informed, ammonium sulphate is the main ingredient in such solutions for treatment.

As already said, the structure of wood makes its impregnation a much more difficult problem than that of textile fabrics. For this reason the problem is as much, if not more, a mechanical one than a chemical one. It was early recognised that very considerable pressure, as well as the use of hot solutions, was needed to accomplish much impregnation, and if we are to guard against injury to the fibre, the problem increases in difficulty.

The typical apparatus devised to effect this saturation of the wood was a large cylinder, from 70 to 100 ft. in length and from 5 to 7 ft. in diameter, closed at one end, with a movable head at the other. It was fastened, when closed, by a complicated system of radial multilocking bolts to the external end of the cylinder. The cylinder, which was constructed of steel plates riveted together, was intended to be filled with truck-loads of the lumber to be fireproofed, taking from 10,000 to 15,000 feet board measured at a time. The first treatment in this case is usually a steaming of the wood, designed to swell it and open up the pores. This is followed by the application of a vacuum for the purpose of facilitating the final step of impregnation, which consists in admitting the treating solution, and putting on as strong a hydraulic pressure as the cylinder will stand. Each piece of the lumber thus has its surface enveloped by the solution, which is being forced into its open pores. But a pressure of 150 lb. is usually quite as much as can be maintained continuously in such a cylinder without excessive leakage around the door and at the riveted joints, and to effect a complete saturation, even with soft woods 1 inch thick, requires in such a case from 30 to 36 hours. A core saturation in heavier timber, such as 4 ins. × 4 ins. or 6 ins. × 6 ins., is rarely, if ever, obtained even in soft woods, and never in the hard woods. Obviously, if wood of all kinds and sizes needed for building construction is to be treated in the rough, core penetration is essential, as the timber has afterwards to be sawed and planed, and it is certainly desirable, from motives of economy of working, that this be accomplished in a reasonable time.

It was this that led to the trial of steaming, followed by the application of a vacuum to withdraw the softening sap and cell contents. Study of the behaviour of woods when their external surfaces are surrounded by liquids under pressure has shown that for each variety there is a maximum normal pressure which it will endure, unless applied with shock, with no resultant injury to the cellular structure. This varies from 300 lb. with white pine to 1,200 lb. with white oak.

An invention, which was described in the *Scientific American* of July 28, 1900, and which I have frequently had an opportunity of seeing in operation in Philadelphia, has, I believe, removed most of these mechanical difficulties and made the matter of thorough core impregnation of both hard and soft woods a sure and relatively rapid operation, and that without injury to the structural strength of the wood. In this invention of Mr. Jos. L. Ferrell, M.E., the hinged gate is replaced by a heavy gate, sliding between vertical guides against a phosphor-bronze bearing and placed in a massive gate-housing near the end of the cylinder. This gate is lifted vertically by hydraulic power, so that the simple touch of a small lever suffices to open or close a gate weighing some 5 tons. The greater the pressure exerted by the liquor in the cylinder, the greater the force with which the gate is pressed against the bearing, and the tighter the joint must be. The cylinders themselves are made of cast steel, 3 inches thick, so that the pressures may be, and have been, employed up to 1,500 lb. By the intervention of a hydraulic accumulator it is possible to perfectly cushion the shock of the high-pressure pumps, so as to prevent all bruising of the wood when under strong pressure. This ability to apply the full pressure needed to saturate the wood without bruising it makes the preliminary steaming and vacuum unnecessary, which is greatly to the advantage of the wood with reference to the preservation of its full structural strength and appearance, when used in the finished state.

I have seen several varieties of wood, white and yellow pine and ash boards, 1 inch thick, saturated 150 per cent. (weighed wet) in less than one hour in such a cylinder. After kiln-drying, the permanent gain in the weight of the wood will be found to be from 7 to 10 per cent., distributed throughout its whole cellular structure, and not in the exterior layers only, as shown by the examination of cross-sections under magnification. With somewhat higher pressure and longer time in the cylinder, the hard woods like oak and cherry, in sizes up to 12 ins. × 12 ins., have been saturated with equal thoroughness, as was shown by sawing through and examining the sections.

Turning now to the question of the nature of the fireproofing material which is to be used, we find (Koller, Die Imprägnierungs-Technik,' 140. Vienna, 1896) that Gay Lussac, in studying the problem of fireproofing fabrics, had already made a classification of what seemed to him available materials, under three heads. First, substances which, on heating, leave an infusible earthy residue, to cover the combustible fibre and thus protect it; secondly, substances which fuse at a moderate heat, and thereby coat the fibre with a glassy protective coating; and thirdly, volatile salts, which liberate gases that do not support combustion and tend to extinguish flame. To the first class belong alum and lime and magnesia salts; to the second, borax and silicate of soda; and to the third class, the salts of ammonia, such as the sulphate, chloride, and phosphate. He commends borate and phosphate of ammonia, because they combine in some degree the properties of the second and third classes.

Löchtin, whose work with fireproofing materials as tested upon heavy unsized paper we have already referred to, enumerates 12 substances in the class of "antipyrenes," or substances which make the wood-fibre specially uninflammable. After a closer comparison of their relative fire-retarding power and the various drawbacks connected with their use, he finally gives his opinion as follows: "There remains, then, as the best fire-protective materials, the three before-mentioned ammonium salts (chloride, sulphate, and phosphate), and aluminium hydroxide." These results of Löchtin, obtained with strips of paper, are not far from representing the consensus of opinion of those who have done most of the work in the impregnation of wood for fireproofing purposes. But, as already pointed out by Gay Lussac, they operate differently, and, before making a comparison of their effectiveness, it would be well to ask the question as to what are the qualities considered desirable in a fireproofed wood, and what undesirable results are to be avoided.

The first and most important thing to be attained, of course, is that the wood should become fire-resistant in the highest degree, that it should resist the action of extraneous heat and flame, carbonising in contact with flame with extreme slowness, and holding no glow even when the direct contact with extraneous flame ceases.

A second desideratum is that the chemical treatment should have, if possible, a distinct preservative effect, so that the life of the treated wood should exceed that of untreated wood.

Thirdly, the cost of the treatment must be moderate, as its adoption will be barred if the materials are such as to make the process an expensive one. If fireproofed wood is to come into use at all, its price must be comparable with that of other materials of construction. The features to be avoided in the product of any proposed fireproofing treatment ar of no less practical importance, and should be carefully noted in our discussion of the merits of any particula fireproofing material.

First of all, the fireproofing material should not be of hygroscopic nature, because in such case it would destroy paint and keep the surface of the wood in an undesirabl moist condition. For this reason calcium, magnesium, and zinc chlorides are practically excluded, although an attemp has been made in a recent German patent to produce fo this purpose a basic calcium chloride, which it is claime is free from this drawback, and is recommended for th fireproofing of wood.

A second undesirable feature is when the chemical compound comes continually to the surface as an efflorescenc This will take place when substances of a volatile natur are used, as the impregnating material is gradually liberate from the cells of the wood and forces its way to th surface, where it slowly vaporises. When such a surfac is wetted, after the water dries off an efflorescence wi always show, as I have had occasion to observe i numerous instances. Of course the wood after a tim becomes weaker in its fire-resistant character by reason this loss of material. Certain ammonium salts, such the sulphate and chloride, will not stand the test at a satisfactorily. In the dry-kiln the liberation of ammoniac gas begins even at 125° F., and the efflorescence is fr quently recognisable, even when the surface has bee varnished, if the wood has been exposed to a strong su shine for any length of time. Of course such efflorescenc speedily ruins the appearance of a varnished wood.

Thirdly, the chemical used must not allow of a fung growth developing, for in such case the wood will dec more rapidly than untreated wood. Here again the amm nium salts, including the phosphate as well as the sulpha are unsatisfactory, since, when the conditions of warm and moisture are favourable, the treated wood develops fungous growth, and in consequence deteriorates rapidly strength. I have seen samples of wood treated wi sulphate of ammonium which, after two years' keeping a warm moist place, had crumbled to pieces because decay throughout the interior of the woods.

Fourth, the chemicals used ought not to be poisonous character, so that splinters impregnated with it, if accident run into the flesh or wounding it, shall endanger life or health. Nor should any noxious gas liberated in the heating or carbonising of the wood.

Lastly, the fireproofing material should not cause corrosion or rusting of iron, copper, or brass which, in form of screws or bolts, are passed through the wood whi has been treated.

Approaching the question of the choice of fireproofi chemicals again in the light of what we have seen a fi proofed wood ought to be and what it ought not to be, find, as Löchtin found with his experiments with absorbe paper, that we come down to the salts of ammonium a those of aluminium. Of the latter, Löchtin tried pota alum and aluminium hydroxide. He got much bet results with aluminium hydroxide (precipitated from so tion of sodium aluminate by carbon dioxide) than w alum. In fireproofing experiments that I have witness and followed, aluminium sulphate gave much better resu than alum, and in fact better than any of the ammoni salts, while it proves to be less open to objection in resp to the several points just noted as undesirable in a fi proofed wood than any other compound I have known be used.

luminium sulphate belongs to the first of the classes ire-protecting materials established by Gay Lussac, ough he only tried potash alum and not the simple hate, and not, as far as I can learn, upon wood. As as the aluminium sulphate in the superficial layer of d impregnated with the chemical is decomposed by the , a deposit of alumina is formed, the non-conducting erties of which make it a barrier against the propa- on of the carbonising effect and protect the interior in ry notable degree.

hite pine blocks, 1 in. thick, were saturated with sul- e of aluminium and exposed to the flame of a Bunsen er, applied to the side in such way that the point of nner cone was kept continuously against the wood. At same time, similar blocks treated with sulphate of am- ia were exposed to the same test. The Bunsen flame d through the latter samples in a few minutes less than our; at the end of six hours the wood that had been ted with sulphate of aluminium had not burned through. blocks were then sawed through, and the degree of onisation and disintegration showed very clearly the ective effect of the non-conducting alumina deposit.

oreover, as a result of repeated measurement, it has found that the residual alumina occupies a space from and a half to three times as great as the dried salt from h it is formed. It is, therefore, evident that in forming, pands so that it fills out the air spaces and intercellular es of the wood very fully; as a result of this, we have mpact non-conducting barrier which interposes itself to action of the flame, and protects in a notable degree woody tissue at the back of it.

lphate of ammonia, on the other hand, as was recog- d by Gay Lussac already, operates by reason of the ration of ammonia gas which tends to extinguish flame. it undoubtedly will do, more efficiently at first, and actively as it is dissipated by continued heat. It, of se, interposes no mechanical barrier to the progress of conduction and carbonisation.

or what may be called the test of fire resistance, one ciple, it seems to me, ought to guide us. We ought to roximate as near as may be the conditions that would lop in actual exposure of the wood to a conflagration moderately large scale. For that reason it has always ued to me that the so-called "shavings-test" is of account, if taken by itself. Any of the fireproofing nicals that are at present under discussion as available prevent the shavings from burning with flame, although steadily carbonise and fall to pieces when charred ughout. A test more in accord with a condition likely levelop in practice is to take a piece of inch board h has been fireproofed, and test it by application of ct flame upon one side until the flame cuts or bores ugh it, or until it disintegrates and breaks apart from ough carbonisation. For comparative tests, Bunsen ers with the same gas consumption per hour placed uniform distances from the boards, will give us the t accurate results. I have found pieces of inch-boards, 8 ins., to be very convenient for these tests.

nother condition likely to arise in actual conflagrations at the wood may be exposed for some time to a strong t without direct contact with flame—in fact, heated to temperature of dry distillation without flame contact. liable fireproofed wood ought not to lose in fire-resisting er by such previous heating if afterwards exposed to e contact.

sharp kiln-drying at a temperature approximating that hich destructive distillation begins ought to be applied the samples under examination, and then the direct lication of flame tried as before.

nder the head of physical properties of the wood, we tests as to the hygroscopic character of the treated ds, and as to the development of efflorescent coatings. ks of fireproofed wood, with a planed surface exposed, ht to be placed for definite lengths of time in chambers, atmospheres of which are saturated with moisture, and effect noted, whether the surface becomes damp or ally wet with condensed moisture.

or the test of efflorescence, the blocks, after exposure dry atmosphere, should be wiped with a damp cloth and again allowed to dry, and the surface examined for any salt-like film or coating.

Under the head of chemical tests, should be tested the action of the fireproofed wood upon metals, such as iron and copper, and alloys like brass and phosphor-bronze, which are likely to be used in construction in the form of nails, screws, and bolts. It is obvious that the finished wood when in use will hold some moisture, and some of the proposed fireproofing chemicals in the presence of this moisture act quite decidedly upon metals and metallic alloys, corroding them and causing stains and discoloration of the wood. The mechanical or structural strength tests are also of the highest importance. When the older methods of saturation, whereby the wood was steamed and then, after application of vacuum, submitted to pressure for long periods, were the only ones available, it was recognised that a compression of the cellular structure of the exterior layers of the wood took place, so that the wood was distinctly weakened, and the results for tensile strength and bending and breaking tests were accepted as necessarily lower than for the same wood untreated.

The United States Navy, in its specification of tests for fireproofed wood, made an allowance of 30 per cent. loss of strength as compared with the same grades of wood in the untreated state. I am able to state, upon the authority of able mechanical engineers of New York, who have tested the wood fireproofed by the Ferrell method, which I have explained in this paper, that no such allowance is necessary in the fireproofed wood obtained by the new method of treatment.

In conclusion, I would express my opinion that this question of fireproofed wood is an urgent one, and one that is pressing for immediate action upon the part of those interested in an improved and safe building construction.

If it be true, as I believe, that the resistance of the wood to flame has been made at least five times as great as was heretofore possible, and that, too, without injury to its structural strength, we have put an entirely new aspect upon the question of practicability and value of fireproofing treatment.

THE APPLICATION OF THE SULPHUR COLOURS TO THE PRINTING OF COTTON FABRICS.

BY LOUIS J. MATOS.

Since the introduction of this class of substantive colours to the dyeing of cotton, and the various improvements that have been made in their production, tending to simplify their use from the standpoint of the dyer, but few systematic attempts have been made on a practical scale, with a view of making them universally useful in the printing of cotton fabrics.

Up to the present, the several attempts that have been made were not successful from a commercial point of view, but they have been of great value in pointing a way which, if followed in a scientific manner, will ultimately lead to the development of one or more processes that will be of practical utility in the print-works.

In order to fully appreciate the difficulties that stand in the way of accomplishing the desired results, it may be well to take up, briefly, the sulphur-colour problem from the position of the dyer, and endeavour to obtain some facts that may be of use to us in the present consideration.

The sulphur colours are adapted only to cotton, for which fibre they all manifest a more or less strong affinity; so strong, in fact, that they are classed with the "fast" dyes, as this term is now understood by colourists. As a rule, they are quite indifferent to the majority of reagents, which places them in active commercial competition with every known type of cotton black—aniline black not even excepted.

The principal characteristic of all the sulphur blacks is the marked ability to resist the action of mineral acids while they are also practically unacted upon by alkalies. Various chemicals, including stannous chloride, while not completely destroying the colour as dyed, seriously injure it, causing the shade to change to greys, browns, olives, &c., but the most certain in its action is a solution of sodium or calcium hypochlorite, which, when properly applied, completely destroys the dyed colour without impairing the strength of the cotton upon which it is dyed. In this connection it may be well to remark, that the use of a dilute solution of sodium hypochlorite serves to detect a dyeing of a sulphur black from dyeings of other cotton blacks, such as aniline oil (or salt): diazotised and developed, or ordinary direct dyeing blacks.

In the practical application of the sulphur blacks to cotton by the dyeing process, eliminating the various modified conditions due to variety of raw material to be dyed, such as warps, piece-goods, yarns, &c., the operation may be said to depend upon a few well-known and recognised principles, which may be summarised as follows:—

Perfect solution of the dyestuff.
Continued solubility during the dyeing operation.
Alkalinity of the dyebath.
Density of the dyebath.
Actual ebullition.

Complete and continued solubility of the dyestuff must be conceded, or else perfect fixation of the colour upon the fibre cannot be assured. Should even an incipient precipitation of colouring matter occur in the dyebath during dyeing, a deposit of free colour will form on and in the folds and twists of the individual fibres forming the yarns, and which cannot be completely removed, even by prolonged washing and soaping. This deposit of free colour is the cause of "bleeding" into whites, when such dyed yarns are woven into check or striped effects and subsequently washed. When the deposit is more extensive, to such an extent as to "smut" when friction is applied, as by rubbing the dyed material with a white cloth, it is termed "crocking," and in the early days of the sulphur blacks this defect was the cause of these blacks being reported upon adversely in many mills.

The alkalinity of the dyebath must be maintained to guard against the precipitation of the free colour above mentioned, and also to minimise the separation of free sulphur—the carbon dioxide of the atmosphere having a marked influence upon the aqueous solutions of several of the sulphur colours in this regard. An alkaline bath also ensures that the colour in solution will remain in a reduced state, and in this connection it would be interesting to ascertain the mechanism of the reaction that takes place between the cellulose molecule and that of the colour.

The density of the dyebath is regarded by the author as a physical factor rather than chemical, inasmuch as it appears to influence the duration of the dyeing operation rather than the depth of shade.

Ebullition is essential to good results, though superior results have been secured by working with a fresh cold dyebath made up with the Autogene Black of the St. Denis Dyestuff and Chemical Co., by prolonged immersion, a process of dyeing that, at present, is not commercially available. To ensure regular and level shades, the dyeing should proceed at an actual boil, and the duration extend for a period of about one hour, so as to allow of results to be secured in a time corresponding with those of other processes.

The several generalised facts touched upon above will, in a measure, aid us materially in reaching conclusions that will facilitate our work in textile printing. In the first place, printing of textiles implies the application of colours to fabrics in the form of patterns or designs, but for our purpose we will only consider blacks, as these are attracting greater attention than colours proper.

To print a given colour it must first be dissolved in a suitable solvent, incorporated with other substances that will aid the fixation of the colour on the fabric to be printed, and finally thickened with a paste, so that the "colour"—the actual printing paste—will carry and hold its consistency on the cloth after it leaves the engraving on the shell.

To accomplish this with some dyestuffs is an easy matter, but others require special treatment, on account of extreme solubility or other causes, but the sulphur blacks, as a rule, are free from such defects. The only serious obstacle in the way of making the best use of this class of products lies in the action which they have upon the design rollers or "shells" which from the advent of the cylinder machine, have been made of copper or alloys of which copper is the predominating metal. It is well known that in dyeing with the sulphur colours, copper fittings should be excluded from the dye-vats, on account of the action that the metal has upon a solution of the dyestuff, but from the textile printer's standpoint, his printing colour is likely to suffer in tinctorial value, together with a parallel eating away of the finer details of the engraving on the design roller, which, in many instances, means considerable loss to the works.

It is to nullify this destructive action upon the copper printing rollers that nearly all the chemical work has been done tending towards a process that would enable the recognised good qualities of the sulphur blacks to fill their proper place in the printing of fabrics. I shall briefly review the most important work that has been done, and which will show that the right lead is being followed, although much yet remains to be accomplished.

In almost all instances where printing pastes are made up sodium sulphide forms an integral part; it may be added directly to the paste, which is so thick as to retard the spreading of the very soluble alkaline solution, or it may be formed on the printed cloth while the latter i passing through the steamer. In any event its action i the same, that of converting the colour into, or of retaining it as, a *leuco* compound, in which state it is taken up by the fibres, after which it is oxidised and thus becomes fixed i an insoluble form.

A process applied to a sulphide colour proper, embody u the use of caustic soda, is as follows:—

Sulphide black	1½ lb.
Water	16 oz.
Wheat starch	1½ oz.
Soda solution, 32·5 per cent. NaOH (= 1·35 sp. gr.)	26 oz.

The colour is gradually added to the starch paste, at th same time feeding portions of the caustic soda solutio When solution is complete the paste is somewhat thin, b upon cooling it materially thickens, and when cold it i ready to print, which is done without pressure, the tim required being about 30 minutes. The quantities materials indicated above are based upon several trials a process original with the Clayton Aniline Company. peculiar fact has been observed by several investigators experimenting with the sulphur colours in printing—th glucose, when first padded on the cloth and then dried a over-printed, materially shortens the time of passa through the steamer. I believe that to Mr. A. G. Gre belongs the credit of first observing this fact. Oth reducing sugars besides glucose, however, also affect t time of development during steaming. The use of dextri in the dyebath has been recommended evidently to inf ence the reduction. The use of lactic acid and sugar-o milk is recommended by the Berlin Aniline Company, connection with caustic soda, as overcoming the injurio action of the sulphide on the copper shells.

By a process patented by the Clayton Aniline Compa the printing of blacks in which the sulphur has been int duced by means of thiosulphuric acid is effected by causi the insoluble colour to dissolve in a boiling solution sodium sulphite, when it is thickened with an ordinary sta printing paste, allowed to cool, when caustic soda a glucose are incorporated. This patent mentions the teresting point, that if glucose has been previously padd on the cotton cloth, it is then available for the simultane printing of indigo.

Sansone's process is particularly adapted to the so-call "sulphur colours" that are free from sulphur as such, sulphides, and which do not require special purification, to sulphur colours that can be purified. These colo which may be, *per se*, insoluble, or else brought into solut by means of a strong solution of an alkaline sulphite, thoroughly incorporated with an excess of caustic soda sodium silicate, and then suitably thickened with a print paste, and then applied to the cloth, dried, steamed, washed. It is claimed that by this process prints secured of equal fastness to aniline black.

A process has been patented involving the purificatio the sulphur colour by precipitation with either an acid common salt, and acting upon the precipitate with a al line reducing agent, thereby removing all danger to co per printing shells; or, the precipitated colour may be re iced by means of zinc dust in the presence of an alkali. A ther method, also patented by the Elberfeld Company, co ers the reduction of the precipitated colour by means o lkaline glucose, and afterwards removing the hydrogen su hide by suitable salts of iron, copper, &c.

printing paste for such a zinc-reduced colour would be a nt as follows :—

Sulphur black	30 to 45 grms.
Water	40 c.c.
Zinc dust	22 grms.
Caustic soda solution, 1·25 sp. gr.	28 c.c.

at with constant stirring until the reduction is complete, a thicken with 60 to 80 c.c. of tragacanth paste (6 : 100) 5 grms. of glucose. Allow the paste to cool, strain t ough a cloth, print, dry, steam without pressure, and h.

A method for printing a sulphur colour free from alkaline phides, and patented by Voetter, provides for the in- poration at a low temperature of the colour with an ali carbonate, a suitable thickening agent, and pre- itated sulphur. Printing is done as usual, but the aming is carried on for half an hour at from 3 to 4 lbs. ssure. The *rationale* of the process is that the free phur, during the steaming, combines with the alkali sent forming the sulphide, thus completing the reaction d fixing the colour on the fibres.

In reviewing the various methods for applying these culiar colours to cotton, we cannot overlook the most portant, and historically important, position occupied by three pioneers of this now extensive group, namely, chou de Laval, Thiocatechine, and Vidal black, each of ich was applied by printing on a cylinder machine t later than 1894, and these prints are, without doubt, the ry first practical results ever obtained with the sulphur lours. The commercial types of colours used were signated by the letter "S" to distinguish them from the dinary types as sold for dyeing proper. In this connec- n it may be well to observe that a salt of chromium is incorporated with the printing paste, which evidently rved the same purpose as the so-called "after-treatment" th a similar salt in a separate bath, as is customary in eing.

The following quantities will serve as a guide for the eparation and application of the printing pastes for these lours:—

For Cachou de Laval S. and Thiocatechine S.

	Light Shade.	Medium Shade.
ickening	10 lb.	10 lb.
lour	5 oz.	12 oz.
ld water	1 pint	1 pint
romium acetate, 1·162 sp. gr.	3 oz.	6 oz.

For Vidal Black S.

	Light Shade.	Medium Shade.
hickening	10 lb.	10 lb.
olour	5 oz.	2 lb.
hromium acetate, 1·162 sp. gr.	1½ oz.	4 oz.

The colour in each case is dissolved in the water, the hromium acetate added, and finally the thickening, which s a 10 per cent. gum tragacanth paste. The mixture is horoughly stirred and then passed through a sieve. The otton is printed, dried, and steamed without pressure, ashed, and soaped. The resulting shades possess all the ood qualities of the respective dyes, as when they are pplied by the ordinary dyeing process.

The difference between the ordinary types of these three olours and the "S" marks, is that the latter are products endered suitable for printing by having been previously converted into sulphite compounds, as exemplified by the Poirrier process patented in this country in 1896.

Discharge printing may properly be mentioned in connection with what has previously been said regarding the direct printing of the sulphur colours, particularly the blacks, and for this purpose advantage can be taken of the action of combined alkali chlorates and ferricyanides. The fabric is previously dyed with a sulphur black, and a discharge paste printed on, having the following composition :—

Aluminium chlorate, 1·2 sp. gr.	1 gall.
Sodium chlorate	3 lb.
Potassium ferricyanide	½ lb.
Dextrine paste (1 : 1)	1½ lb.

After printing, the goods are steamed for about five minutes, washed, and soaped. If coloured discharge effects are desired, chromium or iron chlorates are substituted for that of aluminium and the discharged fabric may then be dyed by passing through a bath of such colours as have an affinity for the mordants, printed and fixed; such colours may be the Alizarines, Galiocyanines, &c.

The entire subject, however, resolves itself into the problem of applying the sulphur colours or certain modifications of them, in such a manner as not to act injuriously upon the copper rolls. A process of printing has been devised, based upon the use of nickel-plated rolls, the process being patented by the Farbenfabriken of Elberfeld. Although the art of electroplating has reached a high degree of excellence, the writer fears that the film of deposited nickel will very soon show signs of wear at the edges of any sharp design, and when once fairly started may cause extended stripping. Again, it is believed that where a design is made up of considerable tracery, frequent loose particles of nickel-plating will find their way under the doctor blades and cause imperfections in the prints.

The entire subject is one of much interest, not only to the manufacturer of cotton prints, but also to the colour manufacturer, who will have a very considerable increase in the consumption of this special class of dyestuffs if a process is worked out that will overcome the existing objections to them, and at the same time not interfere with the present method of constructing the printing shells.

In the discussion Dr. H. Schweitzer mentioned that Katigen colours which belonged to the class of sulphur colours, could not only be applied to cotton but also to other fibres, silk, linen, jute, and to wood, straw, and paper. He also stated that the process of printing with nickel-plated rolls was a perfect success. He showed a book with dye-tests of all kinds of fibres, and also prints made with Katigen colours on nickel-plated rolls.

COMMERCIAL CARBONATE OF BARIUM.

BY RUSSELL W. MOORE, A.M., M.Sc.

CARBONATE of barium is imported into the United States in various forms :—the natural witherite in lumps and powder and the precipitated article in powder. The usual method of preparing the artificial carbonate is by roasting the natural sulphate with carbon, extracting the sulphide or hydrosulphides with water and precipitating with carbon dioxide or an alkali carbonate. Difficulties are met with owing to the presence of polysulphides in the solution which yield free sulphur with the traces of oxygen in the carbon dioxide. This in the drying process combines with the carbonate and gives an impure product. By boiling the suspended carbonate with barium hydroxide the sulphur can be removed, but an examination of numerous samples of commercial barium carbonate indicates either that such processes of purification are not generally employed or do not completely effect the desired object.

The tariff of the United States imposes no duty on witherite either in lumps or powder, but assesses 25 per cent. *ad valorem* on the precipitated article. Hence it is frequently necessary to ascertain the origin of a sample. This is done as follows :—About 5 grammes are dissolved in dilute hydrochloric acid, in an Erlenmeyer flask, and a strip of paper moistened with acetate of lead placed in the neck of the sample is artificial barium carbonate, the paper is always blackened. After the sample is dissolved by the acid as completely as possible, the residue is fused with carbonate and nitrate of potash and tests made for barium and sulphuric acid. Both of these are usually present in commercial precipitated barium carbonate, indicating the presence of undecomposed barium sulphate.

The presence of the original material and an intermediate product in the finished article furnishes safe ground for the conclusion that it is the precipitated variety made from the sulphate.

On microscopic examination samples generally show the origin by the presence or absence of crystals, but it has been generally found more satisfactory to use the chemical methods as above outlined, as small crystals are sometimes found in barium carbonate known to have been precipitated.

Nottingham Section.

Meeting held at Burton-on-Trent, on Wednesday, January 28th, 1903.

MR. ARCHBUTT IN THE CHAIR.

THE DECOMPOSITION OF SALICYLIC ACID BY MOULD.

BY F. L. LOTT, F.I.C.

A standard solution of salicylic acid of an equivalent strength of $\frac{1}{3}$ oz. per brl. (*i.e.*, 0·08663 grms. per litre), made in 1892, was noticed in June 1902 to have grown a number of mould colonies consisting of white mycelial tufts of interlaced hyphæ with a quantity of small transparent spores and numbers of larger dark brownish-green spores, many of which appeared to be sporulating. Some of the hyphæ also were larger and dark coloured. The salicylic acid had disappeared, the solution giving no colouration with ferric chloride.

This solution was poured off carefully so that the mould growth was left in the bottle, and a fresh solution of salicylic acid of half the previous strength was added, *i.e.*, $\frac{1}{4}$ oz. per brl. This was tested every few days by adding a drop of very dilute ferric chloride to the bottle which at first produced the usual violet colour of the salicylic reaction, and this colour slowly disappeared in a day or so. Eventually in six weeks time no salicylic acid was left, and a somewhat copious growth of mould of a markedly dark colour was produced.*

A second experiment was started three weeks ago (Jan. 6th) a $\frac{1}{4}$ oz. per brl. solution being put into four bottles and treated as follows:—

1. *Solution alone.*—On Jan. 22nd, *i.e.*, 16 days, two colonies of mould appeared, and these were filtered off. The solution now, Jan. 28th, coloured by Fe_2Cl_6, therefore salicylic acid still present.

2. *Solution with two drops of Ferric Chloride Solution.*—The colour remained constant up to Jan. 23rd when there was a slight fading coincident with the appearance of a mould colony; this was filtered off. The solution now, Jan. 28th, coloured by Fe_2Cl_6. Salicylic acid still present.

3. *Solution with Mould Growth from first experiment added Jan. 6th.*—This solution now, Jan. 28th, faintly coloured by Fe_2Cl_6. Traces of salicylic acid.*

4. *Solution with Mould Growth from first experiment added Jan. 6th and two drops Fe_2Cl_6 Solution.*—Colour disappeared by Jan. 22nd, added two more drops Fe_2Cl_6 solution. Colour disappeared by Jan. 26th, and two drops of Fe_2Cl_6 then failed to produce any colouration. Now Jan. 28th. No salicylic acid present.

Conclusion.—Certain mould growths will decompo salicylic acid solutions, and more rapidly with small amoun of a solution of ferric chloride.

DISCUSSION.

Mr. WOOD asked if Mr. Lott had identified the species mould, and referred to a growth of penicillium in dec normal sulphuric acid in which skins had been treated.

Mr. ADAMS asked if the author had made any expe ments with solutions containing more than $\frac{1}{2}$ oz. per brl. salicylic acid. He pointed out that, in a 5 per cent. solutio of sodium phosphate, a green growth quickly appears, y he had kept a saturated solution for several years witho any sign of growth taking place.

Mr. OSWELL asked how long it had taken the mould entirely destroy the salycilic acid in the solutions.

Mr. HIND referred to the flocculent deposit which for in many acid solutions.

Dr. STERN mentioned that traces of an iron salt had be observed to accelerate decomposition in similar cases.

The CHAIRMAN remarked on the occurrence of growt of algæ in iron pipes which were used for peaty waters.

Mr. LOTT, in reply to Mr Wood, said he had not be able to grow this mould except in the salicylic acid solutio referred to, and had not, therefore, been able to identify but he believed it to be one of the ustilaginæ. He had a noticed growths of penicillium in decinormal sulphuric aci

In reply to a question as to experiments with stron solutions, $\frac{1}{3}$ oz. per brl. was the strongest solution he l completed experiments with, but he had some furt experiments with stronger solutions in hand.

In reply to Mr. Oswell he said mould had appeared the bottles in 16 days, and as soon as it began to grov commenced to reduce the amount of salicylic acid pres When the $\frac{1}{4}$ oz. solution was placed in a bottle contain the mould the salicylic acid was entirely destroyed in ab five weeks, but if ferric chloride was added the action more rapid.

The flocculent deposit referred to by Mr. Hind as occ ring in many acid solutions was very frequently a mo growth, though not always so. These experiments firmed Dr. Stern's statement that many moulds w stimulated in their growth by dilute iron solutions.

In agreement with the Chairman's remarks as to occurrence of algæ in iron pipes through which peaty w ran he referred to the large growths of various organisms the drainage pipes on sewage farms and accompany deposits of iron.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, January 26th, 1903.

MR. A. J. MURPHY IN THE CHAIR.

NOTE ON THE RELATIVE EFFICIENCY OF INSULATING MEDIA.

I.—LOOSE PACKINGS.

BY S. H. DAVIES, M.Sc.

As there is little information readily available to techno- gists on the efficiency of the insulating materials use practice, I venture to place my results before the Societ

After a series of preliminary experiments, which not be detailed, a calorimeter was constructed, consis of two cylindrical tin vessels 4 in. and 6 in. in diam respectively, each 12 in. in length. The annular s and a space of 1 in. between the bottoms was packed the insulating substance, which had been dried in the a ordinary temperature. The open ends of the vessels covered with thick layers of wood and felt, through wh projected a thermometer and the handle of a glass stirring rod. As a further protection against loss of heat at the upper surface, the stirring rod worked vertically through a wide glass tube closed at both ends.

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* Jan. 31st. This mould growth was found to contain sufficient ferric chloride to give a full colouration to a fresh solution of salicylic acid added to it. Solution No. 3 contained no traces of salicylic acid on Jan. 31st.

The method of experimenting was to place a known weight of hot water in the inner vessel and then immerse the calorimeter in a large volume of running water kept at a constant temperature. The level of the hot water corresponded with that of the packing and of the cold water. The stirrer was raised a given number of times every minute, and readings taken every five minutes. The results are given in Table I.

TABLE I.

Experimental Results.

Air-dried Material.	Hot Water in Inner Vessel. Initial Temperature.	Final Temperature.	Fall of Temperature.	Mean Temperature.	Cold Water, Outside. Constant Temperature.	Mean difference of Temperature.	Duration of Experiment in Minutes.	Water in Calorimeter.	Water equivalent of Calorimeter.	Weight of Material in 3,300 c.c.
Flaky wood charcoal	91·3	81·5	9·8	86·4	8·8	77·6	40	2,210	42·5	770
Asbestos fibre common	82·1	66·8	15·3	74·45	8·8	65·65	45	2,225	42·5	770
Slag wool (heavy)	90·9	79·5	11·4	85·2	8·9	76·3	55	2,185	42·5	1,740
Granulated cork	93·3	83·0	10·3	88·15	8·9	79·25	50	2,250	42·5	325
Sawdust (spruce)	91·2	81·25	9·95	86·22	8·9	77·32	35	2,225	42·5	695
„ (very moist)	87·5	71·3	16·2	79·4	10·4	69·0	20	2,155	42·0	1,290
Kieselguhr	91·5	79·4	12·1	85·45	8·0	77·45	55	2,180	42·0	790
Cow-hair felt	90·6	81·8	8·8	86·2	11·8	74·4	55	2,275	42·0	420
Pumice (small)	91·25	80·5	10·75	85·87	10·3	75·57	40	2,275	42·0	[illegible]
Light magnesia	90·8	81·9	8·9	86·35	10·2	76·15	50	2,260	42·0	[illegible]
Slag wool (light)	92·25	83·5	8·75	87·87	11·8	76·07	55	2,200	42·0	455
Air space bounded by bright metallic surfaces.	95·0	83·75	11·25	89·37	10·3	79·07	40	2,220	42·0	—
Air space bounded by bright metallic surfaces and two layers of glazed paper intervening.	94·0	84·6	9·4	89·3	10·3	79·0	40	2,200	42·0	—
Air space bounded by dull-black surfaces.	89·8	78·5	11·3	84·15	10·1	73·75	25	2,260	42·0	—

The hair felt was used as 1 in. sheet; the pumice in pieces of $\frac{1}{4}$ in.; and granulated cork in pieces of $\frac{1}{8}$ in. mean diameter. The light magnesia is the basic carbonate of magnesium in the form of powder.* The two samples of slag wool, although differing extraordinarily in weight, are fair samples of commercial varieties. The mean thickness of the packing on sides and bottom, as determined by displacement, proved to be 1·031 in. The mean effective area through which heat was transmitted was 254·7 square inches. From these results I calculate the coefficients of conductivity given in Table II., coefficient (*a*) being the number of British thermal units lost per hour, per square foot of area, by transmission through 1 ft. of the insulating medium, with a difference of temperature of 1° F. between the sides; coefficient (*b*) being the number of Calories lost per hour, per square metre of area, by transmission through 1 metre of the insulating medium, with a difference of temperature of 1° C. between the sides.

TABLE II.

Coefficients of Conductivity.

Air-dried Material.	Moisture. — Per Cent. Loss at 100°.	(*a*.) B.T.U.'s per sq. ft. per hour.	(*b*.) Calories per sq. m. per hour.
1. Slag wool (light)	0·2	0·054	0·045
2. Hair felt	7·3	0·058	0·048
3. Light magnesia	3·4	0·062	0·051
4. Granulated cork	4·0	0·069	0·057
5. Slag wool (heavy)	0·2	0·07	0·058
6. Kieselguhr	3·4	0·073	0·06
7. Flaky charcoal	4·7	0·082	0·068
8. Pumice	0·8	0·095	0·079
9. Sawdust (spruce)	9·0	0·096	0·08
10. Asbestos fibre	0·6	0·136	0·112
11. Sawdust (very moist)	approx. 50·0	0·298	0·217
1. Air space with bright metallic surfaces and two layers of glazed paper intervening.		0·077	0·064
2. Air space with bright metallic surfaces		0·093	0·077
3. Air space with dull-black surfaces.		0·163	0·135

It may be urged that these figures really represent the combined conductivities of two thicknesses of metal plus that of the insulator; but this introduces a negligible error, as the conductivity of tin plate (coefficient (*b*) = 55) is some hundreds of times greater than that of the insulator, and therefore the whole thickness of the metal wall is practically maintained at the same temperature as the water in contact with it.

The results obtained with air spaces between the two vessels, although expressed for the sake of comparison as coefficients of conductivity, really represent the total diffusivity of the arrangement, due mainly to radiation from one metallic surface to the other, also to the actual conductivity of the air and to convection currents. The true conductivity of air is approximately 0·018 (coef. (*b*)).

It will be seen that blackening the surfaces of the calorimeter facing the air space almost doubles the loss of heat, whereas the interposition of two layers of glazed writing paper, turning the one air space into two, and preventing transverse convection currents, makes a highly efficient arrangement.

An important consideration, especially in marine work, is the density of the insulating material. The results given in

TABLE III.

Density of Material.

Material.	(*a*.) Weight in lb. per cubic foot.	(*b*.) Weight in kilos per cubic metre.
1. Granulated cork	6·1	98
2. Hair felt	7·9	127
3. Slag wool (light)	8·6	138
4. Light magnesia	10·1	167
5. Sawdust (spruce)	13·1	210
6. Flaky charcoal	14·5	233
7. Asbestos fibre	14·5	233
8. Kieselguhr	15·0	240
9. Pumice (small)	25·0	401
10. Slag wool (heavy)	32·9	527

---

* Magnesite powder should on no account be used; it has nine times the density and nearly three times the conductivity of the precipitated carbonate.

Table III. are obviously dependent on the closeness of packing, and are only approximate.

The choice of material obviously depends on the cost per unit volume. This is a variable quantity, but the data given in Table IV. may be of value.

TABLE IV.

Cost of Material per Unit Volume.

Material.	At a Price of	Cost per cubic foot in pence.	Cost per cubic metre in pence.
1. Sawdust	7s. per ton	0·5	17·3
2. Flaky charcoal	3*l.* per ton	7·8	276
3. Slag wool (light)	9*l.* per ton	8·3	294
4. Kieselguhr	6*l.* per ton	9·6	341
5. Granulated cork	15*l.* per ton	9·8	346
6. Hair felt	9*d.* per sheet 21 × 39 × 1	20·6	727
7. Pumice (small)	9*l.* per ton	24·1	850
8. Light magnesia	24*l.* per ton	26·8	947
9. Slag wool (heavy)	9*l.* per ton	31·8	1121
10. Asbestos fibre (common)	84*l.* per ton	137·0	4832

The non-combustible nature of the substance; its liability to decay and the possibility of harbouring vermin will also influence our choice for certain purposes. Bearing these considerations in mind, the above data will enable us to decide upon the best insulating material for use in the construction of either hot or cold chambers, for coating brine pipes, &c. The relative merits of insulators for steam pipes will be discussed in a further note.

It will be seen from Tables II., III., and IV., that magnesia, hair felt, and granulated cork are good substances to use for insulation. Sawdust is incomparably the cheapest material, but is a poor insulator. Kieselguhr is a good insulator, but is somewhat heavy. Flaky charcoal has a moderate density and insulating power. Pumice is a poor insulator. Slag wool is a good insulator, but is very variable in quality and should be specially selected, the heavier kinds are costly per unit volume. Its dust (consisting of glassy hairs) is irritating to the throat and skin. Asbestos is quite unsuited for ordinary insulation. Where a non-combustible material is required, magnesia or a selected slag wool may be used. Pure magnesia powder is not suitable for loose packing; it tends to settle and to percolate through the joints; it is supplied mixed with a small proportion of asbestos, and where any considerable height is to be filled intermediate partitions are advisable. The calorimetric results indicate that, if care is taken to avoid surfaces with a high emissivity for heat, in many cases a good and most economical method of insulation is to do away with packing altogether, and to provide single or double air spaces, bounded by impervious layers. To avoid radiation as far as possible, smooth white surfaces (*e.g.*, a coating of white paint) should face the air spaces. It is of the first importance that the air spaces should be well sealed, especially in the insulation of a cold chamber, for, if any circulation of air is permitted from outside it will not only directly diminish the insulation by convection, but will deposit moisture on the inner surface and thus further impair the efficiency of the arrangement.

Lightfoot states (Encycl. Britt. XXXII. "Refrigerating Machinery") that a usual plan for erecting a cold chamber inside a stone or brick building in England is to leave a 1 in. air space bounded by a single layer of tongued and grooved boards, and then to provide a 7 in. space packed with slag wool bounded by two layers of tongued and grooved boards. He describes the use of cork bricks in Germany, two or three courses of which are employed, finished off with cement. For lager beer cellars, fermenting rooms, &c., brick walls with single or double air spaces are used. In Canada, two or three air spaces are commonly used, each formed between two layers of tongued and grooved wood. On board ship, flaky wood charcoal is largely employed. In Australia and New Zealand, where pumice is very plentiful, it is largely used as an insulator. In this connection it is interesting to note that powdered pumice is much inferior to small lumps, the conductivity rising to 0·139 (coef. b.) for the powder. Thus a layer, 14 in. in thickness of powdered pumice would be required to insulate a chamber as effectively as 8 in. of pumice in small lumps or 5 in. of light magnesia.

In coating brine pipes it is a common custom to board round with a trunk about 1 ft. square, and to fill the intervening space with sawdust. Unless close boarding is secured this forms a poor insulation as the sawdust, being cooler than the air surrounding it, eventually absorbs large quantities of moisture, and may then conduct heat three times as readily as dry sawdust (see Table II).

To insulate brine pipes, whether packing is used or not, a closely sealed air space is the first requisite.

DISCUSSION.

Mr. JOHN W. COBB commented on the value of Mr. Davies' results as being unbiassed by trade influences. With reference to the problem of steam-pipe covering, it was to be borne in mind that many insulators were out of the question, because the temperatures of super-heated steam induced carbonisation and consequent ineffectiveness of the insulating medium. Mr. Davies had given no figures for magnesia, the increasing use of this material for heat-insulating work, as in the Mond gas plants, would make such figures of considerable interest and value. It should also be remembered that, although for filling-up purposes the materials tested could no doubt be used, if cohesion were required as in pipe covering, a binder would in most cases be necessary, and the effect of the binder might be to materially affect the results.

Mr. Davies had shown the great difference between the insulating effect of an air-space in which convection currents were prevented, and that of an air-space in which convection currents could circulate freely. This difference was so great as to induce the view that the comparative value of an insulating material was primarily determined by its power of enclosing air and of preventing the production of convection currents in that air.

In valuing an insulating material an important point in practice was the rate of deterioration of its insulating value under the influences of temperature and weathering to which it was subjected. The order of effectiveness at the time of application was not necessarily the order after a considerable period of use.

Mr. GARDNER said that it seemed to him that the results were of a twofold character, depending upon the constitution of the material and the convection currents set up in the air, and asked whether Mr. Davies had made any experiments with a material of low conductivity, moulded, or otherwise obtained, in a cellular form.

Mr. POPPLEWELL asked if Mr. Davies had experimented with asbestos as an insulating material on steam piping.

Mr. DAVIES in replying to Mr. Cobb's remarks said that he would include in his paper, before publication, the values for magnesia, which, owing to an accident, he had been unable to put before them. With regard to the use of binding materials and the insulation of steam pipes in general, he promised to contribute a further note.

He believed that convection currents were almost entirely prevented in the sort of packing he had tested. The value of an insulator depends on the real conductivity of the solid, and on the volume and distribution of the contained air.

Thus solid pumice is evidently a comparatively good conductor, and when it is finely powdered, the number of points of contact between the solid particles, and therefore the conductivity of the material, is increased; at the same time the proportionate volume of enclosed air is diminished. The breaking down of fibrous materials on steam pipes might have a similar effect.

In reply to Mr. Gardner, Mr. Davies said that he had not tried any experiment on the lines indicated.

In answer to Mr. Popplewell, he pointed out that asbestos is a poor insulator and a costly material, and should only be used where its infusible and fibrous properties make it of special value.

NOTE ON SELENIUM IN COKE.

BY J. F. SMITH.

Some time ago, while examining samples of coke for arsenic by means of the sulphide method, it was noticed that some of the samples gave a sulphide of a lemon yellow colour, while on passing more hydrogen sulphide, a portion of it changed, and some red particles separated; on allowing the liquid and precipitate to stand in a warm place for about 18 hours, the colour of the precipitate was found to have changed to a dark brown. Larger quantities of the precipitate were prepared and analysed qualitatively, the results of which showed that it consisted only of selenium and sulphur.

Deposits, obtained in a Marsh's apparatus, were oxidised, sublimed, and examined under the microscope, and were found to consist entirely of a fernlike structure.

As some of the samples contained traces of arsenic as well as selenium, it was decided to try the method and apparatus devised by L. v. Babo and Fresenius, for the purpose of separation.

It will be remembered that this method is based on the fact that a mixture of 3 parts of sodium carbonate and 1 part of potassium cyanide will retain any substance other than arsenic, when heated in a slow current of carbonic acid.

It was thought that by taking advantage of this, the arsenic could be obtained from the precipitate in the form of a mirror, so that it could be estimated by comparison with standard mirrors prepared in the same way, and then obtain the selenium from the residue left in the boat, in which it would probably be in the form of selenocyanide of potassium, which is soluble, in water, and from which solution the selenium could be precipitated by means of hydrochloric acid, as a red flocculent precipitate which could be washed, dried, and weighed.

After several trials it was found that it would be necessary to reduce the first precipitate obtained from the residue a second time, and also that it would be necessary to purify the red precipitate obtained after this second reduction, by dissolving it in a saturated solution of potassium cyanide, and reprecipitate by means of hydrochloric acid.

The following was the method of proceeding finally adopted:—

From 100 to 200 grms. of the finely ground coke or fuel were weighed and placed in a large porcelain basin, mixed with sufficient distilled water to form a paste, to which was added from 100 to 200 c.c. of pure hydrochloric acid. The dish and its contents were then heated on a water bath, and about 0·5 grm. of pure chlorate of potassium was added every 5 or 10 minutes for about an hour, after which the liquid was poured through a filter, the residue again heated with pure hydrochloric acid and chlorate of potassium until nothing more could be extracted that was precipitated with sulphuretted hydrogen. The contents of the basin were then transferred to the filter and well washed with hot distilled water. The combined filtrates and washings were then heated on a water-bath until the smell of chlorine had disappeared. The solution was then reduced with a slight excess of pure sulphurous acid, and again heated until the excess of sulphur dioxide was expelled.

The solution was then allowed to cool to 70° C., and a current of pure sulphuretted hydrogen, prepared by the method given by Divers and Shimidzu, in the Journal of the Chemical Society's Transactions for 1884, page 699, was passed through it until saturated; the solution, &c., were then allowed to stand in a warm place during the night, after which the precipitate was collected and washed in the usual manner, the filtrate and washing being again treated with sulphuretted hydrogen to make sure that everything had been precipitated.

The precipitate was then repeatedly digested with a little ammonium sulphide, for some time on a water bath, after which the solution was filtered from any suspended matter, which was well washed, and the washings added to the filtrate.

The sulphides were then reprecipitated from the solution by means of pure hydrochloric acid, the precipitate was collected on a small filter, washed, and dried at a temperature a little below 100° C. The filtrate and washings were then concentrated, and, if anything separated, it was added to the main precipitate.

When the precipitate was dry it was mixed with dried pure potassium cyanide and carbonate of soda; the mixture was then placed into a porcelain boat. The boat and its contents were then placed in the reduction tube of a Babo and Fresenius apparatus and reduced in a slow current of dry carbonic acid according to their instructions, and any mirror formed was compared with standard mirrors for the estimation of the arsenic.

After the apparatus had cooled, the boat was withdrawn, and the residue dissolved in hot distilled water; the solution so obtained was now saturated with pure hydrochloric acid and boiled for some time; the precipitate was filtered off, washed, dried, and again reduced with a fresh portion of the cyanide and carbonate of soda mixture, any arsenic deposited in the reduction was estimated and added to the amount found by the first mirror.

The residue in the boat was again dissolved in water, and the solution saturated with hydrochloric acid and boiled; the red precipitate was collected on a small filter, washed and dissolved in a hot saturated solution of potassium cyanide; the solution was then filtered, if necessary, and the solution saturated with pure hydrochloric acid, and boiled for about 15 minutes, after which it was allowed to stand for some hours.

The red precipitate of selenium was collected on a tared filter, washed, and dried at a temperature slightly below 100° C., and finally over concentrated sulphuric acid until the weight was constant, the increased weight of the filter giving the amount of selenium present in the amount of coke taken.

The amount of selenium found in coke from several parts of Yorkshire by the above method varied from a very slight trace to 0·015 per cent.

Though all the reagents used for the above had been specially purified, it was preferred to make blank tests, using the same quantities of the reagent, &c. as in the actual tests, in order to avoid any chance of contamination from the vessels, &c. used.

Obituary.

CHARLES MARTIN STILLWELL, A.M.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY,
AND OF THE NEW YORK SECTION.

CHARLES MARTIN STILLWELL, A.M., died Jan. 11, 1903, at his home in Brooklyn. He was a graduate of Brown University, of the class of 1866. For two years after graduation he filled the position of tutor in chemistry at his college. In the year 1868, he opened a laboratory in New York City as analytical chemist.

Mr. Stillwell was a member of several chemical societies, a contributor to the chemical journals, and was well known for his ability as a skilful analyst. His quiet, unassuming manners, and his generous, sympathetic nature, won for him a large circle of warm friends, who sincerely mourn his loss.

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I.—PLANT, APPARATUS, AND MACHINERY.

ENGLISH PATENTS.

Temperature Indicator. L. W. Winslap, London. From A. Heinz et Cie., Herstal, Belgium. Eng. Pat. 13,956, June 19, 1902.

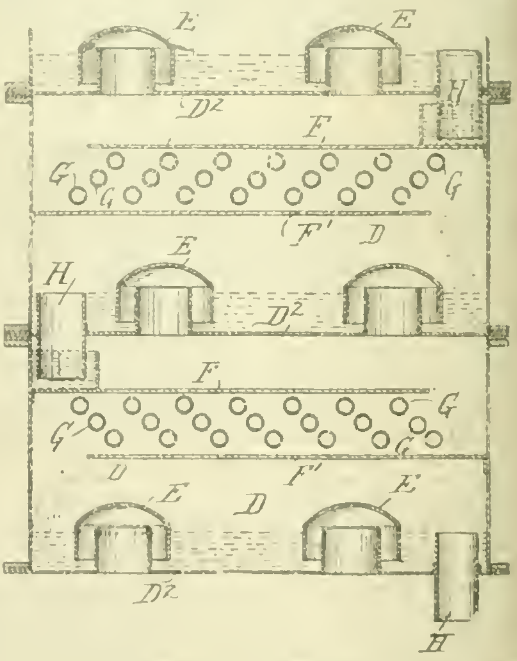
The instrument has a coiled expansion tube fixed at one end, and adapted at the free end to move a pointer over an index scale or dial. The scale or dial has a series of holes to receive a movable pin or pins, inserted in positions corresponding with the predetermined limits of temperature, and, when engaged by the pointer, the circuit of an electric bell or other signal is completed.—R. A.

Vacuum Evaporating Apparatus [Salt, Caustic Soda, and Saccharine Solutions, &c.]. C. Ordway, New York. Eng. Pat. 20,147, Sept. 15, 1903.

See U.S. Pat. 709,172 of 1902; this Journal, 1902, 1267. —R. A.

Distilling Apparatus. W. E. Lummus, Lynn, Mass., U.S.A. Eng. Pat. 25,967, Nov. 25, 1902.

The liquor to be treated is vaporised in a still, and the vapours are passed upwards through a rectifying column, in which they are subjected to a fractional condensation and distillation, the most volatile of the vapours passing from the top of the column to be condensed in a separate condenser. The rectifying column consists of a series of similar chambers, D, separated by diaphragms, D^2. The vapours enter each chamber through a "staggered" series of "boiling caps," E, and bubble through the condensed liquid in the bottom of the chamber, vaporising some of the more volatile components of this liquid. The vapours then pass upwards in a zigzag direction around intermediate diaphragms, F F^1, and between cooling tubes, G, which condense some of the heavier vapours, the remaining vapours entering the next chamber in the same manner. The condensed liquid from each chamber overflows through a downtake tube, H, having a liquid seal at the bottom, into the chamber next beneath, the residues from the lowest chamber returning to the still. The cooling tubes are arranged in inclined or "staggered" rows between the intermediate diaphragms of the chambers, and are connected in series to the cooling jacket of the separate condenser, the cooling medium flowing downwards through the tubes in the column in opposition to the ascending flow of the vapours.—R. A.



UNITED STATES PATENTS.

Filter. C. Scudder, Trenton, N.J. U.S. Pat. 717,932, Jan. 6, 1903.

The filtering medium is carried in the lower compartment of a pan which floats in the liquid to be filtered; the filtered

liquid runs from the upper compartment of this pan, by means of a flexible tube, into a reservoir placed below.
—J. W. H.

Filter; Barrel ——. B. Tully, Elkton, Col., Assignor to F. M. Woods, Telier County, Col. U.S. Pat. 718,680, Jan. 20, 1903.

The filter consists of a revolving barrel, provided with a closely-fitting lining of acid-proof material, such as lead, and a series of filters formed in the lining, the barrel having apertures at the points where the filters are located. A "launder" on the exterior of the barrel is connected by a series of branch pipes to the lining, in communication with the filters.—R. A.

Filter; Centrifugal ——. G. Moore, Salt Lake City, Utah. U.S. Pat. 718,858, Jan. 20, 1903.

The revolving drum of the filter is of truncated conical form, and its inner surface is corrugated and lined with a filtering medium, the corrugations extending so as to direct the liquid (which is supplied at the top against the filtering medium) towards the bottom of the drum. Near the bottom, the drum has a series of apertures, through which the liquid is discharged into a surrounding trough, the solids being retained upon the filtering medium. The filtration is facilitated by imparting a longitudinal jarring action to the driving shaft, on which the drum is mounted.—R. A.

Filter. F. Stiner, Lawrence, Mass. U.S. Pat. 718,886, Jan. 20, 1903.

A casing is divided, by a number of vertical partitions of filtering material, into chambers provided with openings for the discharge of accumulated solids on the inlet side of each partition and in proximity to the lower edge thereof. An inlet pipe delivers to one of the end chambers, and a discharge pipe leads from the opposite end chamber at the axis of the casing. A pressure pipe is connected with each of the chambers, by which a fluid may be introduced for the purpose of cleaning the partitions. Through a stuffing box, situated in an opening in one of the end chambers, a spindle extends into the chamber, and carries a movably-mounted brush in proximity to each partition, against which the brush is pressed by a spring. Certain of the chambers are filled with granular filtering material.—C. S.

Separator; Centrifugal ——. E. Bardolle, Paris. U.S. Pat. 717,963, Jan. 6, 1903.

In a casing of paraboloid form, concentric drums of similar shape are revolved. The gases (or fluids) to be treated, enter at the base (at the vertices of the paraboloids) and leave by outlets from the several drums. The drums are rotated by the driving cog wheel gearing into a worm on the drum shaft.—J. W. H.

Condenser. F. Lamplough, London. U.S. Pat. 718,851, Jan. 20, 1903.

This condenser comprises a series of main tubes surrounded by a chamber having a steam-inlet, flattened cross-tubes fixed within the main tubes and communicating with the surrounding space, and jets from the spaces surrounding the main tubes, for directing the partially condensed steam through the main tubes and on to the cross-tubes.—R. A.

Furnace; Hot Air ——. W. H. Chappell, Morenci, Mich. U.S. Pat. 718,980, Jan. 27, 1903.

The furnace is provided with a horizontal radiator and a vertical radiator, in communication with each other and with the fire-box and chimney respectively. The vertical radiator consists of upper and lower horizontal drums connected at their ends by vertical pipes, the upper drum being connected on one side with the chimney, and on the opposite side with the outlet of the horizontal radiator. A controlling damper is arranged between the last-mentioned two connections.—R. A.

Distilling Water; Apparatus for ——. J. Ellison, Spanish Fork, Utah. U.S. Pat. 718,991, Jan. 27, 1903.

The apparatus comprises a combined boiling-chamber and distilled-water chamber, separated by a partition having an ascending tubular outlet, and, superposed thereon, a combined condensing-chamber and water-reservoir, separated by an inverted cone-shaped partition. A baffle-plate having marginal flanges is arranged beneath the last mentioned partition, and provided with terminal openings discharging into the distilled-water chamber. Air inlets and outlets and a draw-off cock are also provided.—R. A.

[*Water*] *Cooler.* F. Guttenberg, Brooklyn, N.Y. U.S. Pat. 719,212, Jan. 27, 1903.

The liquid to be cooled is delivered from a receptacle above into a coil arranged in a chamber below, containing ice, and it flows by the action of gravity through the coil to a discharge spout near the top of the chamber. The receptacle for the liquid to be cooled is supported above the chamber by a holder, with its faucet end resting in a socket, connected with the inlet end of the coil.—R. A.

Digester-Linings; Composition for ——. E. Hentschel, Muskegon, Mich. U.S. Pat. 719,216, Jan. 27, 1903.

The composition consists of litharge (260 lb.), Portland cement (100 lb), quartz or crushed fire-brick (100 lb.), glycerin (20 galls.), and silicate of soda ($4\frac{1}{2}$ galls.).—R. A.

French Patent.

Distillation, Concentration, Pasteurisation, and Rectification; Apparatus and Process for ——. Garrigou. Fr. Pat. 319,232, March 3, 1902.

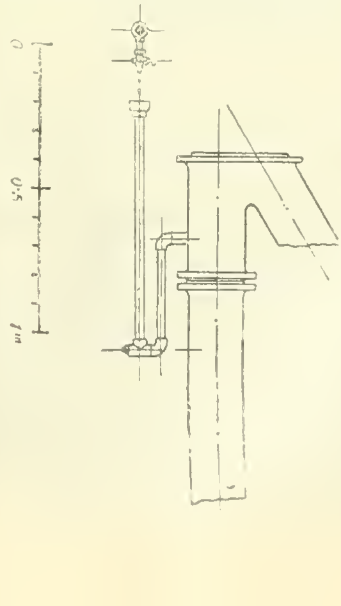
The process consists in bringing the liquid undergoing distillation, into contact with surfaces heated to the most suitable rectifying temperatures by vapour coming from a separate generator, which last is charged with any suitable liquid.

The apparatus comprises a vertical cylinder containing three or more bulbs, intercommunicating, and supplied with vapour from a separate boiler, to which the condensed liquid is continuously returned, after the manner of an inverted condenser. The liquid to be distilled, is preheated by passage through a spiral heater, also operated on the thermo-siphon principle from the above boiler, and is then discharged over the bulbs, which effect its distillation and rectification. The disengaged vapour passes through the retort-head of the cylinder, and is condensed by a spiral cooler. The apparatus being closed, distillation may be conducted *in vacuo* or at any desired pressure. Apart from this, the apparatus may be used for concentrating, sterilising or pasteurising liquids.—H. T. P.

II.—FUEL, GAS, AND LIGHT.

Ascension-Pipe Stoppages; Prevention of ——. Burgemeister. J. f. Gasbeleucht., 46, [4], 66—67.

For several years the author has successfully prevented the formation of obstructions in ascension pipes, by means of



the arrangement shown in the illustration. Water is admitted into the pipe drop by drop, so that it is completely evaporated, and the cooling thus effected, prevents the deposition of carbonaceous particles. When the method is first introduced, the carbonaceous deposits already formed in the pipe are loosened and flow downwards, so that it is necessary to remove the greasy accumulation frequently from the lower part of the pipe; but afterwards, when the pipe is quite clean, one need only clear the pipe by means of a cross-head at each charging of the retort.—H. B.

Cyanogen from Coal-Gas. J. Bueb. J. f. Gasbeleucht., **46**, [5], 81—83.

A criticism of recent papers by Feld (this Journal, 1903, 16—17) and Nauss.

In German gasworks the profit on the recovery of cyanogen amounts to less than 2 per cent. of the net profits of the concern, but further inducements to adopt the process are, the desire to supply a pure gas and to prevent the destruction of the plates of gas-holders and the gas-meters. The yield of cyanogen depends upon the kind of coal used and the temperature of carbonisation. The following table is based on the actual results of a year's working, the yield being stated as grms. of Prussian blue, in the cyanide mud, per cubic metre of gas :—

Works	Kind of Coal.	Prussian Blue.
		Grms per cb. m.
Potsdam	English	1·45
Warsaw	Upper Silesian.....	2·87
Ruhrort	Westphalian.......	3·55

In these works the extraction of the cyanogen from the gas was technically perfect.

Owing to the much smaller cyanogen-content of coke-oven gases, the recovery in this case is impracticable, depreciation and interest on the extraction plant being relatively too high.

The author controverts the statement that, to obtain a high yield of cyanogen, by avoiding formation of sulphocyanide, it is necessary to remove ammonia as completely as possible beforehand. By his process, which depends upon the separation of an insoluble double salt of ammonium cyanide and ferrocyanide, and which is applied to the unwashed gas, almost all the cyanogen is obtained as ferrocyanide, only 1 per cent. of that contained in the mud being sulphocyanide.—H. B.

English Patents.

Coal; Binding Material for ——, and other Substances, and Process of Producing same. D. de Vuhtch, Paris. Eng. Pat. 2307, Jan. 28, 1902.

See Fr. Pat. 217,847 of 1902; this Journal, 1902, 1446.
—F. H. L.

Fuel Briquettes; Artificial ——, and Method of Manufacturing the same. A. J. Boult, London. From W. A. Koneman, Chicago. Eng. Pat. 20,669, Sept. 22, 1902.

Two or three parts of anthracite or non-caking coal, and one part of caking coal, both reduced to extremely fine powder by mechanical means, are mixed together and made up into briquettes with "bone-soup," a material obtained by treating slaughter-house refuse with steam under a pressure of 40 lb., and separating the grease and meat-fibre in a filter-press. In order to render the agglutinant insoluble, and the briquettes not liable to disintegrate on exposure to the weather, chlorine is formed within the mass, by incorporating with it a suitable quantity of calcium hypochlorite, and then adding ferrous sulphate solution. Further protection may be gained by immersing the finished briquettes in molten grease, and then treating them with a solution of lime or alum (See also U.S. Pats. 711,166 and 711,167 of 1902; this Journal, 1902, 1423.)—F. H. L.

Charcoal Bricks; Manufacturing Porous Coked ——. M. Elb, Dresden, Germany. Eng. Pat. 21,104, Sept. 27, 1902.

The materials, which are used for the manufacture of those briquettes that are consumed in "samovars" and the like, are mixed with some substance such as potassium or sodium bicarbonate, or an ammonium salt, then formed into bricks, dried, and coked in the usual manner. This process has the advantage that the gas liberated by the decomposition of the salts is only evolved during the initial stages of the coking operation, so that the briquettes are given an even porous structure all through. They are therefore said to burn quietly and continuously. Eng. Pat. 23,051, 1895, is referred to; but in that specification an addition of organic matter is suggested, which is decomposed later during the coking, and so leaves the briquettes with an unevenly distributed porosity.—F. H. L.

Fuels; Appliance for Heating, Straining, and Regulating Liquid ——. T. B. Marchant, London. Eng. Pat. 2071, Jan. 25, 1902.

The liquid fuel is passed, by gravitation, through a tube containing a series of strainers, of progressively increasing fineness of mesh, to remove the unliquefied constituents, the tube being heated, by means of a water- or steam-jacket, to facilitate the passage of the oil. All the parts are in duplicate, so that one set can be removed and cleaned without stopping the burner; and either set of strainers can be cleaned by means of a reversed jet of steam or air. The separate strainers slide on a centre bolt, and can be set at different distances by means of corresponding distance pieces.—C. S.

Furnaces [Boiler]. J. Hargreaves, Farnworth-in-Widnes, Lancashire. Eng. Pat. 2898, Feb. 5, 1902.

The furnace has a sloping dead-plate leading downwards to sloping fire-bars, the space above the dead-plate being kept full of fuel by a feed-hopper. The more volatile portions of the fuel are distilled on the dead-plate, and pass to the furnace, while the remainder of the fuel is pushed automatically on to the fire-bars. The fire-bars are supported on a bearing bar having a channel for water, and may be either stationary or capable of reciprocating movements. Clinkers, &c., move downwards over the fire-bars, and fall into a clinker chamber, wherein any unburnt carbon is consumed. The clinker chamber is provided with a front-grate and rocking bottom-bars for the discharge of ashes, &c. Air passages through the walls and roof of the furnace have inlets to the interior, directed upon the surface of the fuel near the dead-plate. The furnace is supported on wheels to facilitate removal.—R. A.

Furnaces [Boilers, &c.]. R. Herrmann, Magdeburg, Prussia. Eng. Pat. 23,950, Nov. 3, 1902.

The well-known step-grate, or inclined grate, with short horizontal bars, is employed in the furnace, and a channel, having a narrow entrance and a narrow exit, leads from close above the grate bars to the flues. The mixture of gases expands from the narrow inlet into the wider part of the channel, and moves slowly through the channel, so that a complete combustion is effected before it reaches the cool parts of the flues.—R. A.

Furnaces; Calcining or Smelting ——. A. Pfoser, Achern, Germany. Eng. Pat. 19,895, Sept. 11, 1902.

When the upper part of a calcining or smelting furnace is used for steam raising, by having a water-tube boiler placed in it, it is customary to throw a second brick arch across the furnace above the furnace arch proper. This is said to have the disadvantage of wasting heat, and of proving a source of danger. It is therefore proposed to form the upper arch of plates, grooved and tongued together, each portion having a short upright tube protected by a conical cap. Where the arch springs, there is fitted a wide pipe, leading downwards, through which any water dropping from a leaky tube is removed, so as to protect the brick arch from being wetted. The hot gases pass through the metal arch by means of the upright pipes, escaping from underneath the caps. Provision is also made for introducing cold air between the two arches when it is desired to stop or diminish generation of steam in the boiler.—F. H. L.

Gases for Furnace Combustion; Treatment of ——. G. J. Stock and A. Putnam, Darlington. Eng. Pat. 5326, March 4, 1902.

Gases, such as Mond gas, which burn with a non-luminous flame, and which, being too deficient in incandescent carbon to radiate heat, cause excessive local heating of furnace linings, are mixed with vaporised oil or tarry matter, "whereby the insufficiency of incandescent carbon is rectified and an even radiation of heat secured."—H. B.

Gas from Gasoline; Apparatus for Manufacturing ——. C. J. Johnson, St. Louis, Mo. Eng. Pat. 20,718, Sept. 23, 1902.

An automatically controlled carburetter, comprising a carburetting vessel; a water-motor for forcing air and gasoline into the bottom and top respectively of the carburetter, the motor being controlled by the movement of a pressure-diaphragm therein; a regulator for controlling the supply of gasoline relatively to the air supply; an air-pump; a gasoline-pump; a gasoline reservoir; and mechanism for linking up the various moving parts.—H. B.

Calcium Sulphocyanide; Manufacture of —— [*from Gas*]. C. C. Carpenter. Eng. Pat. 22,170, Oct. 18, 1902. VII., page 212.

United States Patents.

Combustion Process. J. Latham, Philadelphia, Pa. U.S. Pat. 709,372, Sept. 16, 1902.

A down draught is caused in one part of the incandescent fuel by a current of pre-heated air; this air then passes through other parts of the fuel, and afterwards again through an incandescent portion.—J. W. H.

Gas; Method of Producing ——. J. F. Stacey, Assignor to T. E. Matthews, Nashville, Tenn. U.S. Pat. 718,884, Jan. 20, 1903.

The coal-gas is mixed with heated air, in the proportion of 6—9 parts to 94—91 parts of gas, before the temperature of the latter has fallen below 200°—205° F., and before purification, the mixture being immediately passed through a scrubber.—C. S.

Gas; Process of Making ——. B. Talbot, Leeds. U.S. Pat. 718,887, Jan. 20, 1903.

Coal is "uniformly spread on the surface of a bed of distilling coal," which is maintained at a temperature approximating that of the combustion of carbon. The bed of coal is kept uniformly stirred, transversely, to prevent the formation of incandescent craters or cavities through the upper layers. The rate of combustion is regulated by circulating water through the stirring apparatus; and the necessary amount of air for supporting efficient combustion is introduced by a jet of steam furnished by the water circulation. The stirring mechanism also serves to effect the return of condensable distillation products to the region of combustion.—C. S.

French Patents.

Fuel; Solid Artificial ——. A. A. Pihan. Fr. Pat. 321,628, May 30, 1902.

Briquettes are made by mixing together 64 parts of cinders, 21 parts of coal dust, 8·5 parts of naphtha, and 6·5 parts of pitch. The employment of mineral, vegetable, or animal oils in the crude state as agglutinants, is also claimed.—F. H. L.

Coke Oven. T. S. C. Lowe. Fr. Pat. 321,399, May 24, 1902.

Apparatus is described for carbonising coal by an intermittent process, part of the gas liberated being employed to heat the oven and the regenerative chambers, while part is left available for other purposes. There are 67 claims. (See also Eng. Pat. 7826 of 1902; this Journal, 1902, 906.) —F. H. L.

Gas-Producer. P. Saviron and C. Mendizabal. Fr. Pat. 321,276, May 20, 1902.

A fuel gas is made by charging a certain quantity of raw coal on to the top of a mass of incandescent coke in a producer, introducing below the hearth a current of steam, or steam and air, and leading the products through a second similar producer to fix the vapours coming from the distillation of the coal; the process being either worked intermittently with an intermediate blow of air, or continuously with a constant current of air and steam. Coke of special hardness may be prepared by working a single producer in such fashion that the products of distillation of the raw coal lying on the top of the coke have to pass downwards through the latter, being decomposed and filling up the pores with graphitic carbon.—F. H. L.

Gas-Producer. C. Whitfield and C. G. Norris. Fr. Pat. 321,672, June 2, 1902.

A water-bottom gas-producer at the base of which is a grate formed in the shape of an inverted V, the apex of which carries a tube for the admission of air. The usual steam injector is fitted laterally, and is connected at its side with a pipe leading from the top of the producer, so that the gases escaping from the upper part of the fuel may be re-injected along with steam and air, into the base of the producer, finally leaving it through a flue situated half-way up.—F. H. L.

Acetylene Generator. L. J. Bal. Fr. Pat. 321,216, May 17, 1902.

A dripping generator with its water supply governed by the bell movements. In the annular part of the gasholder receptacle, between the bell and the tank, is a float which carries a pipe with open end, communicating through a flexible tube with the water inlet of the decomposing chamber. Normally, this float holds the mouth of the pipe above the water level; but when the bell descends, a striker depresses it below the level, and some liquid reaches the carbide. The carbide vessel contains superposed, subdivided boxes; the topmost is attacked first, whilst water enters, and gas escapes also from the top. The gas pipe leading to the holder, is water-sealed.—F. H. L.

Acetylene Generator. J. Choulet. Fr. Pat. 321,232, May 17, 1902.

A contact apparatus having its water-supply governed by the gas pressure. It consists of an upright casing, the main portion of which is a displacement-holder for the acetylene; but at the upper extremity is a separate small displacement apparatus for the supply of water to the carbide containers. The closed part of the main holder communicates with the closed part of the small vessel, so that the head of liquid in both, is identical. When the pressure falls, the level of the water in the closed part of the small holder rises above a lateral tube leading to the decomposing chamber. There are two of these formed as horizontal drawers, at the base of the casing, and fitted with carbide receptacles divided by vertical partitions. The gas escapes from them through a tall U-tube, which rises and descends through the liquid in the open part of the large holder, then enters the closed compartment, and causes the gas to bubble through the water there. The water-supply pipe is branched so as to feed either carbide-container, and is fitted with hand-worked cocks.—F. H. L.

Acetylene Generator. J. W. Weeks. Fr. Pat. 321,419, May 26, 1902.

See Eng. Pat. 11,498, 1902; this Journal, 1902, 1127. —F. H. L.

Naphthalene for Lighting; Utilisation of Vaporised ——. G. P. J. Lion. Fr. Pat. 321,495, May 21, 1902.

For incandescence lighting, naphthalene, contained in a reservoir at the base of the lamp, is kept fused by means of a gas or spirit flame, and is forced, by the pressure of its vapour or otherwise, up a narrow tube to a vaporiser, which is heated by a second flame. The vapour issuing from a jet on the vaporiser mixes with air, and is burned beneath a mantle as usual. For lighting by a luminous flame, liquefied naphthalene is led down a vertical pipe from a reservoir to a vertical ring-shaped tube, within which a flame is formed by the combustion of the vapour issuing from two convergent jets, the ring, vertical tube, and reservoir being heated by the flame itself, after a preliminary heating by means of a spirit flame. (See also Fr. Pat. 319,599; this Journal, 1902, 1525.) —H. B.

Lamps, Incandescent; Method of Making ——, and New Product resulting from the Manufacture. Siemens and Halske Aktien Gesellschaft. Fr. Pat. 321,412, May 26, 1902.

An amorphous powder of vanadium, tantalum, or niobium, or a suitable mixture of these metals with other amorphous metallic powders not easily fusible, is made plastic by mixing it with a readily volatilised agglomerant, such as paraffin, &c. The paste is first heated in a furnace to carbonise or volatilise the agglomerant, and is then heated by the passage of the electric current, and formed into a coherent metallic body; or the powder may be pressed, without an agglomerant, into the desired shape, and be formed into a metallic body by the electric current. The pentoxide or acid hydrate of niobium and tantalum, which are bad conductors, may be employed with an agglomerant, and are transformed into an oxide of greater conductivity by heating in carbon dust or an indifferent or reducing gas, after which decomposition is produced by the passage of the current. Combinations of the metals in question with the elements of the fifth group of the periodic system (nitrogen, phosphorus, arsenic), or with sulphur, with or without the admixture of a suitable agglomerant, may be employed; or the carbides of the metals, with or without the addition of pure metals, may be shaped as incandescent bodies, and heated with the exclusion of air, the carbides being brought into reaction with the oxides, so that a coherent pure metallic body is formed, which can be given the desired form by lamination, drawing out, pressure, &c.—G. H. R.

Lamps, Incandescent; Method of Making ——, and Product resulting from the Manufacture. Siemens and Halske Aktien-Gesellschaft. Fr. Pat. 321,413, May 26, 1902.

The filament is formed of the carbides of vanadium, tantalum, or niobium mixed with the corresponding metal or oxide, or both, or with those of other rare earths.—G. H. R.

Incandescence Mantle. P. C. Schottmann. Fr. Pat. 321,191, May 17, 1902.

Ordinary mantles are knitted with the smooth side on the exterior of the fabric and the ribbed side on the interior. As the projections interfere with the action of the flame, the patentee either knits the fabrics so as to have the smooth side on the interior, or he turns an ordinary mantle outside in.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum; Production of —— in Hanover and Brunswick. J. H. Sachse. Chem. Rev. Fett- u. Harz-Ind., 1903, **10**, [1], 2—5.

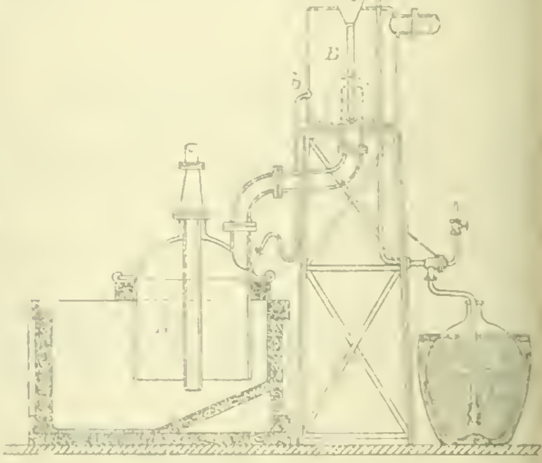
Petroleum is found in various places in the great valley in Hanover lying between the Wesergebirg and the Teutoburger Wald: in Wietze, Hanigsen, Oelheim, Horst, and to the east of Brunswick. There are now 12 companies at Wietze dealing with petroleum, of which eight are concerned with the production. In 1899, the total petroleum produced in Germany was 27,027 tons, of which 23,554 tons were derived from Alsace. In 1900, the total production of Germany amounted to 50,375 tons, of which 22,597 tons came from Alsace, whilst the increase of 23,348 tons is to be attributed almost entirely to the Wietze industry. The depth of the borings at Wietze ranges from about 150 m. to 200 m., each boring yielding quantities ranging from about 200 barrels to 20 barrels or less. Wietze oil is dark in colour, and has a specific gravity of 0·94 at 15° C. A large quantity of the oil, after removal of the lighter portions (13 to 15 per cent.) is used, either directly or in admixture with Russian residues, as lubricating oil for railways, for which it is specially suitable, on account of the small proportion of paraffin that it contains. When refined, Wietze oil yields mainly spindle and machine oils of very good quality, whilst the by-products consist of an extremely small amount of benzine, and about 6 per cent. of Ia petroleum, and the same quantity of IIa petroleum.

Fractional distillation of Wietze crude oil gives the following results:—Fractions boiling below 100° C., 0·5; from 100 — 150° C., 1·0; from 150 — 270° C., 12·5; from 270 — 300° C., 5·5; and above 300° C., 80·5 per cent. by volume.

The Oelheim and Horst petroleum industries are as yet insignificant. Oil obtained at Horst, from borings of about 190 m. in depth, contains about 6 per cent. of benzine and about 35 per cent. of lamp oil.—C. A. M.

Sulphate of Ammonia Saturator. A. Feldmann. J. f. Gasbeleucht., **46**, [5], 86.

In an open saturating box is suspended a lead bell A, in which the washed gas collects, and is led into B, where any ammonia it may still contain is retained by bubbling the gas through sulphuric acid. To avoid crystallisation in B, fresh acid is admitted several times during each charge at *a*; the excess of partly saturated acid flowing down through *b* to the surface of the liquid under A, where it meets with the residual ammonia in the washed gas. By this means the loss of ammonia, as the acid in the saturator approaches neutralisation, is avoided.—H. B.



English Patent.

Coal-Tar Compositions and Pitches; Manufacture of —— H. H. Lake, London. From F. J. Warren, Newton, Mass., U.S.A. Eng. Pat. 9322, April 22, 1902.

See Fr. Pat. 320,828, 1902; this Journal, 1903, 139.
—T. F. B.

French Patent.

Hydrocarbons of the Homologous Series, C_nH_{2n-2}, present in Petroleum and Vaseline; Formation of Fatty Acids and Soaps from ——. G. Reale. Fr. Pat. 321,510, May 28, 1902. XII., page 218.

IV.—COLOURING MATTERS AND DYESTUFFS.

Dinitrotoluene and Dinitrobenzene; Manufacture of ——. F. C. Kayser. Zeits. f. Farb. u. Text. Chem., 1903, **2**, [1 and 2], 16—20 and 31—32.

The author describes the method employed some years ago for the manufacture of these products in one of the principal English factories. The details given refer principally to dinitrotoluene, because at that time this was the more important product, being cheaper and also giving redder shades of Bismarck Brown and Chrysoidine, more suitable for the staining of cheap wood, for which purpose these dyestuffs were in great demand.

Plant employed: (*a*) *Nitrating Vessel.*—This consists of a cast-iron cylinder, $\frac{1}{2}$-in thick, 6 ft. high, and 4 ft. in diameter, provided with a cover. The cylinder stands in a rectangular wooden box, about 6 ft. square by 4 ft. high. A nozzle cast on the bottom of the cylinder projects through the front of the box, and is made water-tight with gypsum. A short length of iron pipe (about $1\frac{1}{2}$ ins.) is screwed into the nozzle, the other end carrying an earthenware or iron tap. The box, provided with a water supply, stands on brickwork some feet from the ground. The cylinder-cover contains two man-holes and a small outlet for the escaping gases. A spindle passes through a stuffing-box in the centre. The spindle rests in a removable foot-step, and carries three parallel agitators, each of which consists of two inclined screw blades. The upper end of the spindle carries a toothed wheel, engaging with one on the main shaft, which drives the stirring apparatus of several nitrating vessels. The temperature is taken by means of a thermometer supported in an iron tube screwed into the nozzle close to the cylinder. The thermometer passes through a a rubber cork, and is kept in position by means of a screw-cap.

(*b*) *Acid Mixer.*—This is a rectangular cast-iron tank $\frac{1}{4}$ in. in thickness, and 5 ft. long by $3\frac{1}{2}$ ft. wide, by 2 ft. deep, fitted with a loose overhanging cover in which is a large hole for charging and mixing, and two smaller ones for the escaping air and gases. A thick-walled nozzle is cast on the wide side, into which a cast-iron tap, provided with a long handle, is screwed. The acid runs from this into a glass funnel resting in a right-angled piece of inch piping inserted in the side of the nitrating vessel, where it is bent slightly downwards. The acid is mixed in the vessel by means of a rod terminating in a disc.

(*c*) *Waste Acid Tank.*—This consists of a lead-lined wooden tank, 7 ft. long by 4 ft. wide, and 4 ft. deep. It stands at a lower level than the nitrating vessels, the acid running from several of these into a lead-lined wooden gutter, and is emptied through an earthenware tap inserted near the bottom.

(*d*) *Boiling-up Tank.*—A similar lead-lined wooden tank, about 7 ft. long by 4 ft. wide by $2\frac{1}{2}$ ft. deep, somewhat inclined, and provided with a tap. A leaden pipe with lateral perforations, resting on bricks, serves for boiling up.

(*e*) *Crystallising Vessels.*—Ordinary glazed earthenware pots, of the shape of a truncated cone, holding about 20 litres.

(*f*) *Drainage Plant.*—This consists of several inclined wide lead-lined wooden gutters, or troughs, divided by means of laths, so that each division supports and holds in position a crystallising vessel on its side. Underneath the trough is a system of steam pipes for warming the apparatus.

With regard to the size and arrangement of the plant, several nitrating vessels are necessary, but the tanks described are sufficient for working 1,200—1,600 lb. of toluol or benzol at one operation.

Method of Working.—Towards the end of the day 700 lb. of sulphuric acid, 170° Tw. (66° B.), are poured into (*b*) followed by 450 lb. of nitric acid, 88° Tw. (44°·1 B.). After well stirring, the hole in the cover is closed, and the acid is allowed to stand. At the same time 400 lb. of toluol, weighed off in screw-capped iron tins, each containing 100 lb. and provided with handles, are tipped into the nitrating vessels. At 7 o'clock the next morning the cooling jacket is filled with cold water, the agitator is started, and acid is allowed to flow in, so that the operation is completed by about 3 p.m., the temperature rising in about 1 hour to 60° C., and remaining at that. A better cooling effect can be obtained by corrugating the wall of the nitrating cylinder. The agitation is maintained until 5 p.m., when the apparatus is left till the next morning. At 7 a.m. the dark acid is drawn off into carboys, until a change in colour denotes the presence of nitrotoluol. The apparatus is then closed, the agitator started, and the acid prepared the previous day, is run in. This consists of 1,350 lb. of sulphuric acid (170° Tw.) and 450 lb. of nitric acid (90° Tw.). The acid is allowed to run in so that by 1 p.m. the operation is complete, the agitation being continued till about 4 p.m. The normal working temperature, which is reached in about $1\frac{1}{2}$ hours, is 115° C. The cooling tank contains no water, and the temperature is regulated by the rate of flow of the acid. Only very little fume is given off. When a sample drawn from the cock solidifies on cooling, the operation is complete. The agitator is then stopped, and after half an hour the spent acid is run into (*c*) and the oil subsequently into (*d*), which is partly filled with boiling water. The boiling is continued for some time, the longer the better, the mixture being stirred with a wooden rod. After then standing for 15 minutes, the oily nitro-product sinks to the bottom, and is drawn off into the crystallising vessels, of which about 12 are filled. The product solidifies in 1—2 days, according to the time of year. In the event of a badly-conducted operation giving an oily product, the pots are placed on their sides on (*f*), and slightly warmed, in winter, until oil no longer drips from them. The solid product is eventually turned out of the crystallising vessels and broken up by hand. After the first operation, it is possible to use the dinitro waste acid for the manufacture of nitrotoluol. The mixture then consists of only 300 lb. of nitric acid (88° Tw.) with the whole of the waste acid from the dinitro charge. If fresh acid be used for each charge, it is only necessary to employ for each 400 lb. of toluol, 600 lb. of sulphuric acid and 400 lb of nitric acid.

For the manufacture of dinitrobenzene, more nitric acid is wanted, 400 lb. of benzene requiring 480 lb. of nitric acid (88° Tw.) and 720 lb. of sulphuric acid at a temperature of 70° C. The yield of dinitrotoluene obtained from 400 lb. of toluol, including a small quantity which forms as a crust on the top of the waste acid when cold, is from 700—720 lb., equivalent to 90—93 per cent. of the theoretical amount. The disposal of the waste acid from the nitrotoluol manufacture is an important item in the cost of manufacture. The dark acid, amounting to 13—14 carboys from each operation, has a specific gravity of 133°—134° Tw. It can be employed for neutralising the soap lyes from cloth manufacture or for making ferrous sulphate. Employed in the manufacture of nitric acid, it yields at most a nitric acid of 72° Tw., and attacks the retorts to a considerable extent. This is avoided by mixing it with an equal weight of fresh sulphuric acid, when a nitric acid of 88° Tw. can be obtained. The acid can also be concentrated in large cast-iron vessels to 167° Tw., when small quantities of nitrotoluol and nitric acid and torrents of sulphurous acid are given off. The dark product obtained, gives a bright nitric acid of 101° Tw.

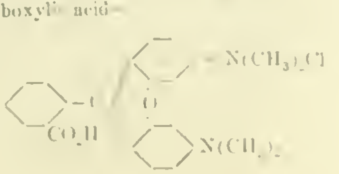
Analytical Control.—The benzol or toluol is tested by distilling 100 c.c. in a fractionating flask and shaking the first 5 or 10 c.c. with an equal volume of sulphuric acid. The acid is then drawn off and the treatment repeated, when the volume should remain unchanged. The toluol or benzol mixed with twice the volume of sulphuric acid, should also impart no colour to the latter. A better way of testing the benzol or toluol is to convert 200 c.c. of the product in question into the nitro compound in a flask, an operation which takes from 2—3 hours. After separating and washing in a separating funnel, the nitro compound is heated to 150° C. The distillate is again treated with three times its weight of nitrating acid and again distilled up to 130° C., the distillate being measured. The manufacture is best controlled by observations of the waste acids. The mononitro waste acid at 15° C. should show at 15° C. 132°—134° Tw., and contain 1—$1\frac{1}{2}$ per cent. of nitric acid by weight (1 c.c. with 10 c.c. of sulphuric acid in a nitrometer giving 6—9 c.c. of NO). The nitrotoluol on fractional distillation should not give more than 1 per cent. of unaltered toluol. A normal dinitro waste acid should show 150°—154° Tw., and contain 3—4 per cent. of nitric acid, 1 c.c. giving 20—25 c.c. of gas. A laboratory method for obtaining dinitrotoluene is also given. A thick-walled round flask, holding 3—4 litres, is provided with a three-holed india-rubber stopper with thermometer, funnel, and bent glass tube. 400 grms. of toluol are treated with a mixture of 700 grms. of the strongest English sulphuric acid and 450 grms. of nitric acid (88° Tw.). The temperature is maintained at 60° C., the operation lasting about four hours. After separating and drawing off the acid, the nitrotoluol is treated with 1,350 grms. of sulphuric acid and 450 grms. of nitric acid (96°—97° Tw.) for three hours, the temperature being about 115° C. The waste acid is then drawn off through a funnel provided with a cork, the oil being afterwards run into a dish containing about [illegible] litres of boiling water, and vigorously stirred. After settling, the oil is drawn off by means of a funnel into a dry receptacle, and weighs about 661 grms. The waste acid on cooling gives another 48 grms. after melting and washing. For a second operation with 400 grms. of toluene, the waste dinitro acid (155° Tw.), measuring 850 c.c. (1 c.c. in nitrometer gives 31·5 c.c. of NO), is mixed with 300 grms. of nitric acid (88° Tw.). The waste acid from this operation measures about 960 c.c., and contains about 1 per cent. of nitric acid. The further nitration gives 677 grms. of dinitrotoluene, together with 43 grms. from the waste acid—a total of 720 grms. The waste acid (154° Tw.) measures 850 c.c., and contains 3½ per cent. of nitric acid.—T. A. L.

Diphenylamine and Tolylphenylamine; Some Derivatives of ——. F. Reverdin and P. Crépieux. Ber., 1903, **36**, [1], 29—35.

The authors, in the course of some investigations on dyestuffs, have prepared the following derivatives:—*o*-Tolyl-2′.4′-dinitrophenylamine, by heating together *o*-toluidine, dinitrochlorobenzene, and fused sodium acetate to 200° C. The product crystallises in lemon-yellow prisms or orange needles melting at 129° C. On treatment with nitric acid, it forms a mono- and a dinitro product, the former (reddish-brown prisms) melting at 158° C., and the latter (yellow prisms) at 190° C. With picryl chloride, *o*-toluidine gives *o*-tolyl-2′.4′.6′-trinitrophenylamine, orange-red prisms melting at 164° C. *m*-Tolyl-2′.4′-dinitrophenylamine crystallises in ochre-red needles, and melts at 161° C., whilst the corresponding *p*-tolyl compound forms red needles and melts at 137° C. The acetyl compound (colourless prisms) melts at 142° C., whilst, on nitration, a tetranitro-*p*-tolylphenylamine is obtained melting at 219° C. The condensation of *o*-chloraniline and 2.4-dinitrochlorobenzene yields 2-chloro-2′.4′-dinitrodiphenylamine, which crystallises in golden-yellow needles melting at 149° C., and gives, on nitration, 2-chloro-4.2′.4′-trinitrodiphenylamine (yellow prisms) melting at 166° C. The product 3-chloro-2′.4′-dinitrodiphenylamine separates from dilute acetone in yellowish-red matted needles melting at 183° C., and gives, on nitration, a chlorotrinitrodiphenylamine. 4-Chloro-2′.4′-dinitrodiphenylamine, crystallising in small orange-red needles melting at 165° C., gives, on nitration, a *p*-chlorotetranitrodiphenylamine separating in amber-yellow prisms melting at 183° C. 2.4-Dichloro-2′.4′-dinitrodiphenylamine, obtained from 2.4-dichloraniline, crystallises in long yellow needles melting at 166° C. It gives a dichlorotetranitrodiphenylamine melting at 198° C. The authors have also condensed 2.4-dinitrochlorobenzene with *o*-toluidine-*p*-sulphonic acid and with *p*-toluidine-*o*-sulphonic acid, as well as with the amides of these acids. Sodium 4-methyl-2′.4′-dinitrodiphenylamine-3-sulphonate, obtained by heating *p*-toluidine-o-sulphonic acid, chlorodinitrobenzene, and fused sodium acetate for 1½ hours to 160° C., forms long red prisms soluble in water and alcohol, whilst the corresponding derivative from o-toluidine-*p*-sulphonic acid gives yellow prisms having similar properties. Starting with the corresponding sulphamines, the *p*-toluidine derivative yields 4-methyl-2′.4′-dinitrodiphenylamine-3-sulphonamine, crystallising in yellow prisms melting at 255° C., whilst the isomeric compound, 2-methyl-2′.4′-dinitrodiphenylamine-5-sulphonamine crystallises in long light yellow prisms melting at 209° C. Both products dissolve in alkalis with a dark red colour, and are precipitated by acids.—T. A. L.

Para- and Meta Rhodamine. E. Noelting and Ad. Paira. Rev. Gén. des Mat. Col., 1903, **7**, (74), 33—35.

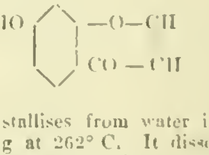
Rhodamine, obtained by fusing phthalic anhydride with dimethyl-*m*-aminophenol, may be considered as phenylpyronine-*o*-carboxylic acid—



The authors have prepared the two isomeric compounds in which the carboxyl group is in the meta and para position respectively, relative to the central carbon atom. For this purpose they have condensed nitrobenzaldehydes with dimethyl-*m*-aminophenol, obtaining nitrophenylpyronines. These, on reduction, yield the corresponding amino compounds, which are diazotised and converted into the cyano derivatives, giving on hydrolysis phenylpyronine carboxylic acids isomeric with ordinary Rhodamine. The intermediate *m*- and *p*-aminophenylpyronines, which can also be obtained by condensing *m*- and *p*-aminobenzaldehyde with dimethyl-*m*-aminophenol, can, after diazotisation, be combined with phenols, giving azo compounds. The isomeric rhodamines dye silk a more bluish pink than ordinary Rhodamine, and the Anisoline, *i.e.*, the ethyl ester of *p*-Rhodamine, gives a violet-pink. An attempt to obtain ordinary Rhodamine by diazotising *o*-aminophenylpyronine was unsuccessful, as nitrogen was given off, and it was not found possible to convert the amino group into the cyano and then into the carboxyl group.—T. A. L.

3.4-*Dihydroxychromone; Synthesis of* ——. E. David an St. v. Kostanecki. Ber., 1903, **36**, [1], 125—129.

In an analogous manner to that by which Kostanecki, Pau and Tambor have synthesised 3-hydroxychromone, the authors have now obtained 3.4-dihydroxychromone. Gall acetophenonedimethyl ether is condensed with oxalic d. ethyl ester in presence of sodium to a β-diketone, 3.4-d methoxy-2-hydroxybenzoylpyruvic ethyl ester, which, o boiling with hydrochloric acid, gives 3.4-dimethoxychro mone-β-carboxylic acid crystallising from alcohol in needle melting at 272° C. This product, on distillation, lose carbon dioxide, giving 3.4-dimethoxychromone, whicl melts at 124° C., and yields, on boiling with hydriodi acid, 3.4-dihydroxychromone—



The substance crystallises from water in long shini white needles melting at 262° C. It dissolves in alkali with an orange-yellow colour, shows the pyrocatech reaction with ferric chloride, and gives some unimporta shades with Scheurer's mordants. The crystals dissolv with a slightly yellowish colour in concentrated sulphuri acid, but the solution is non-fluorescent. A diacetyl con pound can be obtained with acetic anhydride and fuse sodium acetate, crystallising from dilute alcohol in plate melting at 110° C.—T. A. L.

Indigo; Colloidal ——. R. Möhlau and M. R. Zimme mann. Zeits. f. Farben- u. Textil-Chem., 1903, **2**, [2 25—26.

Lysalbic acid and protalbic acid, products of the alkal hydrolysis of egg albumin, convert indigo into a colloid form. For this purpose, 13 grms. of a 20 per cent. indig paste are suspended in 200 c.c. of water, and mixed wi 4 grms. of caustic soda and 10 grms. of solid sodiu hydrosulphite in 100 c.c. of water. On gently warmin the contents of the flask, the indigo is reduced, an after cooling, a faintly alkaline solution of 4 grms. lysalbic acid, assuming an average yield of 25 per ce (Paal, this Journal, 1902, 996), or an equivalent amou of protalbic acid, or a mixture of the two, is run in. Th solution is then filtered in a current of coal-gas, and mix with 80 c.c. of commercial hydrogen peroxide. It forms perfectly stable solution of colloidal indigo, which can evaporated to dryness, yielding an easily soluble amorpho mass. Organic acids, such as acetic, oxalic, tartaric, citric acid, produce in the aqueous solution, either at on or after some time, a blue precipitate, which partially dissolves on making the solution alkaline. Ammonia, t fixed alkalis, and their salts give no precipitate, whi alcohol, acetone, and pyridine throw down indigo. Dialy destroys to a certain extent the stability of the soluti owing to the loss of lysalbic acid, which diffuses out. T ɔstitution of other colloidal substances, such as gum ıtrin, glue, or sugar, in place of those employed, only lds ordinary indigo. Colloidal indigo can be employed dyeing in the case of vegetable fibres, alternate passages the ordinary temperature through the solution and dilute phuric acid giving, when frequently repeated, the desired ıde. Animal fibres require mordanting with alumina or phur, and are dyed with the aid of heat. The shades tained are, as regards fastness to light and rubbing, not erior to those from an ordinary indigo vat, but they are t so fast to soap and milling. Colloidal indigo is also table for making writing ink, being somewhat faster to ht and water than the so-called aniline inks.—T. A. L.

α-Naphthol; A Reaction for ——. H. Arzberger. XXIII., page 231.

English Patents.

onoformyl-α_1-α_2-Naphthylene-diamine β_3- or β_4-Monosulphonic Acid; Preparation of ——. F. Gaess, Freiburg. Eng. Pat. 3152, Feb. 7, 1902.

heating together formic acid (20—30 per cent. solution) th 1.4.6- or 1.4.7-naphthylene diamine sulphonic acid, a mixture of these acids, one of the amino groups is mylated, and the resulting compound gives a sparingly uble yellow diazo compound, which combines with phthols, naphthylamines, and their sulphonic acids to m certain valuable azo dyestuffs.—T. A. L.

onazo Dyestuffs and of Intermediate Products for Use therein; Manufacture of Mordant-dyeing ——. C. D. Abel. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 4028, Feb. 17, 1902.

E Fr. Pat. 318,806; this Journal, 1902, 1452.—T. A. L.

lphur Colours; Manufacture of ——, and Materials for Producing the Same. R. B. Ransford. From L. Cassella and Co., Frankfort-on-Maine. Eng. Pat. 4653, Feb. 24, 1902.

IE Indophenol obtained by oxidising a mixture of *p*-inophenol and xylenol (CH_3:CH_3:OH = 1:4:5), or the rresponding *p*-hydroxyphenyl-*p*-hydroxyxylylamine or a rivative thereof, is heated with sulphur and sodium lphide at about 120° C. The product dyes unmordanted tton fast deep violet shades from a bath containing dium sulphide.—T. A. L.

lphurised Dyestuffs; Manufacture of ——. W. G Thompson and Co., Ltd., and L. E. Vlies, Manchester. Eng. Pat. 4708, Feb. 25, 1902.

YDROXYNITRODIPHENYLAMINE (from *p*-aminophenol and 2.4-chlorodinitrobenzene) is combined with diazo compounds of the benzene and naphthalene series. The sulting azo derivatives are heated with alkali sulphides, ith or without the addition of sulphur. A further series dyestuffs is obtained by adding picric acid or dinitroıenol to the melt from the above-mentioned azo comɔunds and polysulphides. The products dye unmordanted tton black.—T. A. L.

lphur Dyes; Manufacture of ——. H. H. Lake. From Chem. Fabrik vorm. Sandoz, Basle. Eng. Pat. 7849, April 3, 1902.

RONZE to dark brown sulphide cotton dyestuffs are ɔtained by heating, with sulphur and alkali sulphides, -hydroxynaphthoquinone-alphylimino and β-hydroxyıphthoquinone *m*-nitro or *m*-aminoalphylimino compounds temperatures from 240°—300° C. The products dye, om salt baths, shades which are fast to washing, alkalis, ids, and light, and are not materially altered by oxidising gents or bichromates.—T. A. L.

United States Patents.

zo Dye, Yellow; and Process of Making Same. F. Runkel, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 719,048, Jan. 27, 1903.

IAZOTISED *p*-sulphanilic acid is combined with α-methyldole. The resulting azo compound dyes wool greenish-yellow shades fast to light, acids, and alkalis. (See Fr. Pat. 321,521 below.)—T. A. L.

Yellow Azo Dye, and Process of Making Same. F. Runkel, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 719,049, Jan. 27, 1903.

DIAZOTISED *o*-toluidine is combined with the sulphonic acid of α-methylindole, giving a yellow dyestuff for wool fast to light. (See Fr. Pat. 321,521 below.)—T. A. L.

French Patents.

Anthraquinone Dyestuffs; Manufacture of New ——. Farbenfabr. vorm. F. Bayer and Co. Supplement dated May 16, 1902, to Fr. Pat. 243,315, Dec. 3, 1894.

ACCORDING to a previous supplement, purpurin sulphonic acid, when condensed with aromatic amines, yields condensation products insoluble in water, owing to the elimination of the sulphonic acid group during the reaction. The products are identical with the mono- and dialphyl derivatives of purpurin described in the chief patent. The patentees now find that by heating purpurin sulphonic acid with an aromatic amine (*e.g.*, *p*-toluidine) at a moderate temperature (90°—120° C.) in presence of a condensing agent such as boric acid, new dyestuffs are obtained, the sodium salts of which are soluble in water and give pure blue shades on unmordanted wool.—T. A. L.

Acridine Dyestuffs; Manufacture of —— Soc. Anon. des Prod. F. Bayer and Co. Fr. Pat. 321,272, May 20, 1902.

SEE U.S. Pat. 716,084; this Journal, 1903, 90.—T. A. L.

Azo Dyestuffs, and Intermediate Products for Making the Same; Manufacture of New ——. Soc. Anon. des Prod. F. Bayer and Co. Fr. Pat. 321,521, May 29, 1902.

CERTAIN indole derivatives, such as α-methylindole (Pr-2-methylindole) and B_3 Pr-2-dimethylindole, by treatment with fuming sulphuric acid (20 per cent. SO_3), are converted into sulphonic acids, which combine with diazo compounds even in a strongly acid solution. Analogous products are obtained by combining sulphonated diazo compounds with indole derivatives. The dyestuffs give yellow to yellowish-orange shades on wool from an acid bath.—T. A. L.

Sulphide Dyestuffs; Manufacture of Brown ——. Kalle and Co. Fr. Pat. 321,329, May 21, 1902.

WHEN *m*-dinitrotoluene (CH_3:NO_2:NO_2 = 1:2:4 or 1:2:6, or a mixture of the two) is fused with sodium sulphide and sulphur, different products are obtained according to the proportion of sulphur employed. With sodium sulphide and little sulphur a dyestuff is obtained which is readily soluble in water, and gives reddish-brown shades on cotton. If, however, dinitrotoluene be heated with sodium tetrasulphide and sulphur to about 230° C., a melt is obtained which requires a subsequent treatment with sodium sulphide in order to render it soluble. The product thus formed, dyes unmordanted cotton brighter and more orange shades.—T. A. L.

Azo Dyestuffs; Manufacture of Formyl Intermediate Products and —— derived therefrom. Les Fabr. de Coul. d'Aniline et d'Extraits ci-dev. J. R. Geigy. Fr. Pat. 321,351, May 22, 1902.

FORMYL-*p*-PHENYLENE diamine and alkylformyl-*p*-phenylene diamine are obtained by reducing with iron and acetic acid *p*-nitroformanilide and *p*-nitroalkylformanilide respectively. These products after diazotisation combine with phenols or amines or their derivatives, and the formyl group can be split off from the resulting compounds, which can then be rediazotised and combined with a suitable component. In cases in which the first combination is with an amine capable of subsequent diazotisation this operation may be carried out, the resulting product combined with a suitable component, the dyestuff then finally hydrolysed, and, if necessary, again diazotised and combined. The manufacture of formyl derivatives of sulphonic and carboxylic acids of aromatic amines is also claimed, as well as that of the formyl derivatives of aminonaphthol sulphonic acids. The latter combine with diazo compounds, forming azo dyestuffs, or with the intermediate compounds from diphenyl derivatives, giving mixed azo dyestuffs.—T. A. L.

Acridine Dyestuffs; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 321,39[illegible], May 21, 1902.

See U.S. Pat. 716,264; this Journal, 1903, [illegible].—T. A. L.

Polyazo Dyestuffs; Manufacture of ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 321,626, May 30, 1902.

See U.S. Pat. 717,550; this Journal, 1903, 140.—T. A. L.

Azo Dyestuffs; Manufacture of Nitroalphylacidylaminonaphthol Sulphonic, Nitroalphylaminoacidylaminonaphthol Sulphonic, Aminoalphylacidylaminonaphthol Sulphonic, or Aminoalphylaminoacidylaminonaphthol Sulphonic Acids and New —— derived from them. Soc. pour l'Ind. Chim. à Bâle. Fr. Pat. 321,640, May 31, 1902.

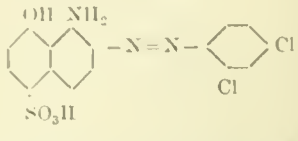
See Eng. Pat. 13,778 of 1902; this Journal, 1902, 1274. —T. A. L.

Tanning and Dye-Wood Extracts; Manufacture of ——. A. E. Peyrusson. Addition, dated May 22, 1902, to Fr. Pat. 318,523, Feb. 8, 1902. XIV., page 219.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Black Primary Disazo Dyestuffs on the Fibre; Formation of ——. W. Elbers. Zeits. f. Farb. und Text. Chem., 1903, 2, [2], 26—31.

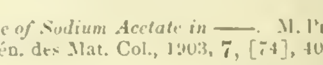
The early attempts to obtain black azo dyestuffs on the fibre by combining β-naphthol with Naphthol Black or with diazotised Azotol C gave results much inferior to those produced by logwood or ordinary Aniline Black. Better results were obtained by substituting for the β-naphthol, 1.7-aminonaphthol (B D), which gives a tolerably fast black with diazotised *p*-nitraniline. Especially valuable results are obtained by substituting for β-naphthol the monoazo dyestuffs obtained from 1.8.5- and 1.8.4-aminonaphthol sulphonic acid combined with 1 mol. of the diazo compounds of chlorinated, brominated, or nitro-aromatic bases. The combination takes place in acid solution, the azo group entering the amino side of the molecule, so that on coupling on the fibre with a second diazo compound, the latter enters the hydroxy side. It is noteworthy that these disazo dyestuffs, when formed outside the fibre, are not suitable for giving black shades on cotton. With regard to the shades obtained, bases of the benzene series and their substitution products give redder shades than those of the naphthalene series and their substitution products, whilst in the benzene series *o*-toluidine gives the reddest shades, followed by aniline and then *p*-toluidine. The introduction of chlorine has a reddening action—more so than bromine in the same position. The nitro group in the *o*- or *m*-position acts similarly, whilst it has a greening tendency in the *p*-position. Of amines of the benzene series, picramic acid stands nearest to the bases of the naphthalene series in giving green shades. 1.4-Nitronaphthylamine gives greener shades than the 1.5-derivative, approximating in this respect to α-naphthylamine, whilst β-naphthylamine usually gives the greenest shades. The brightest shades are obtained by development with diazo compounds from those dyestuffs which contain in the amino portion of the aminonaphthol sulphonic acid, *o*-nitraniline or its substitution products, chloronitraniline, $NH_2 : NO_2 : Cl = 1 : 2 : 4$, or nitraminophenol ether, $OR : NO_2 : NH_2 = 1 : 3 : 4$, followed by *p*-nitraniline. The dullest shades are produced by dinitraniline, 1.4- and 1.5-nitronaphthylamine giving on development a neutral black. The combinations of 1.8.5-aminonaphthol sulphonic acid with the same developers give greener or less red shades than the 1.8.4 acid. In many cases the entrance of these diazo compounds into th phenol side of the aminonaphthol sulphonic acid produces an opposite effect. Thus β-naphthylamine on the phenol side gives violet shades with dyestuffs of the 1.8.4-aminonaphthol sulphonic acid. On the other hand, *p*- and o-nitraniline and their substitution products produce a developers on entering the phenol side of the aminonaphthol sulphonic acid, in comparison with other developers greener shades, so that with these developers, for example all dyestuffs of the 1.8.5-aminonaphthol sulphonic aci develop to a greenish-black. Several of these example are given in Ger. Pat. 116,676, and one is more particularl described. This product is termed Nigrophor, and i obtained by combining 1.8.5-aminonaphthol sulphonic aci with *p*-dichloraniline. It is represented by the formula—



and when combined with a diazo compound, the latte enters the molecule ortho to the hydroxyl. It is especiall suitable for printing, for which purpose the Nigrophor i mixed with a suitable thickening and printed, the good being subsequently passed through a diazo bath. Wit α-naphthylamine a black is obtained faster to soap tha that with *p*-nitraniline. The black can also be develope directly by printing a mixture of Nigrophor and Nitro amine Red with a suitable thickening, and hanging th goods in a warm place or steaming them for a short tim The shades obtained are fast to acid and chlorine, and th process has the advantage over the ordinary Aniline Bla process that it does not tender the fibre.—T. A. L.

Dyeing; Use of Sodium Acetate in ——. M. Prud'homm Rev. Gén. des Mat. Col., 1903, 7, [74], 40—41.

According to v. Georgievics, a fine red shade is obtain on wool mordanted with alum and tartaric acid when dy with Alizarin in presence of sodium acetate. The dye however, is not so fast to acids as that obtained with aceta of lime. This statement is confirmed by the author, wh however, finds that if the dyeings so obtained on cott or wool be boiled in a dilute bath of calcium acetate, t shades become somewhat darker, and are then fast to acid so that the sodium has been replaced by calcium in t aluminium alizarin lake. This reaction emphasises t important part played by lime in the composition aluminium alizarin lakes fast to acids and boiling soa The analysis of an ash from cotton dyed as above, show the proportion of alumina to lime to be $2Al_2O_3$ to 3Ca Rosenstiehl finds that when dyed in presence of acetate lime, each molecular proportion of Alizarin combines wi one molecular proportion of lime, and the lake contai two molecular proportions of alumina, three of lime, a three of Alizarin, and has the constitution—



due to interaction of the hydroxyls in the molecules the aluminium hydroxide $Al(OH)_3$, calcium hydroxi $Ca(OH)_2$, and Alizarin in three successive phases.—T. A

Hydrosulphite Vat; Determination of the Value of t ——. W. Kielbasinski. XXIII., page 231.

English Patents.

Retting of Flax, Hemp, Ramie, and the like; Process a Apparatus for the Expeditious ——. A. van Steenkis Brussels. Eng. Pat. 211, Jan. 3, 1902.

Flax and similar textile fibrous materials are subjected, about an hour each time, first, to water at a temperature 100° C. for the purpose of converting one of the pectin constituents of the fibres into soluble pectic acid, a

:ondly, to water heated by steam under three atmospheres' essure, to transform the remaining pectinous matters into luble metapectic and parapectic acids. Owing to the rger proportion of pectin present in them, hemp and mie require to be treated twice in the second of these ths, to ret them completely. Before the fibrous materials e removed from the second bath, about 3 per cent. of ycerin or sodium sulphoricinate is added to it, to render e materials soft and silky, when dried, and to prepare em for the operation of scutching, and thus render necessary the process of greasing with tallow.

The apparatus employed, consists of an openwork sket, for the reception of the textile materials, on an ial shaft, which is operated intermittently in order to ect partial rotations of an openwork drum with longitunal bars or rails, which serve as supports for the basket, combination with a boiler or digester. A claim is also ade for the apparatus by means of which the intermittent rtial rotations of the drum are effected.—E. B.

nimal Fibres Intended to be Dyed ; Treating ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 4175, Feb. 18, 1902.

E Fr. Pat. 318,741 of 1902; this Journal, 1902, 1532. is stated that the affinity of animal fibres for basic dyeuffs, appears, as a rule, to be increased rather than creased by treatment in the manner described (*loc. cit.*). —E. B

yeing Apparatus. B. Siegel and G. Schütze, Poessneck, Germany. Eng. Pat. 24,631, Nov. 10, 1902.

HIS apparatus, in which the circulation of dye liquor is fected alternately in opposite directions, is characterised y the renewing dye liquor being introduced into the liquorpply pipes at points some distance away from the liquorlet orifices, to the end that the renewing liquor may come intimately mixed with the circulating liquor before is comes into contact with the textile materials which are ing dyed.—E. B.

iling and Finishing Textile Materials ; Processes for ——. R. S., J. H., and F. R. Carmichael, Paris. Eng. Pat. 5998, March 11, 1902.

HE objects of this invention are :—(1) To effect in a ngle operation the oiling, finishing (sizing), and weighting textile materials, by the use of a mixture of casein, parts ; soap, 8 parts ; sodium carbonate, 2 parts ; ineral "or like" oil, 60 parts ; water, 300 parts ; and ading substances, 200 parts. (2) To finish (size) and eight textile materials in a durable manner, *i e.*, so that ey shall be capable of undergoing the operations of eaching, mordanting, dyeing, and printing, by the use of sein as the medium for fixing the weighting materials. he use of sodium carbonate along with the casein is, it stated, not only unnecessary, but is even deleterious, if e latter substance has been suitably washed, and thus eed from acid impurities.—E. B.

hread or Fabric with Metallic or Metallically Glittering Coating, and Method of Producing Same. E. and W. Leuscher, Teutschenthal, Germany. Eng. Pat. 18,684, Aug. 25, 1902.

o make them appear like metal threads or metal fabrics, reads or fabrics "of any description" are coated with owdered dyestuffs, especially those of the azo or azoxy ries, or with metallic powders, by means of caoutchouc, gar-agar, starch, isinglass, gelatin, gutta-percha, resin, or her colloidal substances. These are applied in various ays; thus, for example, the fabrics to be coated are awn through a hot bath of agar-agar (5 per cent.) and lycerin (7·5 per cent.), to which the necessary quantity .g., 5 per cent.) of bronze powder is added ; after being ried, the fabrics are treated with formalin, and finally, ter again being dried, they are rendered glossy and supple y a passage through a solution of celluloid and castor oil acetone.—E. B.

United States Patent.

Dyeing Raw Stock ; Process of ——. W. J. McConville, Lawrence, Mass. U.S. Pat. 718,651, Jan. 20, 1903.

Textile fibrics, in an unmanufactured state, are fed in small quantities into a trough containing dye-liquor, and are then discharged along with the dye liquor into a vat, where the dyeing operation is completed, the whole process being made as continuous as possible. The liquor is returned from the vat to the trough, being admixed on its way to the latter with a certain quantity of concentrated dye-liquor.—E. B.

French Patents.

Colours of Carpets, Tapestries, &c. ; Process for Revivifying the ——. M. Losson. Fr. Pat. 321,444, May 27, 1902.

The faded carpet, &c. is impregnated with a suitable electrolyte by means of a spraying apparatus, and then electrodes connected with the poles of a source of electricity are passed over its surface, so that the electrolyte is decomposed by the passage of the current, and reacts by the products of its decomposition on the colouring matters of the material, which is afterwards dried by eliminating the liquid either by heat alone, or by a current of air also. —G. H. R.

Sizing, Hardening, and Waterproofing Paper and Similar Fibrous Materials ; Process for ——. S. Meyer. Fr. Pat. 321,264, May 20, 1902. XIX., page 226.

VII.—ACIDS, ALKALIS, AND SALTS.

Cyanogen from Coal-Gas. J. Bueb. II., page 204.

Ammonium Sulphate ; Saturator for Manufacture of ——. A. Feldmann. III., page 206.

Potassium Chlorate : Reputed Electrolytic Reduction of ——. A. Brochet. XI. A., page 215.

Copper Telluride ——. W. E. Ford. Amer. J. Science, 1903, **15**. Eng. and Mining J., 1903, **75**, [3], 113.

A new mineral, to which the name *rickardite* has been given, has been discovered at Vulcan, Col., U.S.A. It occurs in small lens-shaped masses, the vein material being chiefly pyrite, whilst native tellurium, generally intimately associated with the new mineral, is present in unusually large masses, some of which measure 3 ins. across. Other associated minerals are *petzite*, *berthierite* in embedded prisms resembling *stibnite*, a greenish-brown micaceous substance, probably *roscoelite*, and native sulphur. The mineral, after careful hand picking, was found to be free from gold, silver, lead, selenium, sulphur, arsenic, and antimony. On analysis the following results were obtained :—

——	I.	II.	Average.
Cu	40·68	40·81	40·74
Te	59·36	59·06	59·21
Total	100·04	99·87	99·95

The mineral is thus a telluride of copper, of the composition Cu_4Te_3, and probably consists of 1 mol. of cuprous telluride, Cu_2Te, and 2 mols. of cupric telluride, CuTe. *Rickardite* has a deep purple colour, which is shown by a fresh fracture, and also by the powder, even when ground very fine. Its hardness is 3·5 and its sp. gr. 7·54. It gives a pale azure-blue flame colour, tinged in the outer parts with green. When heated alone on charcoal in the blowpipe flame, or fused on charcoal with sodium carbonate and borax, it gives a deposit of tellurium dioxide and a brittle globule of copper telluride, yielding, only with considerable difficulty, a malleable bead of copper.—A. S.

English Patents.

Condensers for Nitric and other Acids. W. Bate, Hayle, Cornwall, and F. G. Orme, London. Eng. Pat. 25,790, Nov. 24, 1902.

To ensure efficient circulation of the condensing water, and to enable a defective pipe to be removed and replaced without interfering with the other pipes, &c., the vertical condensing pipes are surrounded by separate open topped water-jackets, which may be made of lead and fused to the lead covering of a portion of the frame. Each jacket has a gland and joint-ring at the bottom, and is provided with inlet, overflow, and drain pipes, having suitable cocks or valves.—R. A.

Common Salt; Manufacture of ——. Salinen-Direction Lüneburg, and O. Sachse, both of Luneburg, Germany. Eng. Pat. 1758, Jan. 22, 1902.

See Fr. Pat. 318,202, Jan. 29, 1902; this Journal, 1902, 1395.—E. S.

Metal Sulphates; Improved Process for Obtaining ——, from Mattes. O. Meurer, Cologne, Germany. Eng. Pat. 7463, March 27, 1902.

See Fr. Pat. 295,379, 1899; this Journal, 1903, 93. Compare also Eng. Pat. 23,664, 1899; this Journal, 1900, 901.—E. S.

Sulphocyanide of Calcium; Manufacture of ——. C. C. Carpenter, London. Eng. Pat. 22,710, Oct. 18, 1902.

Gases containing cyanogen compounds (such as coal-gas) are brought into contact with milk of lime mixed with flowers of sulphur; or with a moist compost of slaked lime and sulphur, whereby calcium sulphocyanide is formed. E. S.

United States Patents.

Sulphuric Anhydride; Method of Making ——. J. B. F. Herreshoff, Brooklyn, N.Y. U.S. Pat. 719,332, Jan. 27, 1903.

A mixture of sulphurous acid gas and air is heated and brought into contact "with sufficient catalytic material to effect only a partial conversion of the mixture into sulphuric anhydride"; the mixed gases are then withdrawn, cooled by heat exchange with entering gases, and, in their "original volume or amount," are returned to the contact material for completion of the transformation into sulphuric anhydride.—E. S.

Sulphuric Anhydride; Apparatus for the Manufacture of ——. J. B. F. Herreshoff, Brooklyn, N.Y. U.S. Pat. 719,333, Jan. 27, 1903.

The apparatus for carrying on the process described in the preceding abstract, comprises a number of contact chambers, interposed between which are heat-exchanging chambers, each of the latter having two separate paths or channels. A supply-pipe is connected with one path of one of these chambers, which path is also connected with the like path of the next similar apparatus. The inlet of the first contact chamber is connected with one path, and the outlet of the same with the other path of the adjacent heat-exchange chamber, this latter path being also connected with the inlet of the next contact chamber, the outlet of the latter being connected with the second path of the heat-exchange apparatus, the first-mentioned path of which is connected with the supply-pipe.—E. S.

French Patents.

Sulphuric Anhydride; Apparatus for the Manufacture of —— [by the Contact Process]. Société de la Fabrique de Produits Chimiques de Tentelewa. Fr. Pat. 321,275, May 20, 1902.

The tubes containing the contact material are disposed vertically in the lower part of a closed chamber, having a perforated plate fixed below the opening receiving the sulphur dioxide and air from a connected reheating apparatus. The tubes open at their lower ends into a collecting chamber communicating with the reheater, and also, by a valved passage, with an outlet for the gases containing the sulphuric anhydride formed, the proportions of which, returning for re-treatment or exit, are regulated in such manner as t preserve the desired temperature in the reacting vessel Various modifications are described, but in all the form of apparatus, means are provided for filtering the gaseou mixture, and connections are made to the reheater.—E. S

Sulphuric Anhydride; Application of Metals of th Tantalum Group in the Manufacture of —— [by th Contact Process.] Benhard and Loyer. Fr. Pat. 321,573 April 22, 1902.

Oxides of metals of the tantalum group are reduced in th electric furnace, or otherwise, to obtain a spongy mass o metallic appearance, applicable for use as contact materia in the production of sulphuric anhydride. It is stated tha the superficial oxidation liable to occur in using thi material as described, does not interfere with its activity a catalytic agent.—E. S.

Metals of the Alkalis; Production of the Oxides of —— The Société Badische Anilin und Soda Fabrik. Fr. Pat 321,116, May 26, 1902.

Sodium peroxide is ground with sodium, the proportion used being such as are required by the equation $Na_2O_2 +$ $2Na = 2Na_2O$. On applying a hot wire or the like to th mixture, the reaction takes place, with development of hea and fusion. The receptacle is preferably kept cool, i order to prevent the oxide attacking its surface and becoming thereby impure. Potassium oxide (K_2O) and othe corresponding alkali metal oxides, are similarly obtained —E. S.

Cyanogen and its Compounds from Gases; Recovery o ——. W. Feld. Fr. Pat. 321,225, May 17, 1902

See Eng. Pat. 26,396, 1901; this Journal, 1903, 145. —T. F. B.

Oxygen Generators; Impts. in ——. L. Kamm. Fr. Pat. 321,327, May 21, 1902.

See Eng. Pat. 7048 of 1902; this Journal, 1902, 1077. —E. S.

Nitrites; Production of ——, by Reduction of Nitrates b Means of Powdered Metals. A. Sturm. Fr. Pat. 321,49 May 21, 1902.

Sodium or potassium nitrite is obtained by mixing th nitrate with finely-divided lead, tin, or copper, and heatin the mass in a muffle furnace. The nitrite is separate from the litharge (or other oxide formed) by lixiviation. —E. S.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

Glass; Manufacture of Sheet or Plate ——. W. E. Hea Marian, Ind., U.S.A. Eng. Pat. 19,829, Sept. 10, 1902

See U.S. Pat. 710,357 of 1902; this Journal, 1902, 1330. —C. S.

Glass for Paving or for Mural and like Decorati Purposes; Painted and Burnt ——. A. Schule Strasburg. Eng. Pat. 23,968, Nov. 3, 1902.

After the colours have been fired in the glass, the bac of the latter is coated with rough particles of suitab materials (sand, stone, plaster of Paris, glass, &c.), whic are then burnt in, and readily adhere to the mediu employed for fixing the glass in position on the wa pavement, &c., to which it is afterwards applied.—C. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

English Patents.

Wood, Fireproofing and Preserving; Impts. in —— J. L. Ferrell, Philadelphia, U.S.A. Eng. Pat. 460 Feb. 24, 1902.

See Fr. Pat. 319,123 of 1902; this Journal, 1902, 1455 —J. H. C.

efractory Bricks and like Articles; Manufacture of ——. O. Imray, London. From Carborundum Co., Niagara Falls, New York, U.S.A. Eng. Pat. 19,493, Sept. 5, 1902.

ixtures of powdered amorphous carborundum and silica proper proportions are compressed (after mixing with licate of soda, glue, or other binding material when ecessary), and then subjected to the heat of the electric raace. Articles of carbide of boron may be similarly epared from a mixture of carbon and boric acid.
—J. H. C.

tone; Artificial ——. H. Birkbeck, London. From Mielck's Stone and Terra-Cotta Co., New York. Eng. Pat. 20,492, Sept. 19, 1902.

ee U.S. Pat. 711,329 of 1902; this Journal, 1902, 1397.
—C. S.

United States Patent.

Cement; Process of Making ——. H. E. Rüsager, rederiksberg, Denmark. U.S. Pat. 718,729, Jan. 20, 1903.

ee Eng. Pat. 2409 of 1901; this Journal, 1902, 118.
—R. A.

X.—METALLURGY.

Nickel Steels; Micrography of ——. L. Guillet. Comptes rend., **136**, [4], 227—229.

Three series of nickel steels, containing respectively 0·120, 0·350, and 0·850 per cent. of carbon, were examined, the nickel in the members of each series varying from 0 to 30 per cent. by steps of about 2·5 per cent. The solvent used to lay bare the structure was an alcoholic solution of picric acid. In each series, as the nickel increased, the *pearlite* crystals of ordinary steels were gradually replaced by crystals of *martensite*, and these in their turn by the polyhedra indicative of γ-iron, and the higher the carbon, the lower was the percentage of nickel needed to effect these changes. The following tabulation shows the results:—

Class.	Micrographic Character.	Steels with 0·120 C.	Steels with 0·350 C.	Steels with 0·850 C.
		Per Cent. Ni.	Per Cent. Ni.	Per Cent. Ni.
1	α-iron + pearlite...	0-10	0—7	0 5
2	α-iron + martensite	10-15	7—12	5—10
3	martensite+γ-iron.	15—27	12—25	10—15
4	γ-iron.............	Over 30	Over 25	Over 15

Mild nickel-steels containing 0—10 per cent. of nickel are similar to ordinary steels; those with 10—15 per cent. are hard steels; those with 15—21 per cent. are very hard, formed chiefly of *martensite*; those with 21—27 per cent. are less hard, as the γ-iron increases. All these have a high elastic limit; but as the proportion of nickel rises beyond 27 per cent., the elastic limit rapidly decreases. The passage from irreversible to reversible steels corresponds closely with the appearance of the polyhedra; the first steel in each series exhibiting this structure is non-magnetic at the ordinary temperature.—J. T. D.

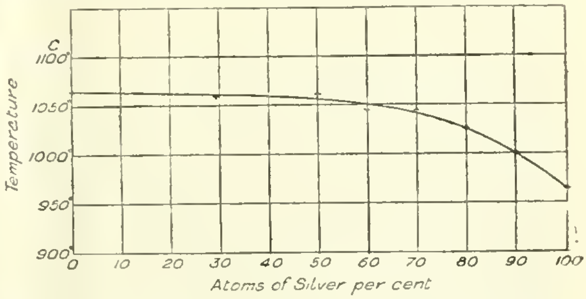
Alloys of the Gold-Silver Series; Certain Properties of the ——. Sir W. C. Roberts-Austen and T. K. Rose. Proc. Roy. Soc., 1903, **71**, [470], 161—163.

In a previous communication (this Journal, 1900, 1117) it was shown that gold-copper alloys rich in gold are not homogeneous after they have solidified, and the inference was drawn that standard gold which consists of 11 parts by weight of gold to one part by weight of copper, is unsuitable as a material for the preparation of the trial plates by which the standard of the coinage is tested. These trial plates must, according to law, contain $916\frac{2}{3}$ parts of gold and $83\frac{1}{3}$ parts of "alloy," *i.e.*, of some other metal, and the authors point out that if they are to be of uniform composition, the alloy or mixture of the two metals must solidify as a whole, a condition which can only be fulfilled by isomorphous mixtures. Gold-silver alloys form cases of isomorphism, and the authors have determined the freezing-point curve of a number of these alloys. The results obtained, together with some previously obtained by Heycock and Neville, are given in the following table, whilst the form of the curve is shown in the accompanying diagram.

Percentage of Gold present in Alloy. By Weight.	Percentage of Gold present in Alloy. In Atoms.	Freezing Point.
		° C.
100·00	100·00	1064
80·99	70·25	1061
64·60	49·97	1061
54·80	39·89	1046
43·98	30·07	1044
31·71	20·28	1028
17·23	10·23	1000
2·26	1·25	962*
0·91	0·50	961*
0·00	0·00	960*

* Observed by Heycock and Neville.

The results substantially confirm Gautier's conclusion (see this Journal, 1896, 906) that the freezing-point curve follows a straight line if the percentages by weight of the constituents be taken as abscissæ, but it was observed that the first additions of silver did not depress the freezing-point of the gold, even the alloy containing 50 atoms of gold to 50 of silver, or 64·6 per cent. by weight of gold solidifying only 3° below the freezing-point of pure gold. With further additions of silver, there is a steady acceleration in the rate of lowering of the point of solidification. The alloys all consist of large grains, but these are built up of smaller grains, the ultimate structure being exceedingly minute. An ingot of a standard gold-silver alloy, *i.e.*, one containing $91\frac{2}{3}$ per cent. of gold by weight, was heated for two months in an annealing furnace, the temperature of which was kept at about 700° C. by day, but fell to about 100 C. at night. After this treatment, the grains had increased in size and the crystals forming them had become well developed, but no true segregation could be detected. Plates prepared by rolling out ingots of this standard gold-silver alloy were also found to be uniform in composition, and, in view of the importance of obtaining homogeneous trial plates, this alloy has been used at the Royal Mint since the beginning of 1902 instead of fine gold for checks in the assay of standard bars and coins.—A. S.



Tin Sulphides; Metallurgical Treatment of Complex ——. P. J. Thibault. Trans. Australasian Inst. of Mining Eng., 1902, **8**, [2], 155—163.

At Howell, New South Wales, tin sulphide occurs "chemically alloyed" with copper, iron, and other metals, associated with galena, pyrites, mispickel, blende and silver sulphide in varying proportions, and generally in a gangue of highly-crystallised quartz. In three samples the amount of tin varied between 4·95 and 29·02 per cent.; zinc, 1·923—29·28; copper, 0·3—29·66; iron, 7·65—12·04; lead, 0·682—2·19; silver, 0·253—0·54; manganese, 1·39—9·02; bismuth, traces to 1·43; antimony, 0·396—2·18;

arsenic, 0·00—15·05; tellurium, 0·0—3·0; selenium, 0·0—15·5; and sulphur, 20·08—28·50 per cent. The crude ore is concentrated, the bulk of the lead being separated as a high-grade argentiferous lead concentrate containing small amounts of tin, copper, and other impurities. The other minerals are separated as an argentiferous tin-copper-lead concentrate containing varying percentages of these metals with iron, arsenic, sulphur, and silica.

After discussing the cause of the failure of various methods which have been suggested for the treatment of this latter product, the author states that the most advantageous process appears to be that in which the concentrate is roasted sweet, leached with sulphuric acid, and then with sodium thiosulphate solution, and the residue smelted for tin. The chief objection is the insolubility of a portion of the silver in the sulphuric acid. Chlorination would, however, probably render this insoluble silver soluble in thiosulphate solution. This method might be advantageously applied to the treatment of argentiferous copper-lead-tin matte, provided that the lead, which, if present, would seriously hinder the sweet roasting of the matte, be removed by fusion with iron. By this conversion into matte, the values are concentrated and loss by volatilisation is reduced, as the author has found that if, instead of subjecting the concentrates to a rabbling process during roasting, they are simply piled upon the furnace hearth and a reverberatory heat applied, the amount of sulphur may be reduced from 18 per cent. to 7·18 per cent., with a loss, by volatilisation, of only 0·6 per cent. of silver and 0·9 per cent. of tin, whilst the roasted material is in a suitable condition for the production of a 30 per cent. copper matte.—A. S.

Copper-Manganese-Silicon; Equilibria in the System ——; and Manganese Silicide, $MnSi_2$. P. Lebeau. Comptes rend., **136**, [4], 231—233.

Some metals (silver, tin, zinc, aluminium) when heated with copper silicide, form alloys with the copper, setting free the silicon, which can be extracted as crystallised silicon by treatment with acids. Other metals form silicides, or ternary compounds containing the metal, copper, and silicon. Copper containing a smaller proportion of silicon than corresponds to the silicide can be regarded as a solvent medium in which silicon, introduced in varying quantities, as such or as copper silicide, can be made to act on a metal. There are thus formed a series of systems in which may exist various alloys of copper with the metal, and one or more silicides of the metal. The nature of these systems can be determined by the simultaneous use of chemical, physical, and micrographic methods; but if the silicides alone are to be investigated, matters are much simplified, for most of these are insoluble in dilute nitric acid. Treating thus a series of fusions containing copper and manganese in the proportion of three to one, and various proportions of silicon (made by fusing metallic copper, manganese protosesquioxide, Mn_3O_4, potassium silicofluoride, and the requisite amount of sodium), it was found that those containing less than 10 per cent. of silicon gave residues of prismatic crystals of dimanganese silicide, $SiMn_2$, those containing 10—15 per cent., tetrahedral crystals of manganese silicide, SiMn, while as the silicon increased beyond 30 per cent., there appeared along with crystals of silicon, minute grey octohedra of manganese disilicide, Si_2Mn, sp. gr. 5·24, untouched by nitric or sulphuric acid, but dissolved by hydrofluoric acid or by concentrated solutions of caustic alkalis.—J. T. D.

English Patents.

Dephosphorisation of Metals and Metallic Mixtures. H. J. Phillips, Ebbw Vale, and L. E. Broadstone, London. Eng. Pat. 1917, Jan. 21, 1902.

The metals or mixtures, and more especially iron which contains too much phosphorus for the acid and too little for the basic Bessemer process, are treated while in the molten state with calcium carbide, to which may be added fluorspar and lime or other similar fluxes. The phosphorus passes into a slag which floats upon the surface, whence it may be easily removed.—J. H. C.

Zinc Sulphide from Zinc Ores; Process for the Production of Hydrated ——. V. Bermont, Paris. Eng. Pat. 6752, March 19, 1902.

This process relates especially to the treatment of *calamine* and *smithsonite*. The ore is crushed and treated with ammonia or a solution of an ammonium salt. The liquid is decanted off and treated with a soluble sulphide, *e.g.*, sodium sulphide, in order to precipitate metals other than zinc, a certain proportion of the zinc being precipitated at the same time. After standing for a short time the liquid is filtered. The filtrate contains zinc salts alone, which may be obtained in a pure state by evaporating off the ammonia. If ammonium carbonate be used, pure zinc carbonate is obtained. If hydrated sulphide of zinc be required, the ammoniacal solution is completely precipitated by a soluble sulphide.—(See also Fr. Pat. 315,888, 1901; this Journal, 1902, 1457.)—T. F. B.

Copper from its Ore; Process and Apparatus for Extracting ——. Von Gernet Copper, Ltd., and A. von Gernet. Eng. Pat. 24,350, Nov. 6, 1902.

The ore is roasted on a hearth connected with an inclined tube down which water is flowing. At the upper end of this tube the sulphur dioxide comes into contact with crude copper oxide (from a previous roasting) and the solution of copper sulphite formed in the presence of excess of sulphur dioxide, flows down this inclined tube into a vessel.

The resulting sulphite solution may be evaporated, to expel excess of sulphur dioxide, and precipitate copper sulphite which is roasted and reduced in the usual way; or it may be treated with excess of sulphuric acid, and subjected to electrolysis.—T. F. B.

Coal and other Substances [Ore Dust]; Binding Material for ——, and Process of Producing same. D. de Vulitch. Eng. Pat. 2307, Jan. 28, 1902. II., page 201.

Slagwool; Manufacture of ——. W. P. Ingham, Redcar. Eng. Pat. 3331, Feb. 10, 1902.

The slag is melted in a regenerative reversing furnace, which is provided with a spout and means of tilting to pour the molten slag from the spout, adjacent to which is a steam jet; the molten slag is poured from the furnace and blown direct into the wool-house, the furnace being heated during the entire process. (See also Eng. Pats. 23,670 & 25,468 of 1897; this Journal, 1898, 1052.)—T. F. B.

United States Patents.

Cast Iron; Process of Converting ——, into Steel or Malleable Iron, and the Product so obtained. J. A. Hunter, Bradford, Pa. U.S. Pat. 719,117, Jan. 27, 1903.

Cast iron is strongly heated, but not to its fusing point, and is then subjected to the action of gases evolved by heating a mixture of two parts of nitric acid with three parts of sulphuric acid, by volume; or to the action of a semi-liquid mixture of the acids with an inert substance, such as sand.—E. S.

Precious Metals; Process of Separating ——, from Matte. F. R. Carpenter, Denver, Col., Assignor to J. H. Berry, Detroit, Mich. U.S. Pat. 718,601, Jan. 20, 1903.

Iron is dissolved in the molten matte, which is then "subdivided into smooth shot-like grains" for treatment in a lead bath "maintained at a temperature insufficient to fuse matte, but sufficient to cause absorption of the precious metals from it." Compare U.S. Pats. 718,087-8-9; this Journal, 1903, 147.—E. S.

Gold-Extracting Process. T. B. Joseph, Mercur, Utah. U.S. Pat. 718,639, Jan. 20, 1903.

Gold and silver ores are subjected to the leaching action of an aqueous solution of potassium cyanide and calcium hydroxide, carbon dioxide gas being forced into the solution with compressed air, or other oxidising agent.—E. S.

nelting Furnace. F. B. Pettengill and E. Nicholson, Assignors to Oil Blast Furnace Smelting Co., Los Angeles, Cal. U.S. Pat. 718,726, Jan. 20, 1903.

HE smelting chamber is lined with spaced water tubes nnected to hollow "headers," with firebrick between the bes, in connection with a combustion chamber similarly ied.—E. S.

urnace for Treating Metals. H. D. Hibbard, Plainfield, N.J. U.S. Pat. 718,760, Jan. 20, 1903.

See Eng. Pat. 4917 of 1901; this Journal, 1902, 410. —E. S.

last Furnace. L. Bentley, Assignor to L. F. Fieser, both of Columbus, Ohio. U.S. Pat. 718,945, Jan. 20, 1903.

HE downtake has an upwardly leading portion, with ward dust-arresting projections, having inwardly inclined pper sides and horizontal lower sides. The downtake is rolonged downwards into a wider cylindrical portion contituting a dust-trap, having an explosion or "bleeder" alve beneath; and from the upper part of the cylinder, utlet flues pass upwards and then downwards into a lowying flue, which is substantially in the same horizontal lane as the inlet end of the downtake.—E. S.

Ore Concentrator. F. L. Bartlett, Denver, Col. U.S. Pat. 718,970, Jan. 27, 1903.

THE ore concentrator consists of a laterally inclined shaking able having a number of shelves arranged at descending evels. Launders are arranged for discharging the overflow from the lower edge of each shelf on to the next lower shelf, and each shelf is provided with longitudinal "riffles" gradually and slowly decreasing in height from the upper end of the table to a point near the lower end, and thence tapering abruptly to the lower end of the table.—E. S.

Ore Concentrator. C. Brown, Bishop, Cal. U.S. Pat. 719,181, Jan. 27, 1903.

A circular dish-shaped table, having a hollow shaft leading from its centre, is so supported that it may be tilted at right angles to the direction of oscillation, and means are provided for giving it a step-by-step rotation. The table has a series of radiating strips, curved continuously in one direction, and highest at their lower ends adjacent to the shaft opening, and tapering, and merging into the surface of the table at their outer ends.—E. S.

Ore Amalgamator. J. E. Sutphen, Assignor to Newton Reduction Co., both of Albany, N.Y. U.S. Pat. 719,161, Jan. 27, 1903.

The claim is for "the combination of a stationary cylinder or shell having paddles arranged to revolve therein, adapted to pass through mercury contained in the lower part of the cylinder or shell, and carry it up to various points of discharge through the material under treatment, with arms swinging loosely from a shaft through such cylinder or shell, and carrying at the upper end of such arms, a float, and at the lower end thereof a silver plate adapted to prevent violent agitation, jar and concussion of the material and the mercury, and for said silver plates to come in contact with the mercury."—E. S.

French Patents.

Steel-Castings; Process for producing ——, by a second Fusion. R. Gros. Fr. Pat. 321,600, May 14, 1902.

The steel is remelted in a cupola provided with several rows of tuyères served at a higher blast - pressure than is customary for iron cupolas.—W. G. M.

Amalgamation; Apparatus for ——. J. J. Hill. Fr. Pat. 321,258, May 20, 1902.

The pulp flows across a series of traversed semi-cylindrical pockets, in each of which is an amalgamated copper cylinder with longitudinal strips of a metal that does not amalgamate. These cylinders are mounted so that they rotate under the action of the flow of pulp, and they are so placed as to revolve eccentrically as compared with the curve of the pockets, with the result that the pulp passes through a gradually narrowing space under each cylinder until it emerges and passes to the next cylinder. At the bottom of each trough there is a layer of mercury, which can be run off at will into a channel beneath. The pulp flows out between amalgamated copper plates at the opposite end of the pan. The whole is mounted on screw-supports by which the angle of inclination of the apparatus can be altered.—W. G. M.

Mattes and Crude Metal; Process and Apparatus for the Industrial Treatment of ——. H. G. Thofehron and B. de Saint-Seine. Fr. Pat. 321,392, May 24, 1902.

Compare Eng. Pat. 10,101, May 15, 1901; this Journal, 1902, 862.—W. G. M.

Aluminium; Solder specially applicable to ——. (Mrs.) E. E. Neild and F. Campbell. Fr. Pat. 321,677, June 2, 1902.

See Eng. Pat. 4713 of 1901; this Journal, 1902, 976. —W. G. M.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Potassium Chlorate; Reduction of Reputed Electrolytic ——. A. Brochet. Comptes rend., 1903, **136**, 155—157.

Bancroft (Trans. Amer. Electrochem. Soc. **1**, 65) and Burrows (this Journal, 1903, 32) have recorded an apparent electrolytic reduction of potassium chlorate with a copper anode, with the production of a much greater quantity of potassium chloride than the equivalent of hydrogen set free at the cathode. The author confirms this fact, but regards the brown deposit also formed, not as pure cupric oxide, but as a mixture containing cupric oxide, metallic copper and a little chloride.

In the electrolysis of an alkali salt with a soluble anode, the normal series of reactions consists of the formation of a salt of the metal, the precipitation of the hydroxide from this by the action of the alkali set free at the cathode, and the reduction of the hydroxide to the metal by the hydrogen, the sum of the chemical reactions being *nil*. In the electrolysis of potassium chlorate with a copper anode, there proceeds, along with the above normal series, an abnormal series of reactions of a purely chemical nature, depending on the reduction of the chlorate by the presence of the metallic copper, as for instance: $Cu(ClO_3)_2 + 6Cu = CuCl_2 + 6CuO$. Such reactions take place readily at the temperature of the water bath without electrolysis, cuprous oxide being first formed, which reacts with the cupric chloride and chlorate to precipitate basic salts. In the electrolysis of potassium chlorate, however, the normal series takes place simultaneously, and the basic chlorides are decomposed by the alkali and partly reduced to metallic copper by the hydrogen; no true electrolytic reduction of the potassium chlorate occurs.—J. F. B.

Hydrogen Peroxide; Decomposition of ——, by Electrolytic Hydrogen and Oxygen. S. Tanatar. Ber., **36**, [1], 199—202.

Hydrogen peroxide is not directly formed by electrolysis. Its appearance during the electrolysis of sulphuric acid, carbonates and orthoborates is due to secondary reactions. On the contrary, free hydrogen peroxide is decomposed when solutions of alkalis or acids are electrolysed. By electrolysing in series, solutions of sulphuric acid alone, and of sulphuric acid mixed with hydrogen peroxide, it was found that both the hydrogen and the oxygen reacted on the peroxide, to an extent increasing with the proportion of peroxide. When this reaches 3 per cent., the action of the evolved oxygen is quantitatively complete; that of the hydrogen is so too when the solution contains 6 per cent. of peroxide. The equations are:—$H_2 + H_2O_2 = 2H_2O$; $O + H_2O_2 = H_2O + O_2$. That the action of the oxygen does not take place through the formation of ozone, when $O_3 + H_2O_2 = H_2O + 2O_2$, is shown by the fact that the volume of oxygen liberated in the peroxide voltameter is not 4/3, but double that liberated in the other voltameter. The amount of oxygen liberated from the peroxide is independent of the nature of the electrolyte (H_2SO_4, HNO_3, H_3PO_4, NaOH) with which the peroxide is mixed; so that the reaction is caused, not directly by the anion, but by the secondarily liberated oxygen. Strong sulphuric acid (2 vols. H_2SO_4 + 1⅓ to 2 vols. of the diluting liquid) appears to protect the hydrogen peroxide from these reactions, especially from oxidation; an observation in accord with that of Berthelot and Richarz. The reaction occurs more readily with larger electrode-surface and with weaker currents.—J. T. D.

Lead, Nickel, and Bismuth; Electrolytically-formed Peroxides of ——. A. Hollard. Comptes rend., **136**, [4], 229—231.

When a very concentrated solution of lead nitrate (10 grms. of lead as nitrate in 300 c.c., with 12 c.c. of nitric acid of sp. gr. 1·287, with an amount of cupric nitrate equivalent to 10 grms. of copper) is electrolysed, the deposit on the anode has very nearly the composition PbO_2, the factor necessary to convert the weight of the deposit into the weight of the lead it contains being 0·861 (against 0·866 for PbO_2). As the concentration decreases, however, the proportion of oxygen in the deposit increases (or that of lead decreases), the factor, when in the same bulk of liquid there is only 0·0106 grm. of lead instead of 10 grms., being 0·740. Whether this is due to the admixture of PbO_2, with varying proportions of a single higher oxide, or to a series of peroxides, is not yet decided.

Nickel, from an alkaline pyrophosphate solution made acid by means of chromic acid, also gives on electrolysis (0·05 grm. of nickel in 300 c.c., at 70° C.) a peroxide of formula NiO_4, stable up to 170° C.; and bismuth as sulphate (0·05 grm. of bismuth in 350 c.c., containing 20 c.c. of nitric acid of sp. gr. 1·287 and 40 grms. of crystallised copper sulphate) gives a lemon-yellow peroxide, Bi_2O_7, stable up to 180° C.—J. T. D.

Acid, Hydrocyanic; A New Electro-chemical Synthesis of ——. J. Gruszkiewicz. Zeits. f. Elektrochem., 1903, **9**, [4], 83—85.

By passing a rapid torrent of sparks from an induction coil between platinum wire terminals placed close together in a glass vessel through which a mixture of carbon monoxide, hydrogen, and nitrogen was flowing, hydrocyanic acid was formed, and could be absorbed by passing the mixed gases through potash solution. When a mixture of the composition, 33·34 CO, 50 H, and 16·66 N, is used, no HCN appears to be formed. If, however, the volume of carbon monoxide is increased at the expense of the hydrogen, so that the mixture becomes 38·44 CO, and 42·34 H, and 19·32 N, expressed in volumes per cent., the reaction is marked and increases rapidly until the percentage of carbon monoxide by volume is from 49·8 to 52·44, the ratio of CO : N being 2 : 1. The rapidity of formation is then tenfold what it is when the percentage of nitrogen is 28·4. In one experiment with 54·6 CO, 20·5 H and 24·9 N, 0·0364 grm. of potassium cyanide (= 0·0151 grm. HCN) was obtained in one hour, the quantity of mixed gases passed over the spark area being 3 litres. This is equivalent to 0·4 per cent. of hydrogen cyanide in the escaping gases. The cheapness of the constituent gases (water-gas, Dowson-gas, &c.), encourages the hope that the process may be industrially successful.—W. G. M.

Bismuth; Electrolytic Determination of ——, *and its Separation from other Metals.* A. L. Kammerer. XXIII., page 230.

English Patents.

Liquids; Electrolysis of ——. [*Liquid Conductor.*] H. H. Lake, London. From G. Rambaldini, Grosseto, Italy. Eng. Pat. 2376, Jan. 29, 1902.

Instead of employing porous partitions in the electrolysis of liquids of various natures, the latter may be maintained separated by an impenetrable partition, an upper stratum of a specifically lighter liquid being provided as conductor in direct contact with the others, and prevented from mingling with them by their different densities. The electrodes which are placed in the two lower liquids are connected above the partition, and the apparatus is so constructed that the lower liquids can flow uninterruptedly into and out of the corresponding divisions without any mingling with the upper liquid taking place.—G. H. R.

Batteries; Two-fluid Electric ——. J. W. Mackenzie, London. From La Soc. Anon. L'Eclairage Elect. sans Moteur, Brussels. Eng. Pat. 5018, Feb. 27, 1902.

An independent carbon of the same shape as the zinc electrode is placed opposite each face of the latter, so as to "equilibrate" the actions of the battery. One form of battery is described in which the zinc electrode is a plate placed between two carbon electrodes composed of thin layers of carbon arranged perpendicularly to the surface of the zinc, and whilst presenting a much larger total surface than the latter, they do not exceed its outline.—G. H. R.

Storage Batteries. [*Active Material.*] W. E. Winship, San Francisco, Cal. Eng. Pat. 12,857, June 5, 1902.

See U.S. Pat. 703,875, 1902; this Journal, 1902, 1031.
—G. H. R.

United States Patent.

Water Purifier [*Electrical*]. J. Johnson and C. Mumm. U.S. Pat. 718,935, Jan. 20, 1903. XVIII. B., page 226.

French Patents.

Electrode; Lamp-black ——. C. A. von Welsbach. Fr. Pat. 321,330, May 21, 1902.

See Eng. Pat. 19,468 of 1901; this Journal, 1902, 1282.
—G. H. R.

Chlorides; Electrolysis of Alkali ——. H. Cuénod and C. Fournier. Fr. Pat. 321,422, May 26, 1902.

To avoid the simultaneous formation of oxygenated compounds of chlorine when producing chlorine and caustic soda by electrolysis, a solution of the salt to be electrolysed is maintained in a small cell between the cathode and anode liquids, the former of which circulates through several superposed compartments, the fresh salt solution being fed in at the top, and the concentration of the soda increasing as it passes downwards, so that the differences of pressure borne by the intermediary liquid, and by the cathode liquid in the various compartments, increases at the same time as the amount of soda. The intermediary cell, into which the electrolyte is led at a sufficiently raised temperature, contains a metallic peroxide in order to prevent the formation of combinations other than those which reconstitute the electrolyte. The intermediary cell may also be formed of discs of asbestos, or similar material placed above each other and compressed. A central perforation forms the anode or cathode compartment, and a series of separate perforations constitutes the intermediary cell.—G. H. R.

Colours of Carpets, Tapestries, &c.; Process for Revivifying the ——. M. Losson. Fr. Pat. 321,444, March 27, 1902. V., page 211.

Water; Apparatus for the Purification of ——, *by Electrolysis.* J. S. Zerbe. Fr. Pat. 321,576, May 29, 1902. XVIII. B., page 226.

(*B.*)—ELECTRO-METALLURGY.

Galvanised Iron; Comparative Tests for Hot and Cold ——. [*Electric Zincing and Hot Galvanising.*] C. Richter. Electrochem. Zeits., 1902, **9**, [8], 161—164; [9], 184—186; and 1903, **9**, [10], 208—215.

Within recent years the electrolytic galvanising or zincing process has made much progress. Electrolytic plants using several hundred thousand ampères are now in operation. The author, however, dissociates himself from the view that the electrolytic or cold galvanising process will ultimately completely replace the older hot galvanising ocess. In covering iron with a thin film of zinc, it is ecessary to distinguish objects which are preferably eated by the hot process; objects which can be treated ther by the hot or by the cold process, and where consently a competition between the two is rendered possible; d, lastly, such objects as can be coated, and only coated, a rational way by the cold process.

The author considers that the electrolytic process would ake still more rapid progress if it were not impeded by e lack of proper methods for testing the products in each se.

At present the methods of testing the quality of plated oods is in a very undeveloped condition. When tests are ade at all they are usually confined to a statement that e particular material was exposed to the atmosphere of a boratory, &c. for a specified time, and did not show signs f rusting, or that it was buried in the earth or subjected to e action of certain liquids, or bent or deformed in certain ays without showing any ill effects.

To be of value at all, the tests, whatever they are, ought o be comparative. The author suggests generally that omparisons should be instituted between the following five roups of properties.

A. *Geometrical and optical properties of the metallic film*, omprising—

1. Form. 2. Colour. 3. Lustre.

B. *Mechanical properties of the film with, and without, eference to the material coated*, comprising—

4. Hardness. 5. Continuity. 6. Elasticity. 7. Tensile strength. 8. Adhesion.

C. *Chemical and Electro-chemical properties of the lating, with, and without, reference to the object plated*, including—

9. Chemical composition. 10. Power of resisting corrosion. 11. Protective power.

D. *Thermal properties*—

12. Coefficient of contraction and expansion.

E. *Change in properties of the plated material*—

13. Any alterations in the properties of the material after treatment.

Some of these properties, or changes of properties, are of more and others of less importance; all, however, are dependent on the conditions of the surface of the metal to be coated, and on its nature, as well as on the method of preparation and subsequent treatment.

The author then discusses in great detail the fundamental principles relating to each property which may be utilised as a basis for setting up a rational system of comparative tests for plated goods in general.—J. S.

English Patents.

Decarbonising Cast Iron Articles; Method of and Apparatus for ——. B. H. Thwaite, Westminster. Eng. Pat. 179, Jan. 3, 1902.

The articles to be decarbonised are heated in an electric furnace to a bright red heat, and subjected to the action of carbon dioxide at considerable pressure.—T. F. B.

Furnaces; Electric ——. P. L. T. Héroult, La Praz, France. Eng. Pat. 3912, Feb. 15, 1902.

The furnace comprises a well of refractory material in which is effected the reduction of the ore fed into it at a high temperature. There is a carbon crucible at the bottom of the furnace, and a carbon block at the top, and the current is conducted from one to the other through the coke or other fuel which fills the well below the upper block, and is constantly fed through a passage above. The ore is heated in an adjacent preparatory furnace by the hot gases produced by the reduction, and is then fed into the mass of fuel in the well of the furnace. A block of carbon at the lower end of the inclined floor of the preparatory furnace is arranged to produce a short circuit between itself and the carbon block which forms the upper side of the mouth; or the passage through which the coke is fed may open through the centre of a broad carbon plate connected to one of the conductors, and which forms the top of the well of the electric furnace, the other conductor being connected to the carbon crucible.—G. H. R.

United States Patents.

Oxides; Method of Reducing Metallic ——. E. G. Acheson, Niagara Falls, N.Y. U.S. Pat. 718,891, Jan. 20, 1903.

The mixture of carbon and the oxide to be reduced are heated in an electric furnace in which the conductor, which is composed of carbon, is protected by a coating of refractory carbide (compare following abstract).—T. F. B.

Furnace; Electric ——. E. G. Acheson, Niagara Falls, N.Y. U.S. Pat. 718,892, Jan. 20, 1903.

The carbon conductor of the furnace is provided with a protective coating of refractory carbide, the coating extending over the whole surface of the conductor which is exposed to the action of the substance to be heated.
—T. F. B.

Tin from Tin-Scrap; Recovery of ——. R. H. Gould Surbiton, Assignor to C. G. Luis, London. U.S. Pat. 718,927, Jan. 20, 1903.

Tin-scrap is used as the anode in a cell, in which the cathode is composed of some material electropositive to tin and iron (*e.g.*, carbon). Brine is used as the electrolyte, and a current is thus generated which is employed to deposit the tin from more scrap in another cell on an iron or tin cathode, brine being used as the electrolyte as before.—T. F. B.

French Patent.

Steel Wires; Process and Apparatus for the Continuous Tempering of ——, *by Means of an Electric Current.* V. E. Prétot and E. Verschave. Fr. Pat. 321,332, May 21, 1902.

The apparatus consists of a bench for the heating of the wire by its passage between two pincers connected with a source of electricity. The wire becomes red hot as it passes between them, and is carried into the tempering bath, from which it passes to another bench supplied with pincers which reheat the wire by the current passing through them. The wire may also be heated to the desired temperature by its passage through a tube borne by the pincers conducting the current, the apparatus being provided with rheostats which regulate as required the respective temperatures of the heating before and after the tempering.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Oils; Action of Dilute Mineral Acids on ——; *Sources of Error in the Benedict-Zsigmondy Method of Determining Glycerin in* ——. W. Herbig. Chem. Rev. Fett- u. Harz-Ind., 1902, **9**, [12], 275—278.

The main results of the author's investigation are embodied in the following conclusions:—(1) When a determination of the liberated glycerin is required, Turkey-red oils should be decomposed in a flask into which the reflux condenser is ground in, since substances yielding oxalic acid on oxidation with alkaline permanganate are formed by the action of the hydrochloric acid upon cork or rubber. (2) Olive oil and probably the glycerides of saturated fatty acids are relatively stable when boiled with hydrochloric acid for an hour, only about 3 per cent. of triolein being "saponified." (3) On boiling sulphonated oils with dilute mineral acids, glycerin is split off in considerable quantity, in addition to the quantitative liberation of the combined sulphuric acid. (4) The Benedict-Zsigmondy method of determining glycerin must be carried out at the ordinary temperature, since fatty acids soluble in water also yield relatively considerable quantities of oxalic acid when heated for a short time with alkaline permanganate. (5) Ether and unsaturated fatty acids in the glycerin solution also introduce errors, since they yield oxalic acid even at the ordinary temperature. (6) It is highly probable that unsaturated hydrocarbons of the series, C_nH_{2n+2}, are also attacked by alkaline permanganate at the ordinary temperature with the formation of oxalic acid.—C. A. M.

Fats; Influence of different Proteids on ——. F. Pastrovitch and F. Ulzer. Ber., 1903, **36**, [1], 209—211.

Dieterich (Chem. Rev. Fett- u. Harz-Ind., 1899, 168, 181, 201) was unable to obtain any evidence of the existence of enzymes in crude fats to account for the formation of free fatty acids.

Duclaux has asserted that in the decomposition of butter, ammonia is produced by the action of micro-organisms on the casein; but the authors' experiments have not confirmed this. In determining the influence of different proteids on fat (oleomargarine), the fat was melted at the lowest possible temperature, and stirred with a definite quantity of the proteid (with or without water), until solid. From 0·25 to 0·5 per cent. of the proteid (globulin, serum albumin, albumose, alkali albuminate, acid albumin and casein), was thus incorporated, and in some experiments 1 per cent. of water. Each experiment was carried out in duplicate, one sample being exposed to diffused daylight, and the other kept in the dark. The acid value was determined at intervals, the first determination being made after one week, and the last after 14 weeks. The results, given in tabular form, show that in the absence of moisture there was hardly any decomposition in fat containing the dry proteids. In the presence of 1 per cent. of water, the fat containing casein underwent considerable change, the acid value rising in 14 weeks from 0·88 to 3·44 when 0·25 per cent. of casein was present, and to 10·27 in the presence of 0·5 per cent.

The acid value of the fat containing 0·25 per cent. of alkali albuminate, and 1 per cent. of water under the same conditions, had only increased from 0·89 to 1·05 in the dark, and to 1·81 in daylight. Speaking generally, however, there was practically no difference between the amount of decomposition (as measured by the acid value) of the samples kept in daylight, and of those kept in the dark. On the other hand, the Reichert-Meissl values of the fats after 14 weeks were considerably higher in the case of the samples exposed to the light, *e.g.*, 0·17 as against 1·73.—C. A. M.

Cacao Butter [Commercial] ——. P. Pollatschek. XVIII. A., page 225.

United States Patent.

Fats; Process of Purifying ——. J. Klimont, Assignor to E. Khuner und Sohn, Vienna. U.S. Pat. 719,014, Jan. 27, 1903.

The fat is agitated with a concentrated solution of soda, then washed with water, and mixed with a solution of a compound of an alkaline earth metal. It is then filtered, and heated for a time to a temperature above 100° C.—M. J. S.

French Patents.

Hydrocarbons of the Homologous Series, C_nH_{2n+2}, present in Petroleum and Vaseline; Formation of Fatty Acids and Soaps from ——. G. Reese. Fr. Pat. 321,510, May 28, 1902.

The hydrocarbons are heated with cetin, spermaceti, or analogous substances in the presence of concentrated alkali solution. It is stated that the spermaceti esters are decomposed into alkali salts of their respective fatty acids, the liberated alcohols absorbing oxygen and forming the corresponding fatty acids, whilst the hydrocarbons are first transformed into alcohols and then into fatty acids, which form soaps with the alkali present.—C. A. M.

Soap [Soft]; Apparatus for Manufacture of ——. L. Marié de l'Isle and H. de Granville. Fr. Pat. 321,533, May 29, 1902.

The apparatus consists of a boiler with a double bottom heated by steam, and contains two vertical shafts, on which revolve horizontal plates, each of which has finger-like divisions inclining downwards towards the centre, to which they continually throw the soap mass. With this apparatus a yield of 360 to 365 kilos. can be obtained by using 92 kilos. of a 20° potash lye and 300 kilos. of a fat (*e.g.*, olein), the time required being 4 to 4½ hours.—C. A. M.

Soap for removing Grease from the Hands or from Greasy Objects. Soc. P. Thibaud et Cie. Fr. Pat. 321,676, June 2, 1902.

The soap consists of the following ingredients in the proportions mentioned:—Ammonium or sodium sulpho-ricinoleate (or a mixture of the two), 1,000 grms.; ox-gall, 75 grms.; glycerin, 50 grms.; essential oil of thyme, 6 grms.; and colouring matter.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

English Patent.

Zinc Sulphide from Zinc Ores; Production of Hydrated ——. V. Bermont. Eng. Pat. 6752, March 19, 1902. X., page 214.

United States Patent.

Pigment, and Process of making same. W. J. Armbruster, St. Louis, Mo., U.S.A. U.S. Pat. 719,073, Jan. 27, 1903.

A mixture of barium sulphate and carbonate and zinc hydroxide is obtained by mixing solutions of zinc sulphate, an alkali carbonate and barium hydroxide, with or without barium chloride.—M. J. S.

(B.)—RESINS, VARNISHES.

English Patent.

Composition for Cleansing Painted, Varnished, or Polished Surfaces and the like. E. T. Watkin, Upton Park, Essex and W. H. Sereeton, London. Eng. Pat. 16,518, July 25, 1902.

Lemons, or other acid fruit (2 lb.), hydrochloric acid (1 lb.), and water (4 lb.) are boiled to a thick paste and incorporated with oxalic acid (2 lb.) and black treacle (3 lb.). When cold, butyric acid (1 fld. oz.) or other grease-dissolving acid is stirred in, and the whole made up to 1 gall. with water.

The composition is applied to the surface, left for a sufficient time, and then washed off.—R. L. J.

French Patent.

Resin Varnish; Production of an Elastic ——. S. Efrem. Fr. Pat. 321,635, May 31, 1902.

A coherent elastic preparation suitable for coating corks, or for covering the hands in surgical work, is obtained by adding a suitable proportion of an alkali soap and a disinfectant (*e.g.*, formaldehyde) to a solution of a mixture of a resin and a wax. (See also Eng. Pat. 12,150 of 1902; this Journal, 1902, 1469.)—C. A. M.

(C.)—INDIA-RUBBER, &c.

India-Rubber; Sources of ——. H. Hua. Rev. des Cult., **40**, 322—328. Pharm. J., 1903, **70**, [1700], 89.

The author states that much confusion exists as to the best rubber trees of the French African Colonies. *Landolphia senegalensis* has been given as the source of a good rubber from Senegal, which should have been attributed to *L. heudelotii*, A.D.C., and also as the source of a rubber om Brazzaville, French Congo, derived from *L. humilis*, . Schum. *L. heudelotii* is known in Senegal as Toll, in the udan as Goin, and in Guinea as Fae; whilst *L. senegalensis* is known as Mudd in Senegal, and as Saba in the ench Soudan. With *L. klainii*, Pierre, a species which elds excellent rubber, there has been confused another ecies, which further south on the Guinea coast in Angola so yields good rubber. This latter species, to which the thor has given the name *L. pierrei*, Hua, has also been und in European herbaria under the name *L. ovariensis*, eauv. The four useful species of rubber-yielding plants the French African Colonies are *L. heudelotii, L. klainii*, . *pierrei*, and *L. humilis*.—A. S.

ubber; Vacuum-drying of Washed ——. C. O. Weber. Gummi-Zeit., 1903, 17, [18], 397.

ETHODS of removing moisture from wet sheets of washed ubber by gently warming them under diminished pressure ave often been tried, but they are not generally successful. s long as the surface of the sheets remains damp, e evaporation of the water prevents the material from sing in temperature above the temperature of evaporation; but immediately the surface has become dry, e water in the interior of the mass finds itself confined ithin non-porous walls, and can only evaporate as diffuses through the colloidal septum. Even if the ressure of the heating steam does not exceed 0·3 or 0·5 tmosphere, the rubber is heated so strongly that hard arieties suffer considerably, while softer kinds liquefy in laces, soiling the grids, and sometimes the oven itself. aturally, materials which are in powder or porous can be ried by warming them under diminished pressure, but uch an operation is essentially different from the desiccaion of crude caoutchouc.—F. H. L.

Pontianac [Rubber Agglutinant]. C. O. Weber. Gummi-Zeit., 1903, 17, [18]. 397.

ONTIANAC, or "dead Borneo," is supposed to be a product erived from the *Dyera costulata*; but in the United tates, where it is principally employed in caoutchouc mixtures, a considerable quantity of the material is obtained rom the "false" *Castilloa* (*C. tunu*) of Central America. t is a resin-like solid substance, which is usually met with n the form of greyish-white cakes or balls. After washing n hot water, it can be rolled into sheets; but these fall to ieces if hung up for drying. Pontianac becomes sticky ven at moderate temperatures, so that it cannot be rolled ot; but its adhesiveness renders it useful as an agglutinant hen mixed with caoutchouc and a large proportion of ineral powders. When it is to be used in this way, Pontianac is generally prepared by treating it with a little ineral oil and magnesia.

When washed, good Pontianac loses 18 or 20 per cent. f its weight, mostly moisture; and its value rises from 00—350 Mk. in the crude state to 360—420 Mk. per ton. pecial care has to be taken that the articles made from t are free not merely from the large pores which are visible o the naked eye, but also from the microscopic pores which early always occur in loaded goods, originating from the ilm of air adhering to the mineral loading agents. —F. H. L.

English Patents.

Liquid Cement for Patching Cycle and Motor Tyres, Insulating Electric Wires, &c. E. Blundell, Wem, Shropshire. Eng. Pat. 17,431, Aug. 8, 1902.

Raw gutta-percha (16 oz.), carbon bisulphide (72 oz.) and eau de Cologne ($2\frac{2}{3}$ oz.).—R. L. J.

India-Rubber Substitute. W. Prampolini, San Luis, Mexico. Eng. Pat. 20,910, Sept. 25, 1902. (Under Internat. Conv., Feb. 6, 1902.)

The gum of *Synantheraas Mexicanus* (otherwise "Yule," "Copalin," "Yerba del Negro," "Guayule," "Jiguhite," or "Hule") is vulcanised with sulphur and worked up in the same manner as real india-rubber.—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Chrome Liquors; Method for Rapidly Determining the Tanning Value of ——. E. Stiasny. XXIII., page 231.

English Patents.

Leaching and Tanning Apparatus. C. M. Walter, Cincinnati, Ohio, U.S.A Eng. Pat. 24,763, Nov. 11, 1902.

See U.S. Pat. 713,542, Nov. 11, 1902; this Journal, 1902, 1541.—R. L. J.

Glue and Gelatin from Leather and Leather Waste; Manufacture of ——. The Chemische Düngerfabrik Vogtmann und Cie. Gessel. and H. Weiss, Hilchenbach. Germany. Eng. Pat. 22,738, Oct. 18, 1902.

Chrome-leather waste is untanned by soaking in sulphuric acid (40 per cent. solution) for about 10 days, washed, and neutralised with lime, excess of lime being removed by hydrochloric acid and this neutralised by soda. The waste is then boiled for glue and gelatin. Vegetable or oil-tanned waste is soaked in alkali, neutralised, and boiled down.—R. L. J.

United States Patent.

Tanning Process. W. H. Philippi, Bürgel-Offenbach, Germany. U.S. Pat. 708,396, Sept. 2, 1902.

Hides or skins prepared as for ordinary tanning are immersed in liquors obtained by dissolving tar in turpentine oil, pine oil phenols, or similar solvents. Superfluous tar is removed by the aid of soap and warm water.—R. L. J.

French Patents.

Tanning and Dyewood Extracts; Manufacture of ——. A. E. Peyrusson. Addition, dated May 22, 1902, to Fr. Pat. 318,523, Feb. 8, 1902. (See this Journal, 1902, 1462.)

Tinfoil is added to tanning or dyewood extracts during their manufacture to precipitate dark-toned colouring matters developed during the process.—R. L. J.

Tanning Extracts; Decolorising and rendering soluble ——. La Maison commerciale Fratelli Dufour, Genoa, Italy. Fr. Pat. 321,335, May 22, 1902.

See Eng. Pat. 11,502, May 20, 1902; this Journal, 1902, 1146.—R. L. J.

Soaking and Deliming Skins; Process and Apparatus for ——. L. B. Castets. Fr. Pat. 321,331, May 21, 1902.

The skins are (*a*) placed in a drum rotating on hollow trunnions through which the "soak-liquors" may be discharged, and after drumming in water for about one hour, (*b*) the liquor is drawn off, and (*c*) the goods are rotated for about $\frac{1}{2}$ hour in the damp condition. These three processes are repeated until washing is complete, each fresh lot of water being slightly warmer than the last, whilst the density of each soak liquor is observed by hydrometers arranged on a gauge armpiece, until the density falls to about $\frac{1}{10}°$ B. when a final soaking for three hours is allowed with a bran drench if required.—R. L. J.

XV.—MANURES, Etc.

French Patent.

Raw Phosphates; Rendering Soluble the Phosphoric Acid contained in ——, *in Citric Acid.* G. Hoyermann. Fr. Pat. 321,387, May 24, 1902.

See Eng. Pat. 11,873, May 24, 1902; this Journal, 1902, 1146.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Beets; Action of Nematoids on the Yield and Composition of ——. H. Wilfarth and G. Wimmer. Zeits. Ver. deutsch. Zucker-Ind., 1903, [564], 1—11.

THE author has carried out experiments on the influence of nematoids on sugar beets grown under different conditions of manuring, the results obtained being summed up in the following conclusions:—When the beets are plentifully supplied with nutrient material, the yield of roots is diminished by nematoids, but the leaf formation remains almost unchanged, as also does the percentage of sugar in the beets. If the other foodstuffs required by the roots are supplied in sufficient quantities, but the amount of potash is diminished, the action of nematoids in decreasing the crop of beets is increased, and the sugar content is also largely diminished. The nematoids remove from beets all the important foodstuffs in very considerable, and about the same, proportions, so that it is not the potash alone, but the total manuring, which influences the yield. In the presence of only small quantities of potash, this is withdrawn from the beets by nematoids to such an extent that the roots present the appearance characteristic of an insufficient supply of potash, namely, low weight, small percentage of sugar, abundant formation of head, and yellow and brown spots on the leaves; in this case the diminished sugar content and the increase in the proportion of leaves are due solely to the insufficiency of potash. It may be possible, by a suitable excess of manure, to prevent diminution of the yield of roots by nematoids, but this would, of course, be uneconomical. If, in a field strongly infected with nematoids, a low yield and a small percentage of sugar are observed, it may almost certainly be concluded that the soil contains insufficient potash, and this may also be shown by the above-mentioned appearance of some of the heads; should these phenomena be noted early enough, a light top manuring of salts containing a high proportion of potash should be administered.—T. H. P.

Sugar; Colour Test for Traces of ——. M. Ventre-Pacha. XXIII., page 231.

ENGLISH PATENTS.

Sugar-bearing Materials; Process of Purification of——, and Cleansing Compositions therefor. C. A. Spreckels and C. A. Kern, New York. Eng. Pat. 24,569, Dec. 3, 1901.

SEE U.S. Pat. 698,150, April 22, 1902; this Journal, 1902, 715.; U.S. Pats. 699,933 and 700,099, May 13, 1902; this Journal, 1902, 784. U.S. Pat. 703,219, June 24, 1902; this Journal, 1902, 982.—T. H. P.

Centrifugal Separators [Sugar]. F. Hampl, Elbe Teinitz, Austria. Eng. Pat. 13,547, June 14, 1902.

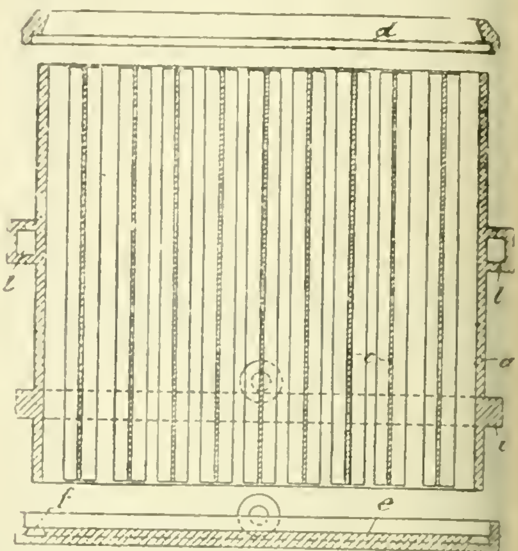
To enable the separator drum to be emptied periodically and closed again without stopping the apparatus, the drum is made of truncated conical form, and connected at the top to the driving shaft, while the bottom of the drum consists of a separate disc longitudinally movable on the said shaft. The drum is emptied automatically, with or without the aid of mechanical clearing devices, the disc being lowered by suitable means so that an annular discharge opening is provided between it and the sides of the drum. A brake mechanism, having two blocks adapted to act at diametrically opposite points, is provided to reduce the speed of the drum prior to the discharge.—R. A.

Alcohol and Yeast; Production of ——, from Beet Residues [Molasses], Beetroots, and other Amylaceous Material. J. Effront. Eng. Pat. 19,351, Sept. 3, 1902. XVII., page 223.

Sugar Moulds. H. Passburg, Moscow. Eng. Pat. 17,177, Aug. 2, 1902.

CLAIM is made for an improved sugar mould, for the production of grooved or channelled plates, which may be easily broken into lumps or cubes, characterised by indented or recessed cross-walls *c*, being inserted in a box or frame *a*, and a bottom or base plate *e*, also an interchangeable o removable cover or hopper *d*. Fig. 1 is a longitudin section through the mould, the bottom and cover of whic

FIG. 1.



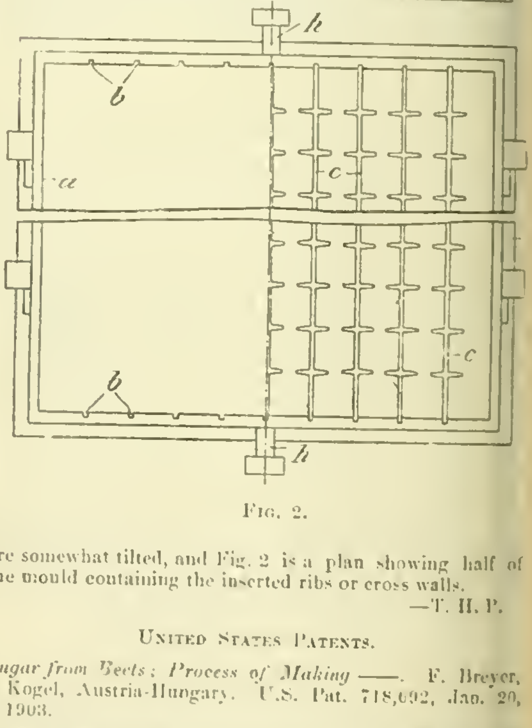


FIG. 2.

are somewhat tilted, and Fig. 2 is a plan showing half of the mould containing the inserted ribs or cross walls. —T. H. P.

UNITED STATES PATENTS.

Sugar from Beets; Process of Making ——. F. Breyer, Kogel, Austria-Hungary. U.S. Pat. 718,692, Jan. 20, 1903.

THIS process consists in treating the beet chips with lime in such proportion that the diffusion product will be slightly alkaline, subjecting the lime chips to diffusion at a temperature not above 50° C., defecating the diffusion products at the temperature at which they leave the diffuser by admixture with a pulverulent and indifferent inorganic substance and by filtration, decolorising the defecated juices by means of lime at a suitable temperature (about 100° C.) and removing the salts by boiling with char and filtering. The limed chips may be subjected to only a partial diffusion at a temperature below 50° C., the juices being then drawn off, and more lime added to the residues, which are then diffused at a higher temperature.—T. H. P.

ugar from Beets; Process of making White ——. L. Hirt, Grevenbroich, Germany. U.S. Pat. 719,113, Jan. 27, 1903.

his process, for manufacturing a single quality of white ugar, consists of the following operations: Producing a oncentrated beet-juice, enriching it with dissolved sugar om a previous "strike", and boiling it to form massecuite, art of the first molasses being in the meantime drawn into he vacuum pan; crystallising and purging the massecuite o produce white sugar, boiling part of the residual molasses nd the clairce together to give seconds massecuite, crystalsing and purging the latter to produce seconds sugar and olasses; returning the seconds sugar to the first massecuite, ansforming the molasses into trisucrate of lime, converting his into monosucrate and adding the latter to the concenated beet-juice.—T. H. P.

French Patents.

yrups and Molasses; Purification of ——. M. Kowalski and S. Kozakowski. Addition, dated May 23, 1902, to Fr. Pat. 315,737, Nov. 8, 1901. (See this Journal, 1902, 921.)

his addition consists in mixing the phenol or other ydroxy-derivative, employed in the purification, with enzine, petroleum, benzene, toluene, or other similar ydrocarbon, the purifying action being thus intensified. —T. H. P.

Sugar Juices; Defecation of ——. Lachaux. Fr. Pat. 321,353, May 22, 1902.

N this process the sugar juice or syrup is subjected to a reliminary defecation by treatment with calcined phosphate f lime, especially that known as phosphated chalk, which s employed in small pieces, and so acts as a filtering agent s well. After being used for this purpose, the material erves as a valuable manure, and may replace phosphates. —T. H. P.

Molasses: Process for Improving the Fermentability of ——. A. Collette and A. Boidin. Fr. Pat. 318,297, Feb. 1, 1902. XVII. page 224.

Polarimeters and Saccharimeters; Impts. in ——. P. Pellin. Fr. Pat. 320,503, April 19, 1902. XXIII., page 230.

XVII.—BREWING, WINES, SPIRITS, Etc.

Barleys; Malting of German and Foreign ——, and their Suitability for Brewing Purposes. K. Wiedling. Woch. f. Brau., 1903, **20**, [5], 52—54.

In 1902 the Bohemian and some Hungarian barleys attained heir full germinating power and were ready for malting in September. Most German barleys and other foreign sorts were not ready until the middle of November, whereas in 1901 they could be malted in October. One Roumanian barley only germinated to the extent of 85 per cent. even in December. The 1902 barleys on an average did not require so long a steep as the 1901 barleys. Owing to the cold wet summer of 1902, the barleys contained more moisture and had not so fine an appearance as in the previous year; the corns, however, were more floury. In buying malting barley according to the germination test, it must be borne in mind that this test does not yield reliable results with new barleys before November. The differences between the results obtained by the method of steeping with aeration and those from the ordinary steep were not so marked in 1902 as in 1901. If barley which has been steeped by the aeration process be couched thickly on the floor in the first two days, it requires quite as long a time for germination as that steeped in the old way. It is of great advantage to allow the grain to lie in the cistern for 12 hours after running off the last steep-water, as the adherent water would hinder the respiration on the floor. With a 70 hours' steep the author allows 30 hours under water and 40 hours without water.

A table is given in which the average prices and yields of extract of various German and foreign barleys are given. The prices follow the yields of extract; the fineness of the husk and the appearance are secondary matters. Most of the foreign barleys are capable of giving just as stable beer as the German. In Belgium a large quantity of raw grain is brewed, but in Holland the best beers are from pure malt. The pale top-fermentation lager beers are generally kept for four or five months throughout the summer by the retailers and are very stable. The bottom-fermentation breweries employ for their light ales only Californian and Russian barleys. With old plant the yield in practice is never more than three per cent. lower than the laboratory yield, whilst with modern plant the two are practically identical; economies are only to be made by finding cheaper raw materials.—J. F. B.

Hops, Value of, and Utilisation of ——, in Practice. Woch. f. Brau., 1902, **19**, [44], 664—665.

In a paper, delivered before the 14th Annual Convention of the U.S.A. Brewers' Union, Hantke advocates the substitution of quantitative tests in place of the rough physical examination that is generally considered sufficient for the valuation of hops. First and foremost, he considers the proportion of soft resins to be the determining factor, since on these the antiseptic and bitter properties of the hop mainly depend. Experiments are quoted to show that as an antiseptic, the soft resin ranks equal with salicylic acid. Twelve per cent. of soft resin is fixed as the minimum. For the determination of tannin no exact method is available; good hops should contain not under $2\frac{1}{2}$ per cent. As regards moisture, well dried hops should average 10 per cent. Samples containing more than 12 per cent. are likely to deteriorate quickly; whilst hops with less than 9 per cent. of water break up very easily and may be regarded as overdried, and therefore likely to have suffered loss of essential oil and harmful alteration of the resins. The relative proportions of coagulable and soluble albuminoids might be an indication of value as to the ripeness of hops. Apart from this, certain albuminous constituents of hop contribute towards the "heading" properties of beer, whilst others may be the cause of a slight "gluten" turbidity, which is particularly likely to appear if the period of boiling has been insufficient. As regards brewery practice, Hantke advises the employment of the hop tearing and sorting machine, since the lupulin, leaves, and twigs require very different periods of extraction. The seeds should be rejected altogether, since they contain an injurious alkaloidal substance, and besides impart a rancid flavour to the beer.—H. T. P.

Yeast; Influence of the Quantity Sown on the Quality of ——. M. Delbrück. Woch. f. Brau., 1903, **20**, [5], 49.

Starting from the observation that the quantity of yeast produced in a given volume of medium under similar conditions is independent of the quantity originally sown (see this Journal, 1903, 151), the author discusses the bearing of this fact upon alterations in the quality of the yeast obtained. Taking the two extreme cases and neglecting the number of cells which die; when a minimum quantity of yeast is sown, the yeast is entirely rejuvenated and the crop consists almost entirely of new, young cells. The quality of this crop will be determined by the amount of available nutrient and the conditions obtaining during propagation. On the other hand, when the quantity of seed yeast is so large that no budding can take place, the crop will consist merely of the same cells as were sown; the influence of the nutrition and conditions will be comparatively small, as the quantity of nutrient present will probably be fully sufficient to maintain the vital functions of the old cells. Between these limits lie an infinite number of stages comprising the ordinary conditions of the process of yeast propagation, and the factor of the quantity of seed yeast is of primary importance in determining the quality and state of nutrition of the stock yeast of the brewery or distillery, and through it the course of the subsequent fermentations. Attention should be directed to this point when satisfactory results are not obtained.—J. F. B.

Amylomyces Rouxii, a Fungus of Chinese Yeast: Mode of Growth and Reproduction of ——. J. Turquet. Comptes Rend., 1902, **135**, [21], 912; and Woch. f. Brau., 1903, **20**, [5], 51—52.

Calmette and subsequent observers have stated that *Amylomyces Rouxii* has only one method of reproduction, *viz.*, by the formation of endogenous spores or conidia in the longitudinal direction of the mycelial threads.

The author's investigations show, on the other hand, that this fungus may reproduce itself asexually in two ways:—

(1) By spores developed in sporangia which are carried at the ends of numerous branches radiating from the tops of stems which sprout from the mycelium; this is the normal asexual reproduction of the genus *Mucor*.

(2) By the formation of chlamydospores longitudinally in the mycelial threads; these are the endogenous spores or conidia of Calmette.

The first method of reproduction may be observed on media which favour the development of the sporulating organs of the Mucorinæ, such as carrots, boiled rice, orange juice and bouillon containing mannitol. On potato and beer wort gelatin the first method of reproduction is very rare and the second process predominates. The sporangia-bearing stems vary from 0·5 to 3 cm. in height; the sporangia have a diameter of 10—15 μ and are filled with a large number of very small spores. In saccharine liquids with plentiful access of air a thallus may be formed with branched threads which undergo a yeast-like budding. The formation of zygospores has not been observed. *Amylomyces Rouxii* belongs, therefore, to the genus *Mucor*, and should henceforth be known as *Mucor Rouxii*, its nearest relations being *M. racemosus* and *M. circinelloides*. (See also Wehmer, this Journal, 1900, 839.)—J. F. B.

Hydrolytic Enzymes; Influence of the Stereochemical Configuration of the Glucosides on the Action of ——. H. Pottevin. XXIV., page 233.

Fermentations [Beer] at Elevated Temperatures.
W. Windisch. Woch. f. Brau., 1902, **19**, [44], 664.

Although for a number of years the author has recommended the adoption of higher temperatures at pitching and in the fermentation of (bottom-fermentation) beers, it is still the rule, rather than the exception, to carry on fermentation at very low heats, pitching at 4° R., and this particularly in the case of pale (Pilsen) beers. As a necessary consequence, the yeast receives a severe check at the outset, fermentation commences late and proceeds slowly, there is greater risk of wild yeast and bacterial infection and sometimes it is difficult to attain a sufficient degree of attenuation. The yeast, too, may be and often is permanently weakened, thus necessitating frequent changes.

No adequate reasons can be adduced in support of cold fermentation. The claim, often advanced, that only by such means can proper flavour and condition be obtained, has been proved groundless by the test of practical experience. As regards condition and character, beers fermented at higher heats present no inferiority; and there are positive advantages. Fermentation starts earlier and is completed in half the time, or less, than that usually required. On this account, and because of the healthy yeast development, any infection by wild yeasts or bacteria is more thoroughly suppressed, and the beers turn out more stable.—H. T. P.

Wines; Acetaldehyde in the Ageing and Sicknesses of ——. A. Trillat. Comptes rend., 1903, **136**, [3], 171—173.

The oxidation of alcohol in presence of air takes place with the greatest facility, aided by the catalytic influence of various bodies, notably by contact with porous surfaces such as wood. During the process of ageing, the aldehyde formed is modified in absence of air in cask or bottle, condensing with the alcohol with the formation of acetals, a reaction which is considerably favoured by certain catalytic agents, such as ferric chloride or tannin. Acetic acid resulting from more advanced oxidation, likewise combines with the alcohol, yielding esters during the ageing process. The acetals contribute considerably to the bouquet of aged wines.

Modifications due to infection by disease organisms ma run parallel with the ageing process. A considerabl increase in the percentage of aldehyde has frequently bee observed under the influence of *Mycoderma vini*. In suc cases acetals are not formed, and the free aldehyde take part in different reactions. It may either combine wit and precipitate the colouring matter of the wine in the forn of a lake ("*casse*" disease), or it may be polymerised an resinified under the influence of the mineral salts of th wine, as in the case of the disease known as "bitterness," especially if the wine be deficient in alcohol and tannin.
—J. F. B.

Wines; Inversion of Sugar in Plastered ——. G. Magnanini and A. Venturi. Staz. sperim. agrar. ital., **35**, 714—726. Chem. Centr., 1903, **1**, [3], 186.

Two different views, represented by the following equations are held as to the reaction between the potassium bitartrat and the added calcium sulphate in plastered wines:—

I. $2C_4H_5O_6K + CaSO_4 = CaC_4H_4O_6 + C_4H_6O_6 + K_2SO$ (Chancel).

II. $C_4H_5O_6K + CaSO_4 = CaC_4H_4O_6 + KHSO_4$ (Bussy an Buignet).

The authors have examined the question from the stand point of physical chemistry, and show that the view o Bussy and Buignet is untenable from purely theoretica considerations. They have also directly determined th hydrogen ions in plastered wines by comparing the velocity of inversion of sugar (*a*) in plastered wines, and (*b*) i liquids of the same "titre," but the acidity of which wa due solely to free sulphuric acid. A sample of plastere wine with a dextro-rotatory power of 0·4° showed, afte the addition of 10 grms. of sugar to 100 c.c., a rotatory power of + 61·2°, and, after heating for one hour at 70° C. and cooling to 20° C., one of + 59·5°. On the other hand a solution of sugar (10 grms. in 100 c.c.) of the sam "titre" as the wine, but acidified with sulphuric acid showed at first a dextro-rotatory power of 60·5°, but afte heating for 15 minutes at 70° C., a lævo-rotatory power of 6·3°. The slow inversion of sugar in plastered wines thus shows that large quantities of acid sulphates are not formed
—A. S.

Cider and Vinegar; Effects of Fermentation on the Composition of ——. C. A. Browne, jun. J. Amer. Chem Soc., 1902, **25**, [1], 16—33.

The author's investigations consisted of a series of periodica analyses of the contents of a cask of apple juice extending over a period of more than three years from the time of pressing, and divided into stages of alcoholic fermentation, acetic fermentation, and destructive fermentation, tables and curves being given.

Alcoholic Fermentation.—In the early stages there was a rapid fall in the percentage of saccharose, whilst the glucose and fructose remained practically constant. The period of greatest chemical activity was from the fourth to the seventh week, accompanied by the greatest fall in the percentage of fructose and the greatest rise in the production of alcohol. The saccharose and glucose were completely removed during alcoholic fermentation, whilst a small amount of fructose remained unfermented; the fructose was considerably in excess of the glucose during the whole period. Fructose is the only important optically active body present in fully fermented ciders. The other chemical changes comprised a gradual increase of the acetic acid and a decrease of the fixed or malic acid; the pectin or gummy matter precipitated by alcohol also decreased. The volatile esters, as shown by the saponification value of the distillate, increased up to the point corresponding with the maximum production of alcohol, and subsequently decreased as acetification set in. The yield of alcohol from the sugar was 88 per cent. of the theoretical quantity. Loss of alcohol is attributable to evaporation and loss with the evolution of carbon dioxide on the one hand, and to incipient acetification on the other. To prevent this, cider should be racked off after primary fermentation, and the cask tightly bunged.

Acetic Fermentation.—The percentage of fixed acid continued to decrease, the decrease of fructose continued to light extent, but no further diminution took place after acetic acid reached 0·5 per cent., owing to the inhibitive ion of the acid on alcoholic fermentation. The practice of ding fresh apple juice to old vinegar stock is, therefore, ad one, and accounts for the high percentage of reducing gars often found in cider vinegar. The yield of acetic d from alcohol was 89·2 per cent. of the theoretical, and yield of acid from sugar was about 80 per cent. of the oretical. The greater part of the loss was, doubtless, e to evaporation both of alcohol and acid, the bung ing removed during acetification.

Deterioration of Vinegar [" *Over-ageing* "].—On further nding with the bung out, the vinegar gradually lost its ength. The solids and ash increased, owing to concention by evaporation, involving a loss of 30 per cent. of e liquid. The acetic acid decreased at the average rate about 0·1 per cent. per week, the main cause being the idation of the acetic acid by the acetic bacteria themselves. amination of the " mother " before and during deteriora-n showed, however, that the organisms concerned were tirely different, although belonging to the same class. acetification the " mother " consisted of *Mycoderma eti*, whereas in the deterioration the cellulose-forming etifying bacterium, *B. xylinum*, was concerned. Deterio-tion was accompanied by a considerable increase in the pric-reducing bodies and the lævo-rotation, far exceeding at due to concentration of the liquid. Two well-defined henylosazones were isolated; one, in considerable quan-ty, recrystallised from dilute alcohol, melted at 2°—143° C., and turned brown on exposure. Its comosition was that of a phenylhexosazone, and its melting oint corresponded with that of *formosazone*, derived from e products of condensation of formaldehyde; its identity not, however, established. The other osazone was btained only in small quantity; it was insoluble in lcohol, and sparingly soluble in ether; it melted at 40°—242° C., and was identified as *phenyldiacetyl osazone*, erived either from diacetyl or from dimethyl ketol, $H_3.CHOH.CO.CH_3$, the latter being a cupric-reducing ody. The fructose had entirely disappeared.

Racking off and keeping the cask tightly bunged is ecommended for preventing the deterioration of vinegar. inegar settlings were found to consist mainly of dead ells, pectin flocks, and unaltered apple starch.—J. F. B.

English Patents.

Brewing. H. A. Hobson, London. Eng. Pat. 2384, Jan. 29, 1902.

inely-ground malt is first digested with water, in which ops have been boiled, at a temperature of about 130°—40° F., one-third of the clear wort is then run off and the alt is boiled with the remainder of the wort. The mash is ooled to 150° F. and about one-half of the wort which had een drawn off is returned to it. After agitating for half-n-hour and cooling to a still lower temperature, the emainder of the wort is returned and the whole wort is ubsequently run off from the grains. The dilute sparging iquors from one brew are utilised instead of water for oiling with hops and brewing the next batch. (See also ng. Pat. 4943 of 1901; this Journal, 1902, 558.)
—J. F. B.

Beer of Top, Bottom, or Mixed Fermentation; Apparatus for Continuous Brewing of ——. G. Lefebvre, Annappes, France. Eng. Pat. 9990, April 30, 1902.

ee addition to Fr. Pat. 315,959; this Journal, 1903, 157.
—J. F. B.

Beer; Production of " Non-Deposit " ——, *and Apparatus therefor.* E. H. West, L. Chew, and F. Rogerson, London. Eng. Pat. 17,951, Aug. 15, 1902.

'Non-deposit beer" is prepared by cooling the beer as eceived from the fermenting or settling tuns in a cooling pparatus, carbonating it by agitating it with carbon dioxide while still in the cooling apparatus, allowing the treated beer to stand in the cooling apparatus, until the solid matters re partly precipitated, and then forcing the beer from the cooling apparatus by means of a " top-pressure " of sterilised ir through a filter and bottling machine.—J. F. B.

Fermenting and other Purposes; Vats or Vessels for ——. A. Weber, Fischern, Austria. Eng. Pat. 25,350, Nov. 18, 1902.

In the construction of tanks of glass plates in which wire fabric is embedded, the wire fabric is caused to project from the glass at the abutting edges of the bottom and side plates and is embedded in the cement filling between the outer wall of the vessel and the metal-carrier frame. Bolts are arranged extending through the joints between the glass plates, the inner heads of the bolts engaging over the edges of the plates and the hook-shaped outer ends over rods secured in the uprights and embedded in the cement filling. Wires may be arranged passing through the uprights and extending round the vessel and serving as cores for the cement. (See also Eng. Pat. 17,739 of 1902; this Journal, 1902, 1343.)—J. F. B.

Non-intoxicating Beverage, and Process of making same. A. J. Boult, London. From Wahl and Henius, Chicago, U.S.A. Eng. Pat. 26,583, Dec. 2, 1902.

Malt is mashed, with or without malt adjuncts, in such a manner as to produce the smallest percentage of sugar compatible with complete conversion of the starchy matters. The wort is run off from the mash, cooled, and submitted to fermentation without previously boiling it. The fermented wort is then boiled to expel the alcohol, hops are added during the boiling, and the liquor is prepared for use by charging it with carbon dioxide.—J. F. B.

Distillers' Spent Residues or Wash; Treatment of ——. C. V. Thierry, Paris. Eng. Pat. 4008, Feb. 17, 1902.

Glycerin, nitrogenous compounds and saline products are recovered from distillers' spent wash by feeding the residues continuously into a conduit or chamber, maintained under vacuum, and heated, in such a manner that the wash will travel downwards during the operation without the assistance of mechanical devices. The walls of the vessel, inclined at a sufficient angle, form the evaporating or distilling surface, and the stream of wash parts with nearly all its water and the whole of its glycerin before it reaches the bottom where it is discharged. A trap-box is provided to intercept any particles of liquid projected over with the vaporised distillate.—J. F. B.

Phlegms, Wines, Fermented Wort, and Dilute Alcoholic Liquids; Process and Apparatus for Purifying ——. E. Guillaume, Paris. Eng. Pat. 5794, March 8, 1902.

The alcoholic liquids are diluted, if necessary, so that the amyl alcohol and other " tail " products may behave in distillation as " head " products relatively to the mixture of ethyl alcohol and water. The liquids are then fractionally distilled in a continuous column of sufficient power and number of shelves to enable the products hitherto considered as " tail " to be vaporised at the same time as the " head " products, so that to the bottom of this column there only comes a pure mixture of ethyl alcohol and water. The " tail " products are concentrated in a special trunk superimposed on the distilling column by means of an artifice which consists in maintaining sufficiently low the alcoholometric degree of the liquid on all the shelves composing it by admitting at the top either wine or distillers' fermented wort, or preferably hot water or low wines. In order to obtain the head products as strong as possible in alcohol, they are finally treated in a third column, superimposed on the preceding one, from which the tail products are withdrawn at the bottom, and the head products from the refrigerator at the top, both in the maximum degree of concentration. (See also this Journal, 1902, 1343.)—J. F. B.

Alcohol and Yeast; Production of ——, *from Beet Residues [Molasses], Beetroots, and other Amylaceous Materials.* J. Effront, Brussels. Eng. Pat. 19,354, Sept. 3, 1902.

One ton of molasses is diluted with water in a vessel to a volume of 650—700 galls. A 10 per cent. solution of rosin (colophony), with 2·5 per cent. of caustic potash, is added in quantity, ranging from 1 gall. 1 pt. to 3 galls. 3 pts.; 225 galls. of the mixture are then drawn off in reserve, and the remainder is pitched with beer yeast; fermentation is started with aëration at 86 F., and when half the sugar is fermented, the reserved wort is returned to the tun. The claims specify the use of fatty acids, resin acids, fatty soaps or resins, and these bodies are said to be advantageous to the development of the yeast by changing the physical conditions and viscosity of the liquid. —J. F. B.

French Patents.

Beer; Process and Apparatus for Brewing ——. Malotaux. Fr. Pat. 318,899, Feb. 21, 1902.

The object of this invention is, by very fine grinding of the malt, to secure the maximum yield of extract. The difficulties of wort filtration are overcome by centrifugalising the whole mash after saccharification is complete. To this end the mash tun (provided with heating jacket and rake machinery) is of conical shape below and terminates in a wide pipe through which the mash is discharged into a centrifugal placed underneath. The sparging of the grains is effected by a vertical spray pipe fixed close to the wall of the drum, or by a central sprayer.—H. T. P.

Beer: Improved Raw Grain Converter for Brewing ——. The Conversion Company (Billings Machinery and Process), Ltd. Fr. Pat. 319,159, Feb. 28, 1902.

In the old form of Billing's converter, the raw grain is heated and mashed in a closed horizontal cylinder, being agitated during the process by revolving blades. In the new form—the subject of this patent—the rake machinery is entirely done away with, being replaced by air jets introduced all along the bottom of the converter. These jets communicate with a common main conveying hot or cold air under pressure.—H. T. P.

Beer: Mashing Apparatus for Brewing ——. Billet. Fr. Pat. 319,224, March 3, 1902.

The mash tun, cylindrical in form, and provided with a false bottom, is suspended over and in the wort copper, resting on the rim of the latter by means of a projecting flange, in such fashion that the mash can be raised to the mashing temperature by the steam from water (or wort) boiling in the copper below. After mashing, the wort and spargings are run into the copper and boiled with hops; and in order that the hops may be introduced, the mash tun has to be lifted clear of the copper.—H. T. P.

Molasses; Process for Improving the Fermentability of ——. A. Collette and A. Boidin. Fr. Pat. 318,297, Feb. 1, 1902.

The inventors ascribe the comparative unfermentability of molasses, not so much to its deficiency in yeast nutrients, as to the presence of heavy metals, particularly copper and iron; and their process consists in removing these metals by precipitation with phosphoric acid or other suitable reagent, followed by filtration.

Excellent fermentations are stated to be so obtained, and in addition, certain malodorous constituents of the molasses are removed during the treatment.—H. T. P.

Cider; Special Process and Yeast for the Fermentation of ——. Jacquemin and Alliot. Fr. Pat. 318,445, Feb. 5, 1902.

The apple-juice is sterilised by heat, or by addition of potassium bisulphite, and is then seeded and fermented with a pure cultivation of yeast. The yeast used was selected on account of its suitability for the particular purpose, and occurs naturally on the epidermis of the sugar-cane (Ile de la Réunion). It may readily be isolated and grown in quantity by known bacteriological methods. One of the claims relates to the manufacture of summer cider from apple-juice expressed in the autumn and preserved by the addition of potassium meta-bisulphite. (See also this Journal, 1902, 923.)—H. T. P.

Beverages [Wine, Cider ; Apparatus for continuou Carbonating Aërated ——. Driancourt. Fr. Pat. 318,5 Feb. 8, 1902.

The apparatus comprises a cylinder, divided into th compartments, each fitted with a gas injector, in which liquid is partially charged with carbon dioxide, then forc by its own pressure into:—(1) A small collecting vess (2) The saturator. The latter is a vertical cylinder which the upper portion is occupied by a series crenellated shelves, over which the liquid flows in a t layer whilst under high pressure and becomes saturat with gas. (3) A filter press. (4) A collecting vess (5) A bottling machine.—H. T. P.

Vinegar; Apparatus for making ——. Clément. Fr. Pat. 318,241, Jan. 30, 1902.

A small tub, provided with aërating holes round its circu ference about half-way up; a cover through which passe funnel tube reaching to the bottom of the vessel, and las a draw-off pipe. The apparatus is started with wa vinegar and wine, and more wine is added at interva When acetification is complete, a portion of the conte may be withdrawn at intervals, being replaced by fre wine so as to keep the vessel filled.—H. T. P.

Distillation Apparatus [Alcohol]; Improved Form of— Avenarius. Fr. Pat. 319,111, Feb. 27, 1902.

The distillation column is composed of cylindrical sectio superimposed and merely held together by overlappi rims and flanges, between which the internal shelves a jammed. Each shelf has a central rising tubulure, wi loose cover resting on projections. The down-pipe pas through an aperture in the shelf, and is divided into t portions, each flanged at one end; and one of these re upon, the other hangs from, the shelf. In order to redu the prime cost, the entire apparatus is constructed of iro all the internal parts being surfaced with a protecting la of acid-proof enamel.—H. T. P.

Alcohol; Apparatus for the Distillation of ——. Garrig Fr. Pat. 319,233, March 3, 1902.

A particular application of the principle laid do in Fr. Pat. 319,232 (see page 203). The apparatus composed of a shallow closed boiler for producing t heating vapour (alcohol). On this rests the cylindric distilling column, of which the lower portion is provid with four or more shelves and central down pipes. O each shelf is fixed a hemispherical chamber, convex si uppermost, communicating on both sides of the colum with an outside pipe leading to the boiler. The vapo from the latter passes up one of the pipes through t chambers referred to, and back through the other pip and a small cooler, to the boiler. The whole forms heating contrivance of large surface. The upper part the column is at first cylindrical, then tapers to a poi and is completely covered over by a double conical jack but separated from the column by insulating materi Below the jacket is a cooling tank, also insulated from t column. The apex of the latter communicates with condensing spiral, arranged inside the jacket space a the cooling tank already mentioned. Inside the conic top of the column is another spiral which communicat with the jacket space itself. Its lower end terminates ju above the uppermost heating sphere, over which the liqu under distillation is discharged, after having previous been warmed by passing through the jacket space and inn spiral. The distillate is condensed in the outer spir Distillation may be conducted *in vacuo*, to which end t top of the column is connected to an aspirator, and the e tube to a closed recipient.—H. T. P.

Wines and other Liquids; Cellulose Filter for ——. Prade. Fr. Pat. 319,029, Feb. 26, 1902.

A closed cylindrical vessel, inside of which are two co centric cylinders of filter-mass (cellulose), held in place perforated partitions, the whole so arranged that the liqu filters through the outer and inner cellulose layers into t annular space between them.—H. T. P.

Liquids; Filtration of ——, especially Beers, Wines, and Brandies. Filter und Brautechn. Masch. Fabr. vorm. L. A. Enzinger. Fr. Pat. 321,779, June 7, 1902.

Fossil meal is heated in an autoclave with an aqueous solution of hydrochloric and nitric acids, the material is then freed from acid and washed, being preserved in a moist state after pressing out the excess of water. This filtering medium is employed in filter presses, being distributed over the surfaces of the filter cloths by suspending it in water and admitting the liquid to the filter.—J. F. B.

Distillers' Spent Wash; Treatment of ——. C. Sudre. Fr. Pat. 321,701, June 3, 1902.

The spent wash in an acid condition is allowed to flow by ts own weight in a spiral path down a column containing a helical passage in which a vacuum is maintained and which s heated externally to a temperature of about 300° C. The water and glycerin are volatilised by this treatment and the dehydrated residue containing nitrogenous matters s collected at the bottom. The steam in its spiral passage becomes superheated and thus assists in the volatilisation of the glycerin from the concentrated matter in the lower portion of the column. The vapour is then conducted to the top of another smaller similar column, also heated, in which it is freed from projected particles of the wash, before finally being condensed in a receiver. (See also Eng. Pat. 4008 of 1902, above.)—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Cacao Butter [Commercial] ——. P. Pollatschek. Chem. Rev. Fett- u. Harz-Ind., 1903, **10**, [1], 5—6.

According to the author, alterations in the method of obtaining the cacao butter have caused the commercial product to alter in characteristics during the last few years. Formerly the beans were roasted and powdered, and the fat removed by hot expression. The first attempt to obtain a better yield was by a process (Ger. Pat. 89,251 of 1895) n which the residue from the press was more finely powdered and again expressed. The powder was also reated with alkalis or alkali carbonates before roasting, in order to emulsify and saponify fat and break up the other onstituents. Other processes in which the powder is reated with alkali are described in Ger. Pats. 10,664 and 3,394, and as most firms now use such processes, soap or lkalis are usually present in the commercial cacao butter.
—C. A. M.

Fats; Influence of Different Proteids on ——. I. Pastrovitch and F. Ulzer. XII., page 218.

English Patents.

Tea, Coffee, and like Extracts; Production of ——. C. M. Bunker, London. Eng. Pat. 5598, March 6, 1902.

Tea leaves, or coffee are extracted four or five successive imes with boiling water, each extraction lasting about 8 to 0 minutes. The extracts are separately concentrated at a low temperature (98° F.) and then mixed. The mixture may be dried, powdered, mixed with milk sugar, and ompressed into tablets.—W. P. S.

Coffee Extract; Process of Making a Substitute for ——. A. Grünfeld, Bars-Baracska, Hungary. Eng. Pat. 7066, March 22, 1902.

An extract is made of roasted horse-chestnuts.—W. P. S.

Milk and other Liquids; Separation of ——, and Apparatus therefor. C. A. Hult and O. W. Hult, both of Stockholm, Sweden. Eng. Pat. 19,183, Sept. 1, 1902.

ee U.S. Pat. 718,461 of 1903; this Journal, 1903, 136.
—R. A.

Meat-Extract; Process of Producing a Light Coloured ——. F. W. Howorth, London. From W. Liddle, Berlin. Eng. Pat. 24,619, Nov. 10, 1902.

The broth, after removal of albumin, is boiled with the addition of hydrochloric acid to destroy the hæmoglobin. After making alkaline and filtering off the precipitated phosphate of iron, the solution is again brought to its original acidity by means of hydrochloric acid. The iron may also be precipitated by adding calcium hydroxide, the excess of the latter being removed by means of a current of carbon dioxide.—W. P. S.

United States Patent.

Centrifugal Liquid - Separator [Cream]. O. Ohlsson, Södertelge, Sweden. U.S. Pat. 718,724, Jan. 20, 1903.

An inlet-tube for the milk is suspended in the upper end of the separator drum, so that it can swing radially in all directions therein. A liner, consisting of a series of spaced and superposed plates, is mounted by means of a supporting sleeve on the inlet-tube, and is moved radially by the swinging of the tube, such movement serving to maintain the centre of gravity of the liner in coincidence with the drum-axis, during the rotation of the latter. (See also U.S. Pat. 699,003 of 1902; this Journal, 1902, 761.)
—R. A.

French Patents.

Animal Albumin; Colourless, Inodorous, and Tasteless ——. A. Jolles. Fr. Pat. 321,282, May 20, 1902.

See U.S. Pat. 707,423 of 1902; this Journal, 1902, 1191.
—R. L. J.

[Vegetable] Caseïn and Lactic Acid; Preparatian of ——, from Grain and Oil Cake. J. Jean and J. Bougard. Fr. 321,374, May 24, 1902.

From the powdered grain or oil-free cake, caseïn and other soluble constituents are extracted by alkalis, the lignose or cellulose is removed by filtration, and the filtrate is treated according to Fr. Pat. 315,326 to precipitate casein, which is washed, bleached, and dried at 45° C. Lactic acid is then prepared from the liquor which still contains carbohydrates by the methods described in Fr. Pat. 315,325.
—R. L. J.

Caseïn; Fat-free ——. O. Mierisch and O. Eberhard. Fr. Pat. 321,490, May 17, 1902.

Milk is treated with sodium hydroxide (0·2—0·4 per cent.) or other alkali hydroxide in solution, warmed to 40°—45° C., and whirled in a centrifugal machine. The separated milk contains 0·005 per cent. only of fat, and the casein precipitated therefrom is practically free of fat. To remove the last traces of fat, the casein is treated with solvents (ether, benzene, &c.) or dissolved in alkali, extracted and filtered through kieselguhr.—R. L. J.

Coffee Extract; Method and Apparatus for the Manufacture of ——. F. J. Reichert and C. L. J. Heydemann. Fr. Pat. 321,554, April 28, 1902.

See Eng. Pat. 21,768 of 1901; this Journal, 1002, 1341.
—C. A. M.

(B.)—SANITATION; WATER PURIFICATION.

English Patents.

Air; Apparatus for Taking and Testing Samples of ——. A. Lovell, Bristol. Eng. Pat. 805, Jan. 11, 1902.

This apparatus consists of a hermetically closed vessel, adapted to be connected with an air extractor, and to contain the testing preparation, which may be applied to an absorbent pad removably fixed inside the vessel. In using the apparatus, the vessel is exhausted and closed, and is afterwards opened in the atmosphere to be tested, to admit the sample of air, which is then acted upon by the testing preparation.—R. A.

Water Purifier. [Softener.] E. Delmouly, Paris. Eng. Pat. 13,508, June 14, 1902.

The supply of softening solution to the water is regulated by a system of siphons, floats, and water-wheels actuated

by the inflowing hard water. The settling tank consists of a vessel containing a number of superposed cone-trunks, the narrow necks of the latter pointing downwards. The water enters at the bottom of the tank and ascends by passages at the outside edge of the cone trunks, the deposits falling into the centre of the latter. The lowest cone is provided with a closing device operated from the outside.
—W. P. S.

United States Patent.

Water-Purifier. J. Johnson, Minneapolis, Assignor to C. Mumm, Minneapolis. U.S. Pat. 718,935, Jan. 20, 1903.

A cylindrical pipe is fitted at the receiving end with branch air tubes open at the ends to the atmosphere, and arranged obliquely into the vertical main tube. Near the junction of these air tubes, an insulating covering is fitted tightly to the interior of the water-pipe; this covering is provided with curved electrodes, insulated from one another, and connected to opposite poles of a source of electricity.
—T. F. B.

French Patent.

Water; Apparatus for the Purification of ——, by Electrolysis. J. S. Zerbe. Fr. Pat. 321,516, May 22, 1902.

The apparatus consists of a series of electrode plates held between a pair of plates which form a frame, the lower one being provided with feet and a supply pipe, and the upper one with an escape pipe. The electrodes, which have each a lug at one end to maintain electrical connection, are separated by insulating grids provided with a central longitudinal bar terminating near one end of them, and with vertical bars which bind the alternate plates in the path of the current. The alternate electrodes have conduits for the passage of water on the opposite side to the central bars of the grid, and the electrodes are held in place between the plates by bolts.—G. H. R.

(*C.*)—DISINFECTANTS.

English Patent.

Sulphurous Acid Gas; Improved Apparatus for the Delivery of Hot or Cold ——, for Fumigation, Sterilisation, the Extinguishing of Fires, and the like. T. A. Clayton, London. Eng. Pat. 4892, Feb. 26, 1902.

The apparatus comprises a sulphurous acid gas generating chamber, having baffle plates, and a controllable supply of air, between which chamber and the aspirating fan, a cooler or surface condenser is interposed, whereby the maximum efficiency of the fan as regards the quantity of air admitted to support combustion is attained. In case it should be required to use the gas in a hot state, provision is made for returning it to pass through a series of heating tubes within the combustion chamber, before its exit.—E. S.

French Patent.

Encaustic; An Antiseptic ——. E. Toussaint. Fr. Pat. 321,618, May 24, 1902.

An encaustic and disinfectant consisting of a mixture of "Special Benzine," paraffin, amyl acetate, and perfume.
—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Paper; Manufacture of ——. F. Nemeck, Warsaw, Russia. Eng. Pat. 2713, Feb. 3, 1902.

To produce paper of uniform thickness and weight, the stuff is passed from the vat into a scooping chamber, where it is maintained at a uniform level by mechanical arrangements, of which details are given.—R. L. J.

Sensitised Paper [Copying Paper] for taking Press Copies of Written, Type-Written, or Printed Documents; Preparation of ——. S. W. Cuff, London. Eng. Pat. 26,148, Nov. 27, 1902.

A paper, specially adapted for copying purposes, may be prepared by impregnating the pulp—

(1) With a mixture of ferrous chloride and potassium bichromate; or

(2) With a mixture of ferric chloride and sodium bicarbonate.

Good results are obtained when the paper contains 4 or 5 per cent. of the chemicals in all, suitable proportions being—

(1) 10 parts of ferrous chloride to 1 part of potassium bichromate; or

(2) 12 parts of ferric chloride to 5 parts of sodium bicarbonate.

Paper prepared by either of these processes is said to giv darker and clearer copies than unprepared papers.
—T. F. B.

United States Patent.

Pyroxylin Compound. J. H. Stevens, Newark, Assigno to the Celluloid Company, New York. Both of Ne Jersey, U.S.A. U.S. Pat. 718,670, Jan. 20, 1903.

In order to gelatinise soluble pyroxylin, it is dissolved in menstruum obtained by the etherification of a mixture o alcohols with sulphuric acid. The claim is for forming solution of pyroxylin by the use of a liquid consisting of mixture of ethers, obtained by distilling a mixture o alcohols with sulphuric acid.—R. L. J.

French Patents.

Papers and Similar Fibrous Materials; Process fo Sizing, Hardening, and Waterproofing ——. S. Meye Fr. Pat. 321,264, May 20, 1902.

All kinds of fibrous materials are treated by adding t them, in the course of manufacture, rosin either in th powdered state or dissolved in alcohol or other suitabl solvent, the rosin being subsequently melted in the finishe product either by heating or hot pressing. If preferre the manufactured products may be saturated with a solutio of rosin, or products containing rosin may be saturated wit a solvent of this body and then dried.—J. F. B.

Casein [Paper, &c.]: Adhesive Preparations of ——. J. R. Hatmaker. Fr. Pat. 321,601, May 10, 1902.

Casein (70—80 lb.) is dissolved in a solution of bariu hydroxide (20—30 lb. in a sufficiency of water accordin to the desired consistency) or of strontium hydroxid Other substances such as talc or chalk may be incorporat
—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Sorghum; Hydrocyanic Acid in ——. H. B. Slad J. Amer. Chem. Soc., 1903, **25**, [1], 55—59.

Numerous cases have occurred of cattle dying sudden after eating green sorghum, and the author has examin samples of the poisonous cane. On maceration of the gre stalks and distilling into alkali, distinct traces of hydr cyanic acid were detected by the usual tests. The cyan is produced most abundantly in the stalks, less in the leave and not at all in the roots. The sorghum, if dried witho maceration, still retains the power of producing hydrocyan acid, showing that the enzyme and the body on which acts are enclosed in separate cells. Quantitative estimatio yielded from 0·013 to 0·014 per cent. of hydrocyan acid. The acid is evidently formed by the action of t enzyme on a glucoside, but only in certain cases. Th enzyme resists the action of a much higher proportion alcohol than does the emulsin of almonds; it is, moreove without action upon amygdalin. In every case whe hydrocyanic acid is produced, the extract gives a rose-r coloration with excess of concentrated hydrochloric sulphuric acid; this colour is discharged by alkalis, nitr acid, and zinc dust. The colouring matter is precipitat by basic lead acetate, and can be isolated from this pr cipitate; it is apparently produced from the glucosi simultaneously with hydrocyanic acid.—J. F. B.

Ether for Anæsthetic Purposes; Preparation and Preservation of ——. R. Stollé. Ber. deutsch. pharm. Ges., 1902, [7]. J. Pharm. Chim., 1903, **27**, [3], 105.

The author states that the purification of ether by means of sodium is sufficient to remove all impurities which are undesirable in an anæsthetic.

10 grms. of sodium in small pieces are added to 1 litre of ether in a flask provided with a calcium chloride tube, and allowed to remain in contact for three days, after which the mixture is filtered.

The ether thus prepared is kept over sodium, and filtered at the time of use.—T. F. B.

Phenols; Method of Preparing ——. F. Bodroux. Comptes rend., 1903, **136**, [3], 158—159.

When an organo-magnesium compound is exposed to the action of oxygen or air, free from moisture and carbon dioxide, reaction takes place according to the equation $R.MgBr + O = RO.MgBr$. The compounds so formed are decomposed by hydrochloric acid with the production of an alcohol or phenol, as $RO.MgBr + HCl = MgClBr + R.OH$.

The author has studied this reaction with various benzene derivatives brominated in the nucleus, by bubbling oxygen or air through an ethereal solution of their organomagnesium compounds. After about four hours' treatment the ethereal solution is shaken with dilute hydrochloric acid, washed with water, dried, and evaporated; the residue being extracted with alkali. Bromobenzene yielded phenol, *o*- and *p* bromotoluene, the corresponding cresols, *p*-bromanisol the methylic ester of hydroquinone (quinol), and *p*-bromophenetol the ethylic ester of quinol. Unfortunately the yields are small, only 5 to 10 per cent. of the theoretical quantities.—J. F. B.

Di-iodophenol; New ——. P. Brenans. XXIV., page 233.

Hetol-Caffeine (Caffeine-Sodium Cinnamate). G. Griggi. Boll. Chim. Farm., 1902, 109; through Pharm. Zeit., **47**, [91], 900.

0·6 grms. of caffeine and 8·5 grms. of hetol (sodium innamate), are dissolved in 40 c.c. of warm water, and the olution filtered while hot. The filtrate is evaporated to dryness, at a temperature not exceeding 60°—70° C. The product is an amorphous odourless bitter powder, with an alkaline reaction to litmus. It is soluble in 2 parts of water and 50 parts of alcohol. The following reactions distinguish it from caffeine-sodium benzoate and caffeine-odium salicylate. The aqueous 1:20 solution gives with erric chloride an orange-yellow colour, followed by a recipitate, which is soluble in alcoholic solution of hydrohloric acid; with uranium nitrate in very slight excess it ives a bright green coloration.—J. O. B.

Kinos; East African ——. E. Schaer. Ber. der Pharm. Ges.; through Pharm. Zeit., **47**, [83], 817.

Kinos from Pterocarpus bussei and Derris stuhlmannii.—hese closely resemble official kino in appearance and eneral properties, and may be employed for pharmaceutical nd technical purposes.

Kino of Berlinia eminii.—Although this kino, differing materially from the above-named species, does not appear o furnish a substitute for official kino, it may find useful echnical application.—J. O. B.

Catechin. R. Clauser. Ber., 1903, **36**, [1], 101—107.

URE catechin is best prepared by extracting cube catechin ith ether in a Soxhlet's apparatus for several hours and urifying the product by re-crystallisation in water; yield, —20 per cent. Taking the recent formula of Kostanecki d Tambor, $C_{15}H_{14}O_6$, as correct, the air-dried crystals of techin contain 4 mols. of water of crystallisation, and elt at 96° C. In the desiccator at ordinary temperatures, mols. of water are removed and the product melts at 6° C. The last mol. of water is driven off at 100° C., d anhydrous catechin melts at 210° C. The product of e acetylation of catechin yielded results corresponding with the pentacetyl derivative and confirming the formula for catechin as above. When catechin was boiled for several hours with 10 per cent. caustic potash in an atmosphere of hydrogen, the solution, when acidified and extracted with ether, yielded crystals melting at 210°—215 C., consisting of phloroglucinol. Catechin when dissolved in concentrated ammonia and dried *in vacuo* over sulphuric acid, yielded a small quantity of crystals which were very readily oxidisable, and which were hydrolysed by acids and alkalis into catechin and ammonia. In this body, one OH group is probably replaced by an amino group. In aqueous solution in presence of traces of hydrochloric acid, catechin readily condenses quantitatively with formaldehyde, less easily with acetaldehyde, and not at all with other aldehydes. This reaction should form a basis for a method for the estimation of catechin or formaldehyde. The product is a white amorphous precipitate, readily soluble in alcohol and acetone; it is also completely soluble in alkalis, and the solution does not oxidise in the air so readily as that of catechin. All these reactions bring out the close analogy between catechin and phloroglucinol.
—J. F. B.

Propolis. M. Greshoff and J. Sach. Pharm. Weekblad, **47**, 933. Pharm. J., 1903, **70**, [1700], 90.

The authors find that propolis or bee-resin consists of a mixture of 84 per cent. of resin and 12 per cent. of wax, with 4 per cent. of an impurity insoluble in alcohol but soluble in ether. The resin has the composition $C_{26}H_{26}O_8$, m. pt., 60° C.; sp. gr., 1·186; acid value, 140. It is soluble in ether, chloroform, and boiling alcohol, very soluble in acetone, and slightly soluble in carbon bisulphide.

The wax melts at 66° C., and is soluble in boiling 95 per cent. alcohol, from which it crystallises on cooling. Its chief constituent is cerotinic acid, partly in combination with melissyl alcohol.—A. S.

Tropidine; New Synthesis of ——. R. Willstätter. Annalen, 1903, **326**, [1 and 2], 1—22.

This synthesis, in the investigation of which several new monocyclic alkamines of the tropine series were obtained, is carried out as follows:—The previously described *des*-methyltropine (1-dimethylamino-Δ^1-cycloheptenol-3) is converted, by the action of a chloroform solution of bromine on its hydrobromic acid solution, into 2-bromotropinemethylammonium bromide. On reducing the latter with zinc dust and concentrated hydriodic acid, it yields tropidine methiodide, which can then be converted into the corresponding tropidine methylchloride, dry distillation of which, under reduced pressure, gives tropidine.—T. H. P.

Tropine; Synthesis of ——. R. Willstätter. Annalen, 1903, **326**, [1 and 2], 23—42. (See preceding abstract.)

The conversion of tropidine into tropine is carried out as follows:—When tropidine is heated with hydrogen bromide in glacial acetic acid solution, it yields, as is well known, α- and β-bromotropane hydrobromides. The former of these compounds is converted, by the action of alkalis, into 3-bromotropane, and this gives ψ-tropine when heated under pressure with water, aqueous salt solutions or dilute acids, the best yield being obtained when sulphuric acid is employed. Since ψ-tropine, on oxidation, yields tropinone, which is transformed by zinc dust and hydriodic acid into tropine (see Willstätter and Iglauer, this Journal, 1900, 686), the synthesis of the latter is complete.—T. H. P.

r-Cocaine; Synthesis of ——. R. Willstätter and A. Bode, Annalen, 1903, **326**, [1 and 2], 42—75.

The action of carbon dioxide on the sodium derivative of tropinone, suspended in ether, gives rise to a mixture of the sodium salts of two tropinonecarboxylic acids, which, on reduction with sodium amalgam in a faintly acid solution, yield a mixture of r-ecgonine (ψ-tropine-C-carboxylic acid), ψ-tropine-O-carboxylic acid and ψ-tropine. The methyl ester of this synthetic r-ecgonine is readily benzoylated, either by heating with benzoyl chloride or by the action of benzoic anhydride in benzene solution, the product in either case being one and the same racemic cocaine. Attempts to decompose this racemic compound into optically active antipodes by means of active acids have been unsuccessful.

In a table appended to this paper, a *résumé* of the properties of the isomeric ecgonines and their most important derivatives is given.—T. H. P.

Yohimbine; Hydrolysis of ——, by Alkali. L. Spiegel. Ber., 1903, **36**, [1], 169—171.

When yohimbine is hydrolysed by boiling it for two hours with alcoholic potash, a methyl group is split off and the potassium salt of an acid remains in solution. The free acid crystallises well from water in glassy prisms, which soften at 230° C., and melt with decomposition at 257—260 C. The author has given to this body the name of *noryohimbine*; it forms salts both with bases and acids, and is apparently a true carboxylic acid and not a phenol. Analysis gave numbers corresponding with the formula $C_{20}H_{26}N_2O_4$. On drying by heat a constant weight cannot be obtained owing to decomposition, the carbon percentage increasing at the same time.—J. F. B.

Isopyrum; Alkaloids of ——, and Isopyroine. G. B. Frankforter. J. Amer. Chem Soc., 1903, **25**, [1], 99—102.

The American species of *Isopyrum*, *I. biternatum*, is widely distributed; samples of the roots collected in early spring contain little alkaloid, but at midsummer larger quantities are found, and the tubers are larger and more numerous.

The dried and powdered roots were extracted first with dilute aqueous hydrochloric acid (1 in 250) and subsequently with alcohol in presence of hydrochloric acid. The extracts were made alkaline with ammonia, and the filtrates from the precipitates so produced were extracted with chloroform. To the chloroform solution hydrochloric acid was added, and the hydrochloride of the base was obtained in the form of long, fine, prismatic needles. The hydrochloride is soluble in water and alcohol, but almost insoluble in ether; it melts at 255—257 C. A well defined platinochloride is obtained insoluble in water and melting at 238° C.

Isopyroine the free alkaloid, is obtained by the action of alkalis on the hydrochloride in the form of a crystalline substance; it melts at 160° C., and the crystals lose their structure and become grey when dried at 100° C. Analysis indicated the formula $C_{28}H_{46}NO_9$. Isopyroine differs widely from the alkaloids isopyrine and pseudo-isopyrine obtained by Harsten from *I. thalictroides*.

When boiled with methyl iodide for two hours, *isopyroine methyl iodide* is produced; it is a yellow substance, soluble in alcohol, but practically insoluble in water, ether, and chloroform.—J. F. B.

Essence of Rue, and Reactions of the Ketones which it contains. C. Mannich. Ber. deutsch. pharm. Ges., 1902, [7], 267. J. Pharm. Chim., 1903, **27**, [3], 112.

European essence of rue contains about 90 per cent. of methylnonyl ketone, and 1—5 per cent. of normal methylheptyl ketone, the latter being the chief constituent of Algerian essence of rue.

Reduction of methylnonyl ketone with sodium and alcohol gave methylnonyl carbinol, boiling at 120° C., under 14 mm. pressure. The acetyl, benzoyl, and oxalic acid derivatives of the carbinol were also prepared.

Methylheptyl carbinol has a boiling point of 87·5 C. under 10 mm. pressure.

An ether, $C_{22}H_{46}O$, was prepared by heating methylnonyl ketone with 60 per cent sulphuric acid. The corresponding hydrocarbon of the ethylene series was also prepared, and may be converted, by means of potassium permanganate, into carbon dioxide and caproic acid.

The ketones condense under the influence of hydrochloric acid, with loss of a molecule of water, to form other ketones of the type $C_nH_{2n-2}O$.—T. F. B.

Dammar Resin; Essential Oil of ——. H. Haensel. Haensel's Report; through Pharm. Post, **35**, [49], 715.

Dammar resin gives, on steam distillation, 1·06 per cent. of volatile oil of a golden-yellow colour, with a very bitter taste. It is freely soluble in ether, benzene, chloroform, carbon bisulphide, acetic ether, and absolute alcohol, and soluble in 89 parts of 90 per cent. alcohol. Its sp. gr. is 0·9352 at 21° C.; it is optically inactive. It begins to distil at 205° C.; 60 per cent. distils below 240° C., and has the sp. gr. 0·9157; 30 per cent. distils at 240°—265° C. The residue resinifies.—J. O. B.

Genista tinctoria; Essential Oil of ——. H. Haensel. Haensel's Report; through Pharm. Post, **35**, [49], 715.

The dried flowering herb, *Genista tinctoria*, yields to steam distillation 0·0237 per cent. of a dark brown aromatic oil: readily soluble in ether, chloroform, benzene, carbon bisulphide, and amyl alcohol. It is partially soluble in the cold in acetic ether, and in absolute and 90 per cent. alcohol, completely so on warming. Its sp. gr. is 0·8980. It melts at 36° C., and re-solidifies at 31° C. It begins to distil at 80 C.; at 100° C. about 5 per cent. of a dark yellow fluid body is obtained. Another 10 per cent. distils between 100 and 210 C.; the bulk, however, distils above 228° C., leaving a trace of resinoid residue.—J. O. B.

Birch Buds; Essential Oil of ——. H. Haensel. Haensel's Report, 1902; through Pharm. Post, **35**, [49], 715.

Birch buds yield, by steam distillation, 6·25 per cent. of a greenish, turbid, pleasant smelling, volatile oil, having the sp. gr. 0·9592 at 20° C., and the opt. rot. 6° 52′ at the same temperature At 17 C. the oil deposits small crystalline spangles; at 14° C. it becomes quite thick; and at −15° C the oil is barely fluid, and almost wholly crystalline. It is soluble in ethyl and amyl alcohols, in acetic ether, and in chloroform. With light petroleum spirit it gives a turbid solution. It is insoluble in glacial acetic acid, in carbon bisulphide and in potassium hydroxide solution.—J. O. B.

Menthol; Conversion of ——, into Menthene by Organ Acids. J. Zelikow. J. russ. phys.-chem. Ges., **34** 721—729. Chem. Centr., 1903, **1**, [3], 162.

It is known that oxalic acid has the property of splitting off water from hydroxy compounds, with formation of the corresponding hydrocarbons. It is now found that succinic citric, phthalic, terephthalic, and camphoric acids also possess this property. The authors have studied the course of the reaction in the case of oxalic acid and menthol, mixture of the two substances being heated in a small retor in the air-bath at 110—115 C. They succeeded in isolating two intermediate products, the neutral oxalic ester c menthol melting at 68° C., and the acid ester, the latter i the form of a syrup, which is easily decomposed into th neutral ester and oxalic acid. Only in presence of excess o free oxalic acid is the acid ester quantitatively converte into menthene; the neutral ester under the same conditions gives a smaller yield of hydrocarbon. Acid menthyl ester of the other acids named were also isolated.—A. S.

Nerol. A New Aliphatic Terpene Alcohol in Essenti Oils; Occurrence of ——. H. von Soden an O. Zeitschel. Ber., 1903, **36**, [1], 265—267.

Hesse and Zeitschel (see this Journal, 1903, 162) recorde the presence of a new terpene alcohol in French oil c orange flowers, isomeric with and very similar in a its properties to geraniol, to which they gave the nam of *nerol*. The present authors find that oil of "petit grain" forms a cheaper raw material for the preparation c nerol. South American "petit-grain" oil was saponifie and carefully fractionated *in vacuo*. The fractions c higher boiling point contained the nerol associated wit geraniol and terpineol. The terpineol was eliminated b converting the geraniol and nerol into their acid phthal esters in the usual manner. These were purified an saponified, and the separation of the geraniol from th nerol was effected by treating the mixture with powder anhydrous calcium chloride, which gives a solid compoun with geraniol, and subsequently washing out the ner with light petroleum; the yield from "petit-grain" o was about 2 per cent.

Nerol has a sp. gr. of 0·880 at 15 C., it is opticall inactive, and boils at 225—227 C. In chlorofor solution it readily takes up 4 atoms of bromine. Th substance, as hitherto prepared, probably contains 10—1 per cent. of geraniol.

Neryl acetate is easily prepared by boiling the alcohol with acetic anhydride and sodium acetate; it boils at 134° C. under a pressure of 25 mm., and has a sp. gr. at 15° C. of 0·917.

Neryl formate is produced by allowing a mixture of nerol and concentrated formic acid to stand at the ordinary temperature for 24 hours; it boils at 119°—121° C. under 25 mm. pressure, and has a sp. gr. of 0·928.

The very close resemblance of nerol and its esters to geraniol and its esters accounts for the fact that it has hitherto been overlooked. There is little doubt that this alcohol will also be found in other essential oils of which geraniol is a constituent.—J. F. B.

Cerium; Volumetric Determination of ——. A. Waegner and A. Muller. XXIII., page 231.

Cacodylic Acid and Cacodylates; A Reaction of ——. J. Bougalt. XXIII., page 231.

Essences and Medicinal Preparations; Determination of Ethyl Alcohol in ——. T. E. Thorpe and J. Holmes. XXIII., page 232.

French Patents.

Alcohol; Apparatus for the Distillation of ——. Garrigou. Fr. Pat. 319,233, March 3, 1902. XVII., page 224.

Lactic Acid and Casein; Preparation of ——, *from Grain and Oil-cake.* J. Jean and J. Bougard. Fr. Pat. 321,374, May 24, 1902. XVIII. A., page 225.

Camphene free from Halogens; Process for obtaining ——. Soc. Chem. Fabr. auf Actien (vorm. E. Schering). Fr. Pat. 321,746, June 4, 1902.

This process for the preparation of camphene (under which name are included all hydrocarbons which are obtained by dehydration of borneol or isoborneol) consists in heating bornyl halides with fatty bases, especially secondary bases or cyclic imides. For instance, 100 parts of bornyl chloride are heated with 107 parts of a 33 per cent. aqueous solution of methylamine and 400 parts of absolute alcohol for eight hours at 210° C. The mixture is now acidified with sulphuric acid, the alcohol distilled off and the camphene distilled over with steam.—T. F. B.

Guaiacol, Tannin, and Cinnamic Acid; Compound of ——. A. Nissel. Fr. Pat. 321,767, June 6, 1902.

See Eng. Pat. 10,234 of 1902; this Journal, 1902, 1096. —T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Silver Iodide; A Double Salt of ——. D. Strömholm. Ber., **36**, [1], 142.

When a solution of silver nitrate is added to a solution of tetraethylammonium iodide, a yellow precipitate is formed, which quickly changes to a pure white. The same result is observed when a solution of tetraethylammonium iodide is allowed to act on silver iodide.

The substance thus obtained is quite stable to light, showing that no uncombined silver iodide is present, and does not react when shaken with silver chloride (like the product obtained by the action of ammonium iodide on aromatic radicles, or of methyl iodide on ethylene ethylidenedisulphide).

The substance melts with slight decomposition at 225°—230° C., forming a light yellow liquid, and on analysis is found to correspond to the formula $(C_2H_5)_4NI + 2AgI$. —T. F. B.

English Patent.

Sensitised Paper for taking Press Copies, &c.: Preparation of ——. S. W. Cuff. Eng. Pat. 26,148, 1902. XIX., page 226.

French Patent.

Photographs in Natural Colours; Production of ——. J. Szczepanik, Vienna. Fr. Pat. 321,380, May 24, 1902.

See Eng. Pat. 10,813 of 1902; this Journal, 1902, 1097. —T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Explosives: A Recording Pressure Gauge for ——. J. E. Petavel, Manchester, and J. Bruce-Kingsmill, Woolwich. Eng. Pat. 984, Jan. 14, 1902.

A tube of resilient metal is mounted in a hollow plug which is screwed into the wall of the explosion chamber. The plug is closed by a piston which is in contact with the resilient metal and carries a rod, extending beyond the free end of the plug, and provided with a knife-edged stirrup in contact with a knife-edged lever, held in position by a wire under tension. To the lever is attached a small mirror on which light is thrown to produce a "spot" in the usual manner. On pressure being created within the explosion chamber, the resilient tube is compressed, and imparts a rocking motion to the lever and mirror, since the whole system is in tension.—G. W. McD.

Safety Explosives or Blasting Compositions. J. Wetter. From the Westfälisch-Anhaltische Sprengstoff-Aktienges., Berlin. Eng. Pat. 3334, Feb. 10, 1902.

The explosive is intended to produce a large volume of ammonia at the moment of detonation, in order to extinguish flame, and is composed of nitroglycerin (40), nitrocellulose (1), nitrate of ammonia (27), nitrate of potash (4), fatty-acid salt (12·5), liquid hydrocarbon (3·5), rye flour (10), wood flour (2). See also this Journal, Eng. Pats. 25,884 and 26,617, 1902, 1471.—G. W. McD.

Safety Explosives; Manufacture of ——. F. Schachtebeck, Westphalia, Germany. Eng. Pat. 22,645, Oct. 17, 1902.

See Eng. Pat. 11,325; this Journal, 1903, 111. Nitrate of ammonia is dissolved in a jelly consisting of glue or dextrin, or glue and dextrin, and the whole is then intimately mixed with a nitroglycerin gelatin.—G. W. McD.

Phosphorus and Sulphur; Improved Compounds of —— [*for Match Compositions*], *and Methods for Manufacturing same.* E. W. Wheelwright, Birmingham. Eng. Pat. 3045, Feb. 6, 1902.

Phosphorus and sulphur are melted together in such proportions that for 100 parts of phosphorus there will be from 5—50 parts of sulphur, the phosphorus being in larger proportion than in sesquisulphide of phosphorus (P_4S_3). This (sesquisulphide of phosphorus) may be dissolved out of the compound by a suitable solvent and recovered therefrom. The compound is suitable for use in the manufacture of matches.—E. S.

French Patents.

Explosive [*Fulminate Type*]. Société Anonyme Dynamite Nobel. Fr. Pat. 321,285, May 21, 1902.

A substitute for fulminate may be obtained by passing acetylene gas into a solution of silver nitrate slightly acidified with nitric acid. A white precipitate is thus produced, which can be dried at 100° C. without danger. Although insensible to friction and percussion, it detonates powerfully if ignited. If it is desired to have a compound sensitive to friction, chlorate of potash is added to the silver nitrate solution, and a sensitive compound thus obtained.—G. W. McD.

Safety Explosives [*Hygroscopic*]; *Method for Increasing the Stability of* ——. F. Schachtebeck. Fr. Pat. 321,246, May 20, 1902.

See Eng. Pat. 11,325; this Journal, 1903, 111.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

French Patent.

Polarimeters and Saccharimeters; Impt. in ——. P. Pellin. Fr. Pat. 320,503, April 19, 1902.

This invention relates to devices by which the field of the polariscope may be divided into a central disc of polygonal or circular form surrounded by a number of polygonal or circular rings, such a field being easier and less tiring to work with than that usually employed. This result may be produced in two ways: (1) By replacing the ordinary polariser by two or more polarisers having axial perforations of the desired cross-section, together with one polariser not so perforated. (2) By superimposing on an ordinary polariscope an arrangement formed of one or more circular, polygonal, or annular discs of quartz or other doubly refracting crystalline substance. In either of these devices, the consecutive polarisers or the quartz discs are so arranged that their projection on a vertical plane consists of a system of concentric circles or polygons.—T. H. P.

INORGANIC—QUANTITATIVE.

Persulphates; Quantitative Separations by Means of ——, in Acid Solution. M. Dittrich and C. Hassel. Ber., **36**, [1], 284—289. This Journal, 1902, 1114.

For the determination of manganese, add to the cold liquid (400 c.c., containing 3 c.c. of concentrated sulphuric acid) ammonium persulphate solution (20—30 c.c. of a 10 per cent. solution) and heat very gradually on the water bath. Allow to settle completely, filter, wash thoroughly with hot water, dry, ignite, and weigh as Mn_3O_4. Where bases like lime or the alkalis, having a tendency to form manganites, are present, it is well to wash first, till the salts of these bases are removed, with 2 per cent. nitric acid.

Separation of Manganese from Calcium.—The solution is treated exactly as above, and the calcium in the filtrate determined as oxalate in the usual way. When the washing with acid was omitted, the manganese precipitate contained a trace of calcium, and the calcium precipitate a trace of manganese, but not enough, in either case, to affect the analysis seriously.

Separation of Manganese from Chromium.—Chromic salts in acid (or in fixed alkali) solution are completely converted by ammonium persulphate into chromates. At least 30 c.c. of the persulphate solution should be used, and heating should be continued for 2—2½ hours; the volume of the liquid should be 200—300 c.c., and 20 c.c. of 10 per cent. nitric acid should be added. It is also desirable to wash by decantation a few times before bringing the precipitate upon the filter. The chromate in the filtrate is reduced to chromic salt by means of hydrogen peroxide, and the chromium then determined in the usual way.

—J. T. D.

Ferrous Salts; Iodometry of ——. E. Rupp. Ber., 1903, **36**, [1], 164—166.

The Duflos-Mohr method for the determination of ferric salts is based upon the reversible reaction:—$Fe''' + I' \rightleftarrows Fe'' + I$, the quantitative conversion of the ferric into a ferrous salt depending upon the presence of hydriodic acid or hydrogen ions. The author's experiments were made with a view of carrying out the reverse reaction quantitatively, *i.e.*, of determining ferrous salts iodometrically. It was found that this could be effected in the presence of sodium-potassium tartrate, and the following method of working is given. A measured excess of a standardised iodine solution is treated in a stoppered flask with a concentrated aqueous solution of about 5 grms. of sodium-potassium tartrate, and the neutral or very faintly acid solution of the ferrous salt added. After allowing the flask to stand for 3—5 hours at the ordinary temperature and protected from light, the excess of iodine is titrated with sodium thiosulphate solution. The method can be used for the iodometry of mixtures of ferrous and ferric salts. The ferrous iron is determined in the manner described above. Another portion of the material is treated with 5—10 c.c. of dilute sulphuric acid, and a 1 per cent. solution of permanganate added till a permanent rose coloration is produced. The slight excess of permanganate is destroyed by the addition of a small crystal of oxalic acid, the solution is diluted to 75—100 c.c., and the total iron, all of which is now in the ferric condition, is determined by Mohr's method, that is, about 5 grms. of potassium iodide are added, the flask is well closed, and allowed to stand for half an hour at the ordinary temperature, and the solution finally titrated with thiosulphate.

In a trial determination, the amount of ferrous iron differed by + 0·28 per cent. and that of ferric iron by − 0·5 per cent. from the theoretical quantities.—A. S.

Ozone; Determination of ——. A. Ladenburg. Ber., **36**, [1], 115—117.

The author has shown that, though the direct gravimetric method of determining ozone is the most accurate, yet the iodometric method gives good results, provided that a neutral solution of iodide is used for the absorption of the ozone, and is acidified only just before the titration of the iodine. If ozone be led into acidified iodide solution, the results may be too high by as much as 50 per cent. He has now found that ozone may be determined by very slow passage of the gas containing the ozone through a solution of sodium sulphite, the excess of sulphite being determined iodometrically according to Volhard's directions. On the other hand, sodium arsenite solution similarly used gives very variable and not even approximately accurate results. The author concludes that ozone exerts in general an oxidising action proportional in amount to its mass, and that the "catalytic" action which has been suggested to explain the above-mentioned anomalies with acidified potassium iodide solution is but seldom observed.

—J. T. D.

Bismuth; Electrolytic Determination of ——, and its Separation from other Metals. A. L. Kammerer. J. Amer. Chem. Soc., 1903, **25**, [1] 83—98.

Up to the present a satisfactory method for the electrolytic determination of bismuth has been lacking, the main difficulties being the looseness of the deposit and the formation of bismuth peroxide at the anode.—The author now finds the following conditions to give satisfactory results:—Cathode, platinum dish; anode, platinum wire-spiral or platinum basket; solution, 0·1—0·15 grm. of bismuth dissolved in 1 c.c. of nitric acid (sp. gr., 1·42), 2 c.c. of sulphuric acid (sp. gr., 1·84), 1 grm. of potassium sulphate, total dilution, 150 c.c.; time, 8 or 9 hours; temperature, 45°—50° C.; current, $N.D_{100}$ = 0·02 ampère at 1·8 volts. During the last hour the current should be raised to 0·15 ampère. When the deposition is complete, the deposit is washed, without interrupting the current, by removing the acid liquid by means of a syphon and replacing it by hot water. The current is then stopped and the dish is rinsed, emptied and drained. The deposit is dehydrated by a mixture of ether (2 parts) and alcohol (1 part) and finally by pure ether, then dried over a flame and weighed. If dehydration be omitted, the bismuth will suffer oxidation on drying; during electrolysis it is essential to keep the level of the liquid perfectly constant. Bismuth is readily separated from admixture with any one of the following metals, in about equal proportions, with very slight alterations of the conditions:—Separation from zinc (0·6 grm. of normal potassium sulphate, K_2SO_4, employed), cadmium (1 grm. of potassium sulphate), chromium (0·5 grm. of potassium sulphate), nickel (0·5 grm. of potassium sulphate), cobalt (0·5 grm. of potassium sulphate), manganese (0·5 grm. of potassium sulphate and 3 c.c. of sulphuric acid), and uranium (1 grm. of potassium sulphate), most of the metals being present as sulphates. When iron is present, the bismuth tends to remain in solution, and this is especially the case with a mixture of ferric and chrome alums in equal parts. Satisfactory deposits in presence of iron salts can, however, be obtained by employing 0·5 grm. of potassium sulphate and a current of 0·03 ampère for ferrous salts and 0·05 ampère for ferric salts.

—J. F. B.

hrome-Liquors; Method for rapidly Determining the Tanning Value of ——. E. Stiasny. Der Gerber, 1903, **29**, [3], 33—34.

'HE tanning value of chrome-liquors may be rapidly deterined in the following manner :—

" *Two bath*" *liquor.*—To determine potassium bichroate and acid.

(1) Titrate 20—50 c.c., according to strength, with per cent. solution of sodium thiosulphate (1 c.c. = 0·01 rms. of potassium bichromate) in presence of potassium odide, using starch solution for the final point. No. of c. used = (*a*).

(2) Titrate the same volume of liquor as used in (1) ith N/10 sodium hydroxide solution, using phenolphthalein s indicator. No. of c.c. used = (*b*).

Some of this alkali is consumed in converting the ichromate to normal chromate, and the amount combined ith acid only (*c*) is calculated from the formula—

$$b - (0{\cdot}68) \times a = c.$$

"*Single bath*" *liquor.*—To determine available chromic xide, 20—50 c.c. of the liquor are filtered, heated to the oiling point, and titrated with N/10 sodium hydroxide olution in the presence of phenolphthalein. If the liquor onsist definitely of chrome alum or a basic salt of the omposition Cr_2OHSO_4, as is often the case, the value is alculated on the basis that 4 molecules of sodium hydroxide recipitate 1 molecule of chromic oxide. If basic salts f indefinite composition are present, gravimetric methods ust be resorted to.

Barkometer (hydrometer) tests of the density of the iquor are of no value in the case of a used liquor owing to he presence of other salts in solution.—R. L. J.

'erium: Volumetric Determination of ——. A. Waegner and A. Muller. Ber., 1903, **36**, [1], 282.

N the volumetric determination of cerium by means of ydrogen peroxide, cerous salts must first be converted into eric salts. Von Knorre (this Journal, 1898, 72, 491), roposed the use of persulphates in faintly acid solution for his purpose. The author finds that a better oxidising geut is bismuth tetroxide, which in strong nitric acid soluion rapidly and completely effects the conversion of cerous nto ceric compounds, even at the ordinary temperature. 'he method used is as follows :—

About 25—30 c.c. of the solution of the cerium salt are nixed in a measuring flask of 110 c.c. capacity, with an qual volume of concentrated nitric acid. After thorough ooling, bismuth tetroxide (about 2—2·5 grms. for each ·1 grm. of cerium) is added gradually with shaking, and fter allowing to stand for half an hour, water is added up to he mark, and the contents of the flask are well mixed. After tanding for a further 1—2 hours, the clear deep yellow iquid is poured off through a dry filter, 100 c.c. of the iltrate are diluted with an equal quantity of water, and the itration with hydrogen peroxide solution carried out as sual, till complete decolorisation is attained. The small xcess of hydrogen peroxide is then determined by titration vith a solution of potassium permanganate. The results btained by this method agree satisfactorily with those btained by von Knorre's method.—A. S.

ORGANIC—QUALITATIVE.

-Naphthol; A Reaction for ——. H. Arzberger. Pharm. Post, **35**, 753. Pharm. J., 1903, **70**, [1700], 89.

THE following reaction is recommended as being much nore delicate than the ferric chloride test for the detection f α-naphthol in β-naphthol. About 0·3 grm. of the ample is dissolved in 2—3 c.c. of strong alcohol, and 0—15 c.c. of water are added. After shaking occasionlly for 5—10 minutes, the solution is filtered, and to the filtrate 10—12 drops of a 10 per cent. solution of potash nd 1—4 drops of a solution of iodine in potassium iodide (1 of iodine, 2 of potassium iodide and 60 of water) are dded. On shaking gently, a violet coloration will be proluced if α-naphthol is present, whilst pure β-naphthol will give only a yellowish colour. If too much iodine has been added, the excess may be removed by a further cautious addition of potash.—A. S.

Sugar; Colour Test for Traces of ——. M. Ventre-Pacha. Rev. Med. Pharm., **97**, 676. Pharm. J., 1903, **70**, [1700], 90.

IF to 10 c.c. of a sugar solution there is added a mixture of 12 drops of pure sulphuric acid, 5 drops of an alcoholic solution of nitrobenzene, 1 in 2, and 20 drops of a saturated solution of ammonium molybdate, on boiling for three minutes, a blue coloration is produced which increases in intensity with the proportion of sugar present, and may be compared with the colour obtained from a solution containing a known amount of sugar. The best results are obtained with a solution of 1 in 10,000, but even a solution of 1 in 1,000,000 gives an appreciable reaction.—A. S.

Cacodylic Acid and Cacodylates; Reaction of ——. J. Bougault. J. Pharm. Chim., 1903, **27**, [5], 97.

THE author recommends the use of a hydrochloric acid solution of hypophosphorous acid as giving a delicate and characteristic test for cacodylic acid and cacodylates; by this method cacodylates can be detected in presence of methylarsenates.

A small quantity of sodium cacodylate is dissolved in 1 c.c. of water, 10 c.c. of the reagent are added, and the tube corked. After a time, varying according to the amount of cacodylate present, a distinct cacodylic odour is noticeable; 0·5 mgrm. of sodium cacodylate gave a distinct odour after standing for 12 hours.

Methylarsenates give no smell with this reagent, all the arsenic being precipitated, less than 0·1 mgrm. of an arsenate or arsenite giving a brown coloration or precipitate.—T. F. B.

ORGANIC—QUANTITATIVE.

Hydrosulphite Vat; Determination of the Value of the ——. W. Kielbasinski. Zeits. f. Farben u. Textil Chem., 1903, **2**, [2], 33—34.

IN order to efficiently conduct indigo dyeing by means of the hydrosulphite vat, it is necessary to analyse zinc dust, bisulphite, and indigo, and to determine how much indigotin and free alkali the vat contains. Zinc dust is determined by shaking 0·5—1 grm. with iodine solution and dilute sulphuric acid in a well-stoppered flask and titrating the excess of iodine with arsenite. Bisulphite is titrated with normal soda lye and phenolphthalein. Hydrosulphite is analysed under a layer of petroleum by means of indigo sulphonic acid solution containing 0·1 per cent. of indigotin. Indigo is determined by converting 0·5 grm. into the sulphonic acid, titrating one portion with potassium permanganate and the other with a correspondingly dilute alkali hydrosulphite. The relation of the number of c.c. of potassium permanganate to that of hydrosulphite for the same quantity of indigo gives the percentage amount of indigotin. For example, 50 c.c. of indigo sulphonic acid (0·5 grm. of Indigo pure B.A.S.F. per litre) require 17·5 c.c. of permanganate solution (1 c.c. of the permanganate solution corresponding to 0·001394 grm. of indigotin); calculated 98 per cent. indigotin. 200 c.c. of the same indigo sulphonic acid require 10·1 c.c. of hydrosulphite. 200 c.c. of the solution of a natural indigo = 8·5 c.c. of hydrosulphite. This indigo, therefore, contains 98 × 8·5 ÷ 10·1 = 82·5 per cent. of indigotin.

In the vat are determined indigo, soda lye, sodium carbonate, and sulphite. About 2 litres are taken from the centre of the vat and protected by a layer of ether, and from 500—1000 c.c. of it are oxidised with a current of air. The indigo is collected, weighed, and titrated with hydrosulphite. The soda lye is determined in a filtered portion treated with air free from carbon dioxide with decinormal hydrochloric acid after adding barium chloride, using phenolphthalein as indicator, the carbonate in another portion, with the same indicator and the sulphite subsequently, using as indicator methyl orange.—T. A. L.

Ethyl Alcohol in Essences and Medicinal Preparations; Determination of ——. T. E. Thorpe and J. Holmes. Proc. Chem. Soc., **19**, [259], 13.

The authors describe a method of estimating ordinary alcohol in essences and medicinal preparations containing essential oils and volatile substances, such as ether, chloroform, benzaldehyde, camphor, and compound ethers, which has been used for some time past in the Government Laboratory, and which has been found to be both accurate and of very general applicability.

25 c.c. of the sample, measured at 15·5 C., are mixed with water in a separator to a bulk of from 100—150 c.c., and common salt is added in sufficient quantity to saturate the liquid. The mixture is now shaken vigorously for 5 minutes with from 50—80 c.c. of light petroleum boiling below 60 C., and after standing for about half an hour the lower layer is drawn off into another separator, extracted, if necessary, a second time with petroleum, and then introduced into a distillation flask. Meanwhile, the petroleum layers are washed successively with 25 c.c. of saturated brine, the washings added to the main bulk, which is neutralised if necessary, and then distilled. The distillate is made up to 100 c.c. and its relative density determined at the standard temperature in the usual manner. The results thus obtained require a small correction from the circumstance that, as the alcohol present is distilled into four times its initial volume, the errors of the spirit tables are necessarily quadrupled. Details are given of the mode in which the magnitude of this error may be determined, and from these results the mean error of the tables at below 40 per cent. proof (for example, 0·972 sp. gr.), which is the particular section of tables mainly used, may be set down as + 0·2 per cent. of proof spirit, and hence the observed determinations, expressed as percentages of proof spirit, require a subtractive correction of 0·8 per cent.

Tables are given of results obtained on preparations actually made in the laboratory and containing known quantities of ethyl alcohol as evidence of the accuracy and general applicability of the method and of the degree of variation which may be expected to occur between the results of different operators.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Carbon Monoxide as a Product of Combustion of the Bunsen Burner. T. E. Thorpe. Proc. Chem. Soc., **19**, [259], 14.

The author, in the course of an inquiry into the nature of the combustion products of certain of the gas- and oil-stoves in common use, has had occasion to make observations on the behaviour of the Bunsen burner as regards its liability to evolve carbon monoxide when burning under an ordinary laboratory sand-tray. He finds that a burner fed with coal-gas at the rate of 6 cb. ft. per hour and under 0·95 in. pressure will evolve about 0·022 cb. ft. of carbon monoxide when burnt under a sand tray in such manner that the inner cone of the flame impinges, or apparently impinges, on the metal.

Phosphorus Oxychloride; Preparation of ——. G. Erdmann. Ger. Pat. 138,392, Aug. 16, 1901. Zeits. angew. Chem., 1903, **16**, [4], 89.

A current of dry chlorine is led over a strongly-heated, powdered mixture of carbon and a metaphosphate, *e.g.*, calcium metaphosphate contained in a suitable vessel provided with a condenser and receiver.

This process has the advantage of requiring a simple apparatus, since only one gas is employed, and also of effecting a large saving in chlorine compared with the triphosphate method.

A suitable metaphosphate and carbon mixture is that obtained in the ordinary method of manufacturing phosphorus.—T. F. B.

Titanium Sesquioxide and its Salts as Reducing Agents. E. Knecht. Ber., 1903, **36**, [1], 166—169.

The introduction of the salts of titanium oxide as mordants at remunerative prices, and the analogy existing between titanium and tin, led the author to investigate the action o titanous chloride as a reducing agent. Attempts to obtain th compound $TiCl_2$ by reducing the chloride were fruitless, a in no case did the reduction proceed in aqueous solutio further than the trichloride $TiCl_3$. This can be obtained a follows. The hydrate precipitated from commercial titaniu sulphate is dissolved in strong hydrochloric acid, dilute with water, and treated with granulated tin until no furthe increase in the violet coloration takes place. The solutio is then decanted from the tin, diluted with water, and th tin precipitated with sulphuretted hydrogen. A less pur product is obtained by reducing the solution of the tetra chloride with zinc dust and using the solution directly. A more convenient method is to employ the concentrate solution of the commercial product (manufactured electro lytically) which has recently been put on the market, and i sufficiently pure for most purposes. By concentrating thi solution *in vacuo*, it solidifies to a mass of violet crystals which fume in the air and deliquesce on standing. Th crystals dissolve very readily in alcohol and water.

Titanium trichloride is a much more powerful reducin agent than stannous chloride, and gives with an aqueou solution of sulphurous acid (or sodium bisulphite) a precipitate of sulphur, hydrosulphurous acid being forme as an intermediate product, so that if the solution be at one neutralised with soda lye, a solution of sodium hydrosulphit is obtained and titanium hydrate is precipitated. Cupri sulphate is reduced to the cuprous salt, and with an exces of the trichloride to metallic copper. The reduction ferric to ferrous salts is quantitative, and forms the basi of an analytical method for determining iron and titanium Nitro compounds are at once reduced to the correspondin amines, whilst when several nitro groups are present in th molecule it is possible, by adjusting the amount of trichloride to effect a partial reduction. Azo dyestuffs are quantita tively reduced to the trichloride, and a volumetric metho for estimating them has been based upon this observation Moreover, fumaric acid is reduced by the reagent to succinic and citraconic to pyrotartaric acid, whilst indigo yields a once indigo white, and on further reduction, especially o boiling, a yellow crystalline substance, which has not ye been investigated. Prussian blue dyed on cotton is at once decolorised by a dilute solution of the trichloride, but th colour reappears on exposure to air or on washing wit water. It is, however, noteworthy that tetranitrocellulos does not appear to be acted on by titanium trichloride Titanium sesquisulphate, also a commercial article obtaine electrolytically, comes into the market as a sodium sulphat double salt. It has similar properties to the trichloride but is insoluble in alcohol. Titanium sesquioxide or it hydrate is readily precipitated by soda lye from the corre sponding trichloride. The black precipitate is quickl filtered off and washed. It decomposes water, givin hydrogen and forming white titanium oxide. The produc reduces nitrates to ammonia and azobenzene to hydrazo benzene, and provides a convenient reagent for effectin reductions in neutral or ammoniacal solution, no trace o the reducing agent passing into solution.—T. A. L.

Calcium: Extraction of ——. W. Borchers and L. Stockem. Ber., **36**, [1], 17.

The authors furnish further details for working the proces described in a previous communication (this Journal, 190 1284), in reply to a statement by Ruff and Plato, that th process was inferior to that of Bunsen and Matthiesen.

The cathode and its surroundings must be kept belo the melting point of calcium, as, above that temperatur calcium dissolves freely in calcium chloride, giving a sub stance of empirical formula CaCl. (This substance, whic takes the form of red crystals, has been isolated b Stockem.)

Below the melting point of calcium the formation of thi substance in quantity is avoided. The mass must also b kept in a nearly fluid condition, and as the sponge i compressed while in the furnace, as small a surface a possible of the metal comes into contact with the electrolyte the result being that the highest possible yield is obtained. —T. F. B.

romatic Hydrocarbons; Chlorination of Substituted ——, by Ammoniacal Lead Tetrachloride. A. Seyewetz and P. Trawitz. Comptes rend., **136**, [4], 240—242.

HE results of continued work on this subject (see this ɔurnal. 1903, 50) are summarised as follows:—1. Mono- ılorobenzene is with difficulty attacked at its boiling ɔint, or even in sealed tubes at 210° C., by the reagent. onobromo- and moniodo-benzene yield chlorobromo- ıd chloriodo-derivatives. 2. With homologues of benzene ılorinated in the nucleus, further substitution occurs, not the nucleus, but in the side chains, even when these are ready chlorinated. 3. In aromatic hydrocarbons halo- nated in the side chains only, further substitution takes ace in the side chains, not in the nucleus. 4. The esence of nitro groups hinders or prevents chlorination ammoniacal lead tetrachloride.—J. T. D.

Hofmann's Reaction; A New Reagent for ——. J. Tscherniac. Ber., 1903, **36**, [1], 218.

HE conversion of amides into amines has hitherto only en effected by means of hypochlorites or hypobromites alkaline solution; hypoiodites did not appear to react— any rate, phthalimide does not yield anthranilic acid with dine and potash. The author finds that iodosobenzene a new reagent for effecting Hofmann's reaction. When spended in water and added to a solution of phthalimide potash, iodobenzene and anthranilic acid are formed cording to the following equation:—

$$\mathrm{C\ H_4}<\substack{\mathrm{CO}\\ \mathrm{CO}}>\mathrm{NH} + \mathrm{C_6H_5IO} + 3\mathrm{KOH} =$$

$$\mathrm{H_2N\,.C_6H_4.\,CO_2K} + \mathrm{C_6H_5I} + \mathrm{K_2CO_3} + \mathrm{H_2O}.$$

—T. A. L.

i-iodophenol; New ——. P. Brenans. Comptes rend., **136**, [4], 236—238. (See also this Journal, 1901, 496, and 1902, 1094.)

HE author has prepared the di-iodophenol $\mathrm{OH : I_2 =}$: 3:5, from di-iodo-orthonitraniline ($\mathrm{NH_2:NO_2:I_2 =}$: 2 : 4 : 6) by diazotising and pouring the product into oiling absolute alcohol. The *di-iodo-nitrobenzene* ($\mathrm{NO_2:I_2 =}$:3:5), thus obtained, forms yellow needles, m. pt. 103° C., entical with that prepared by Willgerodt and Arnold, ho, however, have attributed to it a wrong melting- oint. This substance, on reduction, gives *di-iodo-aniline* $\mathrm{NH_2:I_2 = 1:3:5}$), m. pt. 107° C. (not 105° C., as given by . and A.). The derived acetanilide does not melt at 01°—102° C. (W. and A.'s figure), but volatilises without sion at 257°—258° C. This di-iodoaniline yields by the iazo reaction *di-iodophenol* ($\mathrm{OH : I_2 = 1 : 3 : 5}$), which orms colourless needles, m. pt. 103°—104° C., readily soluble organic solvents, distilling slowly with steam. Its *ethyl erivative* crystallises from methyl alcohol in long needles, . pt. 29°—30° C. Its *acetate* forms colourless needles, . pt. 79° C.—J. T. D.

ydrolytic Enzymes; Influence of the Stereochemical Configuration of the Glucosides on the Action of ——. H. Pottevin. Comptes rend., 1903, **136**, [3], 169—171.

ISCHER has put forward the hypothesis that the stereo- hemical configuration of the glucosides has a definite elation to that of the enzymes which are capable of ydrolysing them. The configuration of a glucoside is efined by that of the sugar from which it is derived and y the position, α or β, of the alcohol or phenol residue ombined with it. Hence it follows that each enzyme hould confine its action to the derivatives of one sugar, and mongst these to one series of glucosides, either the α or β eries.

Fischer's experiments confirm this law with a few bnormalities, due probably to the fact that the natural nzymes are not single bodies. For instance, he found hat maltase hydrolyses the *d*-glucosides of the α series, ut also methyl-*d*-fructoside, whilst emulsin hydrolyses the -glucosides of the β-series, but also methyl-*d*-galactoside nd milk-sugar, which is also a galactoside.

The author's experiments clear away the above anomalies and bring the facts into accordance with the law. *Schizzosacc. octosporus*, *Mucor alternans*, and *M. mucedo*, when triturated with glass, yield solutions which hydrolyse maltose, α-methyl-*d*-glucoside and glycerol-glucoside, but do not split up cane sugar or methyl-*d*-fructoside; it therefore follows that the hydrolysis of the α-glucosides on the one hand and that of the fructosides on the other is effected by two distinct enzymes. Further, *Aspergillus niger*, when cultivated in Raulin's mineral medium, yields enzyme solutions which hydrolyse amygdalin and the *d*-glucosides of the β-series but which leave milk-sugar and the two methyl-*d*-galactosides unaffected; the emulsin of almonds therefore is not a single enzyme, but contains a ferment of the nature of a lactase. If, however, a vigorous culture of *A. niger* be fed with a solution of milk-sugar or of one of the two methyl-*d*-galactosides, the fungus, when subsequently triturated, yields a solution of enzymes capable of hydrolysing milk-sugar and β-methyl-*d*-galactoside on the one hand and α-methyl-*d* galactoside on the other, according to the substance added to the culture, enzymes termed *d*-galactase-α and *d*-galactase-β being producible at will. The milk-sugar yeasts ferment both milk-sugar and β-methyl-*d*-galactoside and yield extracts which hydrolyse these two galactosides.—J. F. B.

Catalysis and Ferment Action; Elements of Chemical Kinetics, particularly with regard to ——. G. Bredig. Ergebnisse der Physiol., 1902, [1], 134—212. Chem. Centr., 1903, 1, [3], 123.

A COMPREHENSIVE article, in which the author reviews the evidence as to the analogy between the action of inorganic catalytic agents and that of ferments. He concludes that, taking into consideration the labile and micro-heterogeneous colloidal condition of enzymes, enzyme actions are not essentially different from the contact actions of other catalytic agents. (See also this Journal, 1900, 1155; 1901, 376, 845.)—A. S.

RESEARCH.

THE CARNEGIE TRUST.

The Carnegie Trustees have issued regulations for the endowment of post-graduate study and research by means of Carnegie scholarships, fellowships, and grants. Provision is made for scholarships of the annual value of 100*l.* and fellowships of the annual value of 150*l.* in Science and Medicine; of scholarships and fellowships of like values in History, Economics, and Modern Languages and Literature; and of grants in aid of research. Only graduates of Scottish Universities are to be eligible for the scholarships and fellowships, and graduates, professors, lecturers, and assistants in Scottish Universities, or teachers in Scotland recognised for the purpose of graduation by a Scottish University, for the research grants.

New Books.

MONOGRAPHIEN ÜBER ANGEWANDTE ELEKTROCHEMIE. IV. Band. Einrichtungen von Elektrolytischen Laboratorien unter besonderer Berücksichtigung der Bedürfnisse für die Hüttenpraxis. Von H. NISSENSON, Direktor des Central-Laboratoriums der Aktiengesellschaft zu Stolberg und in Westfalen. Wilhelm Knapp, Verlagsbuchhandlung, Halle a. S. 1903. Price M. 2.40.

CONTAINS 51 pages, illustrated with 32 engravings, and the text is subdivided as follows:—PART I.—I. Introduction. II. Object and Value of Electrolysis. III. Fundamental Definitions. IV. Electrotechnical Fundamental Law. V. Calculation of Conductivity. VI. Constituents of an Electrolytic System: (*a*) Sources of Current. (*b*) Instruments of Measurement. (*c*) Current Regulators. (*d*) Conductors, &c. PART II.—Description of the Arrangement of Electrolytic Laboratories of:—1. Aachen. 2. Breslau. 3. Clausthal. 4. Darmstadt. 5. Freiburg i. S. 6. Giessen. 7. Hoboken (Antwerp). 8. Königsberg. 9. Leoben. 10. Lüttich. 11. Munich. 12. Pennsylvania. 13. Stolberg.

Die Herstellung von Metallgegenständen auf Elektrolytischem Wege, und die Elektrogravure. V. Band. Von Dr. W. Pfanhauser, Fabrikant von Maschinen, Apparaten und chemischen Pr paraten für Elektroplattierung, &c. Wilhelm Knapp, Verlagsbuchhandlung, Halle a. S. 1903. Price M. 7.

The work contains 144 pages, illustrated with 101 engravings. The subject-matter is subdivided as follows:—I. Historical. II. Copper Galvanoplastic Baths. III. Physical Properties of Copper Precipitates. IV. Behaviour of Anode Copper. V. Constants of Baths, and of the Metallic Deposits, and their Calculation. VI. and VII. Technical Arrangements, &c. VIII. Preparation of Metallic Powders, &c. IX. Metallic Foils. X. Preparation of Wires, &c. XI. Preparation of Voluminous Bodies. XII. Of Parabolic Mirrors. XII. Of Tubes. XIII. Electrolytic Etching. XIV. Electro-engraving of Josef Rieder.

India-Rubber and Gutta-Percha. A complete Practical Treatise on India-rubber and Gutta-percha in their Historical, Botanical, Arboricultural, Mechanical, Chemical, and Electrical Aspects. Translated from the French of T. Seeligmann, G. Lamy Torrilhon, and H. Falconnet. By John Geddes McIntosh, late Lecturer on the Chemical Technology of Gums, Resins, &c., The Polytechnic, Regent Street. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1903. Price 12*s.* 6*d.*; India and Colonies, 13*s.* 6*d.*; other countries, 15*s.* nett and post free.

284 pages of subject matter, with alphabetical index and 12 pages of bibliography. The text is illustrated with 86 engravings. Part I. India-Rubber.—Historical Introduction. I. India-rubber, Latex, Botanical Origin, &c. II. Climatology, Culture, &c. III. Methods of obtaining the Latex and preparing Crude Rubber, &c. IV. Classification of Raw Rubbers. V. Physical and Chemical Properties of Latex and India-rubber, &c. VI. Mechanical Conversion of Natural into Normal Caoutchouc, &c. VII. Mechanical Conversion of Normal into Masticated Rubber. VIII. Vulcanisation of Rubber. IX. Chemical and Physical Properties of Vulcanised Rubber. X. Hardened Rubber or Ebonite. XI. Mixing Rubber with Mineral and other Substances. XII. Rubber Substitutes, &c., and their Determination in Vulcanised Rubber. Part II. Gutta-Percha.—Historic Introduction, &c. I. Definition, Botanical Origin, and Habitat, &c. II. Climatology, Soil, and Culture. III. Methods of Collection. IV. Classification of Different Species of Commercial Gutta-percha. V. Physical and Chemical Properties, Technical Testing. VI Mechanical Transformations, &c. VII. Methods of Analysis. VIII. Gutta-percha Substitutes. IX. Trade Statistics.

Trade Report.

I.—GENERAL.

THE PATENTS ACT, 1902.

Compulsory Licences and Revocation of Patents.

London Gazette, Feb. 17, 1903.

(See also this Journal, Feb. 16, 1903, 126.)

At the Court at *Buckingham Palace*, the 16th day of *February*, 1903.

Present,

The King's Most Excellent Majesty in Council.

Whereas by the third section of an Act of Parliament passed in the second year of His Majesty's reign intituled "The Patents Act, 1902," it is amongst other things enacted that any person interested may present a petition to the Board of Trade alleging that the reasonable requirements of the public with respect to a patented invention have not been satisfied, and praying for the grant of a compulsory licence, or, in the alternative, for the revocation of the patent; that the Board of Trade shall in the circumstances set out in this section refer the petition to th Judicial Committee of the Privy Council; and that Hi Majesty in Council may make rules of procedure an practice for regulating proceedings before the Judicia Committee under this section, and subject thereto suc proceedings shall be regulated according to the existin procedure and practice in patent matters:

And whereas His Majesty in Council has deemed i expedient to make rules regulating proceedings in suc Petitions before the Judicial Committee,

His Majesty is therefore pleased by and with the advic of His Privy Council to approve of the several rules an regulations contained in the Schedule hereunto annexed and to order, as it is hereby ordered, that on and after th making of this Order the same be respectively observed.

A. W. FitzRoy.

The Schedule above referred to.

Rules to be observed in Proceedings before the Judici Committee of the Privy Council under the Patents Act, 190 Section 3.

I. On receiving written notice from the Board of Tra that a Petition has been referred to the Judicial Committ of the Privy Council, the Petitioner shall, after satisfyin the requirements of Rules II. and IV., apply to the Judici Committee to fix a time for hearing the Petition.

II.—(*a*) No application to fix a time for hearing th Petition shall be made unless the Petitioner shall hav previously given notice to the Patentee, to the Opponent and to any other person claiming an interest in the pate as exclusive licensee or otherwise, that the Petition has bee referred to the Judicial Committee, that it is his intention t apply to the Judicial Committee on a specified day, whic day shall be not less than four weeks from the date wh the notice is served or sent, to fix a time for hearing th Petition, and that any person desiring to be heard befor the Judicial Committee at the time so fixed must enter Caveat at the Council Office on or before the day specified.

(*b*) The said notice shall be served in the usual wa but where the person to be served resides or has his pri cipal place of business outside the United Kingdom, it ma be sent to him by post in a registered envelope.

III.—(*a*) Any person claiming an interest in the pate as exclusive licensee or otherwise, whether he has receive the notice prescribed by Rule II. or not, shall, if he desir to be heard before the Judicial Committee, enter a Cave at the Council Office on or before the day specified by su notice; provided always that, if he has not received th said notice, or if he resides or has his principal place business outside the United Kingdom, he may apply to t Judicial Committee to extend the time for entering h Caveat, on the ground that the time limited by such noti is insufficient.

(*b*) Every Caveat shall specify the Caveator's addre for service, which address shall be within four miles of t Council Office.

IV. An application to the Judicial Committtee to fix time for the hearing of the Petition shall be accompani by eight printed copies of the Specification, and by affidavit of the Petitioner showing the persons to whom, a the manner in which, the notice prescribed by Rule II. h been given.

V. The time for hearing a Petition shall be fixed by Order of the Judicial Committee, and shall be not less th four weeks from the day on which the application for fixi the same is made. The Petitioner shall, immediately aft the issue of such Order, give public notice thereof by a vertising the same once at least in the *London Gazette* a in the *Times*, and in such other newspaper or newspap (if any) as the Judicial Committee may direct. After co pleting such advertisements, the Petitioner shall forthwi lodge an affidavit thereof at the Council Office.

VI. The statements contained in the affidavits requir by Rules IV. and V. may be disputed upon the hearing.

VII. The Petitioner shall be entitled to be served by t Caveators, not less than three weeks before the day

ring, with notice of the grounds of their respective
ections, if such grounds are different from or additional
hose taken by them in the proceedings before the Board
'rade. Copies of all Objections, or additional Objec-
s, so served as aforesaid, shall be lodged at the Council
ce not less than fourteen days before the day fixed for
hearing.

'III.—(*a*) All Petitions and other documents lodged at
Council Office shall (unless the Judicial Committee
erwise direct) be printed in the form prescribed by the
ents Rules of the Board of Trade which are in force for
time being, and the parties shall furnish as many copies
ne documents lodged by them as shall be required by
Judicial Committee.

) Parties shall be entitled to have copies of all papers
ged in respect of the Petition at their own expense.

X. No solicitor or agent shall be entitled to conduct
eedings under this Act before the Judicial Committee
ss he is a solicitor or agent admitted to practise before
Privy Council in accordance with Her late Majesty's
er in Council of the 6th March, 1896. Such solicitor or
nt shall be allowed the same fees, and the same Council
ce fees shall be chargeable in respect of proceedings
er this Act, as are prescribed by the general Rules
licable to proceedings before the Judicial Committee.

. Applications to the Judicial Committee to fix a time
hearing the Petition and on other matters of procedure
l be addressed in the first instance to the Registrar of
Privy Council, who shall take their Lordships' instruc-
s thereon and communicate the same to the parties. In
s of doubt the Registrar may, or, if so requested by any
he parties, he shall, enter the application for hearing
re their Lordships' Board.

I. The Judicial Committee may excuse the parties from
pliance with any of the requirements of these Rules,
and may give such directions in matters of procedure and practice and otherwise as they shall consider to be just and expedient.

XII.—(*a*) Any affidavits, statutory declarations, or other documentary evidence which may have been furnished to the Board of Trade, or any copies thereof which may be referred by the Board to the Judicial Committee, may be received in evidence in proceedings under this Act before the Judicial Committee, subject to such cross-examination of any of the deponents as may be permitted by the Judicial Committee. The Judicial Committee may require the production of any original documents, copies of which are tendered in evidence under this Rule.

(*b*) The parties may tender before the Judicial Committee such further documentary or other evidence as they may be advised.

XIII. The Judicial Committee may refer any matters in connection with proceedings under this Act to be examined and reported on in the same manner as matters may be referred by them under Section 17 of the Act 3 and 4 Will. IV., c. 41 (Judicial Committee Act, 1833).

XIV. The Judicial Committee will hear the Attorney-General or other Counsel on behalf of the Crown on the question of granting the prayer of any petition. Counsel on behalf of the Crown is not required to give notice of the grounds of any Objection he may think fit to take or of any evidence which he may think fit to place before the Committee.

XV. Costs incurred in the matter of any Petition under this Act shall be taxed by the Registrar of the Privy Council, or other officer deputed by the Judicial Committee to tax the same, and the Registrar or such other officer shall have authority to allow or disallow in his discretion all payments made to persons of science or skill examined as witnesses.

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS.

Beilage der "Neuen Freien Presse," Feb. 1903.

(1 Krone = 10*d*. 2 Kronen = 1 Gulden. 1 Kilo. = 2·2 lb.)

The first portion of the Tariff, dealing with import duties, is divided into 51 sections.

NEW TARIFF.				PREVIOUS TARIFF.			
ction.	No.	Article.	New Duty.	Article.	Previous Duty. Auto-nomic.	Previous Duty. By Special Treaty.	No. in Previous Tariff.
			Kronen per 100 kilos.		Kronen per 100 kilos.		
				Raw sugar: below the Dutch standard, No. 19	14·29	..	17*a*
				of the Dutch standard, No. 19 and over	26·18	..	17*b*
V. gar.	19	Beet sugar and all sugar of a similar kind (cane sugar), in every state of purity, with the exception of molasses	26·00	Refined sugar	26·18	..	18
	20	Sugar of other kinds, *e.g.*, glucose, starch sugar, grape sugar, fruit sugar, milk sugar, and the like; caramel (sugar- and beer-colouring)	26·00	Sugar solutions containing cane sugar or invert sugar: suitable for human consumption	19·05	..	19*a*
	21	Molasses	15·00	unsuitable for human consumption, molasses	14·29	..	19*b*
		Note.—Besides the duty, there is imposed on sugar the special tax on articles of consumption, *viz.*, on the sugar in No. 19, the amount prescribed for cane sugar, and on the sugar in No. 20, the amount prescribed for sugar of other kinds.		Starch sugar (grape sugar, glucose, and the like), maltose, and fruit sugar (levulose)	26·18	..	20
				Note.—Besides the duty, there is imposed on sugar the special tax on articles of consumption, *viz.*, on the sugar in Nos. 17, 18, and 19*a*, the amount prescribed for cane sugar, and on the sugar in No. 20, the amount prescribed for sugar of other kinds.			
				Milk sugar	23·81	..	32*a*
				Caramel	23·81	23·81	33*b*
I. rain, lt, &c.	30	Malt	5·40	.. .. ..	3·57	..	25
X. imal ducts.	81	Wax, animal: (*a*) in the natural condition	14·00	.. .. ..	11·90	..	58*a*
		(*b*) prepared (bleached, coloured, formed into tablets and balls), also mixed with other substances, *e.g.*, vegetable wax, &c.	28·00	.. .. ..	23·81	..	58*b*

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS—*continued.*

NEW TARIFF.				PREVIOUS TARIFF.			
Section.	No.	Article.	New Duty.	Article.	Previous Duty. Autonomic.	Previous Duty. By Special Treaty.	No. Previ Tari
			Kronen per 100 kilos.		Kronen per 100 kilos.		
X. Animal Products—*cont.*	83	Skins and hides, raw (green or dry, also salted or limed, but not prepared further)	Free.	.. ..	Free.	**Free.**	60
XI. Fats.	91	Fish- and seal-oil					
		(*a*) in casks or in similar large vessels, of a gross weight of at least 10 kilos.	2·50	.. ..	2·38	..	71–
		(*b*) in vessels of smaller capacity, gross weight less than 10 kilos.	24·00	.. ..	23·81	**23·81**	
	92	Animal tallow, crude or rendered: pressed tallow	2·50	.. .. ..	2·38	..	6
	93	Vegetable tallow, palm oil, palm-kernel and cocoanut oil, solid	2·50	.. .. ..	2·38	**2·38**	7
	94	Wax, vegetable					
		(*a*) Japan wax	2·50	Vegetable wax			
		(*b*) Carnauba wax and other vegetable waxes not specially mentioned:					
		(1) in the natural condition	14·00	in the natural condition	21·90	..	5
		(2) prepared (bleached, coloured, formed into tablets or balls), mixed with other substances	28·00	prepared (bleached, coloured, &c.)	23·81	..	5
		Note. Carnauba wax, and other hard vegetable waxes for the manufacture of cerasin, by permit, under the prescribed conditions and regulations	Free	This modification is not present in the old tariff.			
	95	Stearic acid (stearin), palmitic acid (palmitin)	14·0	.. .. ..	11·29	..	
	96	Paraffin:					
		(*a*) impure, also paraffin scale	16·00	.. .. ..	14·29	**11·90**	
		(*b*) other	20·00				
		Note.—Soft paraffin with a melting point of 42° C. and below, for the manufacture of wax matches, by permit, under the prescribed conditions and regulations	7·00	This modification is not present in the old tariff.			
	97	Degras and elaidic acid	6·00	Degras	2·38	..	7
				Elaidic acid	4·76	..	
	98	Cerasin	10·00	.. .. ..	9·52	..	6
	99	Vaselin and lanoline (purified wool-fat):					
		(*a*) in casks	24·00	Vaselin	14·29	**11·90**	67
		(*b*) in tin boxes and similar smaller receptacles	30·00	Lanoline (without regard to mode of packing.)	2·38	..	
	100	Waggon-grease:					
		(*a*) with mineral-oil or -fat	16·00	.. .. ..	14·29	**11·90**	67–
		(*b*) other	7·00	.. .. ..	2·38	..	
	101	Fats and mixtures of fats not mentioned elsewhere	2·50	Spermaceti	9·52	..	68–
				Other fats	2·38	..	
XII. Fatty Oils.	102	Rape oil in casks, leathern bottles, and drums	12·00	.. .. ..	9·52	**9·52**	7
	103	Linseed oil and other fatty oils not specially mentioned, in casks, leathern bottles, and drums, with the exception of oil-varnishes	10·00	Linseed oil in casks, &c.	9·52	**5·71**	7
				Other fatty oils included in No. 103, in casks, &c.	9·52	**9·52**	
	104	Olive, maize, poppy-seed, sesame, earth-nut, beech-nut, and sunflower oils, in casks, leathern bottles, and drums	24·00	Maize oil in casks, &c.	9·52	**9·52**	7
				Other fatty oils included in No. 104, in casks, &c.	19·05	**9·52**	
				Olive oil, pure, in casks, &c., by agreement	..	**5·71**	7
	105	Cotton-seed oil in casks, leathern bottles, and drums	10·00	.. .. ..	19·05	**9·52**	7
		Notes.—(1) Olive and earth-nut oils (No. 104), and castor oil (No. 103), for technical use, provided they are denatured by a specially authorised customs-officer	2·00	Olive and earth-nut oils, denatured	1·90	**1·90**	72
				Castor oil, denatured, by agreement	..	**1·90**	7
		(2) "Sulphur oil"	2·00	.. .. ..	1·90	**1·90**	7
		(3) Cotton-seed oil for technical use, by permit, under the prescribed conditions and regulations	12·00	This statement is not contained in the old tariff.			
	106	Fatty oils in jars and similar vessels, less than 25 kilos.:					
		(*a*) Oils included in Nos. 102 and 103	30·00	.. .. ..	23·81	**23·81**	7
		(*b*) Oils included in No. 104	36·00				
		(*c*) Cotton-seed oil	18·00				
XIII. Beverages.	107	Beer:					
		(*a*) in casks	5·00	.. .. ..	4·76	..	7
		(*b*) in bottles or jars	18·00	.. .. ..	16·67	..	7
		Note. Besides the duty, beer is also subject to an excise tax.					

General Tariff for the Austro-Hungarian Customs—*continued.*

New Tariff.				Previous Tariff.			
					Previous Duty.		
ction.	No.	Article.	New Duty.	Article.	Auto-nomic.	By Special Treaty.	No. in Previous Tariff.
			Kronen per 100 kilos.		Kronen per 100 kilos.		
III. erages *cont.*	108	Distilled spirituous liquors:					
		(*a*) cognac	200·00	.. .. ..	142·86	..	76*a*
		(*b*) liqueurs, punch-essences, and other spirituous liquors treated with sugar or other substances, French brandy	170·00	.. .. ..	142·86	..	76*a*
		(*c*) arrack, rum	145·00	.. .. ..	142·86	..	76*a*
		(*d*) other distilled spirituous liquors	110·00	.. .. ..	104·72	..	76
		Note. — Besides the duty, the brandy-tax is imposed, according to the higher rate of the home excise-tax					
	109	Wine, fruit-wine, wine- and fruit-must, fruit- and berry juices, not concentrated, mead:		Fruit and berry juices, not concentrated in casks	11·90	..	325
				Lemon juice, by agreement	..	**Free**	..
		(*a*) in casks	60·00	Wine, fruit wine, wine- and fruit must, mead, in casks	47·62	..	77*a*
				Fruit and berry juices, not concentrated, in bottles	95·24	**83·33**	93
		(*b*) in bottles	75·00	Wine, fruit wine, wine- and fruit-must, mead, in bottles	47·62	..	77*a*
		Note. — Wines containing more than 22·5 per cent., by volume, of alcohol, are treated as distilled spirituous liquors	..	For wine containing more than 15, but not more than 28 per cent. by volume of alcohol, the additional tax is 9·05 kronen per 100 kilos. (or 100 litres) net, or 0·90 krone per 100 kilos. (litres) net, per degree over 15 per cent. by volume. Wine containing more than 28 per cent. by volume of alcohol, is taxed as treated brandy in accordance with No. 76*a*.			
	110	Sparkling wine	150·00	.. .. ..	119·05	**95·24**	77*b*
	111	Vinegar:					
		(*a*) in casks	12·00	.. .. ..	11·90	**9·52**	78*a*
		(*b*) in bottles and jars	24·00	.. .. ..	23·81	..	78*b*
	112	Mineral waters, natural or artificial ..	1·50	.. .. ..	1·19	..	79
XV. ood. arcoal, Peat.	135	Wood charcoal, peat and peat-charcoal, lignites and coals, coke, and all solid artificial fuels prepared from these materials	Free	.. .. ..	Free	**Free**	96
XVI. urned Carved oods.	141	Celluloid in plates, rods, or tubes, also polished and underlaid, not further worked up	6·50	.. .. ..	14·29	..	190
VII. nerals.	143	Pyrites	0·30	.. .. ..	Free	**Free**	102
	144	Ores not specially named	Free				
	145	Gypsum:					
		(*a*) crude, also ground	Free	.. .. ..	Free	**Free**	103*a*
		(*b*) burnt	0·60	.. .. ..	Free	**Free**	103*b*
	146	White chalk, heavy-spar (native barium sulphate):					
		(*a*) crude	Free	.. .. ..	Free	**Free**	103*a*
		(*b*) ground, washed	1·00	.. .. ..	Free	**Free**	103*b* 2
	147	Emery:					
		(*a*) crude	Free	.. .. ..	Free	**Free**	103*a*
		(*b*) granulated, ground, washed, pressed	2·00	.. .. ..	Free	**Free**	103*b* 2
	148	Mineral pigments:					
		(*a*) crude	Free	.. .. ..	Free	**Free**	103*a*
		(*b*) burnt, ground, washed, pressed .	3·00	.. .. ..	2·38	**1·19**	103*b* 1
		(*c*) refined	12·00	.. .. ..	11·90	**4·76**	246
	150	Earths and mineral substances not specially mentioned, crude, burnt, ground, or washed	Free	.. .. ..	Free	**Free**	103*a*, *b* 2
		All these substances so far as they are not included in other sections of the tariff.					
VIII. edicinal and rfumery rticles.	151	Liquorice juice, concentrated, in chests or formed into blocks	24·00	.. .. ..	14·29	**9·52**	204
	152	Opium, nutmeg- or mace- butter, cherry-laurel water	36·00	.. .. ..	35·71	..	105
	153	Camphor:					
		(*a*) crude	Free	.. .. ..	3·57	**Free**	118
		(*b*) purified (refined)	35·00	.. .. ..	35·71	..	105
	155	Ethereal oils:					
		(*a*) laurel, rosemary, and juniper oils, light camphor oil	24·00	.. .. ..	14·29	**14·29**	107*a*
		(*b*) not specially mentioned	60·00	.. .. ..	59·52	**35·71**	106*b*
XIX. ye and anning aterials.	162	Indigo, chestnut-wood extract, quebracho extracts, tanning extracts not specially named	8·00	Chestnut-wood extract	3·57	..	112
				Other tanning extracts	7·14	**3·57**	113
				Indigo	..	**Free**	113
		Note.—Indigo, when imported by sea	Free	.. .. ..	Free	..	..
	163	Dyestuff-extracts, not specially named	8·00	.. .. ..	7·14	**3·57**	113

General Tariff for the Austro-Hungarian Customs—*continued*.

New Tariff.				Previous Tariff.			
Section.	No.	Article.	New Duty.	Article.	Previous Duty. Autonomic.	 By Special Treaty.	No. Previ Tari
			Kronen per 100 kilos.		Kronen per 100 kilos.		
XX. Gums and Resins.	164	Tar, with the exception of lignite- and shale-tar	0·50	.. .. ..	0·48	**Free**	114
	165	Resin, common; colophony, pitch not specially mentioned	1·20	.. .. ..	1·19	**Free**	115
	166	Coal-tar-, lignite-tar-, shale-tar-, petroleum-, and stearine-pitch	1·20	.. .. ..	1·19	**0·48**	11
	167	Brewers' pitch, &c.	2·50	.. .. ..	1·19	**Free**	115
	168	Asphalt earths, rock asphalts, crude and ground	0·30	.. .. ..	Free	**Free**	108a
	169	Asphalt-bitumen	5·00	.. .. ..	3·57	**2·38**	116
	170	Asphalt-cement, asphalt-mastic; resin-cement (wood-cement)	7·00	.. .. ..	3·57	**2·38**	116
	172	Ozokerite (mineral wax), crude	Free	.. .. ..	1·19	..	115
	173	Turpentine, turpentine oil, pitch oil (resin oil); crude amber, hartshorn, and caoutchouc oils; coal tar oils of the benzene series; bird-lime	3·50	Crude amber, hartshorn, and caoutchouc oils	14·29	**14·29**	107
				Others	3·57		117
				Resin oil, by agreement	..	**2·38**	..
	174	Copal-resin, dammar-resin, shellac, gum arabic, gum-gadda, Senegal gum, gamboge, gum-tragacanth, gums, resins and gum-resins, natural balsams and vegetable juices, not specially mentioned	3·50	Jalap-resin	35·71	..	10
				Others	3·57	**Free**	118
		Note.—The substances in No. 174, when imported by sea	Free	.. .. ..	Free	..	..
XXI. Mineral Oils, Lignite, and Shale-Tar.	175	Mineral oils, lignite- and shale-tars, crude, with the exception of those named in No. 176	8·30 net	.. .. ..	8·33 net	..	11
		Note.—Crude mineral oils and oils not applicable for illuminating purposes without previous distillation and refining, the sp. gr. of which is over 0·830 at 15° C., by permit, under the prescribed conditions and regulations, in the annual maximum quantity of "200,000 sq. m." Of this 200,000 sq. m., 10,000 sq. m. go to the countries and states represented in the Reichsrath and 190,000 to Hungarian states.	1·62 net	In the old tariff this statement is limited to Roumanian oils	1·62	..	Note
	176	Crude, applicable for illuminating purposes without previous distillation and refining (purification)	11·00 net	.. .. ..	10·95 net	..	120
	177	Refined or partly refined light mineral oils of sp. gr. 0·880 or less	11·00 net	.. .. ..	10·95 net	..	121
		Note.—Mineral oils in Nos. 176 and 177 are subject also, besides the customs duty, to the excise tax of 13 kronen per 100 kilos. net weight.					
	178	Refined or partly refined heavy mineral oils of sp. gr. over 0·880; lubricating oils, also mixed with animal or vegetable oils or fats	12·00 net	Heavy oils of sp. gr. over 0·880, yellow and reddish-yellow lubricating oils, also mixed with animal or vegetable oils or fats	11·90 net	..	121
				Heavy oils of sp. gr. over 0·880, dark coloured	7·14 net	..	121
		Note.—Heavy oils of sp. gr. over 0·880 (with the exception of prepared lubricating oils) for the manufacture of lubricating oils by special concession and under regulations	7·00 net	Heavy-oil distillates as raw material for the manufacture of lubricating oil, without special concession	7·14 net	..	121
	179	Residues from the distillation or purification of mineral oils, not suitable for use as lubricating oils or greases, with the exception of solid residues	7·00 net	Residues from the distillation or purification of mineral oils	7·14 net	..	121
XXIX. Paper and Paper Goods.	284	Paper-stuff, bleached or unbleached: (*a*) from rags (half-stuff)	Free	.. .. ..	Free	**Free**	185a
		(*b*) from wood, straw, esparto, and similar fibres	1·50	.. .. ..	1·19	**1·19**	185b
	285	Pasteboard: (*a*) ordinary, of a weight of 300 grms. and more per sq. m.	7·20	Pasteboard: (*a*) ordinary of a weight of 300 grms. and more per sq. m.	7·14	..	186
				straw-pasteboard, by agreement	..	**2·38**	..
				other ordinary pasteboard covers, by agreement	..	**1·19**	..
		(*b*) cardboard, slate-cards, glazed pasteboard	7·20	.. .. ..	7·14	**7·14**	18
	286	Tarred and fireproof pasteboard	7·20	.. .. ..	7·13	**2·38**	18
	287	Packing-paper of the weight of 300 grms. and more per sq. m.: (*a*) not coloured	7·20	Rough packing-paper, not coloured	7·14	**3·57**	186
		(*b*) coloured or tarred in the mass	10·00	Packing-paper, smoothed, or coloured, varnished, tarred	7·14	**3·57**	187
	288	Blotting-paper: (*a*) ordinary, not coloured	7·20	Grey blotting-paper	7·14	**3·57**	186
		(*b*) fine, also blotting-cards	14·00	Fine, also blotting-cards	11·90	**7·14**	19

Pitch other than coal-tar pitch is forwarded duty-free.

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS—*continued.*

NEW TARIFF.				PREVIOUS TARIFF.			
					Previous Duty.		
ction.	No.	Article.	New Duty.	Article.	Autonomic.	By Special Treaty.	No. in Previous Tariff.
			Kronen per 100 kilos.		Kronen per 100 kilos.		
XIX. er and aper ods— *ont.*	289	Drawing-paper, artists' paper, copper-plate paper	20·00	.. .. ..	16·67	**11·90**	191
	291	Parchment paper	20·00	Genuine	16·67	**11·90**	191
				Imitation	11·90	**7·14**	190
	292	Paper for photographic purposes: (*a*) not sensitised (albumin-, gelatin-, pigment-, &c. paper)	30·00	Pigment-paper	35·71	**28·57**	194
				Albumin- and gelatin-paper	16·67	**11·90**	191
		(*b*) sensitised	50·00	.. .. ..	23·81	**23·81**	331
	293	Other chemical papers	30·00	.. .. ..	23·81	**23·81**	331
XX. itchouc Gutta- rcha.	304	Caoutchouc, gutta-percha (also balata), crude or purified; waste thereof, caoutchouc regenerated from waste caoutchouc (Mitchel rubber)	Free	.. .. ..	Free	..	197
	305	Caoutchouc solutions	6·00	.. .. ..	3·57	..	198
	306	Caoutchouc paste	10·00	.. .. ..	3·57	..	198
XXII. ather and ather oods.	328	Ox- and horse-leather, prepared as for sole-leather (also for belting): (*a*) in back-pieces (butts, croupons): 1. vegetable-tanned 2. mineral-tanned (*b*) other (with the exception of waste leather): 1. vegetable-tanned 2. mineral-tanned (*c*) waste leather	 50·00 60·00 43·00 50·00 35·00	Sole-leather, and sole-leather waste (without distinction as to the tanning materials used) Belting-leather	42·86	**35·71**	214
	329	Ox- and horse-leather not prepared as for sole-leather, also finished, but not enamelled: (*a*) natural-coloured or dyed black (*b*) other	 30·00 43·00	All ox- and horse-leather not suited for sole-leather, half-tanned, vegetable-tanned, red sumach-tanned ("lohrothsumachgar"), or oil-tanned: also all leather prepared with fat (with the exception of belting-leather): also grained, sleeked, stretched, natural-coloured; also black ox- and horse-leather; also grained whole or half-hides	21·43	..	213
				Black ox- and horse-leather in smaller pieces, ox- and horse-leather other than black-dyed, bronzed, or with designs imprinted thereon	42·86	**42·86**	215
	330	Calf-leather, with the exception of enamelled leather	60·00	Calf-leather, black or otherwise dyed, bronzed, &c. (Black kips are also treated as calf-leather).	42·86	**42·86**	215
				Other calf-leather	21·43	..	213
	331	Goat- and kid-skins, tanned, also split, not dyed, not further prepared	5·00	Sheep- and goat-skins, tanned (not white or oil-dressed); also split, not dyed	14·29	..	213 *Note*
	332	Sheep- and lamb-skins, tanned, not dyed, not further prepared: (*a*) flesh-split (*b*) other	 14·00 30·00				
	333	Goat- and kid-leather, prepared, with the exception of glove-leather and enamelled leather	60·00	Dyed, bronzed, &c.	42·86	**42·86**	215
	334	Sheep- and lamb-leather, prepared, with the exception of glove-leather and enamelled leather	60·00				
	335	Glove-leather of all kinds	43·00	Glove-leather of all kinds	42·86	**42·86**	215
				Black-dyed glove leather by agreement	..	**21·43**	..
		Note.—Glove-leather sent abroad to be dyed, on re-importation, by permit under the prescribed conditions and regulations	20·00	This statement is not contained in the old tariff.			
	336	Enamelled leather of all kinds	60·00	.. .. ..	42·86	**21·43**	215
	337	Leather not specially mentioned, parchment	43·00	Dyed, bronzed leather and leather with designs imprinted thereon, parchment	42·86	**42·86**	215
				Russia leather, crocodile-, seal-, and pig-leather, real or imitation, dyed, by agreement	..	**21·43**	..
				Other leather not specially mentioned	21·43	..	213
XXXV. lass and lassware.	368	Glass-mass, enamel- and glaze-mass, ground glass (glass dust)	3·60	.. .. ..	3·57	**3·57**	231
	369	Glass rod, small glass plates, and glass rod, without distinction of colour	3·60				
	370	Hollow glass, ordinary, that is not ground, not decorated, not stamped:		.. .. ..	3·57	**3·57**	240
		(*a*) in its natural colour, but not white	5·00	.. .. ..	4·76	**3·57**	232*a*
		(*b*) white, also "half-white" (transparent)	10·00 gross	.. .. ..	9·52 gross	**7·14**	232*b*
		(*c*) coloured (coloured in the mass, or flashed)	30·00	.. .. ..	28·57	**17·85**	242

General Tariff for the Austro-Hungarian Customs—*continued.*

New Tariff.				Previous Tariff.			
Section.	No.	Article.	New Duty.	Article.	Previous Duty.		No. in Previous Tariff.
					Auto-nomic.	By Special Treaty.	
			Kronen per 100 kilos.		Kronen per 100 kilos.		
XXXV. Glass and Glassware—*cont.*	371	Hollow glass with only ground-in stoppers or ground bottoms or edges:					
		(*a*) in its natural colour or white (transparent)	10·00 gross	.. .. ..	9·52 gross	..	233
		(*b*) coloured (coloured in the mass or flashed)	30·00	.. .. ..	28·57	**17·86**	242
	372	Hollow glass, refined:					
		(*a*) etched, ground, decorated, or cut:					
		1. in its natural colour or white (transparent)	20·00	.. .. ..	19·05	**14·29**	234
		2. coloured (coloured in the mass or flashed)	30·00	.. .. ..	28·57	**17·86**	242
		(*b*) painted, gilded, silvered	30·00	.. .. ..	28·57	**23·81**	242
		(*c*) spun over, &c., with glass	30·00	.. .. ..	28·57	**17·86**	242
	374	Pressed and massive glass, not specially mentioned:					
		(*a*) crude, also annealed, also with ground bottoms or edges, natural coloured or white (transparent).	20·00	.. .. ..	19·05	**14·29**	234
		(*b*) other (coloured, painted, &c.) .	30·00	Pressed or massive white glass, ground, &c.	19·05	**14·29**	234
				Pressed or massive coloured glass; also ground, &c.	28·57	**17·86**	242
				Pressed or massive glass, painted, gilded, silvered, by agreement...	..	**23·81**	..
	375	Mirror and plate glass, not specially named, crude, not ground, unpolished, not decorated, not coated, not coloured:					
		(*a*) mirror glass, cast or blown; crude cast glass more than 5 mm. thick	4·00	Mirror glass, crude, not ground; cast plates, crude, ribbed; also tiles	3·57	**3·57**	235
		(*b*) plate glass and crude cast glass of 5 mm. or less in thickness, with a perimeter of each plate of:					
		1. 240 cm., or less............	10·00 gross	.. .. ..	9·52 gross	**9·52 gross.**	236
		2. 240—400 cm.	11·00 gross				
		3. over 400 cm.................	13·00 gross				
	376	Mirror and plate glass, not specially named, coloured, not ground, unpolished, not decorated, not coated..	21·00 gross	.. .. ..	28·57	..	242
	377	Mirror and plate glass, not specially named, ground, polished, decorated, carved; also coloured or flashed:					
		(*a*) not faceted, not coated........	28·00 gross	Plate glass of all kinds, ground, dulled, or coated (also coloured)	28·57	..	237 or 2
		(*b*) faceted, but not coated; cathedral glass, also white	30·00 gross	White cathedral glass	9·52 gross	**9·52 gross.**	236
		(*c*) coated (painted, gilded, or silvered, also decorated by colours either laid on or burnt in	33·00 gross	Painted, gilded, silvered, by agreement.....................	..	**23·81**	..
	379	Wire-glass (cast plates with wire enclosed)	21·00 gross	.. .. ..	35·71	**28·57**	243
	380	Dry plates for photographic purposes, sensitised........................	30·00 gross	.. .. ..	28·57	..	237
XXXVI. Stoneware.	398	Heat non-conducting masses of kieselguhr, mixed with asbestos, hair, sawdust, and the like	4·00	As cement	1·19	**1·19**	245 to
		Note.—Shaped masses of heat non-conducting material of kieselguhr, treated as "cork-stone"	17·00	As cement goods..................	3·57	..	245 to
	399	Cement	1·80	.. .. ..	1·19	**1·19**	245 to
XXXVII. Pottery-ware.	413	Bricks, refractory:					
		(*a*) Dinas-, magnesite-, bauxite-, and graphite-bricks.					
		(1) weight (of one brick) up to 5 kilos.	2·00				
		(2) weight (of one brick) over 5 kilos.	3·00	Refractory bricks of ordinary shape, and of a weight (of one brick) up to 5 kilos, inclusive ...	1·19	**0·60**	250a
		(*b*) others:		All other refractory bricks	2·38	**1·79**	250b
		(1) weight (of one brick) up to 10 kilos	1·20				
		(2) weight (of one brick) over 10 kilos.	2·10				
XXXVIII. Iron and Iron-ware.	428	Pig-iron, iron and steel, old, broken, and scrap, for smelting	1·50	.. .. ..	1·90	**1·55**	257
		Note.—(1) Iron filings and scale from hammering....	Free	.. .. ..	Free	**Free**	*Note*
		(2) Tin-plate scrap for factories at which the tin is recovered, by permit under the prescribed conditions and regulations	Free	This statement is not contained in the old tariff.			
	429	Puddled iron, ingots	3·80	.. .. ..	3·81	**3·57**	258

General Tariff for the Austro-Hungarian Customs—*continued.*

New Tariff.				Previous Tariff.			
					Previous Duty.		
Section.	No.	Article.	New Duty.	Article.	Auto-nomic.	By Special Treaty.	No. in Previous Tariff.
XXVIII. Iron and Iron-ware —*cont.*	431	Iron and steel in bars, forged, rolled, or drawn:	Kronen per 100 kilos.		Kronen per 100 kilos.		
		(*a*) not shaped	6·50	.. .. ..	6·55	**5·95**	259*a*
		(*b*) shaped	8·40	.. .. ..	8·33	**7·14**	259*b*
		(*c*) decorative iron, ornamented	9·50	.. .. ..	9·52	**9·52**	263*a*
		(*d*) finished, not mentioned under (*e*)	12·00	Coarsely painted	11·90	**9·52**	263 (1)
				Tinned, galvanised, &c.		**11·90**	263 (2)
		(*e*) nickel-plated, plated with copper, copper alloys or aluminium	20·00	.. .. .	20·24	**19·05**	263*c*
	432	Sheet iron and plates:					
		(*a*) crude (sheet-iron) of the thickness:					
		1. 2 mm. or more	9·50	.. .. ..	9·52	**9·52**	261*a*
		2. 1—2 mm.	10·70				
		3. 0·6—1 mm.	11·30	.. .. ..	11·90	**11·31**	261*b*
		4. 0·4—0·6 mm.	12·50				
		5. 0·25—0·4 mm.	13·70	.. .. ..	14·29	**12·50**	261*c*
		6. less than 0·25 mm.	15·00				
		(*b*) dressed or cleaned, of the thickness:					
		1. 1 mm. or more	12·00	.. .. ..	14·29	**11·90**	261*d* 1
		2. 0·6—1 mm.	13·70	.. .. ..	14·29	**13·69**	261*d* 1
		3. 0·4—0·6 mm.	15·00				
		4. less than 0·4 mm.	16·00	.. .. ..	16·67	**15·48**	261*d* 2
		(*c*) tinned, galvanised, lead-plated, copper plated, brass-plated, varnished, polished, of the thickness:					
		1. 1 mm. or more	19·00	Also nickel-plated, polished, of the thickness:			
		2 0·6—1 mm.	20·00				
		3. 0·4—0·6 mm.	21·50	0·4 mm. or more	19·05	**19·05**	261*e* 1
		4. less than 0·4 mm.	24·00	less than 0·4 mm.	23·81	**21·43**	261*e* 2
		(*d*) nickel-plated, plated with copper, copper alloys or aluminium	24·00				
		(*e*) with designs (coloured or stamped) or moiré effects thereon, enamelled	29·00	.. .. ..	28·57	..	261 *f*
	433	Sheet-iron and plates, pierced, perforated, hollowed, or cut:					
		(*a*) sheet-iron	17·00	.. .. ..	14·29	**13·09**	265
		(*b*) dressed or cleaned	21·00	As iron-ware	20·24	**19·05**	263*c*
		(*c*) other	36·00	Tinned, galvanised, lead- or copper-plated, painted	35·71	**28·57**	265
				Nickel-plated, polished, enamelled, with coloured designs or moiré effects thereon	59·52	**47·62**	271
	434	Iron-wire:					
		(*a*) of the thickness:					
		1. 1·5 mm. or more	9·50	.. .. ..	9·52	**9·52**	261 to *a*
				Roll-wire, over 4 mm. in thickness, for wire-drawing works, by permit, under the prescribed conditions and regulations	..	**7·14**	..
		2. 0·5—1·5 mm.	12·50	.. .. ..	11·90	**11·90**	261 to *b*
		3. less than 0·5 mm.	15·00	.. .. ..	14·29	**11·90**	261 to *c*
				Scrap-wire of less than 0·5 mm. in diameter, for scrap-factories, by permit, under the prescribed conditions and regulations	..	**3·57**	..
		(*b*) tinned, galvanised, lead-, copper-, or brass-plated, varnished, of the thickness:					
		(1) 1·5 mm. or more	14·30	Wire, varnished, copper-plated, tinned, galvanised, lead-, or nickel-plated	19·05	..	261 to *d*
		(2) 0·5—1·5 mm.	18·00	Of the thickness of 1·5 mm. or more	..	**14·29**	..
		(3) less than 0·5 mm.	21·00	Of the thickness of less than 1·5 mm.	..	**16·67**	..
		(*c*) nickel-plated, plated with copper, copper alloys, or aluminium	24·00	Wire, polished	35·71	**28·57**	270
	435	Tempered wire:					
		(*a*) crude	16·00	(*a*) As untempered wire.			
		(*b*) polished or otherwise further treated	38·00	.. .. ..	35·71	**28·57**	270
XXXIX. Base Metals.	488	Base metals, crude, old, broken, or scrap:					
		(*a*) lead, also alloyed with antimony, arsenic, tin, or zinc	4·80	.. .. ..	4·76	**4·76**	273*a*
		(*b*) tin, also alloyed with antimooy, lead, or zinc; Britannia metal	Free	.. .. ..	Free	**Free**	275[illegible]
		(*c*) zinc, also alloyed with lead or tin	2·40	.. .. ..	2·38	**Free**	274*a*
		(*d*) copper (also refined), electrolytic, rose copper, and cement-copper	Free	.. .. ..	Free	**Free**	276*a*
		(*e*) nickel	Free				
		(*f*) aluminium, magnesium, and alloys of the two	Free				
		(*g*) not specially named	Free				
		(*h*) alloys of base metals not specially named	Free				

General Tariff for the Austro-Hungarian Customs—*continued*.

New Tariff.				Previous Tariff.			
Section.	No.	Article.	New Duty.	Article.	Previous Duty.		No. in Previous Tariff.
					Auto-nomic.	By Special Treaty.	
			Kronen per 100 kilos.		Kronen per 100 kilos.		
XXIX. Base Metals—*cont.*	490	Nickel anodes	14·50	.. .. ..	14·29	**14·29**	276*b*
	491	Sheets and plates (rolled, drawn), not further prepared:					
		(*a*) of lead	12·0	.. .. ..	11·90	**11·90**	273*b*
		(*b*) of tin or Britannia metal	9·50	Of tin	9·52	..	275*b*
				Of Britannia metal:			
				over 0·5 mm. thick	19·05	**19·05**	276*c*
				less than 0·5 mm. thick	23·81	**21·43**	276*d*
		(*c*) of zinc	7·20	.. .. ..	7·14	**3·57**	274*b*
		(*d*) of copper, nickel, aluminium, and other base metals and alloys not specially named, of the thickness:					
		(1) more than 0·5 mm.	19·00	.. .. ..	19·05	**19·05**	..
		(2) 0·5 mm. or less	24·00	.. .. ..	23·81	**21·43**	276*d*
	492	Sheets or plates, hollowed or perforated:					
		(*a*) of lead	12·00	.. .. ..	11·90	**11·90**	273*b*
		(*b*) of tin or Britannia metal	9·50	Of tin	9·52	..	275*b*
				Of Britannia metal	23·81	**23·81**	276*d*
		(*c*) of zinc	12·00	.. .. ..	11·90	**7·14**	274*c*
		(*d*) of copper, nickel, aluminium, and other base metals and alloys not specially named	25·00	.. .. ..	23·81	**23·81**	276*d*
	493	Sheets and plates of all kinds (base metals), polished, varnished, enamelled, nickel-, brass-, copper-plated or plated with other base metals, with coloured or stamped designs thereon	29·00	Sheets and plates, with designs coloured or stamped thereon	47·62	**42·86**	279
				Others	28·57	..	278*b*
	494	Sheets and plates of base metals, gilded or silvered, also plated with gold or silver	60·00	Sheets and plates of copper and brass, plated (silvered)	71·43	**47·62**	276*e*
				Sheets and plates, gilded, silvered, and ornamented with stamped designs	238·10	**238·10**	309
	495	Bar (base) metal and beaten lead for the production of foil	24·00	.. .. ..	47·62	**42·86**	279
	496	Rods, bars, and wire (rolled, drawn):					
		(*a*) of lead	12·00	.. .. ..	11·90	**11·90**	273*b*
		(*b*) of tin or Britannia metal	9·50	Of tin	9·52	..	275*b*
				Rods and bars of Britannia metal and wire of more than 0·5 mm. thickness	19·05	**19·05**	276*c*
				Wire of Britannia metal of 0·5 mm. thickness or less	23·81	**21·43**	277*d*
		(*c*) of zinc:[1]					
		1. Rods and bars	7·20	.. .. ..	7·14	**3·57**	274*b*
		2. Wire	12·00	.. .. ..	11·90	**7·14**	274*c*
		(*d*) Of copper, nickel, aluminium, and other base metals and alloys, of the thickness:					
		1. Over 0·5 mm.	19·00	.. .. ..	19·05	**19·05**	276*c*
		Note.—Rolled rods and roll wire and strips cut from ingots, &c., of the metals named in (*d*), for wire-drawing works, by permit, under the prescribed conditions and regulations	12·00	This statement is not contained in the old tariff.			
		2. 0·25—0·5 mm.	24·00	.. .. ..	23·81	**21·43**	276*d*
		3. 0·25 mm. or less	28·00				
	497	Rods, bars, and wire, polished, varnished, enamelled, plated with nickel, copper, brass, or other base metals, with designs stamped thereon:					
		(*a*) of lead, tin, Britannia metal or zinc	29·00	Not separately classified in the old tariff.			
		(*b*) of copper, nickel, aluminium, and other base metals and alloys, of the thickness:					
		1. Over 0·25 mm.	29·00				
		2. 0·25 mm. or less	36·00				
	498	Copper wire, cemented; wire from base metals or alloys, silvered or plated with silver; all these also laminated, but not further worked	72·00	.. .. ..	71·43	**71·43**	276*e*
	499	Wires from base metals or alloys, gilded or plated with gold, also laminated, but not further worked, of the thickness:					
		(*a*) over 0·5 mm.	72·00	.. .. ..	238·10	**238·10**	309
		(*b*) 0·5 mm. or less	300·00				
XLIII. Noble Metals.	560	Gold, silver, platinum, and other noble metals, not specially named, crude, also old, broken, and scrap	Free	.. .. ..	Free	..	296

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS—*continued.*

New Tariff.				Previous Tariff.			
					Previous Duty.		
ection.	No.	Article.	New Duty.	Article.	Auto-nomic.	By Special Tariff	No. in Previous Tariff.
			Kronen per kilo.		Kronen per 100 kilos.		
XLIII. Noble etals—*cont.*	562	Plates, sheets, rods, and wire of noble metals:					
		(*a*) of gold or platinum	5·50	.. .. ..	476·19	..	308
		(*b*) of silver, also gilded or plated with gold (with the exception of the wire classified under No. 564)	2·40	Sheets and wire of noble metals ..	..	**238·10**	..
	563	Genuine gold-leaf and silver-leaf:					
		(*a*) hammered silver	0·60	.. .. ..	119·05	..	314
		(*b*) prepared silver-leaf	1 50				
		(*c*) gold leaf	6·00	.. .. ..	476·19	..	308
	564	Wire from fine silver, or from fine silver with base metal, also gilded or plated with gold, with a diameter of 2 mm. or less	6·00	.. .. ..	476·19	**238·10**	308
	569	Platinum wire for scientific or industrial use	6·00	.. .. ..	..	**476·19**	..
			Per 100 kilos.				
XLV. ommon Salt.	592	Common salt, both in the unmixed condition (rock- and sea salt, &c.), and also mixed with other substances (salt-liquors, &c.), so far as such mixtures are not classified under other numbers *Notes.*—1. Besides the duty, a license tax of 20 kronen per centner is levied. 2. The Finance Minister can allow the importation of foreign salt, free from duty and license-tax, for technical, manufacturing, and other industrial purposes, under the prescribed conditions and regulations.	2·00 (only by special concession)	Common salt (sea- and rock-salt, &c., salt solutions and sea-water). *Notes.*—1. In the case of a special concession, the license-tax amounts to 18 k. 76 h. per 100 kilos. net of common salt, and 3 k. 76 h. per 100 kilos. net of "Kreuznacher" mother liquors. 3. The Finance Minister can permit the tax-free importation of foreign salt to works and manufactories, at which chemical products, other than luxuries, are prepared, requiring large quantities of salt in their manufacture.	2·00 (only by special concession)	..	317
	593	Common salt, chemically pure (*Chlornatrium chemice purum*); so id products from salt springs for medicinal or scientific purposes, under the prescribed conditions and regulations ..	22·00				
	594	Brines, and liquors containing salt, for medicinal purposes, under the prescribed conditions and regulations ..	5·80				
	595	Sea water in the natural condition (*i.e.*, not enriched)	Free				
XLVI. hemical gents and Products.	596	Elements specially mentioned:					
		(*a*) sulphur (in pieces and rods), also ground and flowers of sulphur phosphorus; antimony, metallic; (antimony regulus); mercury	Free	Antimony, metallic; mercury Others	Free Free	**Free** **Free**	276*a* 318
		(*b*) arsenic, metallic	1·20	.. .. ..	1·19	..	320
	597	Oxides and bases, specially mentioned:					
		(*a*) caustic potash, caustic soda, solid	9·60	Caustic potash Caustic soda	9·52 9·52	**3·57** **7·14**	324
		(*b*) caustic potash and soda solutions	4·80	.. .. ..	9·52	**3·57**	324
		(*c*) barium hydroxide; magnesia, calcined (magnesium oxide, chemically not pure)	1·20	.. .. ..	1·19	..	319*b*
		(*d*) barium peroxide	12·00	.. .. ..	11·90	..	325
		(*e*) alumina, artificial (aluminium hydroxide)	9·60	.. .. ..	9·52	**7·14** (in paste)	324
		(*f*) arsenious acid (arsenic trioxide)	1·20	.. .. ..	1·19	..	320
		(*g*) zinc white (white zinc oxide), zinc grey (grey zinc oxide)	9·60	.. .. ..	9·52	**7·14**	324
		(*h*) tin oxide, artificial (tin ashes) ..	14·50	.. .. ..	14·29	**7·14**	324
		(*i*) lead ashes	3·60	.. .. ..	3·57	..	322
		(*k*) litharge in scales and pieces (silver- and gold-litharge)	4·80	.. .. ..	4·76	**4·76**	322
		(*l*) litharge, ground, in powder; massicot and minium	9·60	.. .. ..	9·52	**9·52**	324
		(*m*) carbon dioxide, liquefied	7·20	.. .. ..	7·14	..	323
		(*n*) ammonia water (gas-liquor), enriched	1·20	.. .. ..	Free	..	353
		(o) ammonia solution (spirits of sal-ammoniac) and spirits of hartshorn	3·60	.. .. ..	3·57	..	322
		(*p*) ammonia, liquefied	14·50	.. .. ..	9·52	..	324
		(*q*) hydrogen peroxide	24·0	.. .. ..	23·81	**3·57**	331
	598	Acids, specially named:					
		(*a*) phosphoric acid, liquid	Free	.. .. ..	Free	..	318
		(*b*) hydrochloric acid; nitric acid (*aqua fortis*); wood vinegar (pyroligneous acid), crude	1·20	Nitric acid; wood vinegar (pyroligneous acid), crude Hydrochloric acid	1·19 1·19	.. **0·71**	320 320
		(*c*) sulphuric acid (sulphuric acid hydrate):					
		1 not fuming	2·0	.. .. ..	1·79	**1·19**	320
		2 fuming	3·0	.. .. ..	1·79	..	330

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS—*continued.*

NEW TARIFF.				PREVIOUS TARIFF.			
					Previous Duty.		
Section.	No.	Article.	New Duty.	Article.	Auto-nomic.	By Special Treaty.	No. in Previous Tariff.
			Kronen per 100 kilos.		Kronen per 100 kilos.		
XLVI. Chemical Agents and Products —*cont.*	598	Acids, specially named—*cont.*					
		(*d*) boric acid:					
		1 crude	Free	.. ..	Free	**Free**	318
		2 refined	7·20	.. .. ..	Free	**Free**	319
		(*e*) oxalic acid	12·0	.. .. ..	9·52	**9·52**	324
		(*f*) hydrofluoric acid)	24·0	.. .. ..	28·31	**23·81**	331
	599	Potassium, sodium, and ammonium salts, specially mentioned:					
		(*a*) manuring salts (crude potash salts in their natural condition, so called "Abraum" salts, and refuse salts, also artificial fertilizers from mixtures of salts); potassium chloride; sodium nitrate; crude borax; crude tartar; wine-lees, dry; vinasse charcoal ("Schlempekohle") ...	Free	Vinasse-charcoal as potash of 85 grade and below	1·90	**1·90**	321*a*
				Vinasse-charcoal as potash of over 85 grade	3·57	**1·90**	321*c*
				Wine-lees	Free	..	354
				Other	Free	**Free** (not for manuring salts.)	318, 319*c*
		Note.—Manuring salts must be forwarded in accordance with the prescribed rules					
		(*b*) Glauber's salt (sodium sulphate)	0·50	.. .. ..	0·48	..	319*b*
		(c) potassium sulphate (duplicate salt); potassium- and sodium bisulphate; tartar preparations; potassium carbonate containing up to 85 per cent. of K_2CO_3	1·90	.. .. ..	1·90	**1·90** (not for tartar preparations.)	321*a*
		(*d*) sodium carbonate, crude or crystallised	1·50	.. .. ..	1·90	**1·90**	321*a*
		(*e*) potassium carbonate containing more than 85 per cent. of K_2CO_3; water-glass, solid	3·60	Potassium carbonate containing more than 85 per cent. of K_2CO_3.	3·57	**1·90**	321*c*
				Water-glass, solid	3·57	**2·38**	322
		(*f*) sodium carbonate, calcined; liquid water-glass	2·40	Sodium carbonate, calcined	2·86	**2·86**	321*b*
				Water-glass, liquid	3·57	**2·38**	322
		(*g*) ammonium sulphate and chloride	3·60	.. .. ..	3·57	..	322
		(*h*) potassium nitrate	4·80	Saltpetre (potassium nitrate) refined	4·76	**4·76**	322
		(*i*) potassium- and sodium bicarbonate; refined borax, sodium sulphite, solid; sodium bisulphite, sodium hyposulphite	7·20	Borax, refined	7·14	**5·95**	323
				Potassium- and sodium bicarbonate	7·14	**7·14**	323
				Sodium sulphite, sodium bisulphite, and sodium hyposulphite, solid	9·52	**9·52**	324
		(*k*) sodium nitrite, crude potassium and sodium manganate and permanganate, potassium oxalate, refined tartar, ammonium carbonate	9·60	Refined tartar	Free	**Free**	318
				Ammonium carbonate	7·14	**4·76**	323
				Sodium nitrite	9·52	..	324
				Others	9·52	**9·52**	
		(*l*) sodium bisulphite in aqueous solution	3·60	.. .. ..	9·52	**3·57**	324
		(*m*) potassium and sodium chromate, yellow; and potassium and sodium bichromate, red, ammonium acetate, potassium acetate (also potassium pyrolignite), sodium acetate (and sodium pyrolignite)	14·50	Potassium acetate, sodium acetate	23·81	**23·81**	331
				Ammonium acetate	14·29	..	324
				Others	14·29	14·29	
		(*n*) potassium and sodium ferrocyanide and ferricyanide; calcium ferrocyanide	20·00	Calcium ferrocyanide	14·29	..	324
				Potassium and sodium ferrocyanide and ferricyanide	14·29	9·52	
		(*o*) potassium and sodium sulphide, also liver of sulphur; ammonium sulphide, potassium and sodium chlorate, sodium phosphate	24·00	Potassium chlorate	23·81	14·29	331
				Others	23·81	23·81	
	600	Calcium, strontium, barium, and magnesium salts, specially mentioned:					
		(*a*) calcium citrate and tartrate, magnesium chloride	Free	Calcium citrate and tartrate	Free	**Free**	318
				Magnesium chloride	0·48	..	319*b*
		(*b*) strontium carbonate, artificial; strontium hydroxide	0·50	.. .. ..	0·48	.	319*b*
		(*c*) calcium chloride, impure, annaline (artificial calcium sulphate), crude barium sulphide; artificial barium carbonate	1·20	.. .. ..	1·19	..	320
		(*d*) spodium (bone charcoal)	2·40	Bone charcoal, new or revivified	1·19	..	320
		(*e*) chloride of lime	3·60	.. .. ..	3·57	**1·79**	322
		(*f*) gas-lime	3·60	.. .. ..	3·57	..	332
		(*g*) brilliant white (Glanzweiss), baryta white (artificial barium sulphate), magnesium sulphate (Epsom salts)	7·20	Brilliant white (Glanzweiss)	7·14	..	323
				Baryta white	7·14	**4·76**	
				Magnesium sulphate	9·52	**7 14**	324
		(*h*) calcium sulphite, bisulphite, and hyposulphite, solid	9·60	.. .. ..	9·52	**9·52**	324
		(*i*) calcium sulphite, bisulphite, and hyposulphite, in aqueous solution	3·60	Calcium sulphite and hyposulphite in aqueous solution	9·52	**9·52**	324
				Calcium bisulphite in aqueous solution	9·52	**3·57**	

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS—*continued.*

New Tariff.				Previous Tariff.			
					Previous Duty.		
ection.	No.	Article.	New Duty.	Article.	Autonomic.	By Special Treaty.	No. in Previous Tariff.
			Kronen per 100 kilos.		Kronen per 100 kilos.		
LVI. hemical ents and ducts—*cont.*		Calcium, strontium, barium—*cont.*					
		(*k*) calcium acetate (pyrolignite) .	14·50	.. .. ..	14·29	**7·14**	324
		(*l*) calcium carbonate (artificial), calcium phosphate (artificial), calcium carbide, strontium nitrate, barium chloride, barium nitrate	24·00	.. .. ..	23·81	**23·81**	331
	601	Aluminium, iron, chromium, nickel, and cobalt compounds, specially mentioned :					
		(*a*) iron mordants of all kinds, ferrous sulphate, zaffre, smalt, strewing-glass	1·20	Ferrous sulphate	1·19	**1·19**	320
				Others	1·19	..	
		(*b*) alums ; aluminium sulphate and chloride	3·60	.. .. ..	3·57	..	322
		(*c*) aluminium acetate and pyrolignite	14·50	.. .. ..	14·29	**7·14**	324
		(*d*) iron sulphide (artificial), iron sesquichloride (solid), nickel sulphate ; also nickel ammonium sulphate	24·00	.. .. ..	23·81	**23·81**	331
	602	Copper, lead, zinc, and tin compounds, specially named :					
		(*a*) copper sulphate, mixed iron and copper sulphates	3·60	.. .. ..	3·57	..	322
		(*b*) zinc sulphate	3·60	.. .. ..	3·57	..	322
		(*c*) verdigris	7·20	.. .. ..	7·14	**3·57**	323
		(*d*) white lead	9·60	.. .. ..	9·52	**9·52**	324
		(*e*) lead pyrolignite, tin salt (stannous chloride) and other tin compounds, lead sulphate (also lead sediment), lead acetate, basic lead acetate	14·50	Tin salt and other tin compounds	14·29	**7·14**	324
				Lead pyrolignite, lead acetate, and basic lead acetate	14·29	**11·90**	
				Lead sulphate ; also lead sediment	14·29	..	
		(*f*) copper nitrate, lead nitrate, zinc chloride, white zinc sulphide, lithopone, "Griffith's white."	24·00	Lithopone, "Griffiths' white"	9·52	**7·14**	324
				Zinc chloride ; also liquid	23·81	**4·76**	331
				Others	23·81	**23·81**	
	603	Sulphur, selenium, antimony, and arsenic compounds, specially named :					
		(*a*) antimony sulphide ("Spiessglanz"), carbon bisulphide	Free	Antimony sulphide	Free	**Free**	331
				Carbon bisulphide	3·57	..	332
		(*b*) arsenic sulphide (orpiment, realgar)	1·20	.. .. ..	1·19	..	320
		(*c*) selenium sponge	3·60	.. .. ..	3·57	..	322
		(*d*) sulphur chloride	24·00	.. .. ..	23·81	**23·81**	331
	604	Organic compounds, specially mentioned :					
		(*a*) crude glycerin	3·00	.. .. ..	1·90	**1·90**	321*a*
		(*b*) refined glycerin, *i.e.*, water-white and otherwise coloured, ash-free	12·00	.. .. ..	1·90	**1·90**	322*a*
		(*c*) aniline oil ; nitrobenzol ; crude anthracene ; crude naphthalene, crude carbolic acid	3·60	.. .. ..	3·57	..	322
		(*d*) pyridine bases	24·00	.. .. ..	23·81	**23·81**	331
		(*e*) cresol (cresylic acid, mother liquors from crystallised pure carbolic acid)	9·60	.. .. ..	9·52	..	324
		(*f*) creolin, lysol, and similar preparations	24·00	.. .. ..	23·81	**23·81**	331
	605	Other chemical agents and products :					
		(*a*) Soot, charcoal powder, and other ground blacks, except the granulated bone charcoal mentioned under No. 600 (*d*)	4·00	Soot, charcoal powder and charcoal-black, except granulated bone-charcoal	3·57	..	325
	606	Bistre	6·00	.. .. ..	3·57	..	325
	607	Prepared blacks	15·00	.. .. ..	11·90	**11·90**	325
	608	Blacking :		Blacking :			
				Also thick liquid	11·90	**9·52**	325
		(*a*) black, not liquid	12·00	preparations not containing resin, turpentine, &c.	23·81	**23·81**	331
				preparations containing resin, turpentine, &c., as lac varnishes	57·14	**57·14**	335
				(*b*) other preparations, also so-called leather creams	..	**60·00**	..
	609	Cements	7·00	.. .. ..	7·14	**4·76**	323
	610	Gelatin (purified, dried animal and vegetable jellies), also powdered, and goods thereof	30·00	Gelatin (animal and vegetable jellies)	14·29	**9·52**	326
				Goods of gelatin (jellies), also powdered gelatin	23·81	**23·81**	332
	611	Glue of all kinds, also isinglass	14·50	.. .. ..	14·29	**9·52**	326
	612	Albumin and albuminoids ; casein, casein-gum	14·50	.. .. ..	14·29	..	326
	613	Starch (also starch flour)	16·00	.. .. ..	14·29	**14·29**	328
	614	Starch gum (dextrin, &c.) and other gum-substitutes not specially mentioned ; pastes, dressing preparations and similar pasting and finishing preparations containing starch flour.	18·00	.. .. ..	7·14	**7·14**	327
				Dextrin, which, according to tests with Fehling's solution, contains 15 per cent. or more of reducing substances expressed as dextrose, is treated as starch-sugar.			

GENERAL TARIFF FOR THE AUSTRO-HUNGARIAN CUSTOMS—*continued.*

New Tariff.				Previous Tariff.			
					Previous Duty.		No. Previ
Section.	No.	Article.	New Duty.	Article.	Autonomic.	By Special Treaty.	Tar
			Kronen per 100 kilos.		Kronen per 100 kilos.		
XLVI. Chemical Agents and Products—*cont.*	615	Pressed yeast	55·00	.. .. ..	47·62	..	329
		Note.—This duty includes the brandy excise tax.					
	616	Yeast, other, except wine-lees and pressed yeast	24·00	.. .. ..	23·81	..	329
		Note.—Seed-yeast (mother-yeast) for breweries, under the prescribed conditions and regulations	Free	Treated as other yeasts.			
	617	Phosphates, rendered soluble by acids (superphosphates)	Free	.. .. ..	Free	**Free**	333
	618	Soap substitutes, not perfumed; polish; toilet-pastes, not containing soap; starch-glaze	24·00	Starch glaze	14·29	**14·29**	329
				Others	23·81	**23·81**	331
	619	Collodion, chloroform, methyl alcohol (wood-spirit), acetone; acetic acid, concentrated	60·00	Concentrated acetic acid, also acetone	57·14	**47·62**	333
				Others	57·14	..	
	620	Ethers:					
		(*a*) ethyl ether (sulphuric ether)	145·00	.. .. ..	57·14	..	333
		(*b*) other simple and also all compound ethers, also œnanthic ether:		Simple ethers, mixtures of the same, compound ethers which possess no characteristic pleasant odour	57·14	..	333
		1. in casks	200·00	All others, especially old, with pleasant odour	178·57	..	337
		2. in other receptacles	300·00				
	621	Liquefied gases, not specially mentioned	15·00	.. .. ..	23·81	**23·81**	331
	622	Chemical agents and products not specially mentioned	15 % of the value.	.. .. ..	23·81	**23·81**	331
		Note.—This duty is limited to an amount of 120 kronen per 100 kilos.		Tartaric acid	..	**14·29**	
				Aqueous solutions of sulphurous acid	..	**3·57**	
XLVII. Varnishes, Colouring-, Medicinal-, and Perfumery Articles.	623	Oil varnishes (not containing resins, turpentine, or mineral oil):					
		(*a*) in casks	12·00	.. .. ..	11·90	..	334
		(*b*) in tin canisters, bottles, &c.	24·00	.. .. ..	23·81	..	334½
	624	Lac-varnishes (containing resins, turpentine, mineral oil, or alcohol)	60·00	.. .. ..	57·14	**57·14**	335
	625	Tar dyestuffs	15 % of the value.	.. .. ..	23·81	**3·57**	330
		Note 1.—This duty is limited to an amount of 120 kronen per 100 kilos.					
		Note 2.—Derivatives from the destructive distillation of coal-tar for further treatment in colour works, by permit, under the prescribed conditions and regulations	Free	Derivatives, classified under Nos. 117, 322, 330, and 331, from the destructive distillation of coal-tar, for further treatment in colour-works, by permit, under the prescribed conditions and regulations	..	Free	
	626	Colours, not specially mentioned	24·00	Artificial organic dyestuffs	23·81	**3·57**	330
				Others	23·81	**23·81**	331
	627	All colours in tablets, bars, paste, tubes, drums, dishes, glsses, shells, boxes	65·00	.. .. ..	57·14	**57·14**	333
	628	Inks, ink-powders, sealing wax	24·00	Also sealing-wafers	23·81	**23·81**	332
	630	Medicinal substances, prepared, also all substances indicated by their inscriptions, labels, wrappers, &c., to be medicinal or veterinary agents; wadding and bandages for medicinal purposes	57·00	.. .. ..	57·14	**57·14**	336
		Note.—Medicinal goods, prepared, containing more than 15 per cent. by vol. of alcohol, are taxed as treated, distilled spirituous liquors.					
	631	Vinegars, fats, and oils, perfumed:					
		(*a*) in receptacles of 5 kilos or more,	24·00	.. .. ..	23·81	**23·81**	108
		(*b*) in receptacles of less than 5 kilos.	180·00	.. .. ..	178·57	..	337
	632	Alcoholic aromatic essences	300·00	Also essential oils, pleasant smelling waters, and perfumed vinegars, with addition of alcohol	178·57	..	337
	633	Perfumery articles (also all scented substances designated as perfumery articles by their labels, directions for use, &c.), cosmetics:					
		(*a*) non-alcoholic (cosmetic paint): perfumed powder, hair-oil, pomades, tooth-pastes, fumigating tapers	180·00				
		(*b*) alcoholic	300·00	.. .. ..	178·57	..	337
XLVIII. Candles, Soaps, and Wax Articles.	635	Tallow candles	14·00	.. .. ..	14·29	..	339
	636	Candles and articles made from fat, not specially named, from stearine, spermaceti, palmitine, paraffin, and other fats	28·00	.. .. ..	26·19	**21·43**	341
	637	Soaps:					
		(*a*) ordinary	12·00	.. .. ..	9·58	**5·95**	342*a*
		(*b*) fine, *i.e.*, perfumed or in tablets, balls, boxes, &c.	36·00	.. .. ..	35·71	..	342*b*

General Tariff for the Austro-Hungarian Customs—*continued*.

New Tariff.				Previous Tariff.			
Section	No.	Article.	New Duty.	Article.	Previous Duty. Auto-nomic.	Previous Duty. By Special Treaty.	No. in Previous Tariff.
			Kronen per 100 kilos.		Kronen per 100 kilos.		
				Also Turkey-red oil	..	**5·95**	
XLVIII. Candles, oaps, and Wax rticles—*cont.*	638	Wax candles, wax torches, wax tapers, night-lights, wax matches	60·00	.. .. ..	59·52	..	340
				Wax and stearine matches enclosed in boxes	..	**7·14**	
				Wax candles, wax tapers, wax torches	..	**28·57**	
				Night-lights attached to floats of cork, cardboard, &c.	..	**35·71**	
XLIX. Combustible Goods.	640	Match-goods, ordinary; sulphur matches, lucifer matches, pipe matches, German tinder, natural, impregnated; German tinder, artificial; tinder (natural and artificial); touch-paper	17·00	Lucifer matches Others	16·67 16·67	**11·90** ..	343
	641	Firework substances	72·00	Also fireworks	57·14	**57·14**	344
	642	Slow-matches (match and blasting cord)	60·00	.. .. ..	57·14	**57·14**	344
				Slow-matches (match- and blasting cord), which are manufactured without the use of gunpowder	..	**35·71**	
	644	Cartridges, percussion caps, and detonating caps with igniting material adjusted (charged)	145·00 only by special concession	Only filled with igniting material. Adjusted (charged)	57·14 125·00 only by special concession.	.. ..	345 346
	645	Explosives prepared from the constituents of gunpowder (nitre, sulphur, and charcoal)	145·00 only by special concession.	.. .. ..	125·00 only by special concession.	..	346
	646	All other explosives not mentioned elsewhere	60·00 only by special concession.	.. .. ..	57·14 only by special concession.	..	347
LI. Waste Products.	652	Manures, animal and other, also artificial fertilisers (not mixtures of salts) except superphosphates (No. 617); wood- and coal-ashes; bones; bone ashes; bone meal; waste bone charcoal only applicable for manuring purposes; Thomas- and other slags; horn- and hoof-clippings; residues from cyanide (ferro- and ferri-) works; ammonia water (gas-liquor) not enriched	Free	Thomas- and other slags Others	Free Free	**Free** ..	102 353
	653	Bran (also almond meal; rice waste: malt grains: solid residues from the manufacture of fatty oils, also ground; distillers' residues; beet cuttings, extracted	Free	.. .. ..	Free	..	354
	654	Grains and marc:					
		(*a*) grape marc	15·00	.. .. ..	Free	..	354
		Note.—If for the manufacture of brandy, by permit, under the prescribed conditions and regulations	Free	This statement is not contained in the old tariff.			
		(*b*) other	Free	.. .. ..	Free	..	354
	655	Wine-lees in the form of dough	5·0	.. .. ..	Free	..	354
		Note.—If for the manufacture of brandy, by permit, under the prescribed conditions and regulations	Free	This statement is not contained in the old tariff.			
		2. Liquid wine-lees is dutiable as wine.					
	656	Waste from glass manufacture, also broken glass, cullet, and earthenware fragments; leather for glue	Free	.. .. ..	Free	..	355
	657	Rags and other waste from paper manufactories	Free	.. .. ..	Free	..	356

—A. S.

hemical Agents and Products in Austro-Hungary; Influence of the New Customs Tariff on ——.

E. Medinger. Neue Freie Presse, Jan. 29, 1903.

One of the most satisfactory features of the new tariff is he introduction of *ad valorem* duties for chemical agents nd products not specially mentioned and for coal tar dyetuffs—an alteration which will act favourably in the interests f manufactories, both those in being and those contemlated, and also, in many cases, of the consumer. The previous duty of 10 gulden (gold) formed, in many cases, only an extremely small fraction of the value, and could therefore have no influence on the imports. On the other hand, the consumer was often prevented from buying cheaply abroad chemical agents not manufactured in Austro-Hungary, as in this case the import duty was prohibitive. A further advantage of the new tariff is a better classification, and especially a removal of the many anomalies in the old tariff, by which a manufactured article either paid no duty or the same or less than the raw materials from which it was produced. The small reduction of the duty on sodium carbonate is also satisfactory, although the decrease is not so great as desired by the numerous industries making use of this substance. It is regrettable, on the contrary, to note the increased duty on sulphuric acid, especially as sulphuric acid works will not profit thereby, owing to the tax imposed on the raw material, pyrites.

The whole tendency of the tariff appears to be to free from duty, to reduce, or, at the least, not to increase the duty on articles employed in agriculture.—A. S.

Cotton Industry in Austro-Hungary; Influence of the New Customs Tariff on the ——.

L. Pollack. Neue Freie Presse, Jan. 29, 1903.

The writer states that the increased taxes, especially on yarn, will not affect the export trade if a rebate is allowed on goods prepared from imported yarns and then re-exported. The regulations under which the proposed rebate would be allowed should not require strict proof of identity of the exported materials with the imported yarn. This rebate is doubly desirable in view of the increased taxes on coal-tar dyestuffs and other chemicals, which will render the cost of production of textile materials greater. A rebate for imported raw cotton fabrics is of special importance for printing-, bleaching-, and dyeing-works.—A. S.

Russian Customs Tariff; New ——.

Frankfurter-Zeit., Feb. 1, 1903.

According to the "Russischen Handels-Telegraphen-Bureau" the new tariff is distinguished from the preceding one by a more detailed classification of the articles. The following chemical products are mentioned separately:—Salts of chromic acid soluble in water (potassium chromate, sodium chromate, &c.), 3·97½ roubles per pood (formerly 2·15); tannic acid (tannin), 1 (formerly 5); copper sulphate, also anhydrous zinc sulphate, zinc chloride, 1·50 (0·80). Chemical and pharmaceutical products not specially mentioned, 5 (1·50); barium sulphate and carbonate, artificially prepared, 1·50 (0·80). The following products are taxed at a higher rate than before:—Iodine and bromine, refined boric acid, 3·60; potassium and sodium iodide, 20; antipyrine, salipyrine, phenacetine, 20 (15); white lead and zinc white, 0 90 (0·50); red lead, 0·50 (0·35); copper and copper-arsenic colours, 6 (0·35); dyestuffs (pigments) from coal tar, alizarin, madder extract, madder or alizarin lake, cochineal-carmine, carmine lake, indigotin (indigo extract in the dry condition), 25 roubles per pood (formerly 14).

[*Note.*—1 rouble = 3*s.* 2·06*d.*; 1 pood = 36·112 lb.]

—A. S.

II.—FUEL, GAS, AND LIGHT.

Coke Production in Germany.

U.S. Cons. Reps., Jan. 27, 1903.

The firms and companies included in the German Tar Selling Syndicate produced coke in 1901 as follows:—

	Tons.
In the Ruhr district (Westphalia)	10,000,000
In Silesia and Saxony	1,820,000
In Aix and Saar districts	1,200,000
Total.......... ..	13,020,000

Of this whole amount, 6,900,000 tons of coke were made in retort ovens, almost all of the Otto-Hoffman type, from which, besides the saving of gas generated by the coking process, other secondary products were recovered, which were valued as follows:—

	Dols.
Tar	1,237,600
Sulphate of ammonia	4,247,300
Benzol	1,175,720
Total.............	6,660,620

Reckoning the value of the 6,900,000 tons of coke thus produced at 13 marks (3·09 dols.) per ton, which was the mean average rate for blast-furnace coke during the ye under consideration, we find the following result:- 6,900,000 tons of coke, valued at 21,321,000 dols.; ta ammonia, and benzol derived therefrom, 6.660,620 dols.

Unfortunately, there are no exact statistics from whi the value of the gas saved by the retort ovens, and used f steaming, heating, and illuminating purposes can be derive but it would be a fair estimate to assume that the gas w worth at least one-fourth as much as the coke, and that t aggregate value of all secondary products — gas, t ammonia, and benzol—was not less, but rather more, th one-half that of the coke, which under the "beehiv system is the sole marketable product obtained.

Coke and By-products at Bilbao (Spain).

Foreign Office Annual Series, No. 2924.

There was a large decrease in the amount of co imported into Bilbao in 1901, due to a considerable increa in the production in the ovens of local ironworks, whi turned out 50,000 tons more than in 1900, and to addition importations overland for Bilbao ironworks from Leon a Palencia. The latter importation was estimated at 30,6 tons.

The Semet-Solvay coke ovens of the Altos Hornos Iro works Company were built during 1901. They consist three batteries of 25 ovens each, carbonising approximate 110,000 tons of coal annually. This form of oven is adapt for treating a mixture of British coal and the comparativel dry coal brought down by the Robla Railway from the co fields of Leon. The by-products obtained from these ove are sold locally, and consisted of 3,000 tons of coal tar a from 900 to 1,000 tons of sulphate of ammonia, for t latter of which a free market has been created by the lar extension of the beet sugar industry in Spain. The Sime Carvés coke ovens in Sestao, now amalgamated with t Altos Hornos, produced about the same quantity of coal ta and sulphate of ammonia as that just mentioned.

IV.—COLOURING MATTERS AND DYESTUFFS.

Dye Woods in Mexico.

Foreign Office Annual Series, No. 2925.

The two principal varieties of dye-woods sent out of t country are logwood and fustic. The greater part of the are exported from the ports on the Gulf of Mexico, sout of Vera Cruz, and consist of 47,000 tons of logwoo valued at 140,591*l.*, as compared with 39,435 tons in 190 which were valued at 139,945*l.*; and 4,650 tons of fusti representing a value of 11,002*l.*, as compared with 5,75 tons exported in 1900, valued at 13,060*l.*

Logwood in Hayti.

Foreign Office Annual Series, No. 2927.

On logwood and logwood roots the export duty i 1 dol. 50 cents gold per 1,000 lb. For the year 1900—01 71,400,847 lb. of logwood and 54,766,100 lb. of roots wer shipped, by far the largest quantities being from Port d Paix and Cape Hayti. Low prices in the United States an in Europe left hardly any profit after paying the expor duty. Prices on the spot were from 1*l.* 4*s.* 6*d.* to 2*l.* 0*s.* 8*d* per ton; for roots 16*s.* 3*d.* to 1*l.* 8*s.* 6*d.* per ton.

VII.—ACIDS, ALKALIS, Etc.

Drugs and Chemicals in Mexico.

Foreign Office Annual Series, No. 2925.

The chemical products show a decrease in value from las year. This may in part be accounted for by the fact tha the principal dealers in drugs and chemicals in this city now have their own factories, where they make many of th acids and drugs, as also a great part of the perfumery some of it being a very close imitation of foreign-mad soap and perfumery. The value of the imports of chemical and drugs in 1901 amounted to 508,181*l.*, as against 525,805*l.* in 1900.

Superphosphates at Bilbao (Spain).

Foreign Office Annual Series, No. 2924.

The "Sociedad Española de Dynamita" completed, during 1901, the extension of its sulphuric acid works, thus doubling their production of this article This step was necessitated by the large and increasing demand for superphosphates for beetroot cultivation.

Manufacture of White Arsenic in Canada.

P. Kirkegaard. Eng. and Mining J., 1903, **75**, 189.

The arsenic produced in Canada is obtained from the residues of the gold extraction works. These residues, arising from the working of mispickel, and containing about 30 per cent. of arsenic and 16 per cent. of sulphur, are dried and calcined at a high temperature for about 2½ hours.

The gaseous products of calcination are condensed, when they are found to contain about 85 per cent. of arsenic trioxide and 2 to 4 per cent. of sulphur. The crude oxide is purified by sublimation on the hearth of a reverberatory furnace, whereby practically pure arsenic trioxide is obtained.

The output of arsenic trioxide from Canada has increased steadily from 113,477 lb. in 1899 to 522,400 lb. in 1900, 1,346,983 lb. in 1901, and about 1,600,000 lb. in 1902.

—T. F. B.

VIII.—GLASS, POTTERY, Etc.

China, Glass, and Earthenware in Mexico.

Foreign Office Annual Series, No. 2925.

The value of the glass-ware imported into Mexico in 1901 amounted to 186,448*l*., as against 244,795*l*. in 1900. A large glass factory has been erected near the city of Puebla, where t is intended to try the production of all kinds of glassware.

The value of earthenware imported, principally from France and Germany, amounted to 66,006*l*., as against 1,334*l*. in 1900. This article was at one time principally n the hands of British manufacturers, but the proportion hat now comes from the United Kingdom is very much educed.

IX.—BUILDING MATERIALS, Etc.

Cement in Guipuzcoa (Spain).

Foreign Office Annual Series, No. 2924.

There are ten cement works in Guipuzcoa where hydraulic ement is made from natural rock. The total output in 901 was 82,081 tons. Cement is also made at Sestao from last furnace slag. After being closed for some years for ant of a proper technical administration, this business sumed operations in 1901 with good prospects of success, ue to the growing interest and reliability of the system reinforced cement known as "ciment armé." This tablishment can produce 50 tons daily.

Cement in Brazil.

Foreign Office Annual Series, No. 2928.

There was a considerable decrease in the importation of ment during the year under review, the quantity imported ing 89,509 barrels, compared with 144,698 barrels in 1900. lgium took the lead with 61,993 barrels, against 122,387 rrels in 1900. Germany came next with 19,200 barrels, ainst 17,144 barrels in 1900, then the United Kingdom th 7,693 barrels, against 3,925 barrels in 1900. Other untries supplied 623 barrels.

X.—METALLURGY.

Copper in Siberia.

U.S. Cons. Reps., Jan. 21, 1903.

Russia consumes annually about 22,000 tons of copper, ,000 tons being imported. Until very recently the tricts of the Ural and the Caucasus furnished the bulk of e copper produced in Russia—90 per cent. of the total. e ores are treated for obtaining the metal by electrolysis. For some time, however, it has been known that Central Siberia, especially the Government district of Krasnojarsk, contains immense deposits of copper ores, which extend almost to the Altai Mountains and contain a relatively high percentage of metallic copper. It is estimated that 21½ tons of ore would produce 1 ton of copper at an expense of about 95 dols. per ton. Since the Trans-Siberian Railroad, which traverses this district, has been completed, and the cost of transportation to Moscow, the chief market for Russian copper, has been greatly reduced, the total cost per ton at Moscow would be about 127 dols. During the last five years, the price for pure copper at Moscow varied between 430 dols. and 524 dols. per ton.

A Russian-English corporation has recently been formed and, it is reported, has received a concession from the Russian Government for the exploitation of an area of about 1,200 acres, about 110 miles from the River Yenisei and directly connected with the Trans-Siberian Railroad. Among other privileges, the corporation will be exempt from internal taxes for ten years.

The engineers of the corporation have already carefully examined the mines and have made the most favourable reports with reference to them, and also as to the timber in the locality.

Copper: Export from Mexico.

Foreign Office Annual Series, No. 2925.

The exports of copper and copper ore in 1901 were 42,047 tons, of which 36,080 tons were of pure copper, and 5,966 tons of ore. This increase in the exports is but the natural outcome of the development of many new properties, especially in the State of Sonora, where 144 were reported as being in existence in 1901, as against 69 in 1900. The total number of copper-producing properties paying taxes to the Government, as returned on Dec. 31, 1901, was 478, as against 352 on the same date in the previous year.

The greater part of the ore and refined metal is sent to the United States, which acts as the great distributing centre. British Columbia is the only other country supplying copper in any quantity to the United States.

Iron Ores at Bilbao (Spain).

Foreign Office Annual Series, No. 2924.

Of the entire quantity of 4,056,701 tons shipped in 1901, 2,281,198 tons were sent to the United Kingdom, being a decrease, as compared with 1900, of 820,365 tons. Germany, who takes phosphoric ore more readily than British ironmasters, increased her direct importation from Bilbao from 66,401 tons (in 1900) to 636,509 tons (in 1901). Canada appeared on the scene for the first time as a direct importer of over 7,000 tons of iron ore.

Manganese Ore in Brazil.

Foreign Office Annual Series, No. 2928.

During the year 1901 the total shipments of manganese ore amounted to 98,828 tons, representing a sterling value of about 142,000*l*., being an increase of 10,701 tons over 1900; a further increase is anticipated in 1902.

The principal countries importing manganese were as follows:—

	Tons.
United States	52,084
United Kingdom	26,020
Belgium	10,198
France	4,970

When greater facilities for the transport of manganese can be afforded by the State railway, manganese ore will form one of the principal articles of export from Brazil. Its exportation is as yet only on a limited scale, but with the employment of increased capital, and the opening up of new mines in other districts which abound in this mineral, very beneficial results should follow. The manganese ore extracted from Brazilian mines is superior in quality to that of any other country in the world. The ore extracted during the year from the different mines at present worked averaged about 52 per cent.

Zinc in Santander (Spain).

Foreign Office Annual Series, No 2921.

The district of Santander has for years past supplied more blendes and calamines than any other part of Spain, the former yielding from 40 to 46 per cent. and the latter from 30 to 40 per cent. of zinc. 1,151 men and 112 women are employed, and 14 engines, with 266 horse-power are used in the working and washing of these ores. Very little calamine was raised in Guipuzcoa, only 52 men and one 5 horse-power engine being employed. The official valuation of the zinc ores raised in 1901 varied from 35 to 41 pesetas (1*l*. 1*s*. 3*d*. to 1*l*. 5*s*.) per metric ton at the mines. There were 513 unworked zinc mines in the districts of Santander, Guipuzcoa, Viscaya, and Palencia, 388 being in Santander. The total production of zinc throughout Spain in 1901 was 117,912 tons. The district next in importance to Santander is Murcia.

Minerals in Bilbao District (Spain).

Foreign Office Annual Series, No. 2921.

The following minerals and other deposits exist in the Bilbao district, but were not worked in 1901:—

Articles.	Province.	No. of Concessions.
Sulphur	Viscaya	45
	Valladolid	1
Arsenic	Segovia	1
Manganese	Burgos	2
	Palencia	1
	Santander	4
Peat	Do.	4
Ochre	Burgos	1
Petroleum	Do.	[illegible]
Graphite	Santander	11
	Segovia	3
Sodium sulphate	Burgos	5
	Logroño	7
Antimony	Palencia	4
	Santander	1
Phosphate of lime	Soria	1

Spelter in Europe in 1902.

Eng. and Mining J., Jan. 24, 1903.

The spelter production of Upper Silesia in 1902 is estimated at about 113,000 metric tons. (In 1901 it was 107,967 tons.) The average quarterly price for the metal in that province, basis works, was as follows (in marks per 1,000 kilos.):—

Year.	I.	II.	III.	IV.
1900	400	400	360	350
1901	320	310	300	300
902	320	340	350	360

The price for sheet zinc rose from 42 marks per 100 kilos. at the beginning of the year to 46 marks, basis Oberhausen, at the end. Since October 1 the Kunigunde rolling mill, previously idle, has been in operation, and the new mill of Count Hugo Henckel at Antonienhütte has been completed, the Piela mill being surrendered to the Schlesische Actiengesellschaft.

Pig Iron Production in the United States.

The total production of all kinds of pig iron in the United States during 1902 was 17,821,307 gross tons, against 15,878,354 tons in 1901, and 13,789,242 tons in 1900.

Of the total iron produced last year, 378,504 tons only were made with charcoal as fuel; 11,665 tons with mixed charcoal and coke; and 17,431,138 with coke and anthracite coal—chiefly with coke. Of the total, 8,808,574 tons were made in the first half, and 9,012,733 tons in the second half of the year.

The division according to classes of iron made was a follows:—

—	1901.	1902.
	Tons.	Tons.
Foundry and forge iron	4,541,250	5,176,568
Bessemer pig	9,596,793	10,393,168
Basic pig	1,448,850	2,038,590
Spiegeleisen and ferro-manganese	291,461	212,981
Total	15,878,354	17,821,307

Stocks of pig iron unsold in the hands of manufacture or under their control at the close of 1902, and not intende for their own consumption, amounted to 49,951 tons, again 70,647 tons at the close of 1901, and 442,370 tons at t close of 1900.

The number of furnaces in blast on December 1902, was 307, against 266 on December 31, 1901; and 2 on December 31, 1900

Of the 17,821,307 tons of pig iron produced in 1902, t five largest producing states were: Pennsylvania, 8,117,8 tons; Ohio, 3,631,388; Illinois, 1,730,220; Alaba 1,472,211; and Virginia, 537,216 tons.

XIV.—TANNING; LEATHER; GLUE, Etc.

Gutta-percha.

India Rubber J., Feb. 2, 1903.

M. Octave Collet states, from inquiries made at Singapo the Malay Peninsula, Borneo, Rhio, the West Coast Sumatra, and Java, that *Palaquium oblongifolium* a *Payena lerii* are the kinds producing the best kind gutta. Singapore is the centre of the export trade. T bulk of the article so exported is swelled by adulterati a plastic kind of gum, probably balata, being mixed w the gutta. The export of the article from Singapore 25 per cent. more than the quantity imported. The gut percha tree cannot be profitably tapped standing. It best tapped after felling, and the incisions in the st must be made as close as possible to one another. company was started by Dr. Ledeboer in Dutch Indies extracting the gutta from the leaf, but the venture fai from the smallness of the capital and from the impossib of getting a large enough supply of leaves. Owing to k competition in the demand for leaves in the Rhio group islands, hardly any gutta-percha leaves can be had th now; all the young trees having been felled, besides F.M.S. Government and the Sultan of Johore have t bidden the export of gutta-percha leaves and young pla from their territories. The process answered in so far t every 60 piculs of fresh leaves yielded one picul gutta-percha. In 1900, a company was floated in Holla for winning gutta from leaves and began operations in following year. It intends to run gutta-percha plantati of its own. M. Collet shows that gutta-percha leaves fr distant forests cannot be procured in paying quanti The only chance of success is to start plantations o large scale to cultivate not only gutta-percha but rubber trees. As regards the materials dealt with, leaves have been found to contain more gutta than fr ones. M. Collet enters into calculations to show h profitable planting gutta-percha trees for leaf extract will prove to be, if properly conducted.

XVI.—SUGAR, STARCH, Etc.

Sugar in Würtemburg.

Foreign Office Annual Series, No. 2923.

The sugar ring formed about two years ago, which joined by all the factories and refineries in Germany, ab 400 in number, exercised some important effects on sugar industry. All the factories sell at the prices fixed the ring, important changes being forbidden. Consequen beet growing is not proving very lucrative, nor do the sugar factories attain the anticipated profits, in spite the fact that the Government grants premiums for expo sugar to the extent of 7*s.* per cwt., whilst the sugar ring grants a bonus on sugar sold in Germany.

The chief profits are made in refining alone. The export n 1900–01, to the United Kingdom and the United States of America, as well as to other countries, particularly Japan, has risen considerably.

The consumption in Germany did not equal that of the previous year. The last season, therefore, closed with much arger stock in hand than the former. A large local sugar factory reports a very favourable year, in spite of a slight ncrease in the price of beet and a further rise in coal, coke, and limestone.

Sugar in British Guiana during 1902.

Argosy, Jan. 3, 1903; *through Bd. of Trade J., Feb.* 5, 1903.

The quality of the cane juice in 1902 was fair, and canes contained from 12 to 13 per cent. of crystallisable sugar. The exports of sugar for the year amounted to about 120,000 tons. The exports for the previous three years were as follows:—

	Tons.
1899	81,538
1900	95,228
1901	92,997

The average cost of production per ton of sugar during 1902 was about 45 dols., or, deducting value of rum made, about 41 dols. net per ton.

The area under cane cultivation during 1902 was 73,800 acres, as compared with 66,000 acres in 1897.

Sugar Crop of Cuba in 1902.

Bd. of Trade J., Feb. 5, 1903.

Manufacturers have delivered for export 5,327,539 bags of raw sugar, weighing 761,077 tons. The exports in 1901 only amounted to 560,700 tons. The local consumption reached about 40,250 tons, and there remains in stock 8,727 tons, as against 37,079 tons 12 months previously. After making deduction for old stock, the crop is found to have been, in 1902, 850,181 tons, against 635,556 tons in 901, being an increase of 214,625 tons. The whole of the exports went to the United States, principally to the northern ports.

Sugar Yield in Russia.

U.S. Cons. Rep., Jan. 26, 1903.

The yield of beetroots for the fiscal year ended November 1, 1902, according to statements of the Ministry of Finance, is 537,617,730 poods (8,741,589 tons), or 7·3 per ent. more than for the same period last year; but owing o a cold and rainy season, 21 per cent. of the total amount remains unharvested. The beetroots are of a higher quality than those of last year in the south-western and central region, but inferior in the Vistula region.

XVII.—BREWING, WINES, SPIRITS, Etc.

Beer in Würtemburg.

Foreign Office Annual Series, No. 2923.

During the last few years the brewing industry has been eadily increasing, but it was unfavourably influenced uring 1901 by various factors, notably the great over-roduction. In 1901 wine entered largely into competition with beer, as the harvest in 1900 had been unusually good, hile other industries were at a low ebb. Also, the increase in the malting duty and legislative enactments regarding the quality of the ingredients contributed to the decline.

Spirits and Vinegar in Würtemburg.

Foreign Office Annual Series, No. 2923.

Conditions of sale and manufacture of spirits of wine and inegar were unsatisfactory, much as in 1900, and call for ttle notice. Prices for spirits of wine and methylated pirit fell from 10 to 12 per cent. on 1900 prices. The sale f vinegar was extremely dull, even more so than in the year 1900. It seems scarcely possible for the home industry to compete with the foreign import from Austria, Holland, and France. The preparation of vinegar from spirits of wine is still heavily pressed by the manufacture of acetic acid from calcium acetate.

XIX.—PAPER, PASTEBOARD, Etc.

Paper in Mexico.

Foreign Office Annual Series, No. 2925.

In the year 1901 the value of paper and manufactures thereof that were imported into Mexico was 404,152*l.*, as against 450,878*l.* in the year 1900. The two articles which increased are wrapping paper, which comes from the United States, and wall papers, which are imported from France and Germany, though of late years the wall paper made in the United States is finding a ready market in Mexico.

The manufacture of paper is still very little known, and no statistics are published either showing the number of factories in existence, the consumption of raw material, or their production.

The making of cardboard is also very backward, and all good Bristol board and photographic mounts and cards are imported, principally from Germany and the United States. Both of these products are now made in the several factories, using rags and wood-pulp; the former are mostly from the country, while the pulp of all kinds specially prepared for the manufacture of paper is imported, in 1901 the value of the imports being 17,069*l.* The value of rags imported during the same period was only 500*l.* Experiments are continually being made to utilise the fibres of this country in the manufacture of paper, but so far they do not appear to give very satisfactory results.

Sulphur and Pyrites in Sulphite Cellulose Factories.

Papier-Zeit., 1903, **28**, [9], 288.

For the last two years several large sulphuric acid manufacturers in Europe and America have been using a pyrites furnace invented by Herreshof (see this Journal, 1899, 376) with mechanical feed, and accurately adjustable air-supply, which effects a perfect roasting of the pyrites, and yields a gas of a richness in sulphur dioxide formerly only attainable by burning sulphur. The oven is fed with pyrites dust; its first cost is considerable, but is soon covered in a large works by the saving effected. A Norwegian pulp factory has recently installed one of these furnaces, and there is every prospect of the native pyrites coming into use in Scandinavia in place of the imported sulphur, with an estimated saving of 50 per cent.—J. F. B.

XX.—FINE CHEMICALS, Etc.

Vanilla in Mexico.

Foreign Office Annual Series, No. 2925.

Only 43,991 lb. of vanilla were exported in 1901, with a value of 57,426*l.*, as against 64,921 lb. in 1900 valued at 62,565*l.*, due to a failure of the crops by heavy frosts in the early part of the year. The value of the exports as here given makes the value of each pound 1*l.* 6*s.*, whereas in the previous year it was only 1*l.* 0*s.* 6*d.*, a difference which coincides with the silver value declared at the custom-houses.

Chemicals in Würtemburg.

Foreign Office Annual Series, No. 2923.

The demand for quinine during 1901 was extremely irregular. Prices rose from 1*l.* 18*s.* per kilo. in January until in May 2*l.* 8*s.* per kilo. was demanded; from August the price fell steadily to 2*l.* per kilo. The hope is expressed that the new plantations in Ceylon and British India may be increased in size, as prices demanded by the Java planters seem to be regarded as abnormally high. Carbolic acid fell heavily in price owing to the manufacture of synthetic carbolic acid. The prices of other chemicals, such as soda, bleaching powder, sulphuric acid, hydrochloric and carbonic acids remained the same or showed a slight rise. Salicylic acid preparations were considerably lower on account of the great competition.

Monazite Sands in Brazil.

Foreign Office Annual Series, No. 2928.

The concession which was granted by the Federal Government in 1901 to a German firm for exploring monazite sands on the foreshore in the State of Espirito Santo, has since been cancelled, owing to non-observance by the concessionnaires of certain clauses of the contract. It is understood that a fresh competition will be opened shortly. There are, however, still existing contracts made with the State Government of Espirito Santo for exploring these sands in State territory, but only on a limited scale.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 2560. Wheelwright and Fiske. Separation of liquids from solids.* Feb. 3.

„ 2693. Wilson. Filters. Feb. 4.

„ 2731. Blair. Evaporators. Feb. 5.

„ 3034. Herlitscka. Centrifugal separators.* Feb. 9.

„ 3373. Freitag. Process and apparatus for evaporating sugar juices, salt solutions, &c. Feb. 12.

„ 3561. Guillaume. Still. Feb 11.

[C.S.] 3031 (1902). Musciacco. Apparatus for measuring and distributing liquids. Feb. 11.

„ 8015 (1902). Hardingham (Johnson). Filter presses. Feb. 11.

„ 10,829 (1902). Adams. Liquid-distributing apparatus for filters. Feb. 11.

„ 19,069 (1902). Pott, Cassels, Cassels, Williamson, and Stuart. Centrifugal machines. Feb. 11.

„ 22,256 (1902). Kiefer. Filters. Feb. 18.

„ 25,229 (1902). Thompson (Voindrot and Boillot). Filters. Feb. 11.

„ 26,695 (1902). Bloxam (Oesterreichischer Verein f. Chem. and Metall. Prod.). Separation, by distillation, of materials having different boiling points. Feb. 11

„ 28,363 (1902). Brunck. Coke-ovens. Feb. 11.

„ 28,409 (1902). Lyell. Filter and cooler. Feb. 11.

„ 28,599 (1902). Kauffmann. Apparatus for evaporating leys and brines. Feb. 18.

„ 28,600 (1902). Kauffmann. Evaporation and concentration of gypseous brine in multiple vacuum evaporators. Feb. 18.

II.—FUEL, GAS, AND LIGHT

[A.] 2748. Fielding. Gas producer. Feb. 5.

„ 2806. Elworthy. Production of water-gas. Feb. 5.

„ 2901. Brace. Gasogenes. Feb. 7.

„ 3101. Whitfield. Apparatus for manufacture of producer- and water-gas. Feb. 10.

„ 3277. Allen and Henley. Gas purifiers, condensers, and washers. Feb. 11.

„ 3278. Thwaite. Production and distribution of fuel-gas. Feb. 11.

3307. Otto-Hilgenstock Coke-Oven Co., Ltd. Coke-ovens. Feb. 11.

[C.S.] 3783 (1902). Bowman. Gas-producing plar Feb. 18.

„ 5340 (1902). Macmillan. Heated air force draught apparatus for the combustion of fuel a fuel-gases, and prevention of smoke in furnace Feb. 18.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM

[A.] 2726. Ellison. Manufacture of tar macada Feb. 5.

„ 3060. Haddan (Dahmen). Manufacture of ca bonaceous substances from tarry matter and residues.* Feb. 9.

IV.—COLOURING MATTERS AND DYESTUFFS

[A.] 2503. Abel (A. G. für Anilinfabr.). Manufactu of red lakes. Feb. 2.

„ 2617. Levinstein and Mensching. Manufacture para-amido xylyl-*p*-oxyphenylamine, and of dy stuffs therefrom. Feb. 4.

„ 2694. Ransford (Cassella and Co.). Manufactu of diphenyl naphthyl methane dyestuffs. Feb.

„ 2960. Foelsing. Manufacture of indoxyl, its hom logues and derivatives. Feb. 7.

„ 2991. Bang (Dahl and Co.). Production of dy stuffs by combining diazo compounds w formyl- and acetyl-para amido phenol. Feb. 9

„ 3182. Ransford (Cassella). Manufacture of rivatives of orthoamido phenol sulpho-acid, a of dyestuffs therefrom. Feb. 10.

„ 3480. Abel (A. G. für Anilinfabr.). Manufactu of yellow sulphurised colouring matters. Feb.

[C.S.] 5648 (1902). Levinstein, Rose, and Levinste Ltd. Manufacture of new di-azo dyestuffs f wool. Feb. 18.

„ 7153 (1902). Johnson (Bad. Anil. und Sodafabr Manufacture of azo colouring matter, and colo ing lakes therefrom. Feb. 11.

„ 7822 (1902). Bloxam (Chem. Werke vorm. Dr. Byx). Manufacture of sulphurised colour matters. Feb. 18.

„ 8114 (1902). Johnson (Bad. Anil. und Sodafab Production of indoxyl and its derivatives. Feb.

„ 18,569 (1902). Newton (Farbenfabr. vorm. Bay and Co.). Production of azo dyestuffs. Feb.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARN AND FIBRES

[A.] 2415. Clegg. Printing or dyeing cloth. Feb. 2.

„ 2417. Cotton. Centrifugal machines for treat fibrous and other material with fluids. Feb. 2

„ 2844. Townsend. Bleaching compound. Feb.

„ 2884. Raabe. Manufacture of yarns. Feb. 6.

„ 3180. Evans. Machine for opening and clean cotton or other fibrous material.* Feb. 10.

„ 3397. Smith. Dyeing machines. Feb. 13.

„ 3479. Abel (A. G. fur Anilinfabr.). Dyeing mix silk and cotton goods with sulphurised dyestu Feb. 13.

„ 3492. Clark (Kann). Treating sheep's wool a other ceratinic fibre. Feb. 13.

[C.S.] 3722 (1902). Jacob (geb. Kohl) and Pritzk Manufacture of flax fibre suitable for spinni Feb. 18.

„ 5921 (1902). Milan. Machine for dyeing, cle ing, &c., goods. Feb. 11.

„ 7073 (1902). Abel (A. G. für Anilinfabr.). P cess for dyeing and printing. Feb. 18.

„ 8279 (1902). Shuttlewood and Fanshawe. D ing yarns in the hank. Feb. 11.

[C.S.] 8510 (1902). Johnson (Bad. Anil. und Sodafabr.). Preparation of indigo vats, and dyeing therewith. Feb. 18.

„ 9336 (1902). Ellis (Soc. Chim. des Usines du Rhône). Dyeing and printing from *o*-nitrophenyl lactoketone. Feb. 18.

„ 10,188 (1902). Johnson (Bad. Anil. und Sodafabr.). Treatment of indigo dyeings on vegetable fibre for increasing the fastness thereof. Feb. 18.

„ 16,980 (1902). Imray (Jung). Mordanting wool. Feb. 11.

„ 17,622 (1902). Bertin. Removing wood from green stalks containing textile fibres, especially ramie stalks. Feb. 11.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 2809. Imray (Meister, Lucius und Brüning). Production of coloured effects on dyed paper. Feb. 5.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 2440. Campbell. Utilising gases given off in the calcination of copperas. Feb. 2.

„ 2596. Simon. Treatment of substances with oxygen. Feb. 3.

„ 3189. Laugheld. Mineral salts. Feb. 10.

„ 3347. Pearson. Production of carbon monoxide. Feb. 12.

„ 3460. Gutensohn. Means for removing incrustating matters from salt and other waters. Feb. 13.

[C.S.] 3923 (1902). Von Hochstetter. Manufacture of acetic and other fatty acids. Feb. 11.

„ 28,700 (1902). Buckland. Chemical fire extinguisher. Feb. 18.

X.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 2458. Krause. Production of artificial stone.* Feb. 2.

„ 2528. Bean. Manufacture of basic cements. Feb. 3.

„ 2726. Ellison. Manufacture of macadam. Feb. 5.

„ 2783. Sutcliffe, Speakman, and Co. Making bricks. Feb. 5.

„ 2802. Geiser. Slabs for building purposes. Feb. 5.

„ 3225. William. Manufacture of plaster of Paris. Feb. 11.

„ 3294. Purvis and Rouse. Artificial stone.* Feb. 11.

„ 3308. Imray (Carborundum Co.). Manufacture of refractory bricks, crucibles, &c.* Feb. 11.

„ 3344. Chandler. Cement jointing compounds. Feb. 12.

„ 3378. Jenkins. Manufacture of bricks, artificial stone, &c. Feb. 12.

„ 3382. Geiser. Production of artificial stone. Feb. 12.

„ 3483. Krüger and Dunkelmann. Manufacture of fire-proof bricks or material. Feb. 13.

C.S.] 3051 (1902). Bruce. Fire-proofing wood. Feb. 18.

„ 3555 (1902). Budd. Production of concrete, plaster, &c. Feb. 18.

„ 4166 (1902). Boult (Fargues). Kilns for burning lime or cement materials. Feb. 18.

„ 4298 (1902). Macfarlane. Basic fire-resisting material. Feb. 18.

„ 5835 (1902). Ryan. Manufacture of materials for asphaltic pavements, &c. Feb. 18.

„ 5873 (1902). Ferrell. Wood preserving. Feb. 11.

„ 14,510 (1902). Redfern. Kilns. Feb. 11.

„ 20,150 (1902) Schwannberg. Manufacture of artificial stone. Feb. 18.

„ 26,558 (1902). Wentz. Manufacture of cement. Feb. 11.

„ 28,343 (1902). Deards. Roof glazing. Feb. 18.

X.—METALLURGY.

[A.] 2515. Shanks. Combined melting and heating furnace. Feb. 3.

„ 2612. Parfitt. Manufacture of metallic compounds containing decarbonised iron. Feb. 4.

„ 3194. Schwartz. Smelting ores.* Feb. 10. (U.S. Appl., April 9, 1902.)

„ 3253. Down. Hardening steel in one operation. Feb. 11.

„ 3459. Gutensohn. Precipitation of metals other than zinc from acid solutions. Feb. 13.

[C.S.] 770 (1902). Siemens. Regenerative gas furnaces. Feb. 18.

„ 3644 (1902). Simpson. Improving the quality of metal. Feb. 11.

„ 4085 (1902). Hughes. Treatment of metals during manufacture into various articles. Feb. 18.

„ 4662 (1902). Deutsch and Hochhauser. Manufacture of magnetic iron and steel castings. Feb. 18.

„ 5860 (1902). Galbraith. Manufacture of steel. Feb. 11.

„ 7505 (1902). Johnson (Chem. Fabr. Griesheim-Elektron). Manufacture of the alkali metals. Feb. 11.

„ 7588 (1902). Wegener. Furnaces. Feb. 18.

„ 21,829 (1902). Surzycki. Smelting furnaces for the continuous production of steel. Feb. 11.

„ 58 (1903). Chenhall. Production of alloys of iron and steel. Feb. 11.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 2574. Mechwart, Coltri, et Cie. Electrolytic extraction of metals from ores and precipitation from solutions. Feb. 3.* (Italian Application, Aug. 1, 1902.)

[C.S.] 26,673 (1901). Elmore. Generation and application of electric currents. Feb. 11.

„ 6304 (1902). Accumulator Industries, Ltd., and Hunte. Electric accumulator plates. Feb. 11.

„ 15,271 (1902). Keller. Electric heating and refining of metals, &c. Feb. 11.

„ 25,524 (1902). De Mestral. Arc lamps, and electrodes therefor. Feb. 18.

„ 27,179 (1902). Acheson. Reduction of compounds by electric heating. Feb. 18.

„ 28,783 (1902). Lake (Clare). Storage batteries. Feb. 18.

XII.—FATS, OILS, AND SOAP.

[A.]. 3150. Smith and Scott. Extraction of fatty matters from bones and other materials. Feb. 10.

„ 3205. Castle. Manufacture of soap. Feb. 10.

[C.S.] 3164 (1902). Klimont. Purification of fats or fatty substances. Feb. 18.

„ 18,741 (1902). Haddan (Edson). Reduction of fish-waste or other oil-yielding material. Feb. 11.

„ 18,742 (1902). Haddan (Edson). Reduction of fish-waste or other oil-yielding material. Feb. 11.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 3174. Cross. Manufacture of ultramarine. Feb. 10.

B.—Resins, Varnishes.

[A.] 3023. Piper. Non-fouling composition for marine hulls.* Feb. 9.

„ 3533. McIvor. Non-conducting coverings for radiating or absorbing heat.* Feb. 14.

[C.S.] 9211 (1902). Messik. Manufacture of linoleum or the like. Feb. 18.

C.—India-rubber, &c.

[A.] 2695. Lucas. Insulating materials, and substitutes for ebonite and the like. Feb. 4.

„ 2804. Geiser and Kehrli. Tenacious elastic substance. Feb. 5.

„ 2939. Gray. Vulcanisation of rubber.* Feb. 7.

„ 3452. Gray. Vulcanisation of rubber.* Feb. 13.

[C.S.] 28,410 (1902). Newman. Waterproofing composition. Feb. 11.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 2456. Peyrusson. Preparation, purification, and preservation of tannic acid and other tinctorial extracts. Feb. 2.* (Fr. Appl., Feb. 8, 1902.)

„ 2949. Hall. Casein solution.* Feb. 7.

„ 3179. Rausch. Horn or bone substitute. Feb. 10.

„ 3236. Felton. Preliminary treatment of hides or skins. Feb. 11.

„ 3485. Reid. Leather or rubber substitute.* Feb. 13.

XVI.—SUGAR, STARCH, GUM, ETC.

[C.S.] 22,537 (1902) Duryea. Production of maltose syrups and sugars. Feb. 11.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 2519. Day and Gaskell. Treatment of distillery refuse or pot ale. Feb. 3.

„ 2520. Day and Gaskell. Treatment of distillery refuse and other materials of a hygroscopic character. Feb. 3.

„ 3051. Garrod. Preparation for use in fining of wines. Feb. 9.

„ 3272. Boyling. Maturing wines and spirits. Feb. 11.

„ 3517. Wilcocks. Charging beer, &c., with carbonic acid. Feb. 14.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[C.S.] 4382 (1902). Bernstein. Testing milk. Feb. 18.

„ 6305 (1902). Eichelbaum. Food preparations. Feb. 18.

„ 7919 (1902). Woolf. Concentrated article of food. Feb. 18.

„ 24,014 (1902). Busch, Gull, and Barry. Pasteurising or sterilising apparatus. Feb. 11.

„ 24,721 (1902). Lake (Winton). Manufacture of food preparations. Feb. 11.

B.—Sanitation; Water Purification.

[A.] 2553. Middleton. Appliance for the purification of sewage. Feb. 3.

[C.S.] 22,745 (1901). Harris. Filtering water for steam boiler and other purposes. Feb. 18.

„ 7238 (1902). Candy. Purification of sewage and other polluted liquids. Feb. 11.

„ 498 (1903). Davidson. Water purifier. Feb. 18. (U.S. Appl., July 2, 1902.)

„ 656 (1903). Allen. Continuous process for separation and precipitation of heavy or flocculent matter from works effluents, &c. Feb. 18.

C.—Disinfectants.

[A.] 3371. Otto. Disinfecting by ozone and stea Feb. 12.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 2420. Milne. Paper- and pulp-making machi Feb. 2.

„ 2463. Menzies, Castro, and Butterfield. Manu- ture and bleaching of paper. Feb. 2.

„ 2673. Turner and Evans. Manufacture of p from ligneous materials. Feb. 4.

„ 3045. Ensminger. Manufacture of compou having a nitrocellulose and casein base. Feb.

„ 3147. British Xylonite Co and Goldsmith. S- stitute for celluloid, horn, &c. Feb. 10.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 2568. Bordas. Medicinal compound. Feb. 3.

„ 3173. Imray (Meister, Lucius und Brünin Manufacture of perfume, and intermediate p ducts therefor. Feb. 10.

„ 3430. Boehm (Winternitz). Manufacturing s bromised or iodised oils in powder form. Feb.

„ 3543. Wetter (Heine and Co.). Terpene alcoh and artificial perfumes. Feb. 14.

„ 3545. Newton (Bayer and Co.). New chem compound. Feb. 14.

„ 3563. Barge and Givaudan. Manufacture of s- charin. Feb. 14.

[C.S.] 3923 (1902). Von Hochstetter. *See under* VI

„ 5799 (1902). Barclay. Apparatus for extract the active principles of drugs, &c. Feb. 11.

„ 6065 (1902). Jackson and Pennington. Manu ture of saccharin. Feb. 18.

„ 8955 (1902). Newton (Bayer). New pharmac- tical compounds. Feb. 18.

„ 22,362 (1902). Gebauer, Gebauer, and Hari. Receptacles for containing and administer volatile liquids. Feb. 18.

„ 27,532 (1902). Johnson (Boehringer). Elimi- tion of the 8-methyl group from 8-met xanthine. Feb. 11.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 2697. Schonecker. Manufacture of a light se- tive paper, cardboard, &c. Feb. 4.

„ 2728. Hart. Producing an ivory grain in pho- graphy. Feb. 5.

„ 3196. Szczepanik. Photography in natural colo Feb. 10.

„ 3546. Newton (Bayer). Developing photogra pictures. Feb. 14.

[C.S.] 22,841 (1901). Gros and Ostwald. Reproduc pictures and the like. Feb. 18.

„ 20,337 (1902). Imray (Meister, Lucius und Br- ing). Photographic developers. Feb. 11.

„ 128 (1903). South. Colour photography. Feb.

„ 768 (1903). Lüttke. Flash-light cartridge. Feb.

XXII.—EXPLOSIVES, MATCHES, ETC.

[A.] 2977. Brock. Explosive compounds and their u Feb. 7.

„ 3020. Nathan, Thomson, and Rintoul. Manu- ture of nitro-glycerin. Feb. 9.

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F. H. Leeds	II., III., XIII., XXI.
A. E. Leighton	XXII.
Herbert Levinstein, Ph.D., B.Sc.	IV., V.
J. McCrae, Ph.D.	IV.
G. W. MacDonald, M.Sc.	XXII.
W. G. McMillan	X., XI., XIV., XXII.
N. H. J. Miller, Ph.D.	XV.
C. A. Mitchell, B.A.	XII., XXII.
R. W. Moore	Trade Report.
A. More	VII., XVIII.
J. G. Parker, Ph.D.	XIV.
H. T. Pentermann	XVI., XVII.
T. H. Pope	XVI., XX., XXI.
F. W. Renaut	Index.
G. H. Robertson	XI.
Chas. Salter	II., III., XVI., XVII.
M. J. Salter	XIII.
R. Sandon	II.
J. Shields, D.Sc., Ph.D.	XI.
A. Shonk	Gen. Chem.
W. P. Skertchley	XII., XVIII.
E. Sonstadt	III., VII., X., XV.
E. Howard Tripp, Ph.D.	III., VII., XVI.
Charles T. Tyrer	XX.
L. J. de Whalley, B.Sc.	XVI.
Joseph T. Wood	XIV.

Notices.

FIFTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, 1903.

The attention of Members of the Society is called to the fact that the International Congress of Applied Chemistry will meet in Berlin, during Whitsuntide week of this year. A committee of this Society has been formed to co-operate with the other British Chemical Societies in endeavouring to secure an adequate representation of British Chemical Industry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General Secretary, in order that a formal invitation from the Organising Committee in Berlin may be sent to them.

The aim of the Congress is to introduce uniform standard methods and rules throughout the world; to provide uniform methods of commercial analysis, thus removing one of the main causes of dispute; to throw light upon points which may assist governments and others in framing regulations concerning transport and duties; and to improve acquaintance with Patent Law.

The Congress is also intended to provide opportunities for mutual exchange of ideas on different branches of chemical work.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows:—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products:—
  Subsection A.—Organic Preparations, including Tar Products.
  Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

Programme.

Tuesday, June 2.—Reception in the Palace of the Imperial Parliament.

8 p.m.—Address by the President of the Organising Committee in the Hall. Supper will be served in the galleries.

Wednesday, June 3.—10 a.m. First General Meeting.

Afternoon.—Sectional meetings.

7 p.m.—Banquet in the Restaurant of the Zoological Gardens. Members may bring ladies.

Thursday, June 4.—Sectional meetings continued.

7.30 p.m.—Reception of the Congress in the Town Hall by the Municipal Authorities. (For gentlemen only.)

9.30 p.m. — "Commers" in the "Philharmonie" building. The boxes will be reserved for ladies.

Friday, June 5.—10 a.m. Second General Meeting. Address by the President of the fourth Congress, Prof. H. Moissan.

7 p.m.—Performance in the Royal Opera House.

7 p.m.—Reception of the German Chemical Society in the gardens of Prof. C. D. Harries at Charlottenburg, Berlinerstr. 36.

Saturday, June 6.—Sectional meetings continued.

Visits to various factories and museums.

Sunday, June 7.—Special trains from the Potsdamer Bahnhof at 9.55 a.m. and 10.15 a.m. to Wannsee, for a trip on the lakes.

Luncheon at Wannsee at 2 p.m.

Monday, June 8.—Sectional meetings concluded.

Afternoon.—Third General Meeting, for bringing t business of the Congress to a close.

Ladies tickets, price 15*s.* each, can be obtained application to the Secretary of the Congress. A ladi committee has been formed to provide entertainment ladies during the business hours of the Congress.

Travelling and Hotel Arrangements.

Parties of 30 and over, travelling together, may obtai reduction of 50 per cent. on fares on all lines of the Ro Prussian Railway, by application to the head office of division in which the journey is commenced.

Karl Stangen's Reise-Bureau will arrange such parti Information can also be obtained as to hotels in Berl also any information concerning the journey to Berlin, enclosing amount for return postage to Karl Stange Reise-Bureau, 72, Friedrichstr., Berlin, W.

A Congress Daily Paper will be published by the Co mittee during the Congress week.

The number of tickets for the social arrangements limited to:—Banquet, 1,500; Reception in Town Hall, 75 "Commers," 1,000 gentlemen, 200 ladies; Performance Royal Opera, 900; Reception of German Chemical Socie 800; Excursion to Wannsee, 1,500.

Applications will be considered in order of priority.

As formal invitations are now being sent out, applicati to join the Congress, accompanied by a remittance of should be sent in to the General Secretary without delay

Changes of Address.

When notifying new addresses, members are requeste write them distinctly, and state whether they are tempor or permanent. Multiplication of addresses is also to avoided as tending to create confusion. When send subscriptions, the use of the form attached to the applica helps in the verification of addresses, on which the s delivery of the Journal depends.

Allen, W. W., l/o 71; Room 1709, 170, Broadway, N York City, U.S.A.
Barrow, Jos., l/o Townfield Lane; 13, The Grove, Beb ton, Cheshire.
Bartripp, G. F.; Jnls. to 31, Albert Road, Walthamsto
Burwell, A. W.; Journals to 125, Euclid Street, Clevela Ohio, U.S.A.
Bush, J. M., l/o Hyde Park Street; c/o W. J. Bush Co., Ltd., Ash Grove, Hackney, E.
Caldecott, A.; Jnls. to Box 67, Johannesburg, Transvaa
Colley, H. H., l/o Iola; c/o Prime Western Spelter Gas, Kas., U.S.A.
Coupe-Annable, H. W., l/o Doncaster; Tungsten and Metals Co., Queen's Road, Battersea, S.W.
Cranfield, Wm., l/o Second Avenue; Higher Grade Bo School, Halifax.
Crosfield, Capt. G. R.; Journals to Volunteer Quart Sankey Street, Warrington.
Davidson, Alex., jun., l/o Edinburgh; 2, Hamilton Terrace, Hillhead, Glasgow.
Deaville, B., l/o Hyson Green; Beech Avenue, Notting
Doerflinger, Wm. F., l/o Brooklyn; Acker Process Niagara Falls, N.Y., U.S.A.
Donaldson, Thos., l/o Stevenston; c/o British South Afr Explosives Co., Ltd., Modderfontein, Transvaal.
Garton, R. S.; Journals to 130, Woodycrest Ave Highbridge, New York City, U.S.A.
Gent, Percy W., l/o Misterton; c/o W. V. D. Kelley, Summer Avenue, Newark, N.J., U.S.A.
Guitermann, E. W., l/o Pawtucket; Passaic Printwo Passaic, N.J., U.S.A.
Hake, C. Napier, l/o Dept. of Trade; 423, Flinders L Melbourne, Victoria.
Hatfield, J. A.; all communications to Ivydene, H Road, Wednesbury, Staffs.

,euthardt, P., l/o Riggindale Road; 33, Rydal Gardens, Streatham, S.W.
Iason, Thos., l/o Hyson Green; Beech Ave., Nottingham.
'auli, Dr. H., l/o Lloyd Street; 48, Cecil Street, Greenheys, Manchester.
'izey, Jas. H., l/o Highgate Road; 22, Duke's Avenue, Muswell Hill, N.
:amsden, J., l/o Lambeth; Suffolk Lodge, Park Hill, Clapham, S.W.
choonmaker, H., l/o Race Street; 703, West Ninth Street, Cincinnati, Ohio, U.S.A.
himotome, H., l/o Ann Arbor; The Higher Technical School, Asakusa, Tokyo, Japan.
impson, Edw. S., l/o St. George's Terrace; Geological Survey Laboratory, Museum Street, Perth, W.Australia.
mith, H. Wood, l/o Oldbury; c/o John Batt and Co., Ltd., 39, Old Broad Street, London, E.C.
ownsend, O. C., l/o Ravenswood; 1, Horton Cres., Rugby.
asey, T. E., l/o 5; 6, South Parade, Leeds.
'alker, Dr. W. H., l/o 7; 19, Exchange Place, Boston, Mass., U.S.A.
'ilson. Gordon, l/o Kirkintilloch; Apartado 121, Mexico, D.F.
'ilson, Leonard P., l/o East Dulwich; Stocksfield, Church Road North, Hanwell, W.

Liverpool Section.

Meeting held at University College, on Wednesday, February 25th, 1903.

MR. FRANK TATE IN THE CHAIR.

FILM CRYSTALS.

BY FRED. W. SAXBY.

After illustrating the growth of crystals and showing how finite forms belonging to definite systems were produced, e lecturer referred to cleavage planes of crystals and eir relation to optical properties. He explained the larisation of light, and then proceeded to show results tained by examining, with polarised light, minute antities of liquids during crystallisation, film figures ing obtained, in many cases worthy the attention of e designer. By taking solutions of copper sulphate, dmium sulphate, cinchona, and brucine, he showed, by e aid of lantern slides, film figures giving various ometric systems, twin systems, triplets, &c. Lines of rce were indicated, and, in the case of brucine, eccentric clei were distinctly shown. A number of the slides exhibited were prepared in colours by the three-colour otographic process.

SESSION 1902—1903.

ednesday, March 25. 1903:—
Mr. R. Forbes Carpenter, F.I.C., and Mr. E. Linder, B.Sc. "Studies on the Claus Kiln Reaction."
Dr. J. T. Conroy. "The Action of Sulphuric Acid on Platinum."

London Section.

Meeting held on Monday, March 2nd, 1903.

MR. WALTER F. REID IN THE CHAIR.

DUTY-FREE ALCOHOL FOR INDUSTRIAL PURPOSES.

BY THOMAS TYRER, F.I.C., F.C.S.
PAST PRESIDENT.

It is desirable to state that no originality is claimed for s paper. Mr. G. A. Prochazka read a paper on "Alcohol Manufacture of Coal-tar Dyes" before the New York ction of the Society (see Journal, 1897, Vol. XVI., p. 223), d Dr. Silberrad, in June 1902, read his report to the Committee on Explosives before this Section. This report was largely compiled from materials supplied by New York paper, and the work of Joint Committees of the London Chamber of Commerce and the Society of Chemical Industry. Our obligations are due to many who have special knowledge of this subject, notably, Mr. Hugo Lorenz, Messrs. Horneywill Bros., Mr. J. van Marken, with other gentlemen in the departments of both Customs and Excise. Also to trade journals: the *Pharmaceutical Journal*, the *Chemist and Druggist*, the *British and Colonial Druggist*, and others, which from time to time have made valuable suggestions and comments, and to my assistant, Mr. Gosling, for the tables and diagrams on the walls. With these acknowledgments the case for your consideration may be presented in a very imperfect way; but it should be noted that, however weak the advocacy, there is a really strong case. If those whose interests appear jeopardised will bestow unprejudiced consideration, something akin to open-mindedness, breadth of view, and general patriotism, as regards Great Britain and the Empire, good will be done to a greater extent than some imagine. Permit a reminder that discussion on the industrial use of alcohol synchronises, to borrow from a trade paper, with concern in most continental countries for the extension of applications of alcohol. Germany is not yet content, France is energetic, Austria expands, even Russia lives, the United States urges, and Britain but stagnates on this question.

The dangers incidental to the unlimited production and use of alcohol in any form, long ago marked out liquids containing it for fiscal and social or domestic treatment. Spirituous liquids received very special consideration at once from moralists and financiers of civilised countries, notably our own. Good Queen Bess, for one, made excellent use of alcohol for revenue purposes. As government is now carried on, probably no reasonable objection can be taken to this preferential and solicitous treatment, for the purpose of taxation. Yet here, as nowhere else, have possibilities for use in the arts been so little recognised and provided for. With the exception of that form of "denaturing" known as "methylation," alcohol has scarcely been at the disposal of the British industrial community, and then only in a comparatively costly form. Its production has been surrounded by complicated arrangements for purposes of control and check; all the more so probably by reason of the very high duty imposed for revenue. The control arrangements suitable in early days prevail still, practically unchanged. Changes have been now and then made, but—the basis of administration and control—the "attenuation" charge on the "wort" remains the same, with its consequent demand for officers, and what is even more important to-day, practically a doubling of the required plant. In a word, the brewing, fermenting, and distilling processes, instead of being continuous and in constant progression, are intermittent. It is conceivable how much delay, not to say expense, is occasioned by this method. A little reflection must show, that however desirable official control of processes may be, the ultimate check is upon the alcohol sent out of bond for sale or use. A duty of 11s. per proof gallon is a serious matter, either for revenue or for industry. There are three modes by which duty is charged in Britain upon spirits in manufacture, and it may be well to quote an Act of Parliament (43 & 44 Vict. c. 24, s. 46).

"1st. For and in respect of every one hundred gallons of 'wort' or 'mash' made in the distillery, the distiller is chargeable with duty at the rate of one gallon of spirits at proof for every five degrees of difference between the highest gravity of the 'wash' as declared by the distiller or as found by the officers, and the lowest gravity of such 'wash' found at any time before distillation; and in the same proportion for any less quantity of 'wash' and for any less decrease of gravity.

"2nd. Upon the proof gallons of spirits in the 'low-wines' produced, after deducting five per cent.

"3rd. Upon the proof gallons of 'feints' and spirits produced, after deducting the 'feints' (if any) remaining from a previous distillation, and included in the account of the 'feints' and spirits produced." The 2nd mode of charge may be disregarded, since it is the all but universal practice to run the "low-wines" and "feints" together, the comparison being made between the charge from attenuation only and the spirit finally produced.

The following extract from the 28th Report of the Commissioners of Inland Revenue may be useful from the point of view of the claims on the distiller. "The duty is almost invariably charged on the spirit finally produced by distillation, but to guard against any abstraction of an article so highly taxed in the process of manufacture, a *presumptive* duty charge is raised against the distiller from the quantity and gravity of the 'wort' and 'wash.' It is based on the loss of gravity that occurs during the process of fermentation, and is technically called the charge from 'attenuation.' The loss of gravity depends on the amount of the spirit produced, and is greatest when the quantity of spirit produced is also greatest. Experiment has shown that at least one gallon of spirit should be produced from every 100 galls. of 'wash,' for every 5° of gravity which is lost; and on this quantity, whether *produced or not*, the attenuation charge renders the distiller liable to pay duty, unless he can prove an accidental loss in the process of distillation." In fact the law does not contemplate that the distiller will ordinarily be charged with a greater quantity of spirit than he actually produces, and therefore the first two modes of charge are subsidiary to the third, and are intended to act as a check upon the distiller by preventing the removal of a portion of the spirit before it has been collected in the spirit receiver and account taken of it for raising the duty charge. It is rarely that the charge falls on the attenuation of the "wort" or on the "low-wines"; when it does the cause is generally to be found in some technical mismanagement or a loss of spirit by some means such as leakage or discharge of the "wash" before being exhausted of its spirit, during the distilling part of the process. The reason of the requirement that the brewing and distilling periods shall be alternate or intermittent and to a large extent distinct is to enable a true account of the quantity and gravity of the "wash" distilled to be secured, to make fraud difficult, and to provide for a balance of the spirits produced and removed to the spirit store, being struck periodically. It is obvious that these elaborate precautions, much less so now than formerly, are needful, and they have been recited in brief to show how very important, from a revenue point of view, the distillation industry is, and some of the difficulties the spirit technologist has to meet, especially if we consider thoughtfully the following somewhat startling figures dealt with, and from which a revenue of 18,190,779*l.* is obtained regarding spirits.

SPIRIT DUTY.

The net receipt of duty under this head in the y
1901–02 amounted to 18,190,779*l.*, allocated as follows :-

	£
To the Exchequer	17,647,421
„ Local Taxation Accounts........	843,358
	18,490,779

a decrease of 1,633,224*l.* compared with the net receipt
the preceding year, divided as follows :—

	£
Exchequer	1,559,268
Local Taxation Accounts................	73,956
	1,633,224

Comparing the number of proof gallons of spirits disti
in 1901–02 with the number distilled in 1891–92, there
an increase of 8,953,000 galls., or 19 per cent. The num
of distilleries at work throughout the kingdom in the y
ended 30th September 1891 was 167. In the year en
30th September 1901 the number was 193, nine of wh
were in England, 156 in Scotland, and 28 in Ireland.

The number of proof gallons of spirits remaining
bonded warehouses on the 31st March 1892 was 95,617,
and on the 31st March 1902, 167,012,000, an increase
71,395,000, or 74 per cent. The number of proof gallon
spirits on which duty was paid was 32,162,000 in 1891
and 34,760,000 in 1901–02, an increase of 2,598,000, or 8
cent. The number of proof gallons retained for consu
tion as beverage in the United Kingdom was, in 1891
31,469,000, and in 1901–02, 33,749,000, an increase
2,280,000 galls., or 7 per cent. If to these figures
numbers of gallons of colonial and foreign spirits impo
be added, the consumption per head of the population
1891–92 was 1·05 proof gallons, and in 1901–02, 1·01 p
gallons.

The number of proof gallons of home-made spirits
ported in 1891–92 was 3,810,000, and in 1901–02, 6,312,
an increase of 2,502,000, or 65 per cent.

The total number of proof gallons of home-made
colonial and foreign spirits methylated in 1891–92
7,518,000 galls., and in 1901–02, 5,268,000, an increas
3,150,000, or 49 per cent.

BRITISH SPIRITS.

Quantities (1) *Distilled*, (2) *Retained for Consumption and Duty-paid, and* (3) *Remaining in Warehouses.*

Year ended 31st March	Quantity of Spirits distilled in				Quantity of Spirits retained for Home Consumption in			
	England.	Scotland.	Ireland.	Total.	England.	Scotland.	Ireland.	Total.
	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Ga
1898	12,360,255	33,711,503	14,547,708	60,652,466	21,981,762	6,760,037	4,156,674	32,898,2
1899	12,913,771	35,769,114	14,754,999	63,437,884	23,145,797	7,078,514	4,100,773	34,334,0
1900	12,966,941	31,798,465	14,480,871	59,246,277	25,623,177	8,380,378	4,713,178	38,716,7
1901	12,603,311	30,196,016	14,221,520	57,020,847	24,993,993	7,471,401	4,238,334	36,703,7
1902	12,438,596	29,973,193	12,780,535	55,192,324	22,826,871	7,115,121	3,807,239	33,749,2

Year ended 31st March	Net Duty.		Quantity remaining in Warehouses at close of Year ended 31st Ma			
	Country in which Paid.	Duty.	England.	Scotland.	Ireland.	Total.
		£	Proof Galls.	Proof Galls.	Proof Galls.	Proof Ga
1898	England	6,532,765	11,973,969	89,758,857	35,943,678	147,676,4
	Scotland	6,399,919				
	Ireland	4,286,222				
	Total United Kingdom.	17,218,906				
1899	England	6,853,314	12,198,210	103,290,391	36,243,908	151,7[illegible]2,53
	Scotland	6,783,802				
	Ireland	4,330,026				
	Total United Kingdom.	17,967,142				

'ear ended 31st March	Net Duty.		Quantity remaining in Warehouses at close of Year ended 31st March.			
	Country in which Paid.	Duty.	England.	Scotland.	Ireland.	Total.
		£	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.
1900	England	7,470,598	12,132,304	109,898,389	35,139,275	157,169,968
	Scotland	7,793,387				
	Ireland	5,039,162				
	Total United Kingdom.	20,303,147				
1901	England	7,536,262	11,905,058	114,853,325	34,744,416	161,502,829
	Scotland	7,650,675				
	Ireland	4,907,066				
	Total United Kingdom.	20,124,003				
1902	England	6,830,279	11,892 458	120,338,282	34,780,994	167,011,734
	Scotland	7,292,312				
	Ireland	4,368,188				
	Total United Kingdom.	18,490,779				

The rates of duty in force between 1891–92 and 1901–02 re as follows :—

	Per Gallon "computed at proof." s.	d.
From 1st April 1891 to 16th April 1894	10	6
„ 17th April 1894 to 30th June 1895	11	0
„ 1st July 1895 to 5th March 1900	10	6
„ 6th March 1900 to 31st March 1902	11	0

lusive of 6*d*. per gallon, which, under the provisions of & 54 Vict. c. 8, s. 7, is required to be surrendered to the cal Taxation Accounts.

Number of Proof Gallons of Home-made Spirits on which Duty was actually paid in each of the Five Years 1898 *to* 1902.

1898	33,713,128	814,855
1899	35,188,524	854,440
1900	39,629,982	913,249
1901	37,707,953	1,004,225
1902	34,760,381	1,011,150

OTE.—The difference between the figures given in the second umn and those returned for consumption represents the quantity ehoused on drawback for exportation.

One hopes that the officials of excise are quite cognisant the latest and most improved methods of the Continent, ecially Germany. That being so it is reasonable to ume that no obstacles would be raised to changes which olve more rapid and economical working—whether in ditions or plant, so long as the main considerations or y raising are conserved. Here distilleries are not nerous; there are 193 in the United Kingdom (possibly many for brilliant competition), but they are large l, within the limits of permission, fairly well equipped.

Dr. W. S. Squire, the eminent expert, says that in erica one distillery produces 300,000 gallons daily, and no larger than one in Scotland producing 60,000 gallons ly.

Number of British Distilleries at Work in the Period from 1st *October* 1890 *to* 30*th September* 1901.

Year ded 30th ptember.	England.	Scotland.	Ireland.	United Kingdom.
1891	10	128	29	167
1892	10	130	28	168
1893	11	132	28	171
1894	11	132	27	170
1895	11	132	27	170
1896	11	136	26	173
1897	11	143	28	182
1898	11	157	29	197
1899	10	161	29	200
1900	10	159	30	199
1901	9	156	28	193

The distiller is required to provide the vessels enumerated in the Spirits Act, and to conduct the manufacture in the prescribed manner. But consideration is never refused to any applications relative to peculiarities in the mode of working, and within the limits of the law there is as much latitude given as is consistent with revenue requirements and the legal obligations imposed on the distilling trade.

Distilleries distributed as follows :—

ENGLAND :—	
Derby	1
Essex	2
Gloucester	1
Lancaster	2
Middlesex	2
Surrey	1
Total	9
SCOTLAND :—	
Aberdeen	10
Argyll	33
Banff	24
Caithness	1
Clackmannan	3
Dumbarton	3
Dumfries	2
Edinburgh	4
Elgin	14
Fife	5
Forfar	3
Haddington	1
Inverness	10
Kincardine	3
Lanark	6
Linlithgow	4
Nairn	2
Orkney	3
Perth	8
Renfrew	4
Ross and Cromarty	8
Stirling	3
Sutherland	1
Wigtown	1
Total	156
IRELAND :—	
Antrim	2
Cork	4
Down	5
Dublin	6
Galway	1
Kildare	1
King's County	1
Londonderry	5
Louth	1
Westmeath	1
Wexford	1
Total	28
UNITED KINGDOM	193

Using materials (United Kingdom) in the year ended 30th September 1901, estimated at :—

	Qrs.
Malt	1,195,790
Unmalted grain	1,442,039
	Cwts.
Molasses	813,708
Glucose	8,377
Sugar	719
Other materials	9,496

The comparative spirit values of different materials in producing wort are shown thus :—

1 cwt. of	Sugar	will yield from	9–12	galls. proof spirit.
,,	Rice	,, ,,	7–8	,, ,,
,,	Molasses	,, ,,	7–8	,, ,,
1 cwt. of	Treacle	will yield from	6–7	galls. proof spirit.
,,	Malt	,, ,,	6–6·5	,, ,,
,,	Beet	,, ,,	8–9	,,
,,	Mangold wurzel	,, ,,	8	,,
,,	Carrots	,, ,,	5	,,

May we take it that on an average the produce from—

	Galls.
1 quarter of barley malt would be ..	18
1 quarter of malt and grain	18–20
1 cwt. of sugar	10
1 cwt. of molasses	6–7

Neither potatoes nor beets are employed.

Equally from a Customs point of view are precaution measures needful, as the following figures will show :—

Table showing the Number of Proof Gallons of Colonial and Foreign Spirits Imported into and Re-exported from United Kingdom, and Home-made Spirits Exported from the United Kingdom, in the period in 1897–98 to 1901–02.

Year ended 31st March	Foreign and Colonial Spirits Imported.				Foreign and Colonial Spirits Re-exported.				Home-ma Spirit Export
	Rum.	Brandy.	Other Spirits.	Total.	Rum.	Brandy.	Other Spirits.	Total.	
	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Ga
1897–98	4,723,450	2,834,180	1,784,734	9,342,364	876,283	52,465	231,206*	1,159,954	4,585,62
1898–99	5,177,552	2,524,107	1,604,767	9,306,426	916,219	59,823	236,093*	1,212,135	5,090,2
1899–1900	6,234,923	2,579,634	1,924,819	10,739,106	984,214	55,869	265,008*	1,305,091	5,284,61
1900–01	6,882,068	2,650,101	2,141,350	11,673,519	889,414	60,944	260,862*	1,211,220	5,773,71
1901–02	6,719,452	3,081,525	2,617,090	12,418,067	927,214	60,468	266,166*	1,253,848	6,312,21

* Including home-made and colonial and foreign spirits mixed in bond, the quantity for 1091–02 being 151,117 galls.

FOREIGN SPIRITS.

Quantities (1) *Imported,* (2) *Cleared for Consumption and Duty-paid, and* (3) *Remaining in Bonded Warehouses.*

Year ended 31st March.	Quantity Imported.				Quantity Cleared for Home Consumption.				Duty.	Quantitity remaining in Bonded Warehouses at close of Year ended 31st March.			
	Rum.	Brandy.	All other Sorts.	Total.	Rum.	Brandy.	All other Sorts.	Total.	Net Total.	Rum.	Brandy.	All other Sorts.	Total
	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.	£	Proof Galls.	Proof Galls.	Proof Galls.	Proo Galls
1898	4,723,450	2,834,180	1,784,734	9,342,364	..	..	..	8,250,603	4,299,961	8,132,000	5,889,000	277,000	14,298,
1899	5,177,552	2,524,107	1,604,767	9,306,426	..	..	..	8,127,940	4,236,160	7,202,000	5,562,000	290,000	13,054,
1900	6,234,923	2,579,364	1,924,819	10,739,106	..	..	..	9,304,163	4,898,930	6,654,000	5,002,000	315,000	11,971,
1901	6,882,068	2,650,101	2,141,350	11,673,519	..	..	..	8,657,098	4,769,763	7,339,000	4,793,000	374,000	12,566,
1902	6,719,452	3,081,525	2,617,090	12,418,067	4,083,414	2,310,565	1,905,763	8,299,812	4,581,520	7,989,000	5,006,000	458,000	13,453,

On the Continent, where distilleries are numerous, comparatively few are large. British distilleries for the most part employ cereals, and, according to circumstances, molasses, of which there are very considerable quantities when desired, or other saccharine substances, at a cheap rate, usually with a drawback or rebate as in the case of molasses to-day. The quantity produced from molasses is small and inferior in quality. Imported spirit is not as a rule inferior, much of it is excellent, but is not so suitable for whiskies; it does not improve with age. The coarser variety of imported spirit suffices for denaturing by commercial methyl alcohol (wood spirit) for the methylated spirits of commerce. (See T.R., Vol. XXI. [20], Oct 31, 1902, p. 1312.) It is chiefly produced from potatoes, which, with beetroot, form the main agricultural staple of large parts of Germany, especially the northern. Distilleries exist in considerable numbers under supervision even more strict than here. They are, for the most, up to date and modern in construction, and in practically continuous operation. It may be well to remember that the governmental system of Germany involves a peasantry, accessible for military eventualities, by conscription, and after short service, a return to the soil, on which they must be maintained ready for service if required. The soil is suitable for little else than the growth of potatoes in great variety, and the rearing of cattle. This population is for the most part employed in the industries, consequent on such con tions, whether direct or related, and the land is maintain in a very high state of manurial efficiency, the cattle bei fed largely on the artificial foodstuffs produced in t spirit and allied industries. As might be expected, t production of spirit was large, and in excess of the requi ments of the people or of industry. Yet the agrari political, domestic, and military conditions permitted sm diminution of output. What was to be done? Obvious to discover outlets and uses. This has year by year be done, and whereas by the application of high scienti knowledge to increase and create, and the preferent effect of their patent laws, with enterprising and intellig methods of business, German chemical and allied industr have grown apace. To some, but not the same extent similar result has occurred in thrifty France.

It may be a digression, but its importance may gauged by perusal of an article in the American Mont "*Review of Reviews*" entitled "Ireland's Emancipatio The writer of the article views the approaching land sett ment in Ireland with intense satisfaction and hopes—in word, for our purpose, it means turning Ireland really in a truly agricultural country, capable of growing potato &c., as in Germany, with varieties suitable for all kinds land, and establishing distilleries on the most approv systems, as in Germany. As the result of experimen

0 varieties of potatoes are known. The same applies some parts of England. The Statistical Abstract for the nited Kingdom for the last 15 years gives :—

—	Great Britain, 1901.	Ireland. 1901.
ltivated acreage.......	32,417,445 acres	15,219,175 acres
tatoes................	577,260 „	635,321 „
her amylaceous matter	133,708 „	1,099,335 „
ttle	6,760,894 „	4,670,323 „

IMPORTATIONS, 1901.

—		Quantity.	Declared Value.	Declared Average Price.
			£	Sh. per Cwt.
tatoes	Tons	707,722	1,851,587	5·23
olasses...........	Cwts.	1,709,674	365,329	4·27
rn :				
Wheat	„	69,708,530	23,081,372	6·62
Barley...........	„	21,873,430	6,163,012	5·64
Oats	„	22,470,670	6,347,719	5·65
Maize............	„	51,372,700	12,387,225	4·32
Other kinds	„	5,326,741	1,767,727	..
Flour of wheat...	„	22,576,430	10,341,519	9·16
Flour of other kinds	„	2,795,908	1,086,716	7·77
Total of corn....		196,124,409	61,175,290	

One can imagine our home distillers aghast at such a roposition, but the suggested additional industries required stify such a hope. One need only mention quite a side roduct, amyl alcohol. The demand in America, and ow greater in Germany, for amyl acetate as a solvent r gums, as well as for explosives use is more than can sily be met; amyl alcohol, 7*l.* a ton, is now fetching 5*l.* a ton. One referred to bye-products—well, molasses nd such like are used for spirit production even in this ountry much more than is supposed, and in Germany e residue is regarded with care; for, treated scientifically, yields potassium salts. *The International Sugar Jourl*, 1902–4, [47], 602—607, in an article on the by-proucts of the sugar industry for making alcohol, states that, together with various chemical compounds extracted om the sugar, molasses, &c., residues, after the removal of e alcohol the profits are made." The article proceeds to escribe the process of treating the residues after distillaon, for "raw potash," which contain 50 to 60 per cent. f potassium carbonate. In small factories the residue is ot converted into "potash" but is sold as a fertiliser, e manurial value of which from 1 cwt. molasses is out 2*s.*

It has been stated that distillation apparatus makers on the ntinent were willing to erect the latest and most approved lant here, on condition of receiving the residues so treated. is stated on the same authority that the British system nd regulations make this impossible. One can appreciate e difficulty a British distiller has to meet, but if the rapping of plant (and it could scarcely mean that) had to e faced in another national industry, notably that of steel, , with the acknowledged wealth of the general body of stillers, ought the same to be possible, so that industries ight return, dying ones revive, and new ones arise. On e other hand, assuming the industries resumed and -created, the Government would rise to the occasion, and rmit, as its staff and experience justify, much more frequent orking, instead of seldom, as now.

These observations are made in knowledge of the facts of e agrarian needs of Germany in particular; of the working the continuous system, of the combination of every llateral interest of production of spirit, whereby, in fact, cohol becomes a bye, rather than the chief product. We e not unmindful of the tariffs against other nations—the istence of which enables that Government to give abateent of duty according to position of the distilleries, size, tput, differentiating even between different industries and es. At the present moment the probabilities are that spirit will be dearer because there is no desire to export, and there is a desire to promote their own industries still more; remember it costs money to pay the rebate or bounties, and so long as uses can be found and encouraged the Government gains—the money does not come out of the distiller's pockets but the nation's.

The *Chemist and Druggist*, in its Trade Report of September 1902, referred to the negotiations then in progress among the distillers of Germany for the general reduction output, says: "We now learn that at a meeting of the spirit ring (Verwerthungsverband Deutscher Spiritusfabrikanten), held in Berlin on September 15, it was decided, with the full approval of 90 per cent. of the members, and with the conditional assent of another 4 per cent., to limit the production, and, as compensation to merchants associated with the ring for the increased cost of spirit, the discount rate was at the same time raised to 36 per cent. Both resolutions took effect on October 1. In addition to this factor operating in the spirit industry, we are now able to furnish details of the new spirit law, already in operation. The taxes are, as in the 1887 decree, of two kinds—'Excise' and 'material,' or 'mash-tun' imposts. The former is increased according to a scale which favours small manufacturers. Thus, a distillery producing 200 to 300 hectolitres per annum is taxed at 5·1 m. per hectolitre whilst another producing 800 to 1,000 hectolitres pays 7·1 m. The incidence here indicated is, however, modified by the 'contingent' clause. Formerly, so long as the production of spirit in any German State did not exceed 4·5 litres per head of its population, a reduction of 0·2 m. per litre from the Excise tax was allowed, the full amount only being charged on the excess. Now, however, the operation of this clause is modified, and is to be revised by the Bundesrath every five years. At present a certain fraction, small for large distillers and gradually approaching unity as the concern decreases in size, is allowed to be produced at the lower rate. This tax falls due as soon as the alcohol is 'officially' made, and a drawback of 6 m. per hectolitre is refunded to exporters. For the purpose of the 'material tax' distilleries are divided into 'agricultural' (using grain and potatoes), 'material' (a euphemistic term for saccharin residues of various kinds), and 'industrial' (including all concerns which cannot be otherwise classified). The first of these pays a mash-tun tax of 1·31 m. per hectolitre of contents mashed; the second, a tax graduated according to the matter employed—0·25 m. for kernel fruits and rack wine, 0·45 m. for berries of all sorts, 0·50 m. for brewery and yeast residues, 0·85 m. for grapes, stone fruits, fruit wine, &c., per hectolitre; whilst the third class is charged 0·2 m. for each litre of pure alcohol produced, a reduction to 0·16 m. and 0·18 m. being made in the case of old-established concerns producing less than 10,000 and 20,000 litres respectively per annum. To belong to the agricultural class the owners of the distillery must grow their own raw materials on the neighbouring land, and the distillery residues must be applied as manure. The incidence of both taxes is also somewhat modified in the case of factories which have, during the course of the revenue year, altered their working material, or have for a part of the time made yeast instead of spirit. Both imposts are remitted on alcohol to be used for industrial purposes—heating, cooking, lighting, and vinegar-making—or when supplied to hospitals, charitable institutions, and scientific establishments. The increased taxation will not, therefore, have any effect on the manufacture of fine chemicals, such as alkaloids and synthetic remedies, nor will it arrest the development of infant industries, like alcohol incandescent lamps and alcohol motors. The non remission of the 'material' tax on exported spirit will, however, be felt by exporters, and will tend to decrease the British import of potato spirit. Similarly, the total drawback of 6 m. allowed to exporters of alcohol and preparations containing it will curtail the export of German tinctures, since this amount, except in the case of small manufacturers, who are lightly taxed, scarcely covers the Excise tax, and leaves untouched the second impost. Another remarkable feature of the new law, foreshadowed in the Imperial decree of 1897, is the abolition of the permission to use duty-free spirits for medicinal purposes."

In the German Spirit Trade Journal, the *Spiritus Zeitung*, of Feb. 12, there appears a notable announcement which translated runs thus: "Agreement," that is by the spirit ring, "as to production for 1903—1904."

Agreement as to Production for 1903-04.

"The carrying of the limitation of production in the current year has generally convinced the distilling industry that a firm limitation of the production cannot be backed for the future in order to obtain security of things generally. This conception, which had already been mooted on the occasion of the departmental meetings everywhere and without opposition, has led to an imposing demonstration during the general assembly, on the 13th February, of the members of the Convention. In this assembly, which was extraordinarily attended, a resolution was carried unanimously with a renunciation of claim to any discussion. Recognising the necessity of a renewed limitation of production for the year 1903-04; the mover, Zu Putlitz, Gross Paskow, has in the meantime made known the following fundamental principles:—The admissible quantity of production is calculated again on basis of the average of production of the five years 1892-97—1900-01, but is limited at about 10 per cent. higher than for 1902-03. In comparison with the admitted quantity for the current year, and in accordance with the general stipulations, the agreement in view for 1903-04 does not mean a limitation but an increase of production."

2. As a minimum contribution of the agricultural potato distilleries—for 1902-03, 90 per cent. of the "contingent," as is well known—a not inconsiderably higher percentage of the "contingent" will be asked for 1903-04. In order to enable a larger number of distillers to join, the general conditions shall this time be arranged in such way that those distilleries will be taken into consideration with which certain deviations from the regular ways of working exist.

The obtaining of declarations of assent is deferred till the autumn of the year 1903, because only at the end of the campaign the exact gauge for the admissible quantity of production for the new price will be found; it is also the intention of agitating for the engagement of the agricultural and industrial distilleries which receive a new "contingent" in the meantime. The principles now published will put every single distiller in a position for his spring sowing to arrange matters as to the area to be planted with potatoes with a view to the engagement of production for 1904, and thus to prevent a falling back in the price of spirit."

It is not permissible, nor if it were so, is it desirable to lead up to a discussion on the relative merits or demerits of any national fiscal system on this occasion. But it is fair and reasonable to urge that everything possible within the limits of the system deliberately adopted shall be done for the creation and furtherance of industries within the realm in which such system operates. May we not reasonably ask, as lovers of our country and flag, whether as much has been done by Government departments as was possible to foster industry and trade? Competitors of other nationalities—friendly, perhaps (as well they may be)—have under our fiscal system been greatly favoured. Speaking broadly, transport, insurance, and freight at through rates have certainly favoured them. Local port and dock charges and high internal freightage have not facilitated our own exportation. Patent laws have hitherto distinctly protected our rivals, and a misdirected Merchandise Marks Act (justified only in one direction) has given an unasked and gratuitous advertisement to these same competitors—excellent customers, no doubt, as the export returns show them to be; so great indeed as to outweigh by far the business with our own colonies. It is probably this consideration mainly which affects any alteration of the fiscal system of the nation in its relations to our Colonial Empire.

We may venture to recall a sentence from our President's address in Liverpool last year which may not have been remembered, but which, as a stimulus to thought and exertion, should be considered. He said, concluding the section of his address devoted to the "Decline of the Aniline Industry," "English brains created the industry. English enterprise developed it. English legislative folly has been the cause of the decline." One cause is in a fair way to be removed by the operation of the new Pate Act and the rules of procedure (which have been fu abstracted in our Journal). A further cause may in great part, if not entirely, removed by an amendme of the Finance Act of 1902. Clause 8, paragraph giving power to "*allow drawback or rebate on Britis made spirit, applied to specified industries, permitt officially as need and discovery indicate*"—unless, inde such a general administrative power already exists, as wo seem to be the case, judging by the concessions and reba made on exporting tinctures, &c. May we hope for favourable consideration of this suggestion? Probably m persons are aware of the sensible concessions and rules of t Excise relating to the exportation of spirituous medici preparations, which came into force in 1889, after mu negotiation and diplomatic urgency. It is quite true t tinctures and a very limited class of spirituous preparatio could be exported under the old arrangement of the Custo "special drawback or rebate upon exportation" (subject conditions of bulk, &c.), but the regulations of the l decade have been gradually extended and enlarged, u there is now no reasonable ground for complaint. This due to the openmindedness of the high officers of the Exc the clear, straightforward way in which the facts were by the exporting manufacturers, and actually demonstra in their laboratories. In 1896, when he had the honour being President of the Society, this subject was referred in detail. Experience has shown that the number of p parations might, and have been, considerably extended, t mixtures even of pure spirit might in certain cases included—so far as an allowance upon the spirit actua contained and mixed in the presence of an officer. this, be it noted, in the open premises of manufacturers wholesale druggists who had become licensed as "Co pounders" and paid the annual fee of ten guineas, with any locks, bolts, or bars. An inspection by an Exc officer, samples taken by him, a declaration, an offi analysis, are all the formalities. Then, soon, a cheque the drawback or rebate. This is the convenient and usefu simple business of allowing a return of the spirit duty differential duty or surtax 5*d*. per proof gallon with th per cent. for waste, and a margin for possible error

Statement of the Number of Proof Gallons of Spirit contained in Tinctures, &c. exported, and on whi Drawback was allowed in the United Kingdom in the under-mentioned Years.

Years ended 31st March	England.	Scotland.	Ireland	Unite Kingd
	Galls.	Galls.	Galls.	Gall
1889 (three months)	1,506	..	..	1,50
1890	9,715	..	..	9,71
1891	13,012	20	..	13,03
1892	20,888	7	..	20,89
1893	27,410	23	..	27,43
1894	41,962	46	..	42,00
1895	38,876	..	..	38,87
1896	56,463	..	..	56,46
Total	209,832	96	..	209,92

The statistics since 1896 are as below, by permission

Drawback on Exportation of Tinctures, &c. (with Allowance for Loss in Manufacture.)

Years ending 31st March	England.	Scotland.	Total.	—
	Gallons.	Gallons.	Gallons.	£
1897	56,780	219	56,999	29,924
1898	67,466	54	67,520	35,448
1899	77,816	1,976	78,892	41,448
1900	79,272	1,454	80,726	42,381
1901	92,195	3,348	95,543	52,038
1902	105,857	3,539	109,396	60,163
Totals	479,386	9,690	489,076	261,375

nalysis—in the case of compounded spirituous prepara-ons. In the case of plain or mixed spirit of 3*d.* per roof gallon and no allowance for waste. These remarks pply also to the exportation under drawback of perfumes nd flavoured essences, subject to suitable modifications. hus it will be seen that something like a sum of 400,000*l.* as been returned to licensed exporters.

On this, possibly, historic occasion, the author feels some tisfaction in having advocated and taken an active part a movement which has rendered some service to British aders. He has lived to see the day when responsible fficials have ceased to say "never," but welcome sugges-ons, with certain legitimate reservations, with eagerness.

The *Chemist and Druggist*, in its issue of January 17, 902, recalls the fact that the privilege as regards chemists contained in 16 Geo. II., c. 8, sec. 12, which Act was assed in the Session of Parliament that began on Dec. 1, 741, and ended on Nov. 16, 1742. The Act imposed uties on spirits, allowed drawback of the same in order to ncourage exportation, and required retailers of spirits to ike out a licence. Section 12 of the Act contains the ollowing exemption :—

Provided always, and be it enacted by the authority foresaid, that this Act, or anything therein contained, shall ot extend to any physicians, apothecaries, surgeons, or hymists, as to any spirits or spirituous liquors which they ay use in the preparation or making-up of medicines for ick, lame, or distempered persons only.

The spirit duty was 11*s.* per proof gallon ; we quote the uties specified in the old Act :—

For every gallon of low wines or spirits of first extraction from foreign or imported materials	6*d.*
Ditto from malt or corn	1*d.*
Ditto from brewers' wash or tilts	1*d.*
Ditto from any other sort or kind of English materials	1½*d.*
For every gallon of spirits made in Great Britian of any kind of wine or cider imported	6*d.*
For every gallon of strong waters or *aqua vitæ* made for sale of any other materials	3*d.*

It is curious to note that the principle of the drawback on pirituous medicines was in essence recognised by the Act.

All this points to the feasibility of carrying on some dustries in this country without overwhelming burdens r needless restrictions, and in part by the application of an lready acknowledged principle. One does not, can scarcely, sk for the system of bounties as in Germany or France. n the end, as one has said before, the nation must pay, but ne feels convinced that the increased revenue from taxed rofits, from many sources related to the industries from xtended employment of labour directly and indirectly ould go very far towards recouping the State for liberal onsideration as regards products in the manufacture of hich spirit, denatured or plain, plays a part. Nevertheless, anufacturers are bound to play their part in employing the reatest economies, not only in plant and processes, but in he utilisation of every useful by-product.

This Society owes a debt of gratitude to those gentlemen f the British Association Committee on this subject, nd not least to our past Presidents, Sir H. E. Roscoe and r. T. E. Thorpe. This concession again points to the need f consistency in this matter, for as Mr. David Howard and Ir. J. C. Umney point out "It is useless to grant freedom or alcohol for research, if freedom is not granted for lcohol required as the result of research."

A year ago Geheimrath Prof. Dr. Otto N. Witt lectured t the Royal Institution on "Recent Developments in olouring Matters," and among other remarkable state-ents said "more recently still it has become the custom n this country (Britain) to view dyestuff manufacture, not o much from its chemical or industrial side, as from the tandpoint of the national economist, who contemplates he values produced by industrial enterprise, and inves-igates the reasons why these values should be *unevenly* istributed amongst the different nations, striving side by ide for progress and engaged in friendly yet none the less ager competition." The learned Professor disclaimed his ntention to treat his subject from that point of view ("Wise Professor !"), yet, later on in his lecture, he tells that according to the rules of permutation 3,159,000 different individual dyestuffs are easily accessible to our industry. Of these at least 25,000 form the subject of German patent specifications and of corresponding specifications in England, France, the United States, and other countries. Over 500 (of the diazo compounds, phenols and amines) are regularly manufactured on the larger scale, in Germany.

There is much for research to do, with or without alcohol, but the force of the observation made by the two gentlemen before mentioned is very considerably increased by Dr. Witt's comment on our attitude.

In the *Chemiker Zeitung* for Jan. 31, abstracted in the *Chemical Trade Journal*, is the following, relating to the effect of research in the colleges in Germany.

"A landmark in organic chemistry is announced by M. M. Richter in the issue of the same Journal for February 4th. He reports that a hundred thousand organic compounds have now been described. In the years 1883–1888, the average number of new compounds described in each year was 3,580; in 1899–1900, 6,270; and in 1901–1902, 6,700. A very large proportion of these compounds have been discovered in Germany, and this fact is to be ascribed largely to the policy of awarding the doctorship on the condition that a thesis is to be submitted. The extensive scientific productivity of the Colleges is closely connected with the prosperity of the corresponding industries. If the Colleges were to produce less original work, a bad effect would at once be produced in the various chemical trades. This, at least, in the author's opinion."

When Dr. Silberrad's paper was read (No. 12, Vol. XXI., June 30, 1902, p. 827) parliamentary sanction for what has been called "duty-free" spirit had not been obtained, and much was anticipated from this movement in official quarters, arising, as it then did, in some need in connection with the work of the Explosives Committee of the Government. That Committee consisted of Lord Rayleigh (chairman); Sir Wm. Crookes; the late Sir W. Roberts Austen; Mr. Haldane, K.C.; Sir Andrew Noble; Captain Tulloch, secretary; with Dr. Silberrad as chief chemist. Mr. Haldane's original motion in the House of Commons appears in the daily parliamentary amendments paper (No. 1567 of June 11, 1902), with this marginal note, "Power to authorise use of spirits without payment of duty in manufactures." ("Hope rises eternal in the breast!") The clause as printed appears in our Journal (No. 12, Vol. XXI., June 30, p. 878). There is not one word about any exception, partial or total. The Spirit Committee of this Society, prompted by the sanguine writer of this paper as convener, wrote a letter of thanks to the then Chancellor of the Exchequer, whose reply was an acknowledgement of the letter and an intimation of its relegation to the department of the Inland Revenue. In due time the clause appeared in the Finance Act, 1902, but with an unexpected insertion of these words, "Provided that foreign spirits may not be so received or used until the difference between the duty of customs chargeable thereon and the duty of excise chargeable on British spirits has been paid." That is to say, a differential duty as heretofore of 5*d.* per proof gallon. As regards this 5*d.*, it was a year ago 4*d.*, and the penny was probably put on as a complement of the Corn Tax. But the blue-books show that, while the cereals are all taxed, a difference was made as regards maize, one of the principal cereals employed by distillers, who get ample consideration for the requirements of excise supervision in the surtax, referred to, on imported spirits and the export allowance on British spirits exported. In fixing these, regard has been had to the increased expense of manufacture consequent on having to comply with legal requirements, but 4*d.* was enough before.

The rebate, or *export allowance*, as it is more usually called, is intended to recoup the *home* distiller for the additional expense to which he is put by the revenue restrictions imposed on his manufacture and for the corn duty on the materials he uses. This allowance is payable only on spirits which are exported from a duty-free warehouse or are used in warehouse for purposes for which foreign spirits are allowed to be used, and on the spirits used in making methylated spirits when the spirit so methylated is exported direct from the premises of a methylator. *The purpose of both allowances is to put foreign-made and spirit of home manufacture on an equal footing in the home and foreign markets.* The surtax (or differential duty) on rum or brandy is 4*d*. per gallon at proof; on other imported spirits it is 5*d*. The *export allowance* on rectified spirits and plain British spirits is 3*d*. per gallon, and on British compounded spirits is 5*d*. per proof gallon.

The value to technologists of the hoped-for concession of duty-free spirit as it stood in Mr. Haldane's motion disappears for us, who desire to recover lost industries or establish new ones; spirit remaining 40 to 45 per cent dearer than for our competitors.

Before 1855 many trades were carried on in Britain at a great disadvantage. The French were surpassing us and taking possession of our markets, owing chiefly to their materials being duty free, while in Britain there was at least 12*s*. 6*d*. per gallon imposed on the spirits of wine. Inferior substitutes for spirits were used in many cases, and by these the character of the goods themselves was injured. The temptation to purchase illicit spirits was great. The subject was brought under the notice of the Treasury in 1853, by a gentleman who had obtained a patent for an artificial lubricant, and asked to be allowed to use spirit either free of duty or at a very reduced rate. The Commissioners supported the application. In the I.R. report (1857), page 6, appears thus: "In the year 1853 a gentleman who had obtained a patent for an artificial lubricant as a substitute for sperm oil, applied to your Lordships to be allowed to use spirit in the manufacture of his lubricant duty free, or at least at a reduced rate. After a care examination of his invention, we found not only that t spirit was rendered unfit for drinking, but that it could n by any means be restored to its original purity. V therefore recommended that the request be compli with."

This led to the experiments of Professors Graha Hoffmann, and Redwood; their report was satisfacto and legislation was resorted to.

The subject of both German and Swiss denaturing w very fully dealt with in Dr. Silberrad's paper in June la before the Society (see Journal, 12, Vol. XXI., page 82 and no material modification has since been made. In t German and French official books, copies of which the Socie has had pleasure of presenting to the recently appointed ch inspector of excise, Mr. Leah, the denaturing of meth alcohol itself is specially provided for. This is necessary, l as most probably know, methyl alcohol may be a potal spirit, and is dutiable here at the same rate as a "low win and according to absence of flavour, even as ethyl alcoh It is absolutely necessary in countries where wood spirit largely produced to secure the impotability of this alcoh Many years ago, perhaps 40, Mr. Eschwege, still a memb of our Society and resident in London, laid out a ve considerable sum of money for plant for purifying wo spirit. His efforts were brilliantly successful, and methyl alcohol of very remarkable purity and potabili was produced in quantity. It was no sooner done th stopped by the Excise. The inventor could not under t then regulations be stopped or dealt with officially, althou to certain knowledge he was inspected, and special regu

REPORTS OF THE "COMITÉ." No. 103.

Consumable Methylic Alcohol Employed Duty Free for Industrial Purposes.

Nomenclature.	Summary.	Dates of the Reports of the *Comité.*	Remarks.
	1.—Questions of Principle.		
Definition of methylic alcohol.	In order to be considered as unfit for consumption as a beverage and to be freed from the expense of excise inspection and denaturation, the alcohol must contain at least 5 per cent. of acetone and 3 per cent. of pyrogenic impurities, which give it a disagreeable empyreumatic odour.	14th March 1900	.. .. ..
Fixing of a general process of denaturation.	Addition, in the presence of officials, 12 kilos. of sulphuric acid of 66° per hectolitre of consumable methylic alcohol.	12th June 1901	.. .. ..
Expense of supervision...	If the process of denaturation does not of itself guarantee the interests of the "Treasury," and it becomes necessary to exercise a complementary supervision, the expense of such supervision has to be borne by the manufacturer.	3rd April 1901	.. .. ..
Medicaments............	Grouped with ethylic alcohol from the fiscal point of view, methylic alcohol must pay full duties, if it is present in the finished medicament.	6th March 1901	.. .. ..
	2.—Authorised Branches of Industry.		
Antipyrin	Addition of 2 per cent. of bromide of methyl	3rd April 1901	Complementary supervision at ma facturers' expense.
Benzoate of methyl.......	General process	12th June 1901	.. .. ..
Bromide of methyl........	General process	8th April 1901	.. .. ..
Chloride of methyl........	Mix methylic alcohol and half its weight of commercial hydrochloric acid of 21° or 22°.	24th July 1901	.. .. ..
Collodion	Mix methylic alcohol with its volume of ether and addition of pyroxile: the collodion must contain at most one part of methylic alcohol per one part of ether and hold in solution 6 grms. of pyroxyline per litre.	1st May 1901	The manufacturer must represent least 2 litres of collodion per li of methylic alcohol.
Dimethylaniline	General process	12th June 1901	.. .. ..
Formaldehyde (formol) ..	Addition, to the alcohol, of from 2 to 3 per cent. of industrial formaldehyde.	3rd April 1901	.. .. ..
Gallocyanine	Addition of hydrochlorate of nitrosodimethylaniline at proportion of 3 per cent. of the weight of methylic alcohol.	24th July 1901	.. .. ..
Monomethylamine	General process	12th June 1901	.. .. ..
Orthoform................	General process or addition of from 20 to 25 kilos. of hydrochloric acid of 20° B. per 25 kilos. of alcohol.	24th July 1901	.. .. ..
Salicylate of methyl.......	General process................................	3rd April 1901	.. .. ..
Colours for silk	Addition of 20 grms. of "Indian Yellow" (a colouring matter from aniline) per 100 litres of pure alcohol.	24th July 1901	.. .. ..

ons, if not a change in the law, were necessary before this ould legally be done. One sympathises with the inventor, it success under our system could only have resulted in actical prohibition, and, at the best, concessions such as e now desire.

Some time ago, when the subject of facilities was being onsidered as to methyl alcohol, the authorities gave ermission, under supervision, for the use of methyl cohol denatured with $\frac{1}{5}$ per cent. of pyridine bases, stablishing thus a precedent. The permission was not tilised, it is understood, because of the price of methyl cohol, which is controlled by a ring whose export price is rohibitory as regards colour makers. The balance, how- ver, may be restored when the immense resources of ussia are utilised and advanced, for, as is known, timber sawn lengths, &c. is exported, but, comparatively cently, the sawdust, shavings, and *débris* generally of the ood industry are utilised, and the results, including methyl cohol, made available. Yet regard must be had to the onsideration before mentioned as to potability.

In consequence of this possibility in France, the regula- ons for denaturing methyl alcohol itself are definite. They e given in the table on preceding page.

It is clear that, as a rule, some form of denaturing will e required as one condition of industrial expansion, as in ermany, France, or Switzerland. This being so, we may ote the official statistics as to—

METHYLATION.

Table showing, for England, Scotland, and Ireland, nd for the United Kingdom, the number of Proof Gallons of Home-made and Colonial and Foreign Spirits Methylated in the Period 1891–92 *to* 1901–02.

Year ended 31st March	England.	Scotland.	Ireland.	United Kingdom.
	Home-made Spirits.			
	Proof Galls.	Proof Galls.	Proof Galls.	Proof Galls.
1891-92	2,595,255	441,813	25,172	3,062,240
1892-93	2,498,118	362,177	29,022	2,889,317
1893-94	2,763,036	309,962	33,883	3,106,881
1894-95	2,840,278	263,987	34,789	3,139,054
1895-96	3,492,645	309,674	35,763	3,838,082
1896-97	3,664,125	411,917	42,832	4,118,874
1897-98	3,943,582	476,824	40,456	4,460,862
1898-99	4,149,128	587,088	45,153	4,781,369
1899-1900	4,280,437	646,664	50,926	4,978,027
1900-01	4,329,214	692,486	49,013	5,070,713
1901-02	4,010,334	575,606	54,830	4,640,770
	Colonial and Foreign Spirits.			
1891-92	356,423	90,685	8,425	455,533
1892-93	562,792	77,655	5,070	645,517
1893-94	361,272	74,145	1,288	436,705
1894-95	340,456	107,493	..	447,949
1895-96	21,536	69,305	1,149	91,990
1896-97	24,163	273	..	24,436
1897-98	1,706	..	..	1,706
1898-99	3,045	735	..	3,780
1899-1900	5,710	535	..	6,245
1900-01	120,332	..	..	120,332
1901-02	519,325	108,085	..	627,410
	Total Home-made and Colonial and Foreign Spirits.			
1891-92	2,951,678	532,498	33,597	3,517,773
1892-93	3,060,910	439,832	34,092	3,534,834
1893-94	3,124,308	384,107	35,171	3,543,586
1894-95	3,180,734	371,180	34,789	3,587,003
1895-96	3,514,181	378,979	36,912	3,930,072
1896-97	3,688,288	412,190	42,832	4,143,310
1897-98	3,945,288	476,824	40,456	4,462,568
1898-99	4,152,173	587,823	45,153	4,785,149
1899-1900	4,286,147	647,199	50,926	4,984,272
1900-01	4,449,546	692,486	49,013	5,191,045
1901-02	4,529,659	683,691	54,830	5,268,180

For the sake, however, of reference when considering the suitability of denaturing agents for any special branch of industry, it may be useful to include the latest information, thanks to Mr. E. J. Millard, from "The Imperial Spirit-tax Law," by Gustav Lehmann, where the regulations are explained in detail especially for the use of distillers.

Denaturing of Spirit.—Denaturing is either complete or partial: in the former case it is considered sufficient to render the spirit undrinkable, and in the latter further measures are taken to prevent illegal use of the spirit.

For complete denaturing, a mixture is used consisting of 4 vols. of wood-spirit and 1 vol. of pyridine bases, to which must be added, at the time of mixing, 50 grms. of oil of lavender or oil of rosemary to each litre of the mixture. Of this mixture, 2·5 litres are to be added to every 100 litres of the alcohol to be denatured.

Complete denaturing may also be effected by the addition of 1·25 litres of the above general denaturing agent, together with 0·25 litre of crystal violet solution (hydrochloride of hexamethyl-*p*-rosaniline) and 2 to 20 litres of benzol to every 100 litres of alcohol.

For partial denaturing, the following special denaturing agents are to be added to every 100 litres of alcohol:—

(*a*) For industrial uses of all kinds, including the manufacture of medicines, 5 litres of wood alcohol or 0·5 litre of pyridine bases.

(*b*) For the manufacture of brewery glazes and in the treatment of rubber goods, 20 litres of shellac solution composed of 2 parts by weight of alcohol and 1 part of shellac. The spirit used in preparing this shellac solution is to be considered as denatured so long as the making of the solution is officially supervised.

(*c*) For the manufacture of celluloid and pegamoid, 1 kilo. of camphor, or 2 litres of turpentine, or 0·5 litre of benzol.

(*d*) For the manufacture of sulphuric ether; ethereal salts; agaricin, podophyllin, and the gum-resins of scammony, guaiacum, and jalap; aldehyde and paraldehyde; white-lead and other lead salts, such as sugar of lead, &c.; ethyl chloride and iodide; bromo-, chloro-, and iodo-silver gelatin and similar preparations, as well as photographic papers and dry-plates; chloral hydrate; glucosides; collodion, and solutions of pyroxylin in spirit; pancreatin; vegetable alkaloids; salicylic acid and salicylates; santonin, tannin; coal-tar colours, including intermediate products and compounds used in their manufacture; and chemical preparations not specified in which alcohol is no longer present, 10 litres of sulphuric ether, or 1 litre of benzol, or 0·5 litre of turpentine, or 0·025 litre of tar oil.

Collodion for trade use made from denatured alcohol must contain at least 1 per cent. by weight of pyroxylin.

(*e*) For the manufacture of chloroform, iodoform, bromoform, and ethyl bromide, 300 grms. of chloroform, or 200 grms. of iodoform, or 300 grms. of ethyl bromide. It is permitted to dissolve the iodoform in part of the alcohol to be denatured, and to mix the rest of the spirit with this solution.

The remaining sections refer to the manufacture of vinegar, coloured lakes, &c., but (*l*) states that for medical and botanical specimens for educational purposes a denatured alcohol may be prepared by mixing 1 litre of pure methyl alcohol and 1 litre of petroleum-benzine with 100 litres of alcohol.

(*m*) For making soda soaps, 1 kilo. of castor oil and 400 grms. soda-lye.

(*n*) For the manufacture of lanolin, 5 litres of petroleum benzine.

Such denatured spirit is not saleable, but can only be used after special permission, and is only supplied to well-known *bonâ fide* manufacturers of the various articles.

For general use, methylated spirit is made by the admixture of $2\frac{1}{2}$ per cent. of a mixture of wood spirit (80 per cent.) and pyridine bases (20 per cent.) to the natural alcohol.

The following table serves to show the extent of denaturing in Germany. It should be remembered that the new la of 1902 also excludes *duty-free* alcohol for use in pharmacy (see this Journal, T.R., Vol. XXI., [20], Oct. 31, 190 p 1312):—

Spirits allowed Free of Taxation for Industrial and other Purposes in Hectolitres Pure Alcohol.

F. Fischer's Jahresbericht der chemischen Technologie, 1901, page 471.

Year (beginning Oct. 1).	Total allowed Free of Taxation for Industrial purposes, including the Manufacture of Vinegar, Surgical Appliances, Polishing, Heating, Cooking, or Illuminating purposes.	From the Total Quantity the Denaturing took place.									Passed without being Denatured.			
		General Denaturing Agents.	5 per cent. Wood Spirits.	½ per cent. Pyridine Bases.	Vinegar and Water (Wine-, Beer-, or Yeast-Water).	Turpentine.	Animal Oil.	Sulphuric Ether.	Shellac Solution.	Other Substances.	Scientific Purposes.	Surgical and Medical Purposes.	Soap and Perfumery Manufacture.	Othe Pur pose
1890-91	519,104	243,775	13,920	1,100	138,884	35,673	41,975	1,868	1,252	2,465	1,375	12,938	7,593	16,
1891-92	551,300	274,881	13,321	1,250	134,357	38,486	41,701	2,695	899	2,005	1,811	14,503	8,887	15,
1892-93	606,670	315,254	13,250	310	145,026	38,675	49,238	3,725	1,250	436	1,454	14,472	9,059	14,
1893-94	654,394	363,586	12,912	156	154,937	41,836	48,098	3,862	1,371	21	1,598	11,033	7,834	16,2
1894-95	718,806	414,298	14,086	209	150,270	45,699	49,769	4,671	1,395	1,441	1,406	13,451	8,013	13,1
1895-96	808,279	478,766	17,383	206	166,354	44,195	53,752	5,372	1,607	6,291	1,546	17,866	2,670	12,2
1896-97	867,458	528,196	20,251	162	162,470	47,200	60,060	5,094	1,356	6,474	1,573	18,132	1,418*	15,0
1897-98	889,133	528,764	21,650	246	160,109	50,797	71,676	5,808	1,594	4,372	1,686	21,593	1,526*	19,4
1898-99	989,966	600,765	23,513	291	163,629	56,382	76,140	5,875	1,500	5,355	1,916	22,991	1,447*	21,1
1899-1900	1 043,133	655,022	23,055	210	161,672	58,947	78,777	4,995	1,636	7,505	1,911	24,794	1,570*	23,0

* Since January 1, 1896, spirits free of taxation for the manufacture of liquid perfumeries and hair lotions have ceased. During the la four years the quantities mentioned have exclusively been used for the manufacturing of soaps.

As regards France, the denaturing is effected according to the subjoined tables, translated by Mr. Dan Heuser.

Table of the Branches of Industry for which the Employment of Denaturated Alcohol is authorised.

Branch of Industry.	Denaturing Process.	Date of the Report of the "Comite."	Remarks.
Alkaloids, digitaline atropine, santonin.	General process	9th April 1873 9th Dec. 1874	.. .. ..
Aldehyde	Mix the alcohol with 10 per cent. of sulphuric acid of 66°, or 20 per cent. of acid of 54°.	13th June 1874	The mixture to be poured on chromate of potash.
Ethylated aniline	Mix the alcohol with hydrochloric acid and the base to be ethylated. Mix 100 litres of alcohol with 20 kilos. of hydrochlorate of aniline.	{ 8th Dec. 1875 { 18th Feb. 1885 7th July 1886	.. .. ..
Antiseptics	General process	11th Feb. 1891	.. .. ..
Camphor (Bromide of)	General process	13th July 1887	.. .. ..
Chloral	Per litre of 95° alcohol to represent 780 grms. of chloral.	2nd Nov. 1881	Pass a current of chlorine through
Chloroform	Omission of previous denaturation. Denaturation ensues in the course of manufacture.	3rd Nov. 1886	The alcohol is, in the presence of th officials, poured into the still where it is mixed with chloride lime (5 to 6 kilos. of chloride p litre of alcohol).
Chloroform	General process .... Mix the alcohol with 10 per cent. of chloral residue.	Idem. 12th Nov. 1884	.. .. ..
Collodion	Mix the alcohol with an equal volume of ether and add 6 grms. of pyroxiline per litre. Per litre of alcohol of a strength of 95° to represent a quantity of collodion of at least 2 litres. This collodion must contain one part of alcohol per one part of ether, and hold in solution from 12 to 15 grms. of pyroxiline per litre.	2nd Nov. 1881	.. .. ..
Colours obtained from coal tar.	A mixture of: 50 litres of alcohol. 50 litres of nitrobenzol or of nitrotoluol. 10 grammes of caustic soda dissolved in 20 litres of alcohol.	11th Oct. 1893	On condition of inspection by exciseman.
Diastase	The alcohol is added to a solution of malt	6th June 1900	Work in closed vessel. Supervis at manufacturer's expense.
Sensitive emulsion (photography).	General process	17th July 1895	.. .. ..
Ether	Working up, and alcohol containing more than 1 per cent. of essential oils for the manufacture of acetic ether. Addition of 10 per cent. of residue, 10 of sulphuric acid of 66°. Prolonged heating at 86°.	1st Oct. 1899	The alcohol is produced on the sp and the establishment subjecte to permanent supervision of th officials.
Ether	The alcohol worked must be of an actual strength of at least 86°.	13th Dec. 1899	The proportion of methylene is ca culated at the rate of 10 litres p 100 litres of alcohol at 90° (90 lit of pure alcohol).
Acetic ether	A mixture of 100 kilos. of acetate of lime, and 150 litres of residues from sulphuric ether. Addition of 70 litres of alcohol.	11th May 1892	Official supervision is required.

Table of the Branches of Industry, &c.—cont.

Branch of Industry.	Denaturing Process.	Date of the Report of the "Comité."	Remarks.
etic ether	Mix alcohol of a strength 96° with 40 per cent. by weight of sulphuric acid of 66° and 60 per cent., by weight, of acetic acid of good odour, of 80° of pure acid.	19th July 1895	.. .. ..
em	Employed as a solvent for the manufacture and crystallisation of dimethyloxyquinizine (a solid chemical perfume).	..	1. The parties concerned shall, in the presence of the officials, add a proportion of 5 per cent. of residues from acetic ether coming from a preceding operation.
	First process (proportion by weight): 200 parts of acetate of sodium, say 152 kilos. 5. 131 parts of alcohol of a strength of 96°, say 100 kilos. 261 parts of sulphuric acid of 66°, say 199 kilos. Second process (proportion by volume): 20 parts of crystallisable acetic acid, good or bad taste, 95 litres. 21 parts of alcohol of a strength of 96°, say 100 litres. ½ part of sulphuric acid of 66°, say 2 litres 5.	28th July 1897	2. Samples of residues from the preparation of acetic ether shall be sent to the central laboratory of the Excise, where the most suitable product for denaturation shall be settled.
coholised ether	Alcohol used for mixing of ether is liable to the consumption tax.	27th Dec. 1900	.. .. ..
drochloric ether	Mix equal weights of alcohol of 96° and hydrochloric acid of 21°. One-third of the acid is mixed at the beginning of the operation; the two-thirds are added in proportion to distillation.	25th Jan. 1897	.. .. ..
her	Mix the alcohol with 10 per cent. of its volume of ether residues of type No. 3. Add to the mixture 10 per cent. of sulphuric acid of 66° or 20 per cent. of acid of 54°.	18th Aug. 1883	Type No. 3 has been fixed by the "Comité." The process of denaturation by sulphuric acid has been authorised for manufacturers of "sulfovinates."
	Leave in the alcohol the whole of the residue of previous operations, and add 25 per cent. of crude ether.	19th March 1884	..
	Mix the alcohol with 15 per cent. of the ether residues and 1½ per cent. of sulphovinic acid.	15th July 1885	The mixture is poured on an etherising base formed of 100 kilos. of sulphuric acid of 66° and 60 litres of alcohol.
her	Mix with the alcohol half its volume of organic acids, and etherise immediately afterwards by hydrochloric gas.	14th Feb. 1894	.. ..
em	Acetic ether.—Mix with the alcohol with 20 per cent. of residues from acetate of ethyl, and add 10 per cent. of hydrochloric acid of 21°.	Idem	.. .. ..
em	Hydrobromic ether (bromide of ethyl).—Mix 25 litres, of spirit strength of 96°, with 24 kilos. of bromine, and add subsequently to this mixture 2 kilos. of amorphous phosphorus diluted in 3 litres of alcohol of a strength of 96°.	25th Oct. 1881	.. ..
em	Mix 7 litres, 5 of spirit of a strength of 93°, with 8·5 litres of sulphuric acid of 65° and 15 grms. of bromine.	20th Feb. 1889 15th May 1889	.. ..
em	Hydrochloric ether and derivatives Mix equal weights of alcohol of a strength of 96°, and of hydrochloric acid of 21° Beaume.	25th May 1883	.. .. ..
em	Hydroiodic ether (iodate of ethyline) Mix 6 litres of alcohol of a strength of 96°, 4 kilos. of iodine, and 800 grms. of amorphous phosphorus.	Idem	.. .. ..
her	Nitric ether.—Mix one part, by weight, of nitric acid of 36° and four parts of alcohol of 96°.	25th May 1883	.. .. ..
lem	Ethylate of sodium (alcohol sodé).—Mix 8 litres of absolute alcohol with 500 grms. of sodium.	25th May 1883	5
lphuric ether	No audition of residues	31st January 1900	Permanent supervision at manufaturer's expense.
lminate of mercury	General process	29th July 1874 13th June 1894	.. ..
	Add to the alcohol the whole of the foul residues coming from the preceding operations.	6th Dec. 1875	.. .. ..
azogène"	Add to the alcohol 25 per cent. of oil of turpentine and 22 per cent. of mineral oil. Add to the alcohol 40 per cent. of oil of turpentine.	23rd July 1873 23rd Oct. 1873	.. .. ..
lycérophosphate of lime"	The alcohol is added to the "glycérophosphate" dissolved in an aqueous solution of sal ammonia and sal volatile.	6th June 1900	Work in closed vessel. Permanent supervision at manufacturer's expense.
ils (refining of)	Mix the alcohol with the oils under official supervision.	18th June 1890	Expenses for supervision payable by the manufacturer.
ssential oils	Dissolve in a hectolitre of essential oils containing less than 6 per cent. of vinic alcohol and showing at least 85°, 5 kilos. of resin or gum-resin, and 2 litres of nitrobenzol.	13th Feb. 1895	Used for the manufacture of varnish.
Insecticides"	General process	9th April 1873	.. .. ..
doform	Idem	11th Feb. 1891	.. .. ..
ethylene	The quota of pyrogenous impurities has been lowered from 5 to 2·5 per cent.	25th July 1894	.. .. ..
ressings (surgical)	Idem	21st March 1894	.. .. ..
harmaceutic extracts	Idem	18th Oct. 1875	On condition that the alcohol used in the manufacture shall be evaporated and not be found again in the production.

Table of the Branches of Industry, &c.—cont.

Branch of Industry.	Denaturing Process.	Date of the Report of the "Comite."	Remarks.
Transparent soap	General process.	2nd Nov. 1881	.. ..
Sugar (extracting sugar from molasses).	The alcohol shall be considered to be denaturated on account of the use the article is put to.	26th March 1894	.. .. .
Tannin	Addition of pulverised gall-nuts	27th July 1898 2nd Nov. 1898	Work in closed vessel under perm nent official supervision.
"Tannins"	General process	9th April 1873 9th Dec. 1874	.. .. .
Varnish	Varnish must contain 75 grms. of resin per litre in order to have the finished and merchantable characteristics.	19th July 1899	.. .. ..
Varnish or tinctures for varnish.	Same conditions as for surgical dressings. As regards alcohol for polishing purposes, 4 kilos. of resin or gum-resin shall be added.	13th June 1894	The same favour is granted manufacturers of varnish for ha making.
Malachite Green	Omission	27th Oct. 1900	.. .. .

Note.—As regards the term "*General Process*," it is applicable to alcohol intended for industrial purposes and transformed on the sp into finished products. It is effected by denaturing alcohol of 90° strength by *approved* Methylene to extent of 10 per cent. by volume.

Alcohol, Denaturing of, in France, in 1885—1894.

Zeits. fur Spiritusind., 1896, **19**, 289.

The following figures represent the quantities of alcohol which were denatured in France in the years 1885 to 1894.

	Hectol.
1885	49,285
1886	59,196
1887	87,400
1888	107,063
1889	108,240
1890	109,842
1891	105,742
1892	104,947
1893	106,939
1894	120,798

The quantities of denatured spirit used for various purposes during 1890 to 1894 are given as follows:—

——	1890.	1891.	1892.	1893.	1894.
	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.
For heating purposes	37,316	45,705	52,509	53,702	65,826
For lighting purposes	4,114	6,068	4,513	4,990	1,398
For manufacture of varnish	12,470	11,781	10,876	11,740	11,205
For manufacture of hats, and in dyeing	432	210	377	647	2,219
For manufacture of ether	36,961	27,926	25,551	2,178	34,877
For manufacture of aldehyde	3	9	18	45	..
For manufacture of fulminates, alkaloids, &c.	3,350	2,547	1,816	2,557	2,654
For destruction of insects	9	2	8	5	18
For other purposes	15,187	11,534	9,296	11,105	2,801

Production of Denatured Spirit in France.

——	1901.	1900.
	Hectols.	Hectols.
Total production	2,437,964	2,656,282
Of which—		
Amylaceous Matter	269,074	562,455
Molasses	1,006,933	796,675
Beet	578,628	973,225
Wine	330,866	149,407
Others	252,963	174,506

Consumption of Denatured Spirit in France.

Total consumption	251,565	221,214
Of which		
For lighting and heating	153,005	125,618
For varnishes and lacquers	13,481	14,762
For polishing purposes	2,902	2,750
For celluloid, &c.	5,009	7,198
For dyeing	743	692
For collodium (silk)	3,786	186
For chemical and pharmaceutical	2,766	1,719
For ether and explosives	60,784	64,873
For scientific purposes	129	386

The conditions for comparison being thus, it remains mere to state that Great Britain and America suffer togethe industrially in the matter of alcohol.

The Americans sent a delegate abroad to examine t question in Europe. A very full abstract of the repor entitled "Untaxed Alcohol for the Manufactures and Ar in the United States," appears in Vol. XV., 1896, p. 9 We again quote Mr. Prochazka.

"Ethyl colours cannot be manufactured with taxed alcoh in competition with foreign manufacturers who get the alcohol free of tax. Our main competitors—the manufac turers of Germany—have tax-free alcohol, and are treate very liberally by their Government in that respect.

One example—the important raw material diethylanilin and the valuable green colouring matter, "Emerald Green derived from it—will be sufficient:—

Value of 100 per cent. alcohol:—	Dols.	cts.
1 gall. or 6⅔ lb. Tax paid	2	48
1 lb.	0	37
Tax on 1 gall.	2	20
Tax on 1 lb.	0	33

Diethylaniline.—1 lb. requires in its production not le than ½ lb. of 100 per cent. grain alcohol, rather more.

Alcohol value in 1 lb. diethylaniline:—	Cents.
Tax paid	18·5
Free of tax	2·0
Difference	16·5

The German product, diethylaniline, made with tax fr alcohol, is worth then less than 30 cents per lb.

Emerald Green derived from diethylaniline sells f about 50 dols. per lb. for the imported article, duty pa It contains ethyl groups, corresponding to somewhat le than 40 per cent. of grain-alcohol, or 14·8 dols. per lb. colour in tax-paid alcohol, or more than 25 per cent. of t selling price of the colour, duty added.

Alcohol, free of tax, per lb. of colour, 1·6 cents.

The tax in this class of colours is prohibitive. I impossible for us to manufacture them in competition wi the foreign article. It also acts as a very serious bar the consideration of ethyl alcohol in the inventive develo ment of this important and highly scientific industry in country.

Where alcohol can be recovered in part, the tax hampe very seriously. The cost of the alcohol used in our man facture amounts to about 10 per cent. of the value of th colour (alcohol tax paid): with alcohol free, this woul amount to a little more than 1 per cent., a very seriou difference in the close competitive markets of recent year

Since this was published, changes have taken place the attitude of the Committee of Congress which have be entirely favourable, and a temporary delay of the questio by an unconvinced secretary of committee or departm has occurred lately. We may certainly take it that ou friends, may we say the New York Section, will not content with this setback in view of their recent industr icy. In fact, there has come to hand the following ich follows closely the lines of the British concession on ortation of spirituous preparations.

Drawback on Alcohol.

(Special correspondence to the Reporter.)

Washington, Feb. 13, 1903.

The Treasury Department has issued a series of regu- ions upon the application of the Palisade Manufacturing mpany, of Yonkers, N.Y., for the allowance of drawback duty paid on imported alcohol entering into the produc- n of a variety of medicinal preparations. A feature of se regulations is a provision for the allowance of draw- ck on the preparations referred to when exported in bulk. ey are as follows :—

"On the exportation of certain medicinal preparations own as hemaholoids-arsenated (with strychnia), hema- loids, kolacardinettes, and borolyptol, manufactured by e Pallisade Manufacturing Company, of Yonkers, N.Y., the manufacture of which no other than imported alcohol s used, a drawback will be allowed, equal in amount to e duty paid on the alcohol so used, less the legal deduc- on of 1 per cent.

"The preliminary entry must show separately for each oduct the marks and numbers of the shipping packages, th their contents, and the number of bottles of a given minal size contained in each package. The average antity of the several preparations contained in each minal size of bottle and in each shipping package must so be shown in the said entry, together with the per- ntage of absolute alcohol appearing in the finished oduct. Each package must be marked to show its con- nts, described by the number of cartons and the number bottles of each nominal size contained therein.

"The drawback entry must show the total number of llons of each kind of preparation exported, the per- ntages and quantities of absolute alcohol appearing erein, the percentages and quantities of such alcohol to added thereto, respectively, to compensate for losses in anufacture, and the aggregate quantity of absolute alcohol nsumed in the several manufactures on which drawback duty is claimed. The said entry must further show, in dition to the usual averments, that the exported articles the several kinds were manufactured of materials d in the manner set forth in the manufacturer's sworn atement.

"In liquidation, the quantity of absolute alcohol which ay be taken as the basis for the allowance of drawback ay be the quantity consumed, as shown in the drawback atry, but in no case shall it exceed by proportion for each reparation the quantity shown for the corresponding pre- aration in the sworn schedules attached to and forming part of the manufacturer's statement hereinbefore men- oned. Samples may be taken, or sworn samples furnished, s ordered by the collector, for required determinations.

"Entries covering any of the foregoing preparations xported in bulk or in packages different from those shown the schedules herein referred to may be liquidated, a etailed sworn statement being first filed by the manufac- rer, setting forth clearly the changes made, which tatement shall be officially verified."

The case of British manufacturers is put, in the report f the Joint Committees of the London Chamber of Com- ierce and this Society, which is quoted in full, as being f importance under present circumstances.

Report by Special Joint Committee of Representatives of the Chemical Trade Section of the London Chamber of Commerce, of the Society of Chemical Industry, and of the Drug Club, regarding the Law relating to, and the Regulations affecting Spirits.

See Journal No. 12, Vol. XXI, June 1902, p. 829.

The Joint Committee having considered the law relating the use of spirits, the regulations issued by the overnment authorities thereunder, and the law and egulations in force in Germany and the United States, nanimously recommend :—

1. That all natural alcohol, whether used as such, or in compounded form for the production of medicine in which alcohol remains as such in the finished product, shall be required to pay such duty on its spirit-proof content as shall from time to time be prescribed in the Chancellor of the Exchequer's Budget.

2. That this Committee seek a conference with the officials of the Excise Department of the Inland Revenue to show—

(1) That manufacturers in Great Britain and Ireland are under great disabilities in the use of alcohol in the manufacture of pure chemical pharmaceutical and industrial products, and manufacture of sulphuric and other ethers, chloroform, chloral hydrate, &c.

(2) That the permission given about 40 years ago to manufacture sulphuric ether and chloroform from methylated spirit without excise supervision, as well as also the permission subsequently granted to make chloral hydrate from similar spirit, be withdrawn.

(3) That it is desirable to obtain permission to employ, in buildings set apart for the purpose and under Excise supervision, methylic or ethylic alcohol duty-free, in all industrial or manufacturing operations in which the finished product contains no alcohol as such. (In the manufacture of chloroform, owing to secret processes and the possibility of the use of acetone or methylated spirit, together with the protection import duty on chloroform, the manufacturers do not like working in bond.)

At the subsequent conference with the officials of the Excise Department of the Inland Revenue, it was shown—

(1) That if alcohol could be bought at a price similar to the German spirit in Germany (say 6*d.* to 10*d.* per gall.), and it were possible to work under not too costly supervision, competition would be more equitable.

With regard to the home trade, if the imported product were put on a level with that made at home, *i.e.*, had to pay a duty corresponding to the spirit used in its manufacture, including the differential tax of 4*d.*, English manufacturers would then be placed on an equal footing with foreigners as far as home trade is concerned.

(2) That the manufacture of many products which necessitated the use of alcohol had drifted into German hands.

(3) That if a wide use of denaturing agents could be allowed, such agents as are not harmful to the product to be manufactured should be used, and further, that it is essential to allow the spirit to be recovered by distillation, for use in subsequent operations.

(4) That the denaturing agent should be either cheaper than the spirit or a necessary ingredient in the operation for which the spirit is used, because the cost of methylated spirit, where it can be used, places English manufacturers at a great disadvantage.

(*Note on Cost.*—Methylated spirit, 1*s.* 6*d.* to 2*s.* per gallon. Foreign spirit, 6*d.* to 10*d.*, and 4*d.* tax, per gallon. The difference in cost is not entirely due to the high price of the wood spirit used for denaturing, but also to the fact that British grain spirit at 1*s.* 3*d.* per gallon is used in place of foreign spirit at 6*d.* to 10*d.* per gallon and 4*d.* tax. There appears to be no reason why British spirit should not ultimately be produced as cheaply as German spirit if the spirit trade received sufficient stimulus; and the protective tax of 4*d.* would make it possible for the industry to go on till the trade assumed dimensions which admitted of competition with Germany.)

This report having been placed before the Board of Inland Revenue, they consented to receive a deputation from the Chamber of Commerce, and accordingly they were received by the late Mr. Steele, Chief Inspector of Excise, and Dr. T. E. Thorpe, Principal of the government laboratory. The result is fairly summarised thus :—

Firstly.—That the granting of free alcohol is too big a request, and the authorities could only even entertain it in the case of some special large industry, for which special arrangements could be made, such as the making of smokeless gunpowder. It was urged as an objection that so few would take advantage of free alcohol under the necessary restrictions, that it would practically make monopolies (this, however, would scarcely matter; the manufacture of chloroform, ether, and morphia in this country are already practically monopolies).

Secondly.—That the authorities were prepared to consider some cheaper denaturing agent than naphtha (which adds about 4*d.* a gallon to the price of the spirit).

Thirdly.—That they would also consider whether, for special manufactures, they could authorise a special denaturing agent, choosing one, if possible, that formed part of the process in the manufacture of that particular article.

Fourthly.—That for export they are prepared to extend the present system of drawbacks to almost any extent.

Fifthly.—That they were prepared to consider the readjustment of the Import Tariff on any articles, such as chloral hydrate, where the tariff apparently does not at present take cognisance of the loss of spirit in the manufacture, so that chloral hydrate could be made by the English manufacturers here, and they would grant the drawback on exportation.

Now it was known that the Board preferred to deal with representative bodies rather than individuals; hence the Joint Committee; and it is possible that in the absence of a collective codified request, matters hung fire. Probably, however, the latest and most powerful incentive to action was the need of the Government itself for explosives. Then Mr. Haldane made his noteworthy amendment to the Finance Act of 1902, being ably supported by Mr. J. Fletcher Moulton, K.C., Mr. Cawley, and others; but he did not confine himself to the requirements of the Government only, but broadly to those of certain chemical industries. Our thanks are due, yet he can scarcely have been aware at the time of the effect of the limitations subsequently inserted. It is undoubtedly in answer to the inquiry made (see Journal 24, Vol. XXI., Dec. 31, pp. 1488–9, App. D.) by the Joint Committee that the regulations for industrial use, and the instructions to officers appearing below, by special permission, have been issued, and in a few cases applied for.

THE FINANCE ACT, 1902.

Procedure to be observed in Connection with the Use in Manufactures of Spirits on which Duty has not been Paid (Sec. 8 of the Finance Act, 1902).

1. Any person desiring to use spirits without payment of duty in any manufacture carried on by him, must make application in writing to the Commissioners of Inland Revenue for authority to receive and use such spirits, and must prove, to the satisfaction of the Commissioners, that the use of methylated spirits would be unsuitable or detrimental.

2. The applicant must give full particulars of the situation of the premises upon which and the purpose for which the spirits are to be used, together with a description of the process of manufacture. He must also state the means by which it is proposed to make the spirits unpotable before and during use, and the quantity likely to be required in the course of a year.

3. Spirits on which duty has not been paid may not be delivered for removal to the premises of any person for use in any manufacture except from a duty-free warehouse, and upon production to the officer of that warehouse of a requisition signed by the person authorised to receive the spirits, on which there is a certificate, signed by the supervisor of the district, that the applicant is authorised by the Commissioners of Inland Revenue to receive such spirits.

4. The quantity of spirits to be received at one time must not be less than 100 bulk gallons, and the spirits must be conveyed direct to the premises of the person authorised to receive them, and must there remain without alteration or change, in the cask or package in which they were delivered, until an account thereof has been taken by the proper officer, and they have been rendered unpotable in his presence.

5. Any person authorised to receive spirits on which duty has not been paid must, if so required by the Commissioners of Inland Revenue, provide upon his premises a warehouse, effectually secure to their satisfaction, and all such spirits received must be deposited and retained therein until delivered on proper notice to, and in the presence of, the officer. He must also, if so required, provide a room approved by the Commissioners, in which must be fixed a vat or other vessel of sufficient size to admit of at l t 100 bulk gallons of spirits being rendered unpotable at e time, and must also provide satisfactory accommoda n for the officer of Inland Revenue in attendance at s premises.

6. Security to the satisfaction of the Commissioner f Inland Revenue must be given for the due removal, e custody, and proper use of the spirits, and the e observance of all regulations and conditions made by e Commissioners.

7. The substance or material to be used for the purp e of rendering spirits unpotable, and the mode in which e spirits are to be rendered unpotable, must be approved the Commissioners of Inland Revenue, and the per authorised to receive spirits upon which duty has not b paid must, if so required by the Commissioners, provid store to be approved by them, and used solely for stor and keeping the substance or material so approved.

8. No warehouse, room, or store provided in conform with these regulations shall be open before 8 o'clock in morning or after 5 o'clock in the afternoon, but officer Inland Revenue shall have access at all times to premises of any person authorised to use spirits under th regulations.

9. Notice of the intention to remove spirits from warehouse on the premises of the person authorised to them for the purpose of being rendered unpotable or for under these regulations must be given to the proper offir of Inland Revenue on a form of warrant, on which must specified the particulars of the spirits as warehoused, toget with the distinctive marks and numbers of the casks, the date of deposit in the warehouse, and the spirits must rendered unpotable in the presence of the proper officer, may take an account of such spirits before and on comp tion of the operation, and may, without payment, t samples at any time of the spirits and of any article in manufacture of which they are used or which may be on premises of the user.

10. Spirits which have been rendered unpotable un these regulations shall not thereafter be purified in manner or be recovered by distillation or any other mea except with the express sanction of the Commissioners Inland Revenue.

11. A person to whom authority is granted by Commissioners of Inland Revenue to receive for use in art or manufacture spirits on which duty has not been p shall pay to the proper collector of Inland Revenue, tr time to time, such sum or sums as the Commissioners sl determine for the expense incurred for the attendance an officer at his premises, and shall also pay duty on a deficiency in the spirits received upon his premises wh may arise from abstraction or from any cause which n in the opinion of the Commissioners not be due to natu waste.

Dated this 1st October 1902.

By order of the Commissioners of Inland Revenue.

J. B. MEERS,

Secretary

MEMORANDUM FOR OFFICIAL USE.

[NOTE.—*Permission to use this Memorandum for t paper has been kindly granted by the Chairman of Board of Inland Revenue, Sir H. W. Primrose, C.B., it must be regarded as subject to revision and alteration occasion may require.—T. T.*]

THE FINANCE ACT, 1902.

The Board take into consideration section 8 of t Finance Act, 1902, which runs as follows:—

(1) Where, in the case of any art or manufact carried on by any person in which the use of spirits required, it shall be proved to the satisfaction of t Commissioners of Inland Revenue that the use of meth ated spirits is unsuitable or detrimental, they may, if th think fit, authorise that person to receive spirits with payment of duty for use in the art or manufacture up giving security to their satisfaction that he will use t spirits in the art or manufacture, and for no other purpo and the spirits so used shall be exempt from duty:

Provided that foreign spirits may not be so received or used until the difference between the duty of customs chargeable thereon and the duty of excise chargeable on British spirits has been paid.

(2) The authority shall only be granted subject to a compliance with such regulations as the Commissioners may require the applicant to observe for the security of he revenue, and upon condition that he will, to the satisfaction of the Commissioners if so required by them, render the spirits unpotable before and during use, and will from time to time pay any expenses that may be ncurred in placing an officer in charge of his premises.

(3) If any person so authorised shall not comply with any regulation which he is required to observe, he shall, u addition to any other fine or liability, incur a fine of ifty pounds.

It is in the first place to be observed that the privilege of using spirit duty-free, as contemplated by the section, is to be a personal privilege, entailing personal obligations on he person or persons to whom it is granted; and it follows from this that there can be no question of the Board's granting any general authority under the section to classes of persons, but that each person or body of persons who desires to obtain the benefit of the section must make separate application to the Board, who will consider all the circumstances of each separate application, and form their judgment upon them.

At the same time, in laying down some general principles by which they will be governed in dealing with applications submitted to them, it may be possible for the Board to ndicate certain classes of cases to which the benefit of the section could not, under any circumstances, be conceded, and so to prevent the multiplication of applications which cannot possibly be entertained favourably.

With this view, and also for the purpose of affording guidance generally to the public and to their own officers with respect to their policy in administering the law, as laid down in the section, the Board proceed to embody in this Minute the following observations on the subject:—

The section requires that before the Commissioners can authorise the use of spirits in any "art or manufacture"—terms which they interpret as including the application of spirit to scientific purposes—two main conditions must be fulfilled, viz.:—

(*a*) It must be proved, to the satisfaction of the Commissioners, that the use of methylated spirits is unsuitable or detrimental for the particular purpose; and

(*b*) The security of the revenue must be guaranteed by such means as the Commissioners may require.

These conditions are cumulative, not alternative—unless both can be fulfilled there can be no question of a grant of the authority contemplated by the section. In every case, herefore, it will be necessary to scrutinise in the first instance the objections that may be alleged to the use of methylated spirits, and it is only after the validity of such objections has been admitted, that it will be necessary to proceed to consider whether, or by what means, the security of the revenue can be guaranteed.

It was explicitly stated in the House of Commons, both by those who promoted legislation in the sense of the section, and by the Chancellor of the Exchequer, who assented to it on behalf of H.M. Government, that it was to be understood that the Commissioners should exercise the discretion conferred upon them with great caution, and with a very strict regard to the security of the revenue; and the Board themselves feel strongly that no other attitude would be possible for them.

They intend therefore to insist on a strict observance of the prescribed conditions in every case in which they may grant an authority under the section, and they will not hesitate to reject any application in respect of which it appears to them that the conditions are not, or cannot be, adequately complied with.

Further, as the duty on spirits is so heavy and of so much importance to the revenue, they consider that they may properly require that the advantage to be obtained by the use of duty-free spirit should be substantial both in character and in weight, and that the benefit of the section should not be accorded in cases of trivial importance or in the purely personal interest of individuals.

In accordance with these principles, the Board will refuse to entertain applications under the section, as follows:—

In respect of Condition (*a*).

Where in an art or manufacture the use of methylated spirit is attended by only slight and immaterial disadvantage.

In respect of Condition (*b*).

Where the security of the revenue cannot be guaranteed with reasonable certainty, and at reasonable cost of convenience to the Department. (The cost in money will be a matter always affecting the applicant.)

It is manifest that there must be many cases in which the protection of the revenue would be impossible, if the use of duty-free spirit were permitted, and of these there may be mentioned the following:—

(i) The manufacture of articles intended for human consumption, such as medicines, essences, and tinctures.

(ii) The manufacture of articles not intended for human consumption, but capable of being so used, if made with pure spirit or with spirit only temporarily rendered unpotable, such as perfumes or spirituous mixtures for purposes of illumination or of generation of heat or motive power.

As regards cases to which the benefit of the section may be extended, the Board may say generally that they will be disposed to entertain favourably applications—

(1) From recognised bodies formed for the advancement of science or of scientific education, and requiring to use pure spirit in processes of research or of illustration. Applications of this kind from isolated individuals will not commonly be entertained, but might be so on the recommendation and guarantee of a recognised scientific body.

(2) From persons engaged in an industrial enterprise of such magnitude and importance as to give to it a character of public interest in its bearing upon national trade. In any such case the concession will commonly be made subject to an obligation to render the spirit unpotable, before and during use, by such means as may be found to be most appropriate to the particular circumstances of the manufacture. Only in very rare instances can the Board contemplate the use of pure spirit in manufacture, and then only subject to close and constant excise supervision.

In every case of concession, of whatever kind, the person authorised will be subject to excise visitation, and to the observance of such regulations as regards receipt, storage, use, or recovery of spirits, and the keeping of accounts of the same, as the Board may prescribe.

July 1902. H. W. P.

Now let us consider the effect of these regulations and their meaning:—

1. The applicant must prove, to the satisfaction of the Commissioners, that the use of methylated spirits would be unsuitable or detrimental. It is by no means an easy matter to demonstrate this; but if by "methylation" is understood as the Act of 1880, 43 & 44 Vict. c. 24, s. 123, sub-sec. 3, may on application include "some other substance approved for the purpose," the matter is easier. We all want "pure" undenatured alcohol in some cases; and later on in the Memorandum for official use, paragraph 2, under "Condition *b*," there is express provision for the same, under conditions. This view receives support from the association of the "Conditions" *a* and *b*, earlier in the same Memorandum, with "Art or Manufacture," terms which they (the Board) interpret as including the application of spirit to scientific purposes.

2. There can be no reasonable objections here; methylation is clearly defined as making "unpotable," but not by any means at once or without experiment can a manufacturer, what kind of agent, much less what quantity, in a year. Many applications of spirit are either "unborn" or have died prematurely owing to want of opportunity or suitable conditions.

3, 4, 5, 6, 7, offer difficulties which, however, are by no means insurmountable.

8. Is only reasonable if it is understood as applying to the store or warehouse as to time—but quite reasonable as to access.

9. Is a matter of detail, and reasonable.

10. Opens up a rather important question as to recovery of spirit. In one's opinion there should be no difficulty in satisfying the Excise that the spirit so recovered shall be unpotable. A number of experiments have been made with the writer's cognisance, with mixtures of spirit and denaturators in the proportions indicated in Dr. Silberrad's report, and without results detrimental to the principle of unpotability. This point was conclusively settled in America at the works of Mr. Cooper, at Newark, where, with very elaborate apparatus, they did not succeed in denaturating spirits. Any one who wanted to defraud the Government would not proceed in that way.

11. The provision for paying duty on any deficiency in the spirits received upon premises from abstraction *is "from any cause"* which may in the opinion of the commissioners not be due to "*natural waste*," contains the germ of an important question. What "*cause*" is to be raised, and what is "*natural*" waste?

Then, if any reactions in manufacturing work out to theoretical results, as some of us know to our cost, and notoriously with spirit and spirituous derivatives, waste is a quantity not avoided. How much then may be regarded as natural? Happily, we know we have intelligent, able, and sympathetic administrators of the law, whose servants they are, and a committee of three could, in most cases, settle that point.

The memorandum for official use is even more important than the "Procedure," since it defines the limit of responsibility—the obligations rightly are personal. No impersonal or general permission will be given. One notices the word "privilege" if the conditions are complied with. May we not enquire whether, assuming compliance with reasonable conditions, it is not a "right"? We may let that pass under cover of the words applying to the commissioners, "*if they think fit.*" It would appear from paragraph 2 of the memorandum (July 1902), that the board contemplate numerous applications, and proceed to indicate limitations. The observations upon sections I. and II. of the "procedure" rules apply here, but the memorandum expressly draws attention to the conditions, *a* and *b*, and these must be taken together. To *b* there can be no possible objection, but as regards *a*, if a wide range of approved "denaturants" be already proved elsewhere of use and allowable, little difficulty on that count should arise. From the wording of the latter part of paragraph five, it may be assumed that, subject to the security of the revenue, pure *undenatured* spirit will be allowed where inevitably necessary, as in certain cases it must be. The next two paragraphs are consistent and, in view of the revenue question, reasonable. But again it is well to emphasise the fact that we are seeking to add to the uses for spirit not necessarily undenatured in every case.

To the following paragraph, 8, the immediately foregoing remark applies—triviality is a question of degree. If the industries do not exist now, and can only do so by the help of concessions which have given our rivals 25 years start, they will be small at first, and probably concentrated in few hands—possibly *some form of syndicated manufacture*, a form not inconvenient to the authorities, and having much to recommend it. This may be what is involved in the use of the words "purely personal interest of individuals." It is inconceivable that anything will be done for nothing; therefore indirectly someone must benefit. Condition *a*. It is reasonable in itself; but if the suggestion of "syndicated" manufactures is entertained, then the slight and immaterial can easily within the group of manufacture syndicated. The same remark applies to the first paragraph of condition *b*. Yet when clause (*i*) is considered one is inclined to inquire what, under that head of medicines is not for human consumption. Essences and tinctures lend themselves to no doubt on this head. By "medicines" one presumes is meant liquids containing alcohol, and for internal use. It may safely be presumed few will hesitate there. Clause (*ii*), however, is obviously too narrow, for while the limitation may rightly apply to perfumes, it mig not broadly apply to spirituous mixtures for purposes illumination or for the generation of heat or mot power. It is for these latter uses some of us hope for wide use of suitably denatured spirit. The statis regarding continental use for such purposes are at le interesting. Spirit does actually rival other motor, lightu and heating agents. Further, as regards the "Memor dum" and its concluding paragraphs (1) and (2) may general terms be agreeable, but again the permission to *pure* undenatured is implied in the words "Only in ve rare instances can the Board contemplate the use of pu spirit in manufacture, and then only to close and co stant supervision." Logically it will be permitted subj to cause shown and leave obtained. At any rate, one do not think that, taking into consideration the intere involved, and especially the absence of experience here, t regulations are extreme.

Mr. John C. Umney, in his admirable letter of Decem 18th, 1902, to the *Times*, commenting on the "futility granting free use of alcohol for research, when the final g of chemical research, namely, the advancement of industr cannot be carried out under existing fiscal condition remarks "that the encouragement of facilities for resear in England by the use of duty-free alcohol might aff material assistance to the manufacturer in competi countries, and we might have a second and even mo disastrous repetition of that which took place in t latter half of the last century in the aniline dye indust and which left such marks on chemical manufactu as may possibly never be obliterated." All that is ask once more, we say, is consistency and equal conditio in one way or another with our rivals—subject only Imperial conditions. Admittedly in the main, by bo political parties alike, a radical change in our fiscal pol as regards imports is *impossible*. Mr. Hanbury, Presid of the Board of Agriculture, said last month "that aski for protection was like crying for the moon, because Government would assent to it." Modifications there m be, but a change so completely like our rivals is out the question, with meagre populations in the vast areas our Colonial Empire. The clause in the Customs Cons dation Act of 1876, 39–40 Victoria, chap. 35, still exi but it is a weapon of little value in these times in view just before-mentioned fact and our enormous business w the continent of Europe, and its extension beyond the f articles now treated thereunder would be fraught w serious results. (See Circular Letter, Journal 24, V XXI., December 31, 1902, pp. 1488—9, Appendices and G.) Retaliation is impossible.

Appendix H. in same number of Journal, with its questions formulated by Mr. J. C. Umney, and sig jointly with him by the writer, has been answe unequivocally. To questions—

1. Are you in favour of the use of alcohol free fr duty for manufacturing purposes?

   All reply "Yes."

2. Are you of opinion that the revenue would suffer such provision, taking into consideration the f that industries non-existent could be established a industries existent could be extended with co sponding employment of increased capital a labour and advanced income?

   All reply "No."

3. Would the trade in which you are interested influenced in its home aspect by the impositi of a duty on the substances upon which duty can now be imposed at the will of the Treasury (Appendix F.), but which has not hitherto be done?

   A few think beneficially; but the great major deem further operation of the Act of 1876 wo have a bad effect upon business with our colonies.

4. Would your trade with our colonies and other countr be materially increased by the use of alcohol fr from duty for manufacturing purposes?

The manufacturers of fine chemicals, alkaloids, and aniline dyes answer "Yes," but the manufacturing pharmacists appear satisfied with the existing drawback on exportation, except as regards solid extracts and similar articles.

5.—(*a*) Is there any chemical product, in which alcohol plays any part, which you cannot make in competition with other countries, if you had the use of duty-free alcohol? If there is such a product, please name it.

None.

(*b*) Are there any processes, in which alcohol plays a part, which you cannot carry out, or chemical products which you cannot make in competition with other countries, unless you have the use of duty-free alcohol? If so, please name them.

A very considerable number. No complete list has been made out, being too great, but most name antipyrin, phenacetin, chlorethyl, &c., alkaloids and dyes.

6. Will you compile a list of those industries that could be extended by the use of duty-free alcohol, giving according to your experience as far as possible the the specific articles, the manufacture of which would be influenced?

It may be well to give some idea of what well-qualified d typical technologists regard as requiring the use of ty-free alcohol. One member, in answer to these ques- ns, writes :—

To No. 1.—I am in favour of the use of alcohol free m duty for manufacturing purposes.

To No. 2.—The loss to the revenue of duty on alcohol ll be more than compensated by a progressive development of the chemical industry generally. At the present y alcohol enters into a great many manufactures, mostly a higher class, on which good profits are obtainable, and ich are largely consumed. Alcohol will still be more nerally used in the future. To burden this product must cessarily interfere with business, giving other countries ich have low-priced alcohol all the opportunities. ance, which charges heavily on alcohol has a small emical industry as compared with Germany, or even itzerland.

If, therefore, alcohol is duty free and consequently eap, competition will be possible, new industries must ring up, and those existing will be able to cover more ound. One demand creates another. The present duty certainly crippling an entire industry.

To No. 3.—I am in favour of a duty as per Appendix F. would be a great help to the new industries that must ring up if duty-free alcohol is decided upon. Such a ty, on the finished or intermediate products for the nufacture of which alcohol is used, would be only fair. her countries, with cheap alcohol, have had for years all their favour. The practical exploitation of research was t hampered, they had every chance to gain experience d to improve their methods of manufacture. They secured ge profits from this country and had it all their own way; re was no fear of competition. The British manufacrer would not direct his chemists to invent anything which uld be prohibitive on account of the duty on alcohol, nor uld he care to spend money on letters patent. Of course might invent manufacture abroad, and then import duty e. This would be business, but it would not employ the itish workman. What we want is to produce here and buy as little abroad as possible, seeing that there is such a of chemical raw material at our disposal.

To No. 4.—At present we cannot compete abroad. ly 10—15 years ago a lot more business passed through itish hands for the colonies than now. Hamburg is now big export centre. Since then the continental manufacer has secured the foreign markets, he does no more uire a middleman, and many products cannot be made Great Britain, which is then a dead letter. This refers t only to pharmaceutical products, but also to a good ny aniline dyes, in the manufacture of which alcohol is d. Many patents have lapsed, or are about to lapse, for products which could be advantageously manufactured in this country, if there was free alcohol.

To No. 5A.—I know of no product, where alcohol plays any part, that could not be made in this country.

To No. 5B *and* 6.—I attach hereto particulars of raw materials used in the manufacture of antipyrin, phenacetin, and chloraethyl. I can give full details to show the great bulk of material used, the complication of the manufacture of the first two and consequently the employment for the labouring man that would result from it. When prices were on a high level, France, Germany, and Switzerland manufactured antipyrin, then prices dropped, and France had to give up. England was nowhere, finally, because there was a patent, and if there had not been one, it would not have been able to produce, on account of the duty on alcohol.

Résumé of above.

"It seems quite evident that to charge a duty on alcohol cripples a whole industry, hampers development, research, and stints progress. Alcohol must be free to the British manufacturer, he must be able to handle it as he likes for his legitimate purposes. He must be able to use it pure, to distil and re-distil it, to extract and regain it from residue, and to resume it in his works in such a condition as he can easily rectify with as little cost to himself as possible. In Switzerland denaturing with Methyl Violet or other suitable aniline dye is considered sufficient. As all alcohol received by a manufacturer would probably be entered in a special book, alcohol regained from residue could also be entered as fresh arrival, specifying of course from what obtained. Naturally the free use of alcohol would necessitate the erection of stills, which might be taxed, but slightly only, to ensure registration."

Undoubtedly free or cheaper alcohol is necessary for the proper development of the chemical and pharmaceutical interests of this country. It is unjust to deny it. That these industries are fairly prosperous under present conditions is marvellous. Measurably successful under their present disadvantages, what could they not accomplish if they were placed on an equality with German chemical manufacturers?

Contribution by Mr. A. G. Green, F.I.C., F.C.S., Professor of Dyeing in the Yorkshire College, Leeds, to the Question of Alcohols in the Coal-Tar Industry.

1. *Dyestuffs and other Coal-Tar Products into which Ethyl Alcohol enters as a Constituent.*—Monethylaniline, diethylaniline, ethylbenzylaniline, ethylorthotolnidine, ethylamidophenol, diethylamidophenol ethoxybenzidine, diphenetidine, diethylamidobenzaldehyde, phenacetin, antipyrine, quinaldine, &c.

Brilliant Green, Patent Blue V, Acid Green, Ethyl Violet, Fast Acid Violet, Various Acid Violets, Night Blue, Thiocarmine, New Methylene Blue, Nile Blue 2 B, Spirit Eosine, Pyronine B, Rhodamine B, and 6 G, Quinoline Yellow Chrysophenine, Diamine Yellow N, Diamine Scarlet 3 B, Anisoline, and a number of valuable blues and blacks of the "diamine series."

2. *Dyestuffs and other Coal-Tar Products into which Methyl Alcohol enters as a Constituent.*—Monomethylaniline, dimethylaniline, methylbenzylaniline, dimethylmetamidophenol, methoxybenzidine, dianisidine, dimethylamidobenzaldehyde, dimethylalphanaphthylamine, dimethylparaphenylene diamine, tetramethyldiamidobenzophenone, tetramethyldiamidodiphenylcarbinol, vanillin, &c.

Malachite Green, Patent Blue B N, Light Green S F, Victoria Green, Victoria Blue, Methyl Violet, Crystal Violet, Fast Green, Acid Violets, Indophenol, Prune, Meldola's Blue, Gallanilic Violets, Muscarine, Gallamine Blue, Basle Blue, Nile Blue A, Capri Blue, Methylene Blue, Neutral Violet, Neutral Red, Neutral Blue, Azine Green, Indazine, Acridine Orange, Thioflavine, Pyronine G, Auramine Benzopurpurine 10 B, Azo Violet, Benzoazurine, Heliotrope, Azoeosine, and others.

3. *Dyestuffs in the Manufacture of which Pure Methy. or Ethyl Alcohol is required as a Solvent.*—Gallocyanine, Gallanilide Violets, Gallamine Blue, Muscarine, Rhodamine

6 G, Anisoline, Eosines, and many others. It is also used as a solvent in the extraction or crystallisation of many intermediate products, for which the use of methylated spirit is very unsuitable. As important cases of this may be mentioned:—Salicylic acid is used in large quantities by brewers as an antiseptic agent, also in the manufacture of various salicylates, which are largely employed in medicine, and in addition forms the raw product of a series of important dyestuffs, such as Chrysamine, Chrysophenine, Diamond Black, and others. Tannic acid is used in medicine as a mordant in dyeing and calico printing, and also forms the starting point for the manufacture of gallic and pyrogallic acids, the former of which enters into the constitution of a large number of important colouring matters (such as Gallocyanine, Gallamine Blue, &c.), and the latter has a very large sale as a photographic developer.

In Classes 1 and 2 the alcohol disappears entirely, entering into the chemical constitution of the new compound, from which it could not possibly be again recovered by any practical means. In Class 3 the alcohol employed as a solvent is recovered, rectified, and used again for the same purpose. In most cases there would be a loss of from 5 to 10 per cent. on each operation. Many colouring matters, such as gallocyanine, appear in more than one class, since alcohol is used in their manufacture, both as a constituent and a solvent. The colours for the manufacture of which pure methyl or ethyl alcohol is required, constitute a considerable proportion of the total dyestuffs imported into this country, and must have an aggregate annual value of several hundred thousand pounds. With one or two exceptions they are not manufactured at all in England, and in these cases only in small quantity compared with the foreign production. Amongst the causes for this, the necessity of pure, cheap alcohol for their manufacture is a factor of considerable importance. The coal-tar industry is a large and growing one, but its development in this country is seriously impeded by the present state of the spirit laws, and many important products used in large quantities in dyeing, medicine, perfumery, photography, &c. are entirely excluded from production here. As showing the impossibility of competing, the following comparative calculations of the cost of manufacture of diethylaniline are given:—

In England.

	d.
93 lb. of aniline at 4½d. per lb.	418
15 gallons of pure alcohol at 21s. per gallon	3,780
Yield 119 lb. of diethylaniline	4,198

Cost price of materials alone = $\frac{4198}{119}$ = 2s. [illegible] per lb.

In Germany.

	d.
93 lb. of aniline at 4½d. per lb.	418
15 gallons of pure alcohol at 10d. per gallon	150
Yield 119 lb. of diethylaniline	568

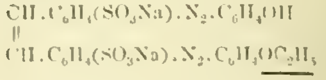
Cost price of materials alone = $\frac{568}{119}$ = [illegible] per lb.

In addition to its bearing upon the colour industry, the necessity for pure alcohol has an equal importance in the manufacture of artificial therapeutic agents derived from coal tar, a trade which commenced some 20 years ago, and has already attained large proportions in Germany. For the manufacture of most of these products, methyl or ethyl alcohol is required as a chemical constituent. As an instance of such compounds may be mentioned the important febrifuge and antineuralgic known as "antipyrine." It is stated that Messrs. Meister, Lucius and Bruning, of Hoechst, who are the patentees of this product, made at one time a profit on it alone of 60,000*l.* a year. The patent has expired, and English manufacturers would certainly take up its manufacture were it not for the fact that the profitable production of the raw product—pure acetic ether—is at present impossible in this country.

A Few Examples by Prof. A. G. Green.

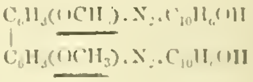
Showing the alcoholic parts of the molecules indicated thick underline.

Chrysophenine.—Sodium salt of disulphostilbene-disaz phenol ethoxy-phenol—



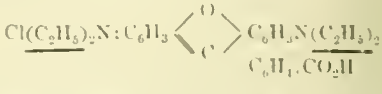
$$\begin{array}{l}\mathrm{CH.C_6H_4(SO_3Na).N_2.C_6H_4OH}\\ \|\\ \mathrm{CH.C_6H_4(SO_3Na).N_2.C_6H_4\underline{OC_2H_5}}\end{array}$$

Dianisidine Blue.—Dimethoxyl - diphenyl - disazo bet naphthol—

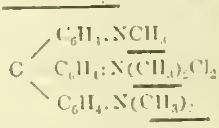


$$\begin{array}{l}\mathrm{C_6H_3(O\underline{CH_3}).N_2.C_{10}H_6OH}\\ |\\ \mathrm{C_6H_3(O\underline{CH_3}).N_2.C_{10}H_6OH}\end{array}$$

Rhodamine.—Diethyl meta amido phenolphtaleine—



Paris Violet.—Pentamethyl-Pararosaniline—



Messrs. Brooke, Simpson, and Spiller consider the ma of free, suitably denatured alcohol of the very high importance.

Messrs. Levinstein and Co. contribute the following list

ANILINE DYESTUFFS.

Alkylating Agents.

Methyl chloride.	Ethyl chloride.
Methyl bromide.	Ethyl bromide.
Methyl iodide.	Potass ethyl sulphate.
Dimethyl sulphate.	

Alkylated Intermediate Products.

Monomethylaniline,	Mono-ethylaniline,
Monomethyl-*o*-toluidine,	Mono-ethyl-*o*-toluidine,
Monomethyl-*p*-toluidine,	Mono-ethyl-*p*-toluidine,
Monomethyl α-naphthylamine,	Mono-ethyl-α-naphthylamine,
Monomethyl-β naphthylamine,	Mono-ethyl-β-naphthylamine,
Dimethylaniline,	Methylethylaniline,
Dimethyl-*o*-toluidine,	Methylethyl-*o*-toluidine,
Dimethyl-*p*-toluidine,	Methylethyl-*p*-toluidine
Dimethyl-α-naphthylamine,	Methylethyl-α-naphthylamine,
Dimethyl-β-naphthylamine,	Methylethyl-β naphthylamine.
Diethyl-*o*-toluidine,	Diethyl-α-naphthylamin
Diethyl-*p*-toluidine,	Diethyl-β-naphthylamin

and very many other secondary and tertiary amines, I also substituted amines, such as the very important dimeth *m*-amidophenol and diethyl-*m*-amidophenol, the base of Rhodamines.

Among dyestuffs prepared from these or similar alkyl intermediate bodies are Pyronine, Rhodamines, Brilli Green, Malachite Green, Methyl Violet, Gallocyan Patent Blue (replacer of indigo extract), Nile Blue, C Blue, &c., &c.

Dyestuffs prepared by directly alkylating the finis products: Congo Orange, Cotton Yellow, Thiofla certain Acridines, and, very important, Chrysophenine.

MANY PHARMACEUTICAL PRODUCTS.

(See list.)

SYNTHETIC PERFUMES AND ESSENTIAL OILS.

Heliotropin, Vanillin, Artificial Musk, Ionone, and Neroli Oil.

Dr. Chas. Dreyfus, Clayton Aniline Co., contributes as ollows :—

DIRECT COTTON COLOURS.

Yellows.

Chrysopheninediamine. Sodium salt of diaminostilbene-disulphonic acid disazophenolphenetol.

Golden yellow.

Orange.

Congo Orange :—

I. Sodium salt of benzidinedisazo-2-naphthylamine-3.6-disulphophenetol.

II. Sodium salt of tolidinedisazo-2-naphthylamine-3.6-disulphophenetol.

Reds.

Benzopurpurin 10 B.

Sodium salt of dianisidinedisazo-di-1-naphthylamine-4-sulphonic acid.

Diamine Reds and Scarlets :—

I. Sodium salt of benzidinedisazodisalicylic acid-2-aminonaphtholsulphonic acid-7. (Red.)

II. Sodium salt of benzidinedisazophenetol-2-naphthol-β-8-disulphonic acid. (Scarlet.)

Blues.

Chicago Blue B.—Sodium salt of dianisidinedisazo-diaminonaphtholsulphonic acid S.

Chicago Blue 6 B.—Sodium salt of dianisidinedisazo-diaminonaphtholdisulphonic acid S.

Diamine Blue B.—Sodium salt of ethoxybenzidinedisazo-2-naphthol-2.7-disulphonic acid-1-naphthol-4 sulphonic acid.

Diamine Blue 3 R.—Sodium salt of ethoxybenzidine-disazo-di-1-naphthol-4-sulphonic acid. (Sky blue.)

BASIC AND MORDANT COLOURS.

Yellow.

Tartrazine.—Di-sodium salt of 1-*p*-sulphoxyphenyl-3-carboxyl-3-*p*-sulphoxyphenyl-hydrazone-3-pyrazolone.

Reds.

Rhodamine.—Phthalein of diethyl-*m*-aminophenol (basic hydrochoride).

Eosines, S.—Potassium salt of tetrabrom-fluorescein ethyl ester.

Safranines.—M S phenyl- or tolyl-diamino tobazonium chloride.

Blues.

Methylene Blue.—Hydrochloride of tetramethyldiamino-phenazthionium.

Capri Blue.—Zinc chloride double salt of diethylamine toludimethylaminophenoxazonium chloride.

Night Blue.—Hydrochloride of tolyltetraethyltriamino-α-naphthyldiphenyl carbidride.

Gallocyanine.—Dimethylaminohydroxyphenoxazone carbonic acid.

Violets.

Hofmann's.—Triethylrosaniline.

Paris.—Hexamethylpararosaniline hydrochloride.

Greens.

Malachite.—Zinc double salt of tetramethyl-di-*p*-amino-triphenyl carbidride.

Brilliant.—Sulphate of tetraethyl-di-*p*-aminotriphenyl carbidride.

Messrs. Claus and Rée, Read Holliday and Sons, Messrs. Sadler and Co., and other well-known firms confirm the above.

Particulars of the consumption of alcohol in colour works, voluntarily afforded, for the year 1897 :—

A.	1.250,000 litres (methyl and ethyl).
B.	3,000 kilos.
C.	60,000 kilos. ethyl. 60,000 „ methyl.
D.	30,000 „ ethyl. 50,000 „ methyl.

Other German and Swiss firms prefer to withhold particulars.

According to the Verein zur Wahrung der Interessen der chemischen Industrie Deutschlands, the total consumption of ethyl alcohol for dye manufacture in Germany was, in 1897, 1,100,000 kilos. It is probable, however, that it is now double this.

It is stated the Badische Anilin und Soda Fabrik use 90 to 100,000 kilos. of ethyl chloride per annum, and there is reason to believe that not one kilogramme is made in England for this purpose. The price of production is stated to be, say, 10*d.* to 1*s.* a kilogramme; here 19*s.* a gallon is payable as duty.

We now arrive at an interesting case as regards this new Act of 1902. At least one application has been made for permission, in a colour works, and after infinite pains had been taken, at great expense, to convince the authorities that ordinary methylated spirit was unsuitable for the purpose required, consent has been given. Suitable rooms for store and lock-up purposes, and probably distillation from residues, are at this moment being erected according to plans and specifications approved by the Board. One case is as good as fifty for illustration, and doubtless the Board will scarcely require us all to become martyrs in order to prove the unsuitability of one particular form of denaturing. If a broad line of suitable denaturants be allowed, we can get on. On the point of the recovery of the alcohols, it is to be hoped no hindrances will be imposed, since, assuming supervision and, not to say, common honesty among respectable people, the arrangement, so to speak, will be inclusive; and there can be very little difficulty in contriving perfect safe receivers—safe at once as regards accessibility and freedom from danger, yet containing a suitable proportion of the denaturant. We have stated that the Newark (U.S.A.) experiments proved that the distillates were in every case unpotable.

A Few Substances, the manufacture of which could be greatly extended by means of Alcohol UNDENATURED, *or, if inevitable,* SUITABLY DENATURED.

Tannic acid.
Gallic acid.
Atropine.
Aconitine.
Agaricine.
Berberine and salts.
Cantharidine.
Coniine.
Cannabin tannate.
Cocaine.
Emetine.
Ergotine.
Eucaine.
Gelsimine.
Hydrastine.
Hyoscyamine.
Hydroquinone.
Iridine.
Jalapine.
Santonine.
Pancreatin.
Pilocarpine.
Thymol.
Salicylates.
Aldehyde.
Paraldehyde.
Bromoform.
Iodoform.
Ethyl chloride.
Ethyl bromide.
Ethyl iodide.
Ethyl acetate.
Ethyl benzoate.
Ethyl formate.
Chloral hydrate.
Pure caustic alkalis.
Oleoresin of capsicum.
Oleoresin of gingerin.
And many alkaloids and fine chemicals.

NOTE.—Of a list of 9 300 substances, about 2,000 appear to require the use of alcohol for their manufacture.

One does not presume to lay down general rules covering permissions, but it may broadly be affirmed that there is quite as much strictness and care in Germany as here—in fact, more—and yet the industries have been carried, so far as is known, without complaint. This remark applies especially to the class of substances commonly called fine chemicals, alkaloids, and synthetic products, a goodly list of which appears at bottom of preceding page.

Among the manufacturers of fine chemicals, Messrs. Howard and Sons, May and Baker, Thomas Tyrer and Co., Morson and Sons, Harrington's, Alfred White and Sons, and others, are emphatic as to this great need. Among pharmaceutical manufacturers, Messrs. Corney, Davy, Hill, Evans, Sons, Lescher and Webb, Burroughs and Wellcome, and others are equally convinced. Messrs. Crosfield and Sons, with others, desire concessions as regard soap, perfumes, &c.

For use in the manufacture of explosives we have the testimony of the Explosives Committee itself, several powder and explosives companies, and of our able chairman, Mr. Reid, who is an expert in this class of products. He mentions certain substitutes for india-rubber, such as "velvril"; also fulminate of mercury, the importation of which was, in 1900, 14,200 lb., requiring for its production 113,600 lb. of 90 per cent. alcohol; in 1901, 12,900 lb., requiring 103,200 lb. of 90 per cent. alcohol.

The following appears in *La Revue des Produits Chimiques*. Obviously, ether and alcohol could not be employed in this country.

New Colloid, and its Process of Manufacture.

The inventor has ascertained that if nitro-cellulose, insoluble at the ordinary atmospheric temperature, is introduced in a mixture of two parts by weight of ethylic ether and one part by weight of ethylic alcohol, and possessing a volume of oxygen greater than that corresponding to the formula $C_{12}H_{15}O_5(NO_3)_5$, and is exposed to a temperature lower than the point of congelation of ethylic alcohol of 95 per cent. in absolute volume, this nitro-cellulose will form a solution or jelly with the ether and will produce a colloid. When in the state of solution or of jelly, the insoluble nitro-cellulose cannot resume its primitive state, but constitutes a body which may be employed, after desiccation, as a powder, or as an agent of cementation, or as an agglutinant, in the manufacture of powder containing other ingredients.

The process of the formation of the colloidal powder consists, therefore, in submitting the ether and the insoluble nitro-cellulose to a mechanical agitation or kneading in any vessel having a cover, and which is surrounded altogether or in part with a cooling mixture.

The nitro-cellulose ought, after its conversion into a colloid, to be submitted to dissociation before it is utilised as a smokeless powder.

The nitro-cellulose, which is mentioned here as the lower limit of the insoluble nitro-celluloses, $C_{12}H_{15}O_5(NO_3)_5$, is the cellulose pentanitrate of Eder.

Other manufacturers urge that it is useless to entertain processes or new materials in which spirit in its present form must be employed, so industries are crushed even at their inception. Messrs. Duncan, Flockhart and Co., J. F. Macfarlane and Co., T. and H. Smith and Co., and Thos. Whiffen make comment in this direction.

The makers of acetic acid for vinegar deplore that they cannot produce from alcohol direct. Of course, it could and ought to be done as co-operated industry.

The professors are more than emphatic in their regret that industries are hampered by regulations which deter them and their students from research in technical directions.

Appendix—Table I.

Raw Material in the German Distilleries.

Year beginning October 1st.	Potatoes.	Grains and all other Substances containing Amylene.	Molasses.	Waste Products from Breweries.	Kernel-Fruit and Husks of the same.	Stone Fruit.	Grape Wines.	Wine Yeast, Husks of Grapes.	Other Substances.	
	Tons.	Tons.	Tons.	Hectolitres.	Hectolitres.	Hectolitres.	Hectolitres.	Hectolitres.	Hectolitres.	Hectokilo.
1890-91	1,685,867	350,048	73,541	237,261	86,890	131,310	9,081	406,814	50,495	1,551
1891-92	1,334,602	491,040	95,370	252,971	89,434	306,031	11,907	195,055	67,495	886
1892-93	1,947,411	322,549	37,461	224,855	64,006	252,940	20,853	270,452	60,481	9,865
1893-94	2,148,014	324,529	33,826	188,233	271,774	602,789	27,911	538,314	84,998	688
1894-95	1,804,256	322,340	76,459	179,765	130,248	421,821	25,484	866,814	82,571	7,842
1895-96	2,210,570	330,674	43,066	182,737	120,064	227,114	30,424	214,756	48,230	9,110
1896-97	2,116,159	314,337	44,540	165,274	60,537	196,778	32,657	529,746	84,584	4,019
1897-98	2,261,195	333,040	46,970	128,260	165,523	192,949	26,665	374,456	88,281	677
1898-99	2,585,823	345,925	34,986	115,992	103,685	230,370	28,204	266,707	78,246	447
1899-1900	2,501,843	346,754	31,551	148,951	86,134	220,587	29,291	372,870	84,785	644

Contingent Output of the Distilleries (in Hectolitres of Pure Alcohol).

Year (beginning Oct. 1).	Quantity produced in Distilleries consuming chiefly							Total.	From this Total the following Quantities were made in Distilleries making Compressed Yeast.		Contingent of Distilleries.
	Potatoes.		Grains.		Other Substances, Gewerbl-lichen.	Molasses.	Other Substances not containing Amylen.				
	Agricultural.	Industrial	Agricultural.	Industrial.					Agricultural.	Industrial.	
1890-91	2,225,403	8,043	171,686	239,541	..	201,235	23,551	2,869,149	93,431	311,181	1,923,441
1891-92	2,119,547	5,376	202,101	332,993	..	260,248	27,679	2,948,244	85,076	294,203	2,134,427
1892-93	2,368,090	8,373	176,871	341,986	..	105,955	27,645	3,028,920	85,967	312,097	2,131,877
1893-94	2,778,949	4,591	185,004	347,143	..	96,376	50,326	3,262,685	86,904	316,535	2,145,040
1894-95	2,168,353	4,195	186,850	337,113	..	218,472	36,688	2,951,671	86,376	307,379	2,188,762
1895-96	2,650,397	4,926	292,623	326,104	574	122,285	26,103	3,333,648	90,676	298,561	2,170,949
1896-97	2,893,598	4,681	224,721	320,845	172	27,794	28,594	3,100,505	93,569	288,557	2,171,284
1897-98	2,540,868	4,198	251,828	325,124	244	134,292	25,268	3,287,890	97,699	286,990	2,176,479
1898-99	3,101,705	5,429	245,681	[illegible]	87	102,889	24,615	3,815,569	102,112	300,877	2,174,505
1899-1900	2,912,765	5,226	276,292	372,414	244	94,734	26,140	3,667,820	[illegible]	317,412	2,170,053

APPENDIX.—TABLE II.

STATISTICAL TABLE OF GERMAN SPIRITS.

Year.	Potato Crop, Average.	Potatoes consumed for Distillation.	Spirits produced from Potatoes.	Whole Spirit Production from all Materials.	Potable Spirits consumed.	Free Spirits consumed.	Free Spirits denatured.	Free Spirits for Vinegar.	Free Spirits for other purposes by Deduction.	Export.	Export to Great Britain, British West Africa, British East Indies.
	Millions of Tons of 1,000 kilos.		Million gallons, liquid, 100 per cent.								
1882	18·07—21·27	..	..	..	..	..	..	..	..	..	..
1883	24·91—29·32	..	..	..	..	..	..	..	..	..	..
1884	24·02—28·27	..	..	..	..	..	..	..	..	..	..
1885	27·95—32·83	..	..	..	..	..	..	..	..	..	..
1886	25·14—29·70	..	..	..	..	..	..	..	..	..	..
1887	25·27—29·74	2·009	55·77	67·276	..	8·527	3·033	2·912	2·582	.	..
1888	21·91—25·79	1·699	45·76	59·994	47·828	..	..	..	..	..	.
1889	26·60—31·31	2·084	55·682	69·190	49·720	..	..	..	..	..	..
1890	23·32—27·35	1·686	49·126	65·318	47·300	..	..	3·055	..	..	..
1891	18·56—21·85	1·335	46·750	64·856	47·498	..	6·047	3·970	3·111	..	..
1892	27·99—33·04	1·947	52·272	66·638	48·664	12·128	6·954	3·190	3·223	..	..
1893	32·28—40·724	2·148	56·848	71·764	48·906	13·347	7·999	3·408	3·209	..	..
1894	29·05—33·609	1·804	47·784	64·944	48·136	14·616	9·114	3·306	3·393	..	..
1895	31·79—37·786	2·210	58·410	73·348	49·456	15·813	10·553	3·660	3·589	..	..
1896	29·28—32·329	2·116	52·756	68·200	49·368	17·782	11·620	3·575	3·890	0·830	..
1897	29·80—33·776	2·261	56·122	72·336	49·698	19·085	11·633	3·526	4·407	1·777	..
1898	31·79—36·721	2·586	68·354	83·952	52·998	19·566	13·415	3·599	4·766	4·845	1·084
1899	38·486	2·502	64·856	80·696	52·300	21·780	14·410	3·559	4·979	3·520	1·239
1900	40·585	2·630	68·016	89·320	53·020	22·948	17·3	8·298		4·136	1·197
1901	48·687	3·150	81·640	93·368	52·316	25·6	15·52	8·987		4·831	1·733

1 liquid gallon 100 per cent. = 1·73 proof gallons. 1 hectolitre = 22 liquid gallons. 4 kilos. = 1 gall.
Stock on Dec. 31, 1902, 22·198 million gallons, liquid, 100 per cent.

ANILINE DYESTUFFS EXPORTED FROM GERMANY.

Frankf. Zeit., Oct. 20, 1902; *through U.S. Cons. Reps., Nov.* 28.

From an article published in the third quarterly volume of the statistics of the German Empire, concerning Germany's export trade in some goods of importance for the German colour industry in the last decade, we select the statements with reference to the aniline colour industry.

The group comprises dyestuffs made of benzol, cresol, phenol, phthalic acid, anthracene, and naphthalene. The report calls attention to the fact that Germany hesitated to take up this new industry, which dates from 1856. The conditions for the manufacture of artificial dyestuffs seemed to be much more favourable abroad than in Germany. In England, the necessary materials—as fuel and the products of the acid and alkali industries—were much cheaper, and tar and its products were also lacking in Germany, because the gas industry was not so highly developed as in England and France. At present, Germany entirely supplies the coal tar for the home colour industry. The importation of coal-tar colours increased from 1892 to 1900, but decreased in 1901. On the other hand, the exportation of aniline colours has steadily increased in the last decade, as shown by the following table, which also gives the exports to the two most important importing countries—Great Britain and the United States:—

Year.	Total Exports.	Exports to Great Britain.	Exports to the United States.
	Metric Tons.*	Metric Tons.*	Metric Tons.*
1892	10,725	2,082	2,526
1894	12,368	2,497	2,326
1896	16,233	3,503	2,684
1898	19,712	4,007	4,231
1900	23,781	5,076	5,152
1901	25,030	5,800	5,123

*1 metric ton = 2,204·6 pounds.

The exports have not increased so much in value as in quantity, a result of lower prices for the goods.

The export to the United States has doubled in round numbers, that to Great Britain increased in a much larger measure. China, which, in 1892, occupied third place, has since been overtaken by Austria-Hungary, which took, in 1901, 2,491 tons, whilst China took 1,856 tons. Italy imported 1,673 tons, and India, 1,430 tons. Whilst France is a regular customer for German coal-tar colours, the export thither is fluctuating, and the same is true of Russia. The export to Belgium has increased two and a half times. To Switzerland also, which has a coal-tar colour industry of its own at Basle, large quantities are shipped.

Now, good may be done by a perusal of what our practical friends in the States proposed—and they are inserted for reference.

PROPOSED ALCOHOL LEGISLATION.

From The Pharmaceutical Era (American), March 11, 1897.

Senator Platt's Joint Congressional Committee on Free Alcohol is still receiving suggestions relative to a suitable bill for it to recommend, and Edward H. Haoce, Chairman of the Committee on Legislation of the National Wholesale Druggists' Association, has helped draw up a section on which he wishes the opinion of the trade. To this end he has issued a circular which has been widely distributed. The bill is understood to be in three parts: (1) methylated alcohol, (2) alcohol sold by druggists or used in medicines, extracts, perfumes, &c., and (3) alcohol for export. The section of interest to druggists has been redrafted four times, and is subject to further alteration before being finally submitted to the Committee. Following is the text of the section:—

"In all products requiring the use of pure ethyl alcohol where denaturalising or depotabilisation of the alcohol is not practicable by the use of wood alcohol or other substances as provided elsewhere in the Act to which this is an amendment, the following limitations are established for the rebate of the internal revenue tax on domestic alcohol used in the domestic manufacture of such products:

1. All preparations intended to be used or commonly used as beverages, and all classes of bitters or cordials, unless it shall be shown affirmatively that such preparations cannot commonly be used as beverages, shall not be admitted to rebate.

2. Where the alcohol does not remain in the finished product a rebate shall be allowed of the tax paid upon the alcohol actually and necessarily consumed or wasted in the process of manufacture. But no rebate shall be allowed on any alcohol used in the process which is recovered and made available for further use unless subsequently consumed or wasted in manufacturing as provided in this Act, or on any alcohol which is susceptible of recovery by any method

APPENDIX.—TABLE IV.

EXPORTS.

(111) *Aniline and other Coal-Tar Dyes.*

—	1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.
Total Export	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	25,030	23,781	21,707	19,712	17,630	16,933	15,784	12,368	11,534	10,725	8,680	7,280	6,975	6,903	6,544
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.
	79,031	77,289	71,994	71,950	67,028	64,932	63,157	53,184	53,176	52,553	41,267	37,854	38,361	40,055	42,539
From this—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
To British India	1,493	1,018	957	1,036	847	801	1,015	745	798	568	510	438	478	169	135
To United Kingdom.	5,729	5,276	4,618	4,007	3,575	3,603	3,258	1,449	2,303	2,052	1,819	1,495	1,357	1,185	1,159
To United States	5,128	5,152	4,923	4,251	3,901	2,684	3,225	2,328	1,975	2,526	1,593	1,238	1,269	949	795

—	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	1876.	1875.	1874.	1873.	1872.
Total Export	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.			Total Export Tons.					
	3,702	4,646	4,822	3,819	3,114	2,563	2,110	1,520	685	675	461	330	276	202	407
	1,000	1,000	1,000	1,000	1,000	1,000	1,000								
	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.								
	38,776	43,843	31,167	34,274	42,010	31,631	31,037								
From this—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.								
To British India	120	97	101	145	42	25	25								
To United Kingdom.	1,088	968	952	739	785	614	497								
To United States	701	537	474	522	361	279	254								

Aniline Oil, Aniline Salts, &c.

—	1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.
Total Export	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	12,791	12,314	12,275	12,330	9,178	7,707	7,135	6,318	4,036	4,630	4,103	3,829	2,298	2,528	2,137
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.
	11,962	11,352	11,662	13,596	11,472	10,020	6,778	6,633	4,915	6,524	8,366	7,659	4,797	4,015	3,419
From this—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
To United Kingdom.	927	869	804	791	626	511	432	261	217	150	230	222	267	173	156
To United States	3,639	3,747	3,224	3,990	2,119	1,764	1,930	1,876	844	1,080	1,297	653	471	271	156

—	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	1876.	1875.	1874.	1873.	1872.
Total Export	Tons.	Tons.													
	1,680	1,713	..	..	..	..									
	1,000	1,000													
	Mks.	Mks.													
	2,518	3,436	..	..	..	..	..								
From this—	Tons.	Tons.													
To United Kingdom.	120	80	..	..	..	..	..								
To United States	252	156	..	..	..	..	..								

IMPORTS.

Aniline and other Coal-Tar Dyes.

—	1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.
Total Imports...	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	1,164	1,174	1,021	1,029	991	875	918	740	780	687	688	621	698	613	600
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.
	3,726	3,816	3,370	3,754	3,768	3,500	3,672	3,184	3,379	3,366	3,509	3,230	3,838	3,728	3,894
From this—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
To United Kingdom.	182	186	149	135	119	173	141	106	69	64	95	86	92	77	56

—	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	1876.	1875.	1874.	1873.	1872.
Total Imports...	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.			Total Import Tons.					
	594	434	480	577	572	509	500	525	316	274	292	409	378	351	640
	1,000	1,000	1,000	1,000	1,000	1,000	1,000								
	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.								
	3,427	3,244	3,602	5,193	7,441	6,363	6,749								
From this—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.								
To United Kingdom.	43	117	140	243	129	39	11								

Aniline Oil, Aniline Salts, &c.

—	1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.
Total Imports...	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	1,184	1,211	1,113	728	961	877	488	402	570	490	310	418	384	382	326
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.	Mks.
	1,125	1,117	1,057	801	1,261	1,062	464	422	684	658	616	836	614	612	522
From this—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
To United Kingdom.	1,110	1,172	950	666	871	684	419	302	454	276	157	253	192	191	127

—	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	1876.	1875.	1874.	1873.	1872.
Total Imports...	Tons.	Tons.													
	275	442	..	..	..	..	..								
	1,000	1,000													
	Mks.	Mks.													
	413	884	..	..	..	..	..								
From this—	Tons.	Tons.													
To United Kingdom.	98	253	..	..	..	..	..								

Appendix.—Table V.

Ethers of all kinds, Chloroform, Collodion.

—	Imports.				Exports.			
			Chloroform.				Chloroform.	
	Metric Tons.	£	Tons.	£	Metric Tons.	£	Tons.	£
1872	27				326			
1873	12				354			
1874	11				210			
1875	16				136			
1876	12				168			
1877	9				190			
1878	7				200			
1879	6				152			
1880	12				217			
1881	26				197			
1882	29				196			
1883	33				194			
1884	10				210			
1885	17				267			
1886	16				420			
1887	25				244			
1888	16				212			
1889	15				329			
1890	29				389			
1891	106.*				308*			
1892	32				369			
1893	31	1,550	2	400	500	12,000	56	6,150
1894	27	1,400	2	250	303	10,600	61	6,150
1895	57	2,900	2	300	634	22,100	66	6,250

	Imports. Ethers of all kinds. In Casks.		In Bottles, &c.		Celloidin Collodion.				Exports. Ethers of all kinds. In Casks.		In Bottles, &c.		Collodion Celloidin.			
	Tons.	£	Tons.	£	Tons.	£			Tons.	£	Tons.	£	Tons.	£		
1896	1	50	1	50	1	..	2	270	92	4,150	160	7,200	444	14,400	92	8,550
1897	1	50	3	200	1	50	1	250	129	5,800	114	5,100	426	14,500	89	7,800
1898	3	200	2	100	1	50	1	100	129	6,500	167	5,350	497	18,650	121	9,700
1899	2	100	2	150	5	200	1	200	105	5,500	133	6,950	888	35,550	86	6,900
1900	2	100	3	150	1	50	1	100	450	22,500	138	6,900	415	16,500	91	7,700
1901	1	50	3	150	3	100	1	150	409	15,350	161	6,050	60	2,400	88	7,500

* From 1891 ether preparations are included.

Appendix.—Table VI.

Export.

*Alkaloids and their Salts (Santonine, Cocaïne, &c.).**

—		1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
Total	Tons	36	36	42	40	34	44	69	51	75	66	58	56	37	..	..	..
	1,000 marks	5,797	4,272	4,240	4,030	3,033	3,935	6,246	4,581	6,759	6,066	5,840	4,264	3,720	..	..	..
From this—																	
To British India	Tons	4	4	3	2	1	5	3	3	3	4	1	1	1	..	..	..
To United Kingdom	„	4	4	7	5	4	4	11	11	19	17	13	8	6	..	..	..

* 1889–1895 include antifebrin and antipyrin.

Imports.

Cantharides.

		1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
Total	Tons	20	21	22	17	16	25	22	16	29	..	..	..	..	..	..	..
	1,000 marks	90	95	79	53	56	94	100	70	151	..	..	..	..	..	..	..

Imports.

Antipyrin, Antipyretics, &c. (5 m.).

		1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
Total	Tons	13	10	5	1	1	..	..	..	..	..	..	..	..	..	..	..
	1,000 marks	158	125	69	38	60	..	..	..	..	..	..	..	..	..	..	..

Exports.

Antipyrin, Antipyretics, &c.

		1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
Total	Tons	33	34	22	17	16	15	..	..	..	..	..	..	..	..	..	..
	1,000 marks	441	472	379	680	1,178	1,103	..	..	..	..	..	..	..	..	..	..

Imports.

Alkaloids and their Salts (Santonine, Cocaïne, &c.).

		1901.	1900.	1899.	1898.	1897.	1896.	1895.	1894.	1893.	1892.	1891.	1890.	1889.	1888.	1887.	1886.
Total	Tons	31	26	36	34	51	33	32	21	34	..	..	..	..	..	..	..
	1,000 marks	4,612	2,534	2,412	2,736	3,810	3,320	4,347	2,889	4,563	..	..	..	..	..	..	..

not exceeding in cost the value for manufacturing purposes of the recovered alcohol.

3. Where the alcohol is destroyed or decomposed or changed into another chemical compound in the process of manufacture, a rebate shall be allowed of the tax upon the amount of the alcohol destroyed or decomposed or chemically changed, and upon the amount actually and necessarily consumed or wasted in the process of manufacture, as above limited.

4. Where alcohol remains in the finished product a rebate shall be allowed of the tax upon the alcohol remaining in the product, and upon the alcohol actually and necessarily consumed or wasted in the process of manufacture as above limited, except in the following cases, and in these no rebate shall be allowed, to wit:

(*a*) Where the relative value of the alcohol and the other constituents of the product, including the cost of labour and of packing, bottling, and sealing, by such methods as the Secretary of the Treasury may approve, and the practicable methods and cost of recovery of the alcohol and the other constituents are such as would permit a profitable separation of the alcohol and placing the same upon the market for use as a beverage, taking into consideration the necessity for the use of surreptitious means in such recovery and the probabilities of detection; or

(*b*) Where the product is of such a character that it is commonly or may commonly be used as a beverage.

Any person desiring to secure a rebate of the tax on the alcohol used in any product or products under the foregoing provisions shall present an application for a license therefor to the collector of Internal Revenue for the district in which such manufacture is carried on, and the Commissioner of Internal Revenue shall issue a license to him to manufacture such product or products for rebate, if the product or products are within the definition and limitations hereinbefore set forth.

An appeal from any decision by the Commissioner of Internal Revenue adverse to the right of an applicant for rebate may be made to a board of experts to be appointed, one by the Secretary of the Treasury, one by the Secretary of Agriculture, and one by the Secretary of War, and their decision shall be binding upon the Commissioner of Internal Revenue. But in any case where it shall appear, after its admission to rebate, that any product so admitted is commonly used as a beverage, or that the alcohol contained in it is commonly separated and placed upon the market, the license to manufacture such product for rebate may be revoked by the Secretary of the Treasury, and a rebate shall not thereafter be granted thereon, unless, upon petition presented to the Court of Claims, said court shall determine that such revocation was erroneous, and that the manufactured product is embraced within the provisions of this Act. All cases brought in the Court of Claims hereunder shall be given precedence, and the Attorney-General shall be assisted in the defence of the interests of the United States in all such cases in said court by the officers of the Internal Revenue Bureau. Such rules shall be made by the court for the summary taking of testimony and hearing of the cases as may be necessary to insure their prompt decision."

There are, of course, points on which British practice and permission will vary, as in the matter of potables; but it must be admitted that the principle of allowance for loss (natural) or waste (normal) in manufacture is not unreasonable, and must be taken into account, first, as a matter of revenue (bearing in mind, however, that the existing revenue will not be affected in the class of bodies we desire here); second, as a matter of factory economics. At first it is obvious, in the absence of these industries, that exact data from experience cannot be demonstrated, as was the case with medicinal spirituous preparations. Yet again, what has been done in good faith can and will be repeated. An instance outside the spirit industry is cognate to the principle already acted upon. Chicory is roasted and ground "in bond," and as coffee loses about one-seventh in roasting, it is not an irrelevant question to ask why the same concession—*that of allowance for waste*—could not be granted in manufactures proposed, so that for the home and export trade the duty would only be paid on the manufactured product.

The *export* difficulty may not be met by a drawback in the case of solid goods, as has been so successfully done in the case of tinctures, essences, and perfumes, in consequence of some obvious difficulties, which are fully appreciated by all manufacturers. But it can probably be met by some measures already foreshadowed. It is well to reiterate that if facilities are granted under clause 8 of the Finance Act of 1902, the revenue would not suffer, for the simple reason that no revenue is at present derived therefrom, and that the revenue would really increase in other directions.

All this while the question has probably been present to the mind, "Where is the benefit in competition with our rivals, if spirit, however denatured, is 40 per cent. to 45 per cent. dearer than to them?" One believes the question can be answered, provided—

1. The authorities will permit—
    (*a*) A change in the mode; processes of fermentation, with perfect freedom as regards "residuals."
    (*b*) An extension of materials in the direction of both cheapness and nature.
    (*c*) A rebate of surtax to distillers for spirit destined and *certified for certain uses in a "licensed" and approved factory, and consideration for inevitable loss in manufacture.* (Remembering always that the *present* output will not be affected.)
    (*d*) An increase of the duty on potable spirits for consumption, and even an increase in the duty on the luxurious champagne and high-class wines.

This is not a method of making "Peter pay Paul" in the usual sense. The axiom has been "tax luxuries," and rightly so. Opinions may widely differ as to what are and what are not luxuries, but, broadly, most would be inclined to classify potable alcoholic liquids of all kinds among them. This being an important Customs question, in one aspect, has also an interest for that department of revenue.

A very eminent expert in spirit matters—indeed, eminent in most matters—has written: "It is a fact that there is *no* profit at present on the manufacture of spirit. The profit lies exclusively in the yeast, and practically the spirit is a by-product." Given a margin for an expert's defence of his case, yet is not the question pertinent, Use the spirit for national good?

That same expert says that at first his proposals for a new adjunct to the fermentation industry were received with incredulity, and sometimes scorn; to-day, distillers are profitable yeast makers. Yet—and it is a valuable proposition—that eminent inventor says he "mastered the excise law as far as it relates to spirits," and he "learned to distinguish between the letter and the spirit of the regulations. Details might be modified, the principle could not. As long as he could show that the modifications did not touch first principles, and did not involve any danger to the revenue, the authorities did all they could for him." Now, gentlemen, the cases do differ, but only in kind. The revenue will not be endangered, because it will have the first word (and the last); the actual revenue from spirit will emphatically not be jeopardised, and then the element of personal security will come in. Can it be imagined that the authorities will be less generous to another section of the industrial community, whose word alone will not be taken, but for whose integrity the state will exact a substantial guarantee. One fanciful notion heard, may perhaps be disposed of at once, that this solicitude for British industry is accompanied by the very inconsistent demand that the regulations should be so framed that all the spirit used for technical purposes shall come from Germany. You have already heard what the policy of the German "ring" and the attitude of the State are; if that is so, we shall not be hindered in that quarter. Some possible means have been indicated, and others are not beyond the ingenuity of combined minds among the authorities and the manufacturers. One emphatic word of hope is based upon the attitude on the part of the officers of Revenue, high and low, which has for years characterised their dealings with traders, individually and collectively. The finest civil service in the world will not be beyond the reach of a patriotic, if a somewhat selfish cry. It may now be well to note some industrial application of spirit which would reduce over-production of alcohol, and increase the demand. It has been made clear that some form of denaturing will, broadly speaking, be made a ondition of industrial expansion, as in Germany and 'rance at least. There, a large industrial use for alcohol ias gradually arisen, and presents itself for this country's onsideration, *viz.*, for the purposes of power, heat, and ight. With the advent of electricity things have changed, nd, to a large extent, the use of suitable volatile geneators is a necessity. It is true we have cheap petroleum, ut it has been demonstrated that alcohol under wide conlitions is no mean rival, certainly not in the matter of dour and cleanliness, or even safety for heating. There s a duty on petroleum, but in Germany and France igures of effective work go to show that alcohol is a factor o be reckoned with; of course suitably denatured.

CONSUMPTION OF DUTY-FREE ALCOHOL IN GERMANY FOR MOTORS.

From Zeits. für Spiritusind.

	Hectols.		Hectols.
Jan. 1903......	120·094	Oct. 1902 to Jan. 1903....	422·851
„ 1902......	84·405	„ 1901 „ 1902....	320·842
„ 1901......	92·090	„ 1900 „ 1901....	381·371
„ 1900......	83·289	„ 1899 „ 1900....	336·267
„ 1899......	79·372	„ 1898 „ 1899....	332·785

Notice the quantity, Jan. 1903 against Jan. 1902.

AVAILABLE POWER DUTY.

From the Jahrbuch des Vereins der Spiritusfabrik.

	Per Cent.
Benzine motor	14—18
Petrol motor	13
Small steam engine................	1·8
Medium steam engine	5·0
Large steam engine................	13·0
Gas motor..........................	18—31
Spirit motor........................	24—28

From Jahrbuch des Vereins der Spiritusfabrik., p. 403.

—	Weight.	Price to Weight.	Kilo.-Calories.	1,000 Calories in Pfennige	Spirit.	Solar Oil.
	Kilos.	Marks.			Litre.	Litre.
Coke.........	100	2·40	8,000	0·3	0·09	0·2
	Cb. m.					
Gas (lighting)	1	0·12	5,000	2·4	0·75	1·58
	Kilos.					
Petroleum ...	100	22·50	10,500	2·15	0·67	1·41
Benzin	100	24·80	10,500	2·36	0·74	1·55
Solar oil	100	16·00	10,500	1·52	0·47	1·00
Spirit........	100	18·00	5,600	3·21	1·00	2·12

Mr. B. E. R. Newlands contributes the following:—

COMPARATIVE VALUE AS FUEL.

Petroleum	0·65
Wood	2·50
Alcohol	1·15

Alcohol Motors in Germany.

At the recent agricultural show at Halle, alcohol motors were very much to the fore, and showed the wonderful strides that Germany has made in their manufacture in the last eighteen months. This is largely due to the Emperor's personal interest in the subject and to the low price at which the spirit for fuel purposes (containing about 90 per cent. of pure alcohol) is obtainable all over Germany, a quart retailing at about $2\frac{1}{2}d$. A great advantage of the spirit motor is that it can be started in from two to three minutes, and that a portable motor can be built weighing half as much as a portable steam engine of equal power. With regard to cost, one of the largest firms exhibiting showed 6 to 8 h.p. portable alcohol motors for 200*l.*; 10 to 12 h.p. motors for 250*l.*; and 16 to 20 h.p. motors for 320*l.* In the tests made, one trial gave a consumption of 0·92 lb. of 86 per cent. spirit, and 0·81 lb. of a mixture of one-fifth benzol and four-fifths 86 per cent. spirit, in both cases per b.h.p. per hour.

Denaturing in Germany.

——	1900—1901.	1899—1900.
	Million Galls. Liquid.	Million Galls. Liquid.
Duty free..............................	25·4320	22·9460
With general denaturing agent denatured	17·2080	14·4100
Imperfectly denatured	7·4734	7·4090
Without denaturing agent, for scientific purposes, hospitals, powder and fulminate of mercury	0·7430	1·1280
Of the imperfectly denatured spirit there were denatured—		
With vinegar	3·6580	3·5570
„ 5 per cent. of wood naphtha	0·4730	0·5060
„ 0·5 per cent. of pyridine base	0·0014	0·0044
„ shellac........................	0·0374	0·0352
„ camphor	0·2060	0·1144
„ turpentine	1·2298	1·2958
„ ether..........................	0·2530	0·1100
„ animal oil....................	1·4674	1·7336
Sundry smaller uses	0·0460	0·0460
	7·3750	7·1024

TABLEAU NO. 440.

Production annuelle des alcools par nature de substances mises en œuvre depuis 1840.* (*Alcool pur.*)

Années.	Alcools provenant de la distillation des								Total.
	Substances farineuses.	Mélasses.	Betteraves.	Vins.	Cidres.	Marcs, Lies, &c.	Fruits.	Substances diverses.	
	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.
1840—1850	36,000	40,000	500		815,000			..	891,500
1853—1857	69,000	137,000	300,000		165,000			..	671,000
1865—1869	84,018	346,640	300,419		553,983			60,124	1,344,614
1870—1875	108,183	582,143	313,771		539,762			46,611	1,591,070
1876	101,402	710,670	243,337	545,994	22,388	76,227	1,228	7,929	1,709,175
1877	163,204	642,709	272,883	157,570	9,468	56,191	1,062	5,795	1,308,881
1878	180,469	646,715	331,716	192,952	9,822	51,079	978	3,496	1,417,227
1879	247,171	723,631	364,714	102,651	7,265	36,831	138	5,118	1,187,879
1880	412,585	685,433	429,878	27,200	3,317	17,373	624	4,658	1,581,068
1881	506,273	685,646	563,240	34,324	2,291	24,621	603	4,289	1,821,287
1882	447,066	703,989	556,056	21,962	9,829	22,893	713	4,058	1,766,565
1883	561,932	750,637	629,998	22,710	8,088	28,918	1,408	7,325	2,011,016
1884	485,001	778,714	569,257	35,251	15,567	43,266	2,799	4,699	1,934,464
1885	567,768	728,523	465,451	23,240	20,908	43,853	7,680	7,028	1,864,514
1886	789,963	471,781	683,985	19,513	28,600	49,311	4,424	4,673	2,052,250
1887	765,050	451,826	672,352	32,758	13,595	41,872	2,386	25,796	2,005,635
1888	794,526	582,152	654,700	41,776	12,933	44,092	4,016	28,188	2,162,483
1889	751,266	559,911	824,090	42,140	15,298	43,881	2,820	6,557	2,245,963
1890	645,255	682,573	800,982	38,799	4,803	34,371	1,160	6,581	2,214,527
1891	392,537	838,615	866,406	51,133	7,759	37,748	5,878	8,013	2,208,119
1892	366,335	902,446	854,329	69,639	13,589	46,210	4,348	6,183	2,263,079
1893	457,877	896,572	861,099	100,829	44,761	74,773	28,222	12,254	2,476,387
1894	415,795	817,525	753,508	161,660	72,135	77,274	29,611	2,205	2,329,113
1895	386,604	846,103	744,325	61,202	45,717	62,592	11,698	3,907	2,165,448
1896	416,530	863,423	544,087	58,652	53,759	78,429	6,051	1,203	2,022,134
1897	484,637	734,819	798,484	83,719	26,579	79,909	6,311	682	2,208,140
1898	683,566	708,270	897,542	45,975	9,352	55,207	4,781	7,767	2,412,410

* De 1840 à 1875, ce sont les moyennes qu'on a indiquées.

TABLEAU No. 444.

Subdivision des quantités d'alcool (alcool pur) soumises au droit de dénaturation depuis 1888.

Designation des Produits.	Quantités totales soumises à la denaturation pendant les Annees									
	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.	Hectol.
Vernis	9,782	9,619	12,470	11,781	10,876	11,740	11,205	11,845	12,148	13,133
Alcools blancs pour l'eclaircissage des vernis	9,047	8,633	7,870	6,653	5,152	6,017	1,253	856	1,627	1,713
Gazogenes pour l'eclairage	2,332	2,613	4,114	6,068	4,513	4,990	1,398	1,069	2,316	1,371
„ pour le chauffage	27,466	31,767	37,316	45,705	52,509	53,702	65,826	69,501	71,069	79,040
Alcools destines a—										
la dissolution des couleurs										145
la chapellerie										685
des usages scientifiques	307	747	432	210	377	617	2 219	2,065	2,450	373
la fabrication du celluloid et autres matieres plastiques										2,215
Ether	48,675	45,769	36,961	27,906	25,554	22,178	31,857	36,032	36,291	41,881
Insecticides, aldehydes, alcaloides et autres produits chimiques et pharmaceutiques	2,396	2,583	3,362	2,558	1,812	2,607	2,672	5,241	5,279	4,812
Usages divers	7,058	6,709	7,317	4,881	4,124	5,188	1,318	7,091	7,040	1,131
Totaux	107,063	108,240	109,842	105,782	101,947	106,939	120,798	134,240	138,560	146,529

TABLEAU II.

Emploi de l'alcool en 1899 et 1900 (alcool pur).

(Bulletin de statisque et de législation comparée, juillet 1901, page 46.)

Ressources.	Annees	
	1899.	1900.
Renseignements extraits des registres administratifs.	Hectol.	Hectol.
Fabrication indigene (bouilleurs de profession):—		
Substances farineuses	714,774	562,455
Melasses	667,493	796,675
Betteraves	1,047,320	973,225
Vins	61,689	97,353
Cidres et poires	2,420	4,229
Marcs et lies	13,107	14,895
Fruits	235	2,247
Substances diverses	1,544	856
Importation (liqueurs comptees a 50 p. c. d'alcohol pur en moyenne)	115,835	112,150
Renseignements établis par évaluation et au sujet desquels l'Administration decline toute responsabilité.		
Fabrication indigene (bouilleurs de cru):—		
Vins	15,317	52,054
Cidres et poires	17,340	42,814
Marcs et lies	55,576	78,565
Fruits	2,743	30,390
Total	2,715,393	2,768,418
Renseignements extraits des registres administratifs.		
Quantites soumises au droit general de consommation	1,754,868	1,782,891
Quantites soumises à la denaturation	216,015	221,214
Quantites converties en vinaigres	50,718	54,514
Quantites representant les manquants couverts par la deduction chez les marchands en gros	96,042	84,799
Quantites declares pour le vinaigre	21,304	14,101
Quantites exportees (liqueurs comptées à 50 p. c. d'alcool pur en moyenne)	288,818	345,743
Decharges pour creux de route	3,665	3,559
Decharges pour pertes, accidents, avaries, etc.	1,755	1,800
Decharges à titre de deficits de rendement ou dechets de rectification	5,586	5,956
Quantites en cours de transport, en transit, etc., à la fin de l'annee	35,482	31,327

Ressources.	Années	
	1899.	1900.
Renseignements établis par évaluation et au sujet desquels l'Administration décline toute responsabilité.	Hectol.	Hectol.
Quantites consommees en franchise chez les bouilleurs de cru	80,629	80,432
Total des emplois	2,554,631	2,655,656
Difference* entre les ressources et les emplois	160,762	112,782

* Cette difference peut s'expliquer par les variations qui se produisent dans l'importance des stocks au commencement et à la fin de l'annee.

TABLEAU III.

Subdivision des quantités d'alcool (alcool pur) soumises au droit de dénaturation en 1899 et 1900.

Désignation des Produits.	Années.	
	1899.	1900.
	Hectol.	Hectol.
Vernis	17,396	14,761
Alcools de chauffage et d'eclairage	109,767	125,642
—— d'éclaircissage	1,287	2,750
Matieres plastiques (celluloid)	9,439	7,198
Collodion	123	186
Presure liquide	146	123
Insecticides	1,918	3,893
Teintures et couleurs	188	156
Ether, filament de mercure, &c.	74,263	64,873
Tannis	195	498
Usages scientifiques	492	386
Chloroforme	296	82
Chloral	210	308
Chapellerie	304	413
Total	216,015	221,214

Bulletin de statistique et de legislation comparee, juillet 1901, page 50.

DISCUSSION.

The CHAIRMAN, before inviting discussion, reminded the members that nominations for the new Committee should be sent to the Secretary a fortnight before the Committee Meeting on April 6th.

Mr. JOHN C. UMNEY said the object of any effective legislation of this kind must be the greatest good to the

greatest number, and he should add the greatest number of British subjects in a matter of this kind. They certainly looked forward to the legislation being imperialistic in its tendency. There could be no question, from the answers which had been read to the questions sent out by that Society and the Chemical Section of the London Chamber of Commerce, that everybody supported the principle of duty-free alcohol for manufacturing purposes, and, therefore, there were only two questions to be answered: one, Would the revenue be affected? and the other, What British industry would be influenced? He did not see that the revenue could be affected to any appreciable extent, because he imagined that the increased returns from the income tax and in other ways would abundantly make up for any little reduction there might be. So far as the effect on British industries was concerned, he did not imagine any could be affected, except the distilleries, and after the facts which had been put before them as to the way the *5d.* per gallon went in supervision and so forth, and after learning that some distilleries only turned out 50,000 galls. or 60,000 galls. per week, whilst in America, from works of similar size, there were turned out 300,000 galls., he should say that *5d.* per gallon was a very excessive charge and amounted practically to a form of compensation. The sooner they recognised that the British distiller wanted compensation and did away with him, the more quickly, he thought, could they obtain the duty-free alcohol for manufacturing purposes. Looking over Mr. Chamberlain's speech in the House of Commons on November 24th, 1902, on the subject of sugar bounties, he found one sentence which seemed to him to sum up their position with reference to duty-free alcohol. "In considering the question of pecuniary advantage, they must not consider only a possible temporary advantage, but the permanent result; and in matters of economics, if they could agree on a principle, they must accept that principle and act on it, in spite of any question of expediency." In this matter we had to consider our Imperial relations, and how we were being hampered and absolutely prevented doing business with our own Colonies, and passing on to them German products. The matter of the protection of the spirit industry in this country must, in comparison, be held to be a very small matter. Personally he should like to see the whole matter of the *5d.* differential duty thoroughly investigated, and he hoped Mr. Tyrer might live long enough—and he was glad to see him looking so well—to see his great aim effected, and duty-free alcohol broadly used for manufacturing purposes.

Mr. David Howard said there were one or two points to which he might allude. With regard to the *5d.* a gallon duty, those who knew the margins on which manufactures were now carried on in the chemical trade would know that that *5d.* might mean a very great deal. Again, in the list of cases in which they had no reason to hope for free alcohol being allowed, one was if methylated spirit could be used without serious disadvantage. To begin with, methylated spirit cost double what their spirit cost to Germans, and that was a pretty serious disadvantage, and if little details, trifles like that, were considered below the consideration of the Government, where was British trade? Again, there was one very important point laid down in the memorandum, that on no account was this to be used for anything which might, could, should, or would be used for human food. He did not know what people did not use for food. Arsenic has unfortunately been largely used in human food, at least in beer, and largely used in human medicine. But one could hardly consider the manufacture of arsenic as coming within the category of food and drugs; yet really it would be one of the things for which free spirit could not, if wanted, be used. Forbidding the use of alcohol for an enormous number of products took away a very large portion of the benefit from anyone except the dye industry. He thought that was what was meant; that the dye industry was to have some advantage (not much), but nobody else was to have the slightest. Again, they had first to prove that, apart from their own pockets, which they were not supposed to consider for a moment—and it was evident that the Government did not consider them—the industry was to be of immense national importance. How could one tell about a new thing whether it was of immense national importance? One could not tell beforehand. It was arguing in a vicious circle. One had first to prove it to be of national importance, by which time the Germans had got possession of the field, and then one might use it when too late to take up the manufacture successfully. There was only one possible solution, and that was to have something like the German system. If alcohol were allowed to be used freely under the strictest supervision, such as would be sufficient for a gold-refiner—because one could not carry away spirit, as one could gold, internally, and afterwards find it—if under such supervision one could use alcohol, the use of alcohol being freely allowed, one might build up new industries; but under the terms of the memorandum it did not seem very likely except in the dyeing industries. Again, there was the proposal, to which he could not see any objection, that articles should be manufactured and the duty paid when they came out of the bonded warehouse. A vast number of articles were made from spirit in Germany and a good deal of spirit was wasted in the process; all the esters for instance. It was impossible to make them in any other way. The only possible way would be to allow them to be made free of duty, and pay the duty on the manufactured article. That was one of the points which might benefit other industries besides the explosives and colour trades, but unless a good deal more was granted than was shadowed forth in the memorandum, it would do manufacturing chemists very little good. It would be another example of the fair words which they obtained from Parliament followed by foul treatment.

Sir William Ramsay said he would only point out one thing which had struck him lately. They had hoped to come under the new arrangement by which certain institutions might claim to have alcohol duty-free for research purposes; but on making inquiries it turned out that absolute alcohol was not to be obtained in this country. The distillers did not make it, it was all imported, and the excuse given was that to make absolute alcohol was a chemical process, and no distillery carried on any chemical process whatever. Therefore they had to buy rectified spirit and make absolute alcohol themselves. The question was, would they be allowed to start an alcohol still. He did not know, but he thought not; so that really the privilege was of very little use. They could buy their absolute alcohol in Germany, and that was all the advantage they got. He must thank Mr. Tyrer for his extremely interesting paper, which he hoped would produce a good effect.

Mr. Grant Hooper thought Mr. Tyrer had represented his paper as a record of things actually accomplished, and undoubtedly there was now at least the possibility of the use of undenatured alcohol for manufacturing purposes. With most things the difficulties at first appeared to be rather great, but he had a strong feeling that time would show that by manufacturing in bond the use of duty-free undenatured alcohol would be possible with the readiness and facility desired. With reference to the remark of Sir William Ramsay about the difficulty of obtaining absolute alcohol, he thought that when the demand was known means would be found to secure its production in the United Kingdom. He could not help thinking that there had been a little exaggeration of the difficulties which had hitherto existed with reference to the use of spirit, for from the figures put before them that evening it would be seen that the consumption of methylated spirit exceeded 5,000,000 galls. annually, and there could be no doubt that although methylated spirit might cost a little more than the cheapest possible spirit, yet at the same time the additional cost was clearly not prohibitive, and the duty-free spirit it rendered available had been a very great boon, and had presented no very great disadvantage, in a large number of operations. With reference to the differential duty which had been spoken of, the object, of course, had been to secure to the home manufacturer who was put to any disadvantage through official regulations, some equivalent which would equalise matters for him in competition with the foreigner. In conclusion, he thought Mr. Tyrer would be satisfied in a brief time, if not immediately, that a great step had been taken in affording manufacturers, on the one hand, the opportunity to manufacture in bond from undenatured spirit, and, on the other, the freedom to suggest denaturing agents other than crude methyl alcohol, which, whilst protecting the revenue, would render the denatured spirit more suitable than methylated spirit for their operations.

Mr. Oscar Guttmann said he could only emphasise everything Mr. Tyrer had said, since the necessity of having duty-free alcohol in connection with the manufacture of a large number of chemical products was growing day by day, the industry with which he had been connected for so many years in particular. Dr. Silberrad in his paper had given only a part of the case, and perhaps did not wish to say how much alcohol might be used in the manufacture of explosives. The present solvent for smokeless powder in this country was acetone, but other countries saw no reason why a large portion of that should not be replaced by alcohol. At present they were obliged to erect drying houses for the purpose of drying the nitrocellulose. Now the new cordite, introduced some time ago, required double the quantity of nitrocellulose, and, consequently, twice the number of drying houses. These houses were not free from danger—for some unaccountable reason they sometimes caught fire; in nine cases out of ten they burned quietly away, but in the one odd case they blew up. Sometimes, even when the nitrocellulose had been very carefully handled, an explosion like that which recently occurred at Woolwich took place. When mixing nitrocellulose into cordite with all the latest and best improvements and every possible precaution, there still may be explosions like the two recent ones. Now, if they could eliminate the whole process of drying and could adopt the process used elsewhere, simply diluting the alcohol by the water contained in the nitrocellulose, pressing out the excess, and using the remainder as a component of the solvent, *i.e.*, forming a mixture with the acetone, they would almost entirely get over the danger. Nitrocellulose moistened with alcohol was known to be very much less liable to go off by friction than dry nitrocellulose. At a rough computation, they could use between half a million and one million gallons a year only in drying, and perhaps as much in dissolving. There were also other industries where, in a similar way, existing processes could be thoroughly transformed into paying ones and into safe ones, and such as might bring credit to this country, if they were only allowed to use the material best adapted for it.

Mr. E. J. Millard said he was interested in the exportation of medicinal spirits and tinctures under drawback. His firm had derived considerable benefit from the new regulations, but it must not be assumed that they were attained at a single stroke. As a matter of fact, the Revenue department appeared to be feeling their way, and seeing to what extent they could safely allow manufacturers to go. Regarding duty-free spirit, they seemed to have now reached a stage that if they could only have a round-table conference with Mr. Tyrer, Mr. Leah, and possibly one other, some method might surely be hit upon by which duty-free alcohol could be used generally. He considered the suggestion that individual application should be made in each case was most unsatisfactory. In the early days of the exportation of tinctures under drawback they were exporting articles, which their friends and neighbours had not received the privilege, for the simple reason that they had not also applied for it nor probably even thought of it. That appeared to be a sort of favouritism, though quite unintentional, and the same thing would happen if individual application was to be insisted upon. It was all very well to say that manufacturers in this country should wake up, but when they were muzzled and tied with red tape, it was rather a difficult process to accomplish. They heard of manufacturers and workmen sending deputations abroad to see how things were done there, and he would venture to suggest that the Board of Inland Revenue might send a deputation of their inspectors to Germany to see how the manufacture of articles was carried on in bond. At any rate he was quite sure that a great deal of progress would be made if they grasped how easily facilities were afforded there, and how difficult they were here. They had only to glance at that part of the paper in which he was particularly interested to see the importance of this matter. With regard to the manufacture of chloroform, iodoform, &c. that was made absurdly easy for the manufacturer in Germany, but here there were no such facilities. He had to deal with an article which Mr. Hooper, as a representative of the Inland Revenue, called "a little dearer," but which was practically 100 per cent. dearer than alcohol itself. They were much indebted to Mr. Tyrer for the excellen way in which he had marshalled his facts, and the overwhelming case he had made out for further concession regarding duty-free spirit.

Dr. Silberrad regretted that he was precluded from discussing the subject brought forward by Mr. Guttmann referring to the use of alcohol in the manufacture of smokeless propellants, in light of its effect on national defence but could only state that Mr. Haldane's clause—and indeed the whole action of the Explosives Committee—were of a purely philanthropic nature. With regard to the question of research, Mr. Howard and Mr. Umney had pointed out that "it is useless to grant freedom for alcohol for research if freedom is not granted for alcohol required as the result of research." This, in his opinion, was scarcely correct, since, in carrying out an investigation, say, on some dyestuffs, chemically pure compounds must be obtained and investigated before their nature could be understood; subsequently their derivatives investigated, and their method of manufacture worked up. This all necessitated the use of pure alcohol as a solvent, if not actually as a reagent. When, however, the chemical constitution was understood, it would not be a difficult matter to settle on some suitable denaturing agent which would not affect the manufacture of the commercial product. In his opinion, this step was a great advance, and likely to lead to the permitting to use a wide series of denaturing agents suited to each special manufacture.

Dr. Schidrowitz said he must say that the attitude of some distillers on this question was quite incomprehensible to him. He should have thought that if duty-free alcohol were allowed for industrial purposes, the distiller in this country would ultimately get a very great increase of business and not the reverse; and at all events he was protected by this differential duty of 5*d.* per gall. and surely he ought to be content with that. But if that were not sufficient compensation, or if at some future date this differential duty should be removed, there were materials and methods with which the distiller might work in future which would probably enable him to produce ultimately on lines quite as cheap as those on which the Germans worked. He might allude in this connection to a paper read before the Canadian Section and published in the January number of the Journal, on the starch obtainable from the cassava root; from which it appeared that one could readily obtain starch from that root at one-fifth the cost of that from maize, which, as they all knew, was the cheapest starch for spirit-producing purposes in this country. He did not suppose they could produce the cassava root in England, but in the great Empire of which this country was the centre there were large tracts in which it could be produced, and situated as they were with regard to shipping, the raw material could be brought here at very little cost, and this in itself would be an opening which might be taken advantage of. Again, there was the agricultural side of the question to be taken into account. The removal of restrictions on the alcohol trade might lead to the planting of potatoes or some other starchy plants in England or Ireland which would ultimately benefit not only the agriculturists, but industrialists in every sense of the word, including the distiller.

The Chairman said that in this country they had very little help from the State, and a good deal of pressure had to be brought to bear on the Government before anything could be done. In other countries it was very different. For instance, the German Emperor came over here in November last, on a visit to Sandringham, and whilst there he saw a chance of using alcohol in the manner that it was being used in Germany. The Emperor wired over to Berlin on Thursday, and on the Saturday morning he had one of the chief manufacturers from Berlin at Sandringham with a full collection of appliances for the industrial use of alcohol. One did not expect or get help of that kind in this country;

but those who paid the cost of government had a right to claim some little assistance from the State. Again, there was an exhibition recently at Berlin of the products of the potato, and over the door there was this short sentence in German: "There you see what there is in the potato." These were words which the German Emperor used at the spirit exhibition a year or two before, and his words being affixed to the door of the exhibition formed a good advertisement for the whole industry. In Germany all classes helped to utilise the products of the soil. One talked here about bringing men back to the soil; but the difficulty was that they could grow nothing which was remunerative enough to enable farmers to pay a fair living wage. It was not the difficulty of a man finding work, but that the work was not remunerative. The Germans started from the right point of view, by making that work remunerative by hook or by crook. He thought Mr. Tyrer had rather underestimated our production of potatoes. In 1901 it came to 3,631,000 tons, and in 1902 to 3,194,000 tons, the latter being a bad year. In the first year the crop averaged six tons to the acre, and in the second about five and a half tons. There was an enormous possibility of growing starchy matters, which could be converted into food or alcohol, on land in this country. The question was very much to the front just now, how to feed the population in time of war. If we, like the Germans, were using a large quantity of potatoes produced in this country, instead of the imported grain now being used for the production of alcohol, we should in time of danger have a large store of food without extra cost to the country.

The following table showed the production of alcohol in various countries, Germany being at the top and Russia second, while Great Britain was sixth in the list:—

The World's Production of Alcohol according to W. Behrend.

——	Year.	Million Hectolitres Pure Alcohol.
Germany	1901-2	4·24
Austria-Hungary	1900-1	2·51
Russia (in Europe)	1900-1	4·04
France	1900-1	2·80
Italy	1899-00	0·18
Switzerland	1901	0·03
Belgium	1901	0·37
Holland	1901	0·36
Great Britain	1909	1·49
Denmark	1901	0·17
Sweden	1900-1	0·25
Norway	1899	0·04
Spain	?	0·50
Roumania	1900-1	0·10
United States	1901	2·44
Total	.. .. ..	19·50

The rapid increase in the imports of German alcohol into this country, together with the unremunerative character of the alcohol industry here at the present moment, showed that our rivals were gaining ground.

The use of duty-free alcohol for industrial purposes in other countries than Germany was on the increase, as was shown by the following figures:—

Austria-Hungary.—In the year 1898—1899 there was used, free of duty, 6,548,816 galls. of 100 per cent. alcohol.

France.—In the year 1901 the following quantities of denatured spirit were used for various purposes:—

	Gallons 100 per cent. Alcohol.
Lighting and heating	3,366,110
Varnishes and lacquers	296,582
Cleaning and polishing	63,844
Celluloid	111,518
Dyeing	16,346
Collodion	78,892
Chemical and pharmaceutical products	60,852
Ethers and explosives	1,530,848
Scientific purposes	9,438
	5,534,430

It was evident from the figures quoted in the paper that Germany was forging ahead tremendously because of the encouragement given. One point was always raised by our authorities. They said: "If you give too many facilities for duty-free alcohol there will be frauds on the revenue." There might be to a slight extent; but he did not think they would be considerable; they were easily detected, and the amount would be small in comparison with the revenue. He had taken the trouble to find out the number of convictions in Germany for frauds on the revenue, where there were such great facilities, and he found that in 1901–2 there were 84 persons convicted, and the amount of the fines only amounted to 16,000 marks, or about 2,300*l*. He did not think they were more lenient there than elsewhere as regards fines in such cases, and that was in a county that produced 93,368,000 gallons of alcohol per annum.

With regard to the scientific uses of alcohol, he really thought it was a great advantage to be able to use it, and he was astonished to hear from Sir William Ramsay that no manufacturer produced absolute alcohol in this country for the use of scientific institutions. It seemed to him there was a good opening for anyone going into the business. He did not think there would be any frauds in the laboratories, and if there were they would be soon found out. With regard to the interesting remarks of Mr. Guttmann as to the use of alcohol, it was quite true that if they had alcohol available under reasonable restrictions for the manufacture of explosives, it could be used in very large quantities, much larger even than Mr. Guttmann stated. Twenty years ago he started the present method of making smokeless powder by indurating the grains, and then used alcohol. He found it very expensive, so that it could not be generally utilised, and methylated spirit was not so suitable as pure spirit would have been. The Government did not then take it up, but the French Government the next year adopted the invention and used it for military purposes. Twenty years later the English Government began to think that if we had alcohol duty free, it might be utilised in the making of explosives, a thing they might have done twenty years earlier. He believed it was owing to the idea of using it for explosive purposes that the recent facilities had been granted. Of course a great deal of the alcohol used in the process could be recovered.

Mr. **Tyrer**, in reply, said this subject was so vast that it could not possibly be adequately treated even in two hours. He did not make any apology for exhibiting what he might call the revenue side of the question and the attitude of the authorities. He must say that he was much surprised at the ignorance of so many persons of the questions involved. It was, after all, comparatively easy to have got at the facts. He became, consequently, imbued with the idea that it would be useful to treat this subject in the form of a *résumé* of the whole subject, putting the case as fairly as he could, but having a strong bias in the direction of the free use of alcohol, so that their friends on the negative side might not be able to take a purely opposite view. He felt certain that a man of the attainments of Dr. Squire, who had himself overcome considerable difficulties, could, with his knowledge and ingenuity, think out and easily arrive at a plan, and arrange a method of improving the existing arrangements consistently with every necessary condition for conserving revenue. He wished it to be clearly understood that the whole basis of the attenuation charge, as stated in the paper, was in the language of a high official who had been good enough to give him the benefit of his corrections. Therefore, they had, to a certain extent, an added value. The duty was paid on the alcohol which was ultimately produced; there surely could not be any very great difficulty in shortening the processes, and securing practically continuous operations instead of intermittent ones.

So much was paid already on spirituous luxuries that he thought they might pay a little more. That was one way of securing some of the means to refund duty, both fiscal and differential; but these were points which doubtless would be discussed in joint committee, and probably at an interview with the authorities, if granted. He once more bore emphatic testimony to the courtesy and consideration of the Excise officials. As often said, this was a big subject, and it was not improbable that papers would be read on special industrial uses, and different methods and experiences of spirit distillation in different countries. He again warmly acknowledged the help given by so many for this paper, and especially that afforded by the Excise and Customs officials.

Addendum.

Dr. W. S. Squire, having an important engagement and being unable to remain for the discussion, writes as follows :—

1. The duty is not really assessed on the one gallon for every five degrees of attenuation. There is a margin of 25 per cent. allowed. That is to say, 12½ per cent. either way from this standard. So long as the distiller does not exceed this he is within the law. Usually he gets from 5 to 8 per cent. more spirit than the standard, and if there is much deviation from this the Excise are put on the alert, so that this charge is really a sort of danger signal.

2. As regards plant, there is no difficulty about a contractor putting up a plant for a distiller, and getting the residuals over a term of years in payment. He (Dr. Squire) should, as a contractor, like to make such a bargain himself. It is roughly assumed by distillers that the residuals (draff and slummage) in a general way pay for the working of the distillery (coals and labour). This will vary a good deal according to local conditions. As a general rule this assumption is approximately true. Getting out the lactic acid and glycerin is a little beyond the average distiller, but they have been got out in paying quantities. The Excise do not in any way interfere with the residuals. The distiller can do what he likes with them.

3. The "mash-tun tax." There is no such thing. The "Maischraum-Steur" is referred to, which concerns the fermenting vessel (technically in Great Britain called a "wash back"), not the mash tun. It is a mistake which persons only imperfectly acquainted with the German language and the German spirit manufacture might easily make. As a matter of fact, there is no mash tun in many of the German and American distilleries. The tax in question is raised on the number of hectolitres which the "wash backs" (fermenting vessels) will hold, irrespective of the strength of the worts. The distiller tries to minimise this tax by getting as much as he can out of his wash backs, and therefore brews his wort as strong as possible. The question of the "Schaumgährung," or foamy head, has also to be considered. If the back overflows the froth must not be collected and put, hence the distiller so brews his wort that the foaming is reduced to a minimum, and thus allows the wash backs to be filled nearly to the brim.

4. Dr. Squire does not think the distillers will be surprised at the idea of potato distilleries in Ireland. For reasons too numerous to discuss now, the thing would not pay.

5. Dr. Squire thinks one complained that maize, the principal cereal used by distillers, is not taxed. As a matter of fact, Dr. Squire writes, of the 193 distilleries mentioned in the United Kingdom, not more than 25 or 30 use maize at all. The reason maize was excepted is that it is largely used as a cattle food in Ireland. Therefore the Irish members of Parliament claimed to have maize excepted. The Government, admitting to some extent the claim, assented. The exception did help the distillers using maize incidentally to a very small extent. They use 60 to 65 per cent. of maize; when yeast is made only 40 per cent.

6. On the statement that "distilleries exist (in Germany) in considerable number under *supervision more strict* than here," Dr. Squire regards that statement as "pretty stiff." The facts are, there are, say, 15,000 distilleries in Germany. The duty, all told, amounts to eighteenpence a gallon. Is it worth while to keep an Excise official at each to collect such a revenue? As a fact, there is absolutely nothing compared with what exists here. In a British distillery, producing, say 20,000 to 30,000 a week, there are about dozen Excise officers, under a supervisor, and these in turn are on duty night and day. Almost every cock in the place is locked by the Excise. Even the fire-doors in pot still distilleries are locked, and are opened only when all the worts of the "period" are collected and secured. There is nothing of this sort in Germany. A distiller, if in the country, is even compelled by law to build houses for the officers, but the Goverment pays a small rent.

Note by the author :—

Dr. Squire's comments are interesting and useful, but they do not destroy the substantial accuracy of the statements made in the paper on the authority of, in some instances, Excise manuals, Excise officials, and in others of German gentlemen acquainted with the practice and procedure in Germany. When Dr. Squire reads his paper "On British and American Distilleries," an opportunity for discussing some of these points may be presented.—T. T.

At the forty-third annual meeting of the Associated Chambers of Commerce, held at the Whitehall Rooms, London, on March 6th (Lord Avebury presiding), these combined resolutions were unanimously adopted, being spoken to by the President and Mr. T. Tyrer, in the absence of Mr. David Howard:—

London.—That in the opinion of this Association, it is desirable that the next Finance Bill should contain a clause to carry out the intention of section 8 of the Finance Act, 1902, that British manufacturers of chemical and pharmaceutical products may be afforded, under Excise supervision, facilities for using duty-free alcohol in cases where the finished product is not dutiable, and thus be in a position to compete with similar foreign manufacturers in the home market.

Manchester.—That the provision of section 8 of the Finance Act, 1902, requiring the payment of duty on imported pure spirit for manufacturing purposes, at a rate equivalent to the difference between the Customs and the Excise duty on spirit, adds about 50 per cent. to the original value of such spirit, and this addition places British manufacturers who use it in a position of serious disadvantage in relation to their continental competitors, who are able to purchase it entirely duty-free, and that representations be made to the proper Government department with a view to the removal of this disadvantage.

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English.—8*d.* each, to the Comptroller of the Patent Office, C. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W.C.

United States.—9*d.* each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Belin et Cie., 52, rue de Vaugirard, Paris.

—PLANT, APPARATUS AND MACHINERY.

English Patents.

Gas or Vapour Separators. P. N. Hooper, London. Eng. Pat. 2697, Feb. 3, 1902.

hese separators are designed to remove lubricating oil and ater from exhaust steam, on its way to the atmosphere, or o a condenser, feed-water heater, or purifier; also for drying ve steam, or ammonia gas in refrigerating plant, &c. The eparator is provided with a series of perforated baffle lates, adapted to reduce the velocity of the gas or vapour elow that at which it is capable of holding matter in uspension.—R. A.

entrifugal Machinery or Apparatus for Steeping or Soaking, and Draining. [Treating Wool, Nitrating Gun-Cotton, &c.] J. B. Alliott, Nottingham. Eng. Pat. 3177, Feb. 7, 1902.

he perforated centrifugal basket of the machine is surounded by a casing, which will retain a sufficient quantity f liquid in the basket when it is stationary, and permit the quid to flow from the basket under the action of centrifugal orce when it is rotating. The casing take the form of a ustum of a hollow cone, &c., and rotates with the basket. —R. A.

rying; New or Improved Method of ——. [Lacquered Articles, &c.] A. Junghans, Schramberg, Germany. Eng. Pat. 10,896, May 12, 1902.

he articles under treatment are dried by exposing them to idiation from an electric arc-lamp, with or without the aid f heat. The method is said to prevent the formation of listers. (See also under Fr. Pats., page 288.)—R. A.

rying Apparatus. R. C. Baughman, Washington, U.S.A. Eng. Pat. 20,742, Sept. 23, 1902.

rotary drying-drum formed with external drying-pockets, which the material to be dried is supplied, and with ternal hot-air spaces, which alternate with the pockets and e in communication with the interior of the drum.—R. A.

eparating Apparatus [Coal Schists, Metalliferous Sands, &c.]. G. C. Marks, London. From F. Blanc, Chambon, France. Eng. Pat. 14,328, June 24, 1902.

centrifugal apparatus in the form of a turbine, rough which is passed the liquid with the matter to separated. Each blade of the turbine is provided on s internal or concave part with a projection and a cavity r retaining the heaviest particles and discharging them to a depositing chamber, the liquid with the lighter parts the material escaping through the central hole of the rbine.—R. A.

ilter [for Lighting-Gas, Liquids, &c.] with Uniformly Compact Filtering Material at Different Levels. J. Elster, Berlin. Eng. Pat. 19,644, Sept. 8, 1902.

he filtering material is packed between net-like "gratings," hich extend over the whole width of the filter. The bars slabs of the gratings are preferably of triangular section, and are arranged so that they lie horizontally and transversely to the direction of flow of the gases, &c., and also form obliquely ascending rows.—R. A.

Distilling Liquids [Water, &c.] and Similar Operations; Process of and Apparatus for ——. H. H. Lake, London. From United States Distillation Co., Indianopolis, U.S.A. Eng. Pat. 24,780, Nov. 11, 1902.

See U.S. Pats. 713,297–8 of 1902; this Journal, 1902, 1523.—R. A.

Exhausting Gases and Vapours, and Apparatus therefor; Improved Method of ——. P. Schütze, Oggersheim, Germany. Eng. Pat. 26,389, Nov. 29, 1902.

One of two chambers or vessels, which are in communication with each other at the bottom and contain a body of sealing liquid, is connected by a non-return valve with the chamber to be evacuated, the other vessel being, by valves actuated automatically by a float, put alternately in communication with the vacuum chamber of an air-pump and the atmosphere. The sealing liquid is thus alternately sucked into and expelled from the second vessel, and produces in the first vessel a vertical reciprocating movement of a liquid piston, which sucks the gases or vapours from the chamber to be evacuated, and expels them through a pressure valve.—R. A.

Thermophores or Devices Employed for the Storage of Heat by Means of Liquefied Salts. I. Timar, Berlin. Eng. Pat. 26,411, Dec. 1, 1902.

Sunflower seeds, Greek hay seed (*Foenum Graecum*), or similar vegetable seeds containing viscous substances and a fat which will not affect india-rubber, are dissolved in hot water and mixed with the thermophore salt, *e.g.*, sodium acetate, "to the extent of about 6 to 7 per cent. of the whole bulk," to remove the disagreeable odour of the salt, and to prevent the salt from injuring the india-rubber- or similar container during crystallisation.—R. A.

United States Patents.

Filter. J. Kostálek, Prague-Vinohrady, Austro-Hungary, Assignor to Society Maschinenbau - Actiengesellschaft vormals Breitfeld, Danek and Co., A. S. S. D. Breitfeld, and D. I. Spol, Karlin, Bohemia. U.S. Pat. 709,712, Sept. 23, 1903.

The liquid to be filtered is delivered by a series of horizontal pipes near the base of the filtering reservoir. The filtered liquid, after rising through the filter-bed, overflows into a gutter surrounding the rim of the reservoir. A funnel under the reservoir and water injectors carry the filtering material discharged from the bottom of the reservoir to the top again.—J. W. H.

Filter and Extractor Press. J. G. Crossman, Watford, Herts. U.S. Pat. 719,438, Feb. 3, 1903.

See Eng. Pat. 8392 of 1902; this Journal, 1902, 959. —R. A.

Separating or Draining Liquids from Solids; Apparatus for ——. C. S. Wheelwright, Bristol, R.I. U.S. Pat. 719,541, Feb. 3, 1903.

The apparatus comprises a vat provided with a false bottom and a vacuum chamber beneath, a cylinder within the vat closely encircling a lifting-screw, and feeding-blades in the bottom of the tank beneath the screw. The lifting-screw and feeding-blades are rotated in opposite directions, a circular flange being provided near the bottom of the cylinder, to prevent the escape of the materials from the feeding-blades, and to guide them to the screw.—R. A.

French Patents.

Extracting Apparatus. Messrs. Egrot, Grangé et Cie. Fr. Pat. 321,577, April 22, 1902.

The material to be extracted is fed by different devices into a horizontal rotating cylinder provided with a number of vertical partitions forming compartments, and passes through specially-shaped openings from each compartment to the next; the extracting liquid flows in the opposite direction through these compartments. Arrangements are described for making the process as complete as possible for volatile liquids.—J. W. H.

Drying and Bleaching by Artificial Light. A. Junghans. Fr. Pat. 321,821, May 21, 1902.

Lacquered articles, materials, &c. are submitted to the action of light or other radiations of suitable wave length for the purpose of drying and bleaching. (See also under Eng. Pats., page 287.)—J. W. H.

Coverings [Mica] for Steam Pipes, Boilers, &c. Mica Boiler Covering Co., Ltd. Fr. Pat. 321,845, June 5, 1902.

The coverings are made in sections to fit the pipes, &c., and consist of an outer layer of flakes of mica cemented with a mixture of silicate of soda and acetate of lead, or of acetate of lead and lime, a middle layer of wood fibre, granulated cork, or similar material mixed with flake mica, and an inner layer of flake mica; the entire mass being finally cemented by impregnation with a liquid containing silicate of soda, acetate of lead, and lime.—J. W. H.

Gases; Liquefying ——. G. Claude. Fr. Pat. 322,107, June 16, 1902.

In apparatus for the liquefaction of gases, involving the obtainment of external work from expansion, a small portion of the gas issuing from the temperature-exchanger is immediately submitted to the temperature of the expanded gas, by means of a small supplementary exchanger, in one compartment of which the gas is liquefied under high pressure, liquefaction in the main expansion chamber being practically avoided.—E. S.

Flask for Holding Ethyl Chloride and other Volatile Liquids. H. Goetz. Fr. Pat. 322,111, May 30, 1902.

A bottle in which the capillary exit tube is not joined to the main body of the flask, but is held by a metal cap which can be removed from the flask at will for cleaning purposes. —T. F. B.

II.—FUEL, GAS, AND LIGHT.

Combustibility; Limits of ——. L. Pelet and P. Jomini. Monit. Scient., 1903, **17**, [734], 94—104.

The authors define the "limit of combustibility" of a combustible substance as the instant at which combustion ceases.

An extensive series of experiments is described, a large number of combustibles being examined, including sulphur, phosphorus, hydrogen, wood charcoal, benzene, coal-gas, and many other organic bodies, the method of working being to ignite the body in a closed vessel, and, at the moment of extinction of the flame, to remove and analyse the gaseous products.

The conclusions arrived at are that, for a certain combustible, burning under fixed conditions, the limit of combustibility depends on (*a*) the nature of the combustible; (*b*) the temperature of the flame produced; (*c*) the quantity of gaseous combustible introduced into the flame in a unit of time; (*d*) the temperature of the surrounding air; also, that only the temperature decides the chemical equilibrium between the combustible gas, oxygen, and the products of combustion.

It was also found that the extinction of the flame depended, not on lack of combustible matter, but on insufficiency of oxygen, or excess of the products of combustion.—T. F. B.

Gas-Meters; Causes and Prevention of Premature Destruction of Wet ——. A. Albrecht. J. f. Gasbeleucht., **46**, [6], 101—105.

As the confining liquid for wet meters, the purest water obtainable, preferably boiled rain-water, should be used. Where the meter is liable to get frozen and the use of a dry meter is excluded, glycerin solution, free from acid, should be employed. Neutral salts, such as common salt, chlorides of calcium and magnesium, are sometimes used to prevent the freezing of the liquid, and it is to the action of these that the corrosion of meters is generally to be ascribed. As the result of a number of experiments, which are quoted, the author concludes that ordinary metals suffer oxidation in pure water containing either oxygen or carbon dioxide; the fixed alkalis and their carbonates prevent the reaction; but the chlorides, sulphates, and nitrates hasten it; whereas if aqueous glycerin be used instead of water in these experiments, the metals are almost entirely unaffected. Under normal conditions the effect of oxygen or carbon dioxide upon the metal of the meter is but slight, but in the presence of solutions of neutral salts, which appear to act catalytically, an appreciable corrosion is brought about in a short time.—H. B.

Oil-Gas; Best Temperature for the Production of ——, to be Mixed with Acetylene and Compressed. W. Hempel. Verhandl. d. Vereins z. Beförd. d. Gewerbfleisses, 1903, 39. Chem.-Zeit. 1902, **27**, [11], Rep. 29.

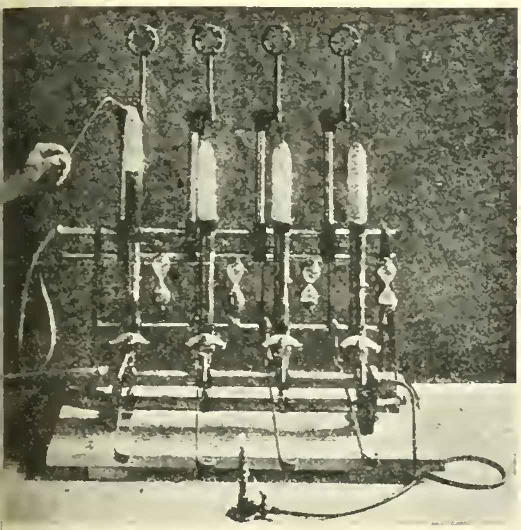
The author's experiments show that, for preparing oil-gas which is to be mixed with acetylene and compressed before use, the gasification of the oil should take place at a temperature of 970° C. In this way an increase of 60 per cent. is effected in the yield of gas, and when the latter is mixed with acetylene and subjected to a pressure of 10 kilos. per sq. cm., a gas is obtained which has an illuminating power equal to that of oil-gas formed at lower temperatures. The hourly production of gas for each retort is, at the same time, increased by about 36·6 per cent.—T. H. P.

Acetylene; Absorbed ——. Engineer, Jan. 30, 1903, 112.

It is known that acetylene can be dissolved in acetone, and that the solution so obtained, or acetylene itself, can be absorbed by a suitable porous substance. The solution and the porous substance containing absorbed gas or solution, possess the advantage over ordinary acetylene of having for a given quantity of candle-power, a considerably smaller volume. In practice, the porous material employed, has a porosity of 80 per cent. by volume, *i.e.*, a vessel of 100 litres capacity when filled with this material, has still space left for the absorption of 80 litres of liquid and gas. This space is about half filled with 40 litres of acetone and acetylene is then pumped in till the pressure reaches 10 atmospheres, when the vessel contains 10,000 litres of gas. By an order of the Secretary of State, dated April 10, 1901, acetylene compressed into porous matter, with or without the presence of acetone, forms an exceptio to the main Order in Council prohibiting compression of acetylene to more than 100 ins. of water column, an may be used at a pressure not exceeding 150 lb. per sq. in. provided (*a*) the porous matter is similar to that of whic a sample has been submitted to the Home Office; (*b*) i fills as completely as possible the space of the cylinder (*c*) its porosity does not exceed 80 per cent.; (*d*) air i excluded from every part of the apparatus; (*e*) the temperature is kept from rising during compression; (*f*) the cylinder has been tested by hydraulic means to a pressure double that at which it is intended to work; and, if acetone be used, (*g*) the liquid does not completely fill the pores of the substance employed. (See also this Journal, 1901, 1196.)—A. S.

Mantles for Incandescent Gas Lighting: Burning-off and Hardening ——. H. Drehschmidt. J. of Gas Lighting, 1903, **81**, [2073], 289.

The Bühlmann apparatus for burning-off and hardening mantles consists of a number of upright tubes (see figure) supporting wire-gauze frames of the shape of the mantles but of slightly smaller diameter, and in length equal to about that of the impregnated, but not burnt-off, mantles. Gas at ordinary pressure is supplied through a horizontal pipe to the interior of these wire-gauze frames, and air at high pressure is supplied through another pipe. The mixture of gas and air is lighted outside the gauze, and the supply of gas is so regulated that the whole of the gauze frame is enveloped in a uniform thin sheath of blue flame. The mantles are smoothed out as usual, and each is put on one of the gauze frames, and the mixture of gas and air is then lighted. In order to impart sufficient hardness and strength to the head of the mantle, a gasing boiling-burner is let down by a lever arrangement immediately after lighting the mixture of gas and air, and its flame plays round the head of the mantle. The lever arrangement also sets in action a sand-glass, adjusted to the time required for shaping and hardening the mantle—usually two minutes. The hardened mantle is lifted off by a hook and the flame then extinguished.—A. S.



English Patents.

Coke; Plant for Manufacturing ——. W. Kennedy, Allegheny, Pa., U.S.A. Eng. Pat. 1040, Jan. 14, 1902.

The combinations include a hearth, one or more movable ovens arranged on same, a car with a movable side forming a bridge from the car bottom to the hearth, and means for shifting the oven and charge from the hearth to the car and back when empty. A series of such hearths may be mounted in two rows, in which case the car runs on rails between them, and the hoisting mechanism is arranged on a carriage mounted on a bridge, which runs on rails parallel to the hearths. The line of ovens is provided with a gas-main, fitted with valves and movable connections to branches extending to the hearths. Heating flues are also provided.—C. S.

Fuel; Composition of Matter to be used with ——, *to Aid in the Consumption of the Gases of Combustion thereof, and to Retard the Combustion of the Fuel itself.* E. L. Livingstone and W. A. Vandercook, New York. Eng. Pat. 2358, Jan. 29, 1902.

A powdered mixture of permanganate (of potassium, sodium, or zinc), 3 lb.; sodium chloride, 72 lb.; hydrogen peroxide, 1 lb., and manganese dioxide, 1 lb., is mixed with sufficient water to sprinkle the fuel, in the proportion of 1 oz. of the mixture to each gallon of water required. The oxygen given off by the permanganate, facilitates the combustion of the gases liberated by the fuel, whilst the chlorine from the salt restrains the too rapid decomposition of the permanganate. The hydrogen from the hydrogen peroxide also assists in completing the combustion of the gases; and the manganese dioxide affords a supply of oxygen after that from the permanganate has been all consumed.—C. S.

Briquettes or the like, and the Manufacture thereof. A. J. Browning and H. Musgrove, Croydon. Eng. Pat. 4779, Feb. 25, 1902.

In order to make a briquette free from an excessive proportion of tar, and at the same time facilitate the distribution of the smaller quantity of tar through the mass of the product, the powdered fuel is saturated with water (about 12 per cent. by weight), then mixed with not more than 10 per cent. of tar (referred to the moistened fuel), pressed into moulds, and dried without heat.—C. S.

Peat and like Materials; Manufacture of Plastic Objects from ——. N. Reif and E. von Reibnitz, Wunstorf, Germany. Eng. Pat. 22,016, Oct. 9, 1902.

The peat is impregnated with binding material (*e.g.*, a mixture of tar, oil, and resin) by means of a spraying apparatus, and then treated with an oxidising agent (sulphur chloride, nitric acid, &c.), also applied in the form of spray, or vaporised by means of hot air to increase its oxidising effect. The apparatus consists of a centrifugal machine, fitted with a series of plates for regulating the automatic emptying of the casing of the machine, and also provided with a spraying device.—C. S.

Bunsen Burners; Impts. in or relating to ——. J. A. Smith, M. Dick, and D. C. Dick, Kilmarnock, N.B. Eng. Pat. 3538, Feb. 12, 1902.

To adapt Bunsen burners for use with acetylene and carburetted mixtures thereof, the inventors prevent the overheating of the gas before combustion, by inserting between the metallic nozzle and the metallic base an intermediate tube, about an inch long, made of non-conducting material, such as asbestos. Ferules are provided on the metallic portions of the burner, and to these the non-conducting portion is attached by means of clamps, which are connected by one or more bridges of metal or other suitable material, attached in such a way as to be insulated from the metal of the burner.—C. S.

Vapour-Burning Apparatus. A. Kitson, London. Eng. Pat. 23,458, Nov. 19, 1902.

The chief features of this apparatus include a vertical vaporising tube, arranged to extend upwards into the mantle, closed at its lower end, and enclosing a tube or passage which leaves a narrow space for the incoming oil, so that the latter is compelled to pass between this tube and the vaporising tube and then pass downwards through the internal tube into a mixing chamber, which receives a supply of air from outside and opens into a surrounding condensing chamber communicating with the burner. The space through which the incoming oil passes is provided with wire gauze or a bundle of wire for collecting any deposited carbon and preventing it from settling on the vaporiser.—C. S.

Gas Testing; Improved Argand Burner for ——. W. Grafton. Eng. Pat. 22,873, Oct. 21, 1902. XXIII., page 319.

Furnace Gases; Desulphurising and Purifying ——. E. Pollacsek, Buda-Pesth. Eng. Pat. 4622, Feb. 24, 1902.

Ten to 15 parts of sawdust, 30 to 35 parts of non-caking coal, 20 to 25 parts of caking coal, 30 to 35 parts of brown coal and peat are mixed with about 12 parts of caustic lime, using a quantity of water equal in weight to the weights of the combustible materials in the composition. The product is moulded into briquettes, and exposed to the air until the lime is converted into carbonate. The briquettes are then disposed in a furnace as vertical partitions, or as a bridge at the rear of the furnace chamber; when, on ignition, the more combustible constituents burn out first, leaving a porous residue of lime which is claimed to absorb the sulphur acids, the "carbonic oxide," and the smoke produced by the combustion of the rest of the fuel, which would otherwise issue from the shaft and contaminate the air of the neighbourhood.—F. H. L.

Carburetting of Gas, and Apparatus therefor. J. Grzybowski, Rixdorf, Germany. Eng. Pat. 25,425, Nov. 19, 1902.

A carburetter in which the gas is treated by bubbling it through a volatile hydrocarbon liquid. The end of the pipe, covered with a perforated thimble, that leads the gas down into the liquid, is provided with a float, so that the pipe rises or falls automatically with the level of the liquid. A by-pass pipe may be provided to enable non-carburetted gas to be mingled with the carburetted gas issuing from the apparatus.—H. B.

Acetylene Gas; Machines for Producing ——. J. and J. Law, Arbroath, Forfarshire. Eng. Pat. 7618, April 1, 1902.

A contact apparatus to which the supply of water is governed by the holder-bell movements. The carbide is held in a pair of horizontal vessels with manholes at one end, the cross-bars holding the manhole-covers in position, being incapable of movement until a lever has been raised which closes the water-inlet to, and the gas-outlet from, the decomposing-vessels.—F. H. L.

Carbide of Calcium Cartridges. T. H. Lewis, London. Eng. Pat. 5954, March 11, 1902.

A "cartridge" or closed receptacle for carbide intended for use in portable acetylene lamps, having a lid carrying a central vessel filled with purifying material, through which the gas is forced to travel before it reaches the burner. Eng. Pat. 22,389, 1899, is referred to.—F. H. L.

United States Patents.

Briquettes; Manufacture of ——. E. S. Meade, Philadelphia, Assignor to North American Fuel Company, Camden, N.J., and Philadelphia. U.S. Pat. 719,830, Feb. 3, 1903.

See Eng. Pat. 11,864 of 1902; this Journal, 1902, 1020. —R. A.

Regulating and Controlling the Supply of Gas and Air to Furnaces; Device for ——. D. Turk, Riesa, Germany. U.S. Pat. 717,640, Jan. 6, 1903.

A dome capable of rotation on a vertical axis, brings openings under it into direct communication with the supply of gas or air, according to its position.—J. W. H.

Gas Process. O. Oppelt, New Albany, Ind., Assignor to P. N. Clarke, Louisville, Ky., and J. H. Stotsenburg, New Albany. U.S. Pat. 719,360, Jan. 27, 1903.

Bituminous shale is heated strongly enough to remove the hydrocarbons and coke the oil, thus rendering the shale porous, and also to decompose superheated steam, which is now introduced to the mass. The water-gas so generated is caused to mix, while still hot, with the hydrocarbons resulting from the first heating.—T. F. B.

French Patents.

Peat; Conversion of ——, into a Non-Fibrous, Compact Substance for Use as Fuel. J. O. Green and H. T. Martin. Fr. Pat. 321,983, May 10, 1902.

Dried peat is passed through a breaker, and then moulded and compressed by forcing it through a pipe by means of a rod or rotating plunger, the heat generated by the friction being sufficient to liberate the bituminous or pitchy constituents, and form the powder into a compact mass.—C. S.

"Calorigene": A Product for Facilitating the Combustion of Fuels. E. Leteneur. Fr. Pat. 322,080, June 14, 1902.

A mixture is prepared in about the following proportions (which refer to 10 tons of the fuel to be improved): Mineral oil, $\frac{1}{2}$ kilo.; naphthalene, 1 kilo.; sodium chloride, 2 kilos.; potassium nitrate, $\frac{1}{2}$ kilo.; nitric acid, $\frac{1}{3}$ kilo.; driers, $\frac{1}{2}$ kilo.; the three first-named being heated in a pan, and well stirred up with the potassium nitrate and nitric acid, followed by the driers. The heat is continued for about 20 minutes, and the powdered product is packed in boxes containing sufficient to treat one ton of fuel. For use, the powder is mixed with 9 galls. of water per box, and is sprinkled over the fuel. The proportions may be modified to suit any particular class of fuel.—C. S.

"Riccocarbone": A Binding Material for Fuel. L. Charlier and T. J. Lambert. Fr. Pat. 322,299, June 20, 1902.

Coal tar, or other hydrocarbon, is distilled up to 270°—310° C. in a retort fitted with stirrers, and, the fire being extinguished, solid or liquid resin is added when the temperature has receded to 300° C. Freshly slaked lime (or other suitable alkaline earth) is next incorporated with the mass, either in the retort or in a separate mixer, at a temperature not lower than 200° C., provision being made for preventing waste in the event of the mass frothing over. The cooled mass is finally discharged into a storage vessel to set hard.

The method is claimed to differ from others, in the suppression of the use of electrified air or any preliminary treatment of the resin or lime; in the use of alkaline earths other than lime; in the recovery of distillation products, and in the use of the final product in a solid, not liquid state.—C. S.

Gases and Vapours of Combustion under Pressure; Process and Apparatus for Producing ——. K. Schultze. Fr. Pat. 321,800, April 30, 1902.

A process and apparatus for generating steam and combustion-gases under pressure, in which fuel is burned with compressed air in a closed vessel, and the heat of the gases is imparted to the water in a boiler, first by leading them through the boiler tubes and then by passing them directly into the water within the boiler. The fuel chamber of the apparatus stands within a closed cylindrical compartment, the water-jacket of which forms the lower part of the boiler. The fuel chamber is isolated from the inner wall of the water-jacket by an annular air-space, to prevent rapid withdrawal of heat from the burning fuel and the resultant incomplete combustion. Compressed air is admitted beneath the fuel; the hot gases pass up through the boiler tubes in the upper portion of the boiler, are then led down a pipe and admitted to the lower part of the water-jacket whence they rise through the water and mingle with the steam produced, in the steam-chamber of the boiler. The mixture of steam and hot gases is used for driving a steam engine, part of the power being used to work the pump which supplies the compressed air.—H. B.

Gas, Illuminating; Process for Manufacture of —— W. J. Dibdin and H. C. Woltereck. Fr. Pat. 322,322 May 5, 1902.

See Eng. Pat. 19,152 of 1901; this Journal, 1902, 1127. —H. B.

Cyanogen Liquors obtained in the Manufacture of Illuminating Gas; Process for the Treatment of ——, in the Cold. Guillet. Fr. Pat. 322,170, June 16, 1902. VII., page 297.

Incandescence or Vapour Burners. The Flameless Gas Light Co., Ltd. Fr. Pat. 322,023, June 11, 1902.

Air, slightly carburetted, is supplied to a burner, the head of which is partly or entirely filled with a number of small tubes, preferably 0·8—2 mm. in diameter, so as to divide the vapour into a number of currents. The tubes may be replaced by sheets of corrugated metal.—C. S.

Incandescence by Gas; New Process of ——, obtained by the Use of Artificial Filaments containing Hydrated Oxides, resistant to Moist Atmospheres. A. M. Plaissetty. Fr. Pat. 321,803, May 2, 1902.

Artificial filaments obtained by the cuprammonium, collodion, or other processes are impregnated with a solution of suitable earths, dried, passed through a bath of ammonia to convert the salts into the hydrated oxides, washed, and dried. The passage of the filament through the ammonia bath is said to render it resistant to moist atmospheres. (See Eng. Pat. 20,747, of 1901; this Journal, 1902, 1389.) —H. B.

Incandescence Mantle [Fabric]. La Société A. Michaud et Müyls. Fr. Pat. 322,232, June 18, 1902.

A mantle fabric so knitted as to have vertical ribs on the interior and rounded meshes on the exterior.—H. B.

Incandescence Mantle having an Unsewn Top. A. H. Chenier. Fr. Pat. 322,258, May 23, 1902.

The impregnated and dried fabric, cut to the length for one mantle, is slit down a short distance at opposite points at the top; each of the flaps thus formed is then folded down over a piece of stout asbestos thread and is stuck down to the body of the mantle by means of "fixing" or adhesive, to enable the asbestos threads to be tied together and the mantle to be turned outside in. The bead thus formed is free from the holes produced by the usual process of sewing the thread through the fabric.—H. B.

Mantle Fabric; Continuous Process of Impregnating and Drying. A. H Chenier. Fr. Pat. 322,259, May 23, 1902.

The cylindrical mantle-fabric is continuously and successively impregnated with a suitable solution, wrung out by passing between two rollers, and dried by circulation in a current of hot air.—H. B.

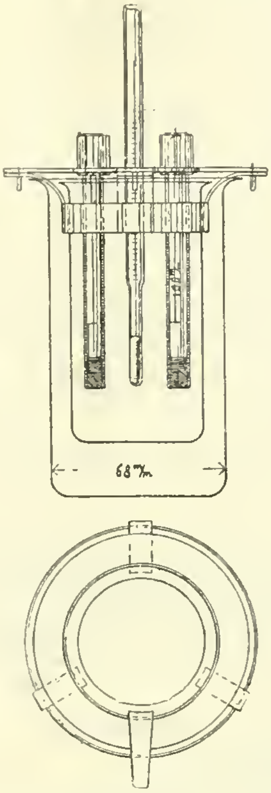
III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Pitch, Asphalt, and Similar Materials; Determination of the Melting Point of ——. G. Kraemer and C. Sarnow. Chem. Ind. 1903, **26**, [3], 55—57.

The methods hitherto in vogue for determining the melting or softening point of a coal-tar pitch do not give trustworthy results. The authors have devised the following process, which finds general employment in the German tar industry.

A quantity of about 25 grms. of the pitch under investigation is melted in a small beaker in an oil-bath at about 150° C., the pitch forming a layer about 10 mm. thick. Into this is dipped an open-ended glass tube 10 cm. long and 5—7 mm. internal diameter. On removing the tube, the upper end is closed by the finger, and the pitch is allowed to solidify in the tube whilst it is held horizontally and rotated. When the pitch has set, the portion adhering to the outside is removed, and the length of the column inside the tube will be about 5 mm. On the top of this is poured 5 grms. of mercury, which is most conveniently measured out in a small tube provided with a mark. The tube containing the pitch and mercury is then suspended in a beaker full of water resting in another beaker also full of water.

The inner beaker also contains a thermometer, the bulb of which stands at the same level as the pitch. The outer beaker is heated with a small flame, and the temperature at which the mercury falls through the layer of pitch is noted as the melting or softening point of the latter. As will be seen from the figure, several observations can be made at once. With substances which soften above 90° C., the outer beaker is filled with paraffin or paraffin oil and the inner with saturated brine or magnesium chloride solution. The melting points found are some degrees lower than those given by existing methods. They depend to a certain extent on the diameter of the tube, the thickness of the layer of pitch, and the height of the mercury column. If, however, the same quantity of mercury (5 grms.) be taken, the somewhat larger diameter of the tube is compensated for by the smaller height of the column of mercury. The thickness of the column of pitch does not, within limits, affect the result. A layer of pitch 5, 6, and 7 mm. thick softened at 61°·5, 60°·5, and 61°·5 C. respectively.



The figures show that the method can be employed for comparative testings, and is in many ways preferable to the older method.—T. A. L.

Tar-Hydrocarbons; Auto-oxidation of some ——. M. Weger. XXIV., page 322.

Creosote; Rapid Determination of Phenol in ——. R. Michonneau. XXIII., page 320.

Colophony in Naphthalene; Qualitative Detection of Small Quantities of ——. R. Hodurek. XXIII., page 320.

English Patents.

Nophthalene and Anthracene which come from the Distillation of Tar; Crystallisation and Immediate Separation from the Mother Liquid of Products to be Crystallised, particularly applicable to ——. E. Fourcy, Corhehem, and G. Buire, Courchelettes. Eng. Pat. 24,884, Nov. 12, 1902.

The liquid (naphthalene- and anthracene-oil) is kept stirred in a double-walled cylinder, from which it descends through a pipe on to the outer surface of a rotating drum, cooled internally by water; the crystals are detached by means of a scraper from the outside of this drum, and are removed to a rotary separator or filter press.—T. F. B.

Pyroligneous Acid; Purifying and Concentrating ——. W. P. Thompson, London. From G. Glock, Berlin. Eng. Pat. 28,595, Dec. 27, 1902.

Sodium bisulphate is added to crude pyroligneous acid, and the solution, after heating, is freed from the tar which separates, and is fractionally distilled. An equal fresh portion of the acid may then be added to the residue in the retort, and after separation of the tar, be distilled as before. Thus, the process may be repeated as often as desired with the original quantity of bisulphate. The distillates are further treated in the same manner, and corresponding fractions distilled together, to obtain strong acetic acid. —E. S.

French Patents.

Asphalt Composition; Manufacture and Use of ——. F. J. Warren. Fr. Pat. 321,574, April 22, 1902.

See Eng. Pat. 9332, April 22, 1902; this Journal, 1902, 1233.—J. W. H.

Asphalt; Manufacture of Artificial ——. R. Hermes. Fr. Pat. 322,288, June 20, 1902. IX., page 299.

Petroleum; Continuous Distillation of Light ——. J. Fischer. Fr. Pat. 322,167, June 16, 1902.

The oil is passed into a vertical cylinder containing a flat-topped perforated steam pipe, discharging steam through the superincumbent constant layer of oil. The incoming oil spreads out on the surface of the existing stratum, and as the descent of the column of oil is gradual, the light constituents are removed by the steam in a continuous manner. Where the liquid under treatment is unsuitable for distillation by direct steam, the perforated pipe is replaced by a heating body, traversed by tubes and heated in any convenient manner.—C. S.

Petroleum and Volatile Hydrocarbons; Continuous Rectification of ——. E. A. Barbet. Fr. Pat. 322,265, June 7, 1902.

The crude oil is passed through a series of heaters and column stills, fitted with condensers and means for collecting and reboiling the various fractions, the light oils being eliminated first, then the burning oils; and finally, the heavy oils are cracked, and the fractions separated in a column apparatus. Means are adopted for utilising the waste heat from one part of the apparatus in other parts thereof.

—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

m-Tolidine. G. Schultz and G. Rohde. Zeits. für Farben- u. Textil-Chem. 1, [21], 567—568.

This body can be made by the usual reactions employed for the production of ordinary *o*-tolidine, but because it is more difficult to make, and does not yield cotton dyestuffs, its technical interest has been but slight up to the present. The authors prepare it from commercial *m*-nitro-toluene, by reducing the latter with zinc dust and caustic soda in alcoholic solution. The resulting hydrazo compound undergoes the usual molecular change on warming with hydrochloric acid. The hydrochloride of the *m*-tolidine is purified by dissolving it in water, and reprecipitating with concentrated hydrochloric acid. The yield is stated to be 80 per cent. of the theoretical. The free base obtained by decomposing the hydrochloride with caustic soda, and extracting with ether, is a crystalline substance melting at 87°—88° C., and not coloured by ferric chloride. The picrate melts at 225° C. The tetrazo compound with naphthionic acid is coloured orange-yellow, that with 1-naphthol-4-sulphonic acid (Neville and Winther's acid) is red; they have but little affinity for the cotton fibre.

—L. G. R.

Sulphonic Acids of Aromatic Bases; Practical Modification of the Technical "Baking Process" for the Production of ——. A. Junghahn. Chem. Ind., 1903, 26, [3], 57—59.

The so-called "baking process," which is employed technically for the manufacture of sulphanilic and naphthionic acids, consists in heating the acid sulphate of aniline or α-naphthylamine in flat trays to 200°—230° C. The author has modified this process in the case of *a*-*m*-xylidine, by heating the acid sulphate to 160°—220° C., and blowing a current of air or carbon dioxide through the fused salt for about 1½ hours, until a dry powder is obtained. The product consists of almost pure *a*-*m*-xylidine-5-sulphonic acid, which appears to be formed directly without any intermediate compound (see also Ber., 35, 3747; this Journal, 1902, 1418). Acid aniline sulphate is converted by the same process in 50 minutes into sulphanilic acid, the crude acid so obtained being white in colour. In the cas of dimethylaniline, the reaction takes about 1½ hours, th product being the *p*-sulphonic acid, whereas the ordinar method of sulphonation with fuming sulphuric acid, yield the technically important (for Rhodamine) *m*-acid. Wi bases which are only sulphonated with difficulty, it i advisable to pass the current of gas through the salt *vacuo*. The new process has the advantage over the ol in being more rapid and yielding a purer product.

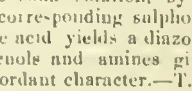
—T. A. L.

p-Sulpho-anthranilic Acid; Preparation of ——. Kall and Co., Biebrich a. Rh. Ger. Pat. 138,188, Nov. 2 1900.

Claim is made for the treatment, in the hot, of the nitr toluenesulphonic acid of the constitution $CH_3:NO_2:SO_3H$ 1:2:4, with caustic soda solution, by which means th sodium salt of the corresponding sulpho-anthranilic acid obtained. The free acid yields a diazo compound, whic combines with phenols and amines giving azo dyestuf having a decided mordant character.—T. H. P.

Indole Dyestuffs. M. Freund and G. Lebach. Ber., 1903, 36, [2], 308—309.

Aldehydes condense with methyl-ketole in equimolecul proportions, and when the products are gently oxidise dyestuffs are produced. The leuco compounds probabl have the constitution—



Condensation of 1 mol. of aldehyde with 2 mols. methyl ketole also takes place, and compounds of th character shown in the following table have bee obtained:—

From	1 mol. of Aldehyde, and 2 mols. of Ketole.	1 mol. of Aldehyd and 1 mol. of Ketol
o-Nitrobenzaldehyde	Yellowish needles, m. pt. 244°.	(Hydrochloride) light brown flakes.
p-Nitrobenzaldehyde	Yellow prisms, m. pt. 238°.	Crystalline yellowis brown compound.
o-Chlorobenzaldehyde	White needles, m. pt. 240°.	(Hydrochloride) light brown plates, m. pt. 194°—195°.
m-Hydroxybenzaldehyde.	Yellowish crystalline compound, m. pt. 222°.	(Hydrochloride) yellow-brown plat m. pt. 222°.
o-Chloro-*p*-dimethylaminobenzaldehyde.	White needles, m. pt. 236°.	Yellowish crystallin compound, m. pt. 282°.
p-Dimethylaminobenzaldehyde.	White prisms or needles, m. pt. 226°.	Yellow-brown amorphous compound.

—J. McC.

Sulphur Dyestuffs; Vidal's Process for Producing —— by Means of Sodium Sulphide and Sulphur. R. Vida Monit. Scient., 1903, 17, [734], 113.

The author points out the difference between his process preparing sulphur dyestuffs and that of Croissant an Bretonnière. He states that there is no general method fo the production of such dyestuffs by heating organic com pounds with alkali sulphides, the reaction depending entire upon the nature of the initial substance.

Vidal's process depends on the formation of substitut aminodiphenylamines, and it will not work with the fat and aromatic compounds used by Croissant and Bretonnièr since they do not contain groupings giving rise to th formation of such compounds.

The processes are quite distinct, for whereas in Vidal process the alkali sulphide is used in conjunction wi sulphur, to form the unstable intermediate compound which are converted simultaneously into the dyestu Croissant and Bretonnière require the use of alkali wi sulphur to obtain their thiophenic derivatives.

The author states that he merely introduced the use of sodium sulphide and sulphur for the reduction of azo- and nitro-compounds as a technical method for carrying out the whole process in one operation, thus avoiding loss in isolating the intermediate compound.—T. F. B.

Brasilin and Hæmatoxylin. J. Herzig and J. Pollak. Ber., 1903, **36**, [2], 398—400.

When β-trimethylbrasilon in dilute alcoholic solution is warmed with hydroxylamine hydrochloride, β-trimethylbrasilon oxime, $C_{19}H_{18}O_3:NOH$, is produced, and can be recrystallised from glacial acetic acid. When boiled with acetic anhydride and sodium acetate, it gives a monoacetyl derivative, which crystallises from alcohol and melts at 179°—182° C.

Monobromotrimethylbrasilin is stable in presence of alkalis, and is oxidised by chromic acid to monobromotrimethylbrasilon, which melts at 225°, and gives a monoacetyl derivative which melts at 271°—274°.

By somewhat modifying Perkin's nitration process, dinitrotetramethyl hæmatoxylon has been obtained. Ten grams of the tetramethyl-hæmatoxylon are warmed on the water-bath with 50 c.c. of glacial acetic acid and 25 c.c. of fuming nitric acid until complete solution ensues; on pouring the product into water the dinitro derivative separates. When recrystallised from glacial acetic acid it is obtained in yellowish needles, which melt with decomposition at 187°—192° C. From alcohol it separates with one molecule of alcohol of crystallisation.

A possibility which suggests itself for the constitution of brasileïn is that it has the doubled formula $(C_{16}H_{12}O_5)_2$, and this would account for its non-reduction to brasilin. This point is at present under investigation.—J. McC.

Isocyanines; Sensitising Action of the so-called ——. A. Miethe. XXI., page 318.

English Patents.

Indigo; Improved Process for Reducing ——. O. Imray. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 5277, March 3, 1902.

See Fr. Pat. 319,390; this Journal, 1902, 1528.—T. A. L.

Azo Colouring Matters and Intermediate Products relating thereto; Manufacture of ——. J. Y. Johnson. From The Badische Anilin and Soda Fabrik, Ludwigshafen. Eng. Pat. 6615, March 18, 1902.

See Fr. Pat. 319,868 and U.S. Pat. 710,059; this Journal, 1902, 1529 and 1328.—T. A. L.

Colouring Matters containing Sulphur; Manufacture and Production of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 6987, March 21, 1902.

See Fr. Pat. 319,965; this Journal, 1902, 1529.—T. A. L.

Anthraquinone Series; Production of Colouring Matters of the —— [Anthracene Dyestuffs]. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 7387, March 26, 1902.

See Supplement to Fr. Pat. 307,104; this Journal, 1903, 22.—T. A. L.

United States Patent.

Ink. H. H. Spohn, Assignor to Carter's Ink Co., Boston, Mass. U.S. Pat. 719,623, Feb. 3, 1903.

A mixture of soluble Prussian blue, tannin, an aniline dyestuff, and carbolic acid or other organic acid for increasing the fluidity and preservation, is claimed as a chemical-proof and wash proof ink.—M. J. S.

French Patent.

Indigo Dyestuffs; Substituted ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 322,198, June 17, 1902.

The dark yellowish-orange compound formed by acting with bromine on starch, when ground with indigo or its homologues, gives up half its bromine, yielding a brominated indigo, the remainder of the bromine being converted into hydrobromic acid, from which the bromine can be regenerated.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES YARNS, AND FIBRES.

Silk Goods; The Causes of Stains on ——. P. Sisley. Zeits. für Farben- u. Textil-Chem., **1**, [21], 568—575.

The author states in detail the precautions necessary to prevent the formation of stains on silk goods, and emphasises the necessity for the greatest cleanliness on the part of the workmen during the weaving of the material. Frequent washing of the hands during the various operations is recommended, yet care must be taken not to allow the material to come into contact with soap.

The use of calcium chloride, magnesium chloride, glycerin, or glucose for improving the "handle" or "scroop," and operations in which starch, caustic soda, and hydrochloric acid play a part, are to be avoided, as rendering the silk liable to stains. Sodium chloride, and indeed all chlorine compounds, are especially harmful, and care must be taken to prevent common salt being produced on the fibre during any of the operations.—L. G. R.

Silk Goods; Causes of Stains on ——. C. F. Göhring. Zeits. für Farben.- u. Textil-Chem., **2**, [3], 58—60.

The writer, commending the paper of P. Sisley on this subject (this Journal, 1902, 1328 and preceding abstract), points out that much of the staining of silk is due to the desire of producers and consumers to obtain a good scroop, handle, and a heavy, rich-looking material at small cost. This has led to the weighting and filling of the goods by means of tin compounds, &c. This is of necessity prejudicial to the quality of the material. The paper by Sir Thomas Wardle and J. Carter Bell is quoted (this Journal, 1897, 297) in reference to there being a ready market in England for silk goods of guaranteed quality and freedom from adulteration. The main conclusions arrived at by P. Sisley are corroborated by the author, but in reference to the entire abandonment of empirical methods, and to the statement that common salt alone is the cause of many stains, the author is not in entire agreement, and thinks that air, vapours, and even water itself must be taken into account in explaining the staining action referred to.—L. G. R.

Silk, Artificial; Properties of ——. Leipziger Färber- und Zeugdr.-Zeit., 1903, **52**, [2], 78.

The double refraction of natural silk is not a general property of the artificial product, but depends upon the raw material used for its manufacture; *e.g.*, gelatin silk is not doubly-refractive. This property can be used to distinguish the different artificial silks by a transverse section on the fibres showing different shades. With the exception of gelatin silk, the properties and appearance under the microscope of the different artificial silks, are very similar. Air-dried samples lose at 110° C., 9·2—14 per cent. of their weight, whilst real Italian raw silk only loses 8·3 per cent. of moisture. The strength of the fibre is not affected by this operation, and when exposed to damp air, the materials absorb the same amount of moisture which was lost on drying.

Natural silk, when burned, leaves a vitreous residue, which turns white only after considerable heating. Chardonnet or Lehne's silk burns easily to a pure white ash, Pauly's silk leaves less than 0·1 per cent. of a yellowish-brown ash containing traces of iron; other artificial products give 1—1·6 per cent. of ash, natural China silk 0·95 per cent., and Tussah silk 1·65 per cent.

Natural silk contains 16—17 per cent. of nitrogen, the artificial product usually less than 0·2 per cent.—E. N.

Formic Acid for Dyeing and Printing; Remarks on the Application of ——. O. Piequet. Bull. Soc. Ind. Rouen, 1902, 412.

About 40 years ago formic acid was tried for technical purposes, but the price (about 10 times the present one) was prohibitive.

More recent experiments demonstrated that formic acid is the most perfect substitute for acetic acid and most of the vegetable acids.

But formic acid does not give a very satisfactory result when used in place of tartaric acid in the preparation of Aniline Black, a dark bronzy shade being obtained instead of a black.

Aluminium formate is much more stable than the acetate. Its preparation is also quicker, aluminium hydroxide very quickly dissolving in formic acid. It is thus an easy matter to obtain a solution of 23° B.

Hydrated chromium sesquioxide is readily soluble in formic acid, but it is better to use aluminium acetate, as the formate is liable to deposit a basic chromium salt, or oxide, on the walls of the vessel containing it.

Tin formate is much more stable than the acetate, and can be used for reduction, or for weighting silk.

The formate obtained by the reduction of potassium bichromate with glycerin in presence of nitric acid possesses great solubility. The product is similar to the aluminium-nitrate-acetate obtained in a similar manner.

Formic acid, like sulphuric acid, imparts "scroop" to the silk, without the additional risk of the serious disadvantages attending the use of sulphuric acid.

In wool dyeing, formic acid, as an "assistant," makes a good substitute for oxalic acid, for ammonium acetate in dyeing, and especially in the process of dyeing with Indulines.

Basic aniline dyestuffs are just as easily soluble in formic as in acetic acid, with the exception, however, of Methylene Blue (slightly less soluble) and Bismarck Brown, which is precipitated.

Tannin and catechu, &c., are easily soluble in formic acid.—E. N.

Titanium Salts as Mordants. C. Dreher. Textile Colorist, 1903, **25**, 4.

All fibres, as well as leather, are more easily dyed to deep shades by the use of titanium salts in conjunction with metallic tannates.

The fabric is mordanted with a tannin solution, passed through a bath containing a metallic salt capable of forming a tannate (chromium and aluminium acetates are suitable salts), and dyed in a liquor containing a titanium salt and a mordant dyestuff.

For instance, the fabric is mordanted with 10 per cent. of its weight of tannin, and then treated with 5 per cent. of aluminium acetate, and dyed in a bath containing 10 per cent. of fustic or red-wood extract and 5 per cent. of titanium potassium oxalate.

According to the author, the titanium salt is decomposed by the acetate, titanium oxide being formed, which is precipitated on the fibre with the dyestuff as a lake.—T. F. B.

Turkey-Red prepared on Once and Twice Mordanted Cotton. J. Pohl. Leipziger Färber- u. Zeugdr.-Zeit., **52**, [2], 13.

Cotton yarn is carefully oiled with 10 parts of Turkey-red oil and 90 parts of water, wrung out, dried at 50° C. for 12 hours, and steamed for 1½ hours under a pressure of 1⅓ atmospheres. The fabric is then mordanted with basic aluminium sulphate, and, since it is important that this substance should be homogeneously fixed, the cotton is well worked in the bath, wrung out, brought back again into the mordant bath, wrung out, and dried at 50° C. for 24 hours. Afterwards the cotton is treated with a warm bath of chalk and water (40° C.) for half an hour and well washed. The dyeing is performed with 8 per cent. Alizarin I. (Bayer), first for 20 minutes in a cold bath, which is then heated for half an hour to 65° C., and kept at this temperature for an hour. After washing and drying, the cotton is oiled for the second time, exactly as before, and steamed The goods are soaped at the boiling point for an hour with Marseilles soap (10 grms. per litre), washed, and dried.

The dyeings by both methods show the same intensity the shades of the goods mordanted twice being a little bluer Both samples plaited with bleached cotton yarn and boiled for two hours with Marseilles soap leave the cotton unstained.—E. N.

English Patents.

Steeping or Soaking, and Draining; Centrifugal Machinery or Apparatus for —— [Treating Wool]. J. B Alliott. Eng. Pat. 3177, Feb. 7, 1902. I., page 287.

Cotton and Cotton Goods [Fireproofing]; Treating Raw ——, to Reduce their Inflammability. W. H. Perkin, jun. and Whipp Bros. and Tod, Ltd., Manchester. Eng. Pat 6421, March 15, 1902.

To render them less inflammable, raw cotton and cotton fabrics are treated, first, with a solution of a ferrocyanid (*e.g.* potassium ferrocyanide), and then, after being dried with a solution of a metallic salt (*e.g.*, zinc acetate). They are then dried, or dried and steamed.—E. B.

Kiers or Vats used in Bleaching Textile Fabrics; Impts in ——. G. B. Sadler, Salford. Eng. Pat. 1368, Jan. 18 1902.

A conical chamber, with orifices for the admission of liquor is arranged at the bottom of the vertical "puff" or "vomit" pipe of a bleaching kier, and is surrounded by a steam coil, from which steam is discharged upwards into the chamber, for the purpose of ejecting the liquor into the vertical pipe above it, and of thus effecting the circulation of the liquor.—E. B.

Turkey Red; Mordant Process for Dyeing ——. O. Imray From Meister, Lucius und Brüning, Hoechst. Eng. Pat 7074, March 22, 1902.

The fibre is oiled and dried in the usual manner, but instead of being charged with a basic sulphate or acetate of aluminium and subsequently treated with chalk or sodium phosphate to fix the alumina, it is introduced into a comparatively dilute solution of an aluminium salt, which, by dissociation, will precipitate aluminium hydrate on the fibre The goods are now slightly rinsed and introduced into the dye-bath, made up as usual with alizarin and calcium salts.

The most suitable salts of aluminium to use are the normal acetate, formate, lactate, thiocyanate, or phthalate, with or without excess of free formic, acetic, or lactic acid or acid aluminium sulphite.

For example, the bath may contain, for 100 kilos. of yarn 2·5 litres of lactic acid and 15 to 20 litres of aluminium acetate of 70° B. in 2,000 litres of water. The bath is heated from 36° C. to 45° C. in about half an hour, when the yarn is removed.—T. F. B.

Fabrics, Paper, or the like; Process for the Ornamentation of ——. H. H. Lake, London. From La Société "Aime Baboin," Lyon, France. Eng. Pat. 2281, Jan. 28, 1902.

Tubes of suitable form, length, and material, and open at both ends or, preferably, at one end only, are employed for the production of coloured designs upon fabrics of all kinds, close or open work, paper, skins, &c. The open ends of the tubes are immersed in the dye liquor, &c.; on withdrawing them, they will be obstructed by films of liquid. The tubes are then applied to the fabric, &c., whereby impressions are produced corresponding to the cross-sections of the tubes.
—M. C. L.

Printing with Sulphurised Colouring Matters; Process of ——. O. Imray, London. From The Fabriques de Prod. Chim. de Thann et de Mulhouse, Thann, Germany. Eng. Pat. 6499, March 17, 1902.

See Fr. Pat. 319,504 of 1902; this Journal, 1903, 25.
—E. B.

United States Patents.

Hydrosulphite for Reducing Indigo. M. Bazlen, Assignor to The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. U.S. Pat. 719,720, Feb. 3, 1903.

See Eng. Pat. 19,762 of 1899; this Journal, 1900, 900.
—E. B.

Organic Acid Mordant, and Process of Making same. W. Beckers, New York. U.S. Pat. 719,555, Feb. 3, 1903.

A reducing, acid liquid, of density 20°—30° B., which, it is stated, is free from albuminoids and adapted for use in dyeing, tanning, &c., is prepared by collecting "the liquid gradually drawn from vegetables by pressure in the pickling process with salt," evaporating this, and filtering from it precipitated vegetable matters.—E. B.

Printing or Colouring Yarn or Similar Material; Apparatus for and Method of ——. W. J. Webb, Yonkers, N.Y., Assignor to The Carpet Yarn Printing Co., New York. U.S. Pats. 719,284 and 719,398, Jan. 27, 1903.

In apparatus for printing yarns by means of a disc, revolving in a trough of colour contained in a travelling carriage, mechanism is provided for subjecting the whole or part of the stripe of colour which is being printed to a rubbing operation, so as to distribute the colour laterally upon the unprinted parts of the yarns; a stripe of colour being subsequently applied to the whole or portions of the parts upon which the colour has so been spread.—E. B.

French Patents.

Retting Textile Fibres; Process of ——. E. L. Crochet. Fr. Pat. 322,224, June 18, 1902.

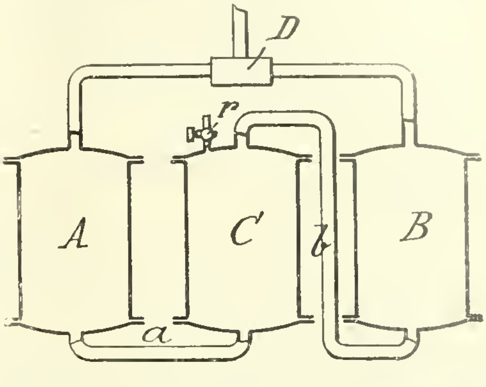
Bast fibres, such as linen and hemp, in either the green or dry state, are freed from encrusting matters by boiling for about 30 minutes with lime water, 50 litres; caustic potash, 5 kilos.; and crystallised sodium carbonate, 5 kilos.; with sufficient water in addition to bring the density of the whole to 6° B.; followed by an immersion for a few minutes in a bath of soft soap, at a temperature of 40°—50° C. After rinsing in warm water and drying, the fibres are ready for the operation of scutching or carding. For fibres heavily coated with pectic matters, as, for instance, those imported from the French colonies, the density of the first bath should be increased to 12°—15° B., while the duration of boiling should be prolonged to one hour's time.—E. B.

Bleaching and Paper Making; Preparing Vegetable Fibres for ——. A. Badoil and E. Boyer. Fr. Pat. 321,747, June 10, 1902.

The non-resinous matters, which encrust vegetable fibres, are rendered soluble in water, while the resinous matters present in them are converted into compounds readily soluble in boiling alkaline solutions (sodium carbonate solution of 1°—2° B.), by the action, during about eight hours' time, of steam at a temperature of 125°—150° C., and under a pressure of 3—5 kilos. The fibres to this end are placed in a battery of vessels communicating with one another. Steam enters one of the vessels and passes in succession through all the rest, except one, which is kept out of operation for the purpose of emptying and refilling. It is essential for the success of the process, it is stated, to allow the gas which is disengaged from the fibres to escape freely along with the steam. After steaming, the fibres are scoured and bleached (bleaching powder solution not over 2° B.), or are converted into paper pulp by the usual processes. A claim is made for the addition of sodium acetate or soap to the water used in the final washing, to protect the fibres from the action of any mineral acid which may be present in them, when textile fibres are being prepared.—E. B.

Textile Materials; Apparatus for Bleaching, Dyeing, and Otherwise Treating ——. L. Dumons. Fr. Pat. 322,172, June 16, 1902.

Two air-tight vessels A and B (see figure) are connected by means of the pipes *a* and *b* with a dye vessel C or a group of dye vessels. Before beginning a dyeing operation, the vessels A and B, which are provided with steam coils for the purpose of heating the liquor, and with tap-funnels for the admission of the dye liquor, and the capacities of which are each equal to that of the vessel or vessels C, are filled with dye liquor, the textile materials to be dyed (*e.g.*, worsted or woollen slubbing, wound on perforated tubes, or cotton sliver or rovings wound in coils) being placed in C. The operation is then begun by opening a four-way tap D, and admitting compressed air into the vessel A, and thus forcing the liquor from A into C, a tap *r* being opened to allow the air to escape from the latter. When the vessel or vessels C are full of liquor, the tap D is turned, causing the liquor in B to be forced into C, and that in C to return into A, while the air passes from the latter through the tap D. The liquor is then driven alternately from A and from B by the movements of the tap D, which are effected automatically by a mechanical device, as one vessel becomes full and the other empty. Finally, the dye liquor is discharged through a pipe. After closing the discharge valve, a current of hot compressed air may be passed through the textile materials to dry them.—E. B.



Mercerising Yarns under Tension; Apparatus for ——. F. Beltzer and F. E. Thiébaut. Fr. Pat. 322,028, June 12, 1902.

Two pairs of hank-carrying rollers are mounted upon arms, around a central axis, in such a manner that they can readily be brought together when the hanks are to be placed upon them, and moved apart as desired, so as to stretch the hanks, which are then mercerised as usual.
—E. B.

Yarns and Tissues composed of Animal Fibres; Methods of obtaining Shaded Effects on ——. H. Giesler. Fr. Pat. 321,371, May 23, 1902.

Based on the discovery that wool which has been treated with concentrated solutions of caustic soda or potash, absorbs dyestuffs at low temperatures, while the fibre in its ordinary condition does not do so, methods have been devised for producing yarns and tissues resembling those obtained by spinning and weaving wool which has been colour-printed in the form of slubbing by the Vigoureux system. The following are some of the methods:—(1) Yarns obtained by spinning ordinary wool with wool treated with concentrated solutions of alkalis, are dyed at a temperature not exceeding 70° C.; (2) woollen tissues are printed on both sides in fine cover patterns with concentrated alkali solutions, and are then dyed as in method (1); (3) reserves containing fatty matters are printed upon woollen fabrics previously padded or printed with alkalis, before dyeing them at a temperature of 40°—60° C.; (4) yarns and tissues composed of mixed vegetable and wool fibres are treated with alkalis, and are then dyed as described.—E. B.

Developing Dyeings from Sulphur Dyestuffs. Actiengesellschaft für Anilin-Fabrikation. Fr. Pat. 321,652, May 31, 1902.

Dyeings obtained from certain sulphur dyestuffs, *e.g.* Immedial Blue C, which are converted on the fibre b the action of oxidising agents, such as air in the presence of steam, sodium peroxide, &c., into blues, are similarly acted upon by air in the presence of sulphites. To this end the dyed fabric, after dyeing and rinsing, is passed through a solution of sodium sulphite (5 grms. per litre) and dried.—E. B.

Printing Woollen Slubbing. La Manufacture Lyonnaise de Matières Colorantes. Fr. Pat. 321,729, June 3, 1902.

Woollen slubbing is printed in the wet state and raw, bleached, "blued," mordanted, dyed, chlorine-prepared or otherwise prepared, without the aid in the operation of the gill-box commonly employed in conjunction with the printing machine in the Vigoureux system of printing.
—E. B.

Sulphur Dyestuffs; Process of Printing with ——. Chemische Fabriken vormals Weiler-ter Meer. Fr. Pat. 322,147, June 9, 1902.

See U.S. Pat. 708,429 of 1902; this Journal, 1902, 1231.
—E. B.

Removing Fatty Reserves from Tissues; Method and Apparatus for ——. T. Luthringer. Fr. Pat. 321,479, May 5, 1902.

Tissues which have been printed with fatty reserves are passed, in the wet state, after dyeing and centrifugalising, through two compartments, in the first of which they are repeatedly immersed in carbon bisulphide, and squeezed to remove the reserves. In the second they are treated with carbon dioxide whilst vigorously fanned, to remove the carbon bisulphide retained in them. They are then dried.
—E. B.

Tissues Waterproof; Process of Rendering ——.
T. Luthringer. Fr. Pat. 321,480, May 5, 1902.

Tissues are passed through a solution of paraffin, stearine, spermaceti, &c., in carbon bisulphide, then through squeezing-rollers, and subsequently into a chamber provided with a hood, connected to a chimney, where the solvent is removed by a current of carbon dioxide, with the assistance of a fan.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

French Patent.

Dyeing Timber; Process and Apparatus for ——.
M. Grünhut. Fr. Pat. 321,919, June 10, 1902.

See Eng. Pat. 13,118 of 1902; this Journal, 1902, 1135.
—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture; The Fan in ——. Plath.
Zeits. angew. Chem. **16**, [7], 159—161.

The experiments quoted by Petschow (this Journal, 1903, 92) cannot be accepted as deciding the question of the economic applicability of the earthenware fan in the chamber process. The author considers the fan a most valuable addition to the process, and quotes the experience of two works in which it has been introduced with excellent results. The fans are inserted between Glover and chambers; one works at 80°—90° C., the other at 60°—70° C. The fan which Petschow used could not, under the then existing conditions of construction, have delivered anything like the 112 cb. m. per minute quoted, and as it was insufficient for its work, pressure in the burners naturally arose. Later (end of 1899) great improvements were made both in the construction of earthenware fans and in the modes of measuring their actual performance. The most recently made fans of the same manufacture have shown a capacity beyond 112 cb. m.—up to 120 cb. m. per minute.—J. T. D.

Boric Acid; Solubility of ——, *in Hydrochloric Acid.* W. Herz. Zeits. anorg. Chem., **33**, 355. Chem. Centr., 1903, **1**, [6], 312.

In order to ascertain whether the statement in Dammer's handbook, that boric acid is more soluble in hydrochloric acid than in water, is correct or not, boric acid was shaken at 26° C. with excess of hydrochloric acid of different strengths, and then in a definite volume of the clear solution, after addition of mannitol, the total acidity determined. In the cases of the higher strengths of hydrochloric acid, the total acidity was determined by the author's method (see page 320). As the following results show, the statement cited is incorrect, the solubility of the boric acid decreasing with increasing concentration of the hydrochloric acid, and finally attaining a practically constant value.

1. Hydrochloric Acid Strength.	2. Boric Acid Strength.	1. Hydrochloric Acid Strength.	2. Boric Acid Strength.
0	0·907 N.	4·320 N.	0·308 N.
0·130 N.	0·895 ,,	6·000 ,,	0·328 ,,
0·260 ,,	0·870 ,,	7·080 ,,	0·327 ,,
0·390 ,,	0·842 ,,	8·740 ,,	0·327 ,,
1·300 ,,	0·615 ,,	9·510 ,,	0·338 ,,
2·160 ,,	0·512 ,,		

—A. S.

Boric Acid and Strong Acids; Simultaneous Volumetric Determination of ——. W. Herz. XXIII., page 320.

Caro's Reagent; Action of Chromic Acid on ——.
A. Bach. Monit. Scient., 1903, **17**, [734], 104.

In a previous paper (Monit. Scient., 1901, 25; see also this Journal, 1901, 578) the author has studied the action of Caro's reagent on potassium permanganate, and ha found that when the reagent is diluted with ice, it gives n reaction with permanganate, but in the concentrated state i reacts vigorously with potassium permanganate, either i solid form or in sulphuric acid solution, oxygen bein evolved and manganese sulphate formed; but the oxyge liberated is almost exactly one-third more in quantity tha would be produced by the action of the permanganic anhydride reduced with hydrogen peroxide.

Chromic acid, like permanganates, is inactive whe brought into contact with diluted Caro's reagent, but whe the concentrated body is used, whether the chromic acid b in the solid state or in sulphuric acid solution, simultaneo reduction takes place, and oxygen is evolved, chromiu sulphate being formed; however, in this case, the quanti of oxygen evolved is equal to that which would be liberate in the reaction between the same weight of chromic ac and hydrogen peroxide.

It is concluded, therefore, that concentrated Caro' reagent is otherwise constituted than when diluted.
—T. F. B.

Potassium Chlorate; Presence of Zinc in ——. D. Vita Boll. chim. farm., 1902, 257; through Annales de Chi Analyt., **8**, [1,] 39.

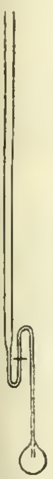
Attention is drawn to the fact that potassium chlora obtained by the process of K. J. Baeyer may possibly b contaminated with traces of zinc. In this process, chlori is made to react on zinc oxide suspended in water, the zin hypochlorite thus obtained being subsequently decompose with potassium chloride. The potassium chlorate which i then crystallised out is liable to contain traces of zin When the salt is used in the course of toxicological analys to destroy organic matter, this trace of metallic impu may easily lead to erroneous results. The impurity ma be readily removed by treating a solution of the salt wi ammonium sulphide, filtering, and recrystallising.—J. O.

Sulphur Chlorides, especially the so-called Sulph Dichloride. O. Ruff and G. Fischer. Ber., **36**, [418—433.

Finding (Ber., **34**, 1719) that the addition to "sulph dichloride" of a solution of aluminium chloride in sulphur chloride gave rise to a compound of aluminium chlori and sulphur tetrachloride, the authors investigated t evidence for the existence of sulphur dichloride. Tw modes of experiment were adopted. In the first, mixtur of sulphur monochloride and liquid chlorine, correspon ing approximately in composition with sulphur dichlori

(S_2Cl_2 = 52·6, SCl_2 = 68·9, SCl_4 = 81·6 per cent. of chlorine), were made; and dried carbon dioxide was passed slowly, at constant temperatures (two series, − 10° C. and 0° C.), through these mixtures. The vapours evolved were collected, and the weights and composition of the evolved vapours and the remaining liquid determined at intervals. In neither series was equilibrium reached; the vapour always contained a higher percentage of chlorine than the liquid, even when the latter contained only 5 per cent. more than that corresponding to S_2Cl_2.

In the second mode of experiment, the freezing and melting points of mixtures of sulphur monochloride with sulphur and with chlorine (from 51·5 to 92·5 per cent. of chlorine) were determined, by cooling with liquid air, and the results plotted. The curve shows two maxima, at − 80° C. and − 30° C., corresponding with S_2Cl_2 and SCl_4 respectively; while the point corresponding with SCl_2 lies (near − 60° C.) near the middle of a long unbroken sweep of the curve extending from the SCl_4 maximum to a very marked minimum at − 113° C., so that the existence of SCl_2 as a definite compound is not indicated at all. The minimum at − 113° C. corresponds to a eutectic mixture containing about 60 per cent. of chlorine. The authors conclude that sulphur dichloride does not exist, but that the liquid corresponding to it in composition is a mixture of the monochloride with the tetrachloride, and possibly also with a chloride much richer in chlorine, to the existence of which the freezing-point determinations seem to point.



The analysis of the liquids was effected by weighing them off in little bulbs, and heating these in sealed tubes to 175° C. for three hours with silver nitrate and 60 per cent. nitric acid. In the case of the mixtures high in chlorine, which could not be handled save in the freezing mixture, the little bulbs were made as shown in the figure, a file-mark made on the capillary where indicated, the whole exhausted, a thread tied to the bend of the capillary, the bulb and capillary dipped under the liquid, the capillary broken by gentle pressure, the filled bulb lifted out by the thread, dipped into liquid air till its contents froze, and the capillary then sealed. The vapours in the first experiments were led through a flask containing cold nitric acid and silver nitrate, a second flask containing hot fuming acid (80°—90° C.) and silver nitrate, and a couple of flasks containing caustic soda. At the end of each operation all the liquids were mixed and heated on the water-bath. The silver chloride formed in all these cases was filtered off and weighed, the silver removed from the filtrate as chloride, and the filtrate from this, evaporated to dryness, taken up with water, filtered, and the sulphuric acid in the filtrate determined with barium chloride.—J. T. D.

Nitrogen; Combustion of ——, to Nitric Oxide in the Electric Flame. W. Muthmann and H. Hofer. XI. A., page 303.

English Patent.

Chlorates and Perchlorates of the Alkali Metals; Producing ——. R. Threlfall and G. E. Wilson. Eng. Pat. 2987, Feb. 5, 1902. XI. A., page 304.

United States Patents.

Acid Chamber for Sulphite Works. W. A. McKee, Hinckley, N.Y. U.S. Pat. 719,844, Feb. 3, 1903.

A vertical water-jacketed cylindrical vessel is provided with a series of conical hoppers within it, and a revolving shaft carrying conical deflectors. A pipe admits the acid gas to the bottom of the cylinder, the passage of the gas being facilitated by the maintenance of a partial vacuum. A weak alkaline solution from an adjacent elevated tank traverses the cylinder in a direction opposite to the course of the gases.—E. S.

Cyanides and Acetone; Making ——. C. B. Jacobs, Assignor to Ampère Electro-Chemical Co., Jersey City, N.J. U.S. Pat. 719,223, Jan. 27, 1903.

Nitrogen is brought into contact with a heated mixture of carbon and an alkaline earth carbonate, whereby the corresponding cyanide is formed. This is treated with acetic acid, thus liberating hydrocyanic acid; the acetate of the alkaline earth metal is now heated, acetone being formed, together with the carbonate of the alkaline earth metal, which is mixed with carbon and used again.
—T. F. B.

French Patents.

Lyes [Acids]; Process for Concentrating Heavy ——. Soc. Command.-Gesellschaft für den Bau von Feuerungsverd.- und Trocken-Anlagen, L. Kaufmann and Co. Addition, dated May 16, 1902, to Fr. Pat. 311,776, June 14, 1901.

Refers to the use of the process for concentrating acids, especially sulphuric and hydrochloric acids. The acid is concentrated in a vacuum, and heated by the circulation of steam or gas, and is then driven back in a thin sheet over the heated surfaces by means of an agitator.—J. W. H.

Bleaching Liquid and Caustic Alkali; Process and Apparatus for the Simultaneous Manufacture of ——, by Electrolysis. H. Seibert and G. Tempel. Fr. Pat. 322,317, May 1, 1902.

The simultaneous electrolytic production of bleach and of caustic alkali may be effected by subjecting alkali chloride to electrolysis, with the employment of diaphragms, and causing the chlorine freed in the anode compartment to be absorbed partly by the electrolyte itself and partly by one or more absorption columns, whether by the electrolyte led there from the anode compartment or by water, whilst caustic alkali is obtained in the cathode compartment. The bleach which has been used, and no longer contains sufficient active chlorine, is continually electrolysed anew, with the addition of salt, and is forced to absorb chlorine, whilst in the cathode compartment caustic alkali is continually obtained. In order to obtain a bleaching liquid very rich in chlorine, the latter is led into a cooling mixture containing chloride of alkali, to produce hydrated chlorine, and the solution of the chloride of alkali which is retained in the water after bleaching, is employed to replace the chloride of alkali decomposed by the electric current, this practice having the double object of producing, on the one hand, a cooling mixture by means of the chloride of alkali, and, on the other, bleaching liquid and caustic alkali simultaneously. The apparatus consists of a receptacle acting as cathode, with anode compartments made of diaphragms and enclosing sheets or rods of carbon, and it is preferably used in combination with one or more absorption columns. The anode is formed of plates or rods of carbon surrounded by pieces of coke, to increase the active surface and diminish the electrical resistance.—G. H. R.

Sodium Bicarbonate; Transforming ——, into Sodium Carbonate. A. H. Hooker. Fr. Pat. 322,022, June 11, 1902.

Moist sodium bicarbonate is compressed into cylinders or blocks, each traversed by a central hole, and the blocks are subjected to a temperature of about 700° C., in a retort such as is used in making coal-gas, the carbon dioxide evolved being preferably collected. Alternatively, the blocks may be heated in superheated steam. The blocks of sodium carbonate obtained are then pulverised.—E. S.

Ammonium Sulphate; Saturator for the Manufacture of ——. A. Feldmann. Fr. Pat. 321,816, May 15, 1902.

See Eng. Pat. 11,525, 1902; this Journal, 1902, 1027.
—E. S.

Cyanogen Liquors obtained in Manufacture of Illuminating Gas; Rapid Process for Treatment of ——, in the Cold. Guillet. Fr. Pat. 322,170, June 16, 1902.

The cyanogen liquors are treated with a strong acid, such as sulphuric acid, with addition of a further quantity of an iron salt if the solutions are over-saturated with gas, *i.e.*, if there be soluble ferrocyanide in the liquor.

This treatment has the result of liberating sulphuretted hydrogen, and forming ammonium sulphate, an insoluble double ferrocyanide of iron and ammonium being produced at the same time.

The sulphuric acid should be added in quantity sufficient to destroy all soluble cyanogen compounds, as indicated by the addition of a drop of the liquor to a little ferric chloride solution.—T. F. B.

Silver Compounds; Process for the Preservation of ——. S. Efrem. Fr. Pat. 321,830, May 31, 1902.

The stability of silver compounds is said to be increased by adding a thickening medium, preferably gelatin, to them. —E. S.

Liquid Air; Manufacture of ——. [*Lubricating Apparatus.*] E. Claude. Addition, dated June 4, 1902, to Fr. Pat. 296,211, Jan. 16, 1900.

In the manufacture of liquid air on the principle of the expansion of the air with the production of external and internal work, from starting work up to the beginning of the liquefaction, the apparatus is lubricated with a mixture of light petroleum (petroleum "ethers") with light "valvolines," in which the proportion used of the latter is successively diminished in proportion as the temperature falls. (See Eng. Pat. 12,905, 1900; this Journal, 1901, 1018.)—E. S.

Air; Apparatus for Liquefying ——, *and for Separating its Constituent Elements.* The Atmospheric Oxygen and Power Co. Fr. Pat. 321,860, June 6, 1902.

The apparatus comprises a compressor, an expansion machine having an evacuation chamber isolated from the atmosphere; arrangements for passing the compressed air through coolers, then through brine and a drying chamber; a thermal interchanger for counter currents; devices for obtaining mechanical force from the heat of the atmosphere; and one or more recipients for liquefied air. When it is desired to obtain liquid oxygen, the nitrogen is volatilised from the liquid air, and is utilised in producing cooling effects, &c. A bottle for the reception and storage of the liquid air or oxygen, suitably enclosed and protected from external heat, and adapted for transport, is described. The apparatus, with certain modifications, may be applied for producing and maintaining low temperatures for storage purposes or the like, or for doing mechanical work.—E. S.

Oxygenated Water [*Hydrogen Peroxide*]; *Quick Preparation of* ——. The Société Gouthière, Laurent et Cie. Fr. Pat. 322,152, June 12, 1902.

To water acidulated with hydrochloric acid, a mixture of barium dioxide and sodium sulphate is added. The liquid is then neutralised by an alkali and filtered. The barium dioxide may be replaced by other suitable dioxides, and the sodium sulphate by the carbonate or phosphate; but the previous process is preferred.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

Hollow-Glass Wares of Equal Weight and Capacity; Manufacture of ——. H. Hilde, Rosswein, and E. Kögler, Aussig, Germany. Eng. Pat. 1973, Jan. 24, 1902.

To minimise the irregularities occurring in objects blown in the same mould, the excess of glass is cut off (after the ware is released from the first mould, and either before or after it has been blown in the second mould) by means of cutting tools adjustably arranged on the table of the blowing machine.—C. S.

Glass Tiles and Glass for Decorative, Glazing, and other Purposes; Impts. in ——. C. H. Thompson, Stourbridge, and The Crystalline Co., Ltd., Manchester. Eng. Pat. 5140, March 1, 1902.

A wavy, undulated, or rippled surface is imparted to the tiles or sheets of glass by placing them on a bed provided with fixed or movable projecting points or irregularities, so that the glass is supported at a number of points. Heat is then applied, so that the glass will collapse at the unsupported parts. One form of such support consists of a bed of metal or fireclay, sprinkled with partly-calcined grains of silica of any suitable size, and either loose or fixed in position; or a metal plate fitted with projections may be used.—C. S.

Pottery Kilns or Ovens; Impts. in ——. J. and W. Burton, Manchester. Eng. Pat. 12,355, May 31, 1902.

The kiln or pottery oven is constructed with a central chimney connected internally with bottom flues only, which are placed below the floor; a number of bottom flues radiating from the central chimney, with apertures opening through the floor into the kiln; a number of branch flues connecting the bottom flues, and also connecting the "fire-mouths" with the bottom flues and with the central chimney, which can be opened or closed as required. The kiln may be converted from a down-draught to an up-draught kiln at will, when desired.—H. F. C. G.

United States Patent.

Photographic Decoration [*China, Glass, &c.*]; *Vitrifiable* ——. L. Crabtree, Assignor to S. T. Aston. U.S. Pat. 719,197, Jan. 27, 1903. XXI., page 319.

French Patents.

Glass-Gall; Process for the Utilisation of ——. F. H. Becker. Fr. Pat. 321,304, April 21, 1902.

See Eng. Pat. 9405, April 23, 1902; this Journal, 1902 1077.—J. W. H.

Glass; Manufacture of Ruby-coloured ——. R. Zsigmondy. Fr. Pat. 321,484, May 9, 1902.

See U.S. Pat. 703,512, July 1, 1902; this Journal, 1902 1027; and Eng. Pat. 5242, March 3, 1902; this Journal 1903, 94.—J. W. H.

Glass; Impts. in Casting ——, *especially Slender Glas of Large Dimensions.* Soc. Anonyme de Courcelle pour la Fabrication des Glaces. Fr. Pat. 321,505, May 28, 1902.

The casting tables are covered, in place of sand, with mixture which is a worse conductor of heat, and has lubricating properties, such as graphite or talc.—J. W. H.

Glass, Porcelain, &c.; Vessels of ——, *with Cellulo Coverings.* Soc. Anon. le Carbone. Fr. Pat. 321,651 May 31, 1902.

The claim is for vessels of glass, porcelain, &c., with covering of celloloid, which may be prepared by continuall dipping into celluloid solution and drying, until a coatin of sufficient thickness is obtained.—J. W. H.

Glass, Porcelain, &c.; Manufacture of Metal-covere Vessels of ——. W. Storr. Fr. Pat. 321,733, June 4 1902.

The vessels are made to conduct the electric current b adding precious metal in powder to the material; afte firing, a covering of metal is formed by electro-deposition (Compare Eng. Pat. 24,328, Nov. 29, 1901; this Journal 1902, 174.)—J. W. H.

Glass; Printing on ——. *A New Product,* "*Chromo-Glass.*" A. Lhédet. Fr. Pat. 321,724, June 3, 1902.

The glass is covered with a thin layer of gelatin; a pape transfer from a reversed drawing is then pressed on th surface; the paper is then washed away and the impressio on the gelatin-coated glass dried, painted, and varnished. —J. W. H.

Enamelling; Process of ——. L. A. Garchey. Fr. Pat. 321,333, May 21, 1902.

An even coating of enamel or glaze is obtained by stirrin the powdered glaze in a liquid, in which it is insoluble, an afterwards placing the plate in this liquid to receive th powder as it falls. When sufficient glaze has bee deposited, the liquid is siphoned off.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

English Patents.

tone; Colouring of ——, *to Imitate Marble.* E. Schwob, Lausanne, Switzerland. Eng. Pat. 4914, Feb. 26, 1902.

'HE parts not to be coloured are treated with a mixure composed of: turpentine oil, 800 parts by weight; permaceti, 10 parts; pure beeswax, 28 parts; stearine, 0 parts. Mineral colours are applied and fixed by treating vith 800 parts of linseed oil (free from fatty matter) and 00 parts of turpentine oil. Finally, a finishing polish is put n the stone by applying an alcoholic solution of shellac. —J. W. H.

tone, Artificial, and the like; Steaming Chambers for the Production of ——. G. P. Wallis, Leeds. Eng. Pat. 6378, March 15, 1902.

'HIS specification refers to a cover for closing the receptacles or steaming stone treated by the process described in lexander's Eng. Pat. 9441 of 1899 (this Journal, 1900, 43). The chamber is fitted either inside or outside with a oint-ring, which may be solid or of angle iron, and has two lots cut in it at top and bottom to allow of the passage of he cover with two lugs on it, and is inserted edgeways into he chamber. The cover, when swung into place with its ugs covering the slots for its admission, is held by means of bridge-piece until the steam pressure within the chamber as risen sufficiently to keep the cover pressed against a acking-ring inserted between it and the joint-ring above nentioned. When the full pressure of steam in the chamber s attained, the cover is forced down upon the packing, and perfectly steam-tight joint is thus obtained.—H. F. C. G.

Stone; Artificial ——. F. Jurschina, Stockholm. Eng. Pat. 25,222, Nov. 17, 1902.

A MIXTURE is made with water, of sand, clay, silicate of oda, and cement, packed into moulds, dried, and fired. A nodification consists in forming a liquid mass of the silicate of soda, clay, sand, and cement, pouring into elastic moulds, nd afterwards packing in the moulding material proper, vith a view to getting all the recesses of the mould well illed up.—J. W. H.

Stone; Artificial ——. G. Harrison, London. From W. Black and H. S. Richards, Chicago. Eng. Pat. 26,758, Dec. 4, 1902.

SEE U.S. Pat. 716,371 of 1902; this Journal, 1903, 145. —J. W. H.

Fire-resisting Material; Manufacture of Flexible ——. The British Uralite Co., Ltd., and R. J. Friswell, both of London. Eng. Pat. 6016, March 11, 1902.

A PULP of finely-divided asbestos is formed into sheets, with or without a filling material, such as chalk; the sheets re afterwards treated with a solution containing an alkali ilicate and a substance capable of decomposing it. The material is then dried at a temperature of about 105° C., and fterwards treated, if desired, by a suitable method to remove he by-products resulting from the decomposition of the lkali silicate. Instead of using water alone, the pulp may be prepared with a weak solution of an alkali silicate and icarbonate.—H. F. C. G.

French Patents.

Stone, Artificial; Manufacture of ——. Société H. Croizier et Cie. Addition, dated May 31, 1902, to Fr. Pat. 308,548, Feb. 27, 1901.

THE stone, consisting of a mixture of sand, lime, and kieselguhr, is, after hardening, further heated to calcine the kieselguhr. The stone may also be treated with soluble silicates before the calcination.—J. W. H.

Artificial Stone; Mortar or Materials for Making ——. J. Loewenthal. Fr. Pat. 322,105, June 16, 1902.

85 PARTS of finely-powdered quartz sand, 4 parts of pulverised quartz, 0·5 part of alunite, 1 part of magnesia, 2 parts of borax, 0·5 part of graphite, and 2 parts of mineral colouring matter are mixed together; before use 3 parts of "mineral oil free from hydrocarbons," and 2 parts of water are added. The material sets hard without being brittle, has a great resistance to crushing, and is not affected by frost; it may be used even at − 40° C.—J. W. H.

Asphalt; Manufacture of Artificial ——. R. Hermes. Fr. Pat. 322,288, June 20, 1902.

A MIXTURE is made of 11 parts, by weight, of tar, 2 parts of resin, 1 part of sulphur, and heated until the sulphur fuses. A temperature of 225° C. is maintained until the resin and sulphur enter into combination. 11 parts of slaked lime are then added. The mass obtained, may replace natural asphalt.—J. W. H.

Refractory Bricks from Calcareous Sandstone. W. Olschewsky. Fr. Pat. 321,489, May 15, 1902.

LIME is mixed with sand containing clay, and submitted to high-pressure steam, whereby silicate and aluminate of lime are formed; finally the bricks are burnt at a moderate temperature.—J. W. H.

Brick-Making; Neutralisation of the Action of Lime in ——. L. Schmelzer. Fr. Pat. 321,843, June 5, 1902.

THE articles, bricks, &c., are submitted to the action of steam, saturated or superheated, whilst being burnt —J. W. H.

Slate Waste; Utilisation of ——. V. Hermant. Fr. Pat. 321,596, May 30, 1902.

POTASSIUM silicate is used as a cementing material for the formation of powdered slate waste into bricks, tiles, &c. —J. W. H.

Mortar; Impermeable ——, *and Method of Use for Flagstones, Facings, &c.* P. V. Parsy. Fr. Pat. 321,653, May 31, 1902.

PORTLAND cement is mixed with powdered pitch and made up as mortar. After use for facing, &c., and hardening, a paint containing tar-oils is used; the tar oil, penetrating the mortar, causes the pitch to dissolve and form a solid mass; a hot iron may be finally used to polish and make absolutely impermeable the outer surface.—J. W. H.

Cement, Portland; Manufacture of ——, *and Apparatus therefor.* E. H. Hurry and H. J. Seaman. Fr. Pat. 321,336, May 22, 1902.

THE crude materials, the chalk having preferably been calcined, are mixed with a little carbonaceous matter, and melted in a reducing atmosphere in a special blast furnace, under a pressure of a few pounds above that of the atmosphere. Any iron compounds present are reduced to metallic iron, which separates from the mass. The clinker thus purified is cooled and powdered.—J. W. H.

Cement for Floors, Pavements, &c. Blanc. Fr. Pat. 322,016, June 11, 1902.

THE cement consists essentially of calcined magnesia, barium chloride, and magnesium sulphate, in the following proportions:—Calcined magnesia or dolomite, 50—65 parts barium chloride, 20—30 parts; magnesium sulphate, 15—20 parts. Other materials may be added according to requirements.—J. W. H.

Clay for Pottery, called "Néo-Cérame." Debert. Fr. Pat. 322,097, June 14, 1902.

A MIXTURE composed of: sulphate of lime, 50 per cent.; carbonate of lime, 15 per cent.; carbonate of magnesia, 15 per cent.; alum, 20 per cent.; is made into a paste of suitable consistency with water.—J. W. H.

X.—METALLURGY.

Steel; Taylor-White Process of Treating Tool ——. Rept. of Committee on Science and the Arts. J. Franklin Inst., 1903, **155**, [2], 127—137.

A good air-hardening or self-hardening steel may be better (in the proportion of 1·5 : 1·0) than a good ordinary tool-steel for rough work, because it will bear a higher temperature in use, and will therefore take a more rapid cut. Hitherto the ordinary manganese and tungsten steels have been hardened by heating to a temperature designated as "cherry-red" (1,500° F.), and then cooling off by an air-blast or otherwise; but in no case was the temperature allowed to exceed that above named. It is now found that, although the cutting speed permissible is reduced if the temperature in hardening has somewhat exceeded that of cherry-redness, it is much greater after treatment at much higher temperatures. The accompanying curve (Fig. 1) illustrates this. Beyond 1,900° or 2,000° F. the steel crumbles, and the limit of safety is therefore passed. Steel to be used for the Taylor-White process should contain at least 0·5 per cent. of Cr, and at least 1 per cent. of Mo or W, and the results are better when higher proportions of these metals are used. The percentage of carbon present, appears to have little or no effect on the results. During the process, the proportion of chromium carbide present is reduced, and the velvety grain of the fractured steel when cooled under ordinary circumstances is replaced by a coarser grain, often with sparkling grains interspersed. After heating, the tool is cooled rapidly to a point below the "breaking-down" temperature (1,550°—1,700° F.) in a lead bath and then slowly in air or lime. It is essential that the temperature should not rise. After cooling off, however, the efficiency may be increased by subjecting the material to a temperature of 700°—1,200° F. for about 10 minutes. The tool is originally heated in a coke furnace until the steel crumbles when tapped with a rod. The lead bath used is shown in Fig. 2; it consists of a cast-iron lead-pot set in a coke fire, the temperature of which is controlled by an air-blast. If the lead become too hot, it is cooled by immersing within it a cooling-pipe with water circulating through it. The temperature of the bath is observed by comparing the colour, as viewed through the pipe T, and the blackened wooden tube surrounding it, with an incandescent electric lamp, run at constant voltage with the aid of a rheostat, the light of which lamp passes through a parallel-sided glass flask containing a suitable fluid. In a series of tests with a special lathe it was found that the relative efficiency of the treated (0·87 per cent. of C) and the best untreated material was, for a tool steel, as 3·6 : 1; for a soft forging steel (0·105 per cent. of C) as 2·2 : 1; and for cast iron (2·95 per cent. of graphitic and 0·91 per cent. of combined C), as 1·3 : 1. Hence the increase of efficiency by the adoption of the new process is greater for hard than for soft forgings. In practice it has been found that hard-sprocket wheels can be bored at more than double the usual speed with Taylor-White tools.—W. G. M.

Fig. 1.

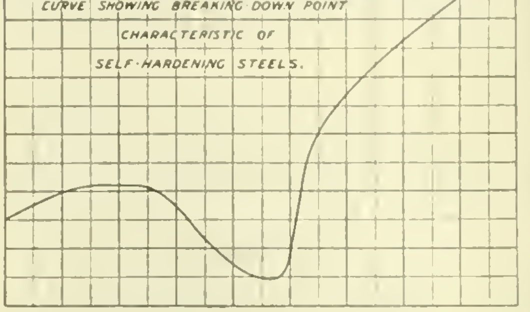
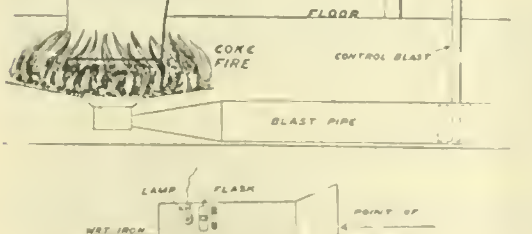


Fig. 2.



Nickel-Steels; Expansibility of ——. C. E. Guillaume. Comptes rend., **136**, [5], 303—306.

The author has extended his study of this question to nickel-steels containing from 50 to 70 per cent. of nickel, and has investigated the effect of small amounts of other elements (manganese, carbon, silicon) on the expansibility of the nickel-steels of minimum coefficient—35 to 36 per cent. of nickel—described in his former paper (Comptes rend., **124**, 176; see also this Journal, 1897, 614). Reduction of the amount of these elements lowers still further the coefficient of expansion, but gives steel which cannot be forged. The physical conditions of casting and subsequent treatment all affect the expansibility, and by choosing the most favourable conditions, an alloy has been obtained having a coefficient of $(+ 0{\cdot}028 - 0{\cdot}00232t)10^{-6}$, so that a kilometre heated from 0° to 20° C. would contract by 0·4 mm. The coefficient of the alloy of minimum expansibility given in the former paper was $(+ 0{\cdot}877 + 0{\cdot}00127t)10^{-6}$. The new alloy has been obtained in the form of wire of 1·7 mm. diameter, which has been largely used for chains for geodesic measurements. Direct experiments have shown that, whilst successive castings of what should be the same alloy may exhibit differences in expansibility, yet different bars made from the same casting, provided they have been subsequently submitted to identical treatment, have the same coefficient—a fact of importance in connexion with the use of these alloys in compensating pendulums, &c. The observations on alloys of high nickel content have allowed the completion of the curve of expansibilities of reversible alloys up to pure nickel; and from this it has been seen that the anomalies formerly observed disappear (at temperatures about 20° C.) in the case of the steels containing 50—70 per cent. of nickel.

—J. T. D.

Gold Ores; Process for the Cyanide Treatment of ——. Cyanid-Gesellschaft m. b. H. in Berlin. D. R. Pat. 138,867, Aug. 2, 1901.

Claim is made for the lixiviation of gold ores, in which the cyanide is replaced—without further purification than the removal of excess of carbon—by the crude mass obtained by fusion of carbides or carbide-like mixtures with nitrogen and a flux.—T. H. P.

Silver-Lead Smelting; Modern ——. A. S. Dwight. Amer. Inst. of Mining Eng. Eng. and Mining J., 1903, **75**, [2], 83.

When a silver-lead blast furnace is acting satisfactorily, the following conditions should obtain:—(1) A large proportion of the lead in the charge should be converted irectl, into bullion. (2) The slag should be fluid and lean. (3) The matte should be low in lead. (4) The urnace should be cool at the top, with a minimum pro-uction of lead-fume and flue-dust, and the charges should escend uniformly over the whole area of the shaft. 5) The "furnace-speed" should be good. (6) The urnace should be free from serious accretions. Most of ie factors which govern the efficiency of the furnace can e gauged and modified as desired.

Behaviour of Iron.—The success of silver-lead smelting epends largely upon the reduction of just the correct mount of iron necessary to separate the lead from the iatte. The reduction should be effected, as far as ossible, by carbon monoxide, *i.e.*, the zone of incan-escence in the charge column should be kept low. In his way the reducing power of the escaping gases is tilised to the fullest extent on the descending charge; he volume and temperature of these gases are diminished, nd the low velocity of their exit tends to reduce the loss f lead in fume and flue-dust. The temperature of the ırnace should be high enough to volatilise the whole of he lead in the charge, if other conditions permit; whilst, ' a rapidly descending charge, constantly replenished with old ore from above, be maintained, this absorbs effectively ie heat of the gases, and acts as a most efficient dust and ıme collector.

Volume of Blast.—The author recommends the plan, with vhich he has obtained uniformly favourable results, of aving a separate blower, of variable speed, directly con-ected to each furnace. The conditions under which the ron will be reduced by carbon monoxide rather than by olid carbon, are best attained by the maintenance of a ninimum amount of fuel, with a correctly adjusted volume f air.

Pressure of Blast.—This is best regulated not by varying he volume of air, but by adjusting the internal resistance f the furnace.

Feeding the Charge.—The ingredients of the charge hould be intimately mixed before being fed into the urnace. In order that the gases may ascend uniformly hrough the smelting-column, the charge, which in practice s never uniform, should be fed in such a manner that the ner material is lodged close to the walls, whilst the coarser articles are placed in the centre.

Effect of Large Charges.—In cases where ore and fuel re charged in alternate layers, large ore-charges, within ertain limits, will give better results than small charges. he gases can readily pass through coke, and hence each uel-zone tends to equalise the gas-currents by giving hem an opportunity to become distributed over the whole urnace-area, whilst each layer of ore compels them to orce a passage under pressure, which is the manner most avourable to effective chemical action. In mechanically-ed furnaces, the charges of ore and fuel are usually ropped in simultaneously, and no separate layers are ormed; consequently, more care must be exercised to ecure proper placing of the coarse and fine material.

Mechanical Character of Charge.—The author recom-iends briquetting the fine ore (though preferably not all f it), and crushing the coarse to such a degree that a iixture is obtained of which about one-third is composed f pieces of from 5 to 2 inches in diameter, one-third of ieces of from 2 to 0·5 inches in diameter, and the remain-ig third of smaller particles. It is advantageous to break he coke up to a certain extent before charging, and a easonable amount of "coke fines" is not detrimental. 'he slag in the charge should be broken to pieces of not iore than 6 inches in diameter. There is no economy in sing the slag hot. A reasonable amount of moisture in the harge is beneficial, and it is often advantageous to wet the re mixtures while bedding them, or to sprinkle the charges efore feeding.

The author finally sums up the advantages of mechanical eeding, and states that it will remove one of the most ncertain factors requiring to be dealt with, thereby bring-ig into clearer view the other factors (fuel and blast roportion, slag composition, &c.), in a way that has ardly been possible under the irregularities consequent pon hand-feeding.—A. S.

Lead, Tin, and Bismuth; Alloys of ——. E. S. Shepherd. J. of Physical Chem., **6**, 519—553. Chem. Centr., 1903, **1**, [4], 223.

On collecting the results obtained by different investigators, it becomes evident that it is not admissible, on the ground of small differences between the calculated and the true specific gravities of alloys, to assume the existence of chemical compounds. The density of an alloy varies considerably according to the thermal and mechanical treatment of the latter.

During the crystallisation of a definite mixture of lead, bismuth, and tin, the author made determinations of the composition of the mother-liquor, chiefly by a gravimetric method (solution in *aqua regia*, distillation of the chlorides of bismuth and tin in a current of hydrochloric acid gas, and separation of these two compounds by means of ammonium sulphide). It was found that pure tin crystallises out, but probably in an unstable, denser form (sp. gr. about 8). In the process of crystallisation, bismuth carries down up to about 4 per cent. of lead, and lead up to about 5 per cent. of bismuth in solid solution. Compounds of the metals, one with another, were not observed.—A. S.

Alloys; Copper-Cadmium ——. P. Denso. Zeits. f. Elektrochem., 1903, **9**, [7], 135—137.

The binary copper-cadmium alloys examined, containing from 1 to 20 per cent. of copper, were all white and, with increasing percentages of copper, more and more brittle and largely crystalline. Acids of considerable strength (such as do not attack copper), leave a residue of metallic copper when allowed to act upon these alloys. But if plates of the alloy be used as anodes in a slightly acid, or a neutral, solution of cadmium sulphate, the current density being low (*e.g.* 1·2 ampères per square decimetre for an alloy containing 10 per cent. of copper or less), a dense soft layer of alloy-crystals will be found on the surface after an expenditure of 3 ampère hours. In order to obtain the crystals, the anode was in these experiments enveloped in silk taffeta. A higher current density caused a partial solution of the cadmium from the crystals, especially near the edges of the anode. But no crystals could be obtained without decomposition from the 20 per cent. alloy, even when a lower current density was used. Analysis of the alloy crystals thus obtained from alloys containing 1, 2·5, 5, and 10 per cent. of copper respectively, showed that in every case they had the composition represented by the formula $CuCd_3$, the percentage of cadmium ranging in different cases from 83·5 to 85·5 (as against 84·15 required by theory). The excess of cadmium in most cases is ascribed to the presence of cadmium mother-liquor. The melting-point of the alloy $CuCd_3$ is above the boiling point of cadmium, so that there is always a loss of this element during fusion. From these experiments it is obvious that any alloys of these two elements that contain more than 16 per cent. of copper cannot contain any free cadmium.

—W. G. M.

English Patents.

Iron Ores; Process of Smelting ——, *and Blast Furnaces therefor.* E. Servais, Luxemburg. Eng. Pat. 20,930, Sept. 25, 1902.

Strongly heated and completely burnt gases from a blast furnace mixed with the reducing gases which are produced by the combustion of fuel, are made to pass through the charge. The furnaces employed, have separate ore and fuel shafts, the latter being provided with a feeding orifice which can be closed airtight by slides and a water seal.

—J. H. C.

Magnetic Ore Separators. C. A. Allison, London. From C. E. Knowles, G. T. Young, G. T. Cooley, and G. H. Elmore, all of Joplin, Miss.; and W. E. Brinkerhoff, E. O'Keefe, and J. Herrin, all of Carthage, Miss., U.S.A. Eng. Pat. 25.893, Nov. 25, 1902.

The ore is delivered from a hopper on to an inclined apron (agitated by an electrical device), passing, near its extremity, between the poles of an electro-magnet, and near and parallel to the inner side of one of the poles. The space between the poles is angular. A continuous travelling belt, carrying "magnetically inductive bodies," acting immediately above the apron, and traversing the magnetic field, picks up the magnetic particles, which, when passed beyond the influence of that field, fall by gravity into successive bins having adjustable partitions, which receive them in the order of their magnetic susceptibility. The indifferent particles pass by gravity, aided by the oscillations, over the steeply-inclined edge of the apron into the first of the collecting bins.—E. S.

Kilns for the Treatment of Ores. H. H. Lake, from A. Rabézzana, Italy. Eng. Pat. 234, Jan. 3, 1902.

The shell of the kiln is divided horizontally by planes consisting of rows of pyramidal caps of rectangular section. This arrangement of caps, which have spaces between each, allows the ore to be divided evenly over the whole kiln, and also permits the ascending furnace gases to come into intimate contact with the ore which rests between the caps.—T. F. B.

Converter Furnaces; Impts. in or relating to ——. C. Raapke, Güstrow, Germany. Eng. Pat. 2545, Jan. 31, 1902.

The furnace comprises an oblong hearth of non-basic material, capable of being turned transversely to its axis, having perpendicular sides and a vaulted top, the inclined back part of which constitutes the blast bottom, whilst the front part is fitted with a charge opening having casting and delivery holes. Chambers placed above the hearth, and heated by the furnace gases, contain an oxygen generator, and are provided with means for delivering the heated oxygen to the blast pipes and tuyères. The converter is adapted for making castings for patterns and the like from iron which is dephosphorised by addition of dolomite to the molten charge.—E. S.

Blast Furnaces, and Apparatus for Catching the Dust and Heating the Blast thereof. J. E. C. Koch, Hove. From W. E. Koch, Sharpsburg, U.S.A. Eng. Pat. 11,886, May 24, 1902.

The gases from the blast furnace are led down an inclined pipe into a large chamber where most of the dust is deposited, passing thence to a similar chamber and then to a chimney. At the top and bottom of these chambers are boxes connected together by pipes; the air for the blast circulates round these boxes, becoming heated in its passage, and thence to the tuyères. The dust is conveyed through worms from the chambers to a fritting furnace.—T. F. B.

Heat of Hot Slag for Generating Steam; Utilising the ——. G. Mitchell, Naco, Arizona, and L. D. Copeland, Los Angeles, Cal. Eng. Pat. 20,225, Sept. 16, 1902

Hot slag is granulated by being fed intermittently into a body of water confined under pressure in a steam generator, which can be closed steam-tight during the operation, and by this means the heat of the slag is utilised in generating a constant supply of steam. The vessel is fitted with means for feeding and discharging the slag, a removable lining constructed in sections, a rotating valve inside the generator, means for equalising pressure on the slag receptacle, a device for breaking up the slag in feeding same, means for dislodging the slag from the feeding receptacle as well as for agitating the cooled slag and assisting its discharge, and means for seating the open end of the tilting slag receptacle over the feed opening in the generator casing.—C. S.

Copper Matte; Conversion of ——, into Metallic Copper. G. Mitchell, Naco, Arizona, U.S.A. Eng. Pat. 28,290, Dec. 22, 1902.

Hot silica is fed into the molten matte while it is being blown in the converter.—J. H. C.

Coloured Impressions on Tin Plates; Printing ——, on a partially clouded Ground, produced by means of Etching. Krokert, Halle-on-Salle, Germany. Eng. Pat. 11,552, May 21, 1902.

The tin plates are first well scoured, and printed with a suitable opaque colour where the clouded ground is not required, afterwards scoured and the printed side dipped in a weak solution of nitric acid The nitric acid acts only upon those parts which have not been printed, and produces the etched effect.

The treated plate is finally well washed in water.

—M. C. L.

United States Patents.

Copper; Method of Converting Copper Matte into Metallic ——. G. Mitchell, Naco, Arizona, U.S. Pat 719,488, Feb 3, 1903.

See Eng. Pat. 28,290, preceding this. See also Eng. Pat. 15,046, 1902, and U.S. Pat. 705,109, 1902; this Journal, 1902, 1185 and 1081.—E. S.

Aluminium; Process of Producing ——. H. F. D. Schwahn, St. Louis, Mo. U.S. Pat. 719,698, Feb. 3, 1903.

An aluminium compound, such as porous aluminium sulphate, is subjected "at a temperature sufficient to effect the reduction," to an upward moving current of a hydrocarbon gas containing sulphur, pressure in excess of that of the atmosphere being maintained.—E. S.

Steam from Hot Slag: Apparatus for Generating ——. H. A. Seymour, Washington, Assignor to G. Mitchell, Los Angeles, Cal. U.S. Pat. 719,520, Feb. 3, 1903.

See Eng. Pat. 20,225, under Eng. Pats. preceding. Compare also U.S. Pats. 711,332–3, 1902; this Journal, 1902, 1401; and U.S. Pats. 711,290–1, 1902; this Journal, 1903, 83.

—E. S.

Ore Treatment; Mechanism for Mixing and Storing Liquids and Gases for ——. S. C. C. Currie, Assignor to W. Courtenay, both of New York. U.S. Pat. 719,756, Feb. 3, 1903.

A water-tank, a caustic alkali tank, an alkali stock tank, and a "mixing chamber," on successively lower levels, communicate by valved pipes. The mixing chamber contains oppositely inclined shelves, and receives a supply of chlorine gas near its bottom; below it, a storage tank for chlorinated liquid receives chlorine from the chamber by a pipe reaching nearly to its bottom, and receives also a supply of water. There is an operating tank having a perforated false bottom, below which a supply pipe enters, as well as a number of storage tanks having separate pipes communicating with the supply pipes, controlled by valves; and means are provided for forcing circulation through the perforated false bottom.—E. S.

Ores Containing Precious Metals; Process of Treating ——. S. C. C. Currie, Assignor to W. Courtenay, both of New York. U.S. Pat. 719,757, Feb. 3, 1903.

The powdered ore is passed slowly through a closed and heated receptacle, and is plunged thence into a hot caustic alkali solution, which solution forms a seal, the steam formed, being conveyed back through the heated receptacle to act on the incoming ore. The treated ore is then removed and washed. Compare U.S. Pat. 718,099, 1903; this Journal, 1903, 147.—E. S.

Ores; Apparatus for Screening, Washing and Assorting ——. F. Hermann, Victor, Col. U.S. Pat. 719,942, Feb. 3, 1903.

Two oppositely inclined chutes, suitably elevated on framework, approach each other at the top so as to admit of ore being discharged from the same car to both. Above the upper part of the chutes, and at the successive steps thereof, a system of perforated water-pipes is located, with means for spraying water on to the ore as it passes downwards over perforated continuations of the chutes, through which perforations the ore passes on to ore-assorting tables, bins being placed to receive it. Means for obtaining both wet and dry screenings are provided, as well as for drying the former.—E. S.

French Patents.

Iron and Steel; New Method of Forming Castings ——. A. Chantraine. Fr. Pat. 322,050, June 13, 1902.

There is a special arrangement of the gutters or grooves by which the stream of molten metal is distributed to the ingot moulds.—J. H. C.

Iron and Steel; Annealing, Hardening, and Tempering ——. G. W. Sargent. Fr. Pat. 322,158, June 16, 1902.

The metals are heated to the required temperature in a bath containing a haloid salt so as to exclude oxygen. —J. H. C.

Iron and Steel; Apparatus for the Production of ——. G. J. Snelus. Fr. Pat. 322,294, June 20, 1902.

The claim is for the combination of a rotating converter with basic lining, and a blowing machine supplying a mixture of hot air and blast-furnace gas.

The gas and air supplies are controlled by separate valves and hydraulic joints are provided to prevent the access of cold air.—J. H. C.

Aluminium-bronze; Manufacture of Copper Coated with ——. M. Dunkelsbühler and H. Wachwitz. Fr. Pat. 322,159, June 16, 1902.

The copper is covered with aluminium of such thickness as to yield, when subsequently heated to incandescence, an alloy of the required composition on the surface of the compound mass.—J. H. C.

Aluminium-bronze; Manufacture of Iron and Steel Coated with ——. M. Dunkelsbühler and H. Wachwitz. Fr. Pat. 322,160, June 16, 1902.

The iron or steel having been cleansed, is coated with a compound plate of copper and aluminium. On heating to about 950° C. the aluminium forms an alloy with the copper.—J. H. C.

Zinc from its Ores, especially Smithsonite and Calamine; Direct Extraction of ——. V. E. Bermont. Addition, dated June 9, 1902, to Fr. Pat. 315,888, Nov. 13, 1901.

See Eng. Pat. 6752 of 1902; this Journal, 1903, 214. Compare also addition, dated Feb. 17, 1902, to Fr. Pat. 315,888; this Journal, 1902, 1457.—T. F. B.

Zinc; Production of —— [*in a Blast Furnace*]. O. Nagel. Fr. Pat. 322,253, May 13, 1902.

The charge, mixed with coke or other carbonaceous fuel, is reated in a blast-furnace with strongly heated water-gas, which is practically free from oxidising or inert gases. The zinc vapours so produced, are subsequently cooled in a chamber filled with water-gas.—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Zinc-Lead Accumulators. O. Grabau. Elektrotechn. Zeit., **23**, 571—573.

The author finds that a cell in which the elements are lead peroxide, a mixture of zinc sulphate and sulphuric acid, nd zinc amalgam, gives an E.M.F. of 2·1—2·4 volts. The weight of the cell is small, whilst its resistance is greater than that of a lead accumulator.—A. S.

Nitrogen; Combustion of ——, *to Nitric Oxide in the Electric Flame.* W. Muthmann and H. Hofer. Ber., **36**, [2], 438—453.

The apparatus used in the authors' experiments consisted of glass globe having four inlet tubes arranged at right ngles. Through two of these were introduced the electrodes, consisting of platinum-tipped copper wires, which assed through tightly-fitting corks so that the distance etween the points could be varied. Through the third the air was led from a gas-holder, and the fourth communicated with two large towers filled with beads, serving as a water scrubber. An induced current of 2,000—4,000 volts and 0·05—0·15 ampère, obtained by means of an alternating-current dynamo and a transformer, was employed. Under these conditions the electric discharge does not take the form of a spark, but of a flame, which burns without noise, flickers in draughts like a candle flame, and may be blown out. An intense smell of nitrogen peroxide is soon perceived, but the formation of ozone cannot be detected. The reaction consists simply of the oxidation of nitrogen. Experiments showed that on passing air through the globe, the amount of nitric acid produced in unit time is approximately proportional to the rate of flow of the air through the flame; a condition of equilibrium obtains in the composition of the gaseous mixture produced, the proportion of nitric oxide in the mixture being fairly constant with any given temperature. The higher the temperature, *i.e.*, the closer the points of the electrodes, the higher is the proportion of nitric oxide found. The authors regard the reaction as being purely a thermal effect. The presence of halogens in the air did not appreciably affect the results.

With reference to the economic aspects of the matter, the authors found that at a temperature of about 1,800° C., the air, after treatment, contained 3·6 per cent. by volume of nitric oxide. To produce a gramme-molecule (30 grms.) of nitric oxide, therefore, there would be required 21,600 cals. for the heat of formation; 13,800 cals. to heat the nitric oxide to 1,800° C.; and 382,260 cals. to heat the non-utilisable air to 1,800° C.—a total of 417,660 cals. This is equal to 0·4 kilowatt-hour, or about 0·5 horse-power-hour. Taking the cost of 1 horse-power-hour as 2 Pfennige, and assuming all the nitric oxide to be converted into nitric acid (by oxidation in the presence of water), 1 kilo. of nitric acid would cost 16 Pfennige. As the present market price of nitric acid, in the form of the 50 per cent. acid, is 70 Pf. per kilo., it would appear that the competition of acid made by the electric process with that made from nitrate of soda is not altogether impossible. There are, however, many difficulties in the way of the electrical method: a loss of energy, when working with such voltages, is unavoidable; it is difficult to pass the air through the flame at an economical speed, without blowing the flame out; the conversion of nitric oxide into nitric acid is not easy, and would become incomplete when a certain concentration of solution was reached.—H. B.

Copper Salts; The Curves of Decomposition of Solutions of ——. M. E. Heiberg. Zeits. f. Electrochem., 1903, **9**, [7], 137—138.

Bose (see this Journal, 1898, 1053) and Coehn have, independently, shown that the current strength increases (under the conditions of the experiments tried) at a somewhat lower voltage (by 0·1 volt) than corresponds to the ordinary decomposition point on the cathode decomposition curve of the solution. Experiments with copper sulphate, commercial and pure, and copper nitrate, acidified with sulphuric acid under various conditions, showed that all exhibited the same lower decomposition point, but a copper sulphate solution which had previously been heated with metallic copper, and was, therefore, in the condition most likely to contain cuprous salts, showed the point the most markedly, and, indeed, only this point was observed on the curve. On the other hand, the point almost disappears if several decomposition curves are taken in rapid succession in the same small volume of solution. Silver voltameters are often reported as giving an abnormally heavy deposit after they have been in use for some time, and this is said to be due to the formation of a sub-salt of silver. But no indication of a lower point could be found in the electrolysis of silver nitrate.—W. G. M.

English Patents.

Insulating Compounds; Electric ——, *for Conductors and the like, and in the Method of applying the same.* The British Thomson-Houston Co., London. From E. Thomson and J. G. Callan, both of Massachusetts, U.S.A. Eng. Pat. 2,264, Jan. 28, 1902.

The conducting wires are covered with a film of rubber or other adhesive next the metal, which is then coated with a number of films of an adherent non-explosive cellulose ester or acetate, preferably the tetracetate of cellulose; or a waterproof heat-resisting compound of structureless cellulose may be employed.—G. H. R.

Insulating Material; New or Improved ——. J. G. Maardt, Copenhagen. Eng. Pat. 5118, Feb. 28, 1902.

A MATERIAL suitable for heat and electrical insulating purposes, is obtained by saturating cork or peat dust, or the like, with a solution of water-glass (sodium silicate), moulding the mass, and then boiling it in a solution of calcium chloride or other suitable chloride. The hardened mass is afterwards washed.—E. S.

Fuses: Electri. ——. S. Z. de Ferranti, London. Eng. Pat. 7,039, March 22, 1902.

A FUSIBLE element is embedded in a material such as plaster of Paris, capable of absorbing and retaining moisture from the atmosphere, and forming a badly-conducting path for the momentary extra current induced when the fuze blows. Vents are provided in the embedding material at the ends of the fusible element, which is enclosed in a metal case insulated from the material, which may also be structurally reinforced to prevent fracture when the fuze blows.—G. H. R.

Conducting Materials for Electricity, applicable more particularly for Use in the Rubbing or Sliding Contacts of Dynamos and Electric Motors. [Metallic Coating.] V. Löwendahl, Stockholm. Eng. Pat. 17,002, July 31, 1902.

GRAINS of carbon are coated with metal, and are subsequently compressed, with or without the application of heat, so as to cause the grains to adhere together mechanically in a compact mass, of which electric conductors are then formed.—G. H. R.

Electro-Chemical Generator. C. H. Grahnm, Philadelphia, G. D. Bouton, Philadelphia, and H. S. Amwake, Camden, N.J. Eng. Pat. 13,749, June 17, 1902.

A ONE-FLUID cell, fitted with a baffle or screen between the electrodes, insulated normally from them, and entirely surrounding one electrode.

The baffle may be of any conducting material, providing it is a better conductor than the electrolyte, so that while the flow of the current is accelerated, the electrolyte in circulation takes a devious course, its action being thus retarded.

The baffle is moveable between the electrodes, and its position is adjusted so that the rate of reducing action of the cell does not exceed that at which the current is being supplied by the generator.—T. F. B.

Chlorates and Perchlorates of the Alkali Metals; Producing ——. P. Threlfall, Edgbaston, and G. E. Wilson, Kidderminster. Eng. Pat. 2987, Feb. 5, 1902.

SEE U.S. Pat. 716,789, 1902; this Journal, 1903, 99.
—G. H. R.

UNITED STATES PATENTS.

Battery: Galvanic ——. [*Revoluble Element.*] H Halsey, New York. U.S. Pat. 719,659, Feb. 3, 1903.

THE battery case contains a number of independent cells, each containing an excitant, a horizontally-mounted rotatable shaft journalled on a pair of bearings, and an independent revoluble carbon element having gear teeth cut in its circumference, mounted on the shaft, and immersed in the electrolyte. There is an independent driving shaft common to all the cells, and independent connections from it extending to the movable element in each cell, whereby movement of the shaft causes movement of the elements of all the cells. A receptacle contains a body of mercury, which is in electrical contact with the independent shaft, and a conductor is in contact with the mercury. An open-ended receptacle of porous material containing a depolariser to be gradually mixed with the electrolyte extends into each cell.—G. H. R.

Battery; Electric ——. [*Removal of Precipitates.*] H. Halsey, Assignor to Halsey Electric Generator Co., Jersey City, N.J. U.S. Pat. 719,660, Feb. 3, 1903.

IN combination with the electrolyte, a number of elements are concentrically arranged, one of which can be rotated, and carries a spiral brush contacting with the other. Means are provided for depolarising the elements and for collecting and insulating precipitates formed in the electrolyte in an adhesive insulated mass at the bottom of the cell, against which a flow of the electrolyte is established. The rotatable element is carried on a vertically-mounted shaft, in the upper end of which is formed a cup containing fluid-conducting material, into which a stationary contact projects.
—G. H. R.

Battery; Electric ——. H. Halsey, New York, Assignor to Halsey Electric Generator Co., Jersey City, N.J. U.S. Pat. 719,661, Feb. 3, 1903.

A NUMBER of cylindrical elements arranged concentrically, rest on the bottom of a casing, on the cover of which a shaft is mounted, carrying one or more spiral brushes mounted on an arm pivoted horizontally, and which project into the space between the elements. Means are provided for rotating the shaft, and for moving the brushes around the channel between the elements at a determined rate of speed.—G. H. R.

Voltaic Cell [Negative Electrode]. M. E. Conrad, Atlantic, Iowa. U.S. Pat., 719,752, Feb. 3, 1903.

THE cell comprises a receptacle for the electrolyte, and positive and negative electrodes, the latter being composed of a metallic oxysulphide (preferably of iron), which combines with the hydrogen of polarisation to form sulphuretted hydrogen and depolarise the cell.—G. H. R.

Electrolytic Cell. R. Grisson, Hamburg, Germany. U.S. Pat. 719,791, Feb. 3, 1903.

THE transforming or conducting cell contains a suitable electrolyte and the electrodes, which latter have no vertically disposed active surfaces. One of the electrodes is o aluminium, and placed so as to prevent the immediate escape of gas-bubbles formed on its surface, and both electrodes present surfaces to the electrolyte which do not readily release gas bubbles formed in it.—G. H. R.

Electrolytic Apparatus [Cathode]. C. J. Reed, Philadephia, Pa., Assignor to the Security Investment Co U.S. Pat. 719,870, Feb. 3, 1903.

THE cathode consists of a vertical plate of conductin material not easily destroyed by mercury, and is adapted t receive an electrolytic deposit of a highly electropositiv metal. The plate may be amalgamated, or adapted t become so and it has horizontal or longitudinal grooves receptacles or channels formed at various heights abov the bottom in or upon both its faces, which project inward and downwards, and contain mercury in contact with th plate. The grooves may also be U-shaped, or the plate may have integral horizontal channels on both faces fo retaining mercury in contact with the plate against th action of gravity. The electrodes contain lead perox and the electrolyte consists of a salt of a highly electropositiv metal, such as zinc.—G. H. R.

Electrolytic Apparatus [Cathode]. C. J. Reed, Phil delphia, Pa., Assignor to the Security Investment C U.S. Pat. 719,871, Feb. 3, 1903.

THE cathode, which is contained in a receptacle, consists of o or more vertical copper plates, each having on its surface coherent covering of amalgam, consisting of a mixture mercury and lead. Or the cathode may be a vertic conducting framework provided with one or more areas amalgamated mercury and a metal more highly electr positive than the framework, the amalgam having on surface an electrolytic deposit of a still more highly electr positive metal.—G. H. R.

Electrolytic Apparatus [*Cathode*]. C. J. Reed, Philadelphia, Pa., Assignor to the Security Investment Co., Pa. U.S. Pat. 719,872, Feb. 3, 1903.

The apparatus comprises anodes, an electrolyte containing a zinc salt, and a number of vertical amalgamated cathode plates connected to a common conductor, contained in a single cell, and each provided with vertical capillary grooves on their surface to facilitate the upward movement of mercury. Each plate is divided by approximately vertical slots into separate areas, provided at the bottom with separate receptacles of inert material containing mercury in contact with the respective areas.—G. H. R.

Electrolytic Apparatus [*Electrode*]. C. J. Reed, Philadelphia, Pa., Assignor to the Security Investment Co., Pa. U.S. Pat. 719,873, Feb 3, 1903.

The battery comprises a cell for the electrolyte, and positive and negative electrodes, one of the electrodes consisting of a vertical plate made up of a conducting framework or support, and a number of amalgamated panels, at different heights, electrically connected to it, each panel being provided with a receptacle of inert material containing mercury in contact with the panel, the edge having inclined portions terminating at the receptacle, and being provided with a trough for each portion. Other forms of the electrode are described.—G. H. R.

French Patents.

Storage Batteries [*Active Material*]. W. E. Winship. Fr. Pat. 321,922, June 10, 1902.

See U.S. Pat. 703,875, 1902; this Journal, 1902, 1031.

Galvanic Batteries; Impts. in ——. C. H. Graham and G. D. Bonton. Fr. Pat. 322,182, June 17, 1902.

See Eng. Pat. 13,749 of 1902; page 304.—T. F. B.

Storage Battery [*Saline Electrolyte*]. A. Genard and E. De Marcy. Fr. Pat. 322,283, June 19, 1902.

The positive active material is contained between the xternal wall of a tubular porous vessel, and a wall of lead orming the positive electrode and the vessel, the negative lectrode being placed in the central space of the porous ube. Saline electrolytes are employed, such as the sulphates f cadmium, manganese, copper or zinc, or zincate of otassium, &c. A variation consists in interposing a sheet f lead between the external wall of the porous tube and ie active material, or several positive electrodes may be nclosed concentrically in each other. The negative ectrode may be of carbon or of lead. In the latter case is a perforated lead tube, having projections, curves, riations or similar modifications of the surface, and is rovided with a ledge, by which it rests on the bottom of ie porous pot, which is covered with a layer of mercury to stablish contact with the negative electrode, which may so take the form of a bundle of fine ribbons of lead. Or ie latter may be employed as a positive electrode, and the bular electrode as the negative one. A negative electrode ecially suitable for use with acid electrolytes may be of ongy lead contained in a porous pot of its own and lmitting of a conducting lead core, or the negative aterial may be applied to the porous wall of the positive ectrode, being contained between its own internal wall and e external one of a central lead tube. Another arrangeent consists in employing a porous vessel in the shape of block capable of absorbing the electrolyte, and containing central hollow in which is placed the negative electrode rrounded by its active material.—G. H. R.

arbon Articles; Manufacture of ——. C. M. Hall. Fr. Pat. 321,173, June 7, 1902.

e Eng. Pat. 12,681, 1902; this Journal, 1902, 1031.
—G. H. R.

sulating Material and Process of Manufacture. [*Silk.*] E. Meyer. Fr. Pat. 322,301, June 20, 1902.

is claimed that a new industrial product is formed by sing silk in threads into a carding machine, from which issues in determinate layers, the thickness of which can be regulated, and passes over a felt-covered drum, where it is impregnated with a binding substance, after which, on leaving the drum, it is formed into plates in a hydraulic press, or may be pressed directly into any desired shapes. The silk may also be ground up in a pulping machine, mixed with a suitable adhesive, and afterwards moulded by pressure into sheets or any other form.—G. H. R.

Gases; Apparatus for the Electrolysis of Absolutely Pure ——. Addition by Hazard-Flamand and Palluadre, dated June 10, 1902, to Fr. Pat. 280,375, by Verney, Aug. 6, 1898.

This specification, which is an addition to a former one (see Eng. Pat. 12,765, 1898; this Journal, 1899, 691) gives some modifications and simplifications of the apparatus previously described.—G. H. R.

Ozone; Apparatus for the Production of ——. J. H. Lavollay and R. Marie. Fr. Pat. 322,240, June 19, 1902.

The process consists in the electrolysis of water, rendered conductive by sulphuric acid. The negative electrode is of lead, exposing a large surface, and the positive electrode of platinum wire, a mm. or less in diameter. The apparatus comprises a series of compartments, charged with sulphuric acid of 1·16 sp. gr., each compartment containing a lead coil for passage of cold water, serving also as an electrode. A centrally placed cylinder open at the top, and reaching nearly to the surface of the liquid, contains a closed glass tube enclosing a copper wire, having a platinum wire terminal fused into the glass and extending into the liquid, constituting the positive electrode. The cylinder is surmounted by a cap or hood, acting as a liquid seal, communicating with a passage for the ozonised oxygen evolved.—E. S.

Caustic Alkali and Bleaching Liquid; Process and Apparatus for the Simultaneous Manufacture of ——, *by Electrolysis.* H. Seibert and G. Tempel. Fr. Pat. 322,317, May 1, 1902. VII., page 297.

(*B.*)—ELECTRO-METALLURGY.

Electric Furnace; Steel Production by the Stassano Process in the ——. H. Goldschmidt. Elektro-techn. Anzeig., **19**, 3181—3183. Zeits. f. Elektrochem., 1903, **9**, [6], 128—130.

Experiments have been made with a small Stassano plant at Darfo, north of the Lake of Iseo. The charge of ore, flux, and charcoal was heated by means of an electric arc. The current, varying at first up to 800 ampères at 80 volts, increased to 1,000 ampères at 100 volts. After 1$\frac{1}{6}$ hours from the start, the current was one of 600 ampères at 70 volts, rising again to the previous maximum after 1$\frac{2}{3}$ hour. The metal was tapped after a run of two hours in all. The charge used weighed 70·25 kilos., and contained: In the ore, 46·5 kilos. of Fe_2O_3; 0·3, MnO; 1·9, SiO_2; 0·25, CaO + MgO; and 0·85, H_2O. In the flux: 3·2 kilos. of CaO; 0·2, MgO; 0·05, SiO_2; 0·3, Al_2O_3 + Fe_2O_3; and 2·7, CO_2. In the carbon: 0·7 kilo. of C; 0·3, ash; and 0·4, water; and in admixtures: 3·5 kilos. of C; 2·5, hydrocarbons; and 0·1, ash. From this there were obtained 30·8 kilos. of malleable iron, containing 28·3 grms. of Mn; 15·2 grms. of S; 2·77 grms. of P; and traces of Si. The percentage of iron recovered was therefore 94, calculated on that originally present. The consumption of electrical power was equal to 97·2 kilowatt-hours, or 130 British h.p.-hours; and the thermal efficiency was 61·3 per cent.

The plant was too small to allow of calculations as to cost being based upon it. The iron or steel produced is exceptionally pure.—W. G. M.

Copper and Nickel from Magnetic Pyrites containing these Metals; Process for the Production of ——. E. F. Günther, Dissert, Aachen. Zeits. f. Elektrochem., 1903, [6], 133.

The ore is concentrated to a regulus; a solution of copper, nickel, and iron is then obtained. The nickel is finally obtained by electrolysis with insoluble or soluble anodes, marketable by-products being obtained in the latter case.
—W. G. M.

Lead; Electrolytic Reduction of ——. P. G. Salom. J. Franklin Inst., 1903, **155**, [2], 107—108. Paper read at Philadelphia Meeting of Amer. Electrochem. Soc.

In the Salom process in use at the Niagara Falls works of the Electrical Lead Reduction Co., sulphide of lead ores are used as cathodes in an acid solution. The hydrogen deposited at the cathode forms hydrogen sulphide with the sulphur of the ore, and the hydrogen sulphide escapes. The apparatus used is described as resembling a pile of leaden plates, the under side of each being the anode of the cell below it, and the upper side the cathode of the cell above. With 48 cells in series a current with a pressure of 130 volts is used, and 2 lb. of lead are obtained per h.p.-hour. The lead is reduced in a spongy form, and is specially adapted to the manufacture of litharge. Accumulator plates will shortly be made from it. The chief difficulty has been that reduction is incomplete, and the degree of reduction is not constant under apparently the same conditions. Moreover, lumps of ore in the immediate neighbourhood of cathode plates were not reduced. At present about 92—95 per cent. of the sulphide is reduced. The ores treated, contained no silver. (See also this Journal, 1902, 1187.)
—W. G. M.

English Patents.

Metals; Method of Heating ——, *in Electric Baths.* J. Girlot, Jette St. Pierre, Belgium. Eng. Pat. 1961, Jan. 24, 1902.

In an electric bath, where the current passes through the article to be heated, the latter is subjected by mechanical means either to a uniform or periodically uniform movement from end to end, so that it, or any desired portion of it, is alternately plunged into and raised out of the bath, thus obtaining the necessary time for the heat to penetrate to the core by the repeated coolings of the surface. Installations are described for effecting the heating by this method of rings, bars, and straight articles.—G. H. R.

Metals; Apparatus for the Electro Deposition of ——. The Calico Printers' Association, Ltd., and W. Cotsworth, both of Manchester. Eng. Pat. 5538, March 6, 1902.

The apparatus, for the electro-deposition of metals on rollers and other articles, consists of an open vat with removable metal rails placed across the top of it, and carrying metal ball bearings supporting a disc secured to a mandrel attached by a liquid-tight joint to one end of a metal shell or equivalent, upon which the electro-deposition of metal is to be effected. Means are provided for rotating the mandrel, and for connecting the shell to it in such a manner that there is ample electrical contact, and it can be lifted in and out, and rotated, and the whole process of electro-deposition effected without change of mandrel, and without touching it by hand.—G. H. R.

Electro-Plating. [*Continuous Cathode.*] J. Bailey, Walsall. Eng. Pat. 15,735, July 15, 1902.

The cathode is in the form of a continuous chain conveyor, driven by chain wheels mounted in a horizontal plane a short distance above the surface of the electrolyte, and arranged so that the work circulates continuously between rows of anodes of greater total area, in order to obtain very rapidly a practically perfectly smooth deposit of metal on the work.—G. H. R.

United States Patents.

Electro-thermally Treating Materials; Apparatus for ——. H. Maxim, London. U.S. Pat. 719,484, Feb. 3, 1903.

The crucible has a number of electrode ports or openings on one side of it, and an opening opposite them. A number of electrodes, consisting each of an inner and outer carbon member with an interposed third member, enter the crucible through the ports, and means are provided for simultaneously and progressively withdrawing them from it. The two inner members of the electrode are adapted to move within the outer one and maintain electrical contact with it.—G. H. R.

Electric Furnace. H. N. Potter, New Rochelle, N.Y. Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 719,507, Feb. 3, 1903.

The furnace consists of a tube composed of a mixture of dry electrolytes, and provided with confronting electric-circuit terminals arranged in pairs at its opposite ends. A suitable electric generator is connected in multiple to the several pairs of terminals, and a ballast device is interposed in each multiple circuit at each of the furnaces.
—G. H. R.

XII.—FATS, FATTY OILS, AND SOAP.

Oleïc and Elaïdic Acids, and Erucic and Brassidic Acids; Isomeric Relationships of ——. A. Albitzky. J. russ. phys.-chem. Ges., **34**, 788—810. Chem. Centr., 1903 **1**, [6], 318.

In continuation of his previous work (this Journal, 1900, 357) the author has tried to ascertain the conditions under which one can obtain from an unsaturated acid through a saturated, in this case a dihydroxy acid; the unsaturated acid being of another stereoisomeric series, and how a dihydroxy acid can be converted into the stereoisomeric compound. By the action of hydrobromic acid on the dihydroxystearic acid melting at 136·5° C., not only are the hydroxyls replaced by bromine, but a portion of the dihydroxy acid is converted into the stereoisomeric compound, *i.e.*, two dibromides corresponding respectively to oleic acid and elaïdic acid are obtained, from which, by means of zinc and hydrochloric acid, the acids named can be prepared. If the dihydroxystearic acid melting at 133°—135° C. be treated with glacial acetic acid and hydrobromic acid, an uncrystallisable syrup of the acetic ester of bromhydroxystearic acid, $C_{18}H_{34}Br(C_2H_3O)O_3$, is produced, from which, by treatment with caustic potash, the dihydroxystearic acid melting at 95°—97° C. is obtained. The stereoisomeric change takes place during the formatio of the bromo-substituted acetic ester, not during the actio of the caustic potash. Thus, the dihydroxybehenic aci melting at 99° C. can be converted into the stereoisomeri dihydroxybehenic acid melting at 130°—132° C.

If the acetic ester of bromohydroxystearic acid be heate for seven hours at 180° C. with silver acetate and glacia acetic acid, and the resulting diacetic ester saponified wit barium hydroxide, two isomeric dihydroxystearic acids ar formed, the high-melting one—the starting material— i smaller quantity.

It has previously been shown (*loc. cit.*) that on melting with silver oxide, the high-melting dihydroxystearic aci is obtained from the dibromo-substituted acid from ole acid, and the high-melting dihydroxybehenic acid from th dibromo-substituted acid from erucic acid. If the bromi be substituted by hydroxyl in acid solution, different resul are obtained. The dibromo-substituted acid from elaid acid, when heated with silver acetate and glacial acetic aci is converted into the diacetyl compound, from which, l saponification with barium hydroxide or caustic potas two isomeric dihydroxystearic acids are formed. Th same result is obtained if sodium acetate be used instea of silver acetate for the preparation of the diacetyl com pound. If the dibromo-substituted acid from erucic ac be treated in the same way with silver acetate and glaci acetic acid, and the diacetyl compound formed, treat with alkalis, the two stereoisomeric dihydroxybehe acids are obtained. In the same way the dibromo-substitut acid from brassidic acid gives a mixture of the t dihydroxybehenic acids.—A. S.

Fatty Acids, Solid: Determination of the Mean Molecu Weight of ——. L. Philippe. Ann. Chim. anal. ap **7**, 447. Chem. Centr., 1903, **1**, [4], 263.

Tortelli and Pergami (this Journal, 1902, 1187) ha drawn attention to the presence of inner anhydrides lactones in fatty glycerides. In kapok oil (this Journ, 1902, 1336) these lactones are present in considera quantity, and in this case it can be readily shown that anhydrides can be produced by washing with hot wa and by heating.—A. S.

Almond Oil (Fixed); Detection of Peach-Kernel Oil in ——. A. Chwolles. XXIII., page 320.

English Patent.

Fish Waste and other Material capable of yielding Oil, Grease, or Gelatin; Apparatus for Rendering or Reducing ——. R. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 18,743, Aug. 26, 1902.

See U.S. Pats. 707,565 to 707,567 of 1902; this Journal, 1902, 1238.—C. A. M.

French Patents.

Oil, and Means of Producing it. A. Hallet and M. Spinnael. Fr. Pat. 321,918, June 10, 1902.

The oil is a mixture of palm and palm-kernel oils obtained by crushing the entire fruit of *Elaeis Guinacensis* in one operation. It has a consistency resembling that of butter, and yields 8 to 9 per cent. of glycerin, and 95 to 96 per cent. of fatty acids, including combined water. The fat melts at 29°—30° C., and the fatty acids at 43°—44° C.
—C. A. M.

Lubricating Products; Manufacture of ——. Soc. Stern Frères et Cie. Fr. Pat. 321,839, June 5, 1902.

Suitable oils or fats are melted, and incorporated with animal, vegetable, or mineral fibres, and the mixtures moulded into briquettes.—C. A. M.

Lubricants; Manufacture of ——. W. F. Downs. Fr. Pat. 322,247, April 22, 1902.

A solid lubricating substance (*e.g.*, graphite) is incorporated with an oil in which it is insoluble (*e.g.*, castor oil), and the product suspended in a second oil, which is immiscible with the first oil.—C. A. M.

Candles, Ointment, &c.; Production of Substance for the Manufacture of ——. O. Liebreich. Fr. Pat. 322,026, June 12, 1902.

See Ger. Pat. 136,917 of 1900; this Journal, 1903, 149.
—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Molybdenum Blue. Gummi-Zeit., 1903, **17**, [19], 418.

Molybdenum blue is obtained either as "molybdenum indigo," MO_5O_7, by precipitating a hydrochloric acid solution of molybdic acid with tin filings, or as "blue carmine" by he action of stannous chloride on molybdic acid solution.

It is a useful but expensive pigment for india-rubber, and s said to be in no wise injurious to the material.—J. K. B.

United States Patent.

Pigment, and Process of Making same. W. J. Armbruster, St. Louis, Mo., U.S.A. U.S. Pat. 719,415, Feb. 3, 1903.

A pigment produced by mixing solutions of zinc sulphate, an alkali carbonate, and barium sulphide. (Compare U.S. Pat. 719,073, Jan. 27, 1903; this Journal, 1903, 218.)
—M. J. S.

(*B.*)—RESINS, VARNISHES.

Shellac; Analysis of ——. E. J. Parry. XXIII., page 320.

English Patents.

Varnishes; Improved Process for the Manufacture of ——. W. P. Thompson, London. From A. L. Tedesco, Paris. Eng. Pat. 3268, Feb, 8, 1902.

See U.S. Pat. 711,596, 1902; this Journal, 1902, 1544; and Fr. Pat. 318,289; this Journal, 1902, 1460.—M. J. S.

Varnishes; Manufacture of ——. E. H. Strange, E. Graham, and E. R. Burrell, London. Eng. Pat. 5402, March 4, 1902.

See U.S. Pat. 708,935, 1902; this Journal, 1902, 1239.
—M. J. S.

Varnishes; Manufacture of ——. E. H. Strange, E. Graham, and E. R. Burrell, London. Eng. Pat. 5403, March 4, 1902.

In carrying out the process described in Eng. Pat. 5402, the use of volatile solvents for copal resin, other than oil of turpentine, is claimed.—M. J. S.

Varnishes; Manufacture of ——. E. H. Strange, E. Graham, and E. R. Burrell, London. Eng. Pat. 5404, March 4, 1902.

The claim is for the preparation of varnishes consisting of solutions of hard gums or resins in volatile solvents, without the addition of linseed oil. The solutions are prepared according to the process described in Eng. Pat. 5402, the solvent for the gum being either oil of turpentine or any of the volatile liquids claimed in Eng. Pat. 5403.—M. J. S.

Drying [Lacquered Articles, &c.]; Method of ——. A. Junghans. Eng. Pat. 10,896, May 12, 1902. I., page 287.

French Patent.

Printing Ink and Varnish. A. G. Wass. Fr. Pat. 322,298, June 20, 1902.

A varnish, for use in letterpress or lithographic printing, is prepared by dissolving 20 parts of rosin in about 18 parts of petroleum of density 0·880—0·920. Printing inks are manufactured by adding colouring matters (*e.g.*, about 5 parts of lampblack) to this (38 parts).—E. B.

(*C.*)—INDIA-RUBBER, &c.

Molybdenum Blue [Pigment for India-Rubber]. XIII. A., col. 1.

Sulphur Chlorides, especially the so-called Sulphur Dichloride. O. Ruff and G. Fischer. VII., page 296.

English Patent.

Sponge; Manufacture of Artificial ——. H. H. Lake, London. From A. Straus, New York. Eng. Pat. 12,473, May 31, 1902.

See U.S. Pat. 702,162; this Journal, 1902, 981.—F. H. L.

French Patent.

Vulcanisation; Process and Apparatus for ——. W. W. Wittenberg, E. Brock, and E. Koch. Fr. Pat. 321,967, April 29, 1902.

See Eng. Pat. 9625, 1902; this Journal, 1902, 1286.
—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Ivory and Bone Bleaching. Report by A. Livache on Coinon's process. Bull. Soc. d'Encouragement pour L'Ind. Nat., 1903, **104**, [1], 14.

The original method of bleaching ivory and bone consisted in exposing the damp material to the action of sunlight, but this process was necessarily very slow.

Clocz suggested a preliminary treatment with turpentine oil or lemon oil, before exposing to sunlight; this method, which was used by Grandon, about 1867, was rapid, but the results obtained were not permanent.

In 1882 the use of hydrogen peroxide was first attempted, and, later on, Coinon used this agent in conjunction with sunlight.

The damp bone or ivory, cut to the required size, is exposed, in closed glass vessels, to the action of sunlight for times varying between 20 days in summer and 30 days in winter, after which it is quite dry, and partially decolorised.

The material is now treated with a solution of hydrogen peroxide (about 6 vols.) at a temperature of 30°—35° C. in sunlight for about six days, after which it is subjected to a second treatment, for one to three days, with more concentrated hydrogen peroxide at a temperature of 35° C. This treatment bleaches the material right through. The bone or ivory is finally dried in glass boxes in sunlight for three or four days. The bleaching obtained by this process is permanent.

The author states that, in ivory bleaching, the hydrogen peroxide must be free from chlorine. In addition to this, when sodium silicate is employed to neutralise the hydrogen peroxide much better results are obtained than by the use of ammonia —T. F. B.

Tannin; Determination of ——. H. Cormimboeuf. XXIII., page 321.

English Patent.

Leather, Substance resembling ——; *Process and Apparatus for Making.* H. Karle, Seckenheim, Germany. Eng. Pat. 17,585, Aug. 11, 1902.

Fibrous substances, such as wadding fleece, are impregnated with a liquid made by mixing equal quantities of the following mixtures: (*a*) poppy oil boiled with roasted copperas (3 per cent.); (*b*) fibrin glue solution (80 parts), fish oil (10 parts), camphor (6 parts), potassium carbonate (2 parts), tan-liquor (2 parts), freed from excess by means of pressing rolls, passed through a drying stove, and then moistened with a liquid made from equal bulks of rubber solution, boiled linseed oil thinned with naphtha, and borneo "mort" or resin. The fleece is then dried thoroughly and finished. A special plant for the purpose is described in detail.—R. L. J.

United States Patent.

Leather; Manufacture of Artificial ——. L. G. Naert. Audenarde, Belgium. U.S. Pat. 719,787, Feb. 3, 1903.

A roughened, woolly, or felted surface is formed upon the fabric serving as a base, and the latter is then impregnated with a dilute solution of xanthate of cellulose, either under ordinary pressure or *in vacuo*, the cellulose is precipitated out, and the whole structure is impregnated with rubber or gutta-percha solution.—R. L. J.

French Patents.

Rapid Tannage; Plant for ——. P. B. Leroy and B. Bruneau. Fr. Pat. 322,010, June 12, 1902.

This plant is of the drum type, and is designed so that the tan liquor is constantly filtered, foreign matter and exhausted liquor are removed, fresh liquor is introduced, and the strength of the vat gradually increased, all without stopping the machinery.—R. L. J.

Finishing Leather; Process for ——. C. J. Miller. Fr. Pat. 322,173, June 17, 1902.

To improve the appearance of the leather, it is finished in a press, between plates, one or both of which are heated by steam or gas. The machine described is a hydraulic press in which the top plate is heated, and the conditions cited as an example are: Temperature of plate, 278° F.; pressure, 2¼—4 kilos., duration of pressure, 5 seconds to 2½ minutes. —R. L. J.

XV.—MANURES, Etc.

Ammonium-Nitrate-Molybdenum Solution for the Determination of Phosphoric Acid; Preparation of ——. A. Mercier. XXIII., page 320.

XVI.—SUGAR, STARCH, GUM, Etc.

Diffusion Juice [Sugar]: Lehmkuhl Process for the Purification of ——. Deutsch. Zuckerind., 1902, [6], 206.

V. Lippmann thought it proved that the smaller amount of lime required is due to the precipitation of albuminoids by sulphate of alumina, and he has obtained no satisfactory answer as to what becomes of the sulphuric acid set free. The excellent quality of the beet-roots worked at Dobeln must have had the greatest part in the results obtained.

Drenckmann urged that sulphate of alumina and alum have been used previously, and abandoned probably on account of their invertive and neutralising action. He found sulphate of alumina and alum both cause inversion, which increases rapidly with rise of temperature.

V. Niessen stated that Lehmkuhl is in accord with theory in causing the coagulation of albuminous matters by salts and acids, for Herzfeld has shown that lime only coagulates a small quantity of these substances. The good effects of the process are in great part due to the action on cellular bodies.

Drenckmann thought that the coagulum produced by the salts should be separated before lime is added, to prevent the re-solution of albuminoids by alkali phosphates set free in the calcic defecation.

Lehmkuhl replied that alumina is rendered insoluble, and is separated in the sludge; the acid remains in solution, and combines with the alkalis of the juice to form soluble sulphates. This quantity of salts, however, is not as great as that which the old lime process introduces by the products of destruction and of decomposition of albuminoid bodies. Further, these products, acid amides, are strongly melassigenic, while sulphates are not, or are much less so. Although the coagulation of albuminoids occurs at 90° C. in presence of salts or acids, fear of inversion is unfounded, for the time of contact with the juice is not sufficiently prolonged for that.—L. J. de W.

Double and Triple Saturation; Experiments on ——. K. Andrlik and V. Staněk. Listy cukrovarnické, 1902, **21**, 133. Chem. Zeit., 1903, **27**, [11], Rep. 30.

The authors have previously shown that the sludge from the third saturation contains only small quantities of organic matter, but among practical men the opinion prevails that for the purpose of obtaining a better product and more satisfactory working, the third saturation is valueless. In order to ascertain the truth on this question, the authors have instituted new laboratory experiments in which th effects of purification of one and the same juice by th two methods have been determined. No matter whethe the juice operated on is dilute or concentrated, chemica analysis shows no appreciable difference between the pro ducts resulting from the two methods of treatment, whil the difference in colour is but slight. Using doubl saturation, the ash contains up to three times as muc magnesia as that obtained when the triple method i employed. In the latter case, the mean amount of dr matter per 100 c.c. of juice is 0·767 grm., and the pe centage of organic matter in the sludge 5·50, whilst th corresponding numbers for the double saturation trea ment are 0·815 grm. and 5·39 respectively. The thir saturation removes 0·002—0·003 grm. of organic matte per 100 grms. of sugar; the sludge formed amounts t 0·061 grm. per 100 c.c. of juice. The greatest effe is not obtained by using the greatest quantity of lime. —T. H. P.

"*Affination*" [*Sugar Refining*]. J. Recht. Bul l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [7 778—782. From Oesterr. Ungar. Zuckerind., 1902, [5 753.

It is the operation preceding refining proper which is term affination, and the author describes the work at the Paris refinery in 1900. In this works the only sugar melted is fine and pure granulated, the method of working bei possible only with such sugar. The sugar gives a cle liquor at 24° Baumé, which is filtered through char, t filtrate being boiled to a small grain and run off very slo The massecuite falls on two endless bands, on which it spread while the bands are running. A little further on pipe supplies clairce in measured quantity, and the b carries the mass into a room, where the mother syrup and clairce are removed, the air drawn in being warmed so as to heat the sugar to a temperature suitable for drying. It is then dried at 50° C., and cut up into cubes. The whole success of the operation consists in obtaining a massecuite working easily and clarifying well. The melted sugar must have been freed from all colouring matters, and the char must give it brilliancy.

By an ideal affination it would be possible to work up the purified sugars directly into refined sugar, by the process of Czerykowsky or of Ritter (Ger. Pat. 48,145), avoiding remelting, filtering, and boiling. In any case, this point is not yet reached; the processes which have eliminated the char department are still incompletely matured, although great progress has been made.

The object of affination is to increase the purity of the sugar and obtain a residuary syrup as free as possible from it, corresponding to a maximum yield of washed sugar.

This result is attained by washing in tanks by the Steffen process, whereby a pure white granulated sugar is obtained, and a drainage syrup of molasses quotient. According to Mittelstaedt, this process has the advantage over centrifugals of a saving in plant, and a better mechanical effect of the washing syrup.

The grain of the sugar to be washed, however, must be regular for normal results to be obtained. Viscous sugars and those which contain a mixture of large and small crystals interfere seriously with the success of the costly installation of the Steffen process.

The inequality of the grain of commercial sugars led to the Langen process of affination (Ger. Pat. 93,684), wherein unsaturated refinery syrups or even water, may be used with heat to dissolve the smaller grain, and the mass formed is boiled in order to build the sugar dissolved on the larger grain, after which the syrup may be spun off in centrifugals.

Affination of raw sugar by mixing and centrifugalising, may be made, by mixing the sugar with warm syrup of such consistency as to dissolve only the fine grain, the mother syrup adhering to the crystals being rendered less viscous, and capable of being perfectly separated from the washed crystals by the following methods:—(1) By addition of syrup; (2) injection of water; (3) dry vapour; and (4) superheated steam.

The syrup process has become obsolete, being everywhere replaced by a final washing with water or steam.

In the Seifert process, paraffin oil is used instead of the final syrup.

Where water is used, it is strongly cooled and sprayed in the centrifugal at a pressure of five to seven atmospheres by a Körting or Fuchs injector for 75 to 90 seconds, giving a yield of 80 to over 89 per cent. of sugar of about 98 nett from raw sugar of 88 nett.

The sugar obtained is very moist, but is not sticky, and is particularly suitable for refining.

Many factories use ordinary steam from the boilers, which is dried twice: once before reaching the centrifugal, and again in the centrifugal itself, as in the arrangement of Natanson. The action of steam as an affining agent is quite different from that of water. The syrup and adhering moisture are heated by the steam, rendered less viscous, and the separation of the syrup formed is facilitated. The yields are very various, being dependent on the grain and other properties. In few factories do ideas coincide as to the action of the steam, pressures from 6 to 0·6 atmospheres being employed, and some even inject air so as to produce a fog. It is only recently that light has been thrown on these opinions. It appears that steam should only be used in a state of extreme division, that is, only in the gaseous state. There should be no condensed or entrained water allowed to reach the centrifugal, and besides heating the syrup, the steam should also drive it with some force towards the perforations in the basket. Thus, the use of superheated steam is indicated.

In the Zahn process (Austrian Pat. 46/4892) the steam is heated to 180° C. at 0·3 atmosphere. The yield with superheated steam is higher than with ordinary steam or with water injectors, and work is absolutely sure and independent of the workman.—L. J. de W.

Molasses; The Baker-Bethany Process for the Extraction of Sugar from ——. E. Silz. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [6], 611—619.

According to Aulard the Baker-Bethany process, as well as the separation process, have for their object the formation of tricalcium sucrate, but the quantity of lime required in the former only slightly exceeds the theoretical limit. Whilst the old separation process demands 70 to 120 kilos. of lime to 100 of molasses, the reaction may now be effected with 30 to 35 kilos. of lime. Thus the injurious action of an excess of lime is avoided. This excess of lime not only develops heat during hydration, necessitating special apparatus for cooling, and extra water, but the reaction is never perfect in presence of the constantly renewed excess of lime. The sucrate thus formed, is also mucilaginous and does not filter well. As the lime continues to slake during filtration, the heat developed, sets free sugar, which is lost in the mother-liquor.

The sucrate produced in the Baker-Bethany process, containing a minimum of hydrated lime, is granular, and filters with remarkable facility, allowing a perfect removal of the mother-liquor. The juice obtained, is purer and brighter than beetroot juice. 100 kilos. of molasses containing 48 per cent. of sugar give about 93 kilos. of syrup at 50° Brix, corresponding to about 50 kilos. of massecuite with 7 per cent. of water. To obtain this massecuite 43 kilos. of water will have to be evaporated.

There will be obtained 43·2 kilos. of sugar as massecuite of 92 of purity. This massecuite, combined with the beetroot work, will give 34 kilos. of raw sugar at 88°, 8 kilos. at 75°, and 7 kilos. of molasses.—L. J. de W.

Sugar Works and Distillery Products; Determination of Ammonia in Vegetable Products, particularly in Beetroots and ——. E. Sellier. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [6], 649—679.

The determination of ammonia may be made (1) By direct displacement, by treating the product to be analysed, hot or cold, with a fixed base, and receiving the ammonia set free, into standard acid. The ammonia is then determined either by titrating the acid not neutralised, or by precipitating as ammonium chloroplatinate and weighing the platinum which entered into combination. (2) By previous precipitation and determination of the separated ammonia by the weight of the precipitate or one of its elements, or by displacing it as in (1). (3) By colorimetry; this process is only applicable where the ammoniacal nitrogen is present in very small quantity, and when a previous separation by distillation offers no inconvenience.

As regards the precipitation with phosphotungstic acid, the author concludes that the precipitation of the ammonia is more complete as the time of contact is prolonged and the quantity of acid is greater. Even with a contact of 48 hours and an acidity of 20 per cent., the whole of the ammonia used, is not found (94·4 per cent. as maximum). The phosphotungstic reagent is not a very sensitive reagent for ammonia, since the re-solution of asparagine must have reached a certain degree before there is precipitation, but, when the acidity exceeds 15 per cent., precipitation is effected, although always incompletely. An excess of reagent is necessary for heavier precipitation, as is also the presence of sulphuric acid. The attack of asparagine in the cold by sulphuric acid is more pronounced by prolonged contact and increased acidity. Analogous experiments with glutamine were not made, as it appeared that the results obtained, condemned the use of phosphotungstic acid for determining ammonia in presence of easily decomposable acid amides; in other cases the results were lower than the truth.

Precipitation of ammonia as chloroplatinate is not applicable to the determination of this body in vegetable products, since betaine and choline are also precipitated.

The distillation with carbonate of soda renders the colorimetric method inapplicable to vegetable products.

None of the processes applied, give exact results, and they cannot be used even for qualitative research. The conclusions previously drawn as to the existence and state of combination of ammonia in vegetables can no longer be considered exact as regards the comparison with the quantities of ammonia existing in sugar works and distillery products at different stages of manufacture.—L. J. de W.

Sugar Works Products ; Products formed by the Kjeldahl Treatment of ——. K. Andrlik. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1902, **20**, [6], 706—707. From Böhm. Zeits. 1902, 667.

When nitrogenous substances are treated by the Kjeldahl process, but without the addition of oxidising reagents, for a time, long enough to obtain decolorisation, ammonia is not always quantitatively produced, but in many cases amines are also formed. The substances which give the whole of their nitrogen as ammonia are animal albumin, the substance of horns, aspartic and uric acids, &c.; those which give both ammonia and amines are the amines themselves, and those which easily separate an amine group by the action of sulphuric acid, as betaine, caffeine, diethylurea, &c. It is thus possible to determine if a substance contain amines or a body having amine groups. The author has found that the borders of the leaves of beetroots yield amines when treated with sulphuric acid.—L. J. de W.

Cane Sugars and Syrups ; Determination of Water in ——. H. C. Prinsen-Geerligs. XXIII., page 321.

Syrups ; Brix Determination of ——. H. C. Prinsen Geerligs. XXIII., page 321.

Reducing Sugars ; Iodometric Determination of —— M. Buisson. XXIII., page 321.

French Patents.

Sugar Beet and other Sacchariferous Materials ; Process and Apparatus for the Preservation of ——, *by Sterilising and Drying the Fresh Slices.* J. C. F. Lafeuille. Fr. Pat. 322,284, June 19, 1902.

The process described, consists in treating the fresh slices with very hot (500—600° C.) sterilising gases coming from a furnace and mixed with sulphur dioxide or other sterilising gas; these gases traverse an endless, continually moving apron on which the slices are spread in a uniform layer. The apparatus is shown in longitudinal section in Fig. 1 and in transverse section through A B in Fig. 2. F represents the furnace hearth; A the flues by which the hot gases pass to the lateral flues A^1 on either side of the furnace, and thence to A^2 below the upper part B of the moving apron; the latter, which is moved by the drums C and C^1 round which it passes, is provided along its whole length with small rollers working on lateral angle irons; the middle of the upper part of the apron is also supported by T-irons. On entering the channel in which the apron moves, the hot gases are directed by the dampers D by which the section of the passage is modified; P represent pyrometers. Other dampers, H, H^1, H^2, and H^3, situated at the end of the furnace where the flues E communicate with the chimney G. also serve for regulating the passage of the gases over the slices.—T. H. P.

Fig. 1.

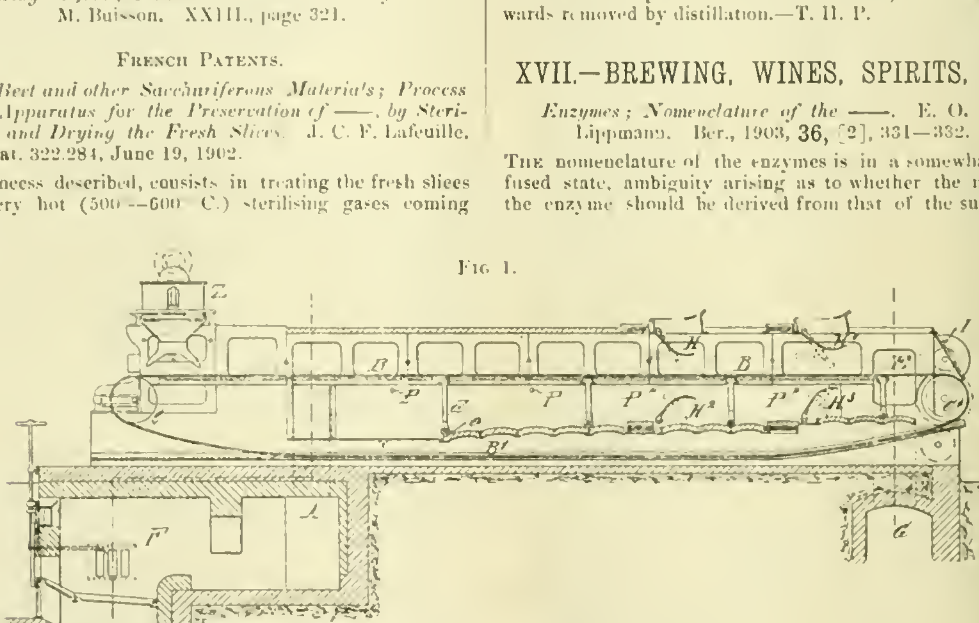
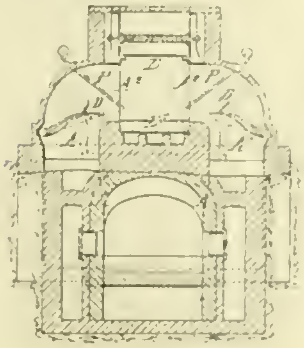


Fig. 2.



Starch and Materials containing Starch; Treatment of ——. A. P. Anderson. Fr. Pat. 321,842, June 5, 1902.

See Eng. Pat. 13,353, June 12, 1902; this Journal, 1902, 1189.—T. H. P.

Soluble Starch ; Process for Preparing ——. L. Blumer Fr. Pat. 322,206, June 18, 1902.

The starch is slowly heated, for five or six hours, to 115° C. with 1 per cent. of a volatile acid, which is afterwards removed by distillation.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Enzymes ; Nomenclature of the ——. E. O. von Lippmann. Ber., 1903, **36**, [2], 331—332.

The nomenclature of the enzymes is in a somewhat confused state, ambiguity arising as to whether the name of the enzyme should be derived from that of the substance acted upon, or from that of the substance produced. Such ambiguity has occurred, for instance, in the use of the term "maltase." Except in cases (such as invertase, emulsin myrosin, zymase, &c.) where no doubt can exist, the author

Name of Enzyme.	Parent Substance.	Product.
Amylo glucase	Starch	*d*-Glucose.
Dextrino-maltase	Dextrin	Maltose.
Cellulo-glucase	Cellulose	*d*-Glucose.
Trehalo glucase	Trehalose	*d*-Glucose.
Lacto-glucase	Lactose (milk-sugar).	*d*-Glucose (and *d*-galac tose).
Melecito-turanase	Melecitose	Turanose (and *d*-glucose
Stachyo-galactase	Stachyose	*d*-Galactose (and othe monoses?).
Carubino-mannase	Carubin	*d*-Mannose.
Inulo fructase	Inulin	*d*-Fructose.
Rutino-rhamnase	Rutin	Rhamnose.

proposes that the names of the enzymes should be compounded from both those of the parent substance and the product. The proposed system is illustrated by the examples from the table in the original given on page 310.

In the case of lipolytic enzymes the name of the fat hydrolysed might be compounded with the word "glycerase."

—J. F. B.

Enzymes in Yeast Life; The Part played by ——.
M. Delbrück. Woch. f. Brau., 1903, **20**, [7], 65—68.

Diastases and Peptases.—The diastatic enzymes of yeast are those which break down the carbohydrate foods into their simplest forms, in which state alone they are subject to the fermentative action of the zymase. The presence of these enzymes in various degrees, determines the attenuative power of the yeast, and constitutes the only satisfactory technical basis for the classification of the various races. On this basis we have an ascending series of typical races, as follows:—Apiculatus yeast, Saaz yeast, Frohberg yeast, Pombé and Logos yeasts, and lastly *Amylomyces Rouxii*. Just as these various diastases prepare the carbohydrate food for the yeast, so the proteolytic enzymes or peptases prepare the nitrogenous foods. The peptases also are secreted in varying degrees by the different races, and play an important part in determining the attenuative power. Owing to the phenomenon known as "break," many yeasts cease to act before all the fermentable sugar has disappeared. The "break" is caused by the presence of a layer of mucus around the cells, which causes them to clot together and settle out from the sphere of action. In yeasts which are rich in peptase, this slimy layer is digested, and the cells remain suspended in the liquid for a longer time. Yeasts rich in peptase tend to yield beers of high attenuation, lacking "body," poor in albumoses, and consequently with inferior "head," whilst with yeasts poor in peptase the converse is the case. The composition of the wort, however, is also a factor, and a wort rich in albumoses will yield better results with a yeast rich in peptase than a wort which contains chiefly amides.

The Digestive Enzymes as Aids to the Oxydases.—The sugars and amides produced by the digestive enzymes, diastases and peptases, diffuse into the cell, and are subjected to the action of the energy-producing enzymes, zymase and oxydases. In addition, the yeast cell stores up a reserve of fat and secretes the enzyme, lipase, capable of digesting this material when required, for production of energy. The oxydases are only fully active in presence of plenty of air; in absence of air it would appear that the glycerin produced by the lipases escapes respiratory oxidation and is eliminated unchanged, whilst the fatty acid may perhaps be the source of the succinic acid.

Glycogen.—Henneberg (this Journal, 1902, 1289) has shown that the glycogen behaves as a very transitory reserve material. It only appears when there is an excess of sugar, and rapidly disappears under the action of the diastatic enzymes. Yeasts such as *S. apiculatus*, which secrete no diastases, are practically incapable of producing glycogen, they have no means of utilising it.

Temporarily unavailable Metabolic Products.—In the presence of readily available nutrients the yeast excretes those products of enzymic activity which it cannot use so readily. Such products are alcohol, amides (*e.g.*, leucine and tyrosine), glycerin, and succinic acid. There is evidence, however, that, under the stimulus of excess of air and possibly with deficiency of carbohydrates, these products, including even the alcohol, may undergo respiratory oxidation, and be utilised in the building up of new protoplasm, and that carbon dioxide is the only true end-product of the vital activity of yeast.

Internal Service of the Enzymes and the re-formation of Protoplasm.—The real end of enzymic activity is to supply energy and digested materials for the building-up of new protoplasm and young cells. If nitrogenous food be not supplied externally, the peptases digest the albumin of the yeast itself for this purpose; the internal reserve materials of the yeast are glycogen, fat, and albumin. Auto-digestion is not primarily a decomposition process, but rather a utilisation of reserve material corresponding with the utilisation of the glycogen and fat. The reserve albumin is capable of sustaining the yeast when growing in solutions of pure sugar with a plentiful supply of air; the amides, leucine and tyrosine are then not eliminated, but utilised.

Life and Death.—The life of the cell depends on the relative balancing of the internal breaking-down and building-up processes. The main regulating factor of the breaking-down processes is the temperature; movement and supply of oxygen stimulate the building-up. Pressed yeast, when stored in a warm place, rapidly destroys itself, because the enzymic breaking-down processes are active, whilst the repairing processes are dormant.—J. F. B.

Anti-enzymes. Woch. f. Brau., 1903, **20**, [7], 70—71.

E. Weinland (Zeits. f. Biol., 1902, **44**, [26], 1 and 45) has drawn attention to the existence of substances, which he names anti-enzymes. He prepared, for example, an extract which prevented the digestion of fibrin by pepsin and trypsin for several days. Windisch points out the importance of Weinland's discovery in respect to brewing, and states that in studying the various processes (the steeping-, germinating-, mashing-, and fermentation-processes) by which beer is prepared, and in which enzymes are the determining factors, the possible influence of the so-called anti-enzymes must in future be taken into consideration.

—A. S.

Yeast; Formation of Sulphuretted Hydrogen by ——.
Osterwalder. Weinlaube; through Zeits. Spiritusind., 1903, **26**, [6], 53.

During the vinous fermentation of wine musts, an odour of sulphuretted hydrogen may frequently be observed. The cause of this has been attributed either to the presence of free sulphur in the musts, or to the decomposition of the yeast sediments.

The author, however, working with perry and wine musts, and with pure cultures of wine yeasts and yeasts from fermenting fruit juices, has found that certain species do exist which regularly produce sulphuretted hydrogen during fermentation in any must, quite apart from any free sulphur or putrefaction of the yeast. The source of the sulphuretted hydrogen has not been determined, but it is probably derived from the albumin of the yeast. Yeasts, however, which do not produce sulphuretted hydrogen under normal conditions, do so if free sulphur be added to the must.

—J. F. B.

Alcoholic Fermentation. R. O. Herzog. Zeits. physiol.
Chem., **37**, 149—160. Chem. Centr., 1903, **1**, [4], 243.

In support of Buchner's theory as to the enzymatic nature of fermentation, the author brings forward a further proof of the ferment nature of zymase. This proof consists in the demonstration of the catalytic nature of alcoholic fermentation by determinations of the reaction velocity of the hydrolysis of glucose and fructose and of the relation between the original concentration and the velocity constant.

—A. S.

Proteolysis; Influence of Oxygen on ——, *in Presence of Chloroform.*
G. Malfitano. Ann. Inst. Pasteur, **16**, 853—856. Chem. Centr., 1903, **1**, [4], 243.

The author found that chloroform in certain cases has a very favourable influence on the process of autoproteolysis, whilst in others, and especially in the absence of oxygen, it has a deterrent action. This is true also for bacteriolysis and diastatic action. In albuminous media, in which proteases are present, the phenomena of "coagulation and de-coagulation" occur simultaneously under the influence of chloroform in the absence of oxygen.—A. S.

Barleys; Malts Prepared from the Present Season's ——.
F. Schönfeld. Woch. f. Brau., 1903, **20**, [7], 68—69.

Owing to the wet harvest of 1902, the barleys malted in the later months of that year contained an excessive proportion of moisture and showed in consequence inferior germinating qualities. Recently, however, the germinating power has attained its normal value, and the malts, on the whole, are not only perfectly modified, but give exceptionally high yields of extract.

This satisfactory state of things is attributed mainly to the generally low percentage of protein in the barley, averaging 8—9 per cent., and to a correspondingly high percentage of starch. Owing to the low protein it is not necessary to cause the malt to "felt" so much on the floor nor to cultivate such a long acrospire, in order to obtain the required degree of modification. It is better rather to curtail the growth in order to avoid excessive destruction of the albuminoids and loss of substance by respiration.—J. F. B.

Malting Barley; Bleaching Powder in the Steep Water for ——. W. Windisch. Woch. f. Brau., 1903, **20**, [6], 61—62.

After reviewing the results obtained by different workers by the addition of small proportions of bleaching powder solution to the steep water, in order to improve the germinating capacity of damaged barley, the author states that the injudicious use of bleach in a brewery is very risky; cases have been known, when it has been employed for disinfecting cellars, of its odour being absorbed by the beer. The action of bleach on barley may be twofold; in the first place, it would have the same effect as plain lime water in preventing the formation of mould and assisting germination; in the second place, there is the special action of the chlorine as a direct germicide, and probably also acting as a stimulus to germination. Experience has shown, however, that under some circumstances bleaching powder may do harm, whereas plain lime water is nearly as effective and never has any injurious effects.—J. F. B.

Starch; Sugars produced by the Hydrolysis of ——, *by Oxalic Acid, with especial reference to Lintner's Iso-Maltose.* H. Dierssen. Zeits. angew. Chem., 1903, **16**, [6], 122—134.

After giving an account of the work of previous investigators on the products of hydrolysis of starch, the author describes his own experiments, in which the sugars formed by hydrolysing starch with oxalic acid were examined. From the results obtained, it is concluded that in this hydrolysis, dextrose, levulose, and a disaccharide are formed. Maltose is never found, and, if formed at all, it is afterwards converted into dextrose. The rotatory and reducing powers of the disaccharide, and also the solubility, appearance, and melting point of its osazone, agree with the corresponding properties of Lintner's isomaltose, and it must hence be concluded that the sugars obtained by Lintner and the author are identical. But the product now described is not attacked by diastase, whilst, in his first paper (see this Journal, 1894, 53), Lintner stated that his isomaltose is converted into maltose by the action of diastase; this statement refers, however, to the isomaltose obtained by the diastatic hydrolysis of starch, while that yielded by the oxalic acid hydrolysis was presumably not tested in this respect.

It might be supposed that the author's isomaltose resembles that of Fischer in being, not a degradation product of starch, but a reversion product of dextrose. That this is not the case is indicated by the experimental data and by the fact that the sugar is fermentable; the product obtained by Fischer was not fermentable, and further, formed a levo-rotatory osazone, whilst that of the author's sugar is strongly dextro-rotatory.

From the results obtained no conclusions can be drawn with regard to the course of the diastatic hydrolysis of starch, but the fact is emphasised that the products obtained in this case differ considerably from those yielded by acid hydrolysis. Additional evidence is also afforded of the tendency of dextrose to form double compounds with other sugars; 1 mol. of the syrupy isomaltose obtained by the author yields crystalline double compounds with any whole number of dextrose mols. from one upwards.

It is probable that *Saccharomyces marxianus* will be found useful in separating isomaltose from its mixtures with dextrose, since the former sugar is not fermented by this yeast species; the tedious fractionation with aqueous alcohol may hence be avoided.—T. H. P.

Brandies: Portuguese ——, *and the Methods of Brandy Analysis.* H. Mastbaum. Zeits. Unters. Nahr.- u. Genussm., 1903, **6**, [2], 49—66.

Among the impurities of brandy are the fruity ethers and volatile oils derived from the raw material; other alcohols, acids, benzaldehyde, and hydrocyanic acid resulting from the degradation of the sugars and from the fermentation; furfural, acrolein and pyridine bases from the distillation; and aldehydes, acids, and ethers from oxidation and condensation during ageing.

The author has examined a large number of natural and manufactured Portuguese brandies, determining the specific gravity, the percentage by volume of alcohol, mgrms. per litre of extract, acid, aldehyde, furfural, ethers, and higher alcohols, and mgrms. (calculated per 100 c.c. of absolute alcohol) of acid, aldehyde, furfural, ethers, and higher alcohols; the sum of the last enumerated comprises the "impurity coefficient." From these results it is concluded that the limit of 300 mgrms. of total impurities (calculated upon 100 c.c. of alcohol) is not suited for true Portuguese brandies, for, as shown in the tabulated results, many brandies which were known to be genuine had a lower impurity coefficient. This coefficient varies between the limits of 148·4 and 977·2 mgrms The standard of 300 mgrms. fixed by the Paris Municipal Laboratory does not therefore decide whether a Portuguese brandy is genuine or not.

The relation of ethers to higher alcohols varies very considerably. Among the results are found such differences as 9:1 and $\frac{1}{3}$:1. Lusson's oxidation coefficient, which i the sum of the acids and aldehydes in the total impurities, varies between 5·1 and 52·9. As the brandies examined were only one or two years old, no connection between the degree of oxidation and the age of the brandy could be established. The estimation of furfural appears to have no analytical significance.

It is possible to differentiate between a manufactured and genuine Portuguese brandy, for generally a high-grad brandy has a low impurity coefficient and a low acidity Three-fourths to four-fifths of the impurities are ethers and higher alcohols; the latter are of importance in the higher grade brandies. The impurity co-efficient is useful o judging whether a considerable quantity of alcohol has been added to a natural brandy. From a hygienic point of view this coefficient is of little value, and, as pointed out before, the French limitation does not apply to Portuguese brandies.—J. L. B.

English Patents.

Beer [Non-Alcoholic]; Impts. in Brewing ——. B. Koenitzer, London. Eng. Pat. 11,734, July 3, 1902.

Malt (80 lb. per 100 galls. of water) is raked in the mash-tun for about three hours at a temperature of about 81—85° C., the extract is then passed into a boiler, and there i added to it a German product known under the name of "ice-sugar" (*Eiszucker*), in the proportion of 2 ozs. pe 100 galls. The whole is then boiled under reduced pressure after which the proper proportion of hops is added, an boiling is continued at atmospheric pressure for abou 30 minutes. The wort is filtered, pitched with yeast, lef for not more than four days, and then allowed to cool. Suc beer contains less than 3 per cent. of alcohol, to whic result the special substance "ice-sugar" is said to contribut —J. F. B.

Brewers' Mash and similar Mixtures; Apparatus fo Filtering and Washing ——. V. Lapp, Leipzig, Germany. Eng. Pat. 20,079, Sept. 13, 1902.

Mashes are separated into their solid and liquid constitu and the former are washed, by means of a rotary filter vat provided with a pervious or perforated wall, or els with two such walls, one encircling the other. When th solid particles vary greatly in size, as is the case wit ordinary grist mashes, the double-walled apparatus preferable, the inner wall being coarsely perforated, an the outer wall finely perforated. A filtering medium ma be carried on the latter, or a constant layer of mas particles may be left to serve the same purpose. The sol matters are washed and then removed, either intermittently or continuously, by means of specially adapted scrapers operated automatically.—J. F. B.

Beer-forcing Apparatus; Purifying the Compressed Air in ——, and Preventing the Beer becoming Stale. E. Klimek, Cracow, Austria. Eng. Pat. 23,394, Oct. 27, 1902.

The compressed air in beer-forcing apparatus is passed, before it reaches the beer, through a vessel provided with a vertical partition extending almost to the bottom, and containing a suitable liquid, such as alcohol, to which 10—15 per cent. of beer yeast has been added.—J. F. B.

Beer Barrels, Wine Casks, and the like; Disinfecting Apparatus for ——. L. Vandam. Eng. Pat. 27,126, Dec. 9, 1902. XVIII. C., page 315.

United States Patents.

Malt for Mashing; Method of Preparing ——. V. Lapp, Leipzig, Germany. U.S. Pat. 719,479, Feb. 3, 1903.

Ground malt is passed through a pipe of relatively small diameter, under the pressure of a compressed agent and the action of a pump, and is subjected, while in the pipe prior to reaching the pump, to the action of water under high pressure, introduced in jets passing radially into the pipe. The malt is then forced, under pressure, from the pump through a series of sieves to the mash tub.—J. F. B.

Wort; Method of Accelerating the Production of ——. V. Lapp, Leipzig, Germany. U.S. Pat. 719,480, Feb. 3, 1903.

Malt is mashed and the mash is separated into a thin and thick portion, the latter is boiled and mixed with the separated thin portion. The resultant mixture is again separated into a thin and thick portion, the latter is heated slowly, then quickly boiled and mixed with the separated thin portion. The mixture is again separated into thin and thick portions, the liquor is separated from the latter and the solid matter is mashed with hot water, the mash is added to the thin portion and the mixture is boiled. The liquor is drawn off and the solid residue is mashed with water, and the liquid portion is then mixed with the two other liquors, the whole being finally boiled and clarified.—J. F. B.

French Patents.

Malt; Mashing of ——, especially for Pale Beers. V. Lapp. Fr. Pat. 321,850, June 5, 1902.

See Eng. Pat. 21,721 of 1902; this Journal, 1903, 40.
—J. F. B.

Wine and other Liquids; Apparatus for Continuous Concentration and Distillation under Vacuum of ——. A. Laude. Fr. Pat. 321,784, April 11, 1902.

The whole apparatus is maintained under a suitable vacuum; the wine to be distilled is contained in two or more heaters provided with steam coils; the vapours pass into an empty boiler also provided with a steam coil from which they ascend to a rectifying plate-column. The alcohol is collected in a series of vessels, and when the alcoholometer indicates zero, the water is collected in another reservoir. At a suitable concentration the residue is run into a cooling vessel and another heater is put into action.
—J. F. B.

Distillation and Rectification; Apparatus for ——. E. Guillaume. Fr. Pat. 321,871, June 7, 1902.

Certain combinations and dispositions of rectifying columns, dephlegmators, &c., are described (1) for the direct distillation and rectification of fermented wash, and (2) for the rectification of distilled spirits. In the first case the rectifying column is heated by the condensation of the crude alcoholic vapours coming directly from the distilling column, whilst in the second case it is heated by steam, the condensed water being employed for diluting the phlegms. The differences in the temperatures of the vapours corresponding with the boiling points of alcoholic mixtures of various strengths are employed for regulating automatically the outlets of the columns so as to govern the alcoholic richness of the vapours.—J. F. B.

Liqueurs; New System of "Bonificateur l'Utile" for Manufacture of ——, by Distillation. J. Longuère. Fr. Pat. 322,115, April 14, 1902.

The apparatus termed "bonificateur l'utile" can be fixed to any distillation plant and enables the extraction, by the alcohol or brandy produced, of any desired aroma or flavour, thus replacing the system of maceration or the addition of flavouring ethers. The apparatus consists of two parts: the first consists of a pair of cylinders provided with inlets at the bottom, and outlets at the top with automatic valves; these cylinders contain perforated baskets holding roasted almonds or other materials through which the alcoholic vapours are caused to circulate. The second vessel consists of a cylinder of somewhat similar construction, also filled with material, through which the phlegms in the liquid state are caused to circulate on their way back to the still.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Flours; Phosphorus in ——. Balland. Comptes rend., **136**, [5], 332—333.

It is known that the determination of phosphorus in the ash of vegetable substances does not give all that present in the original substance, as some occurs in the form of an organic compound, and escapes during the incineration. The author has determined the phosphorus in a number of flours directly, by a method he proposes to describe later. His results, expressed as grammes of phosphorus and of phosphoric oxide per kilo. of bread (containing 35 per cent. of water), are as follows:—

——	P.	P_2O_5.
Military bread, with 80 per cent. bolted flour	1·04	2·17
„ „ 70 „ „	0·91	2·16
Bread from the Paris Civil Hospitals	0·85	1·95
„ civil bakeries	0·53 to 0·78	1·23 to 1·82

Similar results have been obtained for nitrogen; the two sets of figures indicate the gradual diminution of the amount of gluten in the flour. The author attributes this to the system of milling with cylinders, and to the increasing perfection of bolting machinery.—J. T. D.

Starch [in Fodder Materials]; Determination of ——. St. Weiser and A. Zaitschek. XXIII., page 321.

English Patent.

Centrifugal Machines or Separators [Cream, &c.] O. Ohlsson, Sodertelge, Sweden. Eng. Pat. 25,553, Nov. 20, 1902.

The liners of centrifugal milk separators, &c., are made of a series of hollow pyramids, plates, or funnels, superposed in the direction of the axis of the drum, and bent or corrugated circumferentially or in a radial plane, the orifices for the upward passage of the milk through the liner being formed at the apices or highest points of the bends in the plates. [See also U.S. Pat. 718,721, of 1903; this Journal, 1903, 225.]—R. A.

French Patent.

Milk; Preservation of ——. J. Nicolardi. Fr. Pat. 322,081. June 14, 1902.

A definite proportion of sulphurous acid is added to the milk, the cream and casein being eventually separated, leaving the preservative in the whey. An apparatus for adding the sulphurous acid to the milk is also claimed.
—C. A. M.

(*B.*)—SANITATION; WATER PURIFICATION.

Hardness of Water; Determination of ——. W. Peters. XXIII., page 320.

English Patents.

Sewage and other Liquids; Method of, and Mechanism for, Distributing ——. J. E. Willcox and H. P. Raikes, Birmingham. Eng. Pat. 2155, Jan. 27, 1902.

A rectangular filter bed is provided with a central or side sewage carrier or trough, and a travelling sewage distributor fed from it, the distributor being so arranged that it travels over the area of the filter on one side of the trough, distributing the sewage uniformly during the whole forward travel, whilst on the backward travel the sewage is distributed over the other side of the trough. Thus a uniform application of sewage, with equal intervals of rest, is given to every portion of the filter at stated periods. —L. A.

Sewage or other Liquid; Improved Plant and Apparatus for Distributing ——. J. B. Alliott and H. B. Ransom, London. Eng. Pat. 1029, Feb. 17, 1902.

In order to distribute sewage or other liquid uniformly over a rectangular bed by means of a revolving distributor, the corners of the bed are provided with supplementary distributors fed by the travelling radial arm or arms. Such distributors may comprise a trough having in plan the form of a circle, either broken or continuous, with branch troughs extending into each corner. If the distributor is of the type which is moved to and fro along the bed, and is fed from a central trough, the distributing channel may be composed of several slotted pipes, each flanged at both ends, and so fixed that the pipes may be turned about their axes, and the position of the slots varied. If the distributing channels are carried by an endways movable trolley, buffers or inclined rails are provided at each end of the track to facilitate the starting of the trolley on its return journey. Arrangements are also provided for automatically controlling the supply of sewage to the channels.—L. A.

Mixing Definite Quantities of one Liquid or Solution with Another [*Disinfection, Sewage Precipitation, Water-Softening, &c.*]; *Improved Apparatus for* ——. A. S. Legg, Sutton, Surrey. Eng. Pat. 9705, April 26, 1902.

This apparatus comprises a solution chamber, means for agitating the contents of this chamber, a vessel adapted periodically to collect and deliver to the mixing chamber a definite quantity of liquid from the solution chamber, an oscillating mixing chamber operated by the liquid flowing into it, and means for transmitting the motion of the mixing chamber to the mechanism of the solution chamber.—R. A.

Wool Suds or the like; Apparatus for Filtering and Purifying ——. J. Gatecliff, Bradford. Eng. Pat. 24,482, Nov. 8, 1902.

The apparatus consists of two concentric tanks, having conical bottoms with outlet valves. The inner tank has a central vertical tube passing nearly to the bottom, through which the liquid and reagent are admitted, and the latter then rise over the helicoidal depositing surfaces with which this tank is fitted, and overflowing through a coke-breeze filter at the top, are conveyed by means of a pipe to the bottom of the outer tank, through which the liquid again rises and passes through a filter of wood fibre to the outlet. The precipitate arrested by the helicoidal surfaces and the filters falls to the bottom of the tanks and is drawn off from time to time.—L. A.

Drinking Water; Apparatus for the Preparation of ——. R. Henneberg, Berlin. Eng. Pat. 3731, Feb. 13, 1902.

The apparatus comprises a sterilising boiler provided with a worm, the convolutions of which are arranged in the transverse water-tubes of the fire-box, or close below the level of the boiling water, and the upper end of which receives water from the boiling water surface; also a cooler, and a combined filtering and aerating appliance. The whole is so arranged that the water entering the boiler at the lower end, passing upwards through the boiler and then circulating through the coil, is submitted for a considerable time to a boiling temperature without interruption of its flow, and is then sprayed into the filter in a cooled condition, so as to create a partial vacuum and cause thereby the inflow of air with which it becomes saturated.—L. A.

United States Patents.

Liquid-Purifying System. [*Water or Sewage.*] J. J. Derry, Philadelphia, Pa. U.S. Pat. 719,201, Jan. 27, 1903.

A main and series of branch pipes deliver the sewage or water in the form of a film, which is further broken up into drops by means of splash-plates, on to the filter. The main is provided with a series of dams decreasing in size in the direction of the flow of the liquid, and the filtered effluent is further aerated in a collecting drain.—W. P. S.

Water or Sewage; Apparatus for the Purification of ——. J. N. McClintock, Boston, Mass. U.S. Pat. 719,357, Jan. 27, 1903.

The apparatus consists of a septic tank having a supply-pipe provided with a valve. Separate overflows from this tank deliver the liquid on to separate filters provided with separate collecting tanks containing floats which alternately operate valves on the overflow-pipes from the septic tank. The collecting tanks discharge automatically on to a second filter fitted with aerating pipes which extend through the collecting tanks. A collecting tank is also provided for the second filter. An air tube extends from the first to the second filter, the passage of air through the tubes being controlled by floats and valves.—W. P. S.

French Patent.

Water Purifier for Steam Boilers. E. Delmouly, Paris. Addition, dated April 21, 1902, to Fr. Pat. 314,309, Sept. 17, 1901.

This invention relates to the modification of certain features of an apparatus described in a previous patent, which is a continuous water purifier (softener) of the type fitted with internal inverted cones for separating the precipitate from the water. These cones are threaded on to a central tube having slots at the base of each cone closed with shutters, on opening which the mud falls through the central tube to the bottom of the vessel. The proportion of lime water to hard water is adjusted by means of a tank divided into two sets of double compartments, small and large. The water entering the apparatus flows through a three-way cock into one of the smaller compartments, and overflows into one of the larger. When the latter is full, a siphon discharges the contents on to a water wheel fixed over the softening tank. The wheel, in revolving, reverses the three-way cock, and empties the contents of the smaller compartment into the lime-wate vessel, at the same time diverting the inflowing hard wate to the second of the smaller compartments of the measurin tank.—L. A.

(*C.*)—DISINFECTANTS.

Bactericidal Action of Perfumes. H. Marx. Centralbl Bakteriol., 1903, [1], 33, 71. Chem.-Zeit., 1903, 27 [11], Rep. 28.

Experiments have been made by the author on the actio of various perfumes on cultivations of *Bacillus anthracis* an *Staphylococcus pyogenes aureus.* Growth is prevented b the presence in the culture medium of terpineol or nitrobenzene in the proportions 1 : 1000 or 1 : 100 respectivel while agar plates are completely or partially sterilised if drop of terpineol or nitrobenzene is added, or if they ar partly covered with heliotropin or vanillin. Even a relatively short treatment with terpineol (1 : 500) or nitrobenzen (1 : 10) produces such a change in these bacteria that afte wards they develop only slowly. Anthrax or Staphylococ are killed in 60 minutes by terpineol in the concentratio of 1 : 100 and 1 : 10 respectively, whilst nitrobenzene, eve in a concentration of 1 : 10, kills neither of these organism in 24 hours. An especially strong action is exerted b terpineol in combination with a foaming potash soap. In emulsions of bacteria, perfumes—particularly terpineol—effect agglutination, but it is doubtful whether this plays a part in the bactericidal action. The author considers rather that the latter is connected with the property of rendering oxygen active.—T. H. P.

Silver, Colloidal (Collargol); Method of Preparation. —— Danlos and A. Cothereau. Nouveaux Remèdes, **19**, [2], 30.

Colloidal silver for use as an antiseptic is prepared by the following process :—

One hundred grms. of citric acid are dissolved in distilled water, and the solution neutralised with ammonia, when the solution is made up to 500 c.c. 186 grms. of ferrous ammonium sulphate are dissolved separately, in a similar quantity of water. The two solutions are mixed, diluted to 1,500 c.c., and a solution of silver nitrate, 20 grms., in distilled water, 100 c.c., is poured gradually into the mixture, with constant stirring. The precipitate obtained is allowed to settle, protected from light and air ; it is collected, washed, and dried, either over sulphuric acid or in a stove at a temperature not exceeding 40° C. Colloidal silver as thus prepared occurs in small black particles, with a metallic lustre. It contains 97 per cent. of silver ; its solubility in water is 1 : 25 ; its solution does not dialyse. Acids and most salts precipitate the silver from it, in the form of ordinary metallic silver.—J. O. B.

English Patent.

Beer Barrels, Wine Casks, and the like ; Disinfecting Apparatus for ——. L. Vandam, Mons, Belgium. Eng. Pat. 27,126, Dec. 9, 1902.

A measured quantity of disinfectant liquid is delivered from a receiver into a funnel communicating with a steam injector-pipe. The liquid there meets with a jet of dry steam, by which it is volatilised and forced into the room or vessel to be disinfected.—J. F. B.

French Patents.

Disinfecting Salts, known as "Sels de Paris"; Manufacture of ——. La Compagnie Industrielle de Produits Antiseptiques. Fr. Pat. 322,230, June 18, 1902.

Zinc sulphate, 49 parts ; potassium and ammonium alum, 24½ parts each ; potassium and calcium permanganate, 1 part each, are dissolved in water and crystallised, to form "Sels de Paris." According to the present invention, the crystals are mixed with calcium chloride, in the proportion of 1 part of the latter to 200 parts of the crystals, by weight.—E. S.

Calcium Carbide, "Denatured"; Manufacture of —— [*for Viticulture, &c.*]. Soc. des Carbures Métalliques. Fr. Pat. 322,281, June 19, 1902.

Calcium carbide is prepared in the manner described in Bullier's Fr. Pat. No. 236,160 (Feb. 9, 1894) ; but to the ordinary charge is added 10 per cent. or more of calcium sulphate or phosphate. By this means a carbide is obtained which liberates an unusual amount of hydrogen sulphide or phosphide when it is treated with water ; and it is therefore claimed to be specially applicable to the purposes of destroying insects and cryptogamic growths on vines and the like.—F. H. L.

XIX.—PAPER, PASTEBOARD, Etc.

Paper ; Use of Incinerated —— *: Fireproof Paper.* G. L. Papier-Zeit., 1903, **28**, [13], 439.

In the arsenic districts of Saxony it is customary to pack the arsenical earth in clay tubes, which are then heated to redness, and the arsenical fumes are collected. One of the difficulties in this process was caused by the fusion of the earth to the inner walls of the clay tubes, which prevented their frequent use. This difficulty was overcome by inserting cardboard tubes inside the clay ones before charging with earth, thus providing a thin layer of paper ash between the earth and the tube.

It is possible to make paper with a fireproof ash capable of replacing clay capsules. For instance, impregnation with a 25 per cent. solution of sodium silicate has this result, but it is found that if the paper be impregnated before passing over the drying cylinders it is apt to stick to these latter. A more satisfactory method is the application of a solution of sodium tungstate (1 in 25) as the paper passes from the second press rolls to the drying cylinders. Cheaper solutions are as follows : 1 part of ammonium sulphate in 12 parts of water, the first drying cylinder being kept only moderately hot ; or 3 parts of magnesium sulphate and 4 parts of borax in 25 parts of warm water.

As regards the use of paper for incandescent mantles, it is remarked that only asbestos paper would be suitable, but it would have to be prepared in a different manner to the present article. It should have the feel and tenacity of cellulose paper, and in this state it would be readily adopted for wrapping purposes by gunpowder manufacturers.—J. F. B.

Cellulose ; Determination of ——. S. Zeisel and J. Stritar. XXIII., page 321.

English Patents.

Acetyl Derivatives of Cellulose and Oxy-Cellulose ; Production of ——. L. Landsberg, Nuremburg. Eng. Pat. 4886, Feb. 26, 1902.

One part of hydro-cellulose or oxy-cellulose is heated with about 4 parts of acetic anhydride (containing about 1 per cent. of orthophosphoric acid) at from 40° to 90° C., until a uniform gelatinous product is obtained ; the mass is then treated with water, washed and dried.

In the case of oxy-cellulose, sulphuric acid may be employed instead of phosphoric acid ; metaphosphoric acid, pyrophosphoric acid, or phosphoric anhydride may be employed in either process with equally good results, though the temperature must be somewhat higher than when sulphuric or orthophosphoric acid is used. (See also Fr. Pat. 319,848, 1902 ; this Journal, 1902, 1550.)—T. F. B.

Celluloid-like Substance ; Manufacture of ——. E. Zühl, Berlin. Eng. Pat. 23,445, Oct. 27, 1902.

The camphor usually employed in the manufacture of celluloid is replaced by "such derivatives of phosphoric acid as are formed by phenol, cresol, and naphthol on the one hand, and alcohol or anilide radicals on the other hand," replacing the hydroxyl groups of phosphoric acid.

Nitro-cellulose is mixed with the phenyl-, cresyl-, or naphthyl-phosphoric ester or anilide, and the mixture treated in the usual manner. (See also Eng. Pat. 1383, 1902 ; this Journal, 1902, 719.)—T. F. B.

French Patents.

Peat ; Manufacture of Paper or Millboard from ——. M. Krause. Fr. Pat. 322,061, June 14, 1902.

The crude peat is broken up by means of a revolving helix ; it is then suspended in water, the acidity is neutralised, the earthy matter is removed by passing the mass over a series of settling laths ; the fibrous matter is washed and part of the water is removed. The mass is then treated in an edge-runner mill, then in a beating engine, and is finally passed over sand-tables to the mixing chest. The peat-pulp is made into boards by a machine of the cylindrical type. There are preferably two or more vats and making-cylinders, one vat being furnished with peat-pulp and another with mechanical wood-pulp. The making cylinders are alternately dipped into their respective vats, so that the resulting millboard is composed of alternate, very thin layers of the two materials.—J. F. B.

Wood-Pulp and similar Materials ; Apparatus for Impregnating ——. E. O. Eichhorn. Fr. Pat. 322,177, June 17, 1902.

Wood-pulp when reeled in the moist state, as it comes from the machine, is very liable to attacks by mould fungi.

The web is therefore passed between rollers, one of which is kept moistened with an antiseptic solution, which is absorbed by the moist pulp before the latter is reeled up. A bleaching solution may be applied in the same way.
—J. F. B.

Cardboard and Drawing Paper, rendered Waterproof with Coal-Tar, Oils, &c.; Method of Preserving ——. M. Zalinski. Fr. Pat. 321,709, June 3, 1902.

To render their tints or colours permanent, drawing papers, cardboards, and tissues, prepared with oils, coal tar, asphaltum, bitumen, &c., are passed successively through (1) a solution of alum, (2) a solution of fish-glue in alcohol, and (3) a spirit varnish.—E. B.

Paper-Making and Bleaching; Preparing Vegetable Fibres for ——. A. Badoil and E. Bozer. Fr. Pat. 321,747, June 10, 1902. V., page 295.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Alcohol and Aldehyde; Oxidation of ——. J. Slahoszewicz. Zeits. physik. Chem., **42**, 343—352. Chem. Centr., 1903, **1**, [5], 279.

Aldehyde in faintly alkaline or neutral solution decomposes into alcohol and acetic acid. The energy of oxidation of aldehyde is greater, in alkaline solution, than that of alcohol. If alcohol in sulphuric acid be practically compared with aldehyde in sulphuric acid, using platinum electrodes, aldehyde proves to be a stronger reducing agent than alcohol; therefore aldehyde must be oxidised by oxygen more readily than by alcohol. This is at variance with the statement of Dony-Henault (this Journal, 1900, 542), to the effect that, on electrolysis of alcohol, only aldehyde is formed at the anode, in theoretical current-yield. It is stated that this assertion is probably incorrect.
—A. S.

Acetic Acid; Volatility of Aqueous Solutions of ——. W. Chattaway. Analyst, 1903, **28**, [323], 29—30.

The following results were obtained by exposing 502 grms. of a 4·27 per cent. solution of acetic acid in an open dish of about 2 dcm. diameter:—

Number of Hours exposed.	Total Loss.	Loss of Water.	Loss of Acetic Acid.	Acetic Acid in Residue.	Temperature.
	Grms.	Grms.	Grms.	Per Cent.	C.
48	39·10	37·67	1·43	4·35	16
Further 24	13·30	12·60	0·70	4·35	18
„ 72	24·60	23·40	1·20	4·35	14·5
„ 24	15·80	15·03	0·77	4·36	16
„ 48	24·40	23·40	1·00	4·40	16.5
„ 48	26·60	25·54	1·06	4·47	15·5
„ 48	21·70	20·80	0·90	4·53	14
„ 48	20·03	22·28	0·72	4·69	15

—A. S.

Sulphoguaiacin. G. Tarozzi. Boll. Chim. Farm., **41**, 819. Chem. Centr., 1903, **1**, [3], 188.

Sulphoguaiacin or quinine disulphoguaiacolate is prepared in the following manner. Guaiacol sulphonic acid is prepared by warming together equal parts of pure concentrated sulphuric acid and anhydrous guaiacol, the reaction-product is diluted with 10 times its quantity of water, neutralised gradually with barium carbonate, the carbon dioxide expelled by heating and the liquid filtered. To the filtrate the requisite quantity of quinine bisulphate solution is added, the liquid is evaporated on the water-bath, and the residue dried. It forms small yellow scales, soluble in cold water, and much more readily in alcohol. It has a bitter taste and is distinguished from quininesulphocreosotate (Boll. Chim. Farm., **37**) by the fact that it gives no reaction when treated with a few drops of the copper sulphate solution, whereas, in the case of the latter, a yellowish-green ring is formed on the surface of the liquid.—A. S.

Cantharidin; New Method of Preparation of ——. Purao Sing. Pharm. Soc. of Japan, 1902 (239) and (241); through J. Pharm. Chim., **17**, [2], 73.

Twenty-five grms. of powdered cantharides are treated with a mixture of 10 c.c. of nitric acid and 200 c.c. of water. The whole is then evaporated to dryness on the water bath, a little gypsum being added towards the end of the drying. The dried mass is then extracted with chloroform and the solvent distilled off, when, on cooling, the cantharidin crystallises out from the yellowish oily residue. This accompanying oil is readily removed by washing with a small quantity of ether or alcohol. The object of evaporating the powdered "flies" with nitric acid is to partially oxidise the fat, and so render it more soluble and therefore easier to remove from the crop of cantharidin crystals.

An alternative method is that of Nagai. 25 grms. of powdered cantharides, rendered acid with hydrochloric acid, are extracted with chloroform in a Soxhlet apparatus. The chloroform residue, after distilling off the solvent, deposits the greater part of the cantharidin in the form of crystals. The oil accompanying these is removed by washing with ether; the ethereal washings are evaporated, and the fatty residue saponified with a little soda. The soap thus formed is then treated with a solution of alum, which dissolves out the cantharidin which has been removed with the fat. On concentrating the alum solution, this cantharidin separates out and is added to the first crop of crystals obtained from the chloroform extract.—J. O. B.

Ipecacuanha; Alkaloids of ——. C. Lowin. Arch. intern. de Pharmacodyn. et de Thérap., 1903, **11**, 1. Chem.-Zeit., 1903, **27**, [11], Rep. 25.

The author gives a table showing a number of reactions for emetine and cephaeline, the two principal alkaloids of ipecacuanha; of these reactions, the following are important for distinguishing between the two substances:—With Millon's reagent, a 2:100 solution of emetine remains colourless in the cold, but turns yellowish on heating; a solution of cephaeline of similar strength, however, turns violet in the cold, and, on heating, becomes finally dark brown, while colour changes are obtained very distinctly with a 1:1000, and just visibly with a 1:5000 solution. With mercuric acetate, a 2:100 solution of emetine remains unchanged in the cold and becomes somewhat yellowish and turbid on heating; an equally strong cephaeline solution also remains colourless in the cold, but becomes violet, and later dark grayish-brown on heating, a 1:5000 solution of the alkaloid giving a distinctly visible reaction. With Frohde's reagent, emetine solution turns successively greenish-yellow, green, and pale blue, whilst the colours yielded by cephaeline are indigo blue, greenish black, and dark green. The two alkaloids exhibit but slight differences in their toxicological actions. Roots from Rio contain principally emetine, whilst those from Carthagena have more cephaeline. To determine the value of the root, the two alkaloids must be separately determined; a determination of the psychrotine is unnecessary, since this substance only occurs in small quantity, and acts neither as an emetic nor as a nauseant.—T. H. P.

Morphine; An Undescribed Salt of ——. A. E. Tanner. Pharm. J., 1903, **70**, [1701], 134.

In the preparation of a 1 in 20 solution of morphine tartrate, from commercial specimens of the salt, a portion differing in character from the salt used remains undissolved, and on adding an excess of tartaric acid to the solution, a considerable amount of a similar crystalline substance is precipitated. On analysis, this insoluble substance was found to be morphine acid tartrate, $C_{17}H_{19}NO_3C_4H_6O_6$, and a salt prepared by the combination of morphine and tartaric acid in equimolecular proportions had the same composition and also the same crystalline form, *viz.* rosettes of long acicular crystals. The acid tartrate requires at least 100 parts of cold water for solution, and is insoluble in alcohol.—A. S.

Calamus Oil: Composition of ——. R. Beckstroem. Ber. Pharm. Ges., 1902, 257; through J. Pharm. Chim., **17**, [3], 109.

By shaking out with 2 per cent. sodium carbonate solution, normal heptylic acid and palmitic acid were separated from he oil. Subsequent shaking out with 2 per cent. caustic potash solution removed a small quantity of eugenol. Treatment with bisulphite removed aldehydic compounds, among which, asarylic or 2.4.5 trimethoxybenzoic aldehyde, $CHO.C_6H_2.(OCH_3)_3$ was isolated. The residual oil, after removal of the aldehydes, was saponified, and traces of acetic and palmitic acids were thus liberated. The aponified oil, on fractionation, yielded calameone, $C_{15}H_{26}O_2$. This body appears to be closely allied to cineol. It rystallises from alcohol in rhombic prisms melting at 68° C. It is very soluble in acetic acid, alcohol, and hloroform, less soluble in ether and carbon bisulphide, paringly soluble in petroleum spirit. Its opt. rot. in alcoholic solution at 26° C. is $\alpha_D = -8°$.

It combines with hydrochloric acid, and with two atoms of bromine to form the dibromide, $C_{15}H_{26}O_2Br_2$, which decomposes at ordinary temperatures, giving the monobrom-compound, $C_{15}H_{21}Br$. Dilute sulphuric acid and acetyl hloride dehydrate it, removing 2 mols. of water, and converting it into a hydrocarbon, calamene, $C_{15}H_{22}$. This s a liquid boiling at 144° C. at 15 mm.; its specific gravity s 0·9124 at 23° C., and its opt. rot. $\alpha_D = -11° 31'$ at 26° C. Its hydrochloride melts at 108° C.

When oxidised with potassium permanganate, calameone s converted into calameonic acid, $C_{15}H_{24}O_4$, which melts at 30° C. The hydrated acid, $C_{15}H_{24}O_4H_2O$, melts at 153° C. n solution in ether, calameone gives a solid pulverulent ompound with sodium, $C_{15}H_{25}O_2Na$.

The fractions of the oil boiling at a higher temperature than calameone yield, when treated with ether r petroleum spirit and cooled to a low temperature, rystals of asarone. The oil also contains another hydrocarbon, $C_{15}H_{22}$, boiling at 151° C. at 22 mm. pressure, which is distinct from calamene. Since the most important onstituent of calamus oil is considered to be asarone, and hat body contains three methoxyl groups, it is suggested hat the value of the oil may be approximately ascertained y means of a methoxyl determination by Zeisel's method.

—J. O. B.

Peppermint Oil from Piedmont. C. E. Zay. Staz. sperim. agrar. ital., **35**, 816—823. Chem. Centr., 1903, **1**, [6], 331.

THE constants of three Italian peppermint oils are shown in he following table:—

——	I. Extra-refined.	II. Crude.	III. Crude.
p. gr. at 15° C.	0·9160	0·9171	0·9256
cid value (mgrms. KOH for 1 grm.)	0·18	0·76	2·03
aponification value (mgrms. KOH for 1 grm.)	45·2	30·0	33·7
ther value	45·0	29·2	21·6
odine value	147·1	125·2	131·9
efractive index at 16° C.	1·468	1·467	1·468
otatory power in 100 mm. tube in Laurent's apparatus	− 2·34°	− 10·41°	− 7·40°
α_D^{16}	− 2·55°	− 11·4°	− 7·9°
otal menthol	55.5	58·6	45·0
enthol, free	45·78	51·50	38·99
enthol, combined	9·72	7·10	6·01

The author states that the determination of the iodine alue and of the rotatory power affords a sure means for he detection of adulteration of refined peppermint oil with merican turpentine oil.—A. S.

cetone; Making Cyanides and ——. C. B. Jacobs, Assignor to Ampere Electro-Chemical Co. U.S. Pat. 719,223, Jan. 27, 1903. VII., page 297.

Phenols in Medicinal Substances; Determination of ——. E. Borral. XXIII., page 322.

Apomorphine in Morphine Hydrochloride; Detection of ——. Helch. XXIII., page 320.

Perfumes; Bactericidal Action of ——. H. Marx. XVIII. C., page 314.

English Patents.

Piperidine and Analogous Bases; Manufacture of Stable Salts from ——, *and of preparations therefrom.* W. B. Bishop, A. Bishop, and F. W. Passmore, London. Eng. Pat. 1790, Jan. 22, 1902.

Parasulphamine benzoic acid is added to an equimolecular weight of piperidine (or an analogous base) dissolved in water. The solution contains the corresponding salt of piperidine, which, when isolated, is found to be non-hygroscopic, and not, like many piperidine salts, decomposed at the heat of the water bath.

This salt may be made into an effervescent preparation by mixing it with, for instance, sodium bicarbonate and citric or tartaric acid.—T. F. B.

Pyroligneous Acid; Purifying and Concentrating ——. W. P. Thompson. From G. Clock. Eng. Pat. 28,595, Dec. 27, 1902. III., page 291.

French Patents.

Alcohol; Industrial Process for the Synthesis of ——, *by Fournier's method.* Soc. S. Jay et Cie. Fr. Pat. 321,863, June 6, 1902.

A regulated supply of ozone is allowed to react with a strongly cooled mixture of suitable proportions of acetylene and hydrogen in a bulb connected with a cooled receiver for the alcohol formed.

With proper regulation the process is said to give the maximum yield of alcohol, there being no further oxidation.

—T. F. B.

Camphene free from Chlorine; Production of ——. Chem. Fab. auf Actien (vorm. E. Schering). Fr. Pat. 321,851, June 5, 1902.

The haloid compounds of pinene are heated for a considerable time at high temperatures with aqueous or alcoholic ammonia.

For instance 10 kilos. of pinene hydrochloride are heated with 8 kilos. of ammonia (sp. gr., 0·910) for 20 hours at 210°—220° C. in an autoclave. The yield is about 90 per cent. of theory. The word "camphene" covers all compounds obtained by the dehydration of borneol and isoborneol.

See also Eng. Pat. 26,618, of 1901; this Journal, 1902, 1553; and Fr. Pat. 321,746, of 1902; this Journal, 1903, 229.—T. F. B.

Camphene free from Chlorine; Production of ——. Chem. Fab. auf Actien (vorm. E. Schering). Fr. Pat. 321,864, June 6, 1902.

See Eng. Pat. 26,618 of 1901; this Journal, 1902, 1553.

—T. F. B.

Camphenilide of Acetone; Production of Perfumes from ——. Chem. Fab. auf Actien (vorm. E. Schering). Fr. Pat. 321,878, June 7, 1902.

Camphenilide of acetone, prepared by Claisen's or Kaiser's method by condensing camphenilaldehyde with acetone, is used after suitable dilution, as a perfume, either alone or mixed with other odoriferous substances.

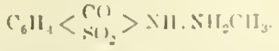
Camphenilide of acetone has a boiling point of 147°—150° C. under 22 mm. pressure.—T. F. B.

"Saccharin" with Ammoniacal Compounds; New Compounds of ——. Givaudan. Fr. Pat. 322,096, June 14, 1902.

The claim covers "all compounds of 'saccharin' with every series of ammoniacal compounds."

The salts of saccharin with mono-, di-, and trimethylamine, as well as the corresponding ethylamines, have been prepared.

Saccharinate of monomethylamine is prepared by mixing aqueous solutions of methylamine and "saccharin" in equimolecular proportions, and evaporating the mixture *in vacuo.* The resulting compound has a melting point of 156·5° to 157° C., and, on analysis, is found to correspond to the formula—



$$C_6H_4<\begin{matrix}CO\\SO_2\end{matrix}>NH.NH_2CH_3.$$

The other compounds are prepared in a similar manner.

The saccharinates described are very soluble in water and alcohol, but insoluble in chloroform, benzene, carbon bisulphide, petroleum spirit, ether, &c.

The salts obtained with tertiary amines appear to be rather less stable than the others.—T. F. B.

Flask for holding Ethyl Chloride and other Volatile Liquids. H. Goetz. Fr. Pat. 322,141, May 30, 1902. I., page 288.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Playertype; Note on ——. J. Hort Player. The Phot. J., 1903, **43**, 15.

The author finds that better results may be obtained in the Playertype process by using a chloro-bromide paper very sensitive to gas-light, instead of the ordinary paper; yellow light may also be substituted for the green light hitherto used.

The process recommended is as follows:—A yellow "screen" is prepared by enclosing a layer of a solution of picric acid (5 grs. in 16 ozs. of water, with about 5 drops of hydrochloric acid), between two thin glass plates $\frac{1}{16}$ inch apart, cemented together to form a watertight cell.

The subject to be copied is laid, face upwards, on a sheet of glass, a piece of gelatin chloride paper is placed, film downwards, on the subject, and the screen laid on top of the paper, the whole being weighted if necessary. Exposure is made to daylight (about 30 seconds), and the paper developed. A convenient developer is hydroquinone (3 grs. to the oz.), with addition of concentrated caustic soda solution as required.

The negative thus obtained is printed in the usual way in direct daylight, the same developer, with 1 to 2 grs. of potassium iodide to the oz., being used.—T. F. B.

Isocyanines; Sensitising Action of the so-called ——. A. Miethe. Chem. Ind., 1903, **26**, [3], 54—55.

Although cyanin (iodoamyl-quinoline-lepidine) acts in the orange part of the spectrum as a most efficient sensitiser, it possesses certain disadvantages, being insoluble in water, and having a tendency to produce spotting and fog on the photographic plate. The author has prepared a series of homologous compounds to those obtained by Spalteholz ranging from iodomethylquinoline-quinaldine to iodohexyl quinoline-quinaldine, as well as some dyestuffs, in which two different alkyl groups are present. Further, in some of the compounds, iodine was replaced by bromine. All the dyestuffs are red to violet, and show a general absorption distinct from that of amylcyanin. The substances are soluble in water and alcohol, but require frequent crystallisation to obtain them free from by-products which are formed in large quantity during the reaction. The methyl and ethylisocyanins are especially valuable for preparing panchromatic dry photographic plates which have an equal sensitiveness over the whole spectrum. For practical purposes, the ethylisocyanin is to be preferred, since the curve of sensibility of this product does not extend too far into the red, so that it is possible to work with plates treated with this product by a tolerably bright red light. Very small quantities of the isocyanins are required, and in order to obtain the maximum panchromatic sensitising effect, 0·016 grm. per litre of emulsion is sufficient, or immersion of the finished silver bromide plate for 1—2 mins. in a colour solution containing 1 part in 50,000.—T. A. L.

Pyrogallol Developers with Caustic Alkalis. E. Valenta. Phot. Corr., 1902, **39**, 703. Chem. Zeit., 1903, **27**, [11], Rep. 32.

As is well known, it is not possible to make use of pyrogallol developers containing an excess of caustic alkali, since such liquids rapidly turn dark brown in the air and yield developed prints which are completely veiled over. The cause of this is the ready decomposability of the triphenolate formed by the excess of alkali. In addition to the triphenolates, mono- and di-derivatives, of the types $C_6H_3(OH)(ONa)_2$ and $C_6H_3(OH)_2(ONa)$, exist, and the author has made experiments to find out whether these latter are as unstable and unsuitable for developers as the former. It is found that, when a caustic alkali is added to a pyrogallol-sulphite solution in the proportion required for the formation of a monoalkali-phenolate, good and almost colourless developers are obtained, which (with the exception of the lithium developer) act much more quickly than pyrogallol-sodium carbonate developers. Of the dialkali-phenolates only the lithium compound can be employed. The negatives obtained with these developers show good gradation. The following formula is recommended A. 160 grms. of crystallised sodium sulphite, 500 c.c. of water and 25 grms. of pyrogallol, made up to a litre with water. B. 11·5 grms. of potassium hydroxide (or 8 grms. of the sodium compound), dissolved in 1 litre of water. Equal parts of A, B, and of water are mixed for development.—T. H. P.

Trioxymethylene in Photography; Use of ——. A. and L. Lumière and Seyewetz. Monit. Scient., Feb. 1903, **17**, 109.

The authors propose the use of combinations of trioxymethylene and sodium sulphite in photographic developers, instead of caustic alkalis or alkali carbonates. They find that 3 grms. of trioxymethylene and 100 grms. of anhydrous sodium sulphite make a good mixture, nine parts of which, together with a little potassium bromide, are used with one part of pyrogallol in 100 parts of water. The mixture of trioxymethylene and sodium sulphite acts precisely like alkalis in developers, *viz.*, as an accelerator; it is found to work equally well with other phenolic developers.

The advantages of this substance over alkalis lies in the fact that it has a tendency to render gelatin insoluble, and to toughen it.

The mixture of trioxymethylene and sulphite may also be used with advantage in the combined toning and fixing for photographic prints in place of alum; but the proportions most suitable are different, *viz.*, five parts of trioxymethylene, one part of anhydrous sodium sulphite, and four parts of sodium chloride. This mixture has an alkaline reaction, hence it does not tend to cause precipitation of sulphur from the thiosulphate as alum does, thus rendering the presence of traces of thiosulphate less harmful to the finished print.—T. F. B.

English Patents.

Nitrocellulose Films and Varnishes; Manufacture of ——. H. Lüttke, Wandsbeck. Eng. Pat. 21,955, Nov. 13 1902.

Nitroglycerin is substituted for the gum, oil, or campho used to render the nitrocellulose pliable.

Suitable proportions are 15 to 30 per cent. of nitroglycerin for films, and 10 to 15 per cent. for varnishes.

In addition to being equally suitable in other respect nitroglycerin is said to have the advantage for photograph purposes over the oils or other substances used, in that has no solvent action on the emulsion layer which is applie to the film.—T. F. B.

Intensifying Negatives; Solution for ——. F. S. Ogilvie Newcastle; from C. A. Ogilvie, Wellington, N.Z. Eng Pat. 5108, Feb. 28, 1902.

The solution consists of mercuric iodide dissolved in exce of potassium iodide solution. The proportions are, approx mately: mercuric chloride, one part; potassium iodid three parts; water, 90 parts; the components being di solved separately, and the iodide run into the solution mercuric chloride.—T. F. B.

Photographic Prints; Preparation of ——, for Toning. T. Baker, Melbourne. Eng. Pat. 24,019, Nov. 3, 1902.

HE prints are immersed in a solution of a soluble chloride, romide, or iodide, or a mixture of these compounds, of uch a strength that they absorb just enough haloid to ender insoluble the soluble silver salts, leaving no injurious xcess of haloid in the print.

A suitable strength is $1\frac{1}{4}$ grs. of sodium chloride in 1 oz. f water, the prints being allowed to remain in the solution or about a minute.

The haloid bath is used with or without the addition of substance which hardens gelatin (aluminium salts, chrome lum, tannic acid, or formaldehyde).

A solution containing $1\frac{1}{4}$ grs. of sodium chloride, and 5 rs. of aluminium sulphate in 1 oz. of water is recommended.—T. F. B.

Photographic Decoration; Vitrifiable ——. L. Crabtree, Newark, N. J., Assignor to S. T. Aston, New York. U.S. Pat. 719,197, Jan. 27, 1903.

N emulsion of a mineral colour and glycerin with gelatin s applied to some medium to form a coated plate, which is ensitised with potassium bichromate. This plate is exposed nder a negative, and applied to the article (china, glass, c.) to be decorated. The whole is treated with hot water o remove the carrying medium and wash out the soluble ortion of the gelatin, and the article fired to destroy the emaining gelatin.—T. F. B.

French Patents.

Developing Bands of Photographic Films; Process and Apparatus for ——. Soc. Voltz, Weiss, and Co. Fr. Pat. 321,397, May 24, 1902.

HE apparatus consists of an adjustable frame, fitted with uides &c., on which the strip of film can be fixed. As the evelopment of each portion of film is finished, the portion covered with a layer of a suitable substance such as elatin, celluloid or mica, thus stopping development.

—T. F. B.

hotographic Intensifier; Process for Making a Solid ——, in a Stable Form. Soc. Anon. Fab. de Plaques Sèches (C. Schleussuer). Fr. Pat. 322,311, April 16, 1902.

HIS intensifier consists of a mixture of mercuric iodide repared by the dry mixing of salts of mercury with odides) with anhydrous sodium sulphite or thiosulphate.

—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patent.

teeping or Soaking and Draining; Centrifugal Machinery or Apparatus for —— [Nitrating Gun-Cotton]. J. B. Alliott. Eng. Pat. 3177, Feb. 7, 1902. I., page 287.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

English Patent.

Gas Testing; Improved Argand Burner for ——. V. Grafton, East Ham. Eng. Pat. 22,873, Oct. 21, 1902.

improve the illuminating power of the No. 1 London rgand burner, the inventor proposes to reduce the internal r passage by a small annular reducing piece, preferably 37 in. in internal diameter, and to vary the height of the ss chimney according to the illuminating power of the s to be consumed: *e.g.*, 4 in. for carburetted water-gas of -candle power, and $4\frac{1}{2}$—6 in. for mixtures of coal-gas and ter-gas of from 14 to 16-candle power, the internal ameter of the chimney being $1\frac{7}{8}$ in. in all cases.—C. S.

INORGANIC—QUALITATIVE.

annous Salts; Use of Sodium Nitroprusside for the Detection of ——. J. Fagès. Ann. Chim. anal. appl., 7, 442—444. Chem. Centr., 1903, 1, [4], 252.

a few drops of sodium nitroprusside solution be added a dilute alkaline solution of a stannous salt, a permanent greyish-red coloration is produced, which, on the addition of a small quantity of hydrochloric acid changes to blue, whilst the colour is completely destroyed by an excess of the acid. If to the decolorised solution, potassium ferricyanide solution be added, a precipitate of Turnbull's blue is produced.—A. S.

Cobalt, in the Presence of Nickel; Detection of ——. C. Reichard. Zeits. anal. Chem., 1903, 42, [1], 10—14.

Solutions of sodium orthoarsenite and cobalt nitrate, when mixed, produce a bulky, slimy precipitate of basic cobaltous arsenite, $Co_7As_2O_{10}$; the nickel salt formed under similar conditions has the composition $Ni_{14}As_2O_{17}$. Both salts are soluble in potassium cyanide, but the cobalt compound, when suspended in water and treated with barium peroxide, gradually oxidises and forms black cobalt sesqui-oxide, whilst the nickel compound is unaffected. The higher oxide of cobalt is insoluble in potassium cyanide, so the two metals may be separated at this stage.

A mixture of cobaltous and nickelous oxides are separated by the same treatment, and the method has general application in the following instances:—

(1) Mixtures of soluble nickel and cobalt salts, from which the sub-oxides may be precipitated by means of alkali.

(2) Mixtures of insoluble oxygen salts, if the metals are present in the lower forms of oxidation.—R. L. J.

Molybdenum Compounds; A Sensitive Test for ——. L. Spiegel and T. A. Maass. Ber., 36, [2], 512—515.

One part of colourless phenylhydrazine is dissolved in 4 parts of 50 per cent. acetic acid. Of this solution, 5 c.c. are added to the liquid which is to be tested for molybdenum, and the mixture is boiled for 1—2 minutes. A red colour is developed if molybdenum be present. In doubtful cases the liquid, after cooling to about 50° C., is shaken up with a few drops of chloroform or acetic ether, when the red colouring matter passes into the organic solvent and is distinctly perceived, when the latter floats on the surface, even when the liquid under examination would otherwise obscure the colour. The test reveals the presence of 0·00001 grm. of molybdenum, or even less, in 10 c.c. of solution. Tungstates, vanadates, antimoniates, chromates, and salts of tin, iron, manganese and uranium, do not interfere. Arsenic acid, in very concentrated solutions, gives a yellowish-red colour with phenylhydrazine, but this is accompanied by the separation of benzene. In somewhat dilute solutions this colour is not developed, and in any case extraction with chloroform serves to distinguish it from the molybdenum coloration.

It is essential that an excess of phenylhydrazine be used.

—H. B.

INORGANIC—QUANTITATIVE.

Indicators; Report of the Commission of the Fourth International Congress of Applied Chemistry on ——. G. Lunge. Zeits. angew. Chem., 16, [7], 145—148.

The Commission was appointed to report on the desirability of recommending uniformity in the use of indicators in volumetric work, at any rate in commercial and reference analyses. The part of the report now published in abstract refers to alkalimetric indicators. The Commission recommend that methyl orange (they deprecate the use of the alternative term *Helianthin*) should always be used for the determination of caustic and carbonated alkalis and of strong mineral acids, and for certain other specific cases mentioned in the analytical text-books. Methyl orange can be readily prepared from sulphanilic acid and dimethylaniline, or it can be bought in a state of purity as the free acid, in violet scales. The sodium salt, as a yellow powder, is also obtainable, but is often adulterated with dextrin and other substances, and should not be bought except under guarantee of its purity. For the determination of organic acids the Commission recommend phenolphthalein as indicator. For borates, silicates, aluminates, &c., special methods must be adopted.—J. T. D.

Boric Acid and Strong Acids; Simultaneous Volumetric Determination of ——. W. Herz. Zeits. anorg. Chem., **33**, 353—354. Chem. Centr., 1903, **1**, [6], 360.

It is known that solutions of boric acid can be titrated, with phenolphthalein as indicator, if the acid be converted into a strongly dissociated alkyl boric acid by the addition of an alcohol (glycerin, mannitol, &c.). This method is not applicable if a strong acid be present, as phenolphthalein is not without action on free boric acid. If, however, in such cases, nitrophenol be used as indicator, the point of neutralisation of the strong acid in the mixture is shown distinctly, and the boric acid may subsequently be determined by adding mannitol and titrating in presence of phenolphthalein as indicator.—A. S.

Ammonium Nitrate-Molybdenum Solution for the Determination of Phosphoric Acid; Preparation of the ——. A. Mercier. Bull. Acad. roy. Belgique, **16**, 389—393. Chem. Centr., 1903, **1**, [6], 359.

The author has examined the various methods which have been proposed for the preparation of the ammonium nitrate-molybdenum solution, and he finds the following to be the most satisfactory:—100 grms. of molybdenum trioxide are dissolved in 144 c.c. of a 10 per cent. solution of ammonia (sp. gr. 0·9593), the liquid is diluted with water to 500 c.c., and poured into one litre of nitric acid of sp. gr. 1·20.
—A. S.

Hardness of Water; Determination of ——. W. Peters. Apoth.-Zeit., 1903, **18**, 25. Chem.-Zeit., 1903, **27**, [11]. Rep. 21.

For the determination of the hardness of waters containing, besides calcium salts, larger quantities of magnesium salts—as is the case with river-water into which the waste water from potassium chloride factories is led—the author recommends the following method:—100 c.c. of the water containing a few drops of alizarin solution are titrated at 100° C. with decinormal hydrochloric acid until the red colour of the liquid changes to yellow, and remains so after continued boiling. Multiplication of the number of c.c. of acid used by 2·8 gives the degrees of temporary hardness on the German scale, since 1 c.c. of decinormal acid corresponds with 2·8 mgrms. of CaO. A known volume, in excess, of a mixture of equal proportions of decinormal sodium carbonate and decinormal sodium hydroxide solutions is then added, the liquid being then boiled for a few minutes and afterwards cooled to 15° C., and made up to 200 c.c. The excess of alkali is then measured by titrating 100 c.c. of the filtered liquid with decinormal hydrochloric acid, using methyl orange as indicator. By multiplying by 2·8 the number of c.c. of decinormal alkali, calculated on 200 c.c. of the filtrate used, the total hardness of the water is obtained in German degrees.—T. H. P.

ORGANIC—QUALITATIVE.

Colophony in Naphthalene; Qualitative Detection of Small Quantities of ——. R. Hodurek. Oesterr. Chem.-Zeit., **5**, 555. Chem. Centr., 1903, **1**, [5], 300.

If pure naphthalene be melted in a test-tube with a trace of colophony, and then concentrated sulphuric acid be allowed to run down the side of the tube, a cornflower-blue coloration is produced at the zone of contact of the naphthalene and the acid. The naphthalene must be at such a temperature that it will not solidify on adding the sulphuric acid. On gentle shaking, the colour spreads throughout the naphthalene layer, but the sulphuric acid remains uncoloured. This test forms a sensitive reaction for the detection of the smallest quantities of rosin in pure naphthalene. Solutions of rosin in toluene and the higher-boiling coal-tar hydrocarbons give the reaction in the same manner as the naphthalene solution, but the liquid must be at a sufficiently high temperature. With a solution of rosin in chloroform, the blue coloration with sulphuric acid only appears after the addition of acetic anhydride. The blue colour of the naphthalene layer disappears immediately on the addition of a few drops of alcohol, ether, acetone, glycerin, or formaldehyde, whilst the sulphuric acid becomes coloured red. The addition of a large quantity of chloroform produces a similar result.—A. S.

Almond Oil (Fixed); Detection of Peach Kernel Oil in ——. A. Chwolles. Chem.-Zeit., 1903, **27**, [4]; through Pharm.-Zeit., **48**, [11], 109.

An equal volume of the oil to be tested is poured upon nitric acid of sp. gr. 1·420; a similar quantity of a 1 per 1,000 ethereal solution of phloroglucinol is then added and the whole vigorously shaken together. Peach kernel oil gives, under these conditions, an intense raspberry-red colour, with a shade of violet. Almond oil gives only a faint rose-red colour. The addition of 10 per cent. of peach kernel oil to almond oil may be detected by this reaction by comparing the tint given with that obtained from pure almond oil.—J. O. B.

Apomorphine in Morphine Hydrochloride; Detection of ——. Helch. Pharm. Post, 1902, 755; through Pharm. Centralh., **44**, [7], 95.

The substitution of a 5 per cent. solution of potassium bichromate for the potassium carbonate solution generally employed is recommended. The reaction obtained is sharper, and there is no loss of time, since oxidation of the apomorphine is quickly accomplished by the bichromate. One drop of the reagent is added to 5 c.c. of a 1.30 solution of the morphine salt. On shaking out with chloroform that solvent removes, and is coloured by the characteristic reddish-violet oxidation product, even if so little as 0·03 per cent. of apomorphine be present in the original salt taken.—J. O. B.

ORGANIC—QUANTITATIVE.

Creosote; Rapid Determination of Phenol in ——. R. Michonneau. J. Pharm. Chim., [7], **17**, [4], 161.

The presence and, approximately, the amount of phenol in creosote may be determined by means of the solubility of phenol in a mixture of glycerin and water as follows:—

Fifteen c.c. of creosote are mixed in a 50 c.c. graduated cylinder with 5 c.c. of glycerin. The solution is then made up to 50 c.c. with water, well shaken, and allowed to separate. The volume of the separated creosote is then read, and the supernatant liquid decanted. Water is again added up to 50 c.c.; agitation, separation, and reading are repeated. Decantation is again performed, a third washing with water made, and the third reading of separated creosote taken.

Pure creosote thus treated gave 14·3 c.c. of insoluble residue with the second and third washings. Creosote containing 10 per cent. of phenol showed 14·3 c.c. after the second washing, and 13·5 c.c. after the third. A mixture of creosote containing 20 per cent. of phenol showed 13·3 c.c. of creosote at the third washing, and one containing 40 per cent. of phenol only 12 c.c. under like conditions.
—J. O. B.

Shellac; Analysis of ——. E. J. Parry. Chem. and Druggist, 1903, **62**, [1201], 175—178. See this Journa 1901, 1245; 1902, 782.)

Detection of Rosin.—A method, based on the solubilit of metallic salts of the acids of rosin in light petroleu spirit, allows of the detection of 5 per cent. of rosin. Th sample of shellac is dissolved in a little alcohol, the solutio poured into water, and the fine impalpable powder which precipitated is collected and dried. It is then extract with light petroleum spirit, and the solution shaken with little water containing a trace of copper acetate. If ros is present, the petroleum spirit will be coloured emeral green.

Determination of Rosin.—Approximately accurate resu are obtained by a determination of the iodine-absorpti value. The iodine value of rosin may be taken as 125 cent., whilst that of pure shellac was found, by the amination of a large number of samples of known ori and purity, to be, on the average, 8—9 per cent. purposes of calculation, the author recommends taking iodine value of shellac as 9 per cent. For confirmat purposes, determinations of the acid value and ester value are useful. The average acid value of shellac is about 60, and the ester value, about 150; whilst for rosin, the corresponding figures are about 165 and 0—5.

The author finds, also, that the percentage of rosin can be determined approximately by a modification of Gladding and Twitchell's method for the separation of fatty and rosin oils; 0·5 grm. of the sample is dissolved in the smallest possible amount of alcohol, the solution is neutralised with alcoholic potash, using phenolphthalein as indicator, poured into about 100 c.c. of water, and a solution of about 0·5 grm. of silver nitrate added. The silver salts of the resin acids are soluble in ether, whilst those of the shellac acids are insoluble. The liquid is extracted twice with ether, the ethereal solution filtered, washed three times with water, and then well shaken with dilute hydrochloric acid. The resin acids set free remain dissolved in the ether. The ethereal solution is well washed with water, filtered, evaporated in a tared dish, and the residue dried to a constant weight. The results are rather high, owing chiefly to the slight solubility of the neutral constituents of shellac in ether. In four determinations with samples containing known amounts of rosin, the results were from 2·3 to 3·4 per cent. above the theoretical figures. (See also this Journal, 1888, 391, 682; 1897, 364.)—A. S.

Tannin; Determination of ——. H. Cormimboeuf. Ann. Chim. anal. appl., **7**, 452. Chem. Centr., 1903, **1**, [4], 258.

The author has examined the method of Crouzel (this Journal, 1902, 1560), but finds it to be wholly unreliable. The precipitate with antipyrine is easily soluble in water; indeed, on standing, it re-dissolves in the mother-liquor.

—A. S.

Cane Sugars and Syrups; Determination of Water in ——. H. C. Prinsen Geerligs. Mededeelingen van het proefstation voor suikerriet in West Java "Kagok" te Pekalongan, [59], 1—5. Chem. Centr., 1903, **1**, [6], 365.

Gunning, in a paper read before the International Congress of Applied Chemistry in Brussels, expressed doubts as to the reliability of the determination of water in cane sugars by drying at 107°—108° C., owing to the fact that at this temperature, volatile acids are formed. The author has made experiments on the subject, and finds that the amount of water in a good commercial sugar can be determined quite well by drying for two hours at 103°—107° C. For the determination of water in lower-grade sugars, the sample is dissolved in a little hot water, a piece of filter-paper impregnated with the solution, and the paper then dried to constant weight (for about four hours) at 105° C.—A. S.

Syrups; Brix Determination of ——. H. C. Prinsen Geerligs. Mededeelingen van het proefstation voor suikerriet in West Java "Kagok" te Pekalongan, [59], 5—24. Chem. Centr., 1903, **1**, [6], 364.

The tables used in the cane-sugar industry for ascertaining the degree Brix of juices and syrups; those giving the ratio between specific gravity and degrees Brix; and those giving corrections for temperature, are based solely upon constants that have been obtained by the examination of saccharose solutions. The use of these tables therefore implies that the solid substances present with saccharose in the products mentioned influence the degree Brix in the same manner as saccharose itself. The author has made experiments to determine how far this assumption is correct, and he concludes that whilst the degree Brix indicates fairly accurately the amount of solid substances present in those products of which saccharose is the main constituent, this is not so in the case of impure products, such as molasses, &c. The accumulated non-saccharine constituents of these impure products, especially the salts, have, in solution, a higher specific gravity than saccharose; consequently the degree Brix indicates too large a percentage of solid substances. For purposes of comparison, however, determinations of the degree Brix under similar conditions of concentration and temperature are sufficient.

—A. S.

Cellulose; Determination of ——. S. Zeisel and J. Stritar. Biedermann's Centralbl., 1902, 863; through Ann. de Chim. anal., **8**, [2], 77.

The method is based on the property of the non-cellulose constituents of wood of being rapidly transformed into soluble products by the action of potassium permanganate in the presence of nitric acid. One to five grms. of the substance, in a finely-divided state, are allowed to swell in nitric acid; the product is then treated, whilst cool, and constantly agitated, with a 3 per cent. solution of potassium permanganate, until the violet colour is persistent for half an hour. This addition of permanganate should occupy about two hours. The excess of permanganate is then decomposed, and the precipitated oxide dissolved by the addition of sulphurous acid, or of sodium bisulphite and dilute sulphuric acid. The residue is collected, washed, macerated at 60° C. for 45 minutes with solution of ammonia (25 per cent.), filtered off, washed, first with hot water, then with alcohol, and afterwards with ether, and finally dried and weighed.—J. O. B.

Reducing Sugars; Iodometric Determination of ——. M. Buisson. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [7], 740—741.

In a previous note (this Journal, 1903, 48) the author pointed out a method of determining reducing sugars by using potassium iodide to titrate the Fehling solution. Since potassium iodide can only be prepared free from iodate with difficulty, he has sought to replace it by another iodide free from this impurity. Iodide of zinc is free from this defect. It is prepared by introducing into a 500 c.c. flask 80 grms. of doubly sublimed iodine with 300 c.c. of water and 30 grms. of finely-granulated zinc. The action proceeds in the cold. Should heating occur, the flask is cooled to avoid any volatilisation of iodine. In 24 hours the solution is almost colourless; it is heated until decolorised, cooled, and made up to the mark. The liquor is filtered, and kept with a few pieces of granulated zinc.

Each 100 c.c. represented 20 grms. of iodide; the solution is about 23° Bé. It is slightly acid.—L. J. de W.

Starch [in Fodder Materials]; Determination of ——. St. Weiser and A. Zaitschek. Pflüger's Arch., **93**, 98—127. Chem. Centr., 1903, **1**, [4], 254.

By the ordinary method of starch determination (solution of the starch by boiling for four hours in an autoclave, inversion of the dissolved starch by hydrochloric acid, and determination of the reducing power of the liquid by means of Fehling's solution), the results obtained are too high, because pentosans are invariably dissolved with the starch, and these on inversion yield reducing substances. The pentoses formed may be determined by Tollens' furfural-phloroglucide method, but in order to know how great a portion of the reduction observed after inversion is to be attributed to the pentoses, it is necessary to have data as to the reducing power of pure arabinose and xylose. For this purpose the authors give two tables, from which it appears that the reducing power of arabinose and xylose decreases with increasing concentration in an exactly similar manner to that of dextrose. Also, at any definite concentration the reducing power of dextrose is about the mean of those of arabinose and xylose. The amount of pentoses found by the phloroglucide method can thus be calculated to dextrose and the result deducted from the total amount of dextrose. In this way the authors found that in previous starch determinations, in which the pentoses were not allowed for, the results obtained differed, according to the amount of pentosans present, by from 3 to 36 per cent. from the correct figure.—A. S.

Hydrazine; Iodometry of ——. E. Rupp. J. prakt. Chem., 1903, **67**, [2 and 3], 140—142.

The method of determining hydrazine volumetrically, described by Stollé (this Journal, 1902, 1351), has been already given by Spiess, who found that the hydrazine solution should be mixed with excess of iodine solution and a substance—preferably sodium acetate or sodium potassium tartrate—for neutralising the hydriodic acid formed, the excess of iodine being determined by titration after 15 minutes' standing.—T. H. P.

Phenols; Determination of ——, in Medicinal Substances. E. Borrat. J. Pharm. Chim., **17**, [3], 98—100.

A QUANTITY of material containing approximately 0·20 to 0·30 grm. of phenols is introduced into a distilling flask with about 75 c.c. of water and 2 or 3 c.c. of hydrochloric acid. The apparatus is connected with a condenser and 40 to 50 c.c. of liquid distilled over. This first distillate is set aside, another 40 to 50 c.c. of water are introduced into the flask, and a second distillation conducted. This will generally remove the last trace of phenols, but, as a precaution, a third distillation should be performed, the distillate tested with bromine water, when, if a precipitate be obtained, a further repetition of the process must be performed.

When phenols of high molecular weight are present, these frequently separate in a solid form, in the condenser tube or in the receiver. They should be washed down with a jet of water. The insoluble phenols in the distillates are then collected on a tared filter, dried over sulphuric acid, and weighed.

The filtrate is treated with an excess of bromine water; the soluble phenols thus precipitated as bromophenols are allowed to settle for 24 hours, then collected, washed, dried over sulphuric acid, and weighed as bromophenols. The amount of bromine in these bromophenols is then determined, in the usual manner, after ignition with lime, as silver bromide. Representing the bromophenols as P_B, the soluble phenol as P_S, and bromine as B, the weight of the soluble phenols present will be found by the equation—

$$P_S = P_B - B + \tfrac{1}{80} B = P_B - \tfrac{79}{80} B.$$

The total phenols are the sum of the soluble and insoluble phenols.—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Pitchblende; Emanating Substances from ——. F. Giesel. Ber., **36**, [2], 342—347.

THE author criticises the observations of Rutherford (this Journal, 1902, 196, 795), and describes the chemical and physical properties of emanating preparations which he has obtained from the rare earths of pitchblende, and which have not lost any of their emanating and radiating power in six months. Thorium is absent from these preparations. The emanation can apparently be absorbed by porous substances, and can be carried off by a current of air, which can then cause a screen of zinc sulphide, if unvarnished, to glow. The air stream discharges an electroscope at once. When the preparation is brought into an electric field, the emanation is urged in the direction of the negative from the positive electrode, and must itself be positively charged. Whether it consists of the positive ions, or merely the vapour of the substance itself, is uncertain. The emanation of the new substance is very different from that of radium, and the author proposes the name "E rays" for the radiation.—H. B.

Amorphous Sulphur; Influence of ——, on the Solidifying Point of Liquid Sulphur. A. Smith and W. B. Holmes. Zeits. physik. Chem., **42**, 469—480. Chem. Centr., 1903, **1**, [5], 274.

KUSTER (Zeits. anorg. Chem., **18**, 369) found that the conversion of liquid sulphur into amorphous sulphur by heating is most complete at 448° C., at which temperature a yield of 34·2 per cent. of the latter is attained. The authors have quantitatively determined how far the presence of amorphous sulphur produces a lowering of the melting-point (119·25° C.) of crystalline sulphur. It was found that this lowering was proportional to the amount of amorphous sulphur present in the liquid sulphur at the moment of solidification. No notable diminution of the amorphous sulphur by conversion into the soluble (in carbon bisulphide) form occurs during the solidification of the melt, but on long keeping, and also by prolonged heating at 70°—100° C., the amount of amorphous sulphur is reduced. For example, within a period of six months, the amount of amorphous sulphur in a sample decreased from 6·92 to 6·38 per cent., also a mixture containing 2·8 per cent. of amorphous sulphur gave, after being heated for 10 hours at 70° C., only 0·57 per cent., whilst on being further heated for some time at 100° C., the whole of the amorphous sulphur was converted into the soluble form.

Pure amorphous sulphur, when extracted five times with cold carbon bisulphide, dissolves to the extent of 4·7 per cent.; the solubility becomes much greater, however, on admixture with soluble sulphur. For example, if a mixture of two parts of amorphous with 98 parts of soluble sulphur be extracted with carbon bisulphide, 13 per cent. of the former is dissolved.—A. S.

Tar Hydrocarbons; Auto-Oxidation of some ——. M. Weger. Ber., 1903, **36**, [2], 309—313.

HIGHLY purified specimens of the cumenes, hydrindene, and tetrahydronaphthalene were kept for 15 months in vessels closed with a cotton-wool plug, in stoppered bottles and in sealed tubes, both exposed to sunlight and in the dark. No change in volume due to polymerisation had taken place in any case. The sulphuric acid test and the specific gravity indicated that no change took place in the sealed tubes nor in the stoppered bottles. In the open vessels, however, a very decided change was apparent; the change was much greater in the light than in the dark. The tetrahydronaphthalene was altered more than any of the other substances. Where the change had occurred, oxygen was present in considerable quantity, and this is attributed to auto-oxidation. In the products, acids are certainly present, but no phenol, aldehyde, or peroxide could be detected.—J. McC.

Mannitol; Esterification of ——, by Phosphoric Acid. P. Carré. Comptes rend., **136**, [5], 306—308.

FORMER authors have stated that the product of the reaction of phosphoric acid on mannitol is an ester of formula $PO.(OH)_2OC_6H_{13}O_5$. The author has observed, however, (1) that water is eliminated during the reaction before esterification begins; and (2) that the velocity of esterification in an equimolecular mixture is much lower than that characteristic of primary alcohols. Careful examination and analysis of the product and of its salts have shown that it is formed according to the equation—

$$PO(OH)_3 + C_6H_{14}O_6 = 3\,H_2O + PO(OH)_2OC_6H_9O_3.$$

—J. T. D.

Ethyl Alcohol; Decomposition of ——, by Carbon, Aluminium, and Magnesium at High Temperatures. R. Ehrenfeld. J. prakt. Chem., 1903, **67**, [2 and 3], 49—93.

THE author has examined the products obtained when carefully dehydrated alcohol is distilled over heated carbon, aluminium, or magnesium, the results arrived at being as follows:—If the carbon is heated to dark redness, the alcohol is completely decomposed into methane, carbon monoxide, and hydrogen, according to the equation $C_2H_6O = CH_4 + CO + H_2$. If the carbon is at a lower temperature, the transformation undergone by the alcohol cannot be represented by one or more definite equations, but it results in the formation of relatively more hydrogen and less carbon monoxide than in the previous case, while a considerable quantity of ethane is also formed by direct reduction of the alcohol. When the alcohol vapour is passed over powdered aluminium heated below dark redness it is decomposed directly into ethylene and water, the latter afterwards undergoing partial reduction into hydrogen; if the temperature of the aluminium be raised to dull redness, this decomposition into ethylene and water proceeds simultaneously with the one yielding methane, carbon monoxide, and hydrogen. The proportion of the alcohol decomposed into these latter products increases when the aluminium is at a bright red heat, and this increase becomes more marked at a yellow heat; in the latter case, energetic reduction of the nascent carbon monoxide by the aluminium also takes place. The change occurring when the alcohol vapour is passed over heated magnesium is not a definite one, but may be regarded as made up of two distinct decompositions. The most noticeable feature, is the considerable proportion of hydrogen produced.—T. H. P.

Trade Report.

I.—GENERAL.

The Changes in the Monthly Trade Accounts.

Bd. of Trade J., Feb. 12, 1903.

A feature in the course of British Trade during recent years has been the gradual assimilation in kind of imports and exports, and in view of this tendency, it has been thought desirable to assimilate the form of the summaries of import and export trade. While this change is convenient for many purposes, the Board of Trade would warn those who use the returns against making comparisons between the values of imports and exports under the same headings without making due allowance for the different modes in which their values are arrived at. The value of imports includes, generally speaking, cost, insurance, and freight, while exports are valued "free on board."

The new summaries of imports and exports are identical in form, each containing four classes, under which the most important groups of article are shown (imports valued c.i.f., exports f.o.b.), viz. :—

I. Food, drink, and tobacco.
II. Raw materials and articles mainly unmanufactured.
III. Articles wholly or mainly manufactured.
IV. Miscellaneous and unclassified (including parcel post).

A list of the headings of chemical interest under classes II. and III. is appended :—

II. Raw materials and articles mainly unmanufactured—
  (*a*) Coal, coke, and patent fuel.
  (*b*) Iron ore, scrap iron, and steel.
  (*c*) Other metallic ores.
  (*d*) Oil seeds, nuts, oils, fats, and gums.
  (*e*) Hides and undressed skins.
  (*f*) Materials for paper-making.
III. Articles wholly or mainly manufactured—
  (*a*) Iron and steel and manufactures thereof.
  (*b*) Other metals and manufactures thereof.
  (*c*) Chemicals, drugs, dyes, and colours.
  (*d*) Leather and manufactures thereof.
  (*e*) Earthenware and glass.
  (*f*) Paper.

Among the other important changes which have been introduced, in response to suggestions from various sources, are the following :—

The imports of "dyestuffs (other than dye woods) and substances used in tanning" have been farther sub-divided, "cutch extracts, gambier, and myrobalans" being now shown eparately. Petroleum oil is now divided into "crude," "lamp," "spirit," "lubricating," "gas oil," and "fuel oil," and soap is classified under the headings "stock and powder," "household," and "toilet."

Among the articles which now for the first time appear eparately in the monthly accounts are white lead and lycerin; while the exports of clay, dyestuffs, and cientific instruments are also distinguished.

The above remarks apply solely to the changes introduced nto the monthly accounts. In addition, a number of hanges have been adopted affecting the import and export sts, and the annual statement of trade of the United Kingdom.

New Customs Tariff of Persia.

See Bd. of Trade J., Feb. 19, 1903, 363.

Revised Customs Tariff of Japan.

See Bd. of Trade J., Feb. 19, 1903, 378.

Valuation Tariff of British India.

Bd. of Trade J., Feb. 26, 1903.

No.	Names of Articles.		Tariff Valuation.	Duty.
			R. a.	
	CHEMICALS, DRUGS, MEDICINES, AND NARCOTICS, AND DYEING AND TANNING MATERIALS.			
10	Chemical products and preparations—			
	Acid, sulphuric	Lb.	0 1½	5
	Alkali, Indian	Cwt.	2 0	..
	Alum	,,	4 10	..
	Arsenic	,,	25 0	..
	Bicarbonate of soda	,,	6 8	..
	Copperas, green	,,	2 12	..
	Explosives, namely, blasting gelatine, dynamite, roburite, tonite, and all other descriptions, including detonators and blasting fuses	..	*ad val.*	,,
	Sal ammoniac	Cwt.	30 0	..
	Sulphate of copper	,,	17 8	..
	Sulphur (brimstone), flour	,,	6 8	..
	,, ,, roll	,,	5 8	..
	,, ,, rough	,,	5 0	..
	All other sorts of chemical products and preparations, including saltpetre and borax	..	*ad val.*	,,
11	Drugs, medicines, and narcotics—			
	Camphor, refined, cake	Lb.	1 9	,,
	,, partially refined, cake, in blocks of about 13 lb.	,,	1 3	..
	Camphor, crude, in powder	,,	1 1	..
	Quinine and other alkaloids of cinchona	..	..	Free
12	Dyeing and tanning materials—			
	Alizarine dye, dry, 40 per cent. ..	Lb.	1 4¼	5
	,, ,, 50 ,, ..	..	1 8½	,,
	,, ,, 60 ,, ..	,,	1 12	..
	,, ,, 70 ,, ..	,,	2 0¼	..
	,, ,, 80	,,	2 4½	..
	,, ,, 100 ,, ..	,,	2 12	..
	,, ,, moist, 10 ,, ..	,,	0 4¾	,,
	,, ,, 16 ,, ..	..	0 7	..
	,, ,, 20 ,, ..	,,	0 8	,,
	Aniline dye, moist (indigo blue) .	,,	0 6½	,,
	,, ,, dry	,,	1 0	,,
	,, salts	,,	*ad val.*	,,

New General Tariff for Austria-Hungary.

This Journal, Feb. 28, 1902, 235.

Note.—Duty is paid in Austria-Hungary calculated on a gold standard. The gold value of a krone is about twelve pence.

II.—FUEL, GAS, AND LIGHT.

Anthracite Coal, Welsh: U.S. Customs Decision.

The recent action of Congress in removing the duty on anthracite coal is emphasized by the action of the Board of General Appraisers in several importations made prior to the repealing measure. Paragraph 415 of the Tariff Act defined anthracite coal as "containing 92 per cent. of fixed carbon." Analysis of the above cargoes showed fixed carbon amounting to 76·9, 83·78, 86·32, 88·16, and 89·72 per cent., and all were held to be dutiable at 67 cents per ton, as coal containing less than 92 per cent. of fixed carbon Under the present conditions all of the above would be free of duty.—R. W. M.

IV.—COLOURING MATTERS, Etc.

Indigo Crop in British India in 1902.

Leipziger Färber- u. Zeugdr.-Zeit., 52, [2], 65.

The decline of the indigo industry in the past year was accelerated by very unsuitable weather and badly-distributed rain, producing in consequence a decrease in the acreage under cultivation to a degree never before experienced, as is shown in the accompanying table.

As estimated by the district surveyors, the average yield of the province Bengal and Behar will amount to about 47 per cent. of a normal crop, but it is to be expected that the more favourable weather in September will improve the

	1901.	1902.
	Acres.	Acres.
Bengal and Behar	312,200	258,300
Agra and Oudh	168,890	93,154
Punjab	71,600	42,300
Madras	16,200	98,100

result of the second crop, so that the total yield will be about 50 per cent., of which North Behar produces about 25.000 factory-mounds, and Bengal 8,000.

Reports received in Punjab promise a good result from the irrigated lands, and a fairly good one from the lands unirrigated.

Madras reports satisfactory results regarding the crops.

(After the First General Memorandum of the General-Director of Statistics in Calcutta.)—E. N.

ALIZARIN GREEN: U.S. CUSTOMS DECISION.

Feb. 6, 1903.

Decided that certain Alizarin Green V., manufactured by the Farbenfabriken of Elberfeld, shall be free of duty under paragraph 469 of the Tariff Act as a dye derived from alizarin or anthracene. An analysis of the samples showing that they were made from alizarin or anthracene, the action of the collector, in assessing duty at 30 per cent. *ad valorem* under paragraph 15, as a "coal tar colour," was overruled. —R. W. M.

COAL-TAR DYES: U.S. CUSTOMS DECISION.

Jan. 21, 1903.

Decided that a mixture of coal-tar dyes, not made from alizarin or anthracene, which gave a bluish violet solution in 50 per cent. alcohol, was dutiable at 30 per cent. *ad valorem* under paragraph 15 of the Tariff Act. This decision overruled the action of the collector at New York, who had assessed duty at 50 per cent. *ad valorem* under paragraph 18 as liquor colouring, the evidence showing that it was suitable for colouring confectionery and not for wine, brandy, or spirits.—R. W. M.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

PRINTING INDUSTRY IN 1902; PROGRESS IN THE ——.

Oesterr. Wollen und Leinen Ind., 1903, [1], 15.

Bleaching.—The method of bleaching pieces in the open width increased in favour.

Printing Methods.—The employment of tannin discharges slowly decreased, these being partly replaced by discharged alizarin and oxazine colours. The use of nitrosoresorcinol for brown and green grounds was revived. Raised goods of the "Velontine" and "Electra" types were in considerable demand. The former are printed through as much as possible on both sides, and are also raised on both sides. "Electra" goods are raised before printing, printed on the raised side, and dyed plain or printed with a stripe or diagonal pattern on the smooth back.—A. S.

VII.—ACIDS, ALKALIS, Etc.

HEAVY CHEMICALS IN THE UNITED STATES OF AMERICA.

Eng. and Mining J., Feb. 7, 1903.

Completed statistics for the year 1902 give the imports of heavy chemicals into the United States, as below, in long tons, comparison being made with 1901 :—

	1901.	1902.
Bleaching powder	53,844	50,167
Caustic soda	1,702	1,189
Sal soda	2,018	1,784
Soda ash	12,006	12,442
Other soda salts	6,400	7,676
Chlorate of potash	362	539

SMELLING SALTS: U.S. CUSTOMS DECISION.

Feb. 5, 1903.

Decided that smelling salts are dutiable at 25 per cent. *ad valorem* as a chemical salt under paragraph 3 of the Tariff Act, reversing the action of a collector, who had classified them for duty at 50 per cent. *ad valorem*, as a toilet preparation, under paragraph 70.—R. W. M.

ANTISEPTIC, DRY: U.S. CUSTOMS DECISION.

Feb. 6, 1903.

Decided, that a mixture of borax and boracic acid was dutiable at five cents per lb., under section 7 and paragraph 1 of the Tariff Act, as boracic acid, this being the component material of chief value. The article was designed for use as a preservative, especially for meat, and was claimed by the importers to be dutiable either at 25 per cent. *ad valorem* as a chemical compound or salt, under paragraph 3, or at four cents per lb., under paragraph 11. as a "borate material not otherwise provided for." These claims were overruled by the Board on the ground that it was a mechanical mixture rather than a chemical compound, and also that the term "a borate material" would not properly describe a mixture the ingredients of which were in the highest state of commercial purity, being designed for admixture with food products.—R. W. M.

XII.—FATS, OILS, Etc.

SOD OIL: U.S. CUSTOMS DECISION.

Feb. 5, 1903.

Certain sod oil which was shown by analysis not to have been made from wool grease was decided to be free of duty under paragraph 568 of the Tariff Act as a grease fit only for dressing and stuffing leather, and not at ½ cent. per lb. as dégras under paragraph 279.—R. W. M.

OIL AND SEED TRADE OF MARSEILLES.

U.S. Cons. Reps., Feb. 9, 1903.

The receipts of cotton-seed oil at this port during December were 2,909 tons, or about double those of any previous month, and the arrivals during the last six months of the year have been 8,228 tons, as against 5,484 tons during the first six months. The stock of cotton seed oil on hand on December 30 was 540 tons against 1,800 tons at the same period last year; this is the lowest figure recorded since 1894. The statistical situation is a follows :—

Total Imports of Cotton-Seed Oil.

Description.	1902.	1901.	1900.
	Tons.	Tons.	Tons
American oil	13,702	33,601	[illegible]
English oil	1,030	604	[illegible]
Other oils	50	114	[illegible]
Total	14,792	34,322	[illegible]

The progress of American edible oils appears in th following table of cotton-seed oil imports at Marseilles :—

Year.	Edible.	Industrial.	Total.
	Barrels.	Barrels.	Barrels.
1902	37,075	5,080	76,040
1901	123,483	39,736	188,736
1900	106,331	57,751	185,751
1899	91,306	158,171	269,106
1898	120,511	142,738	287,709

To counterbalance the short arrivals of American ind- trial oils, Marseilles received, during 1902, excessive supp of soap-making as well as edible-oil making materials ; figures follow.

Oleaginous-Seed Importations at Marseilles.

Article.	1902.	1901.	1900.
	Tons.	Tons.	Tons.
Cotton seed	22,394	23,132	13,126
Sesame seed	99,200	65,387	68,271
Arachides (peanuts):			
Shelled	107,656	61,136	23,847
Unshelled	64,132	74,866	81,655
Linseed	11,476	10,495	11,085
Rape seed and ravison	5,022	8,093	6,585
Poppy seed	3,975	3,516	3,938
Castor seed	26,214	25,931	15,942
Copra	87,348	85,259	103,734
Palm kernels	5,843	11,872	7,981
Mowrah, &c.	5,955	13,518	1,772
Total	439,215	383,205	335,936

Prospects point to an increase in the arrivals of sesame seed, and arachides will also come in heavily.

The high price of olive oil foots is explained as the natural result of a fuller knowledge of a valuable product. The production of this oil by chemical reaction has been carried on for not more than 15 years, and the material sold at a low range for several years because it could be had in annually increasing quantities and was considered a by-product. Now, the chemical reaction is employed everywhere, and the manufacture of foots can only increase materially with the olive crop. More important than this is the actively contested belief put forward by some as an ascertained fact, that 100 lb. of foots will manufacture upwards of 5 lb. more of soap than a like quantity of pressed oil. It is claimed that this method of manufacturing the foots gives the manufacturer of soap a fatty material, without other ingredient, which the pressed oil does not. The supposed intrinsic value of the foots being in excess of that of oil, soap makers have naturally worked the prices up to high levels. Whether this idea of intrinsic value be illusory or not, at this date foots are selling in Marseilles at 11·96 dols. per 220 lb., about 1·93 dols. less than a corresponding grade of olive oil, and one buyer has intimated that the time might come when olive growers would find it advantageous to handle their entire crop by the chemical process, covering, in the lower cost of manufacture, the loss of the high grades of edible oil.

XIII. A.—PIGMENTS, PAINTS, Etc.

HÆMATITE PIGMENT: U.S. CUSTOMS DECISION.

Jan. 23, 1903.

Decided that hæmatite used as a colour was properly dutiable at 40 cents per ton as iron ore under paragraph 121 of the Tariff Act, and not as a crude colour, at 30 per cent. *ad valorem* under paragraph 58.

This reverses former decisions of the Board on similar merchandise. The fact is established that iron ore is dutiable at the above rate without qualification as to its use.—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

INDIA-RUBBER MANUFACTURE; RAW MATERIALS FOR ——.

Gummi-Zeit., 1903, **17**, [19], 418.

Mexico Rubber.—Obtained from Central America, and is of a good strong quality. It is supplied in the form of plates, balls, "sausages," and strips of a black colour. The loss on washing is from 10—15 per cent.

Mollendo Rubber.—Is said to be of good quality. It is obtained from South Bolivia in the form of "biscuits" and "strips."

Mozambique Rubber.—Is obtained from East Africa, from species of Vahea and Landolphia in three qualities, and is similar to Madagascar rubber. It is supplied in orange-red, red, and white balls and "spindles." The loss on washing is from 10—40 per cent.

Mudar Rubber.—Is of a gutta-percha nature, being plastic in hot water, but proves to be a bad insulator. It is the product of the *calotropis giganteus*, a shrub of Southern India. It can be used for waterproofing cloth.—J. K. B.

RECOVERED RUBBER: U.S. CUSTOMS DECISIONS.

Feb. 5, 1903.

Decided that an article made from old and worn-out rubber was dutiable at 25 per cent. *ad valorem* under paragraph 449 of the Tariff Act as a manufacture of soft rubber. Evidence was submitted to show that the article was made from old and worn-out rubber by a process of devulcanisation and separation of impurities. The importers claimed that it was free of duty under paragraph 579 as "old scrap or refuse india-rubber which has been worn out by use and is fit only for re-manufacture." The Board overruled this claim, as the article was rather a manufacture of old rubber than any crude form of rubber or refuse rubber.—R. W. M.

XX.—FINE CHEMICALS, Etc.

CINCHONA AND QUININE.

Chem. and Druggist, Feb. 21, 1903.

In their annual review of cinchona and quinine during 1902 (dated February 6), Messrs. C. M. & C. Woodhouse give some interesting statistics regarding the position of these products. The prominent facts in regard to the series of tables given in the circular, are: (1) that the world's supply of bark is increasing; (2) that the consumption and distribution of quinine are also increasing; (3) that the percentage of quinine in the manufacturing bark is higher than hitherto; (4) that the output of Java quinine is less. Taking the German imports of cinchona, it is interesting to compare with it the following exports of quinine from Germany, viz., in 1898, 7,094,000 oz.; in 1899, 7,447,000 oz.; in 1900, 6,523,000 oz.; in 1901, 6,899,000 oz.; and in 1902, 8,201,000 oz. Our imports from Germany show a continual shrinkage since 1898, the figures last year being 996,000 oz.; while those to the United States totalled 2,006,000 oz., against 1,921,000 oz. in 1901. The exports of quinine from France are remarkable, being officially declared at 2,490,000 oz. during 1902, against 1,222,000 oz. in 1901. This would show that French makers had more than their usual share of the demand last year. Italy exported 66,000 oz., or 6,000 oz. less than in 1901; while the exports from Java fell to 700,000 oz., against 1,033,000 in the previous year. The United Kingdom exported 1,142,000 oz. last year; and as these figures are declared for the first time no comparison can be made. Our imports last year were 1,443,000 oz. for the eleven months, of which Germany sent practically 1,000,000 oz.

PHARMACY ACT, 1868; SUGGESTED ALTERATIONS IN SCHEDULE A. OF ——.

The Committee appointed to consider the poison schedule of the Pharmacy Act suggest the following inclusions (see this Journal, 1901, 775).

PART I.

Arsenic and its Preparations, except any preparation prepared exclusively for use in connection with agriculture or horticulture, and contained in a closed vessel, distinctly labelled with the word, "Poison," the name and address of seller, and a notice of the use to which it is to be put.

Alkaloids.—All poisonous vegetable alkaloids and their salts, and all poisonous derivatives thereof, except preparations of tobacco or the alkaloids of tobacco, prepared exclusively for use in connection with horticulture or agriculture (to be labelled as in the case of similar arsenical preparations). *Atropine and its Preparations. Cocaine and its Salts. Morphine* and its salts, and preparations containing one or more per cent. of morphine. *Picrotoxin.*

PART II.

Acetanilide and its preparations. *Carbolic Acid* and liquid preparations of carbolic acid and its homologues, containing more than 3 per cent. of those substances, except any preparation prepared for use as sheepwash, or for any other purpose in connection with agriculture, horticulture, or sanitation. (To be labelled and bottled as in the cases of arsenic and the alkaloids.) *Cocaine*, preparations of. *Digitalis* and its preparations. *Oxalic Acid* and soluble oxalates. *Mercuric Iodide. Mercuric Sulphocyanide. Strophanthus* and its preparations. *Sulphonal.*

PART III.

Preparations of arsenic, tobacco or its alkaloids, or carbolic acid and its homologues, as mentioned above for use in horticulture, &c., to be labelled with the word "Poison," the name and address of the seller, and the special purpose to which the preparation is to be put.

—T. F. B.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 3613. Tyers. Oil vapour furnaces. Feb. 16.
,, 3619. Nordtmeyer. Disseminating gases in a finely divided state in liquids. Feb. 16.
,, 3714. Burrows. Converting steam into a gaseous product for use in furnaces, &c.* Feb. 17.
,, 3938. Smith. Filters. Feb. 19.
,, 4063. Anzbock and Basch. Utilisation of unconsumed heat in furnaces, &c. Feb. 20.
,, 4335. Marks (Moore). Furnaces.* Feb. 24.
,, 4537. Mark. Method of subjecting materials to the action of air or other gases.* Feb. 26.
,, 4612. Adam. Centrifugal separating apparatus. Feb. 27.
,, 4734. Branch. Autoclaves, sterilisers, digesters, &c. Feb. 28.
[C.S.] 4693 (1902). Zylberlast. Apparatus for cooling liquids or gases. March 4.
,, 7598 (1902). Alberger. Condensers for steam, &c. March 4.
,, 9996 (1902). Fouché. Distilling apparatus. March 4.
,, 19,619 (1902). Kolb. Filter-press. Feb. 25.
,, 27,629 (1902). Abraham. Filters. March 4.
,, 886 (1903). Kneuper. Filter. Feb. 25.
,, 1336 (1903). Marks (Chapman). Filtering apparatus. Feb. 25.

II.—FUEL, GAS, AND LIGHT

[A.] 3626. Marc. Liquid Combustible.* Feb. 16. (Belgian Appl., Aug. 11, 1902.)
,, 3770. Sebille and Ryckman. Material for forming incandescent mantles. Feb. 17.
,, 3800. Foote. Coke ovens. Feb. 18.
,, 3852. Brookes (Stettiner Chamotte-Fabrik Act.-Ges. vorm. Didier). Generator furnaces with inclined retorts. Feb. 18.
[A.] 3899. Stenhouse. Utilisation of waste gases from ammoniacal liquors from gasworks, coke ovens, &c. Feb. 19.
,, 4012. Morris. Producer gas generators. Feb. 20.
,, 4019. Bauke and Fuchs. Generation of water gas. Feb. 20.
,, 4052. Sugg. Burners for testing gas. Feb. 20.
,, 4260. Hecking. Manufacture of briquettes. Feb. 23.
,, 4448. De Alzugaray and Mercer. Recovering cyanogen or its compounds from gases or vapours. Feb. 25.
,, 4464. Peters. Semi water gas producers.* Feb. 25.
[C.S.] 5188 (1902). Acme Sunlight Gas Syndicate, Ltd., and Baumgarten. Acetylene gas generators. March 4.
,, 22,524 (1902). Duclos. Treatment of peat for fuel purposes. March 4.
,, 25,785 (1902). Von Heydebrand und der Lasa. Artificial fuel. Feb. 25.
,, 25,853 (1902). Haddan (Rin). Artificial fuel. Feb. 25.
,, 27,533 (1902). Cie. du Gas H. Riché. Manufacture of compound producer gas. (Int. Appl., Dec. 14, 1901.)
,, 609 (1903). Peters. Self-igniting incandescence bodies for gas lighting. Feb. 25.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 4046. Brookes (Rütgerswerke Act.-Ges.). Process for distilling tar and mineral oils by successive stages. Feb. 20.
,, 4355. Justice (Weed). Treatment of wood to obtain volatile products.* Feb. 21.
,, 4431. Adissewich. Treatment of shale oil, &c. Feb. 25.
[C.S.] 7319 (1902). Holmes. Apparatus for distilling tar, oil, and the like. Feb. 25.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 3654. Ransford (Cassella). Manufacture of polyazo bodies and dyestuffs. Feb. 16.
,, 4250. Abel (Act.-Ges. für Anilinfabr.). Manufacture of a mordant-dyeing azo dyestuff. Feb. 23.
4340. Lake (Oehler). Manufacture of dyes. Feb. 21.
,, 4538. Imray (Meister, Lucius und Brüning). Manufacture of indigo and of an intermediate product therefor. Feb. 26.
[C.S.] 7871 (1902). Levinstein, and Levinstein, Ltd. Production of blue colouring matters containing sulphur. March 4.
,, 9126 (1002). Imray (Meister, Lucius und Brüning). Yellow, orange-red, and red dyestuffs of the acridinium series. Feb. 25.
,, 9195 (1902). Newton (Bayer). New derivatives of the anthraquinone series. Feb. 25.
,, 9619 (1902). Johnson (Kalle). Green or greenish colouring matters containing sulphur. Feb. 25.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 3778. Schmid. Printing vegetable fabrics. Feb. 17
,, 4142. De Pass (Vacuum Dyeing Machine Co.) Dyeing machines. Feb. 21.
,, 4494. Murray. Fire-proofing cotton or other fabric Feb. 26.
,, 4667. Lake (Oehler). Printing on vegetable fibre Feb. 27.

[C.S.] 18,139 (1902). Newton (Bayer). Obtaining fast black shades on wool. Feb. 25.

,, 27,273 (1902). Henning. Production of textile surface ornamentation. March 4.

,, 28,142 (1902). Cleff. Dyeing and printing in aniline black. Feb. 25.

,, 371 (1903). Haddan (Elosegui). Fulling or milling and dyeing and scouring of woollen fabrics. March 4.

,, 894 (1903). Edlich. Imparting a silk- or wool-like appearance to cotton fabric. March 4.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 4517 (1902). Rudolph and Kasiske. Preparing wood, &c., for painting or ornamenting. Feb. 25.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 3679. Craig. Production of alkali cyanides from hydrocyanic acid. Feb. 17.

,, 4049. Woltereck. Production of ammonia by synthesis. Feb. 20.

,, 4050. Woltereck. Production of ammonia by synthesis. Feb. 20.

,, 4405. Leslie. Manufacture of carbonic anhydride Feb. 25.

,, 4501. Piffard. Manufacture of ammonia. Feb. 26.

,, 4513. Grossman's Cyanide Syndicate and Grosman. Manufacture of cyanides and recovery of by-products. Feb. 26

,, 4676. James. Liquefaction of gases. Feb. 27.

[C.S.] 6612 (1902). Vosmaer and Lebret. Ozonisers. Feb. 25.

,, 8300 (1902). Ostwald. Manufacture of nitric acid and the oxides of nitrogen. Mar. 4.

,, 1312 (1903). Vorwerk. Fire-extinguishing powder. Feb. 25.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 3632. Bigot. Manufacture of glazed or enamelled ceramic ware. Feb. 16.

,, 3751. Pilkington. Manufacture of wired glass. Feb. 17.

,, 4031. Shenstone. Furnace for melting silica for making silica glass. Feb. 20.

[C.S.] 3849 (1902). Viltard, Viltard, and Collet. Application of translucent enamels on hard porcelain surfaces. Feb. 25.

,, 7696 (1902). Aigner. Ceramic vessels. Feb. 25.

,, 28,955 (1902). Becker. Manufacture of glass. March 4.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 3630. Middleton (Acheson Co.). Manufacture of earthenware and ceramic products, and preparation of clays, siliceous compounds, and earthy minerals for the manufacture of such products.* Feb. 16.

,, 3845. Bodmer. Ceramic cover for cables.* Feb. 18.

,, 3846. Bodmer. Beton cover for cables.* Feb. 18.

,, 4048. Mills (Seigle). Artificial building materials. Feb. 20.

,, 4154. Bartels. Cement for wood. Feb. 21.

,, 4251. Williams. Manufacture of Portland cement. Feb. 23.

,, 4380. Imray. Non-conducting material for refrigerating purposes. Feb. 24.

,, 4435. Wetter (Heise). Impregnation of wood. Feb. 25.

[C.S.] 4464 (1902) Evans (Crozier et Cie.). Manufacture of artificial stone. March 4.

,, 6601 (1902). Cooksey. Making bricks, tiles, and terra-cotta. Feb. 25.

X.—METALLURGY.

[A.] 4041. Talbot and Gredt. Manufacture of steel and ingot iron.* (Fr. and Belgian Appl. Sept. 15, 1902.) Feb. 20.

,, 4094. Parks Open hearth furnaces.* Feb. 20.

,, 4327. Van Arsdale. Extraction of copper from ore. Feb. 24.

,, 4345. Zenses. Manufacture of cast iron of high tensile strength. Feb. 24.

,, 4454. Kent. Crystalline and fibrous metal. Feb. 25.

,, 4473. Woollen. Method of joining aluminium. Feb. 25.

,, 4722. Wild. Extraction of metals from ores, concentrates, tailings, &c. Feb. 28.

[C.S.] 7171 (1902). Kent and Campbell. Furnaces. Feb. 25.

,, 7352 (1902). Wallace. Manufacture of iron, steel, nickel, and the like. March 4.

,, 8590 (1902). Hardingham (Pearse and Ievers). Anti-friction metals. Feb. 25.

,, 28,925 (1902). Marks (Waring Chemical Co.). Extraction of zinc and other metals from ores and the like. March 4.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 3698. Lilienfeld. Electrodes of arc-lamps.* Feb. 17.

,, 4039. Goddard. Electric batteries.* Feb. 20.

,, 4060. Elieson and Faulding. Storage batteries. Feb. 20.

,, 4208. Heys (Hutchison Acoustic Co.). Cells of electric batteries. Feb. 23.

,, 4368. Cottrell. Electrodes for reversible electric batteries.* Feb. 24.

,, 4410. Fairweather (General Storage Battery Co.). Production of storage battery plates.* Feb. 25

[C.S.] 4357 (1902). Siemens Bros. and Co. and Dieselhorst. Flexible electric conductors. Feb. 25.

,, 28,806 (1902). Halsey Electric Generator Co., Ltd. Galvanic batteries. March 4.

,, 334 (1903). Newton (Coster). Storage battery plate. Feb. 25.

,, 1335 (1903). Marks (Chapman). Electrical treatment of liquids for purifying, &c. Feb. 25.

XII.—FATS, OILS, AND SOAP.

[A.] 3973. Dreymann. Manufacture of soaps.* Feb. 19.

,, 4401. Enoch, and Rose, Downs, and Thompson, Ltd. Method of extracting oil from seeds, &c., and forming cakes from such. Feb. 25.

,, 4420. Turner and Turner. Treatment of refuse soapsuds. Feb. 25.

[C.S.] 190 (1903). Boult (Moore). Oil and grease separators. March 4.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 3768. Armbruster and Morton. Making pigments.* Feb. 17.

,, 3769. Armbruster and Morton. Making compositions to be used for pigments. Feb. 17.

[A.] 3773. Macbeth-Raeburn. Printers' inks. Feb. 17.

„ 4751. Hamilton and Symon. Manufacture of paint or its compositions. Feb. 28.

[C.S.] 27,639 (1902). Boult (Denney Galvanic Paint Co.). Anti-fouling paint for coating vessels, &c. Feb. 25.

B.—Resins, Varnishes.

[A.] 3740. Townsend. Composition for cleaning and polishing metal, &c. Feb. 17.

„ 4156. Stephenson. Metal polish. Feb. 21.

C.—India-rubber, &c.

[A.] 4064. Justus. Insulating plates. Feb. 20.

„ 4113. Hookham. Artificial cork. Feb. 21.

„ 4158. Bertrams, Ltd., and Milne. Machine for treating raw india-rubber and like plastic substance. Feb. 21.

„ 4203. Blundstone, and Mosely and Sons, Ltd. Manufacture of india-rubber goods. Feb. 23.

[C.S.] 8071 (1902). Basenau. Insulating materials or compositions. March 4.

„ 8084 (1902). Clautard and Kessler. Process for regenerating old caoutchouc and treating damaged gums, vulcanised or raw gutta-percha. March 4.

XVI.—SUGAR, STARCH, GUM, Etc.

[C.S.] 319 (1903). Murdoch and Improved Process Manufacturing Co. Manufacture of starch. March 4

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 3688. Souter and Souter. Utilisation of distillers' and brewers' by-products.* Feb. 17.

„ 4218. Meyer (Meyer and Arbuckle). Apparatus for the distillation of spirits, &c.* Feb. 23.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 4150. Bromhead. Food products. Feb. 21.

„ 4759. Nesfield. Sterilisation of water and other liquids, and of alimentary substances. Feb. 28.

[C.S.] 3949 (1902). Lake (Aktieselskabet "Progress"). Preservation of eggs. Feb. 25.

„ 1318 (1902). Davidsen. Reduction of cereals. March 4.

„ 27,840 (1902). O'Brien (Vazeille). Treating grains, beans, or berries, to make them more easily decorticable. March 4.

„ 191 (1903). Boult (McDonald and Fay). Artificial food. March 4.

B.—Sanitation; Water Purification

[A.] 3970. Weddell, Chamberlain, and Player. Apparatus for purifying and softening water. Feb. 19.

„ 4130. Baxter and Watson. Softening and purifying water. Feb. 25.

„ 4548. Rosenberg. Purification of air. Feb. 26.

„ 4549. Rosenberg. Apparatus for ozonizing air. Feb. 26.

[C.S.] 25,336 (1902). Selwood and Aird. Purification and heating feed water. March 4.

C.—Disinfectants.

[A.] 4010. Strawson. Composition for destroying and preventing fungus and insects. Feb. 20.

„ 4426. Hastung. Fumigating and disinfecting match.* Feb. 25.

[C.S.] 28,797 (1902). Carman and Lawrence. Formaldehyde gas generators. (International application, Feb. 4, 1902.) March 4.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 3751. Pilkington and Ormandy. Bulking or weighting material for use in making paper, &c. Feb. 17.

„ 4008. Harvey and Shorthouse. Manufacture of paper tubes. Feb. 20.

„ 4055. Lake (Barber). Drying of paper. Feb. 20.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 3629. Justice (Acheson Co.). Production of compounds containing silicon, oxygen, and carbon in chemical combination. Feb. 16.

[C.S.] 4909 (1902). Froger-Delapierre. Manufacture of vanillin and analogous bodies. March 4.

„ 8195 (1902). Gaess. Production of mono-formyl-α_1-α_2-naphthylenediamine β_3 or β_1-mono-sulphonic acid. March 4.

„ 22111 (1902). Connstein. Process for decomposition of esters of fatty acids. Feb. 25.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[C.S.] 23,551 (1901). Soc. Anon. des Produits Photographiques M.-Y. Manufacture of photographic films. (Int. Appl., May 3, 1901.) March 4.

„ 9393 (1902). Schwartz. Photographic emulsion. March 4.

„ 25,942 (1902). Lauterbach. Rapid Production of photographs on post cards, &c. Feb. 25.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 4009. Huch. Manufacture of non-poisonous matches.* Feb. 20.

„ 4426. Hastung. *See under* XVIII. C.

[C.S.] 25,994 (1901). Robertson and Rintoul. Manufacture of explosives, celluloid, &c. March 4.

„ 13,318 (1902). Hale and Bell. Detonation of high explosives. Feb. 25.

„ 24,812 (1902). Fuhrer. Detonating compositions. March 4.

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Dr. W. Newton. "The Manufacture of Iodine from Nitrate Liquors."

Mr. Watson Smith. "New Modification of Gelligner's Prussian Blue Reaction, and a possible Application."

Dr. A. Dupré. "The Explosion of Potassium Chlorate at St. Helens."

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Notices.

ANNUAL GENERAL MEETING.

he Annual General Meeting will be held at Bradford, rks, on Wednesday, July 15th, and following days. ll particulars will appear in a subsequent issue.

COMMUNICATIONS.

uthors of communications read before the Society, or of its Local Sections, are requested to take notice that ler Rule 43 of the Bye-laws the Society has the right of rity of publication for three months of all such papers. ringement of this Bye-law renders papers liable to be cted by the Publication Committee, or ordered to be tracted for the Journal, in which case no reprints can furnished to the author.

FTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, 1903.

he attention of Members of the Society is called to the t that the International Congress of Applied Chemistry l meet in Berlin, during Whitsuntide week of this year. ommittee of this Society has been formed to co-operate h the other British Chemical Societies in endeavouring secure an adequate representation of British Chemical lustry, and it is requested that the names of those prosing to attend the Congress be forwarded to the General retary, in order that a formal invitation from the ganising Committee in Berlin may be sent to them.

he aim of the Congress is to introduce uniform standard thods and rules throughout the world; to provide uniform thods of commercial analysis, thus removing one of the in causes of dispute; to throw light upon points which y assist governments and others in framing regulations cerning transport and duties; and to improve acquaintce with Patent Law.

he Congress is also intended to provide opportunities mutual exchange of ideas on different branches of mical work.

he Congress will be opened on June 2nd, 1903. On Wedday, June 3rd, Friday the 5th, and Monday the 8th, meets will be held for the reading and discussion of papers. e subjects to be treated are classified as follows:—

I. Analytical Chemistry. Apparatus and Instruments.
II. Chemical Industry. Inorganic Products.
III. Metallurgy and Explosives.
IV. Chemical Industry. Organic Products:—
    Subsection A.—Organic Preparations, including Tar Products.
    Subsection B.—Dyestuffs and their Uses.
V. Sugar Industry.
VI. Fermentation Industries and Starch Manufacture.
VII. Chemistry of Agriculture.
VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
IX. Photo-chemistry.
X. Electro-chemistry and Physical Chemistry.
XI. Legal and Economic Questions connected with Chemical Industry.

Programme.

esday, June 2.—Reception in the Palace of the Imperial Parliament.

8 p.m.—Address by the President of the Organising Committee in the Hall. Supper will be served in the galleries.

dnesday, June 3.—10 a.m. First General Meeting.

Afternoon.—Sectional meetings.

7 p.m.—Banquet in the Restaurant of the Zoological Gardens. Members may bring ladies.

Thursday, June 4.—Sectional meetings continued.

7.30 p.m.—Reception of the Congress in the Town Hall by the Municipal Authorities. (For gentlemen only.)

9.30 p.m.—"Commers" in the "Philharmonie" building. The boxes will be reserved for ladies.

Friday, June 5.—10 a.m. Second General Meeting. Address by the President of the fourth Congress, Prof. H. Moissan.

7 p.m.—Performance in the Royal Opera House.

7 p.m.—Reception of the German Chemical Society in the gardens of Prof. C. D. Harries at Charlottenburg, Berlinerstr. 36.

Saturday, June 6.—Sectional meetings continued.

Visits to various factories and museums.

Sunday, June 7.—Special trains from the Potsdamer Bahnhof at 9.55 a.m. and 10.15 a.m. to Wannsee, for a trip on the lakes.

Luncheon at Wannsee at 2 p.m.

Monday, June 8.—Sectional meetings concluded.

Afternoon.—Third General Meeting, for bringing the business of the Congress to a close.

Ladies tickets, price 15*s*. each, can be obtained on application to the Secretary of the Congress. A ladies' committee has been formed to provide entertainment for ladies during the business hours of the Congress.

Travelling and Hotel Arrangements.

Parties of 30 and over, travelling together, may obtain a reduction of 50 per cent. on fares on all lines of the Royal Prussian Railway, by application to the head office of the division in which the journey is commenced.

Karl Stangen's Reise-Bureau will arrange such parties. Information can also be obtained as to hotels in Berlin, also any information concerning the journey to Berlin, by enclosing amount for return postage to Karl Stangen's Reise-Bureau, 72, Friedrichstr., Berlin, W.

A Congress Daily Paper will be published by the Committee during the Congress week.

The number of tickets for the social arrangements is limited to:—Banquet, 1,500; Reception in Town Hall, 750; "Commers," 1,000 gentlemen, 200 ladies; Performance at Royal Opera, 900; Reception of German Chemical Society, 800; Excursion to Wannsee, 1,500.

Applications will be considered in order of priority.

As formal invitations are now being sent out, applications to join the Congress, accompanied by a remittance of 1*l*., should be sent in to the General Secretary without delay.

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23rd MARCH 1903.

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Koch, Walter E., c/o Lustre Mining Co., Sta. Maria del Oro, via Parral, E Se Durango, Mexico, Metallurgical and Mining Engineer.

Lachman, Dr. Arthur, 907–917, Rialto Building, Mission and New Montgomery Streets, San Francisco, Cal., U.S.A., Chemical Engineer.

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Nemian, Howard S., 122, Hudson Street, New York City, U.S.A., Manufacturing Chemist.

Queeny, Jno. F., Monsanto Chemical Works, 1806–1813, South 2nd Street, St. Louis, Mo., U.S.A., Chemical Manufacturer.

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CHANGES OF NAME.

1890. Bost, W. D. Ashton (previously entered as Ash- Bost), Cartvale Chemical Works, Paisley.

1894. Lawson-Johnston, W. E. (formerly Johnston), Bovril, Ltd., 152, Old Street, E.C., Director.

Liverpool Section.

Meeting held at University College, on Wednesday, January 28th, 1903.

MR. FRANK TATE IN THE CHAIR.

RTIFICIAL DRAUGHT IN VITRIOL CHAMBERS, AND THE USE OF ATOMISED WATER INSTEAD OF STEAM.

BY PAUL KESTNER.

Much has been done during the last 20 years to improve e yield of vitriol chambers; modifications in the shape, imber of chambers in a given set, varying the dimensions, loption of supplementary towers or cooling pipes, increased ed in the Glover and Gay-Lussac towers, the substitution mechanical apparatus for hand labour, mechanical irners, automatic liquid raisers, mechanical draught, &c., c. Of all the modifications none have given better results au those intended to control variations of the natural aught. These variations, depending as they do, not only oon atmospheric conditions, but also on the activity of the rnaces served by the chimney, make it constantly neces- ry to modify the regulation of the burners, the distribution the steam or nitric acid, the opening of the dampers that gulate the passage of the gas, &c., in addition to which ontinuous and minute supervision is essential.

The idea of producing regularity of draught by special oparatus is not new, but the first attempts were not itirely successful owing to the uncertainty as to where to ace the apparatus and of the difficulty involved in con- ructing them of suitable materials. In America consider- ole progress has been made in this direction; in fact, it is ohtful if there exists more than a single sulphuric acid orks in the United States, the chambers of which work ithout fan draught.

The first attempts to use artificial draught appear to have een made in Europe. Hagen of Halsbrücke is thought to e first in date (*vide* Mulhäuser, Zeits. angew. Chem., 27, 902), but he appears to have used Root's blowers in his cperiments; this apparatus for displacing gases seems uite unsuitable for the purpose.

Hageler, of La Salle, appears to be the first to use a entrifugal fan with any commercial success. The object of ie fan is primarily and principally to render the draught onstant. There is an unfounded idea that the fan serves pass more air through the chambers. This is incorrect; ie fan merely regularises the displacement of the gases. t permits, it is true, an increase of the speed at which the ases flow through the conduits and consequently the pass- ig of a greater volume of them in a certain time, but it is rincipally a regulating instrument, by means of which the uantity of oxygen admitted into the apparatus can be ljusted better than is possible with any kind of natural raught.

The question now arises as to the position of the fan in ie gas-conduits. In America, where the use of artificial raught is general, the fan is always at the head of the onduits, and in that country it seems to be an axiom that iis is the best place, and that it should blow so as to place ie chambers under pressure, and not to produce a reduction f pressure. This idea seems to be deeply rooted not only i the United States, but also in Europe, where the use of a u is not widespread. Lunge states that the reduction of ressure has the disadvantage that air will be drawn through ay opening and disturb the process. For this reason he ecided in favour of a slight positive pressure. Petschow Zeits. angew. Chem., No. 1, 1903) describes unsuccessful rials with a stoneware fan; he expresses the opinion that ie gases must be forced through the chambers, and not xhausted at the end. Plath (Chem.-Zeit., No. 89, 1902), ho recommends the stoneware fans, also finds that the iost suitable place would be at the head of the system, nd only on account of the questionable ability of the stoneware to withstand high temperature does he advise finally that it be placed at the end. Niedenführ (Zeits. angew. Chem., No. 11, 1902) likewise admits that the most favourable position would be between the Glover tower and the first chamber, but as the difficulties of constructing a fan suitable for this position appear to be too great, he places it at the end of the set. (See also Robert Nörrenberg's paper on the motion of gases in vitriol chambers, in Chem. Ind., 1899, Nos. 3 and 4.)

If only the question of the fan itself has to be considered, there is everything in favour of its position at the end. The exhausted gases are cool and nearly dry, while the gases coming from the Glover tower have a high temperature and a much greater volume.

At the head, therefore, a larger fan, or one revolving at a higher speed, would be required, displacing very hot gases: this would imply a greater consumption of power and greater wear. All the controlling apparatus is generally found at the end of the system; there is, consequently, a great advantage in having the fan there as well, under the supervision of the man conducting the chamber working. Although the American theory, according to which pressure is necessary in the chambers, has received the practical support of a large number of installations, it seems desirable to study more closely on what foundations it was based.

To begin with, what is to be understood by increase of pressure or lowering of pressure in this case? There is obviously no question of placing the chambers under any considerable pressure by opposing a resistance at the outlet. It is clear that, as regards the yield per unit of chamber space, a better result would be obtained by conducting the reactions under increased pressure, but the construction of the chambers would have to be completely altered. The word pressure has not this significance in this case; it is a question, in fact, only of a difference of a few mm. of water in the pressure of the gases, whether the fan is placed at the head or at the end. Therefore, in installing a fan for regularising the draught, nothing is changed as regards the pressure in the chambers, but it simply renders regular what was irregular before. Assuming, for instance, a plant working at atmospheric pressure in the middle chamber, with variations of 2 mm. over or under, according to the atmospheric conditions and the state of the burners, if a fan be placed at the head of this plant, between the Glover and the first chamber, and its output regulated so as to be constant, the pressure will remain the same during the 24 hours, instead of showing the variations of 2 mm., more or less, which existed before. If this fan be now replaced by another at the end, calculated to forward exactly the volume of gas that exists at the outlet of the Gay-Lussac tower, the result will be precisely the same as before. In the one case, as in the other, the volume of gas passing through the apparatus is the same, there need be no difference of pressure between the two arrangements, although in practice this is not absolutely true.

A fan is rarely added to the chambers without at the same time increasing their production, for in most cases the production is limited by the draught. The fan thus not only affords the means of regularising the draught, but at the same time of increasing it, and cases where it is not used to increase the volume of gas admitted to the plant are rarely met with. If the same plant, at the normal pressure, be provided with a fan capable of doubling the volume of gas (assuming, of course, that the burners can follow the increase), the pressure in the chamber will not be normal. If the fan has been placed at the head, a pressure of, say, 2 mm. of water will be found, while if it be placed under the same conditions at the end, a reduction in pressure of 2 mm. will be observed. This results from the resistance offered in the first case by the Gay-Lussac tower, in the second case by the Glover tower. What importance does a difference of 4 mm. in the pressure, that is to say, 1/200 of the atmospheric pressure, possess as regards the weight of gases in the chambers? What effect can an increase or decrease of volume by 1/200 have on the production of the chambers? The pressure of the atmosphere itself varies sometimes in the same day by 1/50.

These figures must be quoted, to understand the value of the words pressure and vacuum in such a case. Again, if the burner men make a charge of 199 lb. or 201 lb. instead of 200 lb. (and this difference may easily occur), that will make a difference of 1/100 in the volume of the gas sent to the chambers, or a variation 25 times larger than that caused by the difference resulting from the different positions of the fan.

To explain how this notion of "necessary pressure" has become prevalent in the sulphuric acid industry, we must recognise in the first place that it is really theoretical, for pressure favours the reaction of the gases; but in the present case there can be no question of appreciable pressures. In the second place it must be remembered that the first attempts at artificial draught were made with a Koerting steam blower, working between the Glover and the first chamber, where its place was indicated and alone possible, since the blower had at the same time to supply the steam. When the steam blower was replaced by a centrifugal fan, the latter was put into the same place, without inquiry as to whether this position was really indispensable. The American method has certainly been very successful in solving the problem of constructing a fan capable of resisting these conditions, the more so as they have held to fans of small size, implying a high speed of revolution, which is a very unfavourable condition for a fan wheel as a rule. At the same time, the proper position for the fan would seem to be at the end of the system, and not at the beginning.

The first installation of an exhaust fan for leaden chambers dates from the year 1897, the present definite type from 1899. All the fans erected since the beginning, with one or two exceptions only, are still at work; they number at present more than 50, of which nearly one-half were erected on the continent during last year. The fan I have devised has a fan-wheel of regulus metal, very massive and running at a slow speed, with a casing of rolled regulus metal or volvic stone. The peripheral speed is only 52 ft. per second, which is more than sufficient, since the fan is not required to create a pressure or vacuum, but merely to displace the gases with regularity. Benker, who generally works with two Gay-Lussacs, has adopted the plan of placing the fan between these two towers, for at this point the gases are almost dry; besides, it can be put on the ground in a convenient position. When there is only one Gay-Lussac, the fan is placed right at the end of the system. When the local conditions allow it (for instance, if the gases have to be blown into a chimney) this position at the end appears the most suitable, even where there are two Gay-Lussacs; the gases are, in fact, drier and colder, and no further reactions take place in the gases in contact with the fan.

When there is only one Gay-Lussac it will always be an advantage to erect a small tower, for instance, a Lunge-Rohrmann plate tower, on the delivery flue of the fan for recovery; this tower, sprinkled with a little water, will condense all the acid gas or, to speak more exactly, the acid mist always existing at the outlet of a single Gay-Lussac.

The speed of the fan must be variable within certain limits, according to the temperature of the surrounding air. Thus, for good working a difference in the regulation must be made for the day time, when the air is warmer, and the night time, when it is colder and heavier; what is actually required in the leaden chambers is not a certain volume, but a certain weight of air. When the fan is driven from a line shaft or a motor with constant speed, the regulation is effected by means of a damper placed in the suction pipe.

The fan affords a means of increasing the gaseous volume conveyed, and, consequently, of increasing the production in the chambers. As the reactions are more intense in the same space, while the loss of heat, which takes place only by radiation from the wall, remains nearly constant, there results an increase of temperature, and, in consequence, an excessive expenditure of nitrate and a rapid wear of the lead. Various means have been tried to remedy these by cooling the chambers either by water on the outside or by air and water circulating pipes; but none have given such satisfactory results as the substitutio of atomised water for the steam admitted to the chambers.

For each molecule of sulphur dioxide (64 grms.) transformed into $H_2SO_4 + 3H_2O$, which represents approximate the constitution of the acid in the chambers, there ar liberated 65,500 calories (Lunge). The 64 grms. sulphur dioxide require 72 grms. of water. Supposing th acid to condense at 60° C., each gramme of steam (assume as introduced into the chamber at 120° C.) gives u 606·5 + (0·305 × 120) − 60 = 583 cal.; the total hea liberated is therefore—

	Cal.
(1) Heat of formation of the acid.................	65,5
(2) Heat given up by condensation of steam, 583 × 72....................................	41,976
	107,476

If all the water required for the reaction were supplie in a liquid state at 15° C., the heat account would be follows:—

	Cal.
(1) Heat of formation of the acid.................	[illegible]
(2) Heat absorbed by water raised from 15° C. to 60° C. = 72 × 45..............................	− 3,24
	62,2
The difference in the two cases is thus....	45,21

It will be seen that there is a good margin for increas the production, that is, the intensity of reaction in a give space, without increasing the temperature. In realit however, the output of an apparatus does not cons exclusively of acid of 110° Tw. ($H_2SO_4 + 3H_2O$), assumed in the above calculation; leaden chambers, we constructed and well conducted, may yield their ent produce in acid of 140° Tw., and in these circumstances t cooling due to the employment of sprayed water has a the importance just indicated. This remark shows th the weaker the acid produced, the greater is the influen of the atomised water; later on a calculation will be give rendering this fact evident.

Another cause rendering it difficult to obtain exact figu is that the results obtained by working in the summer di from those obtained in winter; the influence of radiat and of the temperature of the air entering the burners be very variable from one season to another and modifyi more or less the results indicated above. Besides, is impossible, except in very rare cases, to replace t steam entirely by atomised water, for in the last chambe for instance, the addition of a little steam is indispensa in order to maintain the temperature necessary for t reactions. One might, however, attack this question fro a different point of view: if a constant quantity of atom water were introduced into the chambers, the temperatu could always be maintained constant, providing the inten of the reactions was varied by admitting more or less ga but as this cannot be carried out practically, this means w not permit of absolutely definite rules being made.

I have just said that atomised water cannot entire replace steam even with the intensive working of 9 cb. chamber space per lb. of sulphur per 24 hours which has be attained; steam is required, not only in the last chamb but also in certain cases in the other chambers, in order prevent the temperature from falling below a cert minimum. Benker considers that this minimum should fixed at about 113° F. for the first chamber. In no intensive working, therefore, only a very little water c be used if this limit is not to be rapidly attained. It however, to the manufacturer's interest to work inte sively, in which case the proportion of water that m be injected in an atomised state depends on the evaporati produced by the Glover, or, more exactly, on the avera strength of the total product.

If instead of $H_2SO_4 + 3H_2O$ we consider $H_2SO_4 + 2H$ as representing the average strength of the total acid dra from the Glover and chambers, the above calculation w be modified as follows:—Heat liberated in product $H_2SO_4 + 2H_2O$ = about 64,000 cal. This acid ne

l_2O = 54 grms. of water. We have seen before that ch gramme of steam gives up 583 cal. The total heat erated is therefore :—

	Cal.
(1) Heat of formation of acid	64,000
(2) Heat given out by condensation of steam 583 × 54 =	31,480
	95,480

If all the water required for the reaction were supplied uid at 15° C., the heat account would be :—

	Cal.
(1) Heat of formation of acid	64,000
(2) Heat absorbed by water raised from 50° C. to 60° C. = 54 × 45 = ...	2,430
	61,570
Difference	33,910

The above well-known calculations led technical spe-alists to seek practical means for substituting to some ctent atomised water for steam. The question however is ot quite so simple as it appears at the first glance. It was ot only necessary to construct spraying apparatus, working gularly and producing a sufficiently fine spray, but there ere other more complex questions to solve, notably to scertain whether the leaden chambers in their usual form ould suit this way of working, and further, where the omisers were to be placed. The answer to these questions as been supplied in a complete manner by Benker; in ct. all the theoretical ideas in this paper are due to him.

Benker has been guided in his investigations by Abraham's eory, which is briefly as follows :—The gases, in moving the chambers from the inlet to the outlet, circulate in ch plane of the chamber, perpendicular to its axis, up the entre and down the sides; that is to say, along the walls here the gases are cooled, whereby a very active descending arrent is established. It is the same circulation that ccurs in every reservoir containing hot liquid, the sides f which are in direct contact with the cold atmosphere. his theory of Abraham's is put into practice by Benker, ho places his atomisers in the longitudinal centre line of e roof of the chamber, near to the top.

The mist of water, however fine, does not evaporate stantaneously, and the small drops have a tendency to ll, but the ascending current of gas keeps them in sus-ension, so that before they can reach the floor of the hamber they are completely evaporated. The vapour then llows the cycle of travel and forms an exact equivalent of e steam coming from the boiler, except that it absorbs 17 cal. per grm., and—this also has its importance—it has ost nothing or next to nothing.

It may be admitted that Abraham's cycle is well realised the chamber is narrow; in a very wide chamber it is robable that the two cycles do not touch one another, and hat there remains in the middle throughout the length f the chamber a relatively quiescent space. Granting this ypothesis, it will be seen at once that, if the atomisers were laced on the centre line in this wide chamber, they would eet with exactly the conditions that Benker wanted to void. Experience has confirmed this conclusion; in a rge chamber the atomisers placed on the longitudinal entre line of the roof of the chambers do not by any means roduce the same result as in a narrow chamber. Benker considers that 20 feet is the best width for the chambers, nd therefore constructs them by preference narrow and igh. In the wider already existing chambers Benker places he atomisers in a zig-zag line at about 10 ft. from each vall, so that they may be in the ascending current.

In basing his process upon this theory, Benker has ucceeded where others before him had failed, and he can t present show a large number of installations working vell; failure resulted whenever he departed from the rinciples just explained.

For 1,000 lb. H_2SO_4 (or 1,550 lb. acid 11° Tw.) about 30 lb. of water are required. If these 730 lb. are supplied n a liquid form, the coal required to transform them into team is saved, or a minimum of 100 lb. of coal. In reality, s I have said above, the average acid produced is not epresented by $H_2SO_4 + 3H_2O$, and one cannot replace all the steam by atomised water, so that the above figures are not obtained in practice. Below are results obtained in some works.

The power required for compressing the water for the atomisers can scarcely be considered; it reaches only to 0·62 theoretically for 1,000 parts, H_2SO_4, taking $H_2SO_4 + 3H_2O$ as the average composition of the acid produced.

Working under these conditions, Benker has produced, using fan draught, the equivalent in vitriol of 1 lb. of sulphur burnt per 9 cb. ft. of chamber spaces with a consumption of less than 2·4 nitre per 100 of sulphur burnt. The following gives some of the results which Benker has obtained at the works where his process has been installed :—

Société de Produits Chimiques, Rome.—The chamber space is 72,140 cb. ft. When the plant was worked with a production of 10 tons (22,025 lb.) of 110° Tw. acid per day, the chamber space was practically 15 cb. ft. per lb. of sulphur. Theoretically, 1 lb. of sulphur produces 3·06 lb. H_2SO_4, therefore, $\frac{22{,}025 + 0{\cdot}67}{3{\cdot}06}$ = 4,802 lb. sulphur required, and consequently $\frac{72{,}140}{4{,}882}$ = 14·95 cb. ft. per lb. of sulphur. The nitre consumption was 1·22 lb. per 100 lb. sulphur burnt. But it was found that the production could easily be raised to 15 tons per day, which corresponds to 9·97 cb. ft. per lb. of sulphur, with a nitre consumption of 2·05 lb. per 100 lb. sulphur burnt.

If we consider the character of the reaction, the somewhat high atmospheric temperature in Italy, and the poor character of the pyrites (29·3 per cent. sulphur and 3 per cent. copper), these results are certainly good. It is true that the plant was at the outset constructed so as to be worked with fan draught and water sprays, the chamber section being such as Benker considered best for the purpose. Although in the case of plant not specially designed for use with artificial draught, and not having the dimensions considered most suitable, the same high results are not always obtained, yet an improvement is always effected by the introduction of fan draught and water atomisers.

At an important works on the banks of the Maine comprising several sets of 130,650 cb. ft. capacity, the chamber space per lb. of sulphur burnt was 21·09 cb. ft. before the introduction of fan draught, &c.; at the commencement of last year the chamber space was only 11·88 cb. ft. per lb. of sulphur, corresponding to a reduction of 43·2 per cent., or an increase in production of 76 per cent. Since then the results have been still further improved. In the same works the daily saving of fuel is about 5 tons on a production of about 140 tons of acid of 110° Tw. Without taking into account the saving in money resulting from the increased production (a saving which is very considerable, seeing that the depreciation of the chambers constitutes an important factor in the cost price of the acid), it is seen that the economy in fuel is considerable, and should easily in one year cover the cost of the installation of the new process. In the case quoted, Benker states that the saving in fuel would have been greater had the works in question not adopted a system of nitre feed which demands the presence of water vapour at the head of the chambers.

At another works in the middle of France where the construction of the plant was far from perfect, the chamber space per lb. of sulphur was 26·27; after the introduction of fan draught and atomisers the chamber space per lb. of sulphur burnt was not more than 14 cb. ft. The nitre consumption before was 4·26 per cent. on the sulphur, now it is 1·8 per cent. These figures speak for themselves.

The atomiser or sprayer employed by Benker is made of iridio-platinum, and is of two sizes; the one delivering about 10 galls. an hour is used for narrow chambers, where there is only one range along the centre line; the other of smaller output is used for wider chambers, where the atomisers are arranged zig-zag.

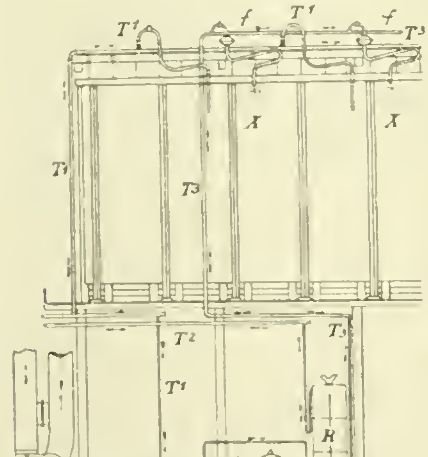
The atomisers produce a horizontal jet (Fig. 1). With centrifugal sprayers of the Koerting type, which produce a conical jet (Fig. 2), the results have always been incomplete; the cone being directed downwards, the little drops are precipitated with too much force towards the bottom of the chamber.

On the main pipe a sponge filter is arranged, besides which a filter is placed before each atomiser in order to avoid any possibility of obstructions. The atomisers are mounted on flexible tubes so that they can easily be drawn out and their working verified. The pressure at which they work is about 40 lb. The arrangement for obtaining regularity of pressure is very well devised. A small pump, generally driven by the engine driving the fan, forces water into a closed reservoir of about 3 ft. diameter and about 8 ft. in height, provided with water gauges. A by-pass allows the level of the water always to be maintained at about the middle height of this reservoir. The upper part of the latter is connected by a pipe with the reservoir of compressed air of the works. The pressure is produced by the delivery of the pump, which works continuously. The communication with the compressed air reservoir is intended to replace the air absorbed by the water; it is only rarely opened. In one works at Orleans air is admitted only once a week.

Fig. 1.

Fig. 2.

Fig. 3.



V Fan.
P Water pump driving the fan.
F Sponge filter continuously fed with the water to be atomised.
R Receiver for water under pressure and compressed air.
XX Atomisers.
ff Filters.
T1 Steam piping.
T2 Compressed air piping.
T3 Water piping.

Fig. 3 shows a diagram of a complete installation of water-atomising arrangement, and shows also the suction draught fan driven by the water pump. The uniformity of pressure is very great; it may be stated that the feed with water by the atomiser is more regular than that with steam. The pressure of the water does not vary at Orleans by 4 lb. per square inch in the course of a week.

To recapitulate, according to the results obtained by combining intensive working under artificial draught with cooling by the use of atomised water, the following results are obtained :—

(1) More regular working.

(2) Increase of production by 50 per cent., without increased consumption of nitre. In this connection it should be mentioned that in works where it is not desired to increase production, the adoption of the processes described above permits of the stopping of about half the existing chambers, still retaining the same rate of manufacture. There results from this, beyond the general economy due to the processes from the standpoint of fuel and nitric acid, also a distinct economy in maintenance, in working, in wear of lead, greater ease of supervision, and the possibility of easily increasing, at any moment, the production of the works without the necessity of putting up new plant. In many of these works, moreover, it would be possible to combine the batteries of burners in such a way as to supply the chambers still in use from the burners of those which have been stopped, and as a result of such possible combinations, increased facility for repairs would be gained.

(3) A notable saving of fuel.

(4) Notwithstanding the increase of production, the lead does not suffer more; we have seen in fact that, even when doubling the intensity of the reactions, the temperature can be lowered below that existing before.

If an increase of production is not aimed at, the advantages derived from the use of atomisers are as follows:—

1. More regular working. 2. Decrease in the consumption of nitre. 3. Saving of coal. 4. Reduced wear of the lead.

Discussion.

Mr. **Eustace Carey** remarked that some years ago th late Dr. Hurter read a paper before this section, in which he showed that the great problem in working vitrio chambers was to get rid, as rapidly as possible, of the hea evolved by the reaction of the various gases in the chamber The use of atomised water instead of steam was obviously considerable contribution in that direction. He was glad t hear that Mr. Kestner approved of placing the fan after th series of chambers. A suitable amount of plus-pressure i the first chambers can be secured where the chambers ar at a suitable height above the pyrites burners, and the fa at the end of the chambers can be trusted to obviate th difficulty of inequalities in the chimney draught. He wa sure that they were all very much indebted to Mr. Kestn for his most interesting paper, and for the great improv ments which he had personally effected in the manufactu of sulphuric acid.

Mr. **R. Forbes Carpenter** said that the application fan draught to the modern forms of coke-ovens wi recovery of residuals had entirely removed the difficult and irregularities experienced where chimney draught h been formerly employed in certain works, much exposed the effects of violent winds. This form of draught regul tion was, he believed, first introduced into American cok oven plants, but it quickly spread to the Continent. I could well understand that such a system would be appli able with advantage to the vitriol-chambers process, whe however it must be borne in mind the Glover and Ga Lussac towers themselves acted in some degree as draug regulators in violent winds.

His own experiences with Sprengel's form of apparat for introducing atomised water dated back, he thought, years. Here steam was employed to atomise the water, t small apparatus being constructed of platinum. For vari reasons, not necessary to detail, the experiment was successful in the works where he was then engaged, th having been considerable wear on the platinum jet. T theory of the downward and upward circulating curre that existed in chambers of varying width, seemed justif by the failure of the atomised water jets at points not the ascending gaseous current. The theory of downw rrent certainly received justification by experiences with e cooling and mixing flues that formed a feature of the elplace system of chamber construction.

Mr. W. R. **Hardwick** asked if Mr. Kestner considered e use of steam on the last chamber necessary. For his wn part, he had always found that steam on the last amber was most detrimental to the absorbing power of e Gay-Lussac. He asked also whether the acid elevator escribed could be used for nitrous vitriol.

Mr. H. T. **Mannington** thought the remarks of the last peaker as to the undesirability of adding steam in the st chamber would be endorsed by most vitriol makers resent. It seemed that steam would still be required; it ould not be done away with altogether, because by using tomised water the temperature would be reduced below hat they knew was necessary. As regards the fan, vitriol akers found that an important matter to attend to was egularity of gas, steam, air, and nitre. He accepted r. Kestner's figures, but it was certainly very remarkable hat they should get an increased production of 20 to 5 per cent. simply by adopting the fan. In regard to tomised water, the nitre consumption did not appear to be nything very remarkable, in fact, not more than in a well-anaged concern under the ordinary method of using team. Of course, by using water instead of steam one hould get an increased chamber space. One great diffi-ulty in the old Sprengel apparatus was that it required ery constant attention to prevent the jet being stopped p; the water had to be carefully filtered as the jet was ery fine. He should like to know if Mr. Kestner had any ifficulty of that sort, or if he had some means of obviating t. Some 25 years ago Mr. Muspratt, at his works in Liverpool, employed the Sprengel jet; the chief object then imed at was the saving of the fuel required for raising he steam, and Dr. Sprengel had thought to get a saving f nitre and a saving of chamber space, as Mr. Kestner id to-day.

Mr. **Arthur Carey** said that mechanical draught in vitriol chambers undoubtedly assisted in obtaining what was so necessary for high efficiency, *viz.*, regularity of conditions. The draught produced by a chimney varied materially with the state of the atmosphere, and in the case of a high wind or gales it varied from moment to moment in a way absolutely impossible to regulate by hand. He thought that where the draught depended on a chimney it was a universal experience that the nitre consumption rose during a gale. With regard to the use of atomised water instead of steam, the advantage was obvious, when once the mechanical difficulties in the production of the spray were overcome. As Dr. Hurter had pointed out long ago, the chief function of the chambers was to dissipate heat; if, therefore, there were fewer units of heat to be dissipated per ton of vitriol, a proportionately larger quantity of vitriol could be made in the same chamber space. He thought the Liverpool Section had every reason to be gratified that they had been chosen by Mr. Kestner for the reading of his very important paper. Mr. Kestner had shown that in one of the oldest of the great chemical processes English technologists had undoubtedly much to learn from their friends and rivals on the Continent.

Mr. W. A. S. **Calder** said he had seen the atomisers described by Mr. Kestner in action they produced in the chambers simply a very fine mist.

Mr. **Kestner**, in reply, said Mr. Carpenter had mentioned the atomising of water by means of a steam jet; that system could not be compared with the one he had himself described that night, because ;the amount of steam supplied by the sprayer was, perhaps, larger than the amount of water atomised. With regard to Mr. Hardwick's question as to steam in the last chamber, he was sorry to say he had no exact data. He knew it was a question which was very much debated, and he did not think that technologists all had the same idea on the subject. It was admitted that the temperature of the chambers must not fall below a certain point. The increase of production, referred to by Mr. Mannington, had been experienced actually in several instances, and he thought the figures given might be relied upon as correct. He would point out that, since a certain temperature was necessary in the chambers, one could not, of course, use as much atomised water in winter as in summer. Difference in climate affected this point similarly; in the south, for instance, the chambers could be worked with more water than in the north. With regard to nitre consumption, one could not expect to obtain high figures of production and at the same time lower the nitre consumption. The consumption of nitre increased with the intensity of working, though, even with high production, the consumption was not higher than it was with low production, omitting the use of atomised water. He should not think of using the automatic acid elevator for nitrous vitriol.

ON THE USE OF AUTOMATIC ACID ELEVATORS FOR FEEDING GLOVER AND GAY-LUSSAC TOWERS.

BY PAUL KESTNER.

Of automatic liquid-raisers those worked by compressed air are most generally used, and about half the towers on the Continent are thus fed.

The type of acid elevator which I have brought out has a volume of 11 galls., and makes from 20 to 60 pulsations per hour, which corresponds to a supply of 220 to 660 galls. per hour. Except in the case of very large plants, three of these elevators suffice for a set; that is to say, one for feeding the Gay-Lussac with acid, the second for returning to the Glover the nitrous vitriol, the third for feeding the chamber acid to the Glover. Sometimes, however, a fourth apparatus is erected in reserve.

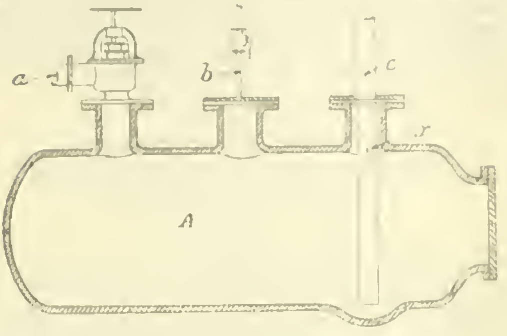
It is preferable to give the apparatus a small capacity and frequent pulsations, this having several advantages besides the smaller volume of the apparatus. The compressor works more regularly, without requiring a large air reservoir between it and the acid elevators, for with a set of four acid elevators working with pulsations at short intervals, the consumption of compressed air is nearly regular. Moreover, acid tanks need only be of small capacity not only on the bottom but especially at the top of the towers. These tanks now only serve as regulators, and might be suppressed entirely, and the acid fed directly into the towers, as does Mr. Fraipont at La Vieille-Montagne, with his "emulsors." The sprinkling by the feed of the acid into the elevator might be regulated at the bottom of the towers instead of at the top, where supervision is difficult. The more one sprinkles, the less necessary it is to regulate precisely the quantity of acid running on to the towers.

One inconvenience sometimes met with in winter, which also occurs with non-automatic eggs and all apparatus working with compressed air, is that the supply of air may get clogged by the formation of ice in the cock or admission valve for the compressed air, at the spot where the air expands. To remedy this, Mr. Coignard, formerly director of the Société des Produits Chimiques at St. Denis, fixes on the general air-piping supplying the acid elevators a drop-feed lubricator containing glycerin. Since this process was applied he had had no further stoppages in winter.

Emulsion.—In some sulphuric acid works a single high Gay-Lussac tower is used instead of two lower towers side by side. This not only makes supervision difficult, but involves, for raising the acid to the Gay-Lussac, a greater pressure than is required in the case of the Glover. The compressed air then becomes very costly in consequence of the reduced efficiency of the compressor, and, unless there are two compressors, all the air has to be compressed to the maximum pressure.

At the Établissements Kuhlmann, at Lille, the difficulty has been got over by placing a relay at half the height and making the lift in two stages. I employ a simpler means; it consists in admitting a small jet of air into the delivery pipe, so as to produce in the pipe what has been incorrectly termed an "emulsion," but what is in reality air cushions separating the interrupted column of acid. Under these conditions the total weight of the column is lightened by the weight of a volume of liquid equal to the volume of the air, and a much lower pressure is required. The reduction that can be obtained in practice, without increasing the consumption of air, is one-third; that is to say, if the height to which the liquid has to be raised is 30 m., there will only be a resistance corresponding to a height of 20 m. The consumption of air is not sensibly larger than in the case of an actual lift of 20 m. without "emulsion."

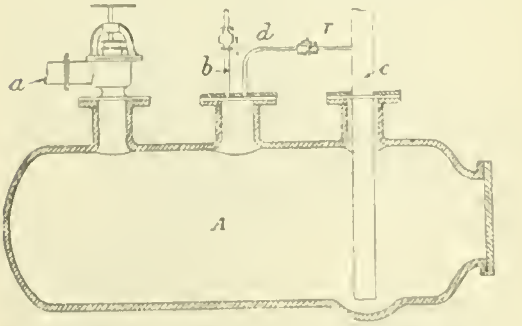
FIG. 1.



The application of this artifice to any kind of liquid elevator is most simple. Fig. 1, say, represents an ordinary acid egg A, with feed pipe a, air-supply pipe b, and acid delivery pipe c; it suffices to make in the pipe c at the top of the part inside the egg a hole x of about 2 mm. At the same time as the acid is forced through this pipe, a continual jet of air is introduced, which in rising forms air cushions, as in the air-lift pump or mammoth pump of Pohlé, the principle of which was described and applied by Charles Laurent in 1888 (Bull. Soc. d'Encouragement, Nov. 18, 1885), twelve years before Pohlé's patent.

By making the hole x larger or smaller, the admission of air, and consequently the weight of the column of liquid in the pipe, can be increased or diminished. In the arrangement shown by Fig. 1, however, this regulation can only be made once for all; in the arrangement indicated by Fig. 2 it can be made as desired. In this case the air is admitted through an external pipe d provided with a cock r, and communicating at one end with the chamber of the acid egg, and at the other with the pipe c; by means of the cock r the quantity of air can be regulated according to the pressure desired.

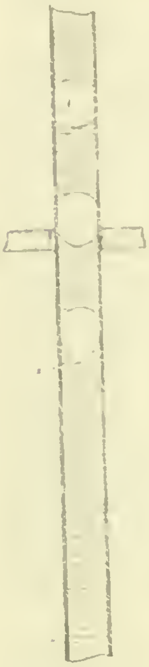
FIG. 2.



For those who are not sufficiently familiar with the phenomena occurring in the air lift pump, it will be sufficient to refer to the sketch, Fig. 3, which represents the delivery pipe c on a larger scale. There can be seen on it the alternating layers of water and air, forming successively interrupted columns. The phenomenon occurs in this way in a narrow pipe, as can be shown by making the pipe of glass.

In a large pipe this will not be so; the air rises in the column of liquid without interrupting it, that is to say, without forming air cushions, and the weight of such a column consequently is not reduced. The maximum diameter, in order to obtain a good result, is 1½ ins.; if pipes of 2 ins. are already in existence, they may be retained, but the result will be less satisfactory. It is better to use pipes of 1¼ ins. diameter and to put up several of them. Mr. Fraipont, of La Vieille-Montagne, who uses "emulsors" for raising the acid to the towers, uses pipes of 1 in., and places several of them side by side. Another point of great importance is the position of the pipe; it should be vertical as far as possible, for in an inclined pipe the air has a strong tendency to follow the upper wall, so that the pistons are not formed as in a vertical pipe.

FIG. 3.



Raising of Nitric Acid.—In most Continental sulphuric acid plants nitr acid is used instead of nitre. Without going into the comparative merits of the two systems, the trouble of raising the nitric acid to the top of the Glover is the main inconvenience for which the Continental progress is blamed.

For the raising of nitric acid, an automatic acid elevator of stoneware has been constructed, which works satisfactorily in many industries. But I would not recommend it for raising the nitric acid to the Glover, on account of the length of the delivery pipes required in most cases. The main difficulty of using the acid elevator for nitric acid lies in the delivery under pressure through pipes; these can only be made of stoneware, which implies the presence of numerous joints.

The most practical means of raising the nitric acid to the towers is to mix it with the nitrous acid sent on to the Glover: a Marriotte's bottle pours the nitric acid continuously into the reservoir of nitrous acid feeding the acid lifter. This mixture thus is made at the bottom instead of having to be made at the top.

It has been attempted to introduce in this way a solution of nitre, but the sulphate of soda formed is little soluble in acid of 140° Tw., and has a tendency to obstruct the Glover. With nitric acid this is not so, and as the sulphuric acid is cold, the mixture has no sensible effect upon the lead, nor upon the the cast iron of the acid elevators.

Manchester Section.

Meeting held at the Technical School, on Friday, March 6th, 1903.

MR. IVAN LEVINSTEIN IN THE CHAIR.

THE ANALYSIS OF MANUFACTURED INDIA-RUBBER.

BY HARRY GRIMSHAW, F.C.S., W. TONG, AND L. R. BARN

Up to comparatively recent years, an analysis of a samp of manufactured india-rubber consisted of a determinati of the specific gravity, the ash after burning, and th sulphur by oxidation and solution, and precipitation barium sulphate. Moisture, if any, was of cour estimated by drying. The sum of these deducted fro 100 gave the percentage of "organic matters," amo which was, of course, india-rubber. We have before n analysis recently obtained by a rubber manufacturer t a considerable cost, in which the traces of "iron, lumina, alkaline salts, copper, &c.," are determined, vhich are mere impurities in the minerals used, whilst all he information on the point vital to the manufacturer is n the item "india-rubber and other organic matter," 8·44 per cent.

By the methods now adopted by those chemists who ave made it a special study, we can obtain, fairly easily nd in a comparatively short space of time, a much more aluable idea of the composition of a sample of anufactured rubber than by a mineral analysis alone.

The method, broadly speaking, consists in the extraction f the finely comminuted rubber, by a series of solvents y which the organic impurities or additions to the rubber re more or less perfectly removed.

As we do not in this paper claim any absolute novelty n the principle of the method, a very brief description f it will suffice.

(1) The first extraction is by means of boiling acetone n the Soxhlet or equivalent apparatus. By this means e extract the oils and resins natural to the rubber, free atty oils, hydrocarbon oils, and resins, and the free ulphur. These can be to a certain extent separated and etermined.

(2) The residue from the acetone extraction is subjected to the action of boiling alcoholic potash or soda. By this extraction we remove the "vulcanised" and oxidised ils (so-called substitutes) together with the sulphur and hlorine combined therewith.

(3) By a maceration of residue No. 2 with cold nitrobenzene the bituminous matters are removed (pitch, asphaltum, &c.).

(4) There is now left the india-rubber, with its combined sulphur, the mineral matter, and insoluble organic matters (carbon, starch, &c.), and by the treatment of this with boiling nitrobenzene and a little chloroform the rubber is dissolved, and after washing with ether the solution contains the rubber with its sulphur of vulcanisation, and the residue contains the carbon, starch, and other insoluble organic materials, and the mineral matters. These can, if desired, be further separated, and, of course, the mineral matter and sulphur therein determined by incineration and oxidation and precipitation in the usual way.

The acetone extraction may take four hours, the potash extraction about four hours, and the cold nitrobenzene about one hour. In a great number of cases the process may stop here, but if the treatment by hot nitrobenzene is also applied, another hour or thereabouts is needed for this.

The immediate object of our paper is to present a series of results which have occurred in our practice, to suggest a scheme of tabulating the results, and to illustrate the method of applying those results. We also offer a few comments on the method which is still in want of development to make it more complete and more correct.

In the following table (No. 1) we have grouped a series of results obtained from samples of native rubber, recovered or reclaimed rubber, and of vulcanised rubber, on the lines we suggest.

TABLE I.—ANALYSIS OF VARIOUS DESCRIPTIONS OF INDIA RUBBER.

Reference.	Description.	1. Sp. Gr	2. Mineral Matter.	3. Total Sulphur.	4. Sulphur free.	5. Sulphur after Cold Nitro-benzol.	6. Sulphur after Hot Nitro-benzol.	7. Acetone Extract.	8. Alcoholic Potash Extract.	9. Nitro-benzol Cold Extract.	10. Nitro-benzol Hot Extract.
Para rubber....	Native rubber, washed and dried........................	0·92	0·317	..	..	..	..	2·28	2·96 3·15*	None	..
Gambia rubber .	" "	0·93	3·02	..	..	..	..	3·60	None	None	..
Camata rubber .	" "	0·90	0·304	..	..	..	..	2·10	None	None	..
T. R............	Reclaimed Para, washed and dried........................	1·101	13·73	..	..	..	..	5·76	1·23	3·54	..
Uganda rubber .	Native rubber, washed and dried........................	1·00	2·77	..	..	..	..	9·60	2·12	7·59 ½	..
Balata..........	Native, washed and dried....	1·02	2·80	..	..	..	..	41·68	1·02	None	..
Victoria, 9, black	American reclaimed rubber.	1·6	52·14	..	..	..	..	7·33	2·36	2·59	..
No 1/75, black ..	" "	1·57	44·1	..	..	..	..	10·26	3·90	12·28	..
No. 6, drab	English reclaimed rubber ...	1·6	53·3	..	..	..	.	18·94	1·70	2·86	..
No. 1, black.....	" "	1·31	31·5	..	..	..	..	15·64	2·11	1·56	..
No. 2½, black....	" "	1·49	51·4	..	..	..	..	20·40	3·71	6·23	..
No. M, black....	" "	1·60	56·48	..	..	..	..	2·86	3·54	2·15	..
No. 9½, black....	" "	1·30	36·48	..	..	..	..	14·86	3·71	6·23	..
No. 12, black....	" "	1·25	27·60	..	..	..	..	10·30	3·76	1·50	..
Yankee, black ..	American reclaimed rubber ..	..	55·30	..	..	..	..	8·24	3·02	6·9	..
M. H., black....	" "	..	33·40	..	..	..	..	26·36	4·05	8·52	..
No. 11, red......	New vulcanised rubber	1·327	30·85	10·04	1·79†	8·25	..	8·06	8·00	1·17	..
No. 1, grey	" "	1·515	64·22	3·33	..	..	..	3·46	5·16	3·2	..
No. 2, grey......	" "	1·80	63·78	4·64	..	..	..	3·42	7·42	2·76	..
No. 3, grey......	" "	1·84	65·90	3·25	0·77‡	2·48	..	4·64	3·00	1·33	..

* Second analysis. These figures are abnormally high. † By difference between preceding and succeeding columns.
‡ A determination of the water, if any, should also be made.

The figures are the result of analysis performed by ourselves, where certain information for trade purposes was desired, and not as complete illustrations of the method of analysis. Consequently, the figures are not as perfect an *exposé* of the method as might be desired, but quite sufficient, we think, to show its usefulness. Fuller results of more numerous analyses are required in order to show how near an approximation to the composition of the mixing from which the sample was made, are needed. No doubt subsequent work by ourselves and others will furnish the necessary figures.

The figures in the table, however, are sufficiently full to show that chemists are in a much better position than they were a few years ago to learn from analysis facts of real value in determining the nature of a sample of native or manufactured rubber.

It will be noticed that columns 6 and 10 in the table are vacant. We are bound to confess that the treatment with hot nitrobenzol has not so far been a practical success in our hands. There is no difficulty in effecting the solution of the rubber, but the separation of this solution from finely-divided mineral matter, lampblack, &c., is, so far as we have gone, so unsatisfactory that we have preferred not to insert the results. We are continuing experiments on this part of the process, as the results, if even approximately correct, are most valuable.

We may at this point note that in the case of all the solvents used it must be remembered that there is a certain amount of "overlapping," so to speak. Bituminous matters are not all insoluble in acetone, and substances imperfectly extracted by acetone will be dissolved by the alcoholic potash and so on.

In spite of these drawbacks, which will always exist in methods of separation of substances of the character under consideration, it will be seen by the following study of the results of an analysis of a sample of known composition that information of real value to the manufacturer is obtained by what we may call "the solution" method of india-rubber analysis.

Sample No. 3, a grey vulcanised rubber (see Table I.), was made from the following mixing :—

TABLE II.

Native rubber (Gambia) ...	8	lb. or	13·3	per cent.
Recovered rubber (Para)...	3	,,	5·0	,,
Recovered rubber (No. 12).	12	,,	20·0	,,
Zinc oxide	8	,,		
Whiting	20	,,		
Magnesia	2	,,	59·2	,,
Litharge.....................	5	,,		
Lime	½	,,		
Sulphur	1½	,,	2·5	,,
Lbs.	60		100·0	

The total amount of rubber is 38·3 per cent. according, to these figures, but, as will be seen by consulting Table I., the three rubbers used contain a certain amount of mineral matter. Making due allowance for this we get the following figures—

(*a*) India-rubber........................	31·8	per cent.
Mineral matter	65·7	,,
Sulphur	2·5	,,
	100·0	

Turning to Table I., sample 3, we find the percentage composition as follows .—

(*b*) India-rubber........................	22·65	per cent.
Resins oils, and bituminous matter.	8·97	,,
Mineral matter	65·90	,,
Sulphur..................................	2·48*	,,
	100·00	

* We take this figure for sulphur because 0·77 out of 3·25 per cent. total sulphur is contained in the acetone extract (column 7).

It is evident from these figures that the whole of the 31·8 per cent. in the mixing (*a*) is not rubber, and, of course, if we compare the analyses in Table I. of the rubbers used, we find that they contain resins, &c., which in amount equal 4·08 per cent. The analysis as calculated from the mixing is, therefore, really as follows :—

(*c*) India-rubber........................	27·70	per cent.
Resins, &c.	4·10	,,
Mineral matter	65·70	,,
Sulphur	2·50	,,
	100·00	

Comparing now the found (*b*) with the calculated (*c*), we find that there is 4·87 per cent. more resins, &c., shown by the analysis than originally existed in the mixing. Some of this discrepancy is no doubt due to the want of absolute accuracy in the process, but as an actual fact we find that even the highest grades of rubber are, by the heat of friction during mixing, and action of the ingredients during vulcanisation, subject to the formation of a small percentage of soluble resinous and bituminous bodies. This is shown to be the case in the figures we have just considered.

Newcastle Section.

Meeting held at Durham College of Science, on Thursday, February 26th, 1903.

MR. W. L. RENNOLDSON IN THE CHAIR.

THE SEGREGATORY AND MIGRATORY HABIT OF SOLIDS IN ALLOYS AND IN STEEL BELOW THE CRITICAL POINTS.

BY J. E. STEAD.

In a short article published in the January 1903 issue of the "Metallographist" by Mr. E. F. Lange, on the presence of cementite and ferrite in steel, the author has shown by his own researches and by evidence published by me, that under special conditions the cementite and ferrite of pearlite in steel containing 0·38 per cent. of carbon separate into comparative widely separated masses. Mr. Sauveur, in a postscript to this article, observes that if pearlite is accepted as a eutectic mixture the simultaneous occurrence of free and massive cementite in low carbon steels is decidedly abnormal and remains unexplained.

It is perfectly true, as Mr. Sauveur has stated, that segregation of the constituents of pearlite has not been explained, and it is also true that, if the condition of pearlite in forged steels, or steels which have not been slowly cooled, is accepted as the normal condition, then such segregation must be considered as abnormal, but it must be remembered that what is abnormal under one set of conditions may be quite normal in another. That this is so will presently be shown.

It was Guthrie who first used the term "eutectic," and he applied it to what was equivalent to a solidified mother liquor in such alloys of metals which on melting yielded mixtures fusible at temperatures below that of the mean of their components. He found that such eutectic mixtures were of constant but not of atomic composition.

Perhaps a simple illustration taken from the domain of the more familiar chemical physics will convey a good idea of what a eutectic is understood to be. I need only refer to one of a great many, viz., common salt and water.

It is well known that common salt and snow, when mixed together, react on each other and liquefy, in other words they mutually dissolve each other. The mixture is quite liquid at 0° F., although the melting point of salt is 780° C., and of water 32° F. = 0 C. If the proportion of salt to water is as 1 to 1·326, and the liquid mixture is cooled slowly down, a point will eventually be reached at which it will begin to freeze, and the temperature will not then fall further till complete solidification has been effected. The exact temperature at which this solidification occurs is −22° C. The solid mixture of salt and water of the composition 76·5 per cent. water and 23·5 per cent salt, formerly called a cryohydrate, is the true eutectic of salt and water.

When this solid and frozen eutectic is treated with alcohol the solid water is dissolved out leaving the salt behind unaffected, and the microscope then shows that there are spaces which had previously been occupied by the ice, thus proving that the salt and ice are quite separate from each other in very minute particles alternately arranged side by side.

If a hot saturated solution of salt and water is cooled down slowly to the eutectic freezing point, as the thermometer sinks, salt will crystallise, and continue to fal out of solution till the temperature reaches −22° C., whic is the freezing point of the eutectic mixture. This mother liquid will then freeze as a whole, separating into fine separate particles of salt and ice. On the other hand, i water is mixed with, say, 10 per cent. salt, and the mixture is similarly cooled, in such a case, no salt will fall out o solution, but between the temperature 0° C. and −22° C the water present over and above the eutectic proportio will freeze, leaving behind a more and more concentrating alt solution. Eventually when the eutectic proportion f salt and water is reached, and heat is still drawn from , it will solidify at the same temperature as in the case hen salt was in excess.

If the two salt solutions above referred to, after cooling o below the eutectic point in a solid state, were to be xamined microscopically, in the case where the salt was n excess idiomorphic crystals of that substance would be ound embedded in the solid eutectic mixture. In the other ase crystals of ice or solid water would be found similarly mbedded.

Simple alloys such as lead and tin, antimony and lead, nd many more, when their components are in eutectic proportion, exactly as in the case of salt and water, have one critical or solidifying point, and when solid neither constituent is in massive or definite crystalline form. If, however, either one or other of the constituents is in excess it invariably is first to fall out of solution or freeze, and it is not until such excess entirely separates and the mother liquor has arrived at the eutectic proportion that he eutectic, or mother liquor, itself begins to solidify. In such a case there is an arrest in the rate of cooling at the moment when the constituent in excess begins to freeze, and this retardation is continued down to the eutectic point when a complete arrest occurs and is maintained until the eutectic is solid.

The microscope clearly shows in the solid alloys what occurs during the cooling, for the constituent which froze n advance of the liquid eutectic is invariably in comparatively large crystalline masses, sometimes in the form of diomorphic crystals, but more generally as plates or crystallites, which are found sometimes embedded in the solid eutectic, or if the specific gravity of the separated crystals is less, or greater, than that of the eutectic and the cooling is sufficiently slow, they are found respectively near the top or bottom of the cold solid alloys.*

In the case of an alloy of antimony and lead, if the antimony is in excess it is present in the form of idiomorphic crystals of antimony. If the lead is in greater excess than the eutectic proportion, it first crystallises and is found as crystallites of the fir tree type embedded in the solid eutectic.

I shall call the eutectic mixtures which are formed when the liquid eutectic solutions become solid, primary eutectics, to distinguish them from eutectic mixtures which are formed in certain cases after the metals have become quite solid, when they cool through definite critical points. This second class I propose to call secondary eutectics.

There are many instances in which eutectics are compound in character, and contain both the primary and secondary forms together. The eutectic of iron, carbon, and phosphorus is an instance of this class.

Segregation in Primary Eutectics.

Although there is evidence that the constituents of many eutectics do segregate to a marked extent, I propose to confine my attention to one I have most thoroughly studied. *viz.*, the iron and phosphorus eutectic.

This consists of two constituents of high melting point, which at a temperature below the melting point of either, mutually dissolve each other with a simultaneous depression of the point of solidification, and in cooling through that point breaks up into its two constituents, and when solid has the characteristic structure of the honeycomb type of eutectic.

The solidification of any eutectic, as well as this, may be compared with what occurs when a simple salt crystallises from a liquid solution. When a few salt crystals, widely separated from each other, have once commenced growing in a gradually and extremely slowly concentrating liquid, they continue to develop and attract the dissolved salt, which they use for the development of their own forms, and new crystals rarely form on the sides of the containing vessel. The attraction of the existing crystals tends to prevent the birth of new ones.

When on very slow cooling a eutectic begins to crystallise, its two constituents fall out of solution simultaneously at relatively microscopically wide distances apart, and continue their growth side by side till the whole of the liquid is solid. When cold the structure is very coarse, whereas, when either a hot saturated solution of salt in water or a liquid eutectic solution have the heat withdrawn from them with great rapidity, every particle of each solution as rapidly parts with a portion of its crystalline component, and instead of a few nuclei or starting points of crystalline growth, the number is excessively great, and there is a correspondingly large number of separate individual crystals.

It is possible to conceive that, were the heat to be instantaneously withdrawn, the salt would be thrown out of solution in almost molecular subdivision, or at any rate, so finely crystalline as to require great magnification to detect the separate crystal particles, and the separate constituents of the solid eutectic would be too fine to be resolved by the highest powers of the microscope. Very slow cooling through the eutectic point of primary eutectics results in what may be called a primary but not a very pronounced segregation of their constituents.

The peculiar attractive force which crystals or crystallised particles appear to have of drawing to themselves other and smaller particles of their own kind, either from liquid or solid solution, or when the particles are in the free state, from either liquid or solid suspension, I propose to call "crystallic attraction."

Segregation below the Eutectic Point.

I now pass on to consider what occurs after a eutectic has become solid, but is very slowly cooled through a point just below the eutectic melting point.

To explain this properly we must consider the question from two different points of view, *viz.*:—

The first, where one or other of the eutectic constituents is in excess of the eutectic proportion.

The second, in which the whole mass is of the eutectic composition.

As an example of the first condition, I have taken the case of an ingot of iron containing about 2 per cent. of phosphorus and a little carbon, in which there is a small quantity of the phosphorus eutectic distributed regularly at short distances apart throughout the mass of phosphoferrite.

In the moderately quickly cooled metal these isolated particles are distinctly characteristic of the honeycombed eutectic (Photo. No. 1). Their form is irregular, and they are arranged generally along or between the spines of the octahedral skeletons of the ground mass, and each patch is enveloped by a fringe of pearlite. After annealing the metal in iron ore, and very slowly cooling it below the eutectic point, there no longer exists any eutectic. The phosphide of iron and phospho-ferrite, the two constituents of the eutectic, have completely separated from each other, and the Fe_3P has changed its form and position and re-formed itself into flat plates arranged between the cleavage planes of the crystal ground mass, and the phospho-ferrite has united with the surrounding metal.

On again heating this metal to above the eutectic melting point, but not to the fusing temperature of the ground mass, and cooling in the air, the eutectic again appears, but this time in the form of broken-up plates, rounded at their edges, and of exceedingly fine duplex structure.

After completely melting the alloy, the original irregular shaped eutectic masses again appear, but this time unaccompanied with any pearlite fringe.

A portion of the original metal was then passed through the cementation process, the effect of which was to completely change the originally very coarsely crystalline structure to that of a columnar form, excepting in the exact centre into which the carbon had not penetrated. This central portion was not more than 1 c.c. in volume, and was nodular in form. The photo No. 2, slightly enlarged, was taken of the metal after fracturing, so as to show the area altered by the combined effect of the carbon and heat, and also a portion of the central portion.

No. 3 is a micro photo of the metal at the junction of the altered and unaltered portions. It is of unique interest, for here there is pronounced evidence that not only has the central portion received no carbon during cementation, but that what little carbide there was originally present has migrated through the solid metal and joined the greater volume of carbide surrounding it. It is easy to see where the carbon is located, for the delicate tracery of bright bands radiating from patches of the phosphide eutectic below are of carbide of iron, and the fringe itself, consisting of layers of phospho-ferrite and carbide of iron, is pearlite.

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* In the case of the individual constituents of the solid eutectics there is no evidence that they ever exist as idiomorphic crystals, no matter how slowly they have solidified, but they are for all that crystalline in character.

The phosphide eutectic areas surrounded by pearlite are exactly of the same character as those in the original metal, with this difference, that here, owing to the exceedingly slow rate of cooling through the eutectic points, the structure of both the primary eutectic and of the pearlite is much coarser than in the original metal, which was cooled down much more rapidly.

That the central part of the nodular area contains no carbon and no phosphide eutectic, but in place has free and segregated phosphide of iron in imperfectly formed crystals, leads to the inevitable conclusion that in cooling down, after the primary eutectic point had been passed, vigorous and active migration has occurred.

No. 4 photo is a micro-photograph of the pearlite fringe in No. 3, greatly magnified.

The series of knob-like extremities shown in this illustration indicate clearly enough what was actually occurring when the metal was cooling down. The rod-like lines are sections of plates of carbide of iron. In another experiment in which the metal was cooled with fair rapidity, that is to say, when the passage of the temperature through 100° below the critical point occupied about ten minutes, the bulbous terminations were absent. The inference seems obvious, that in the more slowly cooled metal, when first they fell out of solid solution, they were not there, and only became bulbous by coalescence and segregation at some temperature below the critical point. Had the favourable conditions for this movement been allowed to continue for a much longer time the terminations would have segregated to such a thickness that they would have joined together to form a solid enveloping ring of massive cementite, and possibly have eventually segregated into a large mass.

Another case may be cited, where, in addition to a considerable amount of phosphorus, there was also about [illegible] per cent. carbon. The metal in this case was very slowly cooled in the hearth of a basic open-hearth furnace.

When microscopically examined the grains of the phosphoretic steel were found to be sheathed by envelopes of free Fe_3P and Fe_3C, excepting in the regions of conjunction of three grains where the phosphide eutectic existed as a very coarse structure, easily resolvable with the aid of a simple lens.

On reheating the specimen to 1,100°, a temperature above the melting point of the eutectic, and cooling in air, the envelopes of Fe_3P were replaced by the characteristic eutectic, and when the piece of metal was completely melted and cooled so that solidification was effected in a few minutes, the crystalline grains were found to be surrounded by envelopes of phospho-eutectic.* We are forced to conclude that in the cooling of this metal in the open-hearth furnace at the point at which the temperature had just passed through the eutectic point the envelopes must have been eutectic. It is certain, therefore, that the segregation into envelopes of free Fe_3P must have occurred when the metal was in a completely solid state.

The facts upon which this hypothesis is based have been repeatedly verified, and they prove that the eutectic when in relatively small masses in presence of a preponderating quantity of one of its constituents, when both constituents are in a completely solid state, and at a temperature below the melting point of the eutectic, yield up to the surrounding mass that part of it which is of the same substance as the mass.

It would appear then, from what has been proved :—

1st. That there must have been migration of the solid constituents of the eutectic.

2nd. That the surrounding mass draws, by crystallic attraction through the walls of solid phosphide of iron, the enclosed phosphoferrite, increasing thereby its own crystal growth, whilst the phosphide of iron coalesces or segregates into continuous and separate masses.

3rd. That if these hypotheses are correct, unless, which is improbable, the phosphide of iron finally and completely throws off the last traces of the phospho-ferrite which penetrates into it, it cannot be perfectly pure Fe_3P, but must contain in solid solution a small proportion of the interpenetrating substance, the quantity probably being dependent upon the rate of cooling after the segregation was more or less complete.

In considering the second condition of the eutectic when it is not in presence of masses of a free constituent it has been found that when the pure phosphide eutectic is annealed for many hours below the eutectic point, there is no separation into masses of phospho-ferrite and phosphide of iron. It retains its characteristic form. As the constituents are equally distributed and close together, the attractions are equally distributed in every direction. Every particle of each separated constituent undoubtedly has an attraction for the nearest particle of the same kind, but they do not join for the simple reason that their attractions are balanced. They are in a condition of equilibrium. It is probable that were the equilibrium not exact segregation would at once begin, and if the heating just below the melting point were continued for a greatly prolonged period, complete segregation of the two constituents would occur.

There is now overwhelming proof that in solids, as in liquids, there is, what has been described by the late Sir W. Roberts Austen as intense molecular vivacity, and, that just as slowly evaporating liquid salt solutions tend to the growth of one single crystal of large mass, so in solids, under suitable conditions, there is a tendency for the parts of each respective constituent to join together so as to form a few large crystals of each. Like attracts like. This is really the cause of segregation in a solid. Probably one crystal larger than its fellows would, if time were afforded, induce by superior crystallic attraction all the smaller ones to unite with it for its own development. It is well known that this does occur when the mass is elementary and is composed of strongly cohering minute crystals. I have before me an instance in which millions of such crystals have moved and changed orientation to build up a single larger one. It is a piece of soft iron, which has been annealed at a suitable temperature for several years.

The original crystals had a diameter of about 0·02 mm., and the single crystal a cube volume of 80,000 sq. mm. From this data it is easily found by calculation that the single large crystal must have been formed at the expense and substance of 4,000,000 of the smaller crystals.

Professor Ewing and Mr. Walter Rosenhain have proved that rolled sheet lead even at normal temperature is capable of active molecular crystallic movement, and that the original minute crystals re-arrange their relative orientation so as to build up a few crystals of much greater dimensions.

Segregation in the Secondary Eutectic Pearlite.

Having given instances of the segregation of the constituents in normal eutectics, we must now pass on to consider the eutectic which is formed in solid steel at a temperature far below the melting point of its component parts or constituents.

It was Dr. Sorby of Sheffield, who, over 30 years ago discovered that annealed and slowly cooled steels contained two constituent parts in thin curved plates, and that this constituent, after polishing and etching, even without any magnification, had the peculiar coloured appearance of mother-of-pearl, an optical appearance caused by the interference of light by the slightly projecting edges of the juxtaposed and curved laminæ of the cementite (Fe_3C). On account of this peculiarity Dr. Sorby described it as the "pearly constituent" of steel.

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* Photographic reproductions representing these changes can be seen in my paper on "Iron and Phosphorus." Journal of the Iron and Steel Institute, No. II., 1900.

Almost all eutectics, whether primary or secondary, ıen polished and etched, if their structure is fine ough and not too coarse, give the same pearl-like pearance.

In pure carbon steels the pearlite proportion of carbide iron and free iron are somewhere about 13·3 per cent. $_3$C and 86·7 per cent. Fe. When steel containing these oportions is slowly cooled from 900° C. to a point a little ıder 700° C., the carbide and iron, originally mixed together, nstituting a homogeneous mass, separate into bands or minæ which are alternately arranged, and co-incidentally ere is a great evolution of heat. The steel when cold nsists entirely of pearlite.

If either the carbide of iron or iron is much in excess of e pearlite proportion the cold steel contains the excess either one or the other, as the case may be, in the form free carbide or free iron, readily seen in the polished and ched steels.

If any of such steels are suddenly quenched at a point st above the critical temperature at which separation curs pearlite does not form, and the parts containing the rbide on etching yield a practically homogeneous surce very minutely crystalline. This constituent called hardenite" is now generally accepted to be a solid lution of carbide of iron in some form in iron. Prof. rnold was first to show that it has approximately the mposition represented by Fe$_{24}$C.

On account of the great similarity in behaviour on oling of the solid solution, of solid carbide of iron and on, and of the alloys in liquid solution, the compound nstituent pearlite is now generally regarded as a eutectic, though the origional definition of Guthrie cannot in strict curacy be applied to it, hence my suggestion to call it a condary eutectic.

There is a great similarity in the relative fineness of the nstituents of the two classes of eutectics according to hether the period they take to form is rapid or protracted. Just as by very slow cooling through the eutectic points the primary eutectics, the constituents become coarse nd relatively wide apart, so under like conditions the minæ which form in the secondary eutectic pearlite are oarse.

This close relation, however, does not stop at the eutectic oint, for exactly as the constituent of isolated particles of e eutectic in phospho-iron eutectics exhibit extraordinary tive molecular vivacity at temperatures below the eutectic oint, so also a similar activity occurs in the cementite and on in the pearlite of steel, more particularly when in the resence of free or massive ferrite (Fe) or cementite (Fe$_3$C).

Very marked instances of molecular movement are fforded in bars of pure Swedish iron which have been rburised by the cementation process. In the economical onduct of that process the quantity of iron cemented at ne operation is considerable, and the cooling is necessarily orrespondingly slow, consequently there is ample time for tive molecular movement after the critical point has been assed. The period of passage through the eutectic point eing also slow the pearlite is invariably comparatively oarse in structure, well defined, and easily resolvable under e microscope.

It is a fact, however, that no matter how slow the passage rough the critical range, if the cooling afterwards is rapid, ere is no sensible secondary segregration of the eutectic onstituents.

I cannot proceed without referring to the series of xcellent drawings of cemented bar by Prof. Arnold and Ir. McWilliams (J. Iron and Steel Inst., 19), and the escriptive paper on the microstructure of the cold steel, s it is a standard contribution to our knowledge of the ementation process. The results are not only confirmatory f my own work, made previous to the publication of their aper, but they have been repeatedly verified by my more ecent researches.

This paper contains abundant proof of what I had reviously found, that in such material if the eutectic quilibrium does not exist in the mass as a whole the free onstituent which is in excess behaves exactly like the free hospho-ferrite in the phospho-iron eutectic. It apparently attracts that part in the eutectic which is of its own kind, and leaves the Fe$_3$C or Fe to coalesce and segregate by similar attraction. It is very rare to find complete segregation, excepting when the amount of pearlite in proportion to the ferrite or iron is small. If the proportion of pearlite is only 5 per cent. segregation is frequently complete. With 10 per cent. to 50 per cent. it is only partial. When the whole mass is entirely pearlite there is also partial secondary segregation, for by continued heating at a point just below Ar$_1$ the lamellar cementite is changed into the granular variety, but the particles are equally distributed. On the other hand, when there is an excess of from 5 per cent. to 12 per cent. of cementite, it appears to attract or draw a portion of the cementite from the pearlite, leaving the ferrite or iron in free broad masses adjoining the thick bands of cementite, and the whole of it if the cells enveloped by cementite are small.

It would certainly seem that the reason why segregation is more pronounced when small quantities of pearlite are present than in cases where it exists in greater quantity, is because the time in cooling in the cementation furnace, which is quite sufficient for the segregation and migration of the constituents of minute particles of pearlite, is not long enough for the completion of segregation of bodies of greater dimensions, the centres of which are further removed from the external attractive crystallic forces.

There is every reason to believe that if the steel just below the critical temperature were to be retained at that temperature for an infinite period, segregation of the larger masses of pearlite would result eventually, but that the nearer the composition of the whole mass approaches that of the eutectic, the greater the length of time which must elapse before the completion of the segregation.

No. 5 represents a photograph of a cemented bar polished and finally "polish etched" on leather moistened with picric acid, a reagent which if the pressure on the polishing block is not too great leaves the iron brown and the carbide of iron or cementite brilliantly white. The white parts, therefore, represent the latter, the black parts represent the iron or ferrite.

The outer more highly carburised parts of the bar (carbon about 1·2 per cent.) consists of almost completely segregated Fe$_3$C. It is known with certainty that when steels containing 1·2 per cent. carbon have just passed through the critical point the cell masses consist entirely of pearlite and are surrounded by envelopes of free cementite. We are, therefore, justified in concluding that such was the case in this bar, but we see that the cell masses do not contain pearlite. They consist essentially of free iron, excepting in the centre of some of the larger cells where a little pearlite is present. The only conclusion we can form is, that the original fine cell walls of Fe$_3$C existing just before the steel cooled through the critical point Ar$_1$ must have by crystallic attraction drawn to itself, at a temperature below the critical point, the carbide from the originally formed pearlite, leaving the ferrite in the free state, and that where the cells were of very large dimensions the attraction from the more distant cell walls were not sufficient in the time afforded to completely remove the carbide, hence some pearlite still remains.

No. 6 photo represents a cemented steel in which the central part consists of pure pearlite or laminæ of carbide of iron and free iron in equal distribution. The external part is more highly carburised, and consists of cells of ferrite with a little pearlite in the centre of some of them surrounded by thick cell walls of cementite. The heat treatment of both inside and outside, of course, must have been identical. The equilibrium of attractive force in the pure pearlite is undoubted, and it remains as it was left after passing the critical point; there is no marked secondary segregation, but in the outer layer of steel, the carbide being in excess, there is no equilibrium, and being in excess it has drawn to itself the carbide from the cells, leaving practically pure iron behind.

The Secondary Segregation Range.

I now pass on to describe a method I have used to ascertain the temperature at which the secondary segregation in pearlite is most active.

The method I refer to is that of heating the bars of steel to a high temperature at one end only, so that there is complete range of temperature between the hot and cold ends. When two such bars of sufficient length are placed close together in a muffle furnace, and are kept in that position for an hour or several hours, it is easy to determine the temperature at every part of them by means of a Le Chatelier pyrometer. In practice the couple is placed at the points where the curved sides of the bars are in contact, and it is steadily drawn from the hot region towards the colder ends. The distance from the terminals of the bar and the recorded temperatures are carefully noted. After heating for the desired period, the bars are removed and allowed to cool in the air, or may be quenched in water, as the case may require, and are then either cut or ground down, polished, etched, and their structure noted.

By this means, in one single piece, may be obtained a complete gradation range, in which there is a correlation of thermal treatment and micro-structure. When such bars of carbon steels are simply polished perfectly or roughly, and are then immersed in dilute nitric acid, the critical point Ar$_1$ or Ac$_1$ is indicated with exactness, especially if the bars were quenched in a cold liquid or even if cooled rapidly in the air, for at a point on each bar directly below the critical point the action of the acid leaves a line or area almost white. Above this line the steel assumes a black or dark brown colour, below the line it etches out dark, but not so dark as the portion above.

The microscope when applied to the examination of the perfectly polished and etched sections shows that the very black area, in the cases where the bars are quenched, contains hardenite, the constituent of hardened tool steels, but if the bars are small and are cooled in the air, the hardenite is replaced by the transition conditions intermediate between the hardening condition and pearlite, but these also etch out dark coloured.

The temperature corresponding to the upper dark border of the white line in pure carbon steels is close upon 690° C., it is in fact the critical point Ar$_1$.

The white line is the result of segregation of the cementite and ferrite.

The area where there is most pronounced segregation closely adjoins the critical point, but it is continued for a distance of 2 or 3 mm. below it, gradually diminishing with the distance.

In the trials I have made a constant temperature was maintained for at least 6 hours, in some cases 70 hours.

The samples exhibited show in a very clear manner the well-defined white line where crystallic attraction and solid migration of solid through solid has been most pronounced.

Photo No. 7 represents one of these bars.

One sample has not been etched, but has been left simply polished with fine emery paper. It is bright from end to end, but on placing it for 10 seconds in a 20 per cent. solution of nitric acid in water, the end originally most highly heated, down to the critical point Ar$_1$ becomes dark brown, and in marked contrast to it, there is a white line, immediately below, diminishing in whiteness for 2 mm. as the distance from the critical point is increased, beyond which the steel surface has a uniform grey colour.

Photo No. 8 represents a pearlite area in a bar containing 0·47 per cent. Carbon cooled down with liquid slag, magnified after etching with iodine 500 diameters. The laminæ of ferrite and cementite are comparatively fine.

Photo No. 9 is a similar area in the same piece of steel after long heating at just below the critical point Ar$_1$.

The bands or plates have now disappeared, and have been replaced by irregular masses of cementite. This represents and explains the reason why the band is white in photo No. 7.

Photo No. 10 represents an area in steel containing 0·1 per cent. carbon, which has been very slowly cooled. The segregation in this case was complete. The white irregular-shaped areas are cementite, the dark background ferrite containing traces of diffused carbide.

Practical Observations.

It is satisfactory to note that in this research the results are of some practical value, for it will be obvious that if steel when forged has the structure which experience shows is the best, and it is only desired to make it of maximum softness by annealing, that the prolonged heating to temperatures above the critical point is only time and fuel wasted, for the maximum softening is effected when the steel in cooling passes through about 20° C. below Ar, or from 690° C. to about 670° C. It must not be understood from this remark that it is advocated to anneal castings and forgings at such a low temperature, for one of the effects aimed at in practical annealing is not so much to soften as to break up a pre-existing coarse structure, and this can only be done by heating to much higher temperatures.

Neither is it advisable to prolong the heating just below Ar$_1$ in the annealing of the purest and softest steels containing little carbon, for they are liable at that temperature to develop coarse crystallisation and consequent brittleness.

If the steel is held at high temperatures above th critical point and is not cooled slowly afterwards there wil be no softening effect. It is clear, therefore, that a comparatively short heating at a temperature where the segregation is most profound will be much more efficaciou in producing the softest possible condition than a much longer heating at either higher or lower temperatur Maximum softness, however, is only required in steel in exceptional cases.

When a high elastic limit is required with a good and safe elongation the heating at the point represented by th white band in photo No. 7 should be avoided, for segregation of the cementite means a reduction of the elastic limit and tenacity.

All my metallographical experience points to the necessity of retaining in finished forgoings the carbide i a diffused state, not in the hardened form, if a combination of the best properties are aimed at, and, therefore, the segregation range should be passed through as rapidly as possible, and the structural steel after being heated through the critical points Ac$_3$, a temperature sufficient to cause as complete diffusion of the carbon as possible, should be cooled down as rapidly as possible to about 600° C., and be then allowed to cool in air, or, in some cases, the ste after heating may be quenched outright, and be reheated to a temperature below the segregating range, and cooled in either air or water from that temperature.

If the structure of the steel originally is very coarse a double heating is advisable to effect a perfect distributio of the carbon, and after the second heating the treatment should be the same as just described.

Treatment of this kind leads to the carbon conditio being in that state called by M. Osmond "sorbite."

Steels which have been subjected to negative quenching that is to say, moderately rapid cooling, such as o quenching, or cooling in air, or which have been quenched in water and reheated to about 500° C., are almost al highly sorbitic in character.

Such sorbite steels, according to my own experience, ar stronger and less liable to break down under continu fibre stresses than less sorbitic material.

Summary and Conclusions.

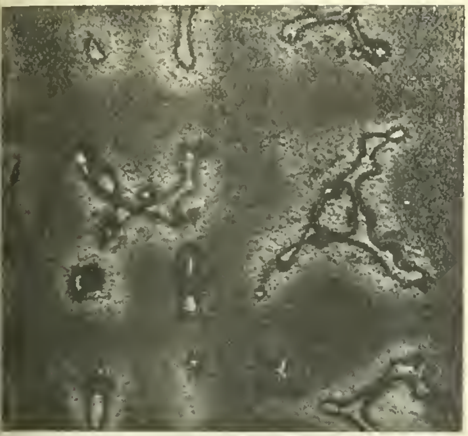
The evidence appears to clearly show, viz.:—

1st. That at certain temperatures near to, but belo the eutectic point of the iron-phosphorous eutectic, the tw constituents when quite solid are capable of migratin from one part to another.

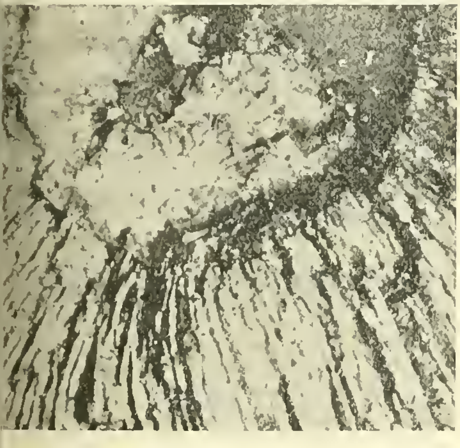
2nd. There is evidence that the large crystalline mass in solids have an attractive force for the smaller particl of the same kind, and under suitable conditions draw the to themselves. This force I have called "crystall attraction."

d. That in the ordinary or primary eutectic referred f the whole mass is of eutectic composition, the tituents being equally distributed and in juxtaposition, ttractions are balanced, and as long as the condition of equilibrium is maintained there is no segregation, at least not during heating for 48 hours.

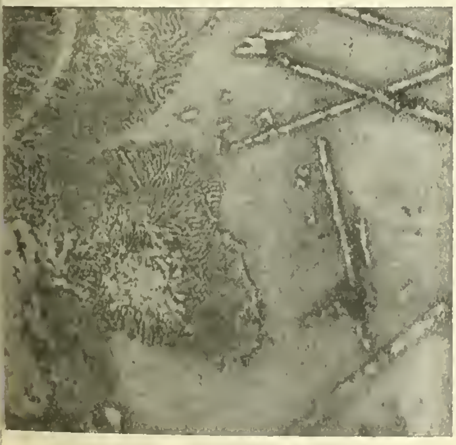
4th. That active secondary segregation occurs when the eutectic exists in isolated areas and is surrounded by



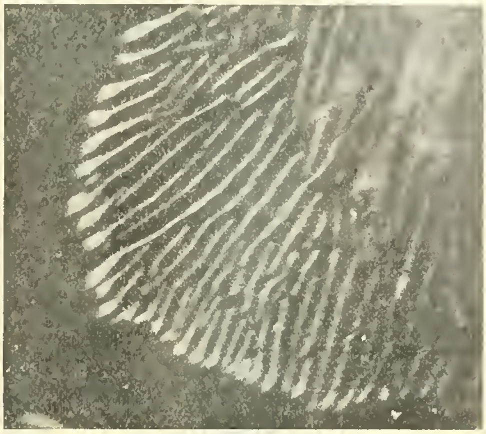
). 1 × 80.—Metal ingot, 2 per cent. P, 0·13 per cent. carbon, before reheating.



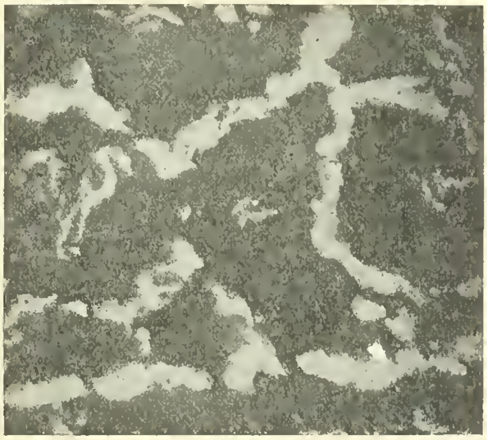
No. 2 × 5.—Phosphorettic iron. No. 1, "cemented."



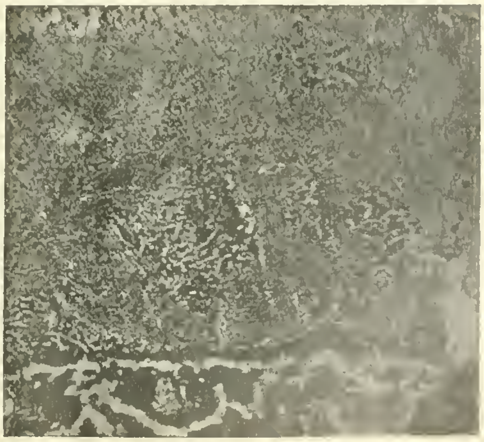
'o. 3 × 80.—Micro-photograph of metal No. 2 at point A.



No. 4 × 250.—Pearlite fringe. White, Fe_3C; black phosphoferrite.



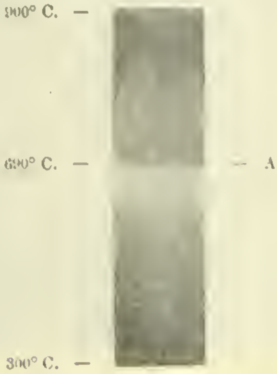
No. 5 × 80.—Cement bar. Dark part, iron; white, Fe_3C.



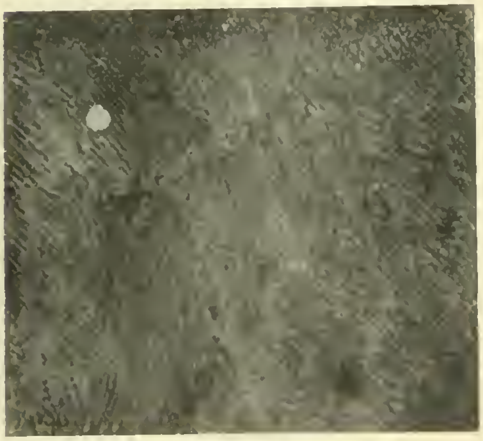
No. 6 × 80.—Cement bar. Dark part, iron; white, Fe_3C.

masses of substance of the same kind as one of its constituents. As there is no equilibrium or balance of the crystallic attractions between the particles of a like kind, both constituents draw together or segregate and cease to be eutectic in character.

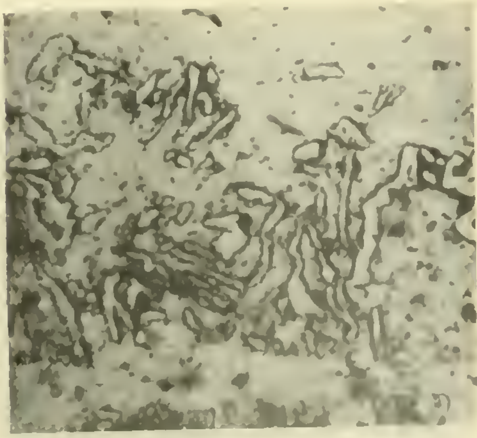
5th. That in the secondary eutectic pearlite, at temperatures below the eutectic point, there is the same tendency for the constituents to migrate and segregate. A bar of steel heated at one end to 900° C. and kept cold at the other end for many hours, after polishing a etching with dilute nitric acid, reveals a white band ju below the critical point, an appearance caused by t segregation of the cementite into relatively large masses.



No. 7.—Bar steel. Natural size. Heated at one end.

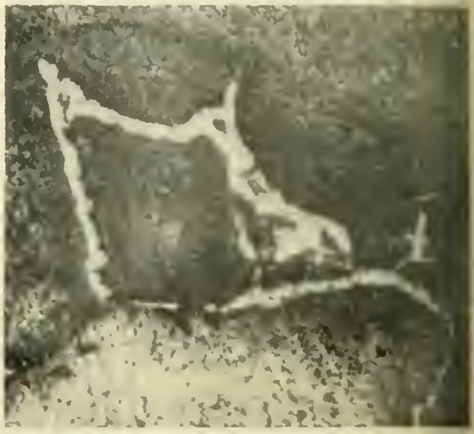


No. 8 × 500.—A pearlite area in a steel with 0·47 per cent. carbon.



No. 9 × 500.—The pearlite of No. 8, after long heating at 670° C. Segregated cementite and ferrite.

6th. That heating steel at the temperature represented b the white band—690° C. to 590° C.—most rapidly produc a softening effect, and that in practical annealing, wh the steel in cooling slowly passes through this zone, t main softening effect is produced. It is, however, the zo in which the elastic limit of the steel is most rapi reduced.



No. 10 × 500.—Soft steel. Very slowly cooled. White band Fe$_3$C; the rest is iron.

New York Section.

Meeting held at Chemists' Club, on Friday, January 23rd, 1903.

MR. R. W. MOORE IN THE CHAIR.

COLD STORAGE.

BY H. T. GALPIN.

In all parts of the world, cold storage is carried o is rapidly increasing. But the value of many food pro is often much diminished or entirely lost from la knowledge as to the chemical and physical propert products, and the best method for keeping and them.

The knowledge of producing and running cold st machinery, and building properly insulated plants, is means perfect. The makers of cold storage mac claim to serve but one purpose, that of producing cold by expanding a gas direct to the stores, or cooling congealable medium which is circulated in pipes t desired place. In the commercial plants the Carb machines are chiefly employed. In my experi laboratory I have Ballantine's automatic machine, only occupies 4 sq. ft. The architectural work in ins plants for cold storage has led to the creation of varieties, but the majority lack essential factors in tion to produce the best results intended. Heat seeks its own level in temperature. Water can b above or below its natural level by the use of ma through which it cannot pass; but heat cannot be because no materials exist through which it canno The rate of its passing, however, varies extrem different substances. Fire-proof materials are not eat-proof as the combustibles. The best of thermal conductors is atmospheric air, but only when confined inute spaces. If it can circulate it transfers heat lly, not by conduction, but by convection. If one of an air-filled space be warmer than the other, the ext to it receives heat, becomes lighter in consequence, rises, creating a circulation. It presently comes in ict with the cooler side, gives up heat to it, contracts, , and returns to its first place. This movement nues until the temperatures on both sides are lised.

e equal distribution of cold by air in circulation is an important factor in the operation of cold storage, to h I will refer later on. Heat being a form of motion, proceeds through an uniform medium, whereas ums of different density retard and dissipate it. An lation should therefore be composed of many layers of e materials in order to retard the heat waves, which undergo change and loss with every transition made. instance, construct the walls proper from brick to rless, anhydrous paint, from paint to wood, from wood ir, from air to water-proof paper, from water-proof r to wood, from wood to compressed, odourless ings, from shavings to paper, from paper to wood, and wood and paper so laid that their fibres lie athwart the of the heat. All insulations must be dry, as water smits heat about seven times as fast as wood across grain, 20 times as fast as paper, and 40 times as fast r.

keep the walls dry in a refrigerated building is not . When cooled below dew point, the moisture condenses. as dew on the grass, or water on the ice pitcher; vise, the deposit from the air is very great with frost; vers the refrigerating coils and more or less its walls. ll dividing partitions are constructed as just stated treated with a 1 per cent. solution of potassium orthorocresol ($C_6H_2.(NO_2)_2.CH_3.OK$), the moisture will eabsorbed by the air after a time; but if not made r-proof, capillary action takes place, filling the pores cells with moisture and impairing their insulating value. only is the insulation impaired, but this moisture is onducive to the development of mould or fungus that ontaminates the air, which afterwards exercises such ractive influence on the keeping of the products in .

oundations are important, and should be stone of good ity, laid in best Portland cement mortar, cemented le and outside to keep them water-tight. Courses of soft tar, tiling placed below the surface in such a manner as bsorb and thoroughly drain all moisture from the earth w the building, should not be overlooked. As a ium for absorbing and distributing cold, I much prefer ium chloride brine. Probably the reason why it has come into general use, to the exclusion of common salt, cause it is or has been much more expensive in its , is more difficult to prepare and handle, and cannot be ined everywhere like common salt. Calcium chloride less corrosive action on the pipes than common salt, cially when exposed to air. It is a better conveyer old than any other salt I know of, because with a n freezing point at a given temperature its specific is higher, consequently less brine is necessary and is required to be circulated than would be in all r mediums with which I have had experience. Most es at their maximum density, other than calcium ride, will freeze at about 7° below zero F., while ium chloride brine will not freeze at 50° below zero F.; e a less dense brine of calcium chloride can be made any other, and give more conducting power per pound.

ittle or no crystallisation takes place in the pipes in calcium chloride brine when temperatures drop below nal, and there is no danger of freezing, if reasonable care aken in its preparation. The freezing point of a 30 per . solution is about 54° below zero F., with a solution of 30 cent. A 25 per cent. solution is usually required in any ks, and for most purposes 20 per cent. is ample density. ice-making, where a brine temperature of 10° to 20° F. rried in the tank, a brine ranging from 12 per cent. to 18 per cent. is all that is required: the brine, of course, must be strong enough to prevent ice forming on the expansion coils, so that the temperature of the expanding ammonia must largely regulate the density of the brine. A strong solution of calcium chloride has a much higher freezing point than a more diluted solution; therefore, a brine containing too much is to be guarded against. The most common test for brine is the salometer or hydrometer. The following figures are proportions found most useful in making brine from the commercial fused calcium chloride, which already contains 25 per cent. of water; the figures represent the percentage of anhydrous calcium chloride:—

Pounds of Calcium Chloride to one U.S. gallon of Water.	Degrees Salometer at 60° F.	Freezing Point. Degrees F.
2½	80	4
3	88	− 2
3½	96	− 9
4	104	− 17
4½	112	− 27
5	120	− 39
5½	xxx	− 54

When standardising the brine the temperature must be at 60° F.

Food products, no matter how pure they may be, are perishable, although with a knowledge of their peculiarities, and care in their keeping, they can be kept unaltered and wholesome for some time. But there are certain natural changes which are sure to occur as soon as an opportunity is given, and these the future successful cold-storage system must reduce to the minimum. Temperature, moisture, ventilation, impurities in atmosphere, bacterial disturbance, and many other causes little known, even trivial in themselves, are responsible for this destruction.

The necessity for change of air in cold storage spaces is as important as in dwellings. For example, analyses of atmospheric air taken from different stores at different times of storage give varying proportions of carbonic dioxide, carbon monoxide, ammonia, sulphuretted hydrogen, and complex organic gases. It is not uncommon to see fungi growing on the walls in cold storage, even within ice which has been produced by condensation through imperfect insulation.

I have detected foreign flavours in cooked food, owing to the storage house being near some source of flavour: especially was this noticeable in eggs, owing to their porosity. This always occurs when the temperature rises. Air, like gases generally, is extremely sensitive to change of temperature or pressure. Ventilation of cold stores, therefore, depends on suitable location of brine pipes and circulating air flues.

There are four systems of refrigeration which involve ventilation: 1st, direct refrigeration, which includes brine pipes located in the rooms; 2nd, indirect refrigeration, where the air supply is first cooled in a closed space, and afterwards passed to the rooms to be refrigerated; 3rd, direct-indirect refrigeration, which may be defined as a system of cooling wherein the cooling surfaces are located in the room to be cooled, and fresh air delivered in or between them in such manner as to be cooled on its way to the room; 4th, combination of these several methods.

Of the four systems I prefer the last one, as the laws of diffusion and gravitation can be best governed for a given temperature.

Of two rooms having equal exposure and equal cooling and ventilating facilities, the one containing greater tonnage of produce will show higher temperature, as all organised matter generates more or less heat. Experiments prove that nearly all fruit, vegetables, and eggs are preserved best in a temperature just above their freezing point.

In buildings supplied with special ventilating apparatus, much satisfaction is obtained by putting an electric recording instrument in the superintendent's office, connecting with every room, steam and brine pipe circuits and air flues, so as to show at any time the exact temperatures throughout the plant. In this way regularity of action will be assured, and at the same time valuable data can be collected.

The question of humidity in cold storage is a little uncertain; however, by the use of a "sling" hygrometer, quite rapid and accurate results may be obtained. The only way air can lose its moisture is by reduction of temperature. Experiments prove that most products keep better when moisture is neither abstracted nor absorbed. When the temperature is fitful, moisture from without or within the body is a source of trouble; because when a gas is saturated with a vapour, the actual tension of the mixture is the sum of the tensions due to the gas and the vapour separately. If a thermostat could be applied so as to maintain a specified temperature as practically as the thermostat which governs the temperature of an incubator, after securing proper humidity and temperature, one would eliminate the expansion and contraction of the product; which not only lessens the keeping powers—particularly when leaving the storage rooms—but would also avoid the loss of weight and prevent the absorption of various taints and flavours which are so often present in the storage room. This is a point upon which I am at present experimenting.

Besides the difficulties caused by poor insulation, fluctuating humidity and temperature, there is another influence which constantly upsets all calculations, and that is the atmospheric air with its varying impurities and electrical conditions. There are always changes, though minute, taking place in organic matter; in spite of the methods applied to retard them these occur even under ordinary conditions. These changes depend on the presence of warmth, moisture, and air. In cold storage all these must be modified so as to keep the food sweet.

It occurred to me that, should I pass the atmosphere through a medium that could destroy all accumulated impurities, I might reach the desired ends. I therefore arranged a series of wash bottles, the first of which contained a saturated solution of formaldehyde. The second bottle contained a solution of ammonia, to eliminate whatever formaldehyde was present in the air. The third bottle contained sodium hydroxide solution, to remove carbon dioxide in any form; and the fourth bottle an acidulated solution, so as to neutralise any alkalinity that might be present, as decomposition is always more rapid in a neutral or alkaline atmosphere. Following this, I was obliged to restore the required amount of humidity, for which I employed calcium chloride, which was put into the brine tank as a matter of economy. My plan was, however, too cumbersome and impracticable for commercial purposes.

There are produced by putrefaction, acids—acetic, butyric, valeric, &c.—ammonia and some of its compounds, and hydrocarbons. I have tried gases, such as oxygen, nitrogen, and hydrogen, carbon dioxide, carbon monoxide, chloroform, ethereal vapours, &c., but the information gained by this research gave no results other than object lessons, and showed that the process of perfect preservation of food products is a more difficult matter than it might at first sight appear to be. One may preserve to the sight, but not to the smell; to the touch, but not to the taste. One may prevent decomposition in the ordinary sense of that term, but at the expense of some vital point of the original character. One must keep in mind at all times the natural colour, odour, reaction, water, consistency, microscopic appearance, and the natural taste and flavour, whether raw or cooked, and effect of such food when injected.

I will but briefly refer to such agents as act as absorbents of gases and vapours, which help to retard the injurious effects to a certain degree: Quicklime, lead acetate, and ferrous sulphate. Still another agent is "carboligni" (charcoal). It possesses the remarkable property of absorbing many times its own bulk of certain gases, and acts, to a certain degree, as a disinfectant. In my laboratory I often use a charcoal quilt to cover fæcal matter and the like, to avoid the emitting of any perceptible odour. One volume of "carboligni" will absorb 90 volumes of ammonia, 85 of hydrochloric acid gas, 65 of sulphur dioxide, 55 of hydric sulphide, 40 nitrous oxide, 35 of carbon dioxide, 9·4 of carbon mo oxide, &c. Much benefit may be derived by the use these agents in purifying the air, both in cold storage an dwellings. Such anti-putrescent substances probably exe their influence in one or more of the following ways They may abstract moisture from any fermentable su stance, or decompose the ferment producing the chang or deoxidise the ferment, or may kill the germ or lun exciting the putrefactive change.

The relation between certain meteorological variations air and the condition of food products is one of gre importance. The consideration of all influences affectu or threatening to affect the food product, from embryonic state in the early spring to the fully-develop state in the fall, within the producer's district demands study. The great change of barometric pressure and hea fall of rain are factors in the production of those atmosphe conditions on which the products of the agriculturist depen The influence of climate, i.e., the variations in temperatu humidity, pressure, and the electric state of the atmosphe as well as the effect of these changes on the phys conditions, forms a more extensive field of study for cold storage expert and one of highest interest as to keeping powers of the product.

There is not a season but there exists some conten element of destruction to the storage product, due marily to some climatic influence, such as mould, ru parasite, scald, decay at surface. Therefore, the inspecti of fruits, vegetables, eggs, meats, and other products purpose of storage demands the greatest care, particula when the history of their source of supply is unkno Mechanical, chemical, or bacterial injuries which m destroy the keeping powers of products are relativ frequent, and are due not only to climatic influences, also to the ignorance and simplicity of the harvester, well as to undue exposure in transportation in old conta nated cans; all of which affects the natural changes. I not an uncommon occurrence to receive eggs in a state decay, although the storage expert is expected by owner to deliver them in Africa or Europe a year hence fresh as from the hen.

Formerly chemistry exercised undisputed sway over t subject-matter of cold storage, but not now, as biology won for itself a co-ordinate position; and to develop t subject, I firmly believe that an intimate connection w the practical conditions are necessary, so that the vestigator may know the absolute necessities of business, and fresh tasks should be set before him.

Meeting held at the Chemists' Club, on Friday, February 20th, 1903.

DR. VIRGIL COBLENTZ IN THE CHAIR.

THE SCHROEDER CONTACT PROCESS OF SULPHURIC ACID MANUFACTURE.

(I.)—HISTORY AND COMMERCIAL DEVELOPMEN

BY DR. FRANZ MEYER.

In 1884 the German Patent Office granted a pa to Emil Haenisch and Max Schroeder on a process making anhydrous liquid sulphurous acid. The inven were at that time connected with the zinc works of Gie Erben in Upper Silesia, and thus they were aware of difficulty which the disposal of the kiln gases offered to German zinc smelters.

The problem of roasting the blende in such a man that the gases could be utilised for the chamber process already been solved by the furnace constructions Hasenclever and Liebig-Eichhorn, but the great h entertained by the zinc smelters in this invention were realised, as the many lead chambers built at the same ti in connection with blende roasting plants cause temporary over-production of sulphuric acid. Schro and Haenisch thought to overcome this unfortu ion of the acid market by utilising kiln gases for purposes, and the result of their efforts in this ion was the sulphurous acid process. Plant for ting this process on a large scale was erected in 1886 'ilhelm Grillo in Hamborn-on-the-Rhine, by Schle- A.-G. für Zinc-Huetten-Betrieb in Lipine, Upper ı, and by the firm of Graf Guido Henckel von ersmarck in Guidotto-Huette, Upper Silesia; but the hat the market for this product is limited was soon ished, and the same reason which had caused the tors to work out the sulphurous acid process, viz., production, led them to invent their first process for facturing sulphuric acid by catalysis from liquid lro-sulphurous acid.

1875 Clemens Winkler* published the results of his ches on the production of sulphuric acid by um-contact; the manufacture of fuming sulphuric by similar means was taken up by several European in competition with Stark in Bohemia, who so far had ıe monopoly on this product. However, it was soon that by the Winkler process the acid could not be as cheaply as was hoped at first, the production of a re of sulphurous acid and oxygen by decomposing uric acid by heat offering many disadvantages. isch and Schroeder were in a position to manufacture nixture of sulphurous acid and air cheaply, in any d proportion, from their liquid sulphurous acid, and induced the Badische Anilin und Soda Fabrik to try urous acid made at Hamborn. These experiments soon abandoned. Then the firm Wilhelm Grillo took atter up with Haenisch and Schroeder, and after the tors had proved in the laboratory that from a mixture ir sulphurous acid and air, sulphuric acid could be with a high yield and good efficiency of the platinum an experimental plant for developing this invention rected (see German Patent No. 42,215). As this ss is described in Lunge's handbook on the Sulphuric Industry, it will only be outlined here.

ıvy wrought-iron tubes, 6 inches in diameter and 13 n length, are filled alternately with a layer of small and tightly packed platinised asbestos, each layer three inches thick. Each tube contained about 15 ese double layers. One end of the tube was left to serve as a pre-heater for the gas mixture. These were put in a furnace horizontally so that the ends were placed above the grate while that part contained the platinum asbestos was situated on the side of the fire bridge. The temperature of the e was kept at an average of about 400° C., while xture of about 1 volume of sulphurous acid and ımes of air was forced through the tubes by means compresser. This machine had two cylinders, the sions of which were in the proportion of 1 to 3. uction of the smaller cylinder was connected with the part of a vessel containing the liquid sulphurous acid, the larger cylinder drew filtered air. The discharge of the two cylinders were connected, and thus urous acid and air were mixed automatically in the d proportion. The anhydride formed in the tubes bsorbed from the cooled gas by sulphuric acid.

results obtained by this process were very satisfactory the beginning, both as to yield and capacity, as a with five tubes had a daily output of about two c tons of anhydride at a yield of 95 per cent. of the y. Two plants out of the five installed to operate rocess are still working with liquid sulphurous acid. t three years ago one of these at the alizarine works arl Neuhaus in Eberfeld, working with the same ised asbestos which was filled in the tubes when the was started in 1890, still gives the same high yield out 95 per cent. of theory. This proves that the tic action of platinum continues indefinitely if pure are used.

German Patent No. 42,215 the inventors claim the use higher pressure than that needed for overcoming the ance in the tightly-packed contact tubes in order to the molecules of sulphuric acid and oxygen more closely together. This, however, was abandoned as soon as it was found that the pressure necessary for overcoming the resistance of the contact material (about 12 lb. to the square inch) was sufficient to yield about 95 per cent. of the theory.

The good results obtained in the experimental plant in Hamborn caused the Badische in 1887 to enter upon a ten years' agreement with the owners of the patent, by which they obtained the right to use the process at a royalty, the firm Wm. Grillo binding themselves not to manufacture anhydride on a larger scale than 0·3 metric tons per diem during this period. The payment of royalties was discontinued in May 1894, at which time the Badische manufactured about 10 metric tons of anhydride per day. Further developments of the Schroeder process at the works of the Badische were described by R. Knietsch in a paper read before the Deutsche Chemische Gesellschaft (see this Journal, 1902, 172). The main improvement was the replacement of the pure sulphurous acid by the cheaper roasting gases.

In Hamborn it was soon found that the restrictions in output of the plant were such that they did not allow the further development of the process; hence the small plant was abandoned. When the agreement with the Badische expired in 1897, Schroeder had to take up his work where he had left it 10 years before. Haenisch had in the meantime parted from Schroeder, and all further improvements of the process in Hamborn were carried through by Schroeder in connection with the A.-G. für Zinc Industrie vorm. Wm. Grillo.

Further investigations were undertaken with a view to cheapen the process by utilising the roasting gases directly and by reducing the resistance of the contact material. Both requirements are fulfilled by the contact material (U.S. Patents No. 636,924 and No. 636,925). In this mass Schroeder replaces the insoluble bodies used heretofore as carriers for the platinum, as for instance, asbestos, pumice-stone, burnt clay, &c., by calcined soluble salts, principally sulphates, in this way obtaining the following advantages:—

1. The contact mass is easily regenerated, hence the kiln-gases do not need to be purified as perfectly as if working with platinised insoluble vehicles.

2. The calcined salt crusts are very porous, so that the contact mass made from them offers much less resistance to the gases passing through them than the tightly-packed asbestos used formerly.

3. The catalytic action of the contact mass made from soluble salts is far superior to that of platinised insoluble carriers, and the contents of the platinum in the contact mass, which were from 8 to 10 per cent. of the weight of the asbestos in the old Schroeder plants, have been decreased to 0·1 per cent. without reducing the efficiency of the contact material.

In working the plant, which was erected in Hamborn in 1898, for converting the sulphurous acid of the blende gases into sulphuric anhydride by means of the new contact mass, Schroeder soon discovered that he could reduce the resistance in the system still further by increasing the area of the contact tubes. The furnace, therefore, was supplied with tubes of 12 in. diameter instead of those of 6 in. diameter used in his old process. But in starting these tubes the yield dropped. The reason of this was found to be that on top of the contact mass in the tubes a channel was formed through which a part of the gases passed, as this way offered less resistance to them than the part of the tubes filled with contact material. To remedy this trouble the tubes were placed on an incline in the furnace, but even then they had to be opened from time to time to fill in any channels which had formed on top of the contact mass. It was, therefore, decided at Hamborn to replace the inclined tubes by an upright receptacle, and, as the increase of the diameter did not seem to have any bad effect upon the yield, a vessel of about 4 ft. in diameter was chosen, which the gases, pre-heated in a separate apparatus, entered at the bottom. The walls and the top of the cylinder were well protected against radiation of heat. Nevertheless, a yield of only 85 or 90 per cent. of theory could be obtained by this apparatus. The reasons for this insufficient yield were discovered by tapping the shell of the

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e also Squire, W. S., Eng. Pat. No. 3278, Sept. 18, 1875, anterior nkler's publication.

vessel and by analysing gas samples taken from the centre and from the surface of the contact mass in the vessel. In this way it was shown that the sulphurous acid in the gas, passing through the interior of the mass, was almost entirely converted into anhydride, while the gas next to the shell was only partly oxidised, due to the loss of heat at the walls. This difficulty was overcome by dividing the vessel into several compartments, and by placing plates of iron with a central hole underneath the screens that carry the contact mass. Thus the gases by passing through the comparatively narrow hole in the partition were thoroughly mixed before entering a new layer of contact mass. The same effect was also produced by placing several shallow vessels, each containing only one layer of contact mass, in series, and mixing the gases by passing them through the comparatively narrow tubes connecting the vessels with each other. The pressure necessary for forcing the gases through the contact mass has thus been reduced to less than one pound per square inch, so that in many of the Schroeder plants rotatory blowers are used for moving the gases instead of compressors.

There is not much to be said regarding the development of the methods and apparatus for purifying the roasting gases, and for absorbing the sulphuric anhydride from the contact gases. As already stated, the regeneration of the contact mass is so easily done, that an absolute purification of the roasting gases is not aimed at. Towers of large diameter filled with coke and sprayed with sulphuric acid have been in most cases found sufficient for purifying the gases. In America asbestos filters are used in addition, especially where the ore contains large quantities of arsenic. These filters were patented by Geo. C. Stone, U.S. Pat. No. 711,187. The gases coming from the contact furnaces are cooled and then absorbed by passing over or through sulphuric acid of proper strength contained in iron apparatus.

There are already 14 plants in operation with a daily output of about 140 metric tons of sulphuric anhydride, *i.e.*, 200 short tons of 66° B. acid, as well as eight designed for a daily production of 100 metric tons of anhydride per diem, in construction.

From the above it will be seen that the process is even to-day an important factor in the chemical industry of the world. In connection with this it is of interest to note that the credit for the first commercial production of sulphuric acid by catalysis, as well as for the rapid development and wide distribution of the present Schroeder process is due to the progressive policy of a metallurgical industry whose interest in the matter was confined primarily to the utilisation of a by-product.

THE SCHROEDER CONTACT PROCESS OF SULPHURIC ACID MANUFACTURE.

(2.)—MANUFACTURING.

BY GEORGE C. STONE.

Although the possibility of making sulphuric anhydride by catalytic action has been known for many years, the process was of no commercial value until the discovery that it was essential that the gases should be free from certain impurities. As the several experimenters worked with gas from different sources, their troubles were caused by different impurities, and each devised means of purification to suit his individual needs.

In 1899, Schroeder, then with the Actien Gesellschaft für Zinc Industrie vorm. Wilhelm Grillo of Hamborn, Germany, realising the difficulty of absolutely purifying the gases, patented a new contact material which accomplishes the results with less platinum than platinised asbestos, and is easily and cheaply regenerated if it become inactive. He makes the mass by adding platinum chloride to a solution of a soluble salt or salts, which are not acted on by sulphuric acid or decomposed at the maximum temperature of the reaction, about 600° C. The solution is evaporated, and the residue ignited to drive off the water of crystallisation and decompose the platinum chloride. The salt mixture is granulated and is ready for use. It is usually slightly hygroscopic, and should be kept from contact with the air. A small fraction of 1 per cent. o platinum in the mass is sufficient, as the porous and granula salt gives the maximum of surface. After considerabl experimenting, a plant was constructed at Hamborn whic has given excellent results with this mass while using different system of purification, and a totally different styl of converter from any described in previous patents.

The Badische Anilin und Sodafabrik, working wit Spanish pyrites, finding that the arsenic in it ruined th contact mass very rapidly, developed a method of puri fication, the main object of which was to remove th arsenic. At Hamborn, where zinc blende free from arsen was used as a source of sulphur, this trouble was n encountered, and for a long time Schroeder did n believe that arsenic interfered. He based his opinion o a short run made at Hamborn with gas, made in pa from arsenical pyrites, the time not being sufficient f the arsenic to affect the contact mass. When the Schroed process was tried in America the deleterious effects arsenic were soon apparent, and a method of removi it from the gas was devised. At Hamborn the ores us contained traces of fluorine which occasioned much troub owing to the formation of silicon tetrafluoride which pr cipitated silica on the contact mass. A simple method w found of removing it from the gas, and it now causes inconvenience. In addition to these two impurities, chlor and hydrochloric acid caused some unsatisfactory resul but a means has been found for removing them.

The effects of these three impurities are very differe Arsenic is the worst as it apparently combines with t platinum, permanently ruining the mass. A contact m that has been acted on for some time by gases contain arsenic will have a considerable portion of the platin rendered soluble in hydrochloric acid. A mass that h been badly contaminated with arsenic can only be made for use by the removal of the latter, which is a complica and troublesome process.

Silicon tetrafluoride spoils the mass by coating it with crust of silica which prevents the contact between the and platinum. The mass can be rendered active by ordinary process of regeneration; but it is, of course, bet to remove the cause of the trouble.

Chlorine and hydrochloric acid exert merely a tempor effect in reducing the yield, which becomes good again soon as pure gas is used.

With properly purified gas the mass retains its acti for a very long time; the first plants started in Ame with proper purifying apparatus are now giving a yiel 96 per cent. and over after more than a year's run with regenerating. When it is necessary to regenerate, the m is spread on a cement floor and sprinkled with a mix of dilute nitric and hydrochloric acids containing a l sugar, mixed to a stiff paste, allowed to stand for a co of days, heated to drive off the water and excess of a cooled and crushed, when it is ready for use. The ma often slightly better after it has been regenerated th was at first.

At present there are twenty-three Schroeder plants or building, seven in Germany, two in Russia, one Poland, one in Italy, two in France, one in Chili, on Mexico, two in South Africa, and six in the United St Some are using blende, some pyrites, some brimstone, one a low grade gold ore. Some of the ores are quite from objectionable impurities, while others are very imp which necessitates such different methods of purific that it is impossible to give more than a general descr of them.

Each has some form of dust catcher next to the bur to take out the coarse dust carried over by the gas; comes a cooler in which the temperature of the g reduced to about that of the air, then scrubbers or wa towers of different kinds depending on the impurit the ore; these also serve to dry the gas. After scrubbers come the filters, which are the most imp part of the purifying system, as most of the arsenic selenium and other volatile impurities are remove them. The dried and purified gas is drawn from the by a positive blower and forced through the prehe in which it is heated to between 300 and 400° C., w mediately enters the converter. Contrary to the perience of the others it is found that, with the Schroeder ntact mass, there is no necessity of using any means regulating the temperature. The sectional converters ive given excellent results with vessels large enough give a production of 10 tons of 66° acid a day. From e converter the gas passes to a cooler in which it cooled to about 50° C., or slightly above the freezing oint of sulphuric anhydride; it then goes through the sorbing system, which consists of various forms of tanks id towers in which it is brought into intimate contact with large surface of acid. The style of absorbers varies in most every plant; the efficiency of all the forms tried is od, in fact almost every form of absorber that brings the is in contact with a large surface of moderately cool acid orks well. The absorption is practically perfect. When e temperature and supply of acid are correct, no vapour in be seen at the escape pipe. The regulation of the acid ipply to the absorbers is very simple and once set requires ery little attention.

Where only acid of less strength than monohydrate H_2SO_4) is to be made some form of scrubber tower is the mplest and best absorber; if fuming acid is desired orizontal cylinders are most satisfactory; these are best llowed by a tower to absorb the last traces of the hydride. Acid up to about 40 per cent. of free sulphuric ydride can be made in the absorbers. If stronger acid required it must be made by distillation.

The tests regularly made in connection with the process re, first, the usual analyses of ore and cinders; second, e determination of the sulphurous anhydride in the itering and exit gases to determine the efficiency of the peration; this is done by the Reich test which is very mple, and is made by one of the workmen every hour; iird, the test of the purity of the gas; the simplest and iost certain test we have for this is to blow a small current f the gas continuously through a calcium chloride tube lled with absorbent cotton; if the gas is properly purified, iere will be no deposit on, or discoloration of, the cotton several weeks.

The conversion is good and uniform; at one plant for a ionth's run the highest day was 97·76 per cent., the west 94·47, and the average 96·68. At another plant he lowest single determination in a 77 days' run was 1·48 per cent., the highest 97·43, and the average 95·39. nother converter was added in the latter part of ovember, which about doubled the capacity. While orking with this, the average conversion to the time this as written (a 66 days' run) was 96·08 per cent. The ntire time lost by stops from all causes during the 66 days as $60\frac{1}{2}$ hours, $3\frac{1}{4}$ hours being due to the shutting down f another works which supplied the acid plant with power; $7\frac{1}{2}$ hours were required to remove some absorbers which ere not needed, making the total stops due to the plant nd process $39\frac{3}{4}$ hours.

For many months the stops at this plant from all causes ave not exceeded 20 hours in any one month. The exact ecords for the other works are not available, but it seems hat their record must be nearly or quite as good.

The conversion seems to be independent of the percentage of sulphur dioxide in the gas within the limits btainable with any of the burners tried. In the 77 days' un mentioned above, the conversion with gas containing rom 3 to 4 per cent. of sulphur dioxide was 95·75 per ent., with 4 to 5 per cent. gas 95·92, with 5 to 6 per cent. as 95·38, 6 to 7, 95·12. The gas could not be kept above per cent. for long enough to obtain reliable results, but t is hoped to continue the experiments later at a small lant now building at Palmerton, Pa.

It is very difficult to determine accurately the proportion hich the acid made bears to the sulphur burned, as it is ecessary to determine the exact composition and quantity f the acid in each of the numerous absorbers and tanks the system at the beginning and end of the run. The ampling of the contents of the horizontal absorbers is articularly difficult, as the acid in the upper part is hot, nd stronger than the cooler acid below it. Figures could nly be obtained accurately for a run of one month at one lant; in this case the sulphur in the acid made and absorbed was 95·01 per cent. of the sulphur burned. The comparison of the amount of acid shipped during considerable periods with the sulphur burned at this and other plants confirms these figures.

The cost of the plant is less than that of a chamber and concentrating plant of equal capacity.

The advantage of the contact process is greater the stronger the acid made, the cost being the same per unit of sulphur for all strengths For acid stronger than 60° B. it is cheaper than chambers; but for 50°, and perhaps for 60° B., it has at present but little, if any, advantage.

Considering that an experience of only about three years with the Schroeder process has brought it to the point where it is more economical than chambers for the production of strong acid, it does not seem too much to expect that before long it will be able to compete with them successfully in the manufacture of the weaker acids as well.

One application of the process that promises to be of great importance is its use in connection with chamber plants to make strong acid, in place of concentrating in the usual manner. A plant is now being built for this purpose, and there is every reason to believe that it will show a marked economy, both in first cost and in operating expenses.

No other contact process seems to have been tried under such varied conditions as the Schroeder. So far it has in every case succeeded in overcoming the difficulties it has met, and all the plants in which it has been tried are now working successfully.

THE SCHROEDER CONTACT PROCESS OF SULPHURIC ACID MANUFACTURE.

(3.)—EXPERIMENTAL INVESTIGATIONS AND OBSERVATIONS.

BY DR. CHARLES L. REESE.

Although this process, from a chemical point of view, is an extremely simple one, yet the theory still remains a mystery, shrouded in the word "Catalysis." Another expression, sometimes used for the purpose of partially explaining the reaction, is "Contact Process," although I have never been able to satisfy myself that the acceleration of the reaction between sulphur dioxide and oxygen is accomplished by simple surface action.

After the very exhaustive paper read by Dr. R. Knietsch before the German Chemical Society in 1901, I shall confine myself to presenting the results of observations and experiments, most of which were made before Dr. Knietsch's paper appeared.

Purity of the Gas.—It is essential, for the continuous operation of the process, that the burner gas should be purified as far as possible, and that certain impurities be entirely absent.

The effect of the presence of the following substances in the gas on the efficiency of the contact mass has been observed:—

Water, carbon dioxide, carbonic oxide, sulphur, hydrochloric acid, chlorine, silicon tetrafluoride, arsenic, and lead. Some of these tests were carried out on a laboratory scale, with an apparatus which is practically a reproduction of the plant on a large scale, using a mixture of sulphur dioxide and air instead of burner-gas; in some, the same apparatus was used with gas produced by burning pyrites.

Water.—It was thought at one time to be essential that the gases should be dried by sulphuric acid not weaker than 60° B., but this was found to be an error, in that the gases could be saturated with moisture, by passing them through water before introduction into the contact mass, without affecting the conversion in any way. Fuming sulphuric acid was produced, but, of course, such a procedure could not be carried out on a manufacturing scale, where it is necessary to use iron pipes.

Carbon dioxide had no effect whatever when introduced into the gas, as was to be expected, but I was surprised to find that *Carbonic oxide* also had no deleterious effect in spite of its reducing properties. On one occasion th conversion in a certain plant ceased altogether, and we were at a loss to know the cause. We, however, soon found that some coal had got mixed with the pyrites in the burners. In this case there was carbon dioxide and, possibly, carbonic oxide present, but there was evidently also a lack of oxygen, and when the coal was consumed, conversion began again.

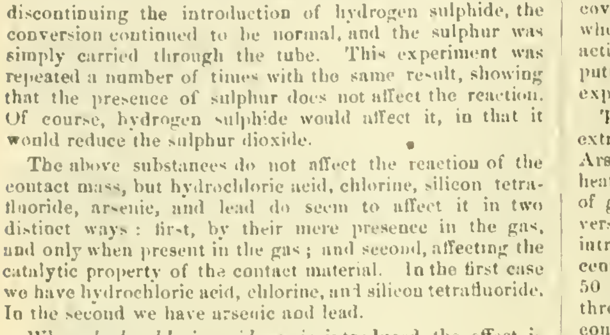
Sulphur will, at times, find its way through two or even three scrubbing towers, and, before the filtering system was adopted, it became necessary to determine whether the presence of sulphur in the gas would effect the catalytic action of the contact material. Experiments were carried out to determine this point. It was desirable to introduce sulphur into the gas in as finely divided a condition as possible. This was accomplished by introducing hydrogen sulphide into the gas. When hydrogen sulphide is mixed with sulphur dioxide the reaction between these two gases takes place, producing sulphur and water, and sulphur was thus introduced into the mass. It was found that on discontinuing the introduction of hydrogen sulphide, the conversion continued to be normal, and the sulphur was simply carried through the tube. This experiment was repeated a number of times with the same result, showing that the presence of sulphur does not affect the reaction. Of course, hydrogen sulphide would affect it, in that it would reduce the sulphur dioxide.

The above substances do not affect the reaction of the contact mass, but hydrochloric acid, chlorine, silicon tetrafluoride, arsenic, and lead do seem to affect it in two distinct ways: first, by their mere presence in the gas, and only when present in the gas; and second, affecting the catalytic property of the contact material. In the first case we have hydrochloric acid, chlorine, and silicon tetrafluoride. In the second we have arsenic and lead.

When *hydrochloric acid* gas is introduced, the effect is instantaneous, reducing the conversion from 98·5 per cent. to 42 per cent.; but when the hydrochloric acid is discontinued, and air passed through for a while to displace the hydrochloric acid, the conversion becomes normal in a short time. This is shown in Fig. 1.

The presence of *chlorine* in the gas seems to have an effect similar to that of hydrochloric acid, although not so intense, as will be seen in Fig. 1 by comparing the chlorine with hydrochloric acid curve. In both cases the dry chlorine or the hydrochloric acid was introduced, until a minimum yield was obtained, which, in the case of the hydrochloric acid, was about 42 per cent., and that of the chlorine about 57 per cent. After disconnecting the chlorine and hydrochloric acid, air was passed through, and then the operation continued at the same temperature. As will be seen by the curve, the percentage conversion gradually rose again to the normal. Although at one point the gas showed a trace of hydrochloric acid, the conversion amounted to 94 per cent.

Fig. 1.



Effect of As. ——

A.—As_2O_3 put in entrance of tube.
B.—HCl passed in for 50 minutes.
C.—Air „ „ 15 „
D.—Resumed, passing SO_2.

Effect of HCl. — — —

E.—HCl introduced continuously.
F.—Air passed in for 30 minutes.
G.—Resumed, passing SO_2.
H.—Trace of HCl in exit.

Effect of Dry Cl. ....

I.—Dry Cl introduced continuously.
J.—Cl disconnected.

Effect of SiF_4. —·—·—

K.—SiF_4 introduced for 2 minutes.
L.— „ „ 1 minute.
M.— „ „ 3 minutes.
N.— „ „ 5 „

The introduction of a small amount of *silicon tetrafluoride* caused the conversion to drop immediately, but on discontinuing the silicon tetrafluoride, the conversion rose in a few minutes to normal. This was repeated a number of times, and a few minutes after the silicon tetrafluoride was disconnected, the conversion rose again to normal. In each case undoubtedly some silica was deposited on the contact mass, but most of it passed through the tube, as was made evident by the fact that silica separated out when the gas came in contact with the water solution used in testing the exit gas. Of course a minute quantity of silicon tetrafluoride in the gas would gradually deposit silica on the contact mass, and eventually cover the catalytic agent, so as to render it inactive; but when contact mass is so affected, it can be easily rendered active by simply removing it from the converter, and putting it back again. The handling will be sufficient to expose new surfaces.

The injurious effect of *arsenic* on the contact mass is extremely marked, as is shown in the curve in Fig. 1. Arsenious acid was placed in the front end of the tube, heated, and carried in to the contact tube by the flow of gas. The effect of the arsenic was to reduce the conversion absolutely to zero, owing to the large amount introduced, but after 40 minutes it rose again to 40 per cent. At this point hydrochloric acid was introduced for 50 minutes to remove the arsenic, and then air drawn through for 15 minutes more. The process was then continued, and the conversion rose to 96·5 per cent. Several attempts were made to find a simple means of removing arsenic from the contact mass, and at first chlorine was used for this purpose. The mass was placed in a tube, heated, and chlorine passed through. This did remove some of the arsenic, but did not regenerate the mass satisfactorily. A very interesting observation, however, was made during this experiment. It was found that the chlorine carried over platinum to the exit end of the tube, and deposited it in the form of chloride. This was done at a temperature of 400°—450°.

It was found in attempting to regenerate or remove arsenic, that hydrochloric acid mixed with the reducing sulphurous gas was much more efficient, as is shown by the curve above referred to, all arsenic having been removed.

It is well known that, when platinum is heated in the presence of *lead* or lead salts, lead combines with the platinum either to form an alloy or a compound, and this combination of lead with platinum undoubtedly destroys the catalytic property of platinum. The effect of lead, however, was not determined in the regular way, but can be shown very readily by one or two simple experiments.

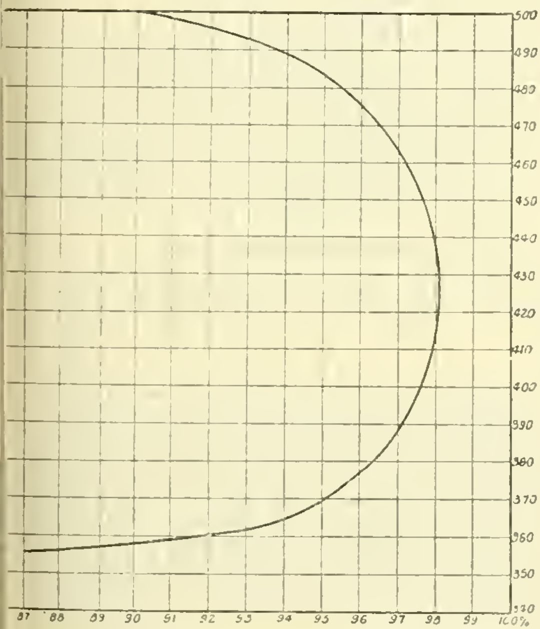
It is well known that when a platinum spiral is heated in a gas flame, the gas turned off for a few moments and on again, the spiral will reignite the gas. A small piece of contact mass will do the same, but if either is moistened with a very small quantity of lead acetate and then ignited, it will lose this property of reigniting gas, unless it is heated sufficiently long to volatilise the lead. A similar experiment will show in a rough way the effect of arsenic on contact mass, or on a platinum spiral.

The principal impurities which I have found in burner gases have been arsenic, lead sulphate, silicon tetrafluoride, hydrochloric acid, sulphur, and selenium. (I have not tested the effect of selenium or tellurium on the catalytic action of platinum.) All burner gases carry a *mist* which makes them visible, and which undoubtedly consists of finely-divided particles of sulphuric acid. This is extremely difficult to condense and separate from the gas. These particles also carry such impurities as arsenic, lead sulphate, sulphur, and selenium. They cannot be separated by scrubbing, either with water or sulphuric acid, but contrary to Dr. Knietsch's opinion, they n all be removed by passing the gases through several yers of filtering material. After the filtering material ecomes wet with the acid which is condensed in its inter-ices, the gas will pass out so free from solid or liquid npurities that a beam of sunlight from a lens cannot be een when passed through a vessel containing the gas. Vhen gas is purified to such an extent the contact mass ill last indefinitely. Another simple test which shows the arity of the gas is to allow it to pass continuously through tube containing absorbent cotton, when any acid or other npurity can be seen after a short time deposited on the otton.

Temperature.—A series of experiments were conducted r the purpose of determining the most suitable tempera-ure to which the gases should be heated, and at which the ghest conversion could be obtained with the Schroeder ontact material, and also to determine between what mits of temperature the process could be carried on mmercially.

The results of these experiments are expressed in the companying curve (Fig. 2), in which it will be seen that e most suitable temperature is about 425° C., but that ere is very little variation between the results obtained at temperature varying from 400° to 435°. Above and below ese temperatures the percentage conversion drops at such rate as to form a regular curve. The reaction starts at etween 330° and 340° C. My experience in testing paired contact mass is that a higher temperature is quired to start the reaction, and that this whole curve ses uniformly as to temperature. In fact, contact mass hich has been very badly contaminated with arsenic and ad can be forced to act by raising the temperature up to out 530°, and, although the impurities are still in the gas, e conversion can be held up to between 85 per cent. and per cent.

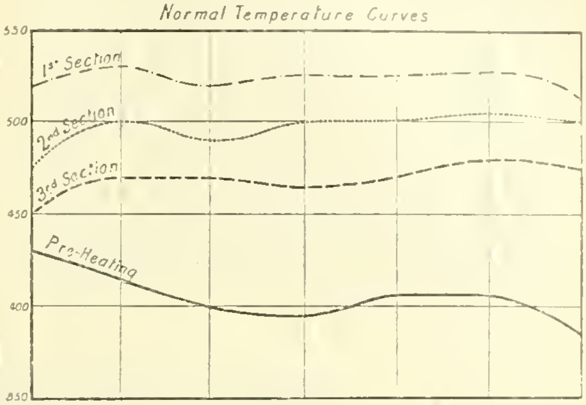
FIG. 2.



Although it seems to be necessary to control the tempera-e, in such processes as those in which platinised asbestos used, by cooling, no such cooling is necessary with the hroeder contact mass when used in sectional converters, er than that resulting from radiation. It is simply cessary to preheat the gas to about 400° C., and the nverters do the rest.

Some observations of the temperatures in the various ctions of one of the converters are very interesting, and y show exactly where the major part of the conversion taking place. The figures are plotted in four curves (Fig. 3), the ordinates of which represent temperatures, and abscissæ, time. It will be noted that the lower curve represents the temperature ot the gas entering the converter; No. 1, the temperature of the gas leaving the first section; No. 2, the temperature of the gas leaving the second section; and No. 3, the temperature of that leaving the third section. (It is to be regretted that there was no thermometer in the top of the fourth section.)

FIG. 3.



It will be noted that there is a rise of more than 100° C. in the first section, due to the heat of the reaction, and that the temperature gradually falls as it enters the successive upper sections, leaving the converter at a temperature below that at which it entered. About 85 to 90 per cent. of the conversion takes place in the first section.

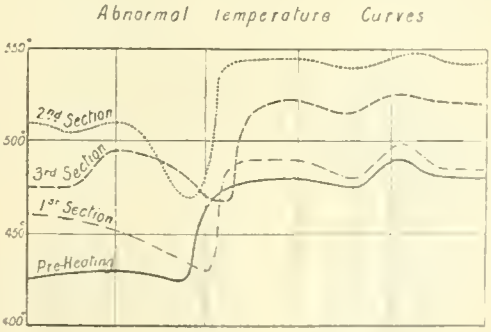
These curves I designate as normal curves. This particular set of observations were made several months after the converter had been put into commission, the readings having been taken with a new set of thermometers.

According to Dr. Knietsch's figures, it is possible that some dissociation takes place in the lower section, owing to the very high temperature attained, but as the temperature naturally falls as the gas passes through the upper sections of the converter to a temperature lower than the dissociating point of sulphur trioxide, any dissociation which takes place in the lower part of the converter will be cared for in the upper sections.

In the early days it was observed that as the contact mass in the lower section became contaminated, the maximum temperature rose to the second section, and so on, till the converter either refused to act, or was forced by raising the temperature in the preheaters to that represented by the maximum temperature under normal conditions.

The series of curves in Fig. 4 represent the temperature under abnormal working.

FIG. 4.



They represent a period of five days' running. It will be seen that on the first two days, with a conversion of 93·5 per cent., the preheating temperature was about normal, but the maximum temperature was reached in the second section rather than the first, but that some work was still being done in the first section. At the end of the second day the first section ceased acting, and it became necessary to raise the preheating temperature so as to bring the heat up to the second section when that again became more active, and the conversion was brought up to 94 per cent.

Absorption.—When sulphur trioxide is allowed to pass over or through water, it is not absorbed as completely as one would expect from the known avidity of sulphuric anhydride for water. Experiments have shown that when sulphur trioxide is passed over water, the rate of absorption increases as the strength of the sulphuric acid formed increases, until that strength reaches a point where its vapour tension is practically reduced to zero. In other words, the completeness of absorption increases as the vapour tension decreases, and when the acid in the system has practically no vapour tension at the temperature of operation, the absorption will be so perfect that the waste gas will be invisible.

If there is any acid in the absorbing system which has a vapour tension, sulphuric anhydride will unite with it, forming minute globules of sulphuric acid, which appear in the form of a cloud or mist, and when in this form it cannot be absorbed or condensed by acid of any strength, or even by alkali, satisfactorily. The only means by which I have been able to condense it is by forcing it through several layers of wet asbestos or cotton wool.

This fact can be readily demonstrated by the following experiment: pass dry gas containing sulphuric anhydride through strong sulphuric acid, and then weak acid, and no fumes will be visible, but if you pass the gas first through weak sulphuric acid, copious fumes will be formed, which will pass through any number of bottles of strong sulphuric acid.

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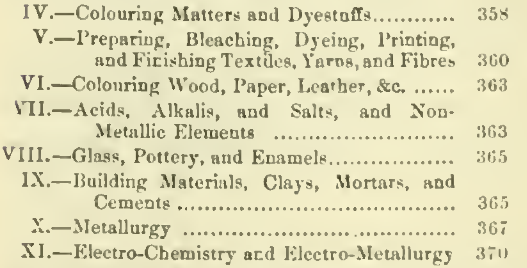
French.—1 fr. 25 c. each, to Belin et Cie., 52, rue de Vaugirard, Paris.

I.—PLANT, APPARATUS, AND MACHINERY.

Safety-Valve for Autoclaves. Report by the Actien-Ges. für Anilin-Fabrikation. Chem. Ind., 1903, 26, [4], 89.

THE device consists of the portion A, which is screwed on to the autoclave and is provided with the flat seat B for the valve C, which fits loosely over it in the form of a cap. This cap contains a plate of soft metal, *e.g.* lead, for the purpose of closing the hole. The valve is loaded by means of the lever F, which is fixed to, but free to turn on, the spindle D, and is counter-balanced by the weight E. In order to prevent the lever from turning right over, it is provided with the projection G at its lower end. The cap C lies loosely under the lever, so that the pressure is distributed uniformly over the whole of the plate of soft metal. The portion of the cap upon which the lever presses is placed somewhat lower than the plate of soft metal, so that, if the valve be opened when in use, the cap subsequently returns to its position of stable equilibrium, and the plate is forced back into its original place. The valve being in the form of a cap, spirting-out of the material in the autoclave is prevented.—A. S.



English Patents.

Centrifugal Machines. G. Pott, J. H. Cassels, D. Y. Cassels, R. Williamson, and A. M. Stuart, all of Motherwell, Lanarkshire. Eng. Pat. 19,069, Aug. 30, 1902.

IN self-balancing centrifugal machines of the Westo type, the step-bearing is fitted overhead, the bearing bein formed between the upper end of a hollow stationar spindle and that of a central spindle, which is secured a its lower end to the outer revolving spindle carrying th basket. A casing enclosing the bearing is adapted to hol the lubricant.—R. A.

Volatile Liquids; Receptacle for Containing and Administering ——. C. L. and T. H. Gebauer and H. A. Haring, all of Cleveland, Ohio. Eng. Pat. 22,362, Oct. 14, 1902.

A receptacle for use with liquids which are volatile at the heat of the hand. It consists of a main body with a capillary exit tube leading into an expansion chamber, with which is connected a nozzle with a capillary exit larger than the first capillary. This nozzle is controlled by a valve, so that, when the valve is closed, no liquid can escape, and, when fully open, a continuous stream of liquid may be obtained. By using an intermediate position of the valve, a spray of liquid results. The nozzle is supplied with a filtering substance (*e.g.*, cotton wool) to prevent any solid particles entering the apparatus.—T. F. B.

Heat-exchanging Apparatus. O. Guttmann, London. Eng. Pat. 22,571, Oct. 16, 1902.

The apparatus, intended for condensing, vaporising, or attemperating purposes, consists essentially of an arrangement of rimmed plates, including "receiving" plates for the reception of the fluid, gas, or vapour to be operated upon, between each pair of which a "covering" plate is interposed for the circulation of a cooling or heating medium, the plates communicating with each other alternately by means of corresponding slots or passages. Perforated partitions or projections are provided to the "receiving" plates, to maintain a definite layer of liquid in them. The combination as a whole, forms circuitous or zigzag circulating passages for the liquid or gas treated and for the heating or cooling medium.—E. S.

Distillation; Separation by ——, *of Materials having Different Boiling Points.* A. G. Bloxam, London. From the Oesterreichischer Verein für Chemische und Metallurgische Produktion, Aussig, Bohemia. Eng. Pat. 26,695, Dec. 3, 1902.

In the separation, by distillation, of liquids or fused volatile solids having different boiling points, either the liquid formed from the condensed mixture of vapours, or the liquid itself to be distilled, is scattered in fine drops in a chamber directly united to the still and traversed by the vapour therefrom. The counter-current principle may also be employed.—R. A.

United States Patents.

Boiler Compound. J. Loudenslager, Tiffin, Ohio. U.S. Pat. 720,267, Feb. 10, 1903.

The preparation consists of a combination of "catechu, potash, soda-ash, and German salts."—E. S.

Furnace. [*Steam Generators, &c.*] G. W. Lyon, Chicago, Ill. U.S. Pat. 720,370, Feb. 10, 1903.

The grate and combustion chamber of the furnace are annular, with heating surfaces on each side, the grate being capable of rotation and being fed with fuel by an automatic conveyor. For steam generation, the grate and combustion chamber are enclosed between concentric water chambers, which are connected by a series of spirally-arranged water-circulating tubes bridging the combustion-chamber, a series of plates supported on these tubes forming a continuous spiral smoke-flue, which has its path of eduction in the same direction as that of the movement of the grate. By the rotation of the grate, a progressive relative movement between the grate and the fuel feed-inlet is effected, so that the combustion is caused to advance progressively from the point of feed.—R. A.

Condenser. T. M. Eynon, Philadelphia, Assignor to Eynon-Evans Manufacturing Co., Pennsylvania. U.S. Pat. 720,908, Feb. 17, 1902.

This condenser comprises a steam-chamber having a suitable inlet, a collecting-chamber in the upper portion of the steam-chamber, and a waterway in communication through a passage with the said upper portion, the passage of the water through the condenser acting by suction to withdraw the non-condensed gases from the steam-chamber. —R. A.

French Patent.

Hydroextractor; Continuous ——, *called "Essoreuse Noel."* Soc. Marchéville-Daguin et Cie. Addition, dated May 13, 1902, to Fr. Pat. 291,015, July 20, 1899.

The pan revolves on a horizontal axis, and a scoop is arranged to remove the inner layer of material, by being traversed parallel to the axis near the top of the pan. The addition relates to the mechanical arrangements for obtaining this double movement.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Lignites; Fuel Value of North Dakota ——. F. A. Wilder. Eng. and Mining J., 1903, 75, [6], 222.

The lignite as it occurs in the mine contains 30—35 per cent. of moisture; samples analysed in the laboratory gave from 17 to 30 per cent. The dried lignite contains, on the average, 51·5 per cent. of fixed carbon, 35·63 per cent. of volatile matter, 8·5 per cent. of ash, and 0·7 per cent. of sulphur. When the lignite is not mixed with clay, the ash is grey and soft like that from wood, and forms no clinkers. At the present time, the whole of the lignite is sent from the mine in the "green" or undried state. On drying, it breaks into small pieces, but, provided suitable devices for burning it are used, the fuel value is not lessened. The fine, dry lignite appears to be especially adapted for use in automatic stokers. In the following table, a comparison of the lignite with Youghiogheney coal as fuel for locomotive engines, is shown :—

——	Youghiogheney Coal.	Lignite.
Date of test	Aug. 6, 1894	Aug. 8, 1894
Duration of test	7 hrs. 30 mins.	8 hrs.
Average temperature of feed water	74° F.	74° F.
Pounds of coal burned	1,400	3,370
Pounds of combustible	1,243	3,170
Per cent. of ash	11·21	5·63
Pounds of coal burned per sq. ft. of grate per hour	8·28	18·72
Total water evaporated at temperature of feed	8,837 lb.	14,157 lb.
Water evaporated in lb., per lb. of coal	6·312	4·2
Water evaporated in lb., per lb. of combustible	7·1	4·46
Temperature of flue gases	510° F.	510° F.
Value of coal	1·00	0·665

The boiler was 6 ft. in diameter by 16 ft. long, with 30 4½-in. flues; the grate surface was 4 ft. 5 ins. by 5 ft.

The coal had been three days out of the mine.

Another test, made at the electric light plant at Fargo, gave the following results :—

Duration of test	12 hours
Boilers used	Two 72—16 tubular; one 200-h.p. Heine water-tube.
Total heating surface	4,823 sq. ft.
Total grate surface	88 sq. ft.
Average steam pressure	83 lb.
Average temperature of feed water	140° F.
Total weight of coal fired	26,400 lb.
Total cost of coal	54·32 dols.
Total weight of water pumped into boilers, and apparently evaporated	97,500 lb.
Equivalent evaporation from and at 212° F.	4·1 lb.
Water evaporated per lb. of coal from average pressure and temperature	3·7 lb.
Coal burned per sq. ft. of grate surface per hour	25 lb.
Per cent. of moisture in coal	30 per cent.
Per cent. of refuse in coal	3½ per cent.

Time of test, from 4.0 p.m. to 4.0 a.m., Jan. 9, 1901.

—A. S.

Recovery Coke-Oven in Germany; Progress of the ——. J. of Gas Lighting, 1903, 81, [2074], 356.

The new Otto-Hilgenstock coke-oven, about 14,000 of which are already in use in Germany, and which is being introduced into England and America, is stated to give a yield of about 15 per cent. more than the old form of oven, whilst the coke is also of better quality. The ovens are walled chambers, 33 ft. long, 5 ft. 6 ins. high, and 1 ft. 8 ins. wide, the small width rendering possible a more regular distribution of the heat. The products of distillation are drawn from the main outlet pipe into condensers and washers, where the tar and ammonia are separated, and the gas, which contains only a small proportion of nitrogen, then passes through a pipe beneath the arch of the oven, and afterwards through branch pipes to the various Bunsen burners. The air necessary for combustion is drawn from the arch of the oven, where it has previously been heated to 400° C., and the flames pass first into the bottom passages, then around the side walls of the chambers, through the upper passages above the chambers, and over the fire-bridge, downwards, into conduits beneath the chambers, and thence into the flue. A temperature of 1380°—1460° C. prevails in the lower horizontal bottom passages, of 1245° C. in the vertical passages, and of 1200° C. in the upper part of the chamber. The ovens are charged from above, and mechanical arrangements are fitted on one side of the oven for the removal of the coke. The yield is said to be 32 tons of metallurgical coke per week per oven. The tar is stated to be particularly rich in benzene hydrocarbons. (See also Eng. Pats. 6857 of 1896, 22,120 of 1897, and 19,757 of 1899; this Journal, 1897, 321; 1898, 35; 1899, 1110.)

—A. S.

Explosion: Influence of Pressure on the Transmission of ——, *in Gases.* A. de Hemptinne. Bull. Acad. Roy. Belgique, 1902, 761—775. Chem. Centr., 1903, **1**, [9], 490.

Gases and vapours were mixed with the requisite proportion of oxygen for complete combustion, and these mixtures were diluted until an electric spark or a wire electrically heated to incandescence, no longer caused an explosion. The minimum pressures in millimetres of mercury are not constant for any one gas, but the following are the average values:—

——	By Spark.	By Incandescent Wire.
Hydrogen	35	192
Carbon monoxide	58	145
Methyl alcohol	45	145
Ethyl alcohol	40	125
Ether	35	125
Benzene	25	105
Acetylene	13	45
Carbon bisulphide	12	14

Endothermic compounds explode at lower pressures than exothermic compounds. Apart from the case of hydrogen, the pressures at which an explosion is caused by an incandescent wire are proportional to those at which an explosion is produced by an electric spark. The author made experiments to ascertain whether under increased pressure reactions could be effected by sparks which fail at the ordinary pressure. It was found, however, that even under strong pressure, the formation of ammonia and hydrocyanic acid could not be effected by sparks in mixtures of nitrogen and "ammonia," and of nitrogen and acetylene respectively.

—A. S.

Natural-Gas in Austria. O. Stephani. Petroleum Rev. and Mining News, 1903, **8**, [207], 168.

The results of the examination of a natural gas from Wels in Austria are shown in the following table. The figures in col. I. are the average of a number of analyses, whilst those in col. II. represent the result of one analysis.

——	I.	II.
Methane	85·60	81·15
"Heavy hydrocarbon"	8·60	6·80
Hydrogen	2·00	3·80
Oxygen	0·70	0·60
Nitrogen	2·25	1·15

—A. S.

Cyanogen-Extraction Process; Practical Results of Bueb's ——, *at Mariendorf Gas Works.* E. Drory. J. f. Gasbeleucht., **46**, [8], 143—144.

Each unit of plant at the Mariendorf works comprises an exhauster, one Drory tar-washer, one naphthalene standard washer, one cyanogen standard washer, two Reutter condensers, and one ammonia scrubber. The cyanogen recovered, amounts to 3·56 kilos. of Prussian blue, equal to 5·25 kilos. of potassium ferrocyanide per 1,000 cubic metres of gas, approximately equal proportions of English and Silesian coals being carbonised. Not less than 96 per cent. of the cyanogen present is absorbed by the washer. The ammonia, free and combined, retained by the cyanide mud, amounts to 28·1 per cent. of the total quantity of ammonia produced in the works; and about 10 per cent. of the sulphuretted hydrogen (inclusive of that combined with ammonia) is similarly retained. Owing to the cooling of the gas on passing through the plant mentioned above, and the continuous wetting of the condensers with weak gas liquor, it is found that the condensers and ammonia scrubber can deal with 50 per cent. more gas than usual. The cyanide mud is sold without further treatment, allowance being made in the price for the ammonia present.

The main advantage of Bueb's process over that of absorption by the oxide in the purifiers, rests upon the almost complete removal of the cyanogen. This enables the oxide to absorb sulphuretted hydrogen more effectively, and it also prevents the damage often caused to gas-meters, gas-holders, &c., by gas containing cyanogen.—H. B.

Alcohol; The Power Use of ——, *in Austria.* Engineer, March 6, 1903, 240.

Experiments as to the value of denatured alcohol as a fuel have recently been carried out in one of the official laboratories of Austria on behalf of the Minister of Commerce. 90 per cent. alcohol having a calorific value of 4,900 calories per litre was compared with regard to its value for motive purposes with petroleum spirit, of sp gr. 0·7, having a calorific value of 7,700 calories per litre. Two nominal 8-h.p. engines were used, and the consumption per horse-power hour was: alcohol, 373·5 grms., or an efficiency of 28 per cent.; petroleum spirit, 340 grms., or an efficiency of 16·5 per cent.

In a vapour lamp consuming 208 grms. per hour at full power and 87 grms. when turned down, 33 grms. or 0·04 litre of 90 per cent. alcohol, was required to heat 1 litre of water to boiling. In illuminating lamps provided with wicks and developing 38 candle-power, the consumption of 90 per cent. alcohol was 24 grms. per 10 candle-hours; whilst in gravity lamps without wicks and developing 50 candle-power, the amount of alcohol consumed was 16 grms. per 10 candle-hours.

As the result of tests made on behalf of the Ministry of Finance, it has been recommended that cheap denatured spirit, specially suitable for motors, be prepared by mixing 100 litres of alcohol with 5 litres of petroleum spirit or benzol, 0·5 litre of pyridine or some heavy oil containing ketones, and 0·2 grm. of Methyl Violet in alcoholic solution as a means of identification. The cost of the denaturing medium is only 35 heller—90 if pyridine is employed—instead of 2·56 kronen when the ordinary process is adopted.

—A. S.

Coal in Pyrites; Determination of ——. F. P. Treadwell and A. A. Koch. XXIII., page 383.

English Patents.

Coke Ovens; Impts. in ——. R. Brunck, Dortmund, Germany. Eng. Pat. 28,363, Dec. 23, 1902.

To obviate the necessity for renewing the whole of the brickwork on the flue side when the portion on the chamber side has become damaged in work, the walls are faced with a layer of brick on the chamber side. This also diminishes the chances of leakage from the chamber, and thus improves the yield of coke and by-products as well as the purity of the distillation gases.—C. S.

Gas Furnaces; Regenerative ——. F. Siemens, Westminster. Eng. Pat. 770, Jan. 10, 1902.

To enable the generator to supply gas of high temperature, which would destroy the metal valves usually employed for admitting the gas to the furnace, the valve is made of a thin hollow metal vessel, of spherical or other suitable form, filled with water, the volume of water being large relatively to the weight of the metal of which the valve is composed. Means are provided for keeping the latter filled with water.

Instead of working the producer at a high temperature and employing these water-cooled valves, the producer may be worked at the usual low temperature with valves of the ordinary type; but in this case one or more openings are made in the flue walls near to the furnace chamber, so that portions of the hot air and gas-streams may mix, and by their combustion raise the temperature of the main body of gas or air before these reach the furnace chamber.—H. B.

Acetylene Gas Automatic Generator. J. Bartlett, Tottenham. Eng. Pat. 24,956, Nov. 13, 1902.

A contact apparatus to which the supply of water is governed by the bell movements. When the holder bell falls, it opens a spring-closed valve at the base of a separate water reservoir, and allows water to flow into one or more carbide receptacles. The latter are water-jacketed, and have screw-down lids; they contain a cage with a conical bottom, into which the charge of carbide is dropped. The water-supply pipe is so constructed as to serve as a vent pipe for any surplus acetylene. A spring safety-valve is fitted in the crown of the bell, and a siphon vent elsewhere, all three blow-offs joining to a common place of escape for the gas. If, however, the apparatus be required for portable work, the vent pipes may be fitted with a rubber or leather bag to store the gas for consumption later on. The gas passes through three filtering chambers on its way to the service, one being inside the water reservoir so as to act as a condenser also.—F. H. L.

Arc Lamps, and Electrodes therefor. La Société G. and P. de Mestral, Paris. Eng. Pat. 25,524, Nov. 20, 1902. (Under Internat. Conv., Feb. 28, 1902.)

This specification relates to modifications of Eng. Pat. 5104, 1902 (this Journal, 1902, 962), *viz.*, a smoke-preventer in the form of a protecting tube or partition, surrounding the upper carbon to prevent the fumes reaching the carbon carriers. Alternating currents may also be employed with a largely mineralised lower carbon and a more slightly mineralised upper one, having only a sufficient percentage of mineral substances in the paste or in the core to avoid the fall of drops of ash or scoria.—G. H. R.

United States Patent.

Coke-Oven. M. E. Rothberg, Lebanon, Pa. U.S. Pat. 720,971, Feb. 17, 1902.

In adjacent open-end coking ovens, a hollow longitudinal wall separates the oven chambers; a series of longitudinal deflecting partitions having openings at alternate front and inner ends, form a vertical series of horizontal reversing combustion-flues within the hollow wall; openings arranged in series in alternate partitions and in line with each other, form short-circuiting passages connecting the combustion flues, and provided with sliding cut-out valves, whereby the action of the combustion flues is locally adjustable.—H. B.

French Patents.

Peat and other Bad Conductors of Heat; Apparatus for Drying and Carbonising ——. A. von Gröling. Fr. Pat. 322,488, June 25, 1902.

The material is fed between a pair of heated endless chains, which draw it onwards, and are mounted so as to exert a progressively increasing pressure. At the same time, in passing over the carrier rollers, one or both the chains are caused to rise and fall slightly, thus alternately opening and closing orifices through which the gas liberated by the treated material is enabled to escape. Uniformity of pressure is ensured by mounting the upper chain rollers in bearings acted upon by springs.—C. S.

Coal Briquettes. L. Weisz. Fr. Pat. 322,626, June 24, 1902.

Dry coal or coal dust is mixed with the milk of lime furnished by slaking 4—6 per cent. of quicklime (referred to the weight of coal taken), and the whole, after eliminating the superfluous water, is exposed to a pressure of 200—400 atmospheres in blocks exhibiting a maximum of superficial area. The compressed masses are transferred to a closed chamber, and subjected to the conjoint influence of furnace gases (cooled to 120° C.) and steam at 100° C., to convert the slaked lime into carbonate.—C. S.

Coal; Artificial ——, *from Coal Dross, Peat, or Lignite.* M. Gotlin, J. Cael, and L. Balagna. Fr. Pat. 322,680, June 28, 1902.

The coal dross, &c. (1,000 parts) is incorporated with a mixture of: waste paper, 20 parts; sulphuric acid of 65° B., 8; sodium carbonate of 35° B., 6; crude petroleum, 12; gas tar, 12; potassium silicate of 25° B., 40; animal charcoal, 4 parts. The waste paper is pulped, pressed, and triturated to a pasty mass with the sulphuric acid, the petroleum, gas tar, soda, and charcoal being added in succession. The product is mixed with the fuel material, which has previously been incorporated with the potassium silicate, and the whole is pressed and treated as usual in the production of briquettes.—C. S.

Briquettes; Agglomerant for ——. E. Trainer. Fr. Pat. 322,821, July 9, 1902.

Industrial and household refuse is treated with acids, acid salts, or other compounds of an acid character, assisted by heat and pressure; tar, asphaltum, or preparations of same, being added before or during the reaction The product is then distilled to recover the volatile constituents, and the residue is used as a binding agent for briquettes, &c.—C. S.

Oil-Gas; Centrifugal Condenser for the Extraction and Mechanical Purification of ——. A. Bouvier and la Société Sautter, Harlé & Co. Fr. Pat. 322,501, June 27, 1902.

An apparatus which serves as an exhauster, and also removes the tarry and other heavy matters from the gas. It is divided into two compartments, in the upper of which revolves a horizontal exhausting fan, while in the lower compartment, but on the same central shaft as the fan, the tar-extracter revolves at high speed. The latter consists of a hollow shell, in the form of an inverted cone, open at top and bottom, and is attached to the spindle by means of helicoidal cross-pieces. The gas enters the tar-extracter at the bottom, passes up through it, and enters the exhauster chamber, whence it is driven out through a tangential opening. Jets of water enter both chambers, and a conical baffle above the tar-extracter prevents any of the tar, which collects on the inner surface of the latter, from being projected into the exhauster chamber.—H. B.

Water-Gas; Process and Apparatus for Generating ——. Soc. Anon. Internat. du Gas D'Eau (Brevets Strache). Fr. Pat. 322,671, July 1, 1902.

See U.S. Pat. 715,218; this Journal, 1903, 19. The apparatus may not only be inclined, but also vertical, so as to have a bed of fuel of considerable thickness, as in ordinary generators.—H. B.

Generator-Gas and Water-Gas; Apparatus for the Production of ——. L. A. Payens. Fr. Pat. 322,721, June 30, 1902.

The patentee claims an apparatus for producing, as desired, either generator-gas or water-gas (carburetted or not), or a mixture of the two. Two generators, in open communication at their upper parts, are connected, by means of valved conduits at their lower parts, with a vertical tubular boiler. The air-blast pipe traverses the boiler, so as to heat the blast beforehand, and at the base of the boiler a superheating chamber is provided, to serve for vaporising oil when the water-gas is to be carburetted. The tubular boiler furnishes the steam required, when water-gas is to be produced, in one or both generators.—H. B.

Hydrocyanic Acid from Impure Illuminating Gas; Process for Absorption of ——. Guillet. Fr. Pat. 322,576, June 16, 1902.

Instead of removing the cyanogen compounds first, the gas is given a preliminary washing in a regulated supply of water to remove the excess of ammonia not required for combination with the hydrocyanic acid.

The usual method gives a gas containing small traces of ammonia, the removal of which by washing, considerably reduces the illuminating power of the gas, but the process claimed, involving only a comparatively small amount of washing, gives a gas of high illuminating power. (See also this Journal, 1902, 1026.)—T. F. B.

Calcium Carbide; Means for Preserving ——. G. Todeschini and A. Ferrario. Fr. Pat. 322,374, June 21, 1902.

By pressure, washing with acid and alkali, and decolorisation with animal charcoal, an oil is obtained from crude petroleum, which boils at 360° C., remains liquid to − 15° C., and has a specific gravity of about 0·850. This material is mixed with 1 per cent. of amyl acetate; and, under the name of "carbuisoline," is used to impregnate calcium carbide, in order to protect that substance from premature deterioration in the air, and to minimise "after-generation" in acetylene apparatus. It is also claimed to protect the metal of the generators from corrosion.—F. H. L.

Acetylene; Purifying Material for ——. R. Granjon. Fr. Pat. 322,715, June 27, 1902.

Wood charcoal, of a suitable kind, is impregnated with chlorine either directly or by means of bleaching powder; the product being preferably reduced to powder, and made up into a mass of proper physical condition with the aid of some agglutinant like cement, some bleaching powder being also added, if desired. It is claimed that this composition removes phosphine from crude acetylene, lasts longer than ordinary hypochlorite mixtures, and does not introduce chlorine into the gas.—F. H. L.

Burner for Using Low-Grade Gas for Incandescence Lighting; Process of, and ——. J. Chamberlain, Fr. Pat. 322,485, June 25, 1902.

See Eng. Pat. 13,191 of 1901; this Journal, 1902, 1021.
—H. B.

Burner for Producing Light by Incandescence [*Gas*]. R. Pictet. Fr. Pat. 322,601, June 28, 1902.

A refractory mantle, or a cone having a vertical central passage and numerous lateral perforations, is surrounded by a protective mantle constructed with large meshes, and the whole is surrounded by a glass chimney. Gas enters the inner mantle or cone, oxygen is admitted to the annular space between the inner and outer mantles, and air flows up between the outer mantle and the chimney. The inner cone or mantle becomes incandescent; the effect of the outer mantle is said to be that it prevents the radiation of heat, without preventing the radiation of light.—H. B.

Electrodes for Arc Lamps; Process of Manufacture of ——. R. Hopfelt. Fr. Pat. 322,371, June 21, 1902.

The electrodes are made of organic combinations of the light alkali metals, alkaline earths, and heavy metals which remain unchanged during the process.—G. H. R.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Indene; Impurities in Commercial ——, *and a New Synthesis of Truxene.* M. Weger and A. Billmann. Ber., 1903, **36**, [3], 640—645.

Indene and benzaldehyde, when rubbed with a concentrated solution of potassium hydroxide, give oxybenzylbenzilidene indene, which melts at 135 C. If freshly prepared indene be employed, a yield of about 80 per cent. is obtained, whilst older preparations give only a lower yield. The excess of benzaldehyde is removed from the mixture by distillation in a current of steam, and in the distillate coumarone has been identified.

Indene absorbs oxygen rapidly from the air, with formation of coumarone. Indene polymerises easily. By boiling under a reflux condenser for 20 hours, about 30 per cent. of indene resin is formed. This polymerisation takes place also at the ordinary temperature.

In order to obtain indene as pure as possible, it is essential to distil it at a low pressure, and keep it out of contact with air; but even then polymerisation takes place, and the authors doubt if it is at all possible to prepare pure indene.

In the distillation of crude indene, a crystalline product was obtained which, after treatment with animal charcoal and recrystallisation from xylene, was proved to be truxene, $C_{18}H_{12}$, (m. p. over 360° C.). The truxene is apparently formed during the distillation of the indene, and this is another factor which renders the preparation of pure indene difficult, or impossible.—J. McC.

Polymeric Compounds; Splitting of ——. *Truxene from Coumarone Resin.* G. Krämer. Ber., 1903, **36**, [3], 645—648.

The unsaturated compound indene shows a decided tendency to suffer condensation of several of its molecules, with elimination of hydrogen, which simultaneously exerts a reducing action on other indene molecules. (See preceding abstract.) This may be a general characteristic of unsaturated compounds, and the tendency may depend upon the degree of saturation. This process is possibly always preceded by a polymerisation, and the subsequent intramolecular displacement of the hydrogen is favoured by heating. Coumarone resin probably undergoes such a change, and truxene has been isolated from coumarone pitch. The pitch obtained from coal-tar is probably formed by a similar process, and the resinification of terpenes is attributable to the same cause, although, at the same time, some resin acids are produced by oxidation. This view is supported by the fact that hydroretene is obtained by the decomposition of colophony. The formation of paraffin oil appears to be analogous to the decomposition of indene.—J. McC.

French Patent.

Gas from Petroleum Wells; Condensing ——. A. von Gröling. Fr. Pat. 322,602, June 28, 1902.

The gases are subjected to the conjoint influence of cold and pressure, to facilitate condensation. The apparatus consists of a compressor which delivers the gas into a condenser, whence the condensed gases are run into a cooled receptacle, whilst the residual gases are passed into a second condenser, where the condensation is facilitated by the pressure to which they are subjected. The permanent gases escape through a safety-valve when the pressure exceeds a certain limit.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

o-Chloronitrobenzene; Action of Alkali and Alcohols on ——. K. Brand. J. prakt. Chem., 1903, **67**, [4], 145—163.

The action of sodium methylate on aromatic nitro compounds generally yields the corresponding azoxy derivatives.

In attempting to obtain o-dichloroazoxybenzene by this method, due to Mitscherlich, the author finds that a number of compounds are formed, according to the conditions of the experiment, and he arrives at the following conclusions :—When o-chloronitrobenzene is treated with concentrated sodium methylate, it yields either o-azo- or o-azoxydichlorobenzene, whilst dilute solutions give o-azoxyanisol. Sodium ethylate gives in all cases chloro-aniline as chief product, whilst simultaneously o-azodichlorobenzene is formed in concentrated, and o-azoxydichlorobenzene in dilute, solutions. Aqueous alcoholic potash-lyes give with o-chloronitrobenzene either o-nitro-anisol or o-nitrophenetol, according to the alcohol employed. The electrolytic reduction of o-azo- or o-azoxydichlorobenzene, according to Böhringer's method, gives benzidines as well as amines, the yields of the products varying according to the conditions. The reduction of o-nitro-anisol by the same method, in presence of stannous chloride or copper powder and hydrochloric acid, yields chloro-o-anisidine, so that, in order to obtain anisidine free from chlorine, it is necessary to carry out the reduction in sulphuric acid solution in presence of copper powder.—T. A. L.

m-Acetylaminobenzaldehyde ; Some Derivatives of —— [*Indigo*]. P. Friedländer and R. Fritsch. Monatsh. für Chem., 1903, **24**, [1], 1—12.

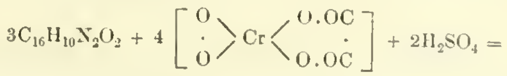
m-Aminobenzaldehyde, on account of its instability, has been little investigated. It very readily condenses, and has not been obtained in a pure state. It is best obtained as a condensed product by reducing the bisulphite compound of *m*-nitrobenzaldehyde with ferrous sulphate and chalk. The amorphous condensation product is then dissolved in about 2 parts by weight of acetic anhydride, boiled, the excess of anhydride decomposed with water, and soda-lye then added in slight excess The *m*-acetaminobenzaldehyde, 1.3.C_6H_4.CHO.$NHCOCH_3$, separates as an oil, which gradually solidifies, and gives, on crystallisation from benzene, white plates melting at 84° C. The product dissolves readily in bisulphite, and gives an oxime, melting at 185° C., with hydroxylamine hydrochloride. On nitration in glacial acetic acid with nitrosulphuric acid, *m*-acetaminobenzaldehyde yields o-nitro-*m*-acetaminobenzaldehyde, 1.4.2.$C_6H_3(NO_2)NHCOCH_3$.CHO, which forms brownish-yellow needles melting at 161° C. This substance gives a hydrazone and an oxime, which melt at 247° and 189° C. respectively. A solution of the nitro compound in benzene, on exposure to sunlight, is converted into o-nitroso-*m*-acetaminobenzoic acid, melting at 240° C., whilst oxidation with permanganate yields nitroacetaminobenzoic acid, melting at 225° C. Hydrolysis of the nitroacetaminobenzaldehyde with tolerably concentrated soda-lye in the cold yields nitroaminobenzaldehyde. By treating nitroacetaminobenzaldehyde, dissolved in acetone, with baryta water, the condensation product acetaminonitrophenyl lactic acid is formed, which contains 2 mols. of water and melts at 62° C. The anhydrous compound melts at 142° C. On dissolving in water and warming with baryta water in slight excess, the product yields diacetyldiamino-indigo, which, on boiling at 120°—130° C. with a dilute acid, is converted into diamino indigo. The acetyl compound, like indigo, can be produced on the fibre from the ketone, the shade approximating very closely to that of indigo, but it cannot be obtained in a crystalline form.

The blue solution of diamino-indigo hydrochloride, which is easily soluble, becomes reddish-violet when treated with nitrite in the cold, probably with formation of a tetrazo compound, since the product combines with an alkaline solution of R salt, yielding a brownish-violet disazo dyestuff. —T. A. L.

Indigo ; Oxidation of ——, *by Chromic Acid in Presence of other Acids* M. Prud'homme. Rev. Gén. des Mat. Col., 1903, 7, [75], 65—71.

In the process for obtaining a coloured design on a blue ground, due to C. Koechlin, by printing on indigo with a colour containing an alkali chromate and passing the goods through a bath containing oxalic and sulphuric acids, although it is well known that the rapidity of the reaction is due to the presence of oxalic acid, no chemical explanation of the phenomenon has hitherto been attempted. The following conclusions have been arrived at by the author. The rapidity with which indigo is oxidised by chromic acid is increased by the presence of other acids, more particularly oxalic, sulphuric, and ferro- and ferricyanic acids. Equimolecular proportions of chromic acid and the mono or dibasic acids condense with elimination of water, and these compounds no longer colour ether blue in presence of hydrogen peroxide, showing that the chromic acid is no longer present in a free state. Since sulphuric acid, a non-reducer, acts in the same way as oxalic acid, it follows that the destruction of colour is a by-reaction. Attempts have been made to establish a parallel between the action of chloric and chromic acids, but the two cases are not comparable. It has been suggested that the reaction is due to the production of the compound CrO_2 formed according to the equation $CrO_3 + C_2O_4H_2 = CrO_2 + 2CO_2 + H_2O$. Recent investigations have, however, shown that CrO_2 behaves as a simple chromate of chromium, and, moreover, hydrogen peroxide in presence of this substance and a dilute acid gives the blue colour of perchromic acid with ether, which is not produced with the condensation product already referred to. Nevertheless, this hypothesis appears to best explain the action of the oxalic acid.

With a suitable concentration the time necessary for decolorisation is very short, and the destruction of the oxalic acid is small, so that for an infinitely short time the following equation might be taken to represent the course of the reaction :—



$$3C_{16}H_{10}N_2O_2 + 4\left[\begin{array}{c}O\\ \cdot\\ O\end{array}\!\!>\!Cr\!<\!\begin{array}{c}O.OC\\ \cdot\\ O.OC\end{array}\right] + 2H_2SO_4 =$$

$$6C_8H_5O_2N + Cr_2(C_2O_4)_3 + Cr_2(C_2O_4)(SO_4)_2 + 2H_2O.$$

—T. A. L.

English Patents.

Indoxyl [*Indigo Dyestuffs*], *and Derivatives thereof ; Production of* ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 8114, April 7, 1902.

See Fr. Pat. 319,670 ; this Journal, 1902, 1528.—T. A. L.

Azo Colouring Matter, and Colouring Lakes therefrom ; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 7153, March 24, 1902.

See Fr. Pat. 319,989 ; this Journal, 1902, 1529 ; and U.S. Pat. 718,356 ; this Journal, 1903, 141.—T. A. L.

Disazo Dyestuffs for Wool ; Manufacture of New ——. I. Levinstein, J. L. Rose, and Levinstein, Ltd., Manchester. Eng. Pat. 5638, March 7, 1902.

The diazo compound from 4.1.3-chloraminobenzene sulphonic acid is combined with an amino compound, such as α-naphthylamine or one of its sulphonic acids ; the aminoazo compound so obtained is rediazotised and combined with an amine, phenol, aminophenol, or a sulphonic or carboxylic acid, alphyl or alkyl derivative thereof. The new disazo dyestuffs so formed give violet to blue and blue-black shades on wool from a neutral or acid bath.—T. A. L.

Sulphurised Colouring Matters ; Manufacture of —— A. G. Bloxam. From Chem. Fabr. vorm. H. Byk, Berlin. Eng. Pat. 7822, April 3, 1902.

See Fr. Pat. 320,369 ; this Journal, 1903, 23.—T. A. L.

Azo Dyestuffs ; Production of New ——. H. E. Newton. From Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 18,569, Aug. 23, 1902.

The diazo compounds of o-aminophenol sulphonic acids, aminohydroxybenzyl sulphonic acids, their derivatives, such as o-aminocresol sulphonic acids and halogen and nitro-derivatives thereof, combine with the 1.5, 1.7, 2.6-dihydroxynaphthalenes, the 1.5, 1.7, 2.6, and 2.8-aminonaphthols, or the monosulphonic acids from 1.5-dihydroxynaphthalene, or from 1.5 or 1.7-aminonaphthols, to give red to blue wool dyestuffs, which on subsequent treatment with oxidising agents, such as chromates, yield deep black shades very fast to "potting." They are also fast to milling, washing, and light.—T. A. L.

United States Patent.

Auramines [Diphenylmethane Dyestuffs], and Process of Making Same; Alkylated ——. C. Hoffmann, Assignor to Farbwerke Meister, Lucius und Brüning, Hoechst-on-the-Main. U.S. Pat. 720,920, Feb. 17, 1903.

Benzylauramine, melting at 116° C., is obtained by heating together equivalent quantities of Auramine and benzyl chloride, together with an agent capable of combining with acids. The product, which is easily soluble in chloroform and hot alcohol, sparingly soluble in ether, and insoluble in water, gives yellow, crystalline salts with mineral acids and dyes mordanted cotton yellow shades, similar to Auramine. See Eng. Pat. 25,089 of 1901; this Journal, 1902, 1528. —T. A. L.

French Patents.

Indigo; Manufacture of Bromine Derivatives of ——. Cie. Parisienne de Coul. d'Aniline. Fr. Pat. 322,348, June 14, 1902.

The patentees describe a number of methods for obtaining more or less brominated derivatives of indigo, either by the action of bromine vapour on dry indigo or by the action of bromine or its vapour on indigo in presence of water or of acids. Dry indigo, when mixed with sand, kieselguhr, sodium sulphate or bromide, &c., absorbs rather more than two atomic proportions of bromine. The product so formed when heated with water or an indifferent solvent like toluene gives off hydrobromic acid, forming a brominated indigo, which separates in brilliant blue crystals. Bromination can also be effected in presence of sulphuric, hydrochloric, hydrobromic, hydrofluoric, or phosphoric acid, care being taken to avoid as much as possible the formation of bromo-isatin. These acids can be replaced by acid salts, such as sodium bisulphate, and in all the examples, indigo white may be employed in place of indigo. Moreover, bromo-indigo can be obtained by suspending indigo or indigo white in sulphuric or acetic acid in presence of hydrobromic acid and of bromides and liberating the bromine by means of an electric current.—T. A. L.

Indoxyl and Indigo; Manufacture of Derivatives of ——. Chem. Fabr. von Heyden Act.-Ges. Fr. Pat. 322,536, June 20, 1902.

See Eng. Pat. 14,049 of 1902; this Journal, 1902, 1181. —T. A. L.

Indole and its Derivatives; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 322,387, June 23, 1902.

Organic compounds of the general formula $R.N.CH_2CO$ (where R represents an organic radicle), such as phenylglycin, its *o*-carboxylic acid, &c., are converted into indole or its derivatives by alkali oxides or hydroxides, or alkaline earths with or without admixture of inorganic substances capable of decomposing water. The yield of indole increases with the temperature, or by the addition of powdered iron, sulphites, sodium ethylate, &c. The indole obtained, is mixed with indoxyl derivatives which are removed by oxidation to indigo. The indole is then either extracted with ether or benzene, or distilled off with steam and separated from the filtrate as a picrate.—T. A. L.

Blue Substantive [Sulphide] Dyestuffs; Manufacture of ——. Badische Anilin und Soda Fabrik. Fr. Pat. 322,784, July 4, 1902.

Methylene Violet or any of its analogues is treated with chloride of sulphur in presence of fuming sulphuric acid. The products dye unmordanted cotton from an alkali sulphide bath, giving blue and violet-blue shades of considerable fastness. These dyestuffs undergo a further modification on heating with sulphur and an alkali sulphide giving blue dyestuffs, which are much faster than the original products. —T. A. L.

Dyestuffs [Azo]; Manufacture of Direct Dyeing Cotton ——. Chem. Fabriken vorm. Weiler-ter Meer. Fr. Pat. 322,500, June 27, 1902.

The intermediate compound obtained by combining equimolecular proportions of a diazotised *p*-diamine (benzidine, dianisidine, diaminostilbene disulphonic acid, &c.) and an aminonaphthol disulphonic acid, is combined in alkaline solution with a tetrazo compound, the new intermediate derivative formed, being combined with amines, phenols, their sulphonic or carboxylic acids. Some of the intermediate compounds give, on boiling, valuable new dyestuffs, soluble in water. Moreover, the products can be diazotised on the fibre and developed with the usual components. The shades obtained, comprise greenish blue, brown, and black.—T. A. L.

Black Monazo Dyestuffs from Naphthol-Sulphaminosulphonic Acids; Manufacture of ——. Fabriques de Coul. d'Aniline et d'Extraits ci-dev. Geigy. Fr. Pat. 322,603, June 28, 1902.

Naphthol-sulphamino-sulphonic acids obtained by the action of ammonia on naphthosultone mono- or disulphonic acids, combine with diazotised picramic acid, forming black dyestuffs for wool which dye evenly, and are very fast to light and milling. These dyestuffs on heating with sodium carbonate on the water-bath are converted into new products, dyeing bluer or greener shades of black than the original dyestuffs, and also very fast to light.—T. A. L.

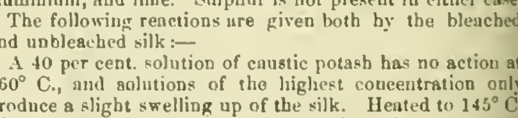
V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Viscose Silk. K. Süvern and F. Mach. Färber-Zeit., 14, [4], 54—56.

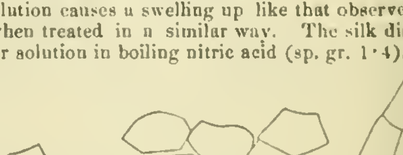
Stearn's unbleached viscose silk contains 0·46 per cent. of ash, and loses at 98° C. 11·44 per cent. of moisture; the corresponding figures for the bleached silk being 0·55 and 11·0 per cent. The aqueous solution of the ash shows an alkaline reaction. The ash of the unbleached product contains a considerable amount of lime, traces of aluminium and iron, and very small quantities of chlorine and sulphuric acid. The ash of the bleached material contains more chlorine, no sulphuric acid, and small quantities of iron, aluminium, and lime. Sulphur is not present in either case.

The following reactions are given both by the bleached and unbleached silk:—

A 40 per cent. solution of caustic potash has no action at 160° C., and solutions of the highest concentration only produce a slight swelling up of the silk. Heated to 145° C. with a concentrated solution of chloride of zinc, a clear solution is obtained. A cold concentrated solution of ammoniacal copper oxide dissolves the silk easily, whilst a dilute solution causes a swelling up like that observed with cotton when treated in a similar way. The silk dissolves to a clear solution in boiling nitric acid (sp. gr. 1·4).



Stearn's Viscose Silk.



Bardy's Viscose Silk.

A 20 per cent. solution of chromic acid gives a dark-oloured solution. Millon's reagent has no effect, potassium odide solution imparts to the silk a brown-violet coloration hich is easily washed out. Diphenylamine dissolved in oncentrated sulphuric acid gives a slight yellowish colora-on. When heated to 195°—200° C. for 1½ hours, viscose lk turns quite brown, and the strength of the fibre is very uch affected.

The best method of distinguishing viscose silk from her artificial silks is by examination of cross-sections ıder the microscope. Viscose silk prepared by the ethods of Stearn or Bardy shows quite characteristic rms. (See figures.)

The figures are sometimes similar to those of collodion lk, but in threads of viscose silk the sharp angles are very ronounced, and the threads lie quite close to each other.

—E. N.

Mordanting. P. Heerman. Färber-Zeit., 1903, 16, [3], 37—43.

ıfluence of the Duration of Mordanting on the Absorption Metallic Oxide Mordants by Silk.—Silk was chosen for is investigation, in preference to other fibres, on account its capacity of becoming mordanted with the oxides or droxides of tin, iron, chromium, and aluminium, by direct action of the salts of these metals at the ordinary temperature, an action which the author terms primary mordanting, to distinguish it from the secondary mordanting produced by drying, heating, or otherwise dissociating or decomposing metallic salts on textile fibres.

The conclusions deduced may be summarised as follows:—

1. With the salts of the above-named metals a state of maximum increase in weight (fibre + mordant) is reached after periods of mordanting ranging from six hours to two days.

2. In the case of chromium (chloride) and iron mordanting salts, this state corresponds with that of the mordant-saturation of the fibre; no further changes occur on prolonging the immersion of the fibre in the mordanting baths.

3. In the case of the tin (stannic chloride) and aluminium (acetate) mordanting salts, the fibre, after this state has been attained, is attacked and gradually dissolved. The combined weight of fibre and mordant then diminishes, although the mordants continue to be deposited upon the fibre. These cause the latter to become "petrified," that is, heavily encrusted with them, and lustreless, stiff, and rough to the touch.

The quantitative results are given in the table below:—

Mordant.	Condition of Silk.	Percentage of Total Absorbable Mordant absorbed in		Maximum Increase in Weight (Fibre + Mordant).		Amount of Ash found in Fibre in which the Maximum Increase in Weight has taken place.
		1 Minute.	1½—2 Hours.	Occurs in about	Is about	
				Hours.	Per Cent.	Per Cent.
n	Raw	34·9	78·7	24	18·45	12·27
	Boiled-off	58·9	94·2	6	19·85	12·41
on	Raw	71·0	92·4	24	9·95	(above 6)
	Boiled-off	36·1	96·5	6	5·10	5·06
romium	Raw	24·5	59·2	48	14·35	7·35
	Boiled-off	25·2	49·1	48	7·24	3·91
uminium	Raw	65·2	91·3	6	1·38	(nearly 2)
	Boiled-off	38·3	77·0	24	3·65	3·91

—E. B.

ranitraniline and Paranitrodiazobenzene as Wool Dye-stuffs. E. C. Kayser. Zeits. f. Farb. u. Text. Chem., 1903, 2, [4], 80—82.

HEN wool is boiled for 1½—2 hours in an aqueous solu-n of *p*-nitraniline containing hydrochloric acid and salt, akes up about 2½ per cent. of the nitro compound, giving dull yellow shade. The colour stands boiling water or ling for five minutes with soap and soda, in the latter e becoming a trifle redder. It is also fast to milling, l does not bleed on to wool or cotton, and also stands ning and sulphur. On exposure to sunlight the colour omes somewhat more orange after 14 days. Paranitr- lioe dyes slowly and penetrates well. Cotton treated in similar manner is only very faintly dyed, and can be shed white with soap, whilst silk similarly treated remains am coloured.

aranitrodiazobenzene also appears to have an affinity wool. By immersing 5 grms. of well wetted flannel in ath containing 0·25 grm. of *p*-nitraniline, 0·5 c.c. of lrochloric acid, 0·125 grm. of sodium nitrite, 0·5 grm. sodium acetate, and a trace of chalk after complete zotisation, in 300 c.c. of water, the wool is gradually d, and in about two hours passes from light yellow to rownish-orange. The bath is almost exhausted, and dyeing is tolerably fast. It is scarcely altered by ling for five minutes with soap, boiling dilute sulphuric l turns it somewhat yellower and brighter, whilst boiling hromate solution darkens the shade. The colour does bleed on milling, and exposure to sunlight for 14 days scarcely any effect. On boiling with copper sulphate eep brown is produced fast to washing, soap, and milling, t as in the case of Paranitraniline Red. Silk behaves like l, whilst diazotised *p*-nitraniline has no affinity for cotton. It is important to avoid an excess of nitrous acid in the dye-bath, and even a preliminary treatment of the fibre with nitrous acid and subsequent washing before dyeing affects the shade. The diazo compounds of α- and β-naphthylamine give comparatively dull and valueless dyeings, but subsequent development with β-naphthol succeeds better than with *p*-nitraniline. The author has also attempted to apply the method employed for obtaining Paranitraniline Red on cotton to wool by dyeing the latter with basic dyestuffs containing a free amino group such as Safranine F F extra and Magenta, and subsequent treatment with diazotised *p*-nitraniline. Magenta under these conditions gives a dark and Safranine a bright orange red-brown, whilst a subsequent treatment with copper yields deep brown shades. Prolonged boiling with soap alters the shades considerably, but in no sense corresponding to a simple removal of the basic dyestuff.—T. A. L.

Sulphide Dyestuffs: Improved Dyeing Process for——. E. Justin-Mueller. Rev. Gén. des Mat. Col., 1903, 7, [75], 72.

In dyeing with almost all sulphide dyestuffs, the surface of the bath becomes covered with a precipitate of milk of sulphur which adheres to the fabric and can only be removed by prolonged and vigorous washing. This inconvenience is especially met with in jigger dyeing. The author finds that the addition of neutral or slightly alkaline sodium sulphite to the bath prevents the precipitation; the quantity of sulphite required depends upon the amount of dyestuff or the precipitate. For each kilo. of Immedial Black NG, 750 grms. of sodium sulphide are required for solution, and in order to prevent any precipitate of sulphur forming, a slightly alkaline solution of sulphite is added corresponding to 750 grms. of sodium bisulphite (38°—40° B). This addition prevents the formation of precipitated sulphur or dissolves it as formed.—T. A. L.

Silk; Formation of Spots in ——. V. Georgievics and A. Muller. Zeits. f. Farben- u. Textil-Chem., 1903, 2, [4], 78—80.

The silk industry during the past seven years has suffered from a peculiar formation of reddish spots in warehoused goods. The formation in time leads to a complete destruction of the fibre. The matter has already been investigated. According to Sisley the formation of the stains is due to the presence of sodium chloride. The authors have examined these spots microscopically and chemically, and from their appearance, colour, and the fact that they principally occur in silks dyed light shades with basic dyestuffs, they ascribe their formation to the presence of iron in the fabric. The spotted portions contain the metal in the ferric, whilst in other parts it is present in the ferrous condition. The percentage of iron varies from 0·00105 per cent. in an unspotted piece to 0·0102 per cent. in one which was strongly marked. It would appear that the formation of the red spots takes place in those parts in which the conditions are favourable to a slow conversion of ferrous into ferric oxide, the change causing a brittleness in the fibre without apparently any chemical change. As it is not possible in the silk industry to obtain a weighted material absolutely free from iron, it is necessary to exclude this metal as far as possible and to provide that any present becomes converted from the ferrous to the ferric state. Practically this is effected by adding to the dipping baths sufficient stannous chloride to convert the ferric chloride into the ferrous salt, which is scarcely absorbed by the silk. The sodium-silicate baths are treated with hydrogen peroxide, which converts any ferrous into ferric oxide. It is also preferable during dyeing to employ sulphuric in place of acetic or tartaric acid.

—T. A. L.

English Patents.

Flax Fibre suitable for Spinning; Manufacture of ——. Ida Jacob, Schwartzburg Rudolstadt, Germany, and W. Pritzkow, Eberswalde, Prussia. Eng. Pat. 3722, Feb. 13, 1902.

The entire leaves of young New Zealand flax or the tips of the leaves of the older plants, after having the brown edges removed, are boiled in a solution of an alkaline salt (borax, sodium carbonate, or sodium bicarbonate); 8 litres of a 0·5 per cent. solution of sodium bicarbonate are sufficient for 1 kilo. of leaves.

The wet leaves are then taken while still warm and beaten with wooden hammers, and subsequently washed with warm soap and water, so that the fibres can be separated; these after being heckled are spun while still moist. Flax prepared in this way can be used for fine fabrics and is exceedingly strong.—E. S. B.

Mordanting Wool. O. Imray, London. From E. Jung, Huningue, Germany. Eng. Pat. 16,980, July 31, 1902.

Wool is mordanted with chromium at a temperature not exceeding 65° C. by means of normal or slightly basic chromium sulphocyanide or double salts, such as ammonium chromium sulphocyanide ($Cr_2(CNS)_6, 6NH_4CNS, 8H_2O$), or alkali ammonium chromsulphocyanide compounds (of the general formula, $M_2(CNS)_8Cr_2(NH_3)_4$, where M = K, Na, NH_4), alone or in conjunction with free acids, chromates, nitrites, or copper salts. For example, the wool is treated at a temperature of 60°—65° C. for 20—30 minutes with a 0·3 per cent. solution of chromium sulphocyanide, to which [illegible]— per cent. (of the weight of the wool) of potassium or sodium bichromate is added. The fibre mordanted in this manner, it is stated, is not in any way damaged.—E. B.

Indigo Vats; Preparation of ——, *and Dyeing therewith.* J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany Eng. Pat. 8510, April 11, 1902.

In dyeing wool in the hydrosulphite indigo vat, the improvement is claimed of the combined addition to the vat of ammonium chloride or other ammonium salt, and animal glue or other proteid body, so as to remove exces of fixed alkali and leave the indigo white in a conditio exceedingly favourable for dyeing purposes.—E. S. B.

Dyeing [Knotted] Yarns in the Hank. R. Shuttlewoo and F. W. Fanshawe, Leicester. Eng. Pat. 8279 April 9, 1902.

Hanks of yarn are knotted in one or more places. Th knots are then dyed the same or different colours. Th hanks may be dyed one or more colours before bein treated as described.—E. B.

Dyeing and Printing; a Process for ——. C. D. Abe London. From The Act.-Ges. f. Anilinfabr., Berli Eng. Pat. 7073, March 22, 1902.

See Fr. Pat. 319,876 of 1902; this Journal, 1903, 25.

—E. S. B.

o-Nitrophenyl-lacto-ketone; Dyeing and Printing fro ——, *and Preparations therefor.* G. B. Ellis, Lond From Soc. Chim. des Usines du Rhone, Lyons. Eng. Pa 9386, April 22, 1902.

Soluble organic, sulphonic, and carboxylic acids or the soluble salts in both the fatty and aromatic series wh mixed with o-nitrophenyl-lacto-ketone render it eas soluble in water and ready for use in the dyeing or printi of textiles.

A mixture of 1 kilo. of o-nitrophenyl-lacto-methyl-keto and 3 kilos. of *p*-toluene-sulphonate of sodium keeps w and can be easily dissolved in 6 litres of water. Such solution can be used for dyeing; the indigo colour be developed with an alkaline solution in the usual manner

The following is an example of the application of t method in printing.

The goods are printed with a mixture of 10 grms o-nitrophenyl-lacto-methyl-ketone, 100 c.c. of 10 per c acetic acid, 40 c.c. of water, and 150 grms. of thicken and after drying, passed through a caustic soda bath develop the indigo in the fibre.—E. S. B.

Indigo Dyeings on Vegetable Fibres; Treatment of — *for Increasing the Fastness thereof.* J. Y. Johnso London. From Badische Anilin und Soda Fabrik. E Pat. 10,188, May 2, 1902.

See Fr. Pat. 320,888 of 1902; this Journal, 1903, 142.

—T. F. B

Waterproofing Composition [for Textile Fabrics]. G. Newman. Eng. Pat. 28,410, Dec. 23, 1902. XIII page 373.

United States Patents.

Indigo Dyeings; Increasing the Fastness of ——. A. Stiegelmann, Ludwigshafen-on-Rhine, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-Rhine. U.S. Pat. 720,591, Feb. 10, 1903.

See Fr. Pat. 320,888 of 1902; this Journal, 1903, 142.

—T. F. I

Wool; Lubricant for ——, *and Process for making* G. B. Holden, Lowell, Mass. U.S. Pat. 720,922, 17, 1903.

Fifteen pounds of turpentine pitch and 7 lb. of quillaia "dissolved" in water, and the solution boiled. Succes additions are then made of 80 lb. of soda ash and 5 lb f ammonium carbonate; a solution of 5 lb. of borax in wa and a mixture of 25 lb. of oleic acid, 42 galls. of he lard oil, 15 galls. of heated cotton-seed oil, and 40 lb caustic soda, the mixture being boiled after each addit Ten galls. of palm oil and 20 galls. of olive oil are fi added and a sufficient quantity of water. Other mixt are described in which the borax is omitted and lar additions of cotton-seed and lard oils are made.—E. S.

French Patents.

Yarns; Treatment of ——. J. H. Ashwell. Fr. 322,557, June 27, 1902.

See Eng. Pat. 19,912 of 1901; this Journal, 1902, 139

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eing Mixed Tissues of Cotton and Silk in Two Colours with Sulphur Dyestuffs. La Manufacture Lyonnaise de Matières Colorantes. Fr. Pat. 322,740, July 2, 1902.

HEN tissues composed of silk and cotton are dyed in the linary manner with sulphur dyestuffs, the two fibres come coloured to almost the same degree. By adding e or gelatin to the dyebath, the present inventors find dyeing of the silk is hindered or prevented, while that the cotton proceeds as usual. At a temperature of —50° C., the cotton, especially when it is mercerised, y be dyed black without the silk being affected. The er may then be dyed any desired tint in the usual way.
—E. B.

ing and Finishing Cotton, Linen, and like Fabrics. T. Aspinall. Fr. Pat. 322,394, June 23, 1902.

e Eng. Pat. 2447 of 1902 ; this Journal, 1903, 91.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

eing, Mordanting, Scouring, or Washing-off and Drying, or Extracting Moisture or Superfluous Liquor from Hair or Skin Mats, Rugs, and Analogous Skin, Hair, r Pile Goods ; Machine for ——. F. Milau, Lockwood. ng. Pat. 5921, March 11, 1902.

OMBINATION of apparatus, comprising a portable rotary nder upon which the skins, &c., to be dyed are fastened, ye-vessel in which the cylinder can be enclosed, a beater gitator, means for raising the cylinder and rotating it le in a raised position, and a steam injector and liquor lation pipe.—E. B.

French Patent.

eing Leather with Sulphur Dyestuffs. La Manufacture yonnaise de Matières Colorantes. Fr. Pat. 322,605, une 28, 1902.

Eng. Pat. 24,697 of 1901 ; this Journal, 1902, 1453. lace of glucose, tannic acid may be employed for the pose mentioned. (See also Fr. Pat. 316,243 of 1901 ; Journal, 1902, 704.)—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Molybdic Acid. F. Mylius. Ber., 1903, **36**, [3], 638—640.

as not been possible to isolate an orthomolybdic acid, oO_6. Dissolved molybdic acid is always colourless, and esponds with allotelluric acid. The most easily soluble bdic acid which has been isolated in the solid condition e yellow dihydrate $(H_4MoO_5)x$, which is formed slowly he action of nitric acid or hydrochloric acid on an ous solution of a molybdate. The solution used in the ation of phosphoric acid contains free molybdic acid acid ammonium salts. An ammonium molybdate of ormula, $NH_3,4MoO_3,6H_2O$ has been isolated in small rless crystals by the decomposition of ordinary onium molybdate by the requisite quantity of nitric, ochloric, or sulphuric acid. It is easily soluble in hot r, but separates out on cooling. At 60° C. there ates from the solution a less hydrated salt. The ion of the salt causes the coagulation of albumin.
—J. McC.

li Acid sulphates ; Displacement by Water of the Suluric Acid of ——. A. Colson. Comptes rend., **136**,], 366.

temperature at which a solution can be diluted without nal change will indicate if the addition of water to a olution produces chemical changes.

studying the variation of this point (called the "dead " of dilution), the author concludes that the chemical osition of dissolved alkali acid-sulphates alters on dilu- sulphuric acid and normal sulphate being produced.

The facts on which he bases his arguments are as follows :—

1. A solution of acid sulphate gives, so far as results on dilution are concerned, the same results as a mixture of equimolecular weights of sulphuric acid and normal sodium sulphate.

2. When a solution of sodium acid-sulphate is cooled slowly, a quantity of normal sodium sulphate, $Na_2SO_4,10H_2O$, crystallises out.

3. Thermochemically considered, solutions of acid sulphate are almost completely converted into sulphuric acid and normal sulphate in the cold by sufficient dilution. The cases of sodium and potassium acid sulphates have been examined.

The author points out the possibility of utilising these results for obtaining sulphuric acid for industrial purposes, by the possible separation of that portion of free sulphuric acid which separates on simple dilution with water.
—T. F. B.

Gypsum in Solutions of Sea-Salt ; Solubility of ——. Ch. Cloez. Bull. Soc. Chim., **29**, [4], 1903, 167—169.

The author found in previous work that when to a saturated solution of sodium chloride, containing enough solid to keep the solution saturated afterwards, one adds a water saturated with gypsum, no deposition takes place, if the solution of calcium sulphate was made with distilled water but when ordinary water is used for the solution one notices a light deposit of calcium carbonate or clay, probably held up in the original water in a colloidal state. If a saturated solution of gypsum, to which some sodium chloride has been added, is allowed to evaporate spontaneously, pure sodium chloride is first deposited, and calcium sulphate only begins to come down after a time, which is often very long.

In the present work, it was found that the solubility of gypsum, in solutions of sodium chloride, increases with the concentration of these solutions ; for instance, 100 c.c. of a solution containing 2·44 grms. of sodium chloride dissolve 0·635 grm. of gypsum, but when 31·3 grms. of sodium chloride are present in 100 c.c., 1·583 grm. of gypsum is dissolved. The determinations were made at a temperature of 14° C. on some solutions left, for more than three months, in contact with excess of pure hydrated calcium sulphate ; the solutions were shaken every day, to saturate them, the excess of gypsum preventing any supersaturation. If 300 grms. of salt are dissolved in a litre of water which has been saturated with gypsum, it can be calculated that 255 grms. of pure sodium chloride will be deposited, before any gypsum comes down. If a solution saturated at the same time with sodium chloride and gypsum is allowed to evaporate spontaneously, one can calculate, and prove by experiment, that the sodium chloride which separates out, contains 4·2 per cent. of hydrated calcium sulphate, which can be isolated by means of a saturated solution of gypsum, the large crystalline grains obtained being quite different from the long needles generally obtained as precipitated hydrated calcium sulphate.

Thus it is not possible to separate entirely, by crystallisation, sea-salt from calcium sulphate. In commerce, milk of lime is used to free salt from magnesium sulphate, which renders it bitter, whereby magnesia and calcium sulphate are formed, the latter being supposed to be almost insoluble. But these experiments show that so-called purified white salt contains 3·4 per cent. (the theoretical maximum being 4·2 per cent.) of calcium sulphate.

Though so soluble in solutions of sodium chloride, gypsum is the first salt deposited in salt-marshes, and the author considers this phenomenon is due to the magnesium salts contained in sea-water ; for gypsum is much less soluble in solutions of magnesium sulphate than in pure water, and the solubility decreases with increase of concentration of the solutions.—W. C. H.

Gypsum : Solubility of ——, in Presence of Chlorides. N. Orlow. J. russ. phys.-chem. Ges., **34**, 949—951. Chem. Centr., 1903, **1**, [9], 497.

The author finds that by increasing the amount of sodium chloride present from 1 to 20 per cent., the solubility of

gypsum is almost doubled, whilst by increasing the proportion of calcium chloride from 1—10 per cent., the solubility is reduced to about one-tenth of the original.
—A. S.

Cyanogen-Extraction Process; Practical Results of Bueb's ——, at Mariendorf Gas Works. E. Drory. II., page 356.

English Patents.

Leucite and Material Containing the Same: Process for the Chemical Treatment of ——. J. O. O'Brien, Manchester. From L. Palestini, Rome. Eng. Pat. 5559, March 6, 1902.

Leucite, or material containing it, enriched by mechanical processes, may be treated with sulphuric acid to obtain potassium alum, with hydrochloric acid to obtain aluminium-potassium chloride, with phosphoric acid to obtain aluminium phosphate and potassium phosphate, or with hydrofluoric acid to obtain silica, hydrofluosilicic acid, alumina, potassium salts, aluminium and potassium fluorides and fluosilicates.—E. S.

Evaporating Leys and Brines for the Production of Salts; Apparatus for ——. E. W. Kauffmann, Kalk, Germany. Eng. Pat. 28,599, Dec. 27, 1902.

An apparatus designed to carry away the crystals immediately on their formation, thus preventing the crystallisation from being interfered with by the agitation of the liquid, and also preventing incrustation of the heating surfaces and pipes.

The apparatus comprises a receiving-chamber for the concentrated liquid, a feed-chamber, a heating-chamber, and and a steam-chamber, superposed in the order named, the steam-chamber communicating with the receiving-chamber through a funnel and central pipe. The liquid enters through the feed-chamber and passes upwards through pipes in the heating-chamber to the steam-chamber, in which a thin layer of the liquid is maintained by suitably regulating the supply. The steam and vapours escape through an outlet at the top, while the crystals formed are carried down with the circulating liquid through the central pipe to the receiving-chamber, from which the concentrated material is passed to a salt-filter, the fluid part being then conveyed to another apparatus, or to the next element of a multiple-effect apparatus, for re-evaporation.—R. A.

Evaporating and Concentrating Gypseous Brine; Process and Apparatus for ——, in Multiple Vacuum Evaporators. E. W. Kaufmann, Kalk, Germany. Eng. Pat. 28,600, Dec. 27, 1902.

The gypsum is first removed from the brine by a preliminary evaporation, in which the temperature is kept so low that the formation of anhydrous gypsum is prevented. The brine thus freed from gypsum is then led through the multiple-effect finishing evaporators, the salt crystals formed being removed by filters while the brine is passing from one evaporator to the next. The vapour from the last finishing evaporator is employed as the heating medium for the preliminary evaporation.—R. A.

United States Patents.

Platinum Contact Substances [Sulphuric Acid]; Method of Regenerating ——. C. Krauss and R. M. von Berneck, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Hochst a/M., Germany. U.S. Pat. 720,361, Feb. 10, 1903.

See Fr. Pat. 318, Feb. 19, 1902; this Journal, 1902, 1454; and Eng. Pat. 4026, Feb. 17, 1902; this Journal, 1903, 93.
—E. S.

Barium Hydrate; Process of Preparing ——. C. B. Jacobs, Assignor to the United Barium Company, N.J., U.S.A. U.S. Pat. 720,927, Feb. 17, 1903.

The purification in question is carried out either with the impure hydroxide in its usual form, or as the crystallised product. In the first case, the hydroxide is dissolved in water and treated with superheated steam, a little zin sulphate being afterwards added to the "fused material."

The crude hydroxide is contaminated with impuritie and amongst them barium hydrosulphide, which discolour the product. Superheated steam is said to decompose thi sulphhydrate, leaving hydroxide, and liberating hydroge sulphide. Zinc sulphate thereafter added in small quantit completes the purification, and is said to completely de colorise the barium hydroxide.—A. S.

Cyanogen Compounds: Production of ——. J. Bueb, Dessau, Germany. U.S. Pat. 720,402, Feb. 10, 1903.

Gases which are capable of yielding cyanogen compoun on being heated are passed over pieces of fire-resistn material which have been heated to the requisite temperatu by direct contact with oxidising flames.

The carbonaceous deposit thus formed is burnt off l further heating, when the fire-resisting material is aga raised to the converting temperature, and the proc repeated till the maximum yield of cyanogen compounds obtained.—T. F. B

French Patents.

Sulphuric Anhydride; Apparatus for Making —— C. Daub. Fr. Pat. 322,834, July 10, 1902.

See Eng. Pat. 9536, April 24, 1902; this Journal, 19 1138.—E. S.

Arsenious Acid; Production of ——, from Mispickel, C. Guénard. Fr. Pat. 322,524, June 4, 1902.

The calcination is effected in a muffle furnace, from wh the volatilised oxide is drawn by an aspirator into a series condensing chambers, the last of which is connected w the chimney. These are provided with an arrangement f withdrawing the condensed oxide without the necessity entering them, so avoiding danger to workmen.—J. H. C

Cobalt and other Metals; Extraction of ——, from Bu Pyrites. A. Taraud, S. Mathieu, and H. Lasne. Fr. P 322,770, July 3, 1902.

A solution is formed in the usual way, and, after preci tating the copper by iron and crystallising out the i sulphate, the liquor is evaporated to dryness, and residue calcined at a dull red heat. The calcined resi is digested with acidulated water, whereby cobalt, nic zinc, and manganese pass into solution together with so iron, while the residue yields a saleable colcothar. T iron is then precipitated by powdered chalk and a curr of air, afterwards the cobalt (and nickel) by chloride lime or other oxidising agent and carbonate of lime, the zinc by lime, whilst manganese remains in the soluti
—J. H. C

Nitrogen and Oxygen, Atmospheric ——; Apparatus Separating. R. P. Pictet. Fr. Pat. 322,600, June , 1902.

The apparatus for separating the nitrogen and oxy from liquid air consists essentially of a closed cylindr vessel, having a central reservoir for liquid air, at which central space a long continuous channel or gu is formed by sheet metal, reaching to near the periph so as to form vertical sides of considerable relative hei It is essential that the liquid air at the bottom of channel should not occupy more than a certain fraction the height, in order to allow space for frothing. channel is divided into chambers by partitions reach below the surface of the liquid, and is thus luted, chamber having a tube outlet for collection of the evolved within it. A serpentine tube (or tubes), nected to an external source of cooled, dry, sligl compressed air, and entirely immersed in the liquid, i into the central space, on reaching which the air has bec liquefied, and on its passage has caused the liquid air a the coil to distil, the oxygen and nitrogen, or a mix of these, collecting apart in the several described cham There is then a counter current of liquid air from central reservoir towards the periphery, and the proce continuous. From the reservoir, the liquid air is d nto a filtering apparatus, in which the congealed carbon iuxide is separated, and the liquid air returns by gravity o the reservoir. See also Eng. Pat. 2713, 1901; this ournal, 1902, 407.—E. S.

ias Retorts [*for Production of Oxygen by Means of Oxidisable Liquids*]; *Impts. in* ——. F. B. Felt and M. Greene. Fr. Pat. 322,617, June 18, 1902.

ee U.S. Pat. 702,855 of 1902; this Journal, 1902, 971. —H. B.

)xygen; Process for the Extraction of ——, *from Liquid Air.* G. Claude. Fr. Pat. 322,702, July 2, 1902.

'he process consists in fractionally evaporating liquid air ith simultaneous condensation of gaseous air in corresponding proportion. A coil in connection with a temerature-exchanger is immersed in the liquid air, and is raversed by an air current at a pressure near that of the tmosphere, a partial vacuum being maintained above the quid air, sufficient to compensate for the heat absorbed by from the coil. The loss by evaporation is made good by ie admission of liquid air from an auxiliary source. In ne of the forms of apparatus, to facilitate the "high xygenation" of the liquid air by evaporation of the itrogen, previously cooled air at, or at less than atmosheric pressure, is bubbled through it. In another form of pparatus, the recipient for the liquid air is divided into mpartments in such manner as to permit of the separate llection of the fractions distilled, devices being used to ve equilibrium of pressure, and to provide against the ixing of the gases separated. See also Fr. Pats. 296,211 id 322,107, 1902; this Journal, 1903, 298 and 288.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

lass; American Opalescent ——. Alexander. Sprechsaal, **36**, 78. Chem.-Zeit., **27**, [15], Rep. 43.

wing to the fact that opalescent glass often turns out ther too transparent or too opaque when fused in open its, experience shows that the only suitable furnace for e purpose is the Boëtius, with covered pots that can be orked *seriatim* and immediately refilled. Opalescence is parted by an addition of felspar and fluorspar to the arge of glass metal, lime being replaced by minium or rium carbonate. The following recipes will furnish good sults:—

Sand, 100 parts by weight; soda, 35; fluorspar, 20; spar, 40; minium, 5; sodium nitrate, 5 parts; or the last ree ingredients may be omitted, in which case the amount fluorspar is doubled, and 20 parts of barium carbonate added.

Should the coal contain sulphur, no risk is incurred of the ss being stained yellow through the absorption of phur by the barium carbonate. A metal suitable for oured glass can be prepared by modifying the proportions felspar and fluorspar.—C. S.

oneware; Crystal Glaze for ——. C. Tittl. Sprechsaal, **36**, 151. Chem.-Zeit., **27**, [15], Rep. 43.

od results were obtained with a glaze of the following nposition:—Calcined potash, 23·45 parts by weight; c. spar, 8·00; barium carbonate, 27·58; crystallised ax, 191·00; zinc oxide, 135·27; felspar, 66·72; henbocka sand, 246·00 parts. The stoneware body was npounded of:—Rörstrand felspar, 556 parts; Löthain y, 1050; Zettlitz kaolin, 750, and Hohenbocka sand, 760 ts. To prepare this body for casting, 100 kilos. are orporated with 200 grms. of ammonia-soda and 50 litres water.

When the above glaze is used, the stoneware, instead of ng baked in the usual manner, is fired at a temperature ial to Seger cone 0·08. If to be coloured, it is then ted with the usual pigments dissolved in glycerin, lightly ed, and afterwards glazed. The final baking is effected ı kiln temperature of Seger cone 2, which both finishes ware and fixes the glaze. The product should be led down as slowly as possible.—C. S.

English Patent.

Potters' Ovens, Kilns, Terra-Cotta, Encaustic Tile, Brick, and other Kilns; Construction of —— *for the Saving of Coal and Prevention of Smoke.* H. H. Redfern, Hanley, Staffs. Eng. Pat. 14,510, June 30, 1902.

Air is supplied to the incandescent coal on the fire-bars by an opening at the back of the bars, from the ash-pit, and also on each side of the grate, from a channel in the wall of the kiln, which channel communicates with the atmosphere by a ventilator situated between two grates. The products of combustion pass into the kiln through "bags" at the backs of the fire-places, and from the kiln through openings in the floor of the kiln to flues which communicate with the chimney. By these means the inventor proposes to supply sufficient air to the coal on the fire-bars, and "for the combustion of the carbonic acid and carbonic oxide gases generated in the mouth or fireplace.' —W. C. H.

French Patents.

Glass in Sheets; Method of Making ——. P. Simon. Fr. Pat. 322,799, July 5, 1902.

The molten glass issuing from the furnace tap-hole is spread by the aid of a sloping discharge plate—provided with diverging grooves—, on to a moving surface, the peripheral velocity of which determines the thickness of the resulting sheet.—C. S.

Enamelled Metal and other Objects, by Heat or Fusion; Printing and Firing Coloured Patterns on ——. C. J. Greenley and J. Day. Fr. Pat. 322,775, July 4, 1902.

See Eng. Pat. 16,486 of 1901; this Journal, 1902, 1183. —C. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Timbers; Determination of the Durability of ——. J. Sehorstein. Baumaterialeukunde, **7**, 226; through Zeits. angew. Chem., **16**, [9], 207.

Fresh wood contains from 6 to 31 per cent. of an optically active xylane (wood-gum) which can be extracted by caustic soda solution, but which is destroyed by the moulds and fungi which attack the wood. To test a wood, two equivalent sections are taken, one is sown with a mould-culture, and after a time both are rasped down and extracted with caustic soda, and the solution obtained is examined with the polarimeter. The durability of the wood is estimated from the extent to which the rotatory power has been diminished by the growth of the mould. —J. T. D.

Plaster of Paris; Researches on ——. *(I.) Burning of Gypsum.* Ch. Cloez. Bull. Soc. Chim., 1903, **29**, [4], 169—171.

It was formerly believed that in the manufacture of plaster of Paris, gypsum was not completely dehydrated, but even when just drawn from the oven retained 7 to 8 per cent. of water. The product consisted mainly, it was supposed, of the hydrate $SO_4Ca + 0{\cdot}5\ H_2O$, corresponding to 6·2 per cent. of water. Laeroix, however, showed that when heated for a long time at a temperature of 125°—145° C., gypsum is completely dehydrated, yielding an anhydrous calcium sulphate, entirely different in its properties from native anhydrite. The author has therefore investigated the theory of manufacture, using for his experiments pure gypsum, carefully freed from foreign matter, repeating the experiments with alabaster from Lagny and with ordinary gypsums.

Only the experiments with pure gypsum are recorded here. Twenty grms. of pure gypsum, containing 4·186 grms. of water, were heated in an oven at 145° C., and lost 2·334, 3·344, and 3·892 grms. of water at the end of 1, 2, and 3 hours respectively, being completely dehydrated at the end of 4 hours. During the process of weighing, it was found that the body rapidly gained in weight, especially as the dehydration proceeded; evidently the plaster obtained at a comparatively low temperature had a strong avidity for water. This view was confirmed by exposing some of the dehydrated substance protected from dust, to the air of the laboratory, at a temperature of 14—16° C., when it absorbed water, as shown in the following table :—

In 1 hour	3·70	per cent. of water.
„ 2 hours	4·27	„ „
„ 3½ „	5·70	„ „
„ 19 „	7·57	„ „
„ 27 „	7·77	„ „
„ 71 „	7·93	„ „

At a temperature of 5—7°, the absorption was slower, but tended towards the same limit. The author obtained a similar result with a commercial sample of plaster. Consequently when drawn from the oven, plaster is anhydrous, but rapidly absorbs water up to about 8 per cent., which does not correspond to any definite hydrate, and certainly not to the hydrate with 0·5 H_2O. The author has recently found that it is appreciated by the trade that burnt plaster increases in weight, becoming constant in about 36 hours. The anhydrous plaster, very easily prepared in laboratories, is a strong dehydrating agent, for example quickly bringing alcohol from 90° to 98°.

—W. C. H.

Plaster of Paris; Researches on ——. (II.) The Setting of Plaster. Ch. Cloez. Bull. Soc. Chim., 1903, **29**, [4], 171—174.

The method employed (described by the author in Congrès international de chimie appliquée, **1**, 315), consists in mixing the plaster with water and following the phenomena with the help of a thermometer, and then constructing curves with the times in minutes as abscissæ, and the differences between the observed and the initial temperatures as ordinates. The curve starts tangentially to the axis of the times, and then rises more or less rapidly according to the method of baking the plaster, or the amount of water employed in the mixing.

When, however, anhydrous plaster is mixed with a certain amount of water, there is a rapid rise of from 14° to 22° C. above the initial temperature during about the first minute, in about 10 minutes there is a fall of 4 or 6°, and for a certain time, the temperature remains stationary, and then rises again, generally to a greater extent than in the previous rise. These phenomena are independent of the amount of water mixed with the plaster.

The author considers that the first and rapid rise of temperature corresponds to the hydration of the plaster; the decided fall in the second stage is, in his opinion, not due to cooling by radiation—for in that case, this part of the curve would have towards the origin a tangent parallel to that of the true curve of cooling obtained when the mass has reached the second maximum temperature. The fall of temperature in the second stage is much more sudden than in cooling, and the author believes it to be due to the solution of the previously hydrated calcium sulphate. During this time the plaster has not set, but is more or less like sand mixed with water; suddenly, when the lowest temperature of this second stage is reached the mass thickens, and the temperature rises gradually, due to the setting of a supersaturated solution.

The setting of anhydrous plaster was compared with that of plasters which had absorbed various amounts of water, namely, 3·18, 4·66, and 7·2 per cent. In all there is an initial rise of temperature, which is less marked in the case of plasters with the higher percentages of absorbed water; when plaster has absorbed 7·64 per cent., there is practically no initial rise of temperature when it is mixed with water. Similarly the fall of temperature in the second stage is less marked with the higher percentages of absorbed water.

Further, the great rise of temperature observed when anhydrous plaster is mixed with water is not due to the first formation of the hydrate with 0·5 H_2O, because there is a sharp rise when plaster which has absorbed more than 6·2 per cent. of water (the amount corresponding to the hydrate 0·5 H_2O) is mixed with water.

The curves given show that in the setting of ordinary plaster the rise of temperature, due to hydration, and the fall, due to solution of the gypsum mutually mask eacl other, but these phenomena are clearly brought out whe anhydrous plaster is experimented upon. In a previou investigation the author found that the hydrate with 0·5 H is not formed in the burning of plaster, and by this study of anhydrous plaster it is shown that the setting of plaste is not due to the hydrate with 0·5 H_2O, but to thre successive phenomena—1. Hydration; 2. Solution; an 3. Setting *en masse* of a supersaturated solution.

—W. C. H.

ENGLISH PATENTS.

Wood; Treatment of ——, for the Purpose of Renderin the Same Fireproof. F. B. Bruce, London. Eng. Pat 3051, Feb. 6, 1902.

The wood to be treated is placed in a solution of commo salt, silicate of soda or alum, and at the same tim subjected to a pressure of 200 to 800 lb. per sq. in whereby the solution is made to penetrate the wood, th latter also being case-hardened by the compression.

—A. G. L.

Wood: Preservation of ——. J. L. Ferrell, Ph delphia, Pa., U.S.A. Eng. Pat. 5873, March 10, 1902

See Fr. Pat. 319,509; this Journal, 1902, 1535; and Fr Pat. 319,123; this Journal, 1902, 1455.—W. C. H.

Concrete, Artificial or Manufactured Stone, Plaster, an Similar Substances used for Building, for Paving, an for other Purposes; Production of ——. R. Buk Birmingham. Eng. Pat. 3,555, Feb. 12, 1903.

Ground granite, slag, gravel, burnt marble, and ceme are mixed with a solution containing about one ounce magnesia, one ounce of silicate of soda, and one ounce red oxide of iron in nine gallons, and then poured int moulds, &c. as usual.—A. G. L.

Stone; particularly Lithographic Stone; Manufactu of Artificial ——. Schwanenberg, Hanover, German Eng. Pat. 20,150, Sept. 15, 1902.

A mixture of pulverised burnt lime and carbonate of lim with or without other mineral filling materials, is treat with sufficient water to slake the lime, and then alternate subjected to the action of carbon dioxide and air, und normal or increased pressure, until sufficiently hardened

—A. G. L.

Basic Fire-resisting Material. A. T. MacFarlane, Rochester. Eng. Pat. 4298, Feb. 20, 1902.

Portland cement is first very thoroughly dried and th mixed with anhydrous tar. The mixture is either form into bricks or slabs and these burnt, or else appl to the interior of a furnace and burnt *in situ*, when a ha black mass is left. Residues from the distillation of ga tar may be used as the binding material.—A. G. L.

Asphaltic Pavements; Manufacture of Materials for —— and the like. T. Ryan, Buxton. Eng. Pat. 5 March 10, 1902.

The crushed wet stone is continuously fed into a revolvi drum, horizontally or slightly inclined, and rifled on t inside. A current of hot air traverses the drum at the sa time in the opposite direction. The dried stone then ent the mixing chamber, with a narrow inclined trough which an archimedean screw conveyor is made to revol This trough is also fed with the bituminous material or t with which the stone is mixed in its passage up the troug being at the same time drained of any surplus tar, whi runs down a central channel preferably provided wi another smaller screw conveyor revolving in an opp direction to the first. The mixing trough may be heat from below by means of steam.—A. G. L.

ement; *Method and Apparatus for Making* ——. R. F. Wentz, Nazareth, Pa., U.S.A. Eng. Pat. 26,558, Dec. 2, 1902.

ee U.S. Pats. 714,842 and 714,843; this Journal, 1903,).—W. C. H.

as Furnaces or Kilns for Burning Lime and Cement Materials; Continuous ——. A. J. Boult. From H. Fargues, Tervasson, France. Eng. Pat. 4166, Feb. 18, 1902.

he kiln is of the regenerative type, consisting essentially : four vertical shafts which communicate with each other / means of a series of flues. They are closed at the ottom by means of a movable shutter, and have an r-tight cover and burner at the top. Three of the mpartments are in use at any one time, the fourth being scharged and charged meanwhile. The actual combustion oceeds in one chamber, air and gas being supplied at e top through the burner, the air passing through the aterial in an adjacent compartment which has just been irnt and cooling it, whilst the products of combustion cape through the third chamber where they give up much their heat to a fresh charge.—A. G. L.

alcining Apparatus [*Cement Clinker*]. The Edison Ore-milling Syndicate, Ltd., London. From T. A. Edison, Llewellyn Park, N.J., U.S.A. Eng. Pat. 4735, Feb. 25, 1902.

ie furnaces are particularly designed for burning cement nker, but may be otherwise used. A long, rotating, arly horizontal burner, is provided at its upper or feed d with a stationary partition and movable feed trough, d at its lower end with pneumatically operating "guns" r the intermittent projection of charges of pulverised fuel o the burner, supplemented by an auxiliary device for ntinuous feed of the fuel, in reverse direction to the vel of the material to be calcined. A pair of re- nerative cylinders is alternately connected to the burner its upper and lower ends, and a reversible fan to each linder is used for the exhaustion of combustion gases or injecting air.—E. S.

United States Patents.

ones for Lithographic and other Purposes; Manufacture of Artificial ——. F. Heuber, Charlottenburg, Germany. U.S. Pat. 720,142, Feb. 10, 1903.

lverised limestone and burnt magnesite are mixed with sufficient quantity of a solution of magnesium chloride form a thin paste, which is cast in moulds, and the perfluous magnesium chloride solution, not required for ecting adhesion, is squeezed out.—W. C. H.

ne; Artificial ——. W. G. Roach and A. C. Roach, Assignors to H. C. Yeiser and O. H. L. Wernicke, all of incinnati, Ohio, U.S.A. U.S. Pat. 720,739, Feb. 17, 1903.

ay, sand, and lime are fused together with a suitable x, such as salt and fluorspar, kept in a liquid state to tle, and then cast in heated moulds, and slowly annealed produce a crystalline aggregate structure. The pro- tions by weight suggested are, "one-half sand for the y, and one-half lime for the mixture of clay and sand.
—W. C. H.

ster for Walls, Ceilings, &c.; Composition for ——. I. M. Hanmore, Los Angeles, Cal., U.S.A. U.S. Pat. 20,799, Feb. 17, 1903.

e plaster consists of diatomaceous earth, calcium oxide, olin, and fibrous material.—W. C. H.

ick. J. B. Dunlap, Tonkawa, Okla., U.S.A. U.S. Pat. 721,030, Feb. 17, 1903.

base of sand is combined with a mixture of soluble cate of soda, carbolic acid, alum, and sulphate of copper.
—W. C. H.

French Patents.

Impermeable Material; Manufacture of —— M. Weinreb and H. Tichauer. Fr. Pat. 322,499, June 27, 1902.

Red lead (minium), plaster of Paris, sawdust, and alum are mixed together with water to form a pasty mass, which is then dried.—W. C. H.

Absorbent Mineral Material and its Manufacture. A. G. Saunders. Fr. Pat. 322,566, June 28, 1902.

See Eng. Pat. 14,590, 1902; this Journal, 1902, 1159.
—W. C. H.

Lime and Cement Kilns; Apparatus for Recovering the Heat of Gases escaping from ——, *and for Heating the Air Supply.* P. Lauer. Fr. Pat. 322,571, June 28, 1902.

The gaseous products of combustion pass by a channel from the top of lime and cement kilns into a regenerating chamber and thence by a flue provided with a damper, to the chimney. The chamber is of brickwork, surrounded with a heat non-conducting material covered with a sheet-iron cover. The air-supply for the furnace is drawn from the atmosphere by a fan, and, forced through bent pipes, placed in the regenerating chamber; after being heated in these pipes it passes to various openings in the bottom of the furnace.—W. C. H.

Lime and Cement Kilns: Apparatus for Regenerating the Gases escaping from the Mouth of ——. P. Lauer. Fr. Pat. 322,776, July 4, 1902.

The gases escaping from the mouth of a lime or cement kiln, are led by a pipe to ports opening into the bottom of the regenerating gas-producer. This latter consists of a cylindrical brick chamber, lined with refractory material, and provided at the top with a hopper for the introduction of combustible material and fluxes; the bottom of the chamber slopes towards a trap-hole by which clinkers, &c. are removed. A little above the gas ports is a number of holes through which air is supplied under pressure from a fan. The regenerated gas, that is carbon monoxide, produced by the reduction of the carbon dioxide from the kiln, in its passage through the incandescent combustible, is led from the top of the regenerator by a main to be used for heating boilers, &c. Coal, coke, charcoal, &c. are fed at intervals into the regenerating chamber, together with a "flux" such as carbonate of lime, which is said to remove cinders and dust carried over by the gases from the kiln, the gases being reduced by passing up through the mass of incandescent combustible.—W. C. H.

Portland Cement; Improvements in the Burning of ——. W. Tucholka. Fr. Pat. 322,574, May 13, 1902.

The out-put of cement kilns, in which the raw material is calcined in the form of pieces or bricks, is increased by the introduction into the upper part of the furnace of raw cement in the form of powder and distributed by means of an air-blast. In the case of an elbow-shaped kiln, the raw cement powder is fed into a hopper, from which it passes down an inclined pipe, through the arch over the furnace, and is uniformly distributed in the latter by an air-blast introduced through the arch, situated in the bend of the kiln. Near the bottom of the hopper is an inclined partition, which causes the cement powder to fall to one side of the bottom of the hopper, from which it is drawn off by an archimedian screw and fed into the inclined pipe. The inclined partition works on a hinge, and is pushed towards the vertical by a spring under the partition, the compression of the spring being released as the cement powder passes from the hopper to the furnace.—W. C. H.

X.—METALLURGY.

Blow-Holes in Ingot Iron; Influence of the Chemical Composition on the Formation of ——. J. A. Brinell Stahl u. Eisen, **23**, 46—53. Chem. Centr., **1**, 1903, [7], 426.

Molten iron absorbs hydrogen, carbon monoxide, and nitrogen. Its solvent power for gases increases with the cooling temperature, but is dependent also on the chemical composition of the bath, being favoured, for example, by the presence of silicon and manganese. As the compounds of the iron with gases are not particularly stable, an evolution of gas begins at a certain point during the cooling. The formation of blow-holes depends mainly upon whether the evolution of gas occurs before or after the superficial solidification of the iron. The author found that an ingot iron containing sufficient manganese and silicon can be cooled to the point of solidification without the formation of blow-holes. In order to obtain a definite type of casting, if manganese be the material added, within certain limits, 5·2 times the necessary amount of silicon is required The capacity of aluminium with regard to the production of dense castings is 90 times that of manganese and 17·3 times that of silicon. The author puts these relations into the form of an equation: $Mn + 5{\cdot}2\,Si + 90\,Al = T$, in which the amounts of the elements are given in percentages, whilst T is a constant, named by the author the "density-value" of the type of casting.—A. S.

Tempered Cast Steel. B. Osann. Stahl u. Eisen, **23**, 22. Chem.-Zeit., **27**, [15], Rep. 46.

This steel is prepared by eliminating carbon from pig-iron, by prolonged heating in close contact with iron oxide. It differs from "workable cast" steel in containing about 0·6 per cent. less carbon. In the manufacturing process the carbon in the stratum nearest the iron oxide is liberated as carbon monoxide, and a further migration of carbon from the centre of the mass ensues, until finally the core no longer exhibits the structure or carbon content of pig-iron. During migration, the character of the carbon is modified from the amorphous state to the graphitic (tempering carbon), though not to graphite.

The raw material consists of 71 per cent. of wrought-iron and steel scrap, and 29 per cent. of special coke pig-iron. The smelting is carried on in cupola furnaces, with lime and coke. The tempering material consists of a mixture of iron oxides. The furnace treatment continues for about 10 days, at 860°—900° C.—C. S.

Alloys of Copper and Aluminium; Thermal Examination of some ——. W Louguinine and A. Schukareff. Arch. Sc. phys. nat. Genève, **15**, [1], 49—77. Chem. Centr., 1903, **1**, [9], 498.

The heat of formation was determined by measuring the heat of solution of aluminium, copper, and alloys of the two metals in aqueous solutions of bromine and potassium bromide. Alloys containing more than 50 per cent. of aluminium could not be examined by this method, because they caused evolution of hydrogen. The heat of formation of dissolved copper bromide is 39,484 cals., and that of dissolved aluminium bromide, 202,193 cals. Of the alloys examined in this way, the one corresponding to the formula Cu_2Al showed the greatest heat of formation. By pouring a fused mixture of the requisite composition on to sand, the alloy CuAl, was obtained in the form of long, thin, silvery needles of sp. gr. at 20° C., 4·042; and specific heat, 0·1586. The authors do not think this alloy is identical with the one described by Brunck (see this Journal, 1901, 1117), corresponding to the formula Cu_4Al_9. (See also this Journal, 1902, 481).—A. S.

Metal Substitution; Experiments on ——. A. J. J. Vandevelde and C. E. Wasteels. Bull. Acad. Roy Belgique, 1902, 795—839. Chem. Centr., 1903, **1**, [9], 489.

Zinc in the form of plates, rods, or balls, was introduced into solutions of copper sulphate, to some of which alcohol was added, and the rate of solution of the zinc was examined. It was observed that after the whole of the copper was precipitated, in all cases a further quantity of zinc was dissolved, with evolution of hydrogen. At first the solution of the zinc in the pure aqueous solutions of copper sulphate is more rapid than in the solutions containing alcohol, but after some time the reverse is the case, and finally the alcoholic solutions dissolve more zinc, with evolution of hydrogen, than do the pure aqueous solutions. —A. S

Hydrofluoric Acid; Employment of ——, in Metallurgical Laboratories. R. Fried. XXIII., page 382.

English Patents.

Metal [Steel]; Improved Method of Hardening, Toughening, or Improving the Quality of ——. W. S. Simpson, London. Eng. Pat. 3644, Feb. 12, 1902.

The articles are enclosed in a chamber connected on one side to a compressed air or gas reservoir, and on the other side to a box, from which, as well as from the chamber, air is exhausted. The articles are then electrically heated to the desired temperature, and rapid cooling is effected by admission of the compressed air or gas, which enters by orifices in an annular space partially surrounding the vacuous chamber.—E. S.

Magnetic [Magnetised] Iron and Steel Castings; Manufacture of ——. S. Deutsch, Floridsdorp, and O. Hochhauser, Vienna. Eng. Pat. 4662, Feb. 21, 1902.

"A process for producing steel or iron castings under the action of magnetic lines of force [from a solenoid], the direction of the said lines of force being changed during the period of casting, and kept uniform during the period of congealing, and the magnetic circuit or circuits being closed by the material to be cast." Castings thus made stated to have increased density, and high magnetic conductance.—E. S.

Steel; Manufacture of ——. W. Galbraith, Sheffield. Eng. Pat. 5860, March 10, 1902.

Common or phosphatic pig-iron (which may contain more silicon than ordinary "basic" iron) is first blown in an acid-lined converter, whereby the content of silicon is greatly reduced, then transferred to a basic-lined converter, and blown with addition of lime, whereby th charge is dephosphorised, and finally the steel is "deox dised" in a Siemens furnace, alloys containing carbon silicon, manganese, or other elements being added as may be required.—E. S.

Steel; Smelting Furnaces for the Continuous Production of ——. S. Surzycki, Czenstochowa, Poland. Eng. Pat 21,829, Oct. 7, 1902.

In stationary smelting furnaces of the Martin type, two or more tap holes are arranged at different levels, but not in vertical line to one another. A single discharging trough has branch conduits closely fitted, one to each tap hole. —E. S.

Alloys of Iron or Steel with other Metals; Productio of ——. J. W. Chenhall, Totnes. Eng. Pat. 58, Jan. 1 1903.

The ore containing the metal required to form the alloy i added, with the necessary flux, to the molten iron or steel and reduction is effected by carbon monoxide gas, or by carbon, preferably as charcoal, previously mixed with th ore. The reduced metal is thus directly absorbed by th bath of molten iron or steel. According to another process the ore of the alloy-metal is mixed with metallic iron o steel, and the mixture smelted. Or the ores of iron may b smelted with the ore of the alloy-metal. The process i especially adapted for the production of ferro-nickel fro oxidised nickel ores.—E. S.

Metals; Treatment of [Annealing, &c.] ——, durin Manufacture into Various Articles. T. V. Hughe Birmingham. Eng. Pat. 4025, Feb. 18, 1902.

Various methods of annealing and pickling are describe and claimed.—E. S.

Metals of the Alkalis; Manufacture of ——. G. W Johnson, London. From the Chemische Fabrik Grie heim - Elektron, of Frankfort-on-the-Main, German Eng. Pat. 7505, March 27, 1902.

See Fr. Pat. 320,815, April 15, 1902; this Journal, 19 148.—E. S.

United States Patents.

eel ; Process of Manufacturing [Toughening, &c.] ——. A. F. Mitchell, Mauhall, Pa. U.S. Pat. 721,061, Feb. 17, 1993.

ɪe steel is heated to a temperature above that of recalescence," then cooled below that temperature thout removal from the furnace, again heated to near recalescence," and finally a portion thereof is ated to a temperature "above recalescence," and then oled.—E. S.

opper Ores ; Process of Treating ——. W. Payne, J. H. Gillies, and A. Gondolf, Crange, N.S.W. U.S. Pat. 719,132, Jan. 27, 1903.

ɪe ore is crushed, roasted to oxide, saturated with a lution of ferrous sulphate or chloride, roasted again, a nall proportion of iron sulphide or sulphur is then added cording to the amount of copper present, the hot ore leached in water, and finally the copper is precipitated. —W. G. M.

res ; Process of Treating Argillaceous and Alkaline ——. C. H. Gage, Denver, Col., Assignor to J. E. Krepps, Pittsburgh, Pa. U.S. Pat. 719,207, Jan 27, 1903.

ow grade refractory ores such as argillaceous or alkaline es, containing gold, silver, copper, nickel, &c. are treated ith a bath of hydrocyanic acid, or of alkali and of copper lphate, and then with potassium cyanide, the precious etals being afterwards deposited electrolytically. They ay with advantage be agitated with heated air during the eatment with hydrocyanic acid and potassium cyanide. e solution containing the precious metals may be passed er a bed of charcoal which has been treated with iron lphate, the bed being within an electric circuit of high nperage and low voltage, whereby the precious metals are posited.—W. G. M.

Ores ; Apparatus for Treating ——. Z. B. Stuart, Los Angeles, Cal. U.S. Pat. 719,273, Jan. 27, 1903.

tank is provided to hold the mixture ; air is mixed with e mass in the tank, and the mixture is passed with a rther supply of air through a circulating and mixing rangement, from which it is returned again to the tank. eans are provided for regulating the height of the suction pe. The tank has a concave perforated bottom with a nical part projecting upwards from the centre. Below it a perforated box with a filtering cloth.—W. G. M.

es ; Process of Extracting Metals from ——. Z. B. Stuart, Los Angeles, Cal. U.S. Pat. 719,274, Jan. 27, 1903.

ɪe ore is agitated with cyanide, water, and air in one ssel, and is then further agitated in another vessel, after ich it is filtered in the first receptacle (*c.f.* preceding stract).—W. G. M.

Ores ; Process of Reducing ——. M. Ruthenburg, Philadelphia, Pa. U.S. Pat. 720,490, Feb. 10, 1903.

mminuted ore of volatile and non-volatile metals, mixed th a fluid hydrocarbon, is sprayed by compressed air m the extension of a hopper passing through the roof of orizontal furnace into its highly-heated combustion zone, ere the mixture inflames, and the reduced non-volatile tal is received by a bath of molten "magma" occupying hearth, from which "molten magma charged with luced metal is progressively withdrawn." Provision is o made for collection of the volatile metals. (See also g. Pat. 13,567, 1901 ; this Journal, 1901, 1218, and npare this Journal, 1902, 621 and 1402).—E. S.

Ore Roaster. F. C. Roberts, Philadelphia. U.S. Pat. 720,969, Feb. 17, 1903.

ore-roasting furnace consisting of two parallel, rec-gular structures, side by side, separated by a space, each ntaining a longitudinal series of independent roasting-ambers and a series of two-storied independent combustion d waste-product chambers ; a railway delivering ore to the shoots of each series of roasting-chambers ; and a railway at the bottom between the two structures for removal of the roasted ore (see also Eng. Pat. 6385 of 1902 ; this Journal, 1902, 1081).—H. B.

Furnace. S. P. Smith, Waterford, N.Y. U.S. Pat. 719,271, Jan. 27, 1903.

The furnace is domed and closed at the top ; the flue projecting into the space below the dome is provided with an outer jacket through which air is admitted. Special provisions are made also in other ways for heating the air. —W. G. M.

Blast-Furnaces ; Method of introducing Carbon, Fluxes, &c. into ——. W. J. Foster, Darlaston, Eng. U.S. Pat. 719,320, Jan. 27, 1903.

See Eng. Pats. 9346 of 1900, and 4147 of 1901 ; this Journal, 1901, 903 ; 1902, 349.—W. G. M.

Furnace Apparatus [Ores, Metals, &c.]. F. H. Foote and T. W. Robinson, Chicago, Ill. U.S. Pat. 720,125, Feb. 10, 1903.

This apparatus comprises a furnace in combination with one or more ore bins provided with heating-jackets, one or more stoves or combustion-chambers, and conveying apparatus constructed and arranged to convey the material from the bins to the top of the furnace. An offtake flue conducts the combustible gases from the top of the furnace to the lower portion of the combustion-chambers, and the products of combustion are led from these chambers through connecting flues and passages to the heating-jackets of the bins.—R. A.

Zinc Smelting Furnace. J. P. Cappeau, Joplin, Mo. U.S. Pat. 720,664, Feb. 17, 1903.

"The combination with a zinc-smelting furnace, of a series of air-pipes arranged at intervals at the front of the furnace, a main air-passage adjacent to the lower ends of the air-pipes, communicating with them, and open at its ends to the outer air, discharge-ports in the air-pipes communicating with the interior of the furnace adjacent to the retorts, gas-pipes arranged adjacent to the discharge-ports, and means for conveying gas to said pipes, whereby air and gas are conveyed and distributed at numerous intervals to the furnace adjacent to the retorts." (See also U.S. Pat. 691,112, Jan. 14, 1902 ; this Journal, 1902, 483.)—E. S.

Welding Compounds ; Process of Manufacturing ——. P. Vervaet, Paterson, N.J. U.S. Pat. 720,300, Feb. 10, 1903.

Molten glass and molten borax are associated to form a homogeneous mass, which, after cooling and hardening, is reduced to a powder for the purposes of the invention. —E. S.

[Metal] Cleaning and Polishing Compound. P. Levi, Brooklyn, N.Y. U.S. Pat. 721,053, Feb. 17, 1903.

A mixture of paraffin oil, 8 galls. ; water, 2 galls. ; and antimony trichloride, 2 oz. Finely-divided antimony oxychloride precipitates and hydrochloric acid are set free in the compound, the former constituting the polishing, and the oil and acid, the cleansing agent.—E. S.

French Patents.

Iron Ores ; Enrichment of ——. R. Renard and A. Becker. Fr. Pat. 322,504, June 27, 1902.

See Eng. Pat. 14,970 of 1902 ; this Journal, 1902, 1333. —J. H. C.

Aluminium ; Manufacture of ——. W. Rubel and N. Bernstein. Fr. Pat. 322,353, June 20, 1903.

Clay is heated to about 1800° C. and afterwards ground up with phosphate of lime or some substance containing that body, sulphuric acid, and a hydrocarbon such as petroleum. The mixture is covered with a layer of carbon, placed in covered crucibles and heated to 1000° or even 2000° C.

After cooling, a button of aluminium is found beneath the pulverulent scoria. In some cases gypsum is used instead of sulphuric acid.—J. H. C.

Nickel and Copper: Treatment of Minerals containing ——. C. Perron. Fr. Pat. 322,430, June 20, 1902.

See U.S. Pat. 709,277 of 1902; this Journal, 1902, 1281.
—J. H. C.

Copper Matte; Reduction of ——. G. Mitchell. Fr. Pat. 322,796, July 5, 1902.

See U.S. Pat. 705,109 of 1902; this Journal, 1902, 1081.
—J. H. C.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

English Patent.

Plates; Manufacture of Planté Electric Accumulator ——. The Accumulator Industries, Ltd., Woking, and J. J. H. Hunte, Charlton. Eng. Pat. 6301, March 11, 1902.

Lead plates of suitable form are subjected to the chemical action of oxygen and chlorine by passing a current through them arranged as anodes in an electrolyte consisting of a solution of an alkali sulphate, such as sodium sulphate, in which is dissolved a chloride of a metal, preferably sodium chloride, and a permanganate of a metal or sulphate of manganese, whereby chemical compounds of lead with oxygen and chlorine are produced. A current is next passed through the plates arranged as cathodes in an electrolyte consisting of a solution of sodium sulphate and sodium chloride, whereby the compounds containing lead and chlorine are broken up, the chlorine completely removed, and the higher oxygen compounds reduced to lead and its lower oxides, and the original plates are converted into plates with a core of lead over which a porous mixture of reduced lead and lead oxide is laid. The plates are subsequently charged, arranged as anodes in an electrolyte.—G. H. R.

United States Patents.

Battery; Storage ——. C. H. Everett, Atlanta, Ga. U.S. Pat. 719,315, Jan. 27, 1903.

The battery plate has a support with arms extending laterally from it, the arms being unconnected at the outer ends, but having corrugated sheet metal strips mounted upon them, with perforations to allow of the electrolyte circulating in the interior of the plates.—W. G. M.

Battery; Secondary ——. [*Central Electrode.*] F. Buchanan, Dayton, Ohio. U.S. Pat. 720,321, Feb. 10, 1903.

The battery is formed of three or more concentric, tubular lead electrodes, the outermost constituting the containing cell, and having suitable spaces on its inner side for the active material. The central electrode has similar spaces on its outer surface, and it and the outer tube constitute each an electrode of single polarity. A concentric tube intervenes between the other two, and supports the active material on both sides, constituting bipolar electrodes, and dividing the electrolyte from the other cells. Means are provided for insulating and maintaining the tubes in suitable relative positions.—G. H. R.

Plates; Process of Preparing Storage Battery ——. R. N. Chamberlain, Assignor to Gould Storage Battery Co., both of New York. U.S. Pat. 720,326, Feb. 10, 1903.

The plates are exposed to electrolytic action as anodes in a solution capable of dissolving lead, such as nitric acid, whereby they are cleaned and roughened, and a solution of lead is produced, which is then redeposited on a cathode, and the anodes are removed and formed.—G. H. R.

Diaphragm: Electrolytic ——, *and Process of Making Same.* H. Rodman, Philadelphia, Pa., U.S.A. U.S. Pat. 720,741, Feb. 17, 1903.

Porous electrolytic diaphragms of hardened, inert gum or rubber are made by mixing crude rubber, sulphur and potassium sulphate, moulding and hardening (vulcanising) the mixture, and afterwards dissolving out the soluble potassium sulphate.—W. C. H.

Materials from Fluids; Apparatus for Electro-endosmotically freeing ——. B. Schwerin, Berlin. U.S. Pat. 720,186, Feb. 10, 1903.

See Eng. Pat. 22,301 of 1901; this Journal, 1902, 1335.
—G. H. R.

Water; Apparatus for Decomposing ——, *by Electrolysis.* W. F. M. McCarty, Rockyridge, Md., Assignor to A. Coppell, New York. U.S. Pat. 721,068, Feb. 17, 1903.

Two upright water-jacketed tanks each contain an electrode, suitably supported, the upper end of which is located between the upper and lower edge of a conduit which connects the tanks about half-way up. There is an inlet that can be closed in one of the tanks above its normal water level, and a water-supply pipe communicates with th other.—G. H. R.

French Patents.

Accumulators: Electric ——. P. E. Placet. Fr. Pat. 322,431, Jan. 20, 1903.

A very thin sheet of lead is wrapped many times round a core of lead or lead alloy of any suitable shape—hollow, flat, round, or square—and is then perforated with a great number of holes to allow of the circulation and chemical action of the electrolyte. The whole is then enveloped in an elastic tissue sewn through and through, so as to form rows of stitching in order to prevent the displacement and fall of the spongy lead and peroxide.—G. H. R.

Insulated Wires; Manufacture of ——. J. A. Heany (John Allen). Fr. Pat. 322,418, June 24, 1902.

This is a machine for the manufacture of insulating wires by the process described in Fr. Pat. 322,449 (see following abstract). The bare wire is passed through a bath of the viscous material, and fibrous incombustible material—such as asbestos—is blown, by a current of air, on to the adhesive coating on the wire, the whole covering being then pressed on to the wire by passing between two pairs of grooved pressing-rolls placed one above the other, and at right angles to each other. The wire, coated with the adhesive, passes upwards through a pipe in the centre of a drum, which is divided into two main compartments by a slanting partition, down the upper surface of which the incombustible material slides, and at the bottom of the slope is cut into shreds by a wheel with projecting teeth; from this wheel the material is passed by a conveyer into a hopper at the bottom of which it meets a current of air, from a fan, which forces it on to the wi as it passes upwards through the centre of the drum.
—W. C. H.

Electric Wires; Insulation of ——. J. A. Heany. Fr. Pat. 322,149, June 24, 1902.

The metallic wire is first coated with a more or less viscous and adhesive paste of sodium silicate and manganese oxide, and on this coating fibrous asbestos is sprinkled, this loo covering being afterwards compacted and incorporated with the underlying viscous paste by the application of heat and pressure.—W. C. H.

[*Insulating*] *Materials for Metallic Surfaces or Conductors.* J. A. Heany. Fr. Pat. 322,627, June 24, 1902.

See Eng. Pat. 17,714, 1902; this Journal, 1902, 1282; also U.S. Pats. 703,198; 703,200; and 703,201; this Journal, 1902, 979.—W. C. H.

Water-, Acid-, and Fire-Proof Insulating Compositions; Manufacture of ——. J. A. Heany. Fr. Pat. 322,628, June 24, 1902.

See U.S. Pat. 703,199; this Journal, 1902, 979.
—W. C. H.

Insulation of Metallic Surfaces or Wires, and the Preparation of Fibrous Asbestos for that Purpose. J. A. Heany. Fr. Pat. 322,629, June 24, 1902

See U.S. Pats. 703,198; 703,200; 703,201; this Journal, 1902, 979.—W. C. H.

(*B.*)—ELECTRO-METALLURGY.

Sodium Amalgam; Electrolytic Preparation of ——. F. S. Shepherd. J. of Phys. Chem., **7**, 29—30. Chem. Centr., 1903, **1**, [8], 435.

The ordinary electrolytic method for the preparation of sodium amalgam suffers from the defect, that the amalgam, being lighter than the mercury, floats on the surface of the latter and separates it from the electrolyte. The author uses an earthenware cell, filled with mercury, which dips just below the surface of a saturated solution of sodium chloride. If the cell has been previously boiled in sodium chloride solution, an average tension of 7 volts is sufficient, as compared with 14 volts in the ordinary method. The drops of water which soak through the diaphragm can be removed by blotting-paper; a more satisfactory method is to cover the mercury with a layer of fused naphthalene, the spirting caused by water coming in contact with the amalgam, being in this way avoided. Experiments were carried out at temperatures between 30° and 95° C., and with current densities ranging from 10·5 to 4 ampères per sq. decigrm. The best yield was obtained at the higher temperature. The highest proportion of sodium contained in the amalgams prepared was 1·6 per cent.—A. S.

English Patents.

Metals and other Substances; Process for the Electric Heating and Refining of ——. C. A. Keller, Paris. Eng. Pat. 15,271, July 8, 1902.

An auxiliary feed chamber is employed in connection with electric or other smelting furnaces, which takes the form of a tapping ladle mounted on a movable truck, enabling it to be moved close to each furnace of a battery, to receive its tappings, and to be passed under a group or groups of vertical electrodes plunged into the fused material coming from the furnace, to place it in the electric circuit and maintain it at the requisite temperature for mixing and refining in the auxiliary chamber, and for subsequent casting into moulds. The successive tappings allow of a much larger quantity of melted material accumulating in the ladle than could be obtained for immediate casting, thus making large castings with a small quantity of material from each. The vertical electrodes are arranged in groups comprising two or more positive and negative electrodes respectively, each group belonging to a separate "regulable" furnace, so that an electrode can be replaced without stopping the operation. Another arrangement consists of a cupola, the front basin of which replaces the ladle, and receives the fused material into which movable vertical electrodes descend, and maintain it at the temperature required for refining the casting, and its direct transformation into steel. The second melting, or the refining of waste iron or steel, is effected by introducing it into a preliminary bath of suitable composition, contained in a ladle provided with movable electrodes which permit of melting with currents of the usual strength without sudden fluctuations.—G. H. R.

Compounds; Reduction of ——, by Electrical Heating, and Apparatus therefor. E. G. Acheson, Niagara Falls, N.Y. Eng. Pat. 27,179, Dec. 9, 1902.

See U.S. Pat. 718,892 of 1903; this Journal, 1903, 217.
-G. H. R.

Generation and Electrolytic Application of Electric Currents: Apparatus for the ——. [*Electro-deposition of Metals.*] F. E. Elmore, London, Eng. Pat. 26,673, Dec. 31, 1901.

A convenient form of unipolar dynamo electric machine applicable for the electrolytic deposition of copper and other metals, has its armature in direct electrical connection with the positive or negative electrodes of an electrolytic cell. The cathodes, in the form of concentric cylindrical shells, are suspended from a disc fixed on the vertical rotating shaft, and dip into a cylindrical tank, on the bottom of which are fixed the anodes which also form concentric cylindrical shells standing up between the cathodes. From the periphery of the disc, which extends beyond the cell, a flange projects downwards, and passing between the poles of a cylindrical electromagnet surrounding the cell, it dips into a tank containing an alloy of mercury and lead. A cylindrical conductor is carried from the trough up the air gap of the magnet, and thence to the conducting walls of the cell. Upon rotation of the disc, an electro-motive force is set up between the upper and lower parts of the flange, and the cathode cylinders being in electrical contact with the upper part of it, a current is generated which passes from the mercury alloy to the anodes. From these it passes through the electrolyte to the cathode, and back to the upper part of the flange, causing a deposit of metal on both sides of the cathode. It is claimed that as the metal is deposited on moving cathodes from stationary anodes, a very rapid rate of deposit can be attained without the necessity for using pumps for the rapid circulation of the electrolyte.—G. H. R.

United States Patent.

Furnace; Electric ——. [*Oven.*] J. F. Hammond, New York. U.S. Pat. 720,024, Feb. 10, 1903.

The oven in this electric furnace comprises a casing formed of upper and lower sections, a dome-muffle being removably incased in, and supported by the furnace. The lower part has separable slabs incased in it, the middle one being movable vertically and laterally. It is electrically wired, and means are provided for carrying a constant current to it, and for making an air-tight joint between the upper and lower sections, and between the inner and outer portions of the latter. The oven has a vertically-movable bottom, a vertical turn-post, and a support connected by a pivot with them to admit of vertical and lateral adjustment of the bottom which has guides of different lengths for directing its movements, and for allowing it to swing laterally in one direction only. A counter-balance lever, attached by a fulcrum to the turn-post, normally holds the oven bottom in an elevated position, and serves as a handle for manipulating it, and an arm on the lever holds the bottom in a depressed position. The cover of the casing is composed of a crown and a lower portion, the lower edges of the former being confined in recesses in the upper edges of the lower part, and a hinge joint between them comprises lugs, a sleeve secured to one of them, and loosely fitted in the other, a pin passing through the sleeve and electrically insulated from it, and having a binding post at one end, and clamp-nuts at the other.
—G. H. R.

French Patent.

Metals and other Substances; Process for the Electric Heating and Refining of ——. C. A. Keller. Fr. Pat. 322,700, July 2, 1902.

See Eng. Pat. 15,271, 1902; col. 1.—G. H. R.

XII.—FATS, FATTY OILS, & SOAP.

Fats; Separation of the Unsaturated Fatty Acids of ——. K. Farnsteiner. Zeits. Unters. Nahr.- u. Genussm., 1903, **6**, [4], 161—166.

In this paper, which is mainly controversial, the author defends his method for the determination of unsaturated fatty acids (see this Journal, 1899, 500). The author has determined the solubility of pure barium oleate in benzene, to which had been added small quantities of absolute alcohol, 95 per cent. alcohol, and 99½ per cent. methyl alcohol respectively. The barium oleate was heated with the solvent till completely dissolved, and the solution, after cooling, allowed to stand for 21—23 hours, with frequent shaking. An aliquot portion (30—50 c.c.) of the liquid was then rapidly filtered, the solvent distilled off, and the residue weighed. The results obtained, are given in the following table :—

Solubility of Pure Barium Oleate in Benzene, with Additions of—

Absolute Alcohol.			95 per Cent. Alcohol.			99½ per Cent. Methyl Alcohol.		
Amount of Alcohol added to 100 c.c. of Benzene.	Amount of Barium Oleate contained in 100 c.c. of Solvent.	Temperature.	Amount of Alcohol added to 100 c.c. of Benzene.	Amount of Barium Oleate contained in 100 c.c. of Solvent.	Temperature.	Amount of Alcohol added to 100 c.c. of Benzene.	Amount of Barium Oleate contained in 100 c.c. of Solvent.	Temperature.
c.c.	Grm.	C.	C.c.	Grm.	° C.	c.c.	Grm.	° C.
5	0·010	9—10	5	0·018	9—10	5	0·013	9—10
5	0·013	11·5	5	0·020	11	5	0·013	11·5
..	..	..	5	0·023	11·5	..	..	..
..	..	..	20	0·049	10	20	0·034	10
..	..	..	100	0·030	9·5	100	0·053	10
..	..	..	200	0·032	9·5	200	0·052	9·5
..	..	..	200	0·028	9·5	..	..	..
..	..	..	Pure 95 per cent. alcohol	0·022	11	Pure 99½ per cent. methyl alcohol.	0·039	11

(See also Lewkowitsch ; this Journal, 1900, 381.)
—A. S.

Disinfectant Soaps. F. Tonzig. Monat. f. pr. Derm., 1902, 318. Pharm. J., 1903, **70**, [1704], 233.

The author concludes, from the results of experiments, that the addition of disinfectants to soap is useless, as, when mingled with the latter, they appear to lose their specific action.—A. S.

English Patents.

Fats or Fatty Oils ; Process for the Purification of ——. J. Klimont, Vienna. Eng. Pat. 3164, Feb. 7, 1902.

The fat, after treatment with alkalis or alkaline salts, is subjected to the action of superheated steam to remove volatile aldehydes, terpenes, &c., and also to a process for separating non-volatile impurities, such as heating the oil to a temperature above 100° C., or treating it with substances that combine with the impurities (*e.g.*, compounds of alkaline-earth metals), or with a solvent (*e.g.*, acetone) that will dissolve the oil and precipitate the impurities. (See also U.S. Pat. 719,014 of 1903 ; this Journal, 1903, 218).—C. A. M.

Fish Waste and other Oil-yieldable Material ; Rendering or Reducing Apparatus suitable for Treatment of ——. R. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 18,741, Aug. 26, 1902.

See U.S. Pat. 707,567 of 1902 ; this Journal, 1902, 1238.
—C. A. M.

Fish Waste and other Material capable of Yielding Grease, Oil, or Gelatin ; Treatment of ——. R. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 18,742, Aug. 26, 1902.

See U.S. Pat. 707,566 of 1902 ; this Journal, 1902, 1238.
—C. A. M.

United States Patents.

Oil from Seeds ; Apparatus for Automatically Extracting ——. A. B. Lawther, Syracuse, N.Y., Assignor to F. O. Swannell, Chicago, Ill. U.S. Pat. 720,532, Feb. 10, 1903.

The meal from the seeds is heated and compressed through an opening by means of a special plunger which extrudes it on to a travelling table, where it is cut off into cake lengths. Each cake is then mechanically wrapped in its cloth and conveyed to the chamber of a press which works vertically with a step-by-step motion, pressing each in turn. Or the cakes may be conveyed to chambers on a rotating table which brings them each in turn under a series of hydraulic presses raised and lowered by hydraulic cylinders, set in action by the cylinder moving the turntable. Or a series of hydraulic presses may be carried on a turn-table.—C. A. M.

Soap ; Apparatus for Manufacturing ——. J. Schweebler, Philadelphia, Pa., Assignor to W. Cavenagh, New York. U.S. Pat. 720,535, Feb. 10, 1903.

The soap is "formed" by being forced through a plate attached to the discharge nozzle of the apparatus. This plate has an opening with bevelled walls, one of which may be flat, whilst a "core member" attached to its face is deflected so as to be in a line with the opening.
—C. A. M

French Patents.

Grease [Elastic] for Mechanical Applications. C. Répi. Fr. Pat. 322,716, June 20, 1902.

About 40 per cent. of elæococca (tung) oil is added to a fat or fats solid at the ordinary temperature.
—C. A. M.

Fats ; Emulsification [Saponification] of ——. F. Perrelet. Fr. Pat. 322,777, July 4, 1902.

The fat, liquefied by heat if necessary, is forced out by a jet and at the moment of issuing impinges upon a current of the reagent (acid, base, &c.) forced out from an opposite jet, the substances being thus reduced to an extremely fine state of division.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

United States Patent.

Lead Pigments ; Process of Manufacturing ——. A. C. Charlier, Glasgow. U.S. Pat. 720,670, Feb. 17, 1903

White-lead is produced by treating litharge, in contact with acidified water, with carbon dioxide at a pressure of about 200 lb. (See also Eng. Pat. 5,637 of 1902 ; this Journal, 1902, 1285.)—C. A. M.

(*B.*)—RESINS, VARNISHES.

English Patents.

Linoleum or like Material ; Manufacture of ——. J. Mensik, Deutschbrod, Austria. Eng. Pat. 9211, April 21, 1902.

Casein, glue, or other proteid substance of like nature is dissolved in an aqueous solution of a hygroscopic salt (*e.g.*, magnesium chloride, zinc chloride, &c.) and the solution coagulated by the addition of oak-wood extract and mixed with resin soap or a soapy oil or fat, and a large amount of powdered cork, wood pulp, or sawdust. A small proportion of formaldehyde (about 5 per cent.) is then added to prevent swelling, and to render the material nsoluble, and the mass pressed and rolled into sheets with or without the addition of any fabric, such as paper, ute, &c.—C. A. M.

Water-proofing Composition [*for Textile Fabrics, Leather*]. G. F. Newman, Peel Forest, Canterbury, New Zealand. Eng. Pat. 28,410, Dec. 23, 1902.

A MIXTURE, in approximately the proportions named, of boiled linseed oil ($1\frac{1}{2}$ galls.), castor oil ($\frac{1}{2}$ gall.), sulphur 2 oz.), and driers (2 lb.) is boiled for three to five minutes, and after slightly cooling, applied to the fabric so as to form three coatings, the material being dried between each application.—C. A. M.

(*C.*)—INDIA-RUBBER.

Rubber-Plant of Lower Congo. E. D. Wildeman. Comptes rend., **136**, [6], 399.

The author points out that most caoutchouc-bearing plants belong to the species "*Apocynaces*," but ought to be divided into different classes, and not wholly placed under he one head of "*Landolphia.*"

A botanical description is given of a plant which comes rom Lower Congo. It appears to belong to the class *Clitandra*, and to resemble closely *Clitandra orientalis*, a native of German East Africa. The caoutchouc is extracted from the plant by boiling with water.

The author states that he hopes later on to furnish some account of the commercial value of the rubber-bearing plants of *Clitandra*, among which may be mentioned *C. Henriquesiana* and *C. cirrhosa*.—T. F. B.

Rubber; Drying of Washed ——. C. O Weber. Gummi-Zeit., 1903, **17**, [22], 478. (See this Journal, 1903, 219.)

The bulk of the water to be removed from washed raw rubber sheets is on the surface of the sheets, and can be removed, by the use of a vacuum drying chamber, within 30 minutes, whereas one and a half days would be required n an ordinary drying room, maintained at a temperature of 50° C. The water enclosed in a sheet which is already dry on the surface, is not removed so quickly by an increase of emperature as one would expect, since it can only escape by diffusion through the caoutchouc septum. The rate of diffusion is influenced more by the composition of the atmosphere surrounding it than by its pressure and temperature. In a vacuum-chamber the atmosphere is practically water-vapour, and is therefore most unfavourable to a rapid rate of diffusion. The author therefore suggests, hat the raw rubber sheets should first be placed in a vacuum chamber to remove surface moisture, and then removed to a drying room, in which the air is made to circulate, to remove the enclosed water, the incoming air being entirely free from water-vapour.

He is of opinion that porosity in finished goods is much more frequently due to the composition of the "mixings" used, especially the quantity of sulphur, than to moisture in he mixings, since it is a very simple thing to produce goods ntirely free from porosity, from mixings containing 10 per ent. of water.—J. K. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patents.

Leather, Artificial; Manufacture of ——. G. S. Falkenstein and C. Falkenstein, Philadelphia, U.S.A. Eng. Pat. 26,596, Dec. 2, 1902.

SEE U S. Pat. 714,791, Dec. 2, 1902; this Journal, 1903, 37. —R. L. J.

Waterproofing Composition [*for Leather*]. G. F. Newman. Eng. Pat. 28,410, Dec. 23, 1902. XIII. B., above.

United States Patent.

Tannin Extracts; Process of Making Decolorised ——. G. Klenk, Hamburg, Germany. U.S. Pat. 720,157, Feb. 10, 1903.

SEE Eng. Pat. 25,063, Dec. 9, 1901; this Journal, 1902, 1462.—R. L. J.

French Patent.

[*Artificial Horn, Shell, &c.*] "*Galalith*"; *Manufacture of* ——. Cie. Française de la Galalith. Fr. Pat. 322,554, June 27, 1902.

GALALITH prepared according to Fr. Pat. 292,705, by the action of alkali-lye on casein, is further modified for special purposes by mixing it with alkaline extracts of epidermal tissue of various kinds.—R. L. J.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Beet; Respiration of the ——. F. Strohmer. Oesterr.-ung. Zeits. Zucker-Ind. u. Landw., **31**, 933—1009. Chem. Centr., 1903, **1**, [8], 471.

IN order to ascertain the causes of the loss of sugar on keeping beets, the author made a series of quantitative experiments as to the influence of certain conditions on the respiration. He concludes that whilst a loss of sugar during the storing of beets cannot be prevented, it can be appreciably diminished if provision be made for the presence of the small amount of cold air required for maintaining the necessary respiration, and the temperature be kept low, though not under − 1° C.—A. S.

Maltose; Detection of Small Quantities of ——, *in Presence of Glucose.* L. Grimbert. XXIII., page 382.

English Patent.

Maltose Syrups and Sugars; Process of Producing ——. C. B. Duryea, Sioux City, U.S.A. Eng. Pat. 22,537, Oct. 16, 1902.

THIS process consists in heating the starch with a very dilute acid so as to produce "a thin boiling or modified starch"; neutralising the acid, treating the mass with malt or malt extract, "and finally separating the maltose from the mass."—T. H. P.

United States Patents.

Evaporating Apparatus [*Sugar*]. O. M. Nilson, Mansfield, La. U.S. Pat. 720,465, Feb. 10, 1903.

THE syrup reservoir is arranged within and heated by a furnace, from which the products of combustion pass upwards through a vertical drum, and then through a horizontal flue arranged beneath the clarifier. The reservoir is connected to the clarifier by a series of normally heated tubes located within the drum, and also by a series of normally cool pipes outside the drum, this arrangement serving to effect the circulation of the syrup. (See also U.S. Pat. 698,733; this Journal, 1902, 783.)—R. A.

Cornstalks or Analogous Plants; Manufacturing Products from ——. G. R. Sherwood, Chicago, Ill. U.S. Pat. 720,850, Feb. 17, 1903.

THE pith of the stalks of Indian corn is separated from the shell, and digested by boiling in a suitable chemical solution until a plastic and adhesive or glutinous substance is formed.—W. P. S.

Cornstalks or Analogous Plants; Manufacturing Products from ——. G. R. Sherwood, Oakpark, Ill., Assignor to National Fibre and Cellulose Co., Chicago, Ill. U.S. Pat. 720,851, Feb. 17, 1903.

THE product claimed, is obtained by mixing, in any desired proportion, the substances formed on separately digesting the pith and fibrous portions of the stalks of Indian corn or similar plants.—W. P. S.

Molasses; Process of Fermentation of ——, without previous Denitration. G. Jacquemin. Fr. Pat. 322,381, June 23, 1902. XVII., page 375.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeasts; Behaviour of ——, in Mineral Nutritive Solutions. A. Kossowicz. Zeits. landw. Vers. Wes. Öst., **6**, 27—59. Chem. Centr., 1903, **1**, [8], 175.

The author has examined the behaviour of various yeasts in molasses solutions. With certain kinds of yeast the production of a reddish-yellow colouring matter was observed, the formation being dependent upon the presence and amount of magnesium salts. The amount of potassium salts is also of some influence, whilst certain organic compounds, *e.g.*, asparagine and tartaric acid, have a prejudicial effect on the formation of the colouring matter. The presence of a large amount of potassium salts retards the fermentation; the retardation is, in general, greater with salts of low molecular weight, but the degree of dissociation of the salts also appears to have no effect. If the amount of potassium salts added is not very great, the yeast soon becomes habituated thereto, and with lower concentrations the fermentation is even favoured. Variations in the amount of potassium salts present, such as occur in the mashes of the molasses distillery, can appreciably influence the course of the fermentation.

The multiplication of the yeast cells is strongly diminished by the presence of a large quantity of a potassium salt. In nutritive solutions containing equal amounts of potassium salts, the degree of propagation is approximately the same. A considerable degree of fermentation with vigorous evolution of carbon dioxide was not observed. The author confirms Wildiers' statement that the presence of certain organic compounds is necessary for fermentation, if by the latter a perceptible evolution of carbon dioxide is understood. He concludes that, whilst the presence of other organic compounds besides sugar is not necessary for the propagation of the yeast, yet these compounds have a great influence on the rate of propagation and, still more, on the fermentation.—A. S.

Beer Yeast; Influence of High Concentration of Salts on the Activity of ——. A. J. J. Vandevelde. Bull. Acad. roy. Belgique, **16**, 374—384. Chem. Centr., 1903, **1**, [7], 411.

The author added sodium, potassium, ammonium, calcium, and barium chlorides; sodium, ammonium, and magnesium sulphates; sodium chlorate, sodium thiosulphate, and ammonium nitrate up to a concentration of one-tenth; and disodium phosphate and potassium ferrocyanide up to a concentration of one-twentieth of a molecular weight, to a sugar-yeast solution. The course of the fermentation was followed by determining the amount of carbon dioxide evolved. It was found that the high concentrations of salts somewhat retarded the fermentation, but that, after a certain time, the same amount of sugar was destroyed as in a solution to which no salts had been added.—A. S.

Fungi; Enzymes in Fermentations by Fission ——. E. Buchner and J. Meisenheimer. Ber., 1903, **36**, [3], 634—638.

The isolation of the fermentative enzymes of the fission fungi (bacteria) in the form of expressed cell juices was abandoned on account of the difficulty of obtaining sufficient cell material with which to work. Recourse was therefore had to the method of killing the cells, without destroying the enzymes, by treatment with acetone.

Lactic Acid Fermentation.—Pure cultures of *Bacillus Delbruckii*, the bacillus concerned in souring distillery mashes, were made and the cells were separated by centrifugalising; the latter were then treated with acetone, and dried. Portions of the dry preparations were triturated with pure sand and a little water until the cells were broken up. The mixture was digested with solutions of cane-sugar at 30° C. for four days, in presence of a little toluene, the complete sterility of the solutions being also demonstrated. In all cases a distinct quantity of lactic acid was produced, and the yield was very materially increased by the presence of calcium carbonate during fermentation, 0·9 grm. of zinc lactate being isolated from the products of the action of 6·5 grms. of dry cells.

Acetic Fermentation.—The bacterium of beer vinegar was employed, the films being collected from the surface of the culture liquids and treated directly with acetone. The dried, dead cells were triturated with sand and kieselguhr, and digested for three days with 4 per cent. alcohol at 30° C. in presence of toluene. Here also the presence of calcium carbonate had a marked effect on the yield; 0·4 grm. of acetic acid was recovered by distillation from the products of the action of 8·7 grms. of dry bacteria.
—J. F. B.

Enzyme which Effects the Anaërobic Respiration of the Cells of the Higher Plants and Animals; Isolation of the ——. J. Stoklasa and F. Czerny. Ber., 1903, **36**, [3], 622—634.

The authors have succeeded in separating, from higher plants and from some of the organs of the higher animals, an enzyme capable of inducing vigorous fermentation in solutions of dextrose or levulose. The method used for isolating the enzyme was Albert's modification of that of Buchner, and the materials treated were sugar beets (*Beta vulgaris*), potato nodules (*Solanum tuberosum*), peas (*Pisum sativum*), beef, ox lungs, and various organs of the dog and goose. The relation between the amounts of carbon dioxide and alcohol formed in the fermentations brought about by the enzyme, thus obtained, is the same as exists in yeast fermentation. The experimental results show that the fermentative enzyme is secreted by the plant cell during normal respiration. There is hence a genetic connection between aërobic and anaërobic respiration.—T. H. P.

Barley; Determining the Germinative Power of ——. H. Fichtner. Allgem. Zeits. f. Bierbrau. u. Malzfabr., **31**, 62. Chem.-Zeit., **27**, [15], Rep. 44.

Urban recently proposed that the germinative power of barley should be tested by boiling the corns a few minutes in water and then applying pressure. Such of them as allow the embryo to protrude under this treatment are to be considered as capable of germinating, the others not. The author, however, finds that the results of the Urban test are unaffected by boiling the corns for 12 hours in a 1 per cent. solution of mercuric chloride, which certainly destroys the vitality of the embryo. In certain other samples where the Urban test gave 98—100 per cent. of germinating corns, practical tests showed only 51—76 per cent.; hence the former method affords no reliable indication of the germinative power.—C. S.

Malt Worts; Influence of Various Conditions in the Malt on the Composition of ——. E. Jalowetz and G. Ewald. Woch. f. Brau., 1903, **20**, [10], 109—111.

A sample of pale brewery malt was subjected to a series of mechanical sortings according to the various factors dealt with below. Each grade was then mashed separately under identical conditions, and the results were compared amongst themselves and with the original malt. Special attention was paid to the composition of the worts with regard to residual apparent maltose and dextrin after fermentation with Frohberg yeast.

Influence of the Steeliness of the Endosperm.—The malt was graded by means of the diaphanoscope into four grades ranging from mealy to steely. The results followed the order of the grades; the more mealy corns gave higher yields of extract, smaller differences between the results from coarse grist and fine meal, higher percentage of maltose in the worts, more rapid saccharification, clearer and paler worts than the more steely corns. After fermentation the apparent residual maltose was practically the same for all grades, but the residual dextrin increased with increasing steeliness, the differences being greater with coarse grist than with fine meal, owing to restricted saccharification.

Influence of Length of Acrospire.—Four grades were sorted out, *viz.*, under 2/3, 2/3, 3/4, and 1/1; the two medium grades being by far the most numerous. The hortest and longest growths of acrospire gave slightly igher yields of extract than the medium grades, the pparent maltose of the worts being practically identical. he apparent unfermented maltose decreased as the length f the acrospire increased up to 3/4, but increased again omewhat in the case of the full-length growths. The esidual dextrin showed a steady decrease with increased ength of acrospire. The regulation of the growth of the crospire is one of the most important means of determining he character and attenuation of the beer; the corns with ull-length acrospires, being relatively "forced," yield beers oor in dextrin and highly attenuated.

Influence of the Size of the Corns.—The malt was eparated into three grades by means of sieves of 2·8, 2·5, nd 2·2 mm. meshes. The yield of extract increased with he size of the corns, the differences being considerably reater in the case of coarse grist than with fine meal. he apparent maltose in the fermented worts varied within arrow limits, whilst the residual dextrin increased slightly ith the size of the corns. These conclusions relate, however, only to the particular case under observation.

Influence of the Material.—The malt was ground and ifted into husks, grist, and flour. The yields from the ifferent portions differed considerably, as might be expected, ut the carbohydrates of the fermented worts showed ractically identical values.—J. F. B.

Mashing; Relative Merits of the Short High-Temperature Process and the Three-Mash Decoction Process of ——. Wiedling. Woch. f. Brau., 1903, **20**, [8]. 82—84.

T has been asserted that the short, high-temperature nashing process gives lower yields than the ordinary hree-mash decoction method; the author's experience hows, however, that practically identical yields are btained, and that with a well-modified malt, the yield of xtract depends not on the method of mashing, but rather n the suitable running-off of the wort. A main condition f the short-mashing process is that, as soon as the first ecoction has been boiled for five minutes, and the residual nash has to be brought to a temperature of 70° C., careful ttention should be paid to the thermometer, and the emperature of 70° C. should be absolutely maintained for ne hour, with occasional stirring and admission of a little team.

No doubt, with a badly modified malt, five minutes' oiling is not sufficient to effect the gelatinisation of all he starch, but it is not difficult to ensure properly modified nalt, and even the three-mash decoction process does not ive good yields if modification is deficient. The proortion of main wort to spargings is chosen so that if a inal wort of 12° Balling be required, the main wort should un off at 20° Balling. The bed of grains should then not e disturbed, but treated with a small quantity of water at 5° C. to wash out the strong wort. The grains should hen be raked up and sparged with water at 81° C., allowed o settle for 20 minutes, and again drained. The grains re next agitated with boiling water and allowed to settle or 15 minutes, this liquor also being run off into the opper. In order to obtain the highest yield, the grains nay receive another treatment with boiling water, and the iquor used for the next day's brewing, being kept over ight at a temperature of 75° C. When working with the hort-mashing process, the author has never been troubled with the straw-like flavour due to the husks, which is liable o occur with the three-mash decoction process due to the rolonged boiling of the mash. Windisch has found that luten-cloudiness may occur in beers brewed in steamheated coppers, owing to the coils being situated so far rom the bottom of the copper that the lower portions of he wort never enter into full ebullition. The author onfirms this fact, especially with the short-mashing process, ecause of the restricted boiling of the mash. If, however, the coils be rightly placed and the steam pressure be ufficient, no trouble occurs. The short-mashing process ends to give beers with more "body" and head-retaining ualities. With barley rich in protein, it is desirable to oil the wort for a long time, fully two hours. The mashing process is found to have little influence on the stability of he beer.—J. F. B.

Absinthe; Determination of Essential Oils in ——. Sanglé-Ferrière and Cunisse. XXIII., page 383.

English Patent.

Filter-presses [*Brewers' Mash, &c.*]. G. G. M. Hardingham, London. From H. Johnson, Brussels. Eng. Pat. 8015, April 5, 1902.

The filter-plates are formed with major grooves or corrugations, to provide for the stretching and consequent sagging of the filter-cloth, and in the surfaces of the major grooves smaller minor grooves are formed to serve as drainage channels. The intervening ridges of the minor grooves serve also to support the filter-cloth when moderately sagged.—R. A.

French Patents.

Malt; Preparation of Unroasted and Kilned ——. V. Lapp. Fr. Pat. 322,768, July 3, 1902.

See Eng. Pat. 21,749 of 1902; this Journal, 1903, 40.
—J. F. B.

Fermentation of Molasses; Process of ——, *without Previous Denitration.* G. Jacquemin. Fr. Pat. 322,381, June 23, 1902.

The process here described consists in employing for the fermentation, a culture of yeast acclimatised to the presence of the acids and volatile products resulting from the acidulation of the juice before fermentation, such a culture being prepared by distilling a certain quantity of molasses mixed with water and acidulated, and by adding the liquid obtained in small successive portions to a pure yeast culture in a saccharine wort. The yeast may also be acclimatised to an artificial mixture of the various volatile products, or to the latter separately and successively. In any case, the yeast obtained is multiplied in any suitable apparatus.
—T. H. P.

Vintage and Musts; Portable Apparatus for the Concentration of ——. G. Crzybowski. Fr. Pat. 322,129, June 28, 1902.

A traction engine draws trucks on which are carried a copper evaporating boiler, a condenser, a vacuum pump, a small motor, and a wine-press. The boiler is heated by steam from the traction engine, the steam being admitted into a jacket around the boiler, and caused to take a spiral course. When the apparatus is ready to work, the press is put into operation by the motor, which subsequently works the air pump; the juice is drawn into the boiler, and concentrated under vacuum at a temperature of 60° C. Steam is supplied for sterilising the recipients and casks for the concentrated must.—J. F. B.

Blood and Serum; Preservation of ——, *in the Manufacture of Beverages rich in Albumin.* M. Hahn. Fr. Pat. 322,368, June 21, 1902.

Blood serum, or egg albumin, is mixed with a fermentable vegetable liquid, such as hopped beer wort, or cider or wine must, so that the mixture contains from 5 to 20 per cent. of albumin. The liquid is then fermented with yeast in the ordinary way, and the yeast is removed. The product is a beverage containing only a little alcohol and a large proportion of albumin.—J. F. B.

Fermented, Alcoholic, and Oleaginous Liquids, Milk, &c.; Apparatus for Ageing and Improving ——, *by means of Oxygen, Ozone, &c.* W. Saint-Martin. Fr. Pat. 322,654, June 30, 1902.

The liquid is forced by means of pressure derived from liquid carbon dioxide or other gas into pipes terminating in atomiser jets, arranged face to face, from which it is discharged in the form of the minutest possible particles into a chamber containing a regulated supply of oxygen. The discharge of the liquid produces a certain amount of electricity, ozonising some of the oxygen, and effecting purification by oxidation. The treated liquid runs away from the chamber through a pipe.—J. F. B.

Alcohol Manufacture; Control Apparatus for use in ——. E. Gibaudan. Fr. Pat. 322,398, June 21, 1902.

The apparatus consists of two wheels supported at the ends of an axle in a vessel. One wheel is fitted round its circumference with troughs into which the alcohol falls, thus causing the system to rotate. The second wheel, called the "gauge wheel," serves to keep the liquid in motion. The axle works a device for counting its revolutions. A gravity float is attached to the end of a lever (the other end of which is fixed to a point on the side of the vessel) which rests on the gauge wheel and determines its revolution.

As the alcohol falls on the upper part of the first wheel it fills the troughs, and overflows into the vessel, the pressure exerted by the lever which carries the float preventing movement until sufficient alcohol is in the vessel to float the gravity bob, at which point the system starts rotating. The level of the liquid thus depends upon the density of the alcohol.—T. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Cow's Milk; Composition of ——. H. C. Sherman. J. Amer. Chem. Soc., 1903, **25**, [2], 132.

Samples were taken at all times of year from the same herd of about 600 cows.

The author finds that the percentage of proteïn (percentage of nitrogen found by Kjeldahl's method × 6·25) and the percentage of fat vary according to the season, being lower in spring and summer than in autumn and winter, while the percentage of lactose remains practically constant throughout the year.

Generally speaking, it was found that the amount of proteïn varies with the amount of fat, and that, taking the average milk, the relation is approximately that expressed by Timpe (Chem.-Zeit., **23**, 1040), *viz.*, proteïn = 2 + 0·35 fat. It was also found that deficiency in solids not fat is usually, as stated by Richmond, due to small amount of lactose, whilst any excess over 9 per cent. is generally largely due to proteïn.

Richmond's statement that the relation between proteïn and ash (ash = 0·36 + 0·10 proteïn) was found to apply very nearly; the author's results approximating more closely to the relation: Ash = 0·38 + 0·1 proteïn.

—T. F. B.

Boric Acid [in Foods]; Colorimetric Process for the Detection and Determination of ——. C. E. Cassal and H. Gerrans. XXIII., page 381.

English Patents.

Milk; Apparatus for Testing ——. A. Bernstein, Berlin. Eng. Pat. 4382, Feb. 20, 1902.

See Fr. Pat. 318,973, 1902; this Journal, 1902, 1475.

—W. P. S.

Food Preparation [Milk Extract]. G. Eichelbaum, Berlin. Eng. Pat. 6305, March 14, 1902.

See Fr. Pat. 319,611, 1902; this Journal, 1902, 1548.

—W. P. S.

Pasteurising or Sterilising Apparatus [Beer or Milk]. A. A. Hasch, R. Gull, and T. J. Barry, all of St. Louis, Mo. Eng. Pat. 24,014, Nov. 3, 1902.

See U.S. Pat. 713,952 1902; this Journal, 1902, 1548

—W. P. S.

Food; A New Concentrated Article of ——. M. Woolf, London. Eng. Pat. 7919, April 4, 1902.

From 65 to 85 lb. of sugar are dissolved in water to make a concentrated solution. This is mixed with a solution of 9 to 12 lb. of gelatin in 3 to 6 galls. of fruit juice. The whites from 85 to 100 eggs are then added, and the mixture formed into tablets.—W. P. S.

United States Patents.

Cereal Food Products; Preparation of ——. J. H. Espey, Springfield, Ohio. U.S. Pat. 720,122, Feb. 10, 1903.

The grains are agitated in a bath containing formaldehyde until the hulls have been removed and floated off. The grains are then washed, cooked, dried, and ground.

—W. P. S.

Centrifugal [Cream] Separator. J. P. Hultgren, Assignor to F. H. Getzman, both of Stockholm. U.S. Pat. 720,810, Feb. 17, 1903.

The separating-bowl is provided with hollow conical liners, which are elliptical in horizontal cross section, and extend diagonally through the liquid space of the bowl. Wedge-shaped projections, having their points turned downwards, are formed on the liners, which are provided with openings at the lower ends of these projections. Suitable provision is made for the supply of whole milk, and the discharge of the separated cream and skim milk. (See also U.S. Pat. 708,643 of 1902; this Journal, 1902, 1291.)—R. A.

French Patents.

Food Products; Process of Preserving ——. W. D. Baker Fr. Pat. 322,438, June 21, 1902.

See U.S. Pat. 709,431, 1902; this Journal, 1902, 1291.

—W. P. S.

Fermented, Alcoholic and Oleaginous Liquids, Milk, &c.; Apparatus for Ageing and Improving ——, *by means of Oxygen, Ozone, &c.* W. Saint-Martin. Fr. Pat. 322,654, June 30, 1902. XVII., page 375.

(*B.*)—SANITATION; WATER PURIFICATION.

Ammonia; Absorption of ——, *by Sea-Water.* J. Thoulet. Comptes rend., **136**, [7], 477—478.

The free and albuminoid ammonia in certain samples of sea-water from the Mediterranean and the North Atlantic, were found to be higher after filtration through a paper filter than before. Experiments in which these waters and also distilled water were filtered through paper and glass wool filters which had been exposed to the ordinary atmosphere, and to one rendered artificially ammoniacal, and in which they were poured drop by drop from one vessel to another through the ammoniacal atmosphere, showed that the effect was due to ammonia which the filters had absorbed and which they yielded again to the liquid. Sea-water appeared to absorb ammonia in this way more readily than distilled water. When two successive quantities of water were passed through the same filter, the free ammonia was raised in the first case from 0·04 to 0·33 mgrm. per litre and in the second case from 0·04 to 0·05, showing that the whole of the ammonia was rapidly washed out of the filter. Hyaline quartz in grains of about 0·5 mm. diameter recently ignited, did not remove any of the ammonia from a sea-water containing 0·75 mgrm. per litre, when it was filtered through it.—J. T. D.

English Patents.

Water Purifier. G. M. Davidson, Oakpark, Ill. Eng. Pat 498, Jan. 8, 1903. (Under Internat. Conv., July 2, 1902.)

See U.S. Pat. 712,770, 1902; this Journal, 1902, 1550.

—W. P. S.

Works' Effluents or other Liquids; Plant and Machinery for the Separation and Precipitation of Heavy or Flocculent Matter from ——. M. Allen, Manchester Eng. Pat. 656, Jan. 10, 1903.

Three or more baffles or partitions are placed in each o a series of settling-tanks, being arranged across the flow of liquid through the tanks. The two outside baffles have their tops above the level of the liquid, but do not reach to the bottom of the tank, whilst the centre baffle is i contact with the bottom and has its top submerged. The inlet, connecting, and overflow troughs are so arranged a to allow one or any of the tanks to be cut out, for the purpose of removing the collected sediment, withou interfering with the working of the others.—W. P. S.

ewage and other Polluted Liquids; Tanks and Apparatus for Effecting the Purification of ——, and the Manufacture of Substances for Use in connection therewith. E. R. Caudy, London. Eng. Pat. 7238, March 25, 1902.

ransversely inclined diaphragms are placed in the ttling-tank so as to alternately reduce and increase the locity of the flow. The diaphragms are perforated at e top and bottom alternately. Means are provided for ithdrawing the deposits.

A tank is also described in which are placed superposed nnel-shaped diaphragms, scrapers and draw-off cocks eing provided for the removal of sludge. An apparatus claimed for intermittently discharging quantities of fluent from or into the settling-tanks, consisting of a oat, which fills when it has risen to a certain height, then nks and releases a valve. A further claim relates to an pparatus for periodically discharging liquid collected in tank. When a certain quantity of the liquid has passed rough a flexible pipe into a second tank, the weight of e latter and its contents actuates a system of levers and oats controlling the discharge valve.

A material for use in bacterial filter beds is manufactured first partially drying mud from docks, rivers, canals, &c., d then carbonising it in the absence of air. Alternate layers dry mud and coal are built up and covered with clay or rf. Sufficient air is admitted to allow the coal to burn. —W. P. S.

French Patents.

ater Purifier. C. C. Clark, H. G. Bleakley, and J. G. Carson. Fr. Pat. 322,730, July 1, 1902.

e U.S. Pat. 703,541, 1902; this Journal, 1902, 1036. —W. P. S.

aste Waters and Effluents; Purification of ——. E. Möller and R. Fölsche. Fr. Pat. 322,765, July 3, 1902.

cid fermentation is allowed to proceed as far as possible. he liquid is then neutralised, heated to a moderate temerature by means of waste steam or by employing it for oling condensers, and allowed to putrefy. A little quickme may finally be added.—W. P. S.

(*C.*)—DISINFECTANTS.

eru Balsam; Anti-Bacterial Properties of ——. M. Piorkowski. Ber. deutsch. pharm. Ges., **12**, 386—391. Chem. Centr., 1903, **1**, [7], 414.

he author finds that proportions of Peru balsam up to bout 20 per cent. have only a slight retarding action on e growth of bacteria. A culture of *Pyocyaneus* after ing left in contact with Peru balsam for 24 hours and en transferred to a nutritive medium, still possessed a rtain germinating power. Cinnameïn does not destroy cteria at a concentration of 1·5 per cent., nor does yracin at a concentration of 4 per cent. Cinnamic acid a concentration of 2 per cent. prevents the growth of cteria, and at a concentration of 4 per cent. destroys em.—A. S.

Disinfectant Soaps. F. Tonzig. XII., page 372.

English Patents.

Disinfectors and Processes of Disinfecting. W. Defries, London. Eng. Pat. 3137, Feb. 7, 1902.

hermetically-closed chamber containing the article first filled with steam. The chamber is then exhausted, ter the steam has acted a sufficiently long time, and it then filled with disinfectant vapour. The apparatus is xt subjected to reduced pressure, so as to suddenly aporate the steam condensed in the article.—T. F. B.

isinfecting and Deodorising Compositions and their Application. T. Unsworth and J. P. Miller, Liverpool. Eng. Pat. 5238, Mar. 3, 1902.

disinfecting composition containing potassium peranganate, plaster of Paris, "whitening," gum arabic, d common salt. The composition is made into blocks, hich can be hung in a cistern.

The proportions of the ingredients are:—Potassium permanganate, 15 lb.; plaster of Paris, 21 lb.; whitening, 4 lb.; gum arabic, $\frac{1}{4}$ lb.; common salt, $\frac{1}{4}$ lb.—T. F. B.

Ozone in Liquids and Solutions; Fixing ——. A. Sprange, London. Eng. Pat. 4153, Feb. 18, 1902.

The process consists in passing ozone through aqueous, alcoholic, or ethereal solutions of "acetyl hydride, $C_1H_3O_2H$" (acetaldehyde), until the solution is saturated.

The solutions thus prepared are found to be very stable, retaining their strength for years, and have been successfully used for impregnating bandages, &c., to render them antiseptic.

It is found that pure "acetyl hydride" dissolves about 2,823 times its volume of ozone, while 10 per cent. solutions (by volume) absorb 536, 748, or 859 times the volume of ozone according as the solvent is water, alcohol, or ether.—T. F. B.

French Patent.

Verdigris; Neutral Adhesive ——, for Treatment of Diseases of the Vine, of Trees, and of Plants generally, and for other Purposes. A. Fafournoux. Fr. Pat. 322,481, June 25, 1902.

The composition is a mixture of an alum, 797 parts; crystallised copper acetate, 200 parts; and Aniline Green dissolved in acetic acid, 3 parts. The proportions of the ingredients used are modifiable, and other colouring matters may be substituted for the Aniline Green.—E. S.

XIX.—PAPER, PASTEBOARD, Etc.

United States Patent.

Paper [from Cotton-Seed Hulls]; Manufacture of ——. W. T. Armistead, Assignor of half to N. B. Bacon, both of Richmond, Va. U.S. Pat. 719,982, Feb. 10, 1903.

Cotton-seed hulls are boiled with alkali under pressure and then ground to a pulp. Absorbent paper or board is made from this material, having a uniform tint imparted by the minute particles of the hulls uniformly distributed throughout the pulp. A felt-paper or board is also produced by saturating the pulp with tar.—J. F. B.

French Patents.

Celluloid; Process for Rendering ——, Uninflammable. H. Beau. Fr. Pat. 322,457, June 24, 1902.

An alcoholic solution of calcium chloride (about 20 per cent.) is added to a solution of celluloid in acetone (about 10 per cent.) in such quantity as to have 1 part of calcium chloride to 10 parts of celluloid.

This mixture is evaporated, spread into thin sheets, washed, and dried at the ordinary temperature.

The quantity of calcium chloride may be increased to 15 or 20 per cent. if desired.

The calcium chloride may also be added to the pyroxylin, suitably broken up; the mixture is then ground with alcohol, and passed through a mill, the rollers of which are heated to about 50° C.—T. F. B.

Celluloid-like Substance; Production of a ——. E. Callenberg. Fr. Pat. 322,506, June 27, 1902.

Halogen derivatives of the ethereal oils, especially turpentine chloride, are substituted for, or used in conjunction with, the camphor or other substance mixed with nitrocellulose or other cellulose compound in the manufacture of celluloid.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Iodine; Solubility of ——, in Glycerin. Catillon. Bull. gén. Thérap., 1903, **145**, 62. Chem.-Zeit., **27**, [15], Rep. 38.

Contrary to the usual opinion, iodine is abundantly soluble in glycerin. By first dissolving the iodine in alcohol or acetone, then adding the glycerin, and driving off the first solvent by evaporation at a low temperature. Another method is to heat a mixture of iodine and pure glycerin to

120°—150° C. in a closed vessel. The solution has the appearance and smell of pure iodine, and the author believes that the phenomenon is entirely one of solution, not substitution or esterification; also that the solution has certain advantages over ordinary iodine tincture.—C. S.

Dihydrocamphene and Pinene Hydrochloride; Nitration of ——. M. Konowalow and S. Kikina. J. russ. phys.-chem. Ges., **34**, 935—941. Chem. Centr., 1903, **1**, [9], 512.

From the results of their experiments the authors conclude that camphene, pinene hydrochloride, and camphor all contain a CH group. As, however, on nitration, the presence of the CH group is only somewhat faintly indicated, it has not the ordinary character of the CH group in the fatty and polymethylene series. In the fatty series, the presence of this group is indicated very distinctly if it is under the influence of a methyl (CH_3) group. It is probable, therefore, that camphene, pinene hydrochloride, and camphor do not contain a methyl (CH_3) group united to the CH group.—A. S.

Marjoram Oil. P. Genvresse and E. Chablay. Comptes rend., **136**, [6], 387.

The authors find that this essence is produced from plants of the type *Calamintha Nepeta*, so they apply this name to the oil. On fractional distillation they found small quantities of *l*-pinene in the first portion of the distillate; this they identified by comparing the nitrosochloride with that prepared from oil of turpentine. The portion passing over between 210° and 220° C. consisted of a new ketone, of formula $C_{10}H_{16}O$, which the authors designate "calaminthone." It is dextrorotatory. The oxime and semicarbazone were prepared. On reduction with nascent hydrogen it gave small quantities of menthol, and also an oil, which, on oxidation with chromic acid, gave a ketone, the oxime of which was identical with *l*-menthone oxime. The fraction distilling between 223° and 225° C. consisted of pulegone: it was identified by the formation with hydroxylamine hydrochloride of the two known pulegone oximes.
—T. F. B.

Peru Balsam; Anti-Bacterial Properties of ——. Piorkowski. XVIII. C., page 377.

Digitalin; Determination of ——, *in Officinal Preparations of Digitalis and Digitalin* E. Calle. XXIII., page 383.

English Patents.

Acetic Acid and other Acids of the Fatty Acid Series; Manufacture of ——. H. von Hochstetter, Troppau, Austria. Eng. Pat. 3923, Feb. 15. 1902.

See Fr. Pat. 318,710 of 1902; this Journal, 1902, 1469.
—T. F. B.

Active Principles of Drugs; Apparatus for Extracting ——, *and for other like Purposes.* J. Barclay, Bromsgrove. Eng. Pat. 5799, March 8, 1902.

A hollow, perforated cylindrical drum, containing the substance to be extracted, is caused to rotate inside a concentric fixed drum, which contains the solvent, heated by a steam coil between the drums.

The outer drum is fitted with a condenser and with pipes leading to a still into which the extracted liquor can be run and there concentrated, the vapour of the solvent passing back into the drum.—T. F. B.

Saccharine; Process of Manufacturing or Purifying ——. S. A. Jackson, Heaton Chapel (Lancs.), and A. J. Pennington, Withington. Eng Pat. 6065, March 12, 1902.

The process consists in fractionally dissolving out the ortho-compound with acetone, in which the para compound is less soluble.—T. F. B.

Pharmaceutical Compounds; Manufacture and Production of ——. H. E. Newton. From Farbenfabr. vorm. F. Bayer and Co. Eng. Pat. 8955, April 17, 1902.

When halogen methyl alkyl ethers react with salicylates, compounds of the type $HO.C_6H_4.CO.O.CH_2.OR$ are produced, R being an alkyl radical. These compounds have considerable therapeutic value.

For instance, 1,600 parts of dry sodium salicylate and 5,000 parts of benzene are mixed with a solution of 805 parts of monochlordimethyl ether in 800 parts of benzene, the temperature being kept below 40° C. After stirring for some time the mixture is washed with sodium carbonate solution, dried over calcium chloride, the benzene distilled off, and the residue distilled *in vacuo*. Methyl-oxymethyl-salicylate of the constitution $HO.C_6H_4.CO.OCH_2.OCH_3$ passes over as a colourless, odourless liquid, having a boiling point of 153° C. at 32 mm. pressure. On heating at the ordinary pressure, formaldehyde is split off, whilst dilute acids decompose it into salicylic acid, methyl alcohol, and formaldehyde.—T. F. B.

8-*Methylxanthines; Production of Chlorine Substitution Products of* ——. G. W. Johnson, London. From C. F. Boehringer und Söhne, Waldhof. Eng. Pat. 27,485, Dec. 12, 1902.

When chlorine or a chlorinating agent is passed through solutions of the 8-methyl xanthines, the hydrogen atoms of the 8-methyl group can be replaced by chlorine, mono-di-, and tri-chloro substitution products being obtained by varying the treatment.

8-mono-chloromethylcaffeine, $C_9H_{11}O_2N_4Cl$, may be prepared by passing a stream of dry hydrochloric acid through a cold solution of 50 grms. of 8-methyl caffeine in 250 c.c of anhydrous chloroform. 200 c.c. of chloroform are now added, and the mixture boiled under a reflux condenser chlorine being passed through the solution. On evaporation of the chloroform, 8-mono-chloromethylcaffeine separates out. Recrystallised from ethyl acetate it gives white needles, melting point 208°—210° C.

8-trichloromethyltheobromine, $C_8H_7O_2N_4Cl_3$, is prepared by adding 100 grms. of 8-methyltheobromine to a solution of 150 grms. of chlorine in 2 litres of phosphorus oxychloride, and agitating the mixture for four hours at the ordinary temperature, when it is filtered. The solution i evaporated *in vacuo* and the residue crystallised from ethy acetate. White prisms are obtained, having a melting point of 211°—212° C.

8-trichloromethyl-7-monochloromethyl-1.3-dimethyl xanthine, $C_9H_8O_2N_4Cl_4$. A large excess of chlorine i passed into a solution of 1 grm. of 8-methylcaffeine in abou 8 grms. of nitrobenzene warmed on a water-bath. Th excess of chlorine is driven off by passing a current of ai through the solution, from which the nitrobenzene i removed by distillation *in vacuo*. The tetrachloromethy xanthine separates out of the residual liquor, and o crystallisation from alcohol is obtained as colourless prism which melt at 204°—205° C.—T. F. B.

8-*Methylxanthine Derivatives; Elimination of the* 8-*Methy Group from* ——. G. W. Johnson, London. Fro C. F. Boehringer und Söhne, Waldhof. Eng. Pat. 27,53 Dec. 13, 1902.

The 8-methyl xanthine derivatives, prepared according Eng. Pat. 526 of 1901 (this Journal, 1901, 833) are co verted into halogen derivatives in which the 8-meth group is substituted, according to Eng. Pat. 27,485 of 190 (See preceding abstract.)

On boiling these halogen compounds with water, carb dioxide and hydrochloric acid are eliminated, the xanthi derivative being produced.

For instance, if 1 part of 8-trichloromethyltheobromi is boiled under a reflux condenser with 130 parts of wat and the solution evaporated somewhat, theobromine cryst lises out on cooling.—T. F. B.

French Patents.

Oxalates from Formates; Production of ——. Elekt Chemische Werke, G. m. b. H. Fr. Pat. 322,534, June 1902.

A mixture of formate and oxalate is heated to 360° 410° C.

This process was designed to obviate the inconvenie of recovering the soda in the process previously patent

(Fr. Pat. 272,084. Sodium formate and soda are heated ether at 360°—400° C.), in which washing and calcining product took place.—T. F. B.

drocyanic Acid from Impure Illuminating Gas; Process or Absorption of ——. Guillet. Fr. Pat. 322,576, June 6, 1902. II., page 358.

XI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

'atatype"; W. Ostwald and O. Gros's Process of ——. hem.-Zeit., 1903, **27**, [12], 117. (See page 380. Eng. Pat. 22,481.)

e photographic processes designated by the above name based on Ostwald's theory that every chemical reaction astened by some catalyser, and that every substance is able of acting as a catalyser upon some chemical re- ion. For instance, in photography, metallic platinum l silver act as catalysers upon the reaction between ogallol and an oxidising agent like potassium bromate, l also upon the decomposition of hydrogen peroxide into er, the former reaction, however, being practically useless. the other hand, if a picture in metallic silver or platinum looded with a solution of hydrogen peroxide in alcohol or, ferably, ether, the solvent evaporates quickly, and the tal catalyses the peroxide until, where the deposit was, hing but water is left, while in the clear parts the per- de remains unaltered. If, then, the original picture was egative, an invisible positive in hydrogen peroxide is ained, and by mere contact in a "printing frame" with atinised paper, the unreduced peroxide may be made to nsfer itself from the film to the latter, where its oxidising perties may be employed to yield another positive by table "development." The impregnated gelatin may be ated with an alkaline solution of manganous chloride or phate, giving a picture in brown manganese dioxide; h alkaline silver solutions, giving a print in black tallic silver; or with alkaline solutions of lead, yielding rown image in lead peroxide. Similarly, the gelatinised per can be dipped in a bath of ferrous sulphate or of rous ammonium sulphate, thus producing a weak picture a yellowish basic ferric salt; and the latter may be con- rted into a violet positive by the action of gallic acid. ain, if paper is coated with permanganate, a brown film manganese peroxide is obtained; and if a line drawing oxalic acid is brought into contact with the paper, a ture is produced of white lines on a brown (MnO_2) und. When this is treated with an ethereal solution of roxide, the catalyser is destroyed on the ground but left changed in the lines; so that, by the above-described ying process on gelatinised paper, a positive may be veloped in either of the colours mentioned.

"Catatype," however, is more serviceable in those photo- phic processes which depend on the use of gelatin or m, because whereas silver films can be prepared of suffi- nt sensitiveness for every purpose, simple gelatin films uire very bright light or long exposures. Here the thod is as follows: A glass negative is produced as al, and treated with hydrogen peroxide; it is then placed contact with paper coated with gelatin or gum and the ired pigment only, and exposed for about 30 seconds. e peroxide in the shadows of the negative being un- luced, is transferred to the paper, and when the latter is ated with a ferrous salt, a ferric salt is produced which ans" the gelatin or gum exactly as bichromate would ve done had it been present, so that the paper can be veloped with warm water or with "warm sawdust tract," in the usual way. Up to this stage, the whole ying process is said not to take more than two minutes.

"Catatype" may also be employed in photo-mechanical cesses, depending on the use of bichromated gelatin, as a stitute for the bichromate, since the film of gelatin gulated by means of the hydrogen peroxide absorbs fatty s in the same fashion as the older material does.

—F. H. L.

Photography; A. Miethe's Three-Colour Process of ——. Chem.-Zeit., 1903, **27**, [18], 195.

By using the dyestuff "Ethyl Red" (a quinoline-quinaldine-alkyl iodide), Miethe has succeeded in preparing gelatino-bromide plates which are almost equally sensitive throughout the entire length of the visible spectrum. Such plates are made by immersing ordinary plates in a 1:50,000 solution of the dyestuff, and, if they are well washed, they are permanent. In conjunction with these plates, three screens are employed, which divide the spectrum into the zones 400—490 $\mu\mu$, 490—589 $\mu\mu$, 589—700 $\mu\mu$; the divisions thus lying near the lines F and D. The relative times of exposure are 2 for blue, 1 for green, and 2·3 for red; but it is more convenient in practice always to expose for the same period, compensating for the different sensitiveness by the addition of suitable "stops" to the lens. Plates prepared with "Ethyl Red" are sufficiently sensitive to yield the three necessary negatives in portraiture after a total exposure of 4 seconds at 10.30 a.m., in September, diffused daylight, using an "aperture" of f/12·5. To give the light required for the manipulation of the plates, Miethe uses two sheets of gelatinised glass, one stained in a 1:30 solution of "Brilliant Yellow," and the other in a 1:100 solution of Methyl Violet, fastened film to film before the lamp.

—F. H. L.

Silver Bromide; A Characteristic Effect of Pressure on ——. J. M. Eder. Phot. Korr., **39**, 702. Chem.-Zeit., **27**, [15], Rep. 48.

The image produced, by pressure, on a dry gelatin plate, is analogous with the latent photographic image, in so far as they are both destroyed by bromine water. A characteristic difference is, however, exhibited when solarised silver salts are employed as reagent. Silver bromide exposed to light, to the point of strong solarisation, and then subjected to pressure, *e.g.*, by writing on the surface with a blunt glass point, &c., undergoes such alteration that the affected portions blacken, when developed, like a normal photographic image. The brief exposure sufficing to furnish an equally intense (developed) black in the case of previously unexposed plates, is incapable of similarly reducing the solarised silver bromide.—C. S.

Solarisation Image; Difference of the ——, *on Silver Iodide and Silver Bromide.* J. M. Eder. Phot. Korr., **39**, 703. Chem.-Zeit., **27**, [15], Rep. 48.

The solarisation image on silver iodide and collodion is destroyed by chromic acid, in the same manner as the normal latent negative image. In both cases progress is gradual, without revealing any intermediate stage of transition from the positive solarisation image into the normal negative image, as is easily detected in the case of silver bromide and gelatin. On the other hand, this transition is also effected by chromic acid in the case of the solarisation image on wet silver bromide and collodion.—C. S.

Silver Chloride Gelatin Plates; Developing ——. E. König. Phot. Korr., **40**, 16. Chem.-Zeit., **27**, [15], Rep. 48.

Contrary to the observations of Liesegang, the author finds that normally exposed pure silver chloride gelatin plates can be rapidly developed by a 1 per cent. aqueous solution of diaminophenol hydrochloride (without sulphite), as also by diaminoresorcinol hydrochloride, though the negative is rather thin. Even a diaminophenol solution slightly acidified with hydrochloric acid will bring up the image in a few seconds. In the case of pyrogallol, the colour of the image can be varied considerably by changing the proportions of sulphite employed. The image obtained with sulphite developers is always very strong, though light in colour by reflected light, whilst sulphite-free, neutral, or alkaline developers give a thinner image with a dark deposit. Trichlorohydroquinone is more energetic than hydroquinone or adurol; dichloro-*p*-aminophenol and edinol act quicker than *p*-aminophenol. The developers obtained by dissolving the hydrochlorides in presence of sulphite are very slow in action, owing to the formation of sodium chloride which acts as a restrainer on the silver chloride emulsion just as potassium bromide does with silver bromide. Even small quantities of sodium chloride retard considerably the solubility of silver chloride in aqueous sulphite solutions. From the results obtained by the author with silver chloride, it may be concluded that the solubility of silver bromide in sulphite developers is strongly retarded by bromine ions, which explains the restraining influence of potassium bromide.—C. S.

Photographic Silver Image; Use of Alkali Salts of Amino-acetic Acid for Reducing the ——. B. Homolka. Phot. Korr., **40**, 19. Chem.-Zeit., **27**, [15], Rep. 48.

Farmer's reducer has the disadvantage of being very unstable owing to the rapid reduction of the potassium ferricyanide by the thiosulphate. This defect may be overcome by replacing the last named ingredient by an alkali aminoacetate, the latter being able to dissolve large quantities of silver oxide and remaining unaffected by the ferricyanide. The reducer is prepared by mixing 5 grms. of ferricyanide with 100 c.c. of the commercial "Pinakol salt N" (a 20 per cent. solution of sodium aminoacetate). This reducer will keep well in brown or yellow bottles, and for use is diluted with 5—10 parts of water. The reducing action proceeds rapidly and is revealed by the formation of a violet grey film. After a short washing in water the plate is placed in an acid fixing bath, where it immediately clears and turns brownish-black. The reducer can be used over again until exhausted.—C. S.

English Patents.

Pictures [Catatype]; Process for Reproducing ——. O. Gros and W. Ostwald, Leipzig. Eng. Pat. 22,841, Nov. 12, 1901. (See also page 379.)

The process consists of taking advantage of the catalytic action of platinum or other substance to reproduce pictures. For instance, when paper impregnated with potassium bromate and pyrogallol is pressed on to a platinum print, a red deposit is formed on the parts of the paper in contact with the platinum. This deposit may be changed into other coloured substances by means of metallic salts (ferric sulphate, for instance, turning it brown to grey, according to its concentration). In general, any oxidising agent with a photographic developer serves the purpose. Or, a silver bromide paper, which has been exposed to light for a moment, when pressed to a platinum print impregnated with potassium bromate, gives, on development in the usual way, a silver print

Other examples of applying catalytic action are given, *e.g.*, for obtaining images of manganese oxides, also by using hydrogen peroxide, permanganate, &c.; processes are also described for obtaining pictures on copper, or by etching pigmented gelatin or glue.—T. F. B.

Photographic Developers. O. I. Imray, London. From Farbwerke vorm. Meister, Lucius, und Brüning, Hoechst a/Main. Eng. Pat. 20,377, Sept. 18, 1902.

It is found that alkali salts of glycocoll or its derivatives, as photographic developers, work as well as pyrogallol, hydroquinone, pyrocatechol (catechol), eikonogen, &c.

As an illustration of the proportion of glycocoll to be used, the following formula is given: 60 grms. of crystallised sodium sulphite and 12 grms. of pyrogallol are dissolved in about 500 c.c. of water, and an aqueous solution of 24 grms. of glycocoll and 12 grms. of caustic soda is added, the solution being diluted to a volume of 1,000 c.c.

—T. F. B.

Colour Photography. W. C. South, Berwyn, Pa., U.S.A. Eng. Pat. 128, Jan. 2, 1903.

A suitable paper is coated with an emulsion consisting of equal parts of water and glue, saturated with an alkali bichromate, containing also the requisite red pigment, and the paper dried. The red is printed on this paper, through the proper negative, prepared with chromatic plates through the proper filters, until the image appears faintly. This print is coated with a blue print mixture of glue and some blue colour, preferably a ferric solution (prepared from ferric ammonium citrate and potassium ferrocyanide). The blue is printed on this, through the proper negative, quite deeply, and the print washed. When dry this print is coated with a mixture of equal parts of water and glue saturated with alkali bichromate, to which is added the yellow pigment, and then dried. The yellow is now printed through its proper negative, until the yellow portion looks fairly well tanned, and the print washed with hot water until all the gelatin unacted on by light has been removed, and dried.

Various kinds of animal glue give good results, but fish glue is recommended.

This process is said to have the advantage over those in which the yellow is printed first, since in such a case the yellow is often obscured by the more powerful blue or red.

—T. F. B.

French Patent.

***Benzaminosemicarbazide** [Photographic Developer]; Preparation of* ——. A. and L. Lumière. Fr. Pat. 322,462, June 26, 1902.

Benzaminosemicarbazide may be employed as a developer for photographic papers containing soluble silver salts It dissolves in the cold, to the extent of 2·7 parts in 100 of water.

Aminobenzamide is diazotised, the diazo-aminobenzamide formed is reduced with stannous chloride and hydrochlori acid, the double tin salt decomposed with sulphurette hydrogen, and the resulting solution of benzamide hydrazin neutralised with sodium carbonate, boiled to expel hydroge sulphide, cooled and treated with potassium cyanate solution whereby benzaminosemicarbazide—

$$NH_2.CO.C_6H_4.NH.NH.CO.NH_2,$$

is precipitated.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patent.

Cartridges; [Flash-Light] ——. H. Luttke, Wandsbeck Germany. Eng. Pat. 768, Jan. 12, 1903.

An envelope, made of thin sheets of collodion, is use instead of ordinary paper, to contain the magnesiu powder. The advantages claimed are easy ignition an durability of the cartridges.—G. W. McD.

French Patents.

Explosives; Manufacture of ——. E. Callenberg. Fr. Pat. 322,946, June 27, 1902.

The addition of turpentine chloride to nitroglycerin rende it less sensitive to shock, prevents it freezing at a ter perature of about – 15° C., and assists it in dissolvi nitrocotton at 35° C. In admixture with ammonium nitrat turpentine chloride reduces the temperature of explosio and renders this class of explosives more stable, and sa for use in dangerous mines. Examples given are:- Nitroglycerin (30), turpentine chloride (4), nitrocotton (1 magnesium sulphate (24), potassium nitrate (40), a sodium carbonate (1); and also ammonium nitrate (9 turpentine chloride (5), naphthalene (1).—G. W. McD.

Matches; Paste for ——. H. de Rocco. Fr. Pat. 322,7 July 1, 1902.

In order to impart porosity to the match-head, a crea starch and cold water is used as a substitute for the g and glue ordinarily employed in match paste. The ot constituents are antimony sulphide, lead oxide, vegeta earth, potassium chlorate, powdered glass, amorph phosphorus, potassium bichromate, oxalic acid, blast powder, and gelatin.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

United States Patent.

Crucible. A. Eimer, New York, N.Y. U.S. Pat. 716,6 Dec. 23, 1902.

The crucible consists of a receptacle wherein a substa may be heated and at the same time operated upon by ired fluid or powder for the purpose of chemical treat- nt and analysis. A platinum or other vessel, with er, has an opening in the latter, in which fits a tube, ing a tapering side-tube which is connected to any ice for supplying the fluid or powder. A central tube connected with another tube leading any escaping our or gas to any suitable receiver. To the lower end the central tube is secured a bell. By this arrange- nt the heat of the escaping vapours, &c., is partly nmunicated to the incoming fluid, the latter being sed to pass down the walls of the crucible. A valve placed within the bell mentioned, prevents excessive npe from the crucible.—R. S.

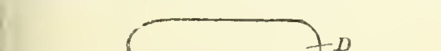
INORGANIC–QUANTITATIVE.

phur in Coal and Coke; Rapid Method for Determining —. C. Sundstrom. J. Amer. Chem. Soc., 1903, **25**, 2], 184.

method described depends on Parr's suggestion of the of sodium peroxide (J. Amer. Chem Soc., **22**, 646).

or coke the method is as follows:—0·7 grm. of finely- dered coke is intimately mixed with 13 grms. of dry um peroxide in a nickel crucible of about 30 c.c. capa- . The crucible is covered and a three-inch fuse (made nitrating cotton wick) inserted under the edge of the r and well into the mixture.

he bottom of the crucible is immersed in water, and the ture fired and allowed to cool; when it is dissolved in er, acidified with dilute hydrochloric acid, filtered and sulphur estimated as barium sulphate. In the case of a small steel bomb is used, of which the figure shows actual size.



he shell A has an internal diameter of $1\frac{1}{4}$ ins. and a h of $1\frac{1}{2}$ ins., being $\frac{1}{8}$ in. thick with a $\frac{1}{8}$ in. flange round top. A cover plate B, $\frac{3}{16}$ in. thick, is separated from bomb by a thin mica washer E, and the whole is wed together by a screw D and clamp C, the screw g insulated from the cover by a piece of fabric F.

7 grm. of coal and 13 grms. of dry sodium peroxide are nately mixed and pressed into the bomb. The fuse ists of a No. 36 iron wire, 4 ins. long, which passes ugh the mixture and is fixed with one end on either of the mica washer, *i.e.*, one end in contact with the b, the other with the cover. An electric current is used re the mixture. When cool, the mass is dissolved in r and treated as in the case of coke.

esults were obtained by the author agreeing very ly with those obtained by Eschka's method, and he as the advantage that sodium peroxide seldom contains hate or other impurity likely to interfere with the determination, in addition to which the apparatus is cheaper and there is no likelihood of contact with gas flames.

—T. F. B.

Boric Acid; Colorimetric Process for the Detection and Determination of ——. C. E. Cassal and H. Gerrans. British Food J., Oct. 1902. Chem. News, 1903, **87**, [2251], 27—28.

If a solution containing boric acid be treated with curcumin —or ordinary turmeric—and oxalic acid, and the mixture evaporated to dryness on the water-bath, an intense Magenta-red colour is produced, different from the "rose-red" colour obtained in the ordinary turmeric test for boric acid. The reaction is much more delicate than the old test, and the colour is practically permanent for 10 or 12 hours but fades very gradually on long keeping. The colouring matter is readily soluble in alcohol and ether, but is destroyed by the addition of water in excess. With alkali, it gives an intense blue coloration. In applying the test for the detection of boric acid in milk and other food products, the ash of the substance, which, if it contain only a very small amount of boric acid, is rendered alkaline with barium hydroxide solution previous to evaporation and incineration, is treated with a few drops of (1) dilute hydrochloric acid; (2) saturated solution of oxalic acid; and (3) alcoholic solution of curcumin or turmeric. The mixture is dried on the water-bath and the residue is extracted with alcohol. Compounds of potassium and sodium in large amounts interfere with the reaction. For the determination of boric acid, for example, in milk, 15—20 grms. of the sample are made strongly alkaline with barium hydroxide solution, and the mixture evaporated to dryness in a platinum dish at a temperature of about 105° C. The residue is well charred, broken up, made slightly acid with hydrochloric acid, and exhausted with successive small quantities of hot water, the extracts being filtered into a 100-c.c. flask. The filter paper and its contents are made alkaline, in a platinum dish, with barium hydroxide solution, the mixture evaporated to dryness, and the residue heated carefully till practically the whole of the carbon has disappeared. The ash is treated with a small quantity of 25 per cent. hydrochloric acid, the solution and washings added to the main extract, and the whole made up to 100 c.c. 10 c.c. of this solution are poured over 10—15 grms. of purified sand (obtained by igniting "silver sand," boiling it with 25 per cent. hydrochloric acid, and thoroughly washing and drying) in a porcelain dish, the mixture is made alkaline with barium hydroxide solution, and evaporated to dryness with occasional stirring. The dry mass is made slightly acid with 25 per cent. hydrochloric acid, 2 c.c. of a saturated solution of oxalic acid, and 2 c.c. of an alcoholic solution of curcumin (1 grm. per litre) are added, and the mixture well stirred. The dish is now covered with a funnel, the stem of which is connected to a set of "potash bulbs" containing barium hydroxide solution, the bulbs being placed in a beaker containing cold water. The mixture is then evaporated to dryness, a gentle current of air being aspirated through the apparatus. An additional 1 c.c. of the curcumin solution is well mixed with the dry mass, and the mixture again dried. The colouring matter formed is extracted with successive quantities of methylated spirit and the extracts filtered. The liquid in the potash bulbs is now mixed with the sand in the dish, made alkaline, if necessary, with barium hydroxide solution, and evaporated to dryness. The dry mass is treated as before with hydrochloric acid, and the oxalic acid and curcumin solutions, and the processes of evaporation and alcoholic extraction repeated, the solution of the colouring matter being added to that previously obtained. A standard colour solution is prepared by treating 10 c.c. of a solution of boric acid of known strength (1 c.c. = 0·1 mgrm. of B_2O_3) in an exactly similar manner, the solution of the colouring matter being made up to 200 c.c.—A. S.

Manganese; Determination of ——, *in Acid Solutions by Persulphates.* H. Baubigny. Comptes rend., **136**, [7], 449—451.

The author has investigated the completeness of precipitation of manganese in presence of varying amounts of acid.

Hydrochloric acid was excluded from the investigation, and the results with organic acids were very unsatisfactory. The figures given in the paper refer to sulphuric and nitric acids only. The process was carried out as described in a former paper (this Journal, 1903, 45), and the filtrates were rendered alkaline with ammonia, heated to boiling for a few minutes after adding more persulphate, and the precipitated manganese filtered off, ignited, and weighed as Mn_3O_4. The filtrates from this operation were in all cases free from manganese. The results show that:—(1) As the solution becomes more strongly acid the tendency to peroxidation of the manganese becomes less strong, and hence the precipitation is less nearly complete. But this effect can be completely counteracted by adding a proportionately larger amount of the persulphate solution; the most strongly acid solution used contained 11 c.c. of concentrated sulphuric acid in 200 c.c. of solution, and with this, 6 grms. of ammonium persulphate were needed to precipitate completely 0·05 grm. of metallic manganese as MnO_2. (2) Sulphuric acid is preferable to nitric acid, for, volume for volume, sulphuric acid (sp. gr. 1·840) works less adversely than nitric acid (sp. gr. 1·338) towards the peroxidation of the manganese, while it is more than three times as effective alkalimetrically in producing acidity. (3) The action is more rapid with sulphuric than with nitric acid, and with very acid solutions the heating should not be too prolonged, for when the persulphate is all decomposed the acid reacts on and dissolves the precipitated peroxide. After the liquid has cooled, however, it may be left for many hours without any solution of the precipitate occurring.
—J. T. D.

Hydrofluoric Acid; Employment of ——, in Metallurgical Laboratories. R. Fried. Zeits. angew. Chem., 1903, **16**, [8], 176—181.

The solution and analysis of ferrosilicon and similar metallurgical products are greatly facilitated by the addition of small quantities of hydrofluoric acid to the solvents. By restricting the quantity of hydrofluoric acid to that prescribed in the following examples, the operations, except those for the estimation of calcium, magnesium, and aluminium, can be performed in glass beakers, which, however, should be set apart for this purpose.

Phosphorus.—1 grm. of powdered ferrosilicon is treated with 25—30 c.c. of nitric acid (sp. gr. 1·2) and 1—1·5 c.c. of hydrofluoric acid. Solution is complete in 2—5 minutes. The boiling mixture is treated with a small excess of potassium permanganate and boiled till the red colour disappears. The manganic oxide is dissolved by a little hydrochloric acid, and the whole evaporated to a syrup. After dilution and filtration, the phosphoric acid is precipitated by molybdate.

Manganese.—4 grms. of the sample are dissolved in concentrated hydrochloric acid, with addition of 5—7 c.c. of hydrofluoric acid. The filtered solution is oxidised with nitric acid, evaporated with excess of sulphuric acid, and the manganese titrated by Volhard's method.

Copper.—The substance is dissolved as for the manganese estimation, and the filtered solution is precipitated by hydrogen sulphide after copious dilution.

Iron.—1 grm. is dissolved in warm hydrochloric acid, with addition of 1—1·5 c.c. of hydrofluoric acid. The solution may at once be titrated by Reinhardt's method, or may be filtered, evaporated with sulphuric acid, and reduced with zinc. The insoluble residue retains traces of iron.

Sulphur.—This is best determined by boiling the substance with hydrochloric acid, and passing the gases through hydrochloric acid containing bromine.

Total Carbon.—The powdered ferrosilicon is oxidised with chromic acid, sulphuric acid, and copper sulphate in a Corleis' apparatus.

Graphite.—2 grms. of substance are dissolved in 35 c.c. of nitric acid with 3 c.c. of hydrofluoric acid at 60° C., diluted immediately, and kept warm for half an hour. The insoluble matter is collected on ignited asbestos, and the carbon in it determined by the Corleis' process.

Calcium, Magnesium, and Aluminium.—The ferrosilicon is dissolved in hydrochloric and hydrofluoric acids in a platinum basin, which, however, is slightly attacked. The dissolved platinum must be precipitated by hydrogen sulphide.

Silicon.—The substance is dissolved in concentrated hydrochloric acid, with addition of potassium chlorate, and the solution evaporated with sulphuric acid.

Phosphorus in Cast Iron.—The addition of 0·5—1 c.c. of hydrofluoric acid after a preliminary boiling with nitric acid ensures the solution of the whole of the phosphorus, and greatly facilitates filtration from graphite, &c.; or the process described for ferrosilicon can be employed, restricting the amount of hydrofluoric acid to 5—6 drops. If the yellow precipitate is to be weighed, after dissolving it from the filter by ammonia and evaporating this solution in a porcelain basin, the filtration of the original solution fro graphite can be dispensed with. The titration of the yello salt is under these circumstances less precise, although f factory control it is to be recommended, owing to th resulting economy of time. The quantity of hydrofluor acid used should, in such cases, be roughly proportioned the percentage of silicon.

Slags.—The estimation of iron in slags is greatly assiste by adding 0·5—1 c.c. of hydrofluoric acid to the hydrochloric acid employed for dissolving the substance. Afte heating for half an hour, the solution is ready for titratio
—M. J. S.

Carbon Dioxide; Determination of Atmospheric ——, *the Walker Method.* A. G. Woodman. J. Amer. Che Soc., 1903, **25**, [2], 150.

The author describes a series of experiments, carried out ascertain the most suitable conditions for working t Walker method for estimating carbon dioxide in air (J. Chem. Soc., 1900, **77**, 1100).

The method consists of allowing a definite volume of (usually 1 to 2 litres) to come in contact with a kno weight of barium hydroxide in solution; the liquid is n filtered under reduced pressure and the amount of bariu hydroxide in the filtrate estimated by titration with standard solution of hydrochloric acid.

The author finds N/100 barium hydroxide soluti and N/50 hydrochloric acid the most convenient to u The vessels for absorption were coated with a layer barium carbonate.

Thirty minutes was found a convenient time for abso tion, no advantage appearing as the result of lon contact.

The author also suggests slight modifications of apparatus used by Walker.

He concludes, as the result of his work, that Walk method is accurate to 0·1 part in 10,000, but with car work he considers that this error should certainly be as as 0·03 part.

He finds the method rapid, easy of execution, preferable to the Pettenkofer method.—T. F. B.

ORGANIC—QUALITATIVE.

Maltose; Detection of Small Quantities of ——, in *Presence of Glucose.* L. Grimbert. J. Pharm. Ch., 1903, **17**, [5], 225—228.

The author finds the process given by Lépine and Bou useless (Comptes rend. de la Société de Biologie, Dec, 1901), in which the two osazones are to be extracted ether to dissolve out the maltosazone, since the maltosaz is as insoluble in ether as the glucosazone. In solut containing only maltose or glucose the formation of osazone is a much more delicate reaction for glucos being possible to detect as little as 1:20,000 of this against only 1:1,000 of maltose. To separate a mix of the two sugars, the purified osazones are either tritur in a mortar with the least possible quantity of acetone, filtered, or diluted with a little water, warmed on the wa bath for five minutes and rapidly filtered. In either c the filtrate on standing deposits crystals of maltosaz By both methods it is possible to detect 0·05 per cen maltose in the presence of 1 per cent. of glucose.
—W. H.

ORGANIC—QUANTITATIVE.

oal in Pyrites; Determination of ——. F. P. Treadwell and A. A. Koch. Zeits. angew. Chem., 1903, **16**, [8], 173—175.

HE rapid estimation of the amount of coal in pyrites can, many cases, be effected with sufficient accuracy for chnical purposes by simple incineration, in addition to e determinations of total sulphur, iron, and moisture hich are usually made, as well as that of carbonic acid in mples containing a notable proportion of carbonates. he apparent loss in incineration must be increased by the nount of oxygen required to convert the iron into ferric ide, in order to obtain the true loss. By subtracting e total sulphur and moisture from the true loss, the mainder will be the organic portion (C, H, N, and O) of e coal, and any carbon dioxide from carbonates present. o calculate the carbon, the organic matter must then be ultiplied by a factor which varies with different kinds of al. For English pit coal, this factor may be taken as ·89, whilst for Bohemian brown coal it is as low as 0·74. much calcium be present, some of the sulphur will be tained in the ash as calcium sulphate, and the accuracy the results is diminished. For greater accuracy, or in cceptional cases, Corleis' method of wet combustion with romic acid is both more convenient and rapid than the rocess of elementary analysis with copper oxide.—M. J. S.

ssential Oils in Absinthe; Determination of the ——. Sanglé-Ferrière and Cuniasse. Ann. Chim. anal. appl., **8**, 17—18. Chem. Centr., 1903, **1**, [9], 543.

HE authors make use of the iodine absorption power of e essential oils, 100 c.c. of the absinthe are treated with c.c. of water, and exactly 100 c.c. of the mixture are istilled over. To 50 c.c. of the distillate, 25 c.c. of a ixture of equal parts of a solution of iodine (50 grms. er litre of 96 per cent. alcohol) and one of mercuric loride (60 grms. per litre of 96 per cent. alcohol) are ded. After allowing to stand for three hours, the excess f iodine is titrated. The number of c.c. of N/10 thio-lphate solution required, multiplied by 0·2032, gives the umber of grms. of essential oils in 1 litre of absinthe. A lank experiment must be made with 50 c.c. of alcohol of e same strength as it occurs in the absinthe.—A. S.

igitalin; Determination of ——, in Officinal Preparations of Digitalis and Digitalin. Ecalle. J. Pharm. Chim., 1903, **17**, [5], 228—232.

HE digitalin referred to is the crystalline glucoside first btained by Nativelle, which is the most active constituent f digitalis. Iron alum is suggested instead of ferrous ulphate in Kiliani's test for distinguishing between French nd German digitalin. For the determination of the igitalin, the solution is purified with normal lead acetate, xcess being removed by sulphate of soda, and is then xtracted with ammoniacal chloroform. The filtered hloroform extract is evaporated on the water-bath, the esidue redissolved in chloroform, and a mixture of ether nd light petroleum spirit added. The whole is carefully haken and allowed to stand for 48 hours, the clear liquid ecanted, and the remainder evaporated, leaving the digi-alin. Tincture of digitalis and ethereal tincture of digitalis, oth officinal French preparations, were found to contain ·0398 per cent. and 0·02337 per cent. respectively of igitalin.—W. H. S.

XIV.—SCIENTIFIC & TECHNICAL NOTES.

Colloidal Metals; Preparation of Solutions of ——. F. Henrich. Ber., 1903, **36**, [3], 609—616.

HE author describes methods of preparing solutions of olloidal gold, silver, platinum, and mercury, in which salts f these metals are treated in solution with hydroquinone quinol), catechol, or pyrogallol, with or without a neutralising gent, such as caustic soda or potash or sodium acetate or hosphate; the solutions thus obtained, after purification y dialysis, can be repeatedly filtered through hardened lter-paper, or boiled in a reflux apparatus, without depositing any metal. The ordinary precautions as to cleanliness of vessels and purity of reagents must be taken, and the water employed by the author was twice distilled and the vessels steamed.

With solutions of hydrogen aurichloride, the three phenols referred to yield colloidal gold solutions of various colours; in acid solutions the resulting liquids are generally blue, but sometimes green or rose-red, whilst in presence of alkali, violet and red colloidal solutions are obtained. The stability of the latter solutions is much greater than that of the former, and is greatest when no metallic lustre is visible in the liquid. On evaporating the red, non-fluorescent, colloidal gold solutions on the water-bath, a solid residue is obtained which has a lustre like gold and in thin layers is transparent; after keeping for more than two months this residue dissolves in water, yielding a colloidal solution. The behaviour of these solutions towards electrolytes is also similar to that described by Bredig in his paper on "Inorganic Ferments." (See this Journal, 1900, 1155; 1901, 376.) In preparing a blue solution of colloidal gold, 50 c.c. of a N/1000 hydrogen aurichloride solution was heated to boiling and rapidly mixed with 10 c.c. of hot N/100 quinol solution. The liquid thus obtained, which was transparent and dark blue, and showed a red, coppery lustre when viewed in reflected light, was dialysed after 10 minutes' standing, and then concentrated by maintaining a difference between the levels of liquid in the dialysing apparatus. A little blue gold precipitated, and was filtered off.

The methods used for preparing the other colloidal gold solutions and also those of platinum, silver, and mercury are similar to the above.—T. H. P.

Silver Sulphide; Action of Hydrogen on Mixtures of ——, with Sulphides of Antimony and Arsenic. H. Pélabon. Comptes rend., **136**, [7], 454—456.

KNOWN mixtures of silver sulphide with antimony sulphide and arsenic sulphide were heated in sealed tubes filled with hydrogen, to 610° C., and the composition of the gas determined after equilibrium had been established. The ratio of hydrogen sulphide to total gas was found to increase with the proportion of antimony or arsenic sulphide in the mixtures, though not in the same ratio. The author attributes this variation to diminution, through the action of the silver sulphide, of the vapour pressure of the other sulphide; as this decreases or increases, the point of equilibrium is pushed in the direction of total hydrogen or total hydrogen sulphide respectively.—J. T. D.

Acetates of Cobalt and Manganese; Oxidation of ——, by Chlorine. H. Copaux. Comptes rend., **136**, [6], 373.

THE author finds that chlorine has a different oxidising action on acetates of cobalt and manganese.

Cobalt Acetate.—One part of finely-powdered cobalt acetate is added in small quantities to two parts of a 5 per cent. acetic acid solution, through which a stream of chlorine passes. The liquid is filtered, saturated with chlorine, and allowed to evaporate spontaneously. Black crystals are obtained, which appear green by reflected light.

The same compound has been obtained by the author by crystallising, from acetic acid solutions, crystallised cobalt chloride with twice its weight of the substance obtained by electrolytic oxidation of cobalt acetate.

The substance is very soluble in water, and on boiling loses acetic acid. Its solutions are neutral to litmus.

The author considers that the substance is a derivative of Co_3O_4, and that the composition should be represented by the formula $[Co_3(C_2H_3O_2)_4]_4CoCl_2, 40H_2O$.

Manganese Acetate.—In 15 per cent. aqueous solutions Gorgeu found that manganese manganite was formed.

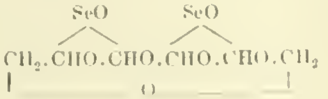
By using 40 per cent. solutions, an intense red colour is produced. On addition of twice the volume of glacial acetic acid, an acetate of manganese slowly separates out, and, on analysis, this was found to correspond to the formula $Mn(C_2H_3O_2)_3, 2H_2O$, appearing to be a derivative of Mn_2O_3.—T. F. B.

Mannitol; Action of Selenyl Chloride on ——. C. Chabrié and A. Bouchonnet. Comptes rend., 1903, **136**, [6], 376.

One molecule of mannitol heated with 2 mols. of selenyl chloride to about 130° C. reacts very vigorously, a thick, viscous liquid being formed, soluble in water and alcohol.

If the aqueous solution be filtered and evaporated, the temperature being raised to 150° C., a mass of long needles is deposited on cooling, which, on analysis, show the composition $C_6H_8O_7Se_2$. This substance decomposes very rapidly at temperatures much above 150° C.

Since all the selenium can be precipitated by heating the substance in presence of sulphurous acid, the authors assign the formula—



$$\mathrm{\underbrace{CH_2.\overbrace{CHO.CHO}^{SeO}.\overbrace{CHO.CHO}^{SeO}.CH_2}_{O}}$$

—T. F. B.

Peroxides; Function of ——, in the Chemistry of Living Cells. IV. The Peroxydases. A. Bach and R. Chodat. Ber., 1903, **36**, [3], 600—605. (See also this Journal, 1902, 1561.)

Certain plants, such as the pumpkin and horse-radish, which contain peroxydases, but no oxydases, serve for the preparation of the former enzymes uncontaminated by the latter. Horse-radish roots were finely ground and allowed to remain for several hours; the mass was then purified, by digestion for 4—5 days, and subsequent washing, with 80 per cent. alcohol, and pressed. The residue was submitted to a systematic extraction with 40 per cent. alcohol, which dissolves the peroxydase; the extract was concentrated at 30° C., filtered, and precipitated by absolute alcohol. After purification the enzyme preparation was obtained as a yellowish-white, gummy mass, extremely soluble in water and readily soluble in 40 per cent. alcohol. These preparations contained a substance which reduced Fehling's solution, but which was eliminated after repeated purification. The purest peroxydase preparations contained about 6 per cent. of ash, free from iron, but containing aluminium and manganese. The specific properties of the peroxydase are destroyed by heating the solutions to boiling, but are regenerated after a few hours; a second heating, however, destroys them permanently. When heated in alcohol, the peroxydase is destroyed at the boiling-point of alcohol. The peroxydase powerfully "activifies" a small quantity of hydrogen peroxide, but is destroyed by larger quantities. Besides hydrogen peroxide, the oxydases of various origins and the organic peroxides produced by the atmospheric oxidation of certain organic substances are "activified" in presence of the peroxydase. Quantitative results of oxygen absorbed and carbon dioxide evolved by the oxidation of pyrogallol, are quoted. These results proved that the peroxydase, in absence of a peroxide, is absolutely devoid of oxidising properties.—J. F. B.

Peroxides; Function of ——, in the Chemistry of Living Cells. V. Separation of the so-called Oxydases into Oxygenases and Peroxydases. R. Chodat and A. Bach. Ber., 1903, **36**, [3], 606—608.

If a solution of oxydase from *Lactarius* be submitted to a systematic series of fractional precipitations by alcohol, two final fractions are obtained, one of which is insoluble in 40 per cent. alcohol and possesses only feeble oxidising properties, whilst the other is soluble and is entirely devoid of oxidising power. The oxidising power of the former is strongly intensified by the addition of the second fraction or of a peroxydase of any origin. It is regarded as an oxygen carrier, taking up molecular oxygen and converting it into peroxide, and is termed by the authors an *oxygenase*; the other fraction is simply a *peroxydase* with the properties described in the preceding abstract. Whereas the peroxydases can readily be obtained free from oxygenases, it has not yet been possible to prepare the latter absolutely free from peroxydases. Quantitative experiments on the oxidation of pyrogallol showed that the activity of the oxygenases prepared from fungi (*Russula* and *Lactarius*) was far more powerfully intensified by the peroxydases of similar origin than by those prepared from pumpkins or horse-radish. On the other hand, the fungus peroxydases have a far weaker "activifying" influence on hydrogen peroxide than those of the latter origin. Peroxydases exist, therefore, of two kinds, one acting more powerfully on oxygenases, and the other on hydrogen peroxide. The oxydases as hitherto known are normally mixtures of oxygenases and peroxydases, and their oxidising power depends on the presence of both bodies. Whilst many plants are known which show no oxydase reaction, practically none exist which do not contain peroxydases. As organic peroxides, the stability of the oxygenases depends on the nature of the radicles combined with the peroxide group. Unstable oxygenases, or those which react readily with water to form hydrogen peroxide, are used up as soon as they are formed in the plant, and cannot be detected; the peroxydases, on the other hand, are uniformly very stable, and can always be detected on the addition of a peroxide.

—J. F. B.

New Books.

Chemical Technology, or Chemistry in its Applications to Arts and Manufactures, with which is incorporated Richardson and Watts' Chemical Technology. Vol. IV. Edited by W. J. Dibdin, F.I.C. F.C.S., &c. Electric Lighting, by A. G. Cooke M.A., &c., Head of the Electrical Engineering and Physics Department of the Battersea Polytechnic. Photometry, by W. J. Dibdin, formerly Chemist and Superintendent Gas Examiner to the Metropolitan Board of Works and the London County Council (1882—1897) J. and A. Churchill, 7, Great Marlborough Street, London. 1903. Price 20*s*.

Large 8vo volume, containing 373 pages of subject-matter with 181 illustrations. The text is subdivided as follows:— Introduction. I. Conductors. II. Parallel Distribution III. Electro-Magnetism. IV. The Closed Dynamo (Genera Theory). V. Closed Coil Dynamo (Design and Regulation) VI. Storage Batteries. VII. Continuous Current Trans former Systems. VIII. Series Distribution. IX. Alternat ing Currents (Theory). X. Alternating Currents (Ma chinery). XI. Alternating Current Distribution. XII The Coupling together of Generators. XIII. Incandescen Lamps. XIV. Arc Lamps. XV. Central Station Economy XVI. Photometry. XVII. Standards of Light. XVIII Methods of Determining the Illuminating Power of Coa Gas.

The Chemical Changes and Products resulting fro Fermentations. By R. H. Aders Plimmer, D.S Longmans, Green, and Co., 39, Paternoster Row, London New York, and Bombay. 1903. Price 6*s*.

8vo volume, with 141 pages of subject-matter, 33 page of bibliography, and the alphabetical index of names o authors and subject-matter. The subject is subdivide as follows:—I. Changes in the Polysaccharides. II. I the Trisaccharides and Disaccharides. III. In th Monosaccharides. II. In the Glucosides. V. Change resulting in the Formation of Optically Active Product VI. Changes in Esters. VII. In Urea and Uric Aci VIII. Changes as the Result of Oxidation. IX. As th Result of Reduction. X. Nitrification and Denitrificatio XI. Various Changes occurring as the Result of Fermenta tions. XII. Changes in Blood. XIII. In Milk, Musch and in the Liquid of the Prostate Gland. XIV. I Albumins as the Result of the Action of Pepsin. X In Albumins as the Result of the Action of Trypsin. XV Proteolysis by Ferments other than Pepsin and Trypsi XVII. Changes and Products occurring as the Result Putrefaction.

PRINCIPLES OF INORGANIC CHEMISTRY. By H. C. JONES, Associate Professor of Physical Chemistry in the Johns Hopkins University. The Macmillan Company, New York. Macmillan and Co., Ltd., London. 1903. Price 17*s*.

LARGE 8vo volume, containing 497 pages of subject-matter, illustrated with 42 engravings, and followed by an alphabetical index. "The aim of this book is to add to the older generalisations, those recently discovered, and to apply them to the phenomena of inorganic chemistry in such a way that they may form an integral part of the subject, and at the same time be intelligible to the student."

Trade Report.

I.—GENERAL.

MINES AND QUARRIES: GENERAL REPORT AND STATISTICS FOR 1902.

Home Office Report 1903.

Output of Minerals under Metalliferous Mines Regulation Acts during 1902.

Mineral.	1901.	1902.
	Tons.	Tons.
Arsenic	3,361	2,425
Arsenical pyrites	2,578	535
Barytes	26,413	22,308
Bauxite	10,191	9,047
Chalk	4,564	8,666
Chert and flint	2,976	2,929
Clay and shale	104,907	95,963
Copper ore and copper precipitate	6,792	6,762
Fluor spar	4.164	4,970
Gold ore	16,374	29,953
Gypsum	151,199	170,196
Igneous rock	98,912	93,664
Iron ore	1,671,025	1,700,624
Iron pyrites	2,577	1,617
Lead ore	26,970	23,615
Limestone	512,158	571,721
Manganese ore	1,646	1,278
Ochre, umber, &c.	5,228	7,666
Rock salt	151,348	162,193
Sand	11,863	13,075
Sandstone	230,604	201,760
Slate	154,324	159,540
Tin ore (dressed)	6,542	6,698
Uranium ore	79	52
Wolfram	18	9
Zinc ore	23,752	25,060
Total	3,220,565	3,322,326

Output of Minerals under the Coal Mines Regulation Acts during 1902.

Mineral.	1901.	1902.
	Tons.	Tons.
Coal	219,037,240	227,178,140
Clay and shale, other than fireclay and oil shale.	140,067	161,053
Fireclay	2,834,997	2,966,310
Iron pyrites	7,661	7,551
Ironstone	6,849,926	7,224,635
Limestone	27,715	33,316
Oil shale	2,354,356	2,107,534
Petroleum	8	25
Sandstone (including "Ganister")	91,254	95,914
Total	231,343,224	239,774,508

In examining the statistics of output given in these tables, it must be borne in mind that the figures do not in all cases represent the total production of the minerals for the year. Large quantities of several important minerals, such as iron ore, limestone, sandstone, slate, clay, &c., are obtained from quarries under the Quarries Act, and from other open workings, the returns from which are not yet available. The totals for coal, and the ores of copper, lead, and zinc, may, however, be regarded as substantially complete. The total mineral output of the United Kingdom, including the returns from quarries, &c., will appear in Part I. of the General Report.

COLOMBIA; REPUBLIC OF ——, CUSTOMS CHANGES.

A consular report, dated Feb. 23, 1903, states that a decree has been issued abolishing all export duties (except on precious metals), to take effect as soon as notice thereof reaches the custom-houses. A Board of Trade circular, dated March 3, 1903, states that, after March 1, all import duties leviable in the Republic of Colombia have been increased tenfold.

NATAL; TRADE OF ——, IN 1902.

Bd. of Trade J., March 5, 1903.

Amongst the imports into Natal may be noted—

——	1901.	1902.
	£	£
Oils, paints, &c.	183,000	238,000
Drugs and chemicals	133,000	169,060
Soap and candles	151,000	142,000
Earthen, china, and stone ware, &c.	37,000	52,000
Cement	37,000	49,000

while the exports include—

——	1901.	1902.
	£	£
Sugar	142,000	161,000
Bark	70,000	75,000
Beer	10,000	9,000
Matches	5,000	5,000

NEW "GENERAL" CUSTOMS TARIFF OF GERMANY.

Bd. of Trade J., March 12, 1903.

A return has just been issued by the Board of Trade containing a translation of the new "General" Customs Tariff of Germany, and comparing, as far as possible, the rates of Customs duty established by the Tariff with the rates which are at present in force on imports into Germany from the United Kingdom This return is in continuation and completion of one issued in 1901 (Parliamentary reference number, Cd. 779), which contained a translation of the greater portion of the Tariff in its form as originally proposed, so far as it affected the principal articles of British trade.

The Tariff, as published, has been framed largely with a view to the negotiations which will follow the approaching termination of the German Commercial Treaties with various Continental Powers.

The Tariff is not in operation, and it is provided by section 16 of the Law establishing it that "the period at which the Law will come into force will be determined by Imperial Ordnance with the concurrence of the Bundesrath." No date, however, has yet been fixed for its entry into operation. Under the commercial treaties referred to above, the tariff rates of import duty leviable in Germany on a large number of articles in which the trade of the United Kingdom is interested are definitely fixed, and the treaties are only terminable 12 months after the date on which they may have respectively been denounced. So far as the Board of Trade are aware, denunciation has not yet taken place with regard to any of them.

The Tariff as now published is liable to modification before it comes into operation, as the result of negotiations beween Germany and other Powers, for the conclusion of new Commercial Treaties.

It may be added that imports into Germany from the United Kingdom at present enjoy most-favoured-nation treatment in virtue of a German law.

II.—FUEL, GAS, AND LIGHT.

Recovery Coke-Oven in Germany; Progress of the ——.

J. of Gas Lighting, 1903, **81**, [2074], 356.

Since the adoption of coke-ovens (see page 355), the yearly production of ammonium sulphate in Germany has steadily increased. In 1895 the production in Westphalia amounted to 10,000 tons, but had increased to 50,000 tons in 1900; whilst the price remained nearly constant.—A. S.

VII.—ACIDS, ALKALIS, Etc.

The American Demand for Sulphur.

C. C. Schnatterbeck, Eng. and Mining J., Feb. 28, 1903.

Heretofore the demand for sulphur in America has been satisfied largely by crude brimstone, but since 1896, when the Sicilian miners formed a combination and advanced prices, acid makers in the United States have considered it better policy to burn pyrites. Subsequently between 1896 and 1902, with the rapid development of manufacturing enterprises, the consumption of sulphur increased over 80 per cent. In 1902, there were consumed 520,537 long tons of sulphur, and of this amount pyrites supplied 337,750 tons, or nearly 65 per cent. In 1896 the sulphur recovered from pyrites amounted to 141,933 tons, showing an increase in 1902 of 195,817 tons, or 138 per cent. This growth in the demand for pyrites sulphur has been due chiefly to the fertiliser acid trade. It has also increased the domestic production of pyrites from 109,282 tons in 1896 to 303,746 tons in 1902, or nearly 178 per cent., and the probability is that there will be a further growth in the future. This ore carries from 42 to 44 per cent. sulphur, and is mined principally in Virginia, Georgia, and Massachusetts. The imports of pyrites, containing from 46 to 52 per cent. sulphur, also show an increase, of about 119 per cent. This heavy import trade is free of duty. Small quantities of good quality pyrites have also been imported from Newfoundland and Norway, but Spain is still the main source of foreign supply. The market value of imported pyrites since 1896 has fallen in a larger ratio than the advance reported in brimstone. This has naturally favoured an increased consumption of pyrites, and should importers succeed in their efforts to supply a larger quantity of non-arsenical ore, it seems likely that those using brimstone exclusively will try pyrites. Imports of brimstone into the United States are free of duty. In 1896, at the time of the organisation of the Anglo-Sicilian Sulphur Co., the imports into the United States were 145,318 long tons, and they furnished about 49 per cent. of the total sulphur consumed here. In 1902, six years later, the brimstone imports were 176,951 tons, which supplied only 33 per cent. of the demand for sulphur. True, there has been an increase of about 22 per cent. in brimstone imports, but this was due principally to the consumption of best unmixed seconds by the sulphite pulp mills. It should be mentioned here that the sulphuric acid manufacturers, when they use brimstone, buy mostly best thirds, which cost about 1·5 dols. per ton less than seconds, the difference in price being due to quality. The import value of brimstone has advanced about 32 per cent. since 1896, and may be taken as an index to the profits that have been made by the combination since its incorporation.

——	Brimstone.		Pyrites.	
	1896.	1902.	1896.	1902.
Production	3,800	10,818	109,282	303,746
Imports	145,318	176,951	199,678	437,319
Total	149,118	187,769	308,960	741,065
Exports	484	1,253	..	3,060
Consumption	148,634	186,516	308,960	738,005
Sulphur content	145,661	182,787	141,933	337,750

The table shows the development of the sulphur trad in America from 1896 to 1902. This period illustrates th influence of the high prices asked for crude brimston by the combination. The figures are in long tons o 2,240 lb., and the sulphur contained in the crude brimston has been calculated at 98 per cent. pure, and in pyrites a 44 per cent. for the domestic ore and 47 per cent. for th imported.

In addition to the above an increasing quantity of sulphu is being recovered from the fumes from roasting blende Zinc works at La Salle and Peru, Ill., are producing a goo acid in this way, and it is hoped that the industry w prosper. In Germany most of the large zinc works mak either sulphuric acid or sulphurous acid from the fumes.

X.—METALLURGY.

Bauxite Mining in Arkansas.

Eng. and Mining J., Feb. 28, 1903.

The Pittsburg Reduction Company is now minin bauxite at Bauxite, Saline County, Arkansas. While muc work has been done there, the plant at the mines is sti incomplete, though its construction is being pushed.

A part of the ore is washed to remove the free silica. A large amount of it can be used without washing. A par of it is dried and the balance calcined. In drying cylindrical dryer is used, the furnace being fired with woo In calcining a 60-ft. rotary calciner is used, fired with ga generated in a 10 by 12-ft. Duff's patent water-seal gas pro ducer. The ore is all ground on a series of coarse and fin crushers, and handled by elevators and conveyers from th tramcars into the cars for shipment.

Spelter Production of the World.

Eng. and Mining J., Feb. 21, 1903.

Henry R. Merton and Co. have compiled their yearl table, showing the approximate production of spelter in th world in 1902. In the statement below the Journal substi tutes its own figures for the production of the Unite States which it makes slightly larger than the Merto report. The figures given are in long tons of 2,240 lb.

——	1901.	1902.	Changes.		Per centag
Belgium, Rhine, and Holland.	199,285	200,140	I.	855	0·4
Silesia	106,385	115,280	I.	8,895	8·4
Great Britain	30,055	39,610	I.	9,555	31·8
France and Spain	27,265	27,030	D.	235	0·9
Austria and Italy	7,700	8,460	I.	760	1·0
Poland	5,935	8,150	I.	2,215	37·5
Total Europe	376,625	398,670	I.	22,045	5·9
United States	125,734	141,471	I.	15,737	12·5
Total, long tons	502,359	540,141	I.	37,782	7·5
Total, short tons	562,642	604,958	I.	42,316	7·5
Total, metric tons	570,397	548,783	I.	38,386	7·5

The production of spelter last year apparently kept u with the increased consumption, since buying was generall steady, and prices firm throughout the year. New sourc of supply of zinc ores continue to be developed. I America the chief additional supply has been drawn fro Colorado, and the exports of ores showed an increase, well as the production of spelter. The new supplies for t European smelters come chiefly from Algeria and Tun while some concentrates from Australia were received British works.

Manganese Exports from Brazil.

Chem. Trade J., March 7, 1903.

The following figures show the export of manganese British vessels during the last three years:—1900, 73,5 tons; 1901, 84,837 tons; 1902, 143,320 tons.

XII.—FATS, OILS, Etc.

Oil Trade of South Italy.

Bd. of Trade J., March 5, 1903.

H.M. Consul at Naples, encloses a report by one of the ading firms in the oil trade of South Italy, from which the lowing particulars have been extracted.

The subjoined table shows the exports of olive oil from allipoli during each of the years 1898–1902 :—

To	1898.	1899.	1900.	1901.	1902.
			Imperial Tuns.		
gland	512	1,011	320	1,279	521
ssia	924	1,791	255	699	119
ince	..	7	2	3	14
ited States (New York)	9	10	6	4	..
lian Ports	597	1,379	1,608	666	456
Total Imperial Tuns	2,042	4,198	2,191	2,651	1,110

" Unfortunately, the new crop has proved an entire failure far as the quantity is concerned, the stock existing on st December last comprising, for the greater part, also the w production. This stock amounted to 2,681 imperial ns, as against 1,625 on the corresponding date of 1901, d 1,100 in 1900. The price of Gallipoli oil on the st December, 1902, was 35*l.* 5*s.* per imperial tun, as compared with 33*l.* 10*s.*, and 26*l.* 15*s.* in 1901 and 1900 spectively."

XIII. C.—INDIA-RUBBER, Etc.

Ceara Rubber in Nicaragua.

U.S. Cons. Reps., Feb. 26, 1903.

So much attention has been given to the cultivation of bber in Central America, that the native rubber of the gion, *Castiloa elastica*, is regarded as the only species sceptible of cultivation in the country. In Nicaragua, e conditions for its growth—hot, humid atmosphere, and moist, though well-drained, soil—limit it to the Atlantic ast.

In view of the neglect of rubber culture in other fertile rtions of the country, it is interesting to note that at La iz, in the district of Leon, where precisely opposite conions of climate prevail to what are needed for *Castiloa istica*—another species, indigenous to Brazil, the " Ceara " commerce (*Manihot glaziovii*), is being successfully inted.

The climate at La Paz is hot and dry, and the soil of lcanic origin, retaining moisture during drought to within few inches of the surface. Temperature averages from ° to over 100° F. During periods of drought, there is t little or no condensation of dew.

XVI.—SUGAR, STARCH, Etc.

Potato-Starch Machinery in Russia.

U.S. Cons. Rep., Feb. 15, 1903.

Twelve new factories for potato-starch are in course of ection in the Warsaw district, which is due to the large ops in this section of Russia. About 90 potato-starch ctories are already in operation. There is a large mand for machinery for the manufacture of this starch, d there is a decided tendency to give preference to all eign machinery other than German. Offers may be ected to Bronislaw Oderfeld, 17, Ujasdowska Aleja, arsaw. Prices should be stated, if possible, delivered Stettin, Germany.

XX.—FINE CHEMICALS, Etc.

xemption from Import Duty of Sulphuric Ether for Use in Factories in Holland.

Bd. of Trade J., March 12, 1903.

A Dutch Decree, dated Feb. 7, exempts from Customs ty, subject to certain conditions, sulphuric ether imported o Holland for use in factories and works.

The translation of this decree may be consulted on application at the offices of the Commercial Intelligence Branch of the Board of Trade.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

[A.] 5145. Owen. Ovens and kilns. March 5.

„ 5308. Schröder. Apparatus for cooling or heating fluids. March 6.

„ 5316. Winter. Centrifugal apparatus. March 6.

„ 5431. Dupont. Distilling apparatus. March 9.

„ 5745. Cyon. Method of watching and controlling chemical processes, and apparatus therefor.* March 12.

„ 5770. Wache and Loenge. Apparatus for concentrating liquids. March 12.

„ 5782. Breakell. Grinding or crushing apparatus.* March 12.

„ 5856. Hudson. Centrifugal machine for the separation of liquids. March 13.

[C.S.] 22,852 (1902). Removing the fumes and gases evolved from vessels employed in various processes. March 18.

„ 24,680 (1902). Adams. Rotary liquid distributors. March 11.

„ 25,324 (1902). Smith, Morrison, and Schindler. Composition for use as a substitute for cork, corkwood, &c March 18.

„ 28,855 (1902). Cliff. Muffle kilns. March 11.

„ 693 (1903). Güttner. Centrifugal separators. March 11.

„ 1397 (1903). Stanton. Condensing apparatus. March 11.

II.—FUEL, GAS, and LIGHT

[A.] 4861. Bian. Purification of furnace gases.* March 2.

„ 4982. Tully (Gas Light and Coke Co.). Manufacture of gas. March 3.

„ 4988. Moor. Treatment of gas liquor March 4.

„ 5080. D'Heureuse. Incandescent mantle. March 4.

„ 5088. Lake (Selas Ges. m. b. H.). Apparatus for producing a mixture of gases for lighting purposes. March 4.

„ 5541. McConechy. Apparatus for producing acetylene gas. March 10.

„ 5566. Brown. Artificial fuel.* March 10.

„ 5589. Branston and Burnell. Manufacture of coal-gas. March 10.

„ 5676. Bowing. Manufacture of combustible gas. March 11.

„ 5695. Schmidt and Neugebauer. Manufacture of fuel blocks or briquettes.* March 11.

„ 5703. McConechy. Acetylene gas generators. March 12.

„ 5781. Jones. Manufacture of gas. March 12.

[A.] 5805. Lion. Carburetting gas by means of naphthalene.* (French application, March 14, 1902.) March 12.

„ 5866. Siemens. Regenerative gas furnaces. March 13.

„ 5910. Dempster and Sons, Ltd., and Broadhead. Gas purifiers. March 14.

[C.S.] 24,514 (1901). Thomson. Combustion of fuel in furnaces and kilns. March 11.

„ 3343 (1902). Beult (Viarmé). Gas generators. March 18.

5482 (1902). Ludwig. Conversion of carbon into graphite or other forms. March 11.

„ 5912 (1902). Simpson. Bunsen burners for liquid fuel. March 11.

„ 6153 (1902). Carmichael and Sahlstrom. Production of fuel from peat, and utilisation of by-products. March 11.

„ 7956 (1902). Hills. Purification of gas. March 11.

„ 9622 (1902). Trewby. Gas retorts. March 11.

„ 22,466 (1902). Laurent. Portable furnace. (International application, Nov. 30, 1901.) March 11.

„ 28,177 (1902). Harrison (Soc. Internat. du Gas d'Eau brevets Strache Ste. Ame). Manufacture of water-gas. March 18.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[C.S.] 24,832 (1901). Wilton. Apparatus for distilling ammoniacal liquors. March 11.

„ 8515 (1902). Tixier. Process for obtaining in one operation all the extracts soluble in water contained in tar. March 18.

„ 100 (1903). Ricklefs. Carbonisation of animal and vegetable substances with or without the production of by-products. March 18.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 5269. Newton (Bayer). Manufacture of a new azo dyestuff. March 6.

„ 5328. Berry and Gerland. Manufacture of soluble indigo. March 7.

„ 5689. Johnson (Badische Anilin und Soda Fabrik). Production of an azo colouring matter. March 11.

„ 5792. Lake (Oehler). Manufacture of disazo dyestuffs.* March 12.

„ 5867. Imray (Meister, Lucius und Brüning). Manufacture of hydrosulphite compounds and methods of dyeing and printing with their aid. March 13.

[C.S.] 9194 (1902). Newton (Bayer). Production of new anthraquinone derivatives. March 11.

„ 10,187 (1902). Johnson (Kalle). Brown colouring matters containing sulphur. March 11.

„ 10,243 (1902). Imray (Meister, Lucius und Brüning). Azo dyestuffs. March 11.

„ 10,516 (1902). Imray (Meister, Lucius und Brüning). Manufacture of brom-indigo-white and bromo-indigo. March 18.

„ 11,179 (1902). Imray (Meister, Lucius und Bruning). Manufacture of esters of methylanthranilic acid. March 11.

„ 11,403 (1902). Newton (Bayer). Dyestuffs of the anthraquinone series. March 18.

„ 11,711 (1902). Johnson (Badische Anilin und Soda Fabrik). Colouring matters of the acridine series. March 11.

„ 12,229 (1902). Levinstein, Levinstein, and Levinstein, Ltd. Blue sulphur dyestuff. March 11.

„ 14,606 (1902). Johnson (Badische Anilin und Soda Fabrik). Manufacture of indol and derivatives thereof. March 18.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS AND FIBRES.

[A.] 5018. Crowther. Agents or solutions for bleaching fibres, yarns, textiles, &c. March 4.

„ 5119. Crowther. Agents or solutions for removin the colour from fibres, fabrics, &c. March 5.

„ 5146. De Pass (Vacuum Dyeing Machine Co. Dyeing machines.* March 5.

„ 5324. Schirp. Dyeing, bleaching, and washin apparatus.* March 7.

„ 5773. Bartelt. Treatment of textile fabrics an yarns. March 12.

„ 5867. Imray (Meister, Lucius und Brüning). S *under* IV.

[C.S.] 16,487 (1902). Küster. Production of fabri with moiré figurings. March 18.

„ 369 (1903). Haddan (Elosegui). Fulling, dyein and scouring of woollen fabrics. March 18.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc

[A.] 5211. Dreher. Dyeing skins or partly prepar leather.* March 5.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 4820. Cummer. Calcining of alumina sulphate like material.* March 2.

„ 5649. Levy. Process and apparatus for separat gases from gaseous mixtures, especially oxyg and nitrogen from the atmosphere. March 11.

„ 5902. Johnson (Chem. Fab. Griesheim-Elektro Treatment of chrome ironstone for the separati of the iron, and obtaining chromium compoun March 13.

[C.S.] 2174 (1902). Hoyne. Production of ozone. March

„ 6145 (1902). Naumann. Treatment of natural so preparatory to producing colourless sodium ca bonate. March 18.

„ 7119 (1902). Halse. Production of charco especially for decolorising liquids. March 18.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 4807. Wood, of Apsley Pellatt and Co. Decorati articles of china, porcelain, earthenware, & March 2.

„ 5085. De Valeriola. Apparatus for use in treati glass. March 4.

„ 5861. Dreher. Manufacture of enamels, glaz glass, and other vitreous products. March 13

[C.S.] 6134 (1902). De Witt. Annealing and dir draught continuous kilns. March 18.

„ 6381 (1902). De France. Kiln for firing cera ware. March 18.

„ 9029 (1902). James. Manufacture of leaded gl. March 11.

„ 14,689 (1902). Thompson (Fontaine et Ci. Flashing of glassware with coloured gl. March 11.

IX.—BUILDING MATERIALS, CLAYS, MORTAR AND CEMENTS.

[A.] 4821. Carpenter. Apparatus for manufacture cement.* March 2.

„ 4876. Oates. Composition for forming joints fireclay, stoneware, &c. March 3.

„ 4907. Briggs. Bituminous cement. March 3.

[A.] 4931. Entwistle and Lowden. Method of drying and burning off bricks, earthenware, cement, &c. March 3.

,, 4935. Eldred. Treatment of lime.* March 3.

,, 5090. Barratt and The United Asbestos Co., Ltd. Non-conducting coverings for boilers, pipes, &c.* March 5.

,, 5193. Gallinowsky and Maguire. Manufacture of plastic compound or cement. March 5.

,, 5594. Lake (Chemische-Technische Fabrik, Dr. Brand and Co.). Process for colouring and hardening natural stone, &c. March 10.

,, 5601. Smith. Process and materials for decorating woodwork. March 10.

,, 5602. Bond. Treating walls, &c., to increase their light-reflecting capacity. March 10.

,, 5848. Tudor and Moore. Manufacture of tiles. March 13.

,, 5917. Faulks. Composite paving. March 14.

C.S.] 7647 (1902). Sellars. Manufacture of building blocks, bricks, &c. March 11.

,, 25,736 (1902). Guinet. Artificial marble. March 11.

,, 25,931 (1902). Barham, Bulbeck, and Innes-Baillie. Kiln for drying and burning bricks. March 11.

,, 28,810 (1902). Landverlin and Chipaux. Cement. (Int. Appl. May 30, 1902.) March 11.

,, 759 (1903). Korff. Construction of bricks. March 11.

X.—METALLURGY.

[A.] 4806. Stanton. Treatment of ores, &c.* March 2.

,, 4894. Jones. Puddling and re-heating furnaces. March 3.

,, 4977. Carson and Ogle. Treatment of zinc and other ores. March 3.

,, 4981. Hadfield. Toughening of manganese steel. March 3.

,, 5016. Kunze and Danziger. Manufacture of zinc. March 4.

,, 5033. Platner. Precipitation of gold from its cyanide solutions. March 4.

,, 5202. Varley. Tuyères. March 5.

,, 5230. Gin. Manufacture of copper sulphate by direct sulphurisation of ores.* March 6.

,, 5597. Marks (Lamargese). Case hardening iron and steel. March 10.

,, 5683. Prescott and Green and Son, Ltd. Manufacture of metallic alloy. March 11.

,, 5694. Duke. Alloys. March 11.

,, 5903. Cowper-Coles, Ltd., and Cowper-Coles. Application of vanadium in manufacturing iron and steel. March 13.

C.S.] 5531 (1902). Ronay. Making briquettes from fine metalliferous material without foreign binding substance. March 11.

,, 9340 (1902). Shone. Solder and fluxes for aluminium. March 18.

,, 9696 (1902). Just and Frith. Metallic alloy March 18.

,, 19,035 (1902). Payne and Gillies. Treatment of ores containing copper. March 11.

,, 23,425 (1902). Thompson (Suddeutsche patent-metall-Papierfabr. A.-G.). Metallic paper which is air-, water-, and grease-proof. March 18.

,, 27,530 (1902). Manners, Reddan, and Shumann. Method of ornamenting metallic surfaces. March 11.

,, 28,240 (1902). Hunter. Manufacture of steel and malleable iron. March 18.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 4783. Thomson. Electrolytic cells. March 2.

,, 4959. Metals Corporation, Ltd., and Cowper-Coles. Electrolytic refining of copper. March 3.

,, 5081. Jacobson. Galvanic batteries.* March 4.

,, 5441. Ramsay. Improved electric light. March 9.

,, 5448. Szirmay and Kollerich. Electrolytic zincing process.* March 9.

,, 5693. Schiele. Plating of metals.* March 11.

,, 5891. Portalier. Electric batteries.* (Belgian appl., Sept. 13, 1902.) March 13.

,, 5892. Staedtefeld. Manufacture of electric insulating material.* March 13.

[C.S.] 3259 (1902). Schattner. Mercury vapour electricity lamps. March 18.

,, 7923 (1902). Goldberg. Electrolytically coating iron with zinc. March 11.

,, 15,312 (1902). Genard. Accumulators. March 18.

,, 28,808 (1902). Halsey Electric Generator Co. Galvanic batteries. March 11.

XII.—FATS, OILS, AND SOAP.

[A.] 5687. Pfestroff and Gillon. Substitute for linseed oil.* March 11.

,, 5789. Dewar and The Linoleum Manufacturing Co. Treatment of wood-oil to form products specially useful in the manufacture of linoleum and the like. March 12.

[C.S.] 28,717 (1902). Fischer. Making a soap-like remedy from fresh-water limestone (tuff-stone). March 18.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 4787. Richardson. Extraction of material for making paint from alum slag. March 2.

,, 5261. Traine. Manufacture of siccatives.* March 6.

B.—Resins, Varnishes.

[A.] 5953. Dreher. Manufacture of varnishes and lacquers. March 14.

C.—India-rubber, &c.

[C.S.] 7215 (1902). Hurrell. Insulating and protecting underground cables. March 11.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 4902. Jetter. Preparing a horn-like material from raw skins. March 3.

,, 5305. Zacharias. Manufacture of leather. March 6.

[C.S.] 2303 (1902). Bögel. Extraction of tanning substances. March 11.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 4858. Sudre. Treatment of residuary liquors of sugar factories. (French application, June 3, 1902.)* March 2.

,, 5166. Mercier. Bleaching flour. March 5.

,, 5280. Naudet. Apparatus for the diffusion and extraction of saccharine juices. March 6.

,, 5439. Steffen. Obtaining pure concentrated beet-root expressed juices and expressed residues rich in sugar.* March 9.

[C.S.] 21,454 (1902). Lagrange. Process for extraction and instantaneous separation of sugar from any syrup in free air and by refrigeration. March 18.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 4872. Southby. Brewing beer. March 3.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

A.—Foods.

[A.] 5446. Jong and Heide. Sterilising milk and other liquids. March 9.

„ 5591. Nissen. Pasteurising apparatus. March 10.

[C.S.] 6549 (1902). Jones. Food preparations or biscuits. March 18.

„ 1306 (1903). James (Casein Co.). Manufacture of milk powder. March 11.

B.—Sanitation; Water Purification.

[C.S.] 6021 (1902). England. Treatment of sewage sludge for the production of manure. March 18.

„ 7436 (1902). Challis. Softening water. March 18.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 4863. Schmerber und Morane. Manufacture of celluloid. March 2.

„ 5339. Goy. Manufacture of paper.* March 7.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

[A.] 5772. Newton (Bayer). Production of pharmaceutical compounds. March 12.

„ 5901. Johnson (Boehringer). Preparation of theophylline and production of an intermediate product.* March 13.

[C.S.] 9038 (1902). Newton (Bayer). Production o naphthacene derivatives and intermediate compounds. March 11.

„ 10,094 (1902). Johnson (Boehringer). Manufacture of hydroxylamine. March 11.

„ 28,638 (1902). Silberrad. Condensation product from mellitic and pyromellitic acids, and derivatives therefrom. March 11.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 4961. Fritzsche. Roll films. March 3.

„ 4962. Fritzsche. Roll films and processes for thre colour photography. March 3.

„ 5014. Tyler. Photographic printing-out pap March 4.

„ 5952. Dreher. Photographic films or surfaces, an developers. March 14.

[C.S.] 9184 (1902) Clarke. Photography in natur colours. March 11.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 5791. Bichel. Manufacture of explosives. March 1

[C.S.] 9480 (1902). Maxim Smokeless powder grai and cartridges. March 18.

„ 10,655 (1902). Bale. Manufacture of matches an striking compositions. March 18.

* * *

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Notices.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held at Bradford, Yorks, on Wednesday, July 15th, and following days. Full particulars will appear in a subsequent issue.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, JUNE 2–8, 1903.

List of British Delegates.

Royal Society.—Dr. W. H. Perkin, F.R.S.; Dr. J. Emerson Reynolds, F.R.S.; Prof. H. E. Armstrong, F.R.S.; Dr. T. E. Thorpe, C.B., F.R.S.

British Association for the Advancement of Science.—Sir Henry E. Roscoe, F.R.S.; Prof. Jas. Dewar, F.R.S.; Prof. R. Meldola, F.R.S.

Chemical Society of London.—Prof. W. A. Tilden, F.R.S.; Prof. W. H. Perkin, jun., F.R.S.; Prof. Wyndham R. Dunstan, F.R.S.; Dr. Alexander Scott, F.R.S.

Royal Institution of Great Britain.—Sir Wm. Crookes, F.R.S.; Geo. Matthey, F.R.S.; Dr. L. Mond, F.R.S.

Institute of Chemistry of Great Britain and Ireland.—Prof. J. Millar Thomson, F.R.S.; George T. Beilby; Dr. J. Lewkowitsch.

Royal Agricultural Society of England.—Dr. J. Augustus Voelcker.

Iron and Steel Institute.—Wm. Whitwell; R. A. Hadfield; J. E. Stead; Bennett H. Brough.

Royal Society of Edinburgh.—Prof. Jno. Gibson; Dr. J. B. Readman; Jas. F. Pullar.

University of Oxford.—J. E. Marsh; P. Brereton Baker; W. W. Fisher; P. Elford.

University of Glasgow.—Prof. Jno. Ferguson; George T. Beilby.

University College, London.—Sir Wm. Ramsay, K.C.B., F.R.S.

Victoria University.—Dr. A. W. Bone; Dr. T. L. Bailey; Dr. J. B. Cohen.

Durham College of Science.—Dr. J. W. Swan, F.R.S.; Dr. J. T. Merz; J. W. Spencer; Prof. P. Phillips Bedson.

Institute of Mining and Metallurgy.—Prof. H. Bauerman; Dr. T. Kirke Rose; J. H. Collins; H. L. Sulman.

Society of Dyers and Colourists.—Dr. E. Knecht, Dr. P. Krais; E. Hickson; Walter M. Gardner.

Royal Photographic Society.—Sir Wm. Abney, K.C.B., F.R.S.; Major-Gen. J. Waterhouse; Prof. R. Meldola, F.R.S.; C. H. Bothamley.

Society of Arts.—Prof. Jas. Dewar, F.R.S.; Dr. W. H. Perkin, F.R.S.; Prof. J. Millar Thomson, F.R.S.; Jos. G. Gordon.

Faraday Society (Electro-Chemists and Electro-Metallurgists).—Prof. A. K. Huntington; Dr. R. A. Lehfeldt; Dr. O. J. Steinhart; R. S. Hutton.

Society of Public Analysts.—Otto Hehner; Bertram Blount.

Federated Institute of Brewing.—C. O'Sullivan, F.R.S.; A. Gordon Salamon.

Association of Leather Chemists.—Dr. J. Gordon Parker.

Society of Chemical Industry.—Ivan Levinstein; Dr. L. Mond, F.R.S.; Walter F. Reid; Thos. Tyrer.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Board, J. T.; Journals to Roseneath, Willsbridge, nea Bristol.

Bolton, E. Richards, l/o S. Kensington; 10, Aynhoe Road Brook Green, W.

Brown, R. J.; Journals to Eversley, Davenport Park Stockport.

Brown, Walter B., l/o Chicago; Victor Chemical Work Chicago Heights, Ill., U.S.A., Superintendent.

Charlton, T., l/o Frederick Street; 2926, Webster Street, San Francisco, Cal., U.S.A.

Clutton, J. H., l/o Goring Villas; Elliott's Metal Co., Ltd Burry Port, R.S.O., Carmarthenshire, Metallurgist.

Colman, Dr. Harold G., l/o Birmingham; Elmside, Worcester Park, Surrey.

Craven, John, l/o Manchester; c/o Dominion Tar a Chemical Co., Ltd., Sydney, Nova Scotia.

Cronquist, Prof. A. Werner, l/o Malmtorgsgatan; 4, Kammakasegatan, Stockholm, Sweden.

Dougall, And., l/o Beverley Road; Argyle Lodge, Hessle Hull.

Dukes, T. William; communications to Box 10, Vryheid South Africa.

Duncan, A. W., l/o Eccles; 1, Trafalgar Road, Highe Bentcliffe, Pendleton, Manchester.

Earp, W. R., l/o Runcorn; Preston Brook, Warrington.

Heys, W. E., l/o Manchester; Llanberis, Bushey Hall Road Watford, Consulting Engineer.

Jarvis, Talbot, l/o Latrobe Cottage; 21, St. Cuthberts Bedford.

Johnson, Jesse F.; Journals to Hamilton Powder Co. Beloeil, Quebec, Canada.

Jonker, H., Czn., subscriptions to Nieuwe Binneweg 340 Rotterdam.

Lippincott, Warren B., l/o Kansas City; c/o Americ Smelting and Refining Co., Maurier, N.J., U.S.A.

McCowan, W., l/o Hampstead; Neilston, N.B.

Mátos, Louis J., l/o 99; 105, North 19th Street, La Orange, N.J., U.S.A.

Perkins, T. S., l/o Brooklyn; 155, Bushkill Street, Easto Pa., U.S.A.

Pont, Francis G. du, l/o Wilmington; Montchanin, Del. U.S.A.

Pope, Prof. Wm. J., F.R.S., l/o Fallowfield; 16, Hop Street, Higher Broughton, Manchester.

Reekie, J. A., l/o Blackford Brow; Blackford House, Whit field, near Manchester.

Riley, Fred., l/o Manchester; 53, India Street, Bosto Mass., U.S.A.

Robertson, And. J., l/o East Main Street; 17, South 12t Street, Richmond, Va., U.S.A.

Sanford, P. Gerald; all communications to 25, Canterbur Road, West Croydon.

Waterhouse, Robert, l/o Warrington; retain Journals.

Wilson, Cecil H., l/o Minna Road; 253, Pitsmoor Roa Sheffield.

Worden, E. C., l/o Millburn; c/o Clark Thread Co., Newar N.J., U.S.A.

rampelmeier, T. J., l/o San Francisco; 1022, Jackson Street, Wilmington, Del., U.S.A.; Journals (temp.) to c/o Dresdener Bank, Berlin.

ung, A. Henry; Journals to Lange Reihe 13, Greifswald, Pomerania, Germany.

tschrift für Elektrotechnik und Elektrochemie, l/o Halle a/S.; Dr. Danneel, Kronprinzenstrasse 55, Breslau, Germany.

Deaths.

ıger, F. Baden, The Grange, Knutsford, Cheshire. Jan. 28.

ery, W. A., Mount Pleasant, Giltbrook, Notts. March 2.

son, J., Eynsham Hall, Witney, Oxon. April 2.

Canadian Section.

Meeting held at Toronto, on Thursday, January 29th, 1903.

PROF. W. R. LANG IN THE CHAIR.

THE PETROLEUM INDUSTRY IN CANADA.

BY W. J. K. VANSTON.

ntroduction.—In 1897, Canada stood sixth in the list of petroleum producing countries, yielding 0·64* per cent. the world's total production. Among the mineral ustries of Canada in 1901, petroleum held the tenth† ce, furnishing 1·37‡ per cent. of the total mineral d uction of the country. Ontario turned out 17·2§ per t. of the minerals produced in Canada in 1900, or a ue of 11,127,808§ dols., and as the crude petroleum duced in the province in that year was valued at 57,007‖ dols. and aggregated 10·34¶ per cent. of the mineral wealth produced therein for the year, it is readily seen that petroleum is one of the most important mineral productions of Ontario. Indications of petroleum have been found in widely separated parts of the Dominion, in Quebec, in Nova Scotia, and in the North-West Territories, but it has been produced in commercial quantities in Ontario alone, and there exclusively in the counties of Lambton and Kent. In Kent, there is what is known as the Bothwell field, but Lambton is the real oil-producing centre of Canada. In the latter county there are two fields but a few miles apart, the Oil Springs territory, with an area of about 1,200 acres, lying between the village of that name and the south boundary of the township of Enniskillen, and the Petrolea field, about 20 miles long and two miles wide, stretching south-east and north-west of Petrolea.

In the North-West Territories, very considerable showings of petroleum have been found from time to time, which seem to point to the future development of an extensive field. To encourage the exploitation of this region, the Government, some years ago, undertook the sinking of test wells. Although these were deep, they have only, so far, produced a strong flow of gas. Nevertheless, "oil" operators still expect, judging from surface conditions, that petroleum will ultimately be found there in paying quantities, and, of late, there have been frequent reports of surface showings, especially in the neighbourhood of the Athabasca River.

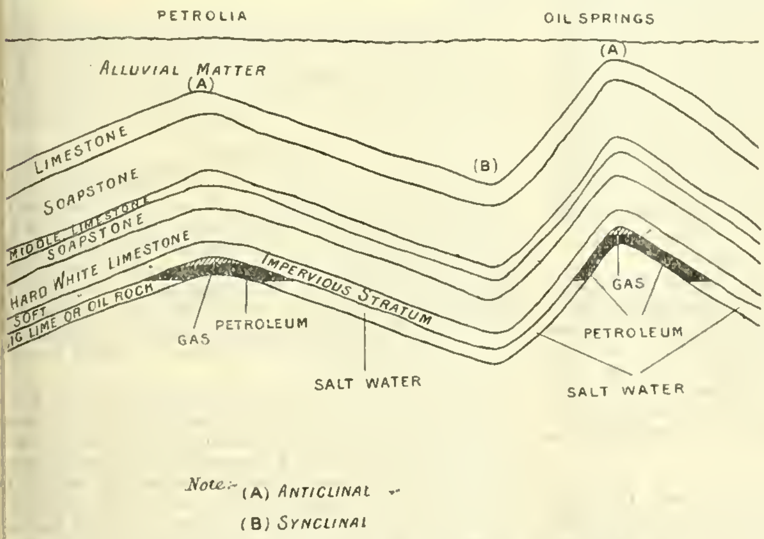
Part I.: Occurrence and Quality of Petroleum in Canada.—The Lambton field is situated* on the "great Cincinnati anticlinal," a mighty ridge, stretching from the southern part of the United States up into Ontario, with Cincinnati at its middle point.

To complete the domes for the reception of the oil, there must be transverse anticlinals, cutting the main one. Two of these exist in Lambton. There is one in the Petrolea field, and another at Oil Springs, with a synclinal between the two areas. The following sketch gives a rough idea of the relation of the two territories, and also shows the anticlinals and the synclinals.

In Lambton, petroleum is found in the corniferous limestone, at a depth of from 460 to 480 feet in the Petrolea field, and at about from 370 to 400 ft. in the Oil Springs area. Surface wells, about 160 ft. deep were obtained at one time at Oil Springs, and were very productive—they were "gushers" in fact — but these have, in most cases, been worked out, and have been sunk to a lower level. In a few instances at Oil Springs, by a system of double casing, oil is pumped in the same well from the two levels.

While crude oil is found in Ontario in the corniferous limestone, it seems not improbable that it may have originated in the Trenton formation. Dr. Bell favours this view while, as he says, not necessarily adopting it.

Support for his view may be found in the fact that in the Lambton field, the driller invariably meets with large quantities of salt water. As the salt bed lies about 1,000 feet† below the oil-bearing strata, there must exist large fissures through which this salt-impregnated water makes its way upward. It is not unreasonable, therefore, to suppose that these may possibly extend to greater depths—to the Trenton formation, in fact—and thus form an outlet



A vertical section showing roughly the relation of the Petrolea and Oil Springs Fields.
NOTE.—The vertical scale is, of course, very much larger than the horizontal.

Report of the Industrial Commission of tho United States, 1, Vol. 1, page 567.

In 1900 it held ninth place, furnishing 1·78 per cent. of the l production (Geological Survey of Canada, Section of Mines, 0, page 85).

Pamphlet, Summary of tho Mineral Production of Canada, 1, page 6.

Geological Survey of Canada, Section of Mines, 1900, page 85.

Geological Survey of Canada, Section of Mines; sheet showing eral Production from 1886 to 1900.

Calculated from data given in the Reports.

* Petroleum Field of Ontario, Dr. Bell, Proc. Royal Society of Canada, V. [4], 1887, pp. 105 to 107.

† Mineral Resources of Ontario.—Rep. Roy. Com., 1890, p. 184.

for the oil which, though formed in these Trenton rocks, is found in the corniferous limestone above them, owing to the operation of hydrostatic conditions.

Some experts hold that the petroleum has been formed in the corniferous rocks, and that *another* supply will yet be found in the Trenton rocks situated at a lower level. The believers in this theory have sunk deep wells; one of which, at Petrolea, was put down 3,736 ft.,[*] but no oil was found.

It is interesting to note in this connection that *our Canadian* geologists, as early as 1863, pointed out in "The Geology of Canada," much of which was written before that date, that petroleum might ultimately be found in the Trenton rocks.[†] This formation has since been a great producer of oil in Ohio and elsewhere.

The significance of this divergence of opinion, as to the real, oil-producing strata in Ontario, lies in the fact that if our present supply of petroleum is drawn from the Trenton rocks, and has risen to the corniferous, then we have no hope of obtaining a further supply by boring deeper if the present field should fail. If, on the other hand, the corniferous strata have furnished the oil which has been, and is drawn from them, then it is just possible that, by sinking to the Trenton, through the corniferous rocks, we may obtain a further supply. The supporters of this view maintain that the one deep well, mentioned above, is not a sufficiently exhaustive test, and they believe that we have a field, yet in reserve, which is analogous to that in Ohio.

The refining value of Canadian petroleum is lower than that of Pennsylvania, but about the same as that of Ohio. From 75 to 78[‡] per cent. of illuminating oil can be produced from Pennsylvania crude, while the Canadian yields only about 40 per cent. of, perhaps, a less valuable illuminant. The quality of Ohio or "Lima" crude seems to be about equal to that of Canada; although it is stated by some (interested parties it is true) that oil refined from it is preferred by the Canadian consumer.

Part II.: Production of Crude Petroleum.—The petroleum was known of in Lambton as early as 1850, but the first important well was struck at Oil Springs by a Mr. Shaw in 1862. Since the very early days, the wells have not, on the average, been large, and they have probably never (certainly not in late years) produced to any such extent per well as do those in the United States and other countries. To meet these conditions great economy had to be practised, and methods introduced which would satisfy the special requirements of the field. The oil operator had everything to learn, he had to experiment, he often failed, he had to make effort after effort, till now after 40 years, we have, as the result of his labours, one of the most highly organised industries in the Dominion, and one in which there has been innovation and the display of ingenuity to an extent to which it would be hard to point to any other Canadian industry of native growth. At present a well pays which yields from 8—10 galls. a day.

The development, which has revolutionised the industry in Ontario, and has made it possible, has taken place mainly in five particulars: first, the boring of the surface instead of digging it, along with the application of steam to boring; secondly, the cheapening of derricks and drilling rigs; thirdly, the introducing of the "jerker-line" system; fourthly, the use of pipe-lines and underground receiving tanks; and, lastly, although this is not so important, the use of gas from the wells as fuel.

When wells were first sunk it was customary to dig and curb a hole 5 or 6 ft. in diameter to the rock. This took a month or more, as at Oil Springs, as the rock is 40, and at Petrolea 120 ft. from the surface. When this latter had been pierced the rock was drilled with what was known as a "spring-pole." The whole task was long and tedious, taking about six months to accomplish, and a well put down in this manner was necessarily very costly.

In time the driller learned to bore the surface with a "mud-bit," like a large "pod-auger." It is about 8 ins. in diameter, and with it a hole can be sunk to the rock in from 8—10 hours. Upon reaching this point a wooden conductor is put in through the soil, and drilling is commence with a drill operated by steam. By this method a well i sunk to the "oil" rock, which lies at a depth of from 165—480 ft. in about six days. An iron tube is put i through the soapstone, to a depth of about 300 ft., to shu off the water, and when the driller gets a showing of oi the well is "shot" with from 8—25 quarts of nitroglycerin and is then ready for the pumps.

The Canadian system of drilling is worthy of note, as i has met with favour in all parts of the world, and th drillers from the oil fields of Ontario have won an enviabl reputation wherever boring operations on an extensive s al are necessary. Their work may be met with in Galicia Russia, Afghanistan, Burma, India, Italy, Germany, France California, and Australia, as well, of course, as in the native county of Lambton.

When the industry was still young in Lambton, th "cable" or "American" plan was used, but as the resu of much experimenting and the display of great ingenuit and perseverance, a distinctly "Canadian" method wa evolved which was found best to suit local requirement This plan became established in the Lambton field, and h since met with general favour the world over.

The drilling "rig" used in Lambton consists of a derric with the boring accessories (including a smithy outfit) and boiler and engine. These latter are of a portable type, and th derrick is so built that it can readily be moved from plac to place without being taken to pieces. It is usually ab 48 ft. high and 15 ft. square at the base. The drilling too in ascending order, are: first, the "bit," 2½ ft. long b 4⅝ ins. in diameter and weighing 70 lb. (this is used aft the rock is reached, a "mud-bit" is used in the soil) secondly, the "sinker bar," 30 ft. long by 3 ins. in diamet and weighing 1,040 lb.; thirdly, the "jars," 6 ft. long an having a weight of 150 lb.; lastly, the boring rods tough, long-grained, white ash, barely 2 ins. in diamet and about 37 ft. long, joined one to the other by means conical iron screw joints. Mr. Brannell gives the cost such a drilling "rig," with 1,000 ft. of boring rods, wit all tools and everything complete, f.o.b. at Petrolea, $1,715.

The engine furnishing the power for drilling is placed some distance from the derrick, to minimise the danger fire when gas is reached, the power is transmitted to crank and pitman, which set a "walking-beam" in motio which, in its turn, gives the vertical motion to the dri rods.

One of the most revolutionary innovations in this i dustry was the introduction of the "jerker-line" syste It was brought into use about 35 years ago, and has be one of the main factors in the success of the Lambton fiel without it one may question whether any extensive petr leum industry in Ontario would have been possible at a Before its employment an engine and an engineer we necessary for each well. Under such circumstances a w had to be exceptionally good to pay. As a consequen many wells, which afterwards became valuable producer had to be abandoned.

The system consists in connecting all the wells in a grou with each other and with a central engine, which operat the whole number. The connection is made by means wooden rods, suspended horizontally from vertical posts short, light, iron rods. Thus suspended the wooden ro swing freely backwards and forwards. The whole of t horizontal rods are connected with a central horizont wheel, which does not revolve, but moves back a forward far enough at each stroke to raise and lower t rods of the pumps, working over pulleys or in connecti with "walking-beams" the required distance.

The following diagram illustrates the system.

A good example of the system is that in operation the property of Messrs. J. L. Englehart & Co. at Petrol where one central plant pumps 233 wells, scattered over area of 400 acres. Four engines, coupled in pairs, ser the entire group.[*]

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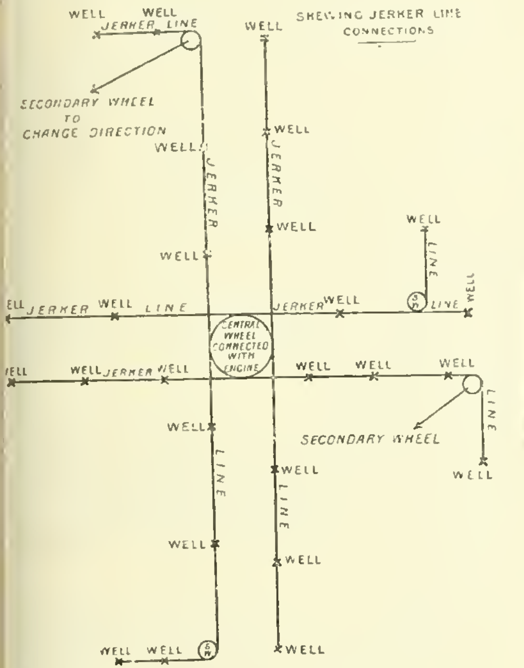
[*] Mr. James Kerr, of Sarnia, a witness before the Royal Commission of 1890.

[†] Geology of Canada, 1863, p. 788.

[‡] Rep. Industrial Com. of U.S., vol. 1, p. 681.

[*] Report of the Bureau of Mines of Ontario, 1900, p. 107.

till another innovation in the Lambton petroleum in-
d ry was the use of pipe-lines and underground tanks for
tl transportation and storage of the oil. Before these were
i oduced all oil had to be "teamed" to the refinery in
t waggons, holding from 8—10 barrels. This cost as
n h as 10 cents a barrel in some localities, and was a
h vy burden on the industry.



DIAGRAM

OTE.—The centre wheel and smaller wheels in the diagram are
ssarily on a much larger scale than the field.

Underground tanks are used for storage, as the soil in the
rict is impervious to petroleum. These tanks are curbed
h walls of flat boards nailed one on top of the other.
e bottom has no covering, the clay, as stated, being
icient to hold the oil. To prevent caving, the tanks are
t always filled with oil or water. Their capacities vary,
an ordinary one, 60 ft. deep by 30 ft. in diameter, with
olume of about 8,000 barrels, can be constructed for
ut 1,760 dols.*

n the northern part of the field it has been found possible
economise by using gas from the wells to run the engines.
ien the flow of gas is found to be strong enough, the
ls are made tight, and it is conducted by pipes to a
-engine which in such case operates the group of wells.
e saving in this matter of fuel by the use of the gas,
ich would otherwise escape and be lost, is often very
ge.

The number of wells in operation in the field, and the
son for the number are points of interest. In 1900, the
nber was given as about 10,000.† The production of
de oil in the same year was 710.498‡ barrels, or about
barrels per well. This is an average of rather less than
-fifth of a barrel per day for each well. The very
agreness of production, per well, accounts for the large
nber. To-day the pressure from below is comparatively
it. I have been informed that it is not more than 15 lb.
the square inch. Accordingly, it is necessary to have a
ge number of wells on a small area, as the oil must all be
mped and the pressure is so slight that the mineral flows
o the well but slowly. When wells were first bored the
ssure was as high as 300 lb. to the square inch, and
pouting" or "flowing" wells were frequently obtained.

A notable example of this case is the well known "Shaw" well, the first at Oil Springs. It "spouted" oil till a large adjacent area was flooded, and petroleum ran down the Black Creek to such a depth that people dipped it off the surface of the water with pails. Crude oil at the time was worth 15 dols. a barrel. All this is passed, however, the pressure is in large part gone, the oil trickles into the wells slowly, and must be pumped up from a depth of from 160 to 485 ft.

"Oil" land in a tested locality is worth from 200 dols. up to as much as 1,000 dols. an acre, according to the production of the surrounding territory. The average value of such land is probably about 300 dols. an acre; for farming purposes it is worth from 30 dols. to 40 dols. an acre. In untested districts farming land worth about 30 dols. an acre is usually held at 60 dols. an acre if it is thought to lie within the oil "belt."

Several modes of acquiring land in the oil fields are commonly employed, and are sanctioned by practice. There is, to be sure, direct purchase at about 300 dols. an acre in tested districts, and at about 60 dols. an acre in the new untried territory. Then there is "bonding" with the right to test and to purchase within a specified time, if desired, at a fixed price per acre for the whole or part of the block. Lastly, there is "bonding" or leasing for a certain number of years, with sometimes the right to purchase at a fixed price at the end of the term. The consideration for this lease is a royalty usually of one-seventh of the oil produced from the property. Custom has settled this as a fair royalty.

Information concerning the cost of production of Canadian petroleum is scarce, and existing estimates vary. It seems reasonable to assume, however that there is a very fair return to the successful "operator" over and above the ordinary market rates of interest. This arises, no doubt, on account of the genuine mining risk involved in the pursuit of this business. Many men have sunk well after well to get nothing but "dry holes," and these "dry" or unproductive wells must be considered when estimating the cost of production over the whole field. No accurate statistics of these are obtainable.

The price of crude oil in Canada is reported to have reached, during the early days of the industry, 15·00 dols. to 20·00 dols. a barrel. Since the price of crude oil declined from the abnormal prices of the sixties it has fluctuated greatly. In 1887 the average price for the year was 78 cents a barrel; in 1890 it was 1·62 dols., thus showing a difference in price between these extremes of 84 cents. The following table gives the average yearly prices of crude oil from 1886 to 1900.

Our petroleum market is very sensitive and is greatly affected by the conditions obtaining in the United States.

Average Yearly Price of Crude Oil, per Barrel, in Canada and the United States (Pennsylvania).

Year.	Average Price, per barrel, of Crude Oil at Petrolea, Ont., Canada.		Average Price of Crude Oil, per barrel, at Oil City, Pa., U.S.A.	
	Dols.	Cts.	Dols.	Cts.
1886	0	88·68*		..
1887	0	78·00*		..
1888	1	03·84*		..
1889	0	95·51*		..
1890	1	17·88*	2	06·41‡
1891	1	33·77*	1	59·16‡
1892	1	26·50*	1	32·33‡
1893	1	10·25*	1	52·33‡
1894	1	00·75†	1	99·33‡
1895	1	49·66†	3	18·58‡
1896	1	59·00†	2	83·58‡
1897	1	42·50†	1	87·58‡
1898	1	40·00†	2	16·59‡
1899	1	48·66†	3	09·75‡
1900	1	62·00†		..

* Statistical Year Book of Canada, 1900, p. 163.
† Geological Survey of Canada, Section of Mines, 1900, p. 1088.
‡ Calculated from Table on p. 50 of the Report of the Industrial Commission of the United States, vol. 1, 1900.

Mr. Boverton Redwood, Petroleum and its Products.
Report of Bureau of Mines, Ontario, 1900, p. 18.
Geological Survey of Canada, Section of Mines, 1900; sheet on
ieral Productions.

"The depression in 1891 to 1893 (see table above) was caused by the discovery of the McDonald field in Allegheny County, with some of the largest wells ever known in this country"‡ (the United States). In Canada the price of oil fell 33 cents. between 1892 and 1894. "Again, the sudden rise in 1895 seems to have been due to the discovery of the fact that the amount of oil on hand and the production were declining very rapidly as compared with the demand."‡ Looking at our table we find that the average price of oil at Petrolea was 48·91 cents, or practically 49 cents a barrel higher in 1895 than in 1894. "In 1897 another decline is due to the opening of the West Virginia fields, while the present rise (1900) is to be ascribed to another decided check in the output, which is clearly destined to grow worse unless new fields are discovered."‡

The price of crude oil at Petrolea in September 1902 was 1·76 dols. a barrel. In October it was 1·81 dols. At present, January 1903, it is 1·99 dols. This continued rise in price is no doubt to a considerable extent in sympathy with the market in the United States, but not so clearly as were the fluctuations described in the preceding paragraphs. There must be noted as a contributory cause of this advance of prices the recent heavy falling off in local production.

As the next table shows, the production of the Ontario field has been from 1887 to 1899 fairly regular, and without any marked tendency either up or down. On the other hand, there was a serious decrease in 1900 which continued in 1901, and which I am informed still continues. It is due simply to a general decline in the production of the wells.

Production of Crude Oil in Ontario.

Calendar Year.	Barrels of 35 Galls.	Calendar Year.	Barrels of 35 Galls.
1886	584,061*	1894	829,104*
1887	713,728*	1895	726,138*
1888	695,203*	1896	726,822*
1889	704,690*	1897	709,857*
1890	795,030*	1898	758,391*
1891	755,298*	1899	808,570*
1892	779,753*	1900	710,498*
1893	798,406*	1901	588,528†

* Geological Survey of Canada, Section of Mines, 1903, p. 104S.
† Geological Survey of Canada, Summary of Mineral Production of 1901, p. 4.

While Canadian production of petroleum during fourteen years has been very uniform, Canadian prices have fluctuated in the main in sympathy with those current in the United States. In this connection it must be remembered that the Pennsylvania oil is of a much higher refining value than the Canadian oil, and that therefore the actual prices are never exactly the same.

We have now to examine the industry in regard to refining, transportation, imports of petroleum, and other elements, including the connection of the Standard Oil Co. of the United States with the Canadian refining industry.

The Refining of Crude Petroleum and other Phases.—The striking feature of present-day refining in this industry is the use of all the by-products of the petroleum; nothing now goes to waste. Previously the tar or residue, after the illuminating and other oils had been extracted, was thrown away, much of it into the Black Creek at Petrolea, and thus lost. Now the residue from the stills is converted into innumerable useful substances.

The main process in the refining of petroleum is distillation, by which its different constituent parts vaporise and pass off in the order of their several boiling points. The crude oil is heated in large cylindrical tanks set horizontally, and the components of the oil as they pass off in the form of vapour are led through "condensers," and thence into separate receptacles.

In the manufacture of illuminating and lubricating oils there are, of course, special processes besides the distillation. After illuminating oil has been obtained from the crude petroleum, it is "washed" with suitable reagents in order to remove the impurities. It is afterwards "bleached and finally "steamed" to drive off the lighter hydrc carbons and to bring it within the Government requirement as to the flash test, which is 85° Abel test.

Each refinery has its own particular methods, and thes methods are for the most part secret. The market to-da demands a product which is of a much higher quality tha that which used to be quite readily received by the public To provide this the highest specialised skill, and the mos modern and advanced methods are necessary.

Since 1898, and up to within the last year, the whole o the refining business in Canada has been in the hands o the Imperial Oil Company of Sarnia. Shortly before 189 there were six* refineries in Canada. In that year th company, controlled it is understood by the Standard Oi Company of the United States, obtained possession of al the other refineries, and moved from Petrolea to Sarni where an abundance of pure water can be obtained, an the transportation facilities are better.

There is now another refinery at Petrolea which has bee established recently.

The Imperial Oil Company of Sarnia has its work situated on the St. Clair River in the southern part of th town of Sarnia. The plant covers about 23 acres, with water frontage and dockage of about 400 ft. along th river, and has a capacity of about 60,000 barrels o crude oil per month.

These works include 16 "crude" stills with a capacit of 600 barrels each, and 6 tar stills with each a capacity o 250 barrels. There is also, in connection with the plant a barrel factory, which can manufacture barrels at the rat of 700 per day. There is a fully-equipped mechanic department which includes boiler-makers, machinists, pip fitters carpenters, bricklayers, and blacksmiths, and ther is also an inspection department under the direction of competent chemist.

When running at full capacity the works have a sta of 228 employees. This number is made up of fiv classes of labour, as shown in the following table, whic also gives the average monthly wages of the individuals o the classes.

Wages and Labour at the Imperial Oil Company's Refinery.

Labour. Number.	Employed.—Class.	Average Wages of Individuals of Class per Month.
		Dols.
9	Superintendents................	100
30	Clerks..........................	50
7	Foremen	65
109	Skilled labourers	60
73	Unskilled labourers	45
228		

Besides illuminating oil and naphthas, this compan manufactures lubricating oils, cylinder oils, paraffin wa candles, and lubricating greases.

The Imperial owns its own pipe-lines, and receives muc of its crude oil through them, paying the market price for at the wells. It also owns its own tank-cars, and receive some of its crude oil in them. For the transportation its refined products, it has switches into its property fro both the "Grand Trunk" and the "Lake Erie and Detro River" Railways, and is able also, with the St. Clair Rive at its door, to ship by water.

While navigation is open, as much oil as possible i shipped in bulk steamers. The oil shipped by rail is either in tank-cars (built specially for the purpose of the o business, and owned by the refining company), in barrel or in tin cans. The latter mode is employed frequently i shipping to the West, where the tin cans, which have capacity of five gallons each, are found convenient fo transporting the oil, for instance, over the mountain These cans are sent out from the works in cases eac containing two cans. Much oil is shipped in barrels whic ve a volume of about 48 imperial galls. These are made the company's works. In their manufacture white oak used, which is obtained principally from Virginia and thern Ohio. These barrels cost about 1·20 dols. each, d are rather more expensive than the American ones, ich cost about 88* cents apiece, but which hold only out 48 "wine" gallons.

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‡ Prof. J. W. Jenks, Industrial Combinations and Prices. Report of Ind. Com. of U.S.A., vol. 1, p. 58.

* Report of Bureau of Mines of Ontario, 1898, p. 17.

The Imperial Oil Company obtains all its crude petroleum m the Lambton field. Its market for illuminating oil confined to Canada. This follows from the fact that nada does not produce a sufficient quantity to meet her n necessities, and has to import. The by-products oduced by the Imperial are marketed to some extent in gland and Spain.

Owing to the heavy decrease in the production of the mbton field as indicated above, and to the fact that the wly-opened refinery at Petrolea still further shortens the pply of crude oil, the Imperial works have been running half their capacity since Jan. 1st, 1902.

In an industry such as this it is extremely difficult to get idea of the invested capital. In fact one can obtain tle better than rough guesses. Besides, there is also a e-line company in the field with its pipe-lines and ceiving stations. To all of this must be added the capital vested in the producing part of the industry.

One large item of capital is the amount invested in oil-oducing property as such. As pointed out before, the erage value of tested "oil" land is about 300 dols. an re. while the average for farm land is 35 dols. an acre. e Petrolea field is about 2 miles wide and 20 miles long, d hence contains about 25,800 acres. The Oil Springs rritory contains about 1,200 acres. The two fields gether make up an area of about 27,000 acres. The lue of this land for oil purposes is thus, say, 8,100,000 dols. d as farm land 945,000 dols. The capital invested in e field as an oil-producing territory is, therefore, say, 155,000 dols.

The above is but one item of the capital necessary to the oducing side of the industry. We must also include mping plants (a very large amount), drilling rigs, the st of wells, which we may place roughly at (10,000 × 0 dols.) 3,000,000 dols.; stocks of iron casing, pipes, mps, tools, and a number of other things that cannot be ven in detail.

In this industry the imports and the tariff are of special terest and of particular importance, as we do not produce ough petroleum to meet our own needs. The result is at people in regions distant from the producing centre amour to have the duty on oil removed as they hold that, nce it is practically a necessity, and since such a large roportion of that used has to be imported, the protected dustry is not of sufficient size and vitality to warrant the nsideration of our tariff framers.

The answer to this contention is, first, that while a roportion of the oil consumed in Canada is imported, still e bulk is of Canadian origin; secondly, that the large apital invested in the industry gives it a rank among the ost important of those of the Dominion; and thirdly, hat this capital would probably be rendered almost alueless if the industry were left at the mercy of the nrestrained competition of American oil.

Percentages of Canadian and American Oil inspected.†

Year.	Canadian.	American.	Year.	Canadian.	American.
	Per Cent.	Per Cent.		Per Cent.	Per Cent.
1881	93·1	6·9	1891	83·6	16·4
1882	81·4	18·6	1892	80·8	19·2
1883	85·4	14·6	1893	80·2	19·8
1884	87·0	13·0	1894	65·8	34·2
1885	85·7	14·3	1895	65·9	34·1
1886	86·0	14·0	1896	64·5	35·5
1887	83·2	16·8	1897	62·7	37·3
1888	84·0	16·0	1898	61·1	38·9
1889	84·3	15·7	1899	60·3	39·7
1890	83·4	16·6	1900	61·3	38·7

All oil sold in Canada must be inspected by Government officials. The following table shows the proportion of Canadian and American oil inspected for the years given. It is practically a table comparing domestic production and imports.

"In 1877 the duty on coal oil was 15 cents a gallon, but in that year it was changed to 6 cents."* In 1894 there was a reduction from the existing duty of 1$\frac{1}{5}$ cents a gallon;† at present the rate is 5 cents a gallon.‡

It would appear that the reduction in the duty of 1894 had an important effect on the importations. It seems as though foreign oil was encouraged to gain a foothold in the country in that year, which happens to show a very large production (see above), and has since, owing to the establishment of trade connections, and to the shortages of Canadian production in succeeding years, been able to maintain itself, and even to gain an ever-increasing strength. Indeed, because of the heavy shortage of 1901, and the still more serious one expected in 1902, it is thought by some that the imports for this year will amount to nearly 50 per cent. of the consumption.

In case of the field failing entirely, there are but two courses open as regards the tariff:—To take the duty off both crude and refined oil, or to remove it from crude oil and retain it on the refined. The first course would deal a death-blow to the industry in all its branches, and would deprive the Government of the whole of a revenue of 175,462.75 dols. The second, that of allowing the raw material to enter the country free, would save for us our refining industry, while at the same time leaving the Government a source of revenue in place of the one lost.

Trustworthy statistics of the price of illuminating oil are probably not to be had. It varies so much from place to place, on account not merely of difference of freight, but also of consideration of competition and other local conditions, that even if reliable records had been kept, they would have to be very extensive as regards both time and place to be of practical value.

The price of Canadian illuminating oil is doubtless in some degree connected with that of American oil considered in relation to the duty of 5 cents a gallon. It is, however, difficult, if not quite impossible, to make a comparison between the price in Canada and the United States. At best, from lack of data, we can only compare isolated cases, which have little value. It seems certain, however, that our tariff is sufficient to ensure a market for our whole product, and American oil enters the country merely to supply a deficiency. A study of the table above shows that since 1894 the increase of importations has been gradual. This, combined with the fact that during the same period the production to satisfy an increasing demand has declined, would seem to bear out the conclusion arrived at above. It does not follow from this that the tariff on oil is too high. On the other hand, there are many who think that a lower duty would seriously hamper the industry, and, as has been shown above, it would probably be advisable, even in the case of a failure of the present crude-producing field without the discovery of a new one, to retain the duty on refined oil that we might have the benefit of the refining business. This, however, is a question to be settled in practical politics.

The change effected in the industry by the entry into the field of the Standard Oil Company in 1898 has not been allowed to pass without criticism. The monopolistic power gained by such a corporation has been feared. It is said that both the consumer and the producer are its prey.

It is difficult to determine the first point. The second result does not, at present, appear to have arrived. The reason for this is probably to be found in local conditions. This company has been forced to keep up the prices of crude oil to encourage the exploitation of new and precarious territory in the face of a decreasing supply. The result has been that since 1898 the price of crude oil has risen steadily.

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* Report of the Industrial Commission of the U.S.A., 1901, vol. 1, . 371.

† Geological Survey of Canada, Section of Mines, 1900, p. 1058.

* Maclean, Tariff History of Canada, p. 18.

† Maclean, Tariff History of Canada, p. 45.

‡ Irwin, Handbook of the Canadian Tariff, 1900.

The petroleum industry has grown up with the country, it has had its failures and successes, it has felt the bitter struggles of tariff legislation. Confined to a narrow area, it has been the wealth-producing mainstay of its district; it has shown vitality and powers of development.

Liverpool Section.

ARTIFICIAL DRAUGHT IN VITRIOL CHAMBERS, AND THE USE OF ATOMISED WATER INSTEAD OF STEAM.

BY PAUL KESTNER.

(This Journal, March 31, 1903, pp. 333—337.)

This paper, which was an abstract of the original as delivered, had to be printed without the author's corrections in consequence of a delay in the post. In the abstract there were omitted the names of those who had contributed to the development of the use of fans for leaden chambers in Europe, including that of Mr. Benker, to whom the industry is particularly indebted.

ERRATA.

Page 333, col. 1, par. 4, line 1.—For "Hageler" read "Hegeler."

Page 333, col. 2, 3rd and 5th lines from bottom.—For "1 200" read "1 2500."

Page 334, col. 1, line 30.—For "*The* first installation of an exhaust fan," &c., read "*My* first installation of an exhaust fan dates from the year 1897."

Page 334, col. 2, line 18.—For "50° C." read "15° C."

Page 337, col. 1.—Omit the question and answer on lines 8 and 9, and col. 2, lines 11 and 12. They refer to the "emulsion arrangement" of the succeeding paper.

SESSION 1902—1903.

Wednesday, April 29, 1903.—Mr. A. Carey and Mr. Max Muspratt. "The Making and Settling of Solutions of Bleaching Powder."

London Section.

Meeting held at Burlington House, on Monday, February 2nd, 1903.

MR. WALTER F. REID IN THE CHAIR.

STATISTICS OF CHEMICAL IMPORTS AND EXPORTS OF THE UNITED KINGDOM AND GERMANY IN THE YEAR 1901, WITH SUGGESTIONS FOR IMPROVING THE OFFICIAL TABLES.

BY F. EVERSHED.

In attempting to compare the chemical export and import trades of different countries, one is met by two preliminary difficulties. In the first place the class comprising chemicals, medicines and colours is not divided, in our Board of Trade returns, with any approach to the minute analysis of the French and German tables, which for many years have named and separately valued 140—150 articles under these headings. Consequently, if it is asked (for example) what quantities of potash salts, of alkaloids, of coal-tar distillates, of iodine, of ammonia, of tartaric acid, of chromates, have been exported from or imported into this country during the last 10 years, no answer can be obtained, these articles not being separately accounted for, but either merged in "oils," "medicines," "coal products," and so forth, or thrown, along with many others, on a statistical waste heap designated "Chemicals, Unenumerated." The othe difficulty is the vagueness of the term "chemicals." Th official statisticians of different nations are, as might b expected, by no means agreed as to the boundaries of th class, and comparisons of the totals given as representing the annual import and export of this class of products fo different countries are consequently misleading, nor is i easy to make the necessary corrections.

It is proposed to discuss these and some other discre pancies and imperfections with the view of obtainin suggestions for the improvement of our official statistica methods which may be put before the Revision Committe This is a departmental committee which sits every autum for the express purpose of making improvements in th published tables.

As methods cannot well be discussed without som reference to results, and the latter are likely to be mor generally interesting than the former, I give, in the table which follow, statistics both of imports and exports, for th year 1901, of all the articles of British trade now officia ly classed under Chemicals and of a large number from th German tables. The latter have been chosen for compariso because of the comprehensive and methodical manner i which they are drawn up, and because Germany is by fa the largest exporter of chemicals of the great industria nations. The French tables are also very full an methodical, but the value of the French export trade i chemicals, &c., is only about half that of our own.* Th United States export trade is still smaller, being not muc more than half that of France in value, and the statistic are not set out with much detail.†

TABLE I.—UNITED KINGDOM, IMPORTS, 1901.

Class IV.—Chemicals, Dyestuffs, and Tanning Substance

Articles.	Imports. 1,000*l*.	Re-Exports. 1,000*l*.	Net Imports. 1,000*l*.
Soda compounds:—			
Soda ash	11	1	10
" bicarbonate	6	0	6
" caustic	4	3	1
" crystals	17	0	17
" sulphate (salt cake).	0	2	(−2)
" other sorts	16	1	15
Bleaching powder	84	0	84
Other bleaching materials	5	0	5
Borax	154	16	138
Saltpetre	207	23	184
Brimstone	99	15	84
Bark for tanning	173	70	103
Cutch / Gambier	392	98	294
Galls	129	85	44
Myrobalans	146	6	140
Sumac	106	19	87
Valonia	324	10	314
Logwood	163	5	158
Other dyewoods	62	11	51
Extracts for tanning and dyeing.	522	50	472
Cochineal	8	10	(−2)
Indigo	789	462	327
Aniline dyes	539	7	532
Alizarine	202	1	201
Indigotin		See below.	
Other coal-tar dyes	36	0	36
Undescribed dyestuffs and tanning materials.	213	30	183
Carbide of calcium	8	0	8
Glycerin		See below.	
Unenumerated (including glycerin).	1,685	339	1,346
Total	6,129	1,264	4,865

NOTE. The "Re-Exports" are the exports of foreign and colon al produce. The "Net Imports," obtained by subtracting the re exports from the (gross) imports, are therefore the import retained for home consumption. Since the imports destined for re exportation are not always exported within the same year, the thir column is apt to be misleading for small values, and occasionall records a minus quantity.

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* Tableau Général du Commerce, &c. Année 1901, Vol. I Paris Imprimerie Nationale, 1902.

† Foreign Commerce and Navigation of the United States fo year ending June 30th, 1901, Vol. I.; Washington Government Printing Office, 1901. (London Agents, W. Wesley and Son.)

In interpreting the tables it must be borne in mind that the articles are liable to considerable fluctuations from ır to year, and the figures given being for a single year y do not represent average values. They merely furnish ough guide to the relative importance of the various icles in the foreign trade of the two countries.* The ıres in all the tables are values expressed in thousands pounds sterling.

Recent alterations in the Import List.—Before 1901 the kinds of soda were combined under the heading Alkali, ich also included bleaching materials. Borax was among unenumerated before 1898, and glycerin before 1903. tch and gambier were combined until 1903. Indigotin lificial indigo) was included among "Other coal-tar dyes" under Indigo?) until 1902, in which year the value ported amounted to 143,613*l.*

TABLE II.—UNITED KINGDOM, EXPORTS, 1901.

ıss IV. (F).—Chemicals and Chemical and Medicinal Preparations (of British and Irish Manufacture).

Articles.	Values. 1,000*l.*
a compounds:—	
Soda ash	282
„ bicarbonate	102
„ caustic	552
„ crystals	32
„ sulphate	14
„ other sorts	113
aching powder	341
ıer bleaching materials	2
tpetre, British prepared	27
minous sulphates	36
phate of copper	846
„ ammonia	1,607
ıer chemical manures	790
l-tar dyes	210
ıer dyes	130
bide of calcium	0
cerin	See below.
inine and its salts } ıer medicines }	1,340
enumerated (including glycerin)	2,501
Total	8,956

Recent alterations in the Export List.—The six kinds of la were undistinguished under the heading Alkali until)1. Bleaching powder was undistinguished from other aching materials until 1901. Carbide of calcium was ong the unenumerated until 1900, alum until 1901, and cerin until 1903. Quinine was separated from other licines in 1902, in which year the value exported was 978*l.*

Nomenclature of the above lists.—The names in Tables and II. must be understood in a commercial rather than cientific sense. Borax, for example, stands outside Soda npounds. The latter heading, with its perhaps need-ly minute subdivisions, was, I am informed by the stoms Statistical Office, adopted in place of the old com-hensive "Alkali" on the recommendation of Messrs. ınner, Mond, and Co. Aniline (oil) and aniline salts are, m told, included in Aniline Dyes, which indeed seem to generally known officially as "Aniline."

Synthetic indigo has been officially christened Indigotin to distinguish it from vegetable indigo, for which the more familiar name is retained. I am informed that the new term "was adopted at the instance of a firm in the trade,* as being the name under which artificial indigo was known," and that this "opinion was confirmed by the Board of Trade expert." Nevertheless, it seems to me erroneous. In scientific literature indigo and indigotin are synonyms for the pure dyestuff, which is present in varying proportions in both the commercial products, and to which they both owe nearly the whole of their value. Commercially these products are both generally, if not universally, known as indigo, while indigotin has long been one of the commercial names of a third and inferior product, sulphonated indigo *alias* indigo extract or indigo carmine. I therefore venture to differ from the authorities quoted, and submit that the word indigotin is quite inappropriate for the purpose. I can see no legitimate reason for departing from the universally understood expression Artificial Indigo.

The first year's statistics (1902) are of interest as showing (if accurate) that artificial indigo is being imported largely in paste form or otherwise diluted. The quantity for the year was 14,691 cwt., the value 143,613*l.*, the average price therefore 9*l.* 16s. per cwt. Of natural indigo the quantity imported was 30,471 cwt., the value 498,043*l.*, the average price therefore 16*l.* 6s. per cwt. It should be observed that Germany and France make no attempt to distinguish between the two products statistically.

The heading "Other Coal-Tar Dyes" in the import list is, I think, superfluous. Having enumerated artificial indigo, alizarine (including all dyes derived therefrom), and aniline dyes (an indefinite and comprehensive term), there can surely be no others.

The Unenumerated.—As noted above, various useful additions have been made to the chemical import and export lists in the last five years, and we must gratefully acknowledge the improvement so made. Nevertheless, the residue of undescribed chemicals and unnamed medicines stands at over $3\frac{1}{2}$ millions sterling in the exports, or a third of the whole value of the trade.

In no other branch of British export trade do I find so large a proportion of goods left undescribed. In a correspondence with Mr. A. J. Wood, the Principal of the Customs Statistical Office, I have urged that this residue should be systematically overhauled, and that any articles it may contain exceeding in value 100,000*l.* (or perhaps 50,000*l.*) per annum as exports should be brought to light and given places on the official export list. The imports should be treated similarly, but here the residue is much smaller. Mr. Wood writes in reference to my suggestion:—"Let me advise you not to ask for too many details and subdivisions of 'Chemicals, Unenumerated,' for I have already tried to obtain the descriptions of all the kinds of chemicals in several consignments which have recently arrived. The reply of the forwarding agents in each instance was that they did not know the names of the various kinds, the goods being consigned to them merely as Chemicals. Therefore if too many details are required it would be found that to attempt a compliance would be to put a hindrance in the way of trade, and that would be a serious matter in these days of rapid despatch of goods." . . . "Minute subdivisions would inevitably cause error. There is also the danger that minute subdivisions would reveal the trade of perhaps one or two firms. Such a thing would be fatal, because the national statistics have been built up in such a manner, and intentionally so, that the trade of individual firms shall not be revealed."

These objections would indeed be fatal to the idea of introducing into our statistics the minute subdivision enforced by the French and German custom houses, but I do not think they are valid objections to the more modest reform I have suggested. This is nothing more than a further extension of the export and import lists on the lines upon which they have been extended during the last few years, and without adding any article of much less annual value than 100,000*l*, or in special cases 50,000*l.* But whereas extensions have hitherto been made irregularly,

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Tables I. and II. are enlargements of those given in the *ıde and Navigation Accounts of the United Kingdom.* The es in that publication being only summaries do not give all "enumerated" articles, and the additional ones have been ıered from the *Annual Statement* for 1901 (Vol. I.). But the er being arranged alphabetically, without classification, it is y by a very tiresome process that one can decide whether icular articles rank as chemicals and form part of the total ıe assigned to that class in the *Trade and Navigation ounts.* It would be a simple matter to indicate against the ıe of each article in the *Annual Statement* the class to which it ngs. Besides the above well-known books I have discovered used the following unadvertised publications issued every uary at the cost of a few pence:—*The Import List. The Export t. Appendix to the Import List. Appendix to the Export t.* The first two are complete lists of the names under which cles are to be entered by importers and exporters in the ensuing . The last two are useful indexes of synonyms showing the ial designations to which various subsidiary articles and un-iliar trade names are to be referred.

* The *Indian* trade, as was afterwards elicited.

by the pressure, as I understand, of sectional trade interests, they should now, I suggest, be made systematically and uniformly with the co-operation, if need be, of a representative body like the Society of Chemical Industry or the London Chamber of Commerce.

As to the feasibility of such further additions, I base my opinion largely on an inspection of the weekly lists of imports and exports published by the Chemical Trade Journal. That enterprising journal extracts from the huge mass of entries in the bills of entry issued at the principal British ports, all that relate to chemical industry, and classifies them under the names of the various chemicals, so far as these are declared. One learns from these entries that there are several dozen consignments per week declared as chemicals without further description, varying in value from a few pounds to 1,000*l.* or more. So far as these consist of cases packed with miscellaneous chemicals, of course they are unclassifiable, but I think inquiry should be made whether most of the more valuable consignments (say of 100*l.* and upwards) might not just as easily be described by definite names, if this were required. Further, one finds a large number of consignments which are declared by distinctive names but by names which have no place in the official lists (*i.e.*, in Tables 1 and 2). These are, therefore, eventually thrown on the statistical waste heap along with the others. For example, there are frequent entries of exports of sal ammoniac, carbonate of ammonia, citric acid, tartaric acid, sulphuric acid, acetic acid, phosphorus, cyanides, bichromates, barium binoxide, all of which are eventually classed as "Chemicals, Unenumerated," notwithstanding that their names were declared by the exporters Many of these are exported in quantities which must amount to large sums annually. Confirmation of this may, in some cases, be obtained from the German and French records of imports from England. France received from us, in 1901, binoxide of barium valued at 17,000*l.*, and chromates of potash and soda valued at 36,000*l.* Germany in the same year received from us phosphorus, 24,000*l.*; ammonia (chloride, carbonate, and hydrate), 70,000*l.*; chromates, 18,000*l.*; and iodine (in transit from Chili?), 88,000*l.*

In view of these facts it seems probable that the residue of $2\frac{1}{2}$ millions ($3\frac{1}{2}$ millions if undescribed medicines are included), might be reduced by about a million sterling by the addition of a dozen new names to the export list.

As regards our unspecified imports, the French statistics record among exports to England in 1901, potash (carbonate and hydrate) 40,000*l.*, cream of tartar 148,000*l.* and superphosphate 44,000*l.* Germany in the same year debits us with carbonate of potash 68,000*l.*, caustic potash 28,000*l.*, sulphate of potash 23,000*l.*, prussiate of potash 15,000*l.*, potassium chloride 87,000*l.*, tartaric acid 61,000*l.*, white lead 181,000*l.*, ultramarine 41,000*l.*, quinine 66,000*l.*, other alkaloids 31,000*l.*, carbolic acid 30,000*l.*, ethereal oils 18,000*l.*

Although part of these may have been merely in transit through England to other countries, the quantities are too large to be altogether neglected, and some of these articles might usefully be added to our import list.

It must not be forgotten that while so large a proportion of chemicals is allowed to pass undescribed, not only are interesting products overlooked, but the "enumerated" products are understated. There are unknown quantities of soda, dyestuffs, &c., lost among the undescribed consignments. This is, therefore, another source of inaccuracy to be added to the well-known inaccuracies to which all trade statistics are liable, such as wrong valuations, careless descriptions, and so forth. It must, however, be admitted that the possibility of improvement in accuracy without entailing delay in transit or undue inquisitiveness and expense, is not very great. Doubtless there must always be a large error, probably of the order of 10 or 20 per cent., in the statistics of individual products, and doubtless the Board of Trade will continue its time-honoured practice of publishing results in six figures without warning us that only the first two can be vouched for.

Definition of the Class.—Coming now to the second difficulty referred to at the beginning of this paper, we have to ask whether the class "Chemicals, &c.," as officially limited, is satisfactory or should be extended. Obviously it is not, and cannot well be made, co-extensive with what we understand by chemical industry in this Society. Metals stand apart, forming a convenient class by themselves. Salt, sugar, alcoholic beverages, and aerated waters come under "Articles of Food and Drink," and, with the exception of salt in France and mineral waters in Germany, none of them are classed as chemical products either in British or foreign tables. It would, therefore, not be wise to disturb them. On the other hand, we find, both in our import and export tables, a large residual class of miscellaneous manufactures, a kind of statistical no-man's-land, any part of which might be annexed without encroaching on any definite statistical province. Among these outlying manufactures we find cements, glass, pottery, paints, leather, paper, caoutchouc manufactures, soap, perfumery, explosives, and coal products. I suggest that paints and certain coal products should be transferred to Chemicals, where they are placed in the French and German though not in the American tables. Debate may arise as to soap, perfumery, and explosives, which are "chemicals" in the German tables only. The latter also include a number of articles only slightly connected with chemical industry (see Table III.). The coal products referred to are coal-tar products used in the manufacture of dyes, medicines, and perfumes. These are insignificant as imports, but amount to a fairly large value in our exports. At present they are hidden partly among miscellaneous Coal Products, and partly among Oils. To obtain any statistics of them, we must resort to the foreign books. Germany took from us in 1901, light coal-tar oils valued at 75,000*l.*, carbolic aci 55,000*l.* (140,000*l.* in 1900), anthracene 33,000*l.*, an naphthalene 37,000*l.* France does not record thes products separately, but received from us Direct Coal-t Products ("produits obtenus directement par la distillatio du goudron d'houille") valued at about 73,000*l.* Thes values would, I think, warrant the addition of three item to our chemical export list: (*a*) Carbolic Acid; (*b*) Anthracene and Naphthalene; (*c*) Coal-tar Oils. The las would comprise benzole, toluol, creosote, and naphtha Aniline oil and salts and toluidine are probably bette included in Aniline Dyes as at present, unless, as i Germany, they are given a separate heading. German received from us about 56,000*l.* of "aniline and anilin salt" in 1900 and the same in 1901, and in each year sen us back about 40,000*l.* of (nominally) the same products—useless exchange, one would suppose, but paradoxes ar too common in international trade to cause muc surprise.

Certain imported manufactured goods and raw materi are absent from Table I., which we should expect to fin there. "Chemical, essential or perfumed oil" (presumabl corresponding to the German "ethereal oils"), valu 244,000*l.*, is not classed among chemicals, nor is methyl alcohol (56,000*l.*), nor are the dutiable articles chlor hydrate, chloroform, and ethers (together 2,300*l.*).

By a curious anomaly, drugs (quinine, opium, &c.) ar chemicals as exports but not as imports.[*]

Although saltpetre has a place in Table I., the famili nitrate of soda and phosphates are absent, presumab because they are natural products and their use is chief as manures. Accordingly they are found in the unsavou company of bones and guano among miscellaneous ra materials. The German and French tables class nitra of soda and superphosphates, but not phosphates, amo chemicals.

Brimstone appears in Table I., but not pyrites manganese, these being referred to metallic ores; Germany they are called chemicals.

Any scheme of classification must be more or le arbitrary, and although our own is certainly open improvement, it is obviously impossible to bring the Briti and foreign tables into good accord without an internatio agreement.

The German Trade.—The large annual volu "*Auswärtiger Handel des deutschen Zollgebiet.*

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[*] A few days after this paper was read, the January number the *Trade and Navigation Accounts* was issued, in whi revised classification is adopted. Paints and drugs are now clas as chemicals, both in the imports and exports.

TABLE III.—GERMAN EMPIRE.

Imports and Exports, 1901. *"Special" Trade* (1). *Class VII., Chemical Industry and Pharmacy, Manufactured Products.*

Principal Articles.	Imports, 1,000*l.*	Exports, 1,000*l.*
) *Imports exceeding Exports.*		
ine	230	26
imonia sulphate	489	108
imonia carbonate and hydrate	82	79
lorates of potash and soda	56	21
etate of lime	136	0
cium carbide	107	3
ch	134	23
	84	75
phthalene	69	11
ht coal tar oils	116	40
od spirit	184	59
iereal oils	259	233
rpentine, other resin oils and amphor oil.	715	49
ewood extracts	97	35
echu	134	18
) *Exports exceeding Imports.*		
la, ash	1	230
caustic	3	55
sulphate	12	63
ash, carbonate	26	272
„ caustic	3	298
„ sulphate	4	258
„ nitrate	30	262
assium, chloride	3	833
„ iodide, &c.	4	137
„ bromide, &c.	0	54
„ cyanide	0	183
aching powder	1	180
ium salts, various	10	70
m, &c.	1	134
tar emetic, &c.	33	58
phuric acid	56	129
taric acid	12	107
lic acid	0	96
nic acid	6	93
icylic acid, &c.	7	66
inine and its preparations	5	410
aloids (santonin, cocain, &c.)	232	290
bolic acid	60	112
line oil and salts	56	598
iline dyes	186	3,982
zarine	2	808
ligo	213	635
nts, &c.	6	106
l lead	9	128
ite lead	7	288
e white, &c.	68	327
harge	4	78
million	2	56
ramarine	2	105
nze- and chrome-colours	4	183
d preparations	3	128
hopon	0	89
d pencils, crayons, &c.	17	251
nting ink	1	93
ieral waters	116	409
p	16	271
fumery	77	512
s and lac varnishes	82	141
trin	5	125
atin	8	98
e	83	167
plosives (dynamite, guncotton, nd nitro-lignin).	4	322
npowder	2	123
es, cartridges, and percussion aps.	10	282
Total, principal articles	4,393	15,475
Other articles (Note 2)	1,142	2,675
Total	5,535	18,150

1) This table relates to what is called the special trade, which ludes most of the transit trade, but not the whole of it—for mple, large quantities of indigo were exported under "special le" for many years before the German synthetic indigo was nufactured.

2) Of the "Other Articles" (all of less value than 50,000*l.*), the owing exceed 20,000*l.*, either as imports or exports :—

a) *Imports exceeding Exports.*—Phosphorus, citric acid, orice juice, albumen, anthracene, heavy coal-tar oils.

b) *Exports exceeding Imports.*—Bromine, benzoic acid, nitric l, hydrochloric acid, borax and boric acid, prussiate of potash, ssian blue, acetate of lead, magnesium chloride, chlorates of ash and soda, manganese salts, alkaline sulphides, sulphate opper, silver salts, arsenic compounds, tin salts, antipyrine, harine, picric acid, varnish colours, blacking, lamp black, ting ink.

(Puttkammer und Mühlbrecht, Berlin, 6 m.) includes a "systematic" classification of articles of trade (differing somewhat from that adopted in the greater part of the work), and the totals for each "systematic" class are reproduced in the more handy *Statistisches Jahrbuch*, where they are conveniently summarised for a series of years. Class VII., Chemical Industry, is divided into (1) Raw Materials, and (2) Manufactured Products. The principal Raw Materials are: *Imports* (total for 1901, 6,316,000*l.*), nitrate of soda, iron pyrites, sulphur, manganese ore, tanning materials, resins, peruvian bark, camphor, gum arabic. *Exports* (total for 1901, 876,000*l.*), crude Stassfurth salts, barium sulphate, and coloured earths.

The principal Chemical Manufactures are given in Table III., including every article which reaches 50,000*l.* per annum either as import or export. In the original, about 80 of less value are also included.

Comparison of British and German Chemical (manufactured) Exports.—Seeing that the German definition of "chemicals" is much wider than ours, it is necessary, for a fair comparison, to supply the values of the principal articles missing from our Table II.

TABLE IV.—UNITED KINGDOM, EXPORTS, 1901.

Principal British Manufactures classed as Chemicals in German but not in British Tables.

Articles.	Values, 1,000*l.*
Ammunition:—	
Dynamite and other high explosives	443
Cordite and other smokeless propellants	240
Gunpowder	172
Other explosives (about)	325
Painter's colours and materials	2,008
Glue, size, and gelatin	133
Soap	1,000
Perfumery	132
Aerated waters	145
Direct coal-tar products	?
Total	4,598

Adding the totals of Tables II. and IV., we get 13,554,000*l.* for British exports to set against the German 18,150,000*l.* The ratio, as it happens, is very nearly the same as the ratio of the populations of the two countries.

The conclusion that our chemical *export* trade is (in the sense of the word "chemical" arbitrarily chosen) about three-fourths that of Germany in value, does not of course entitle us to conclude that this is the ratio of the development of the industry (so defined) in the two countries. The greater part of the product is consumed within the country of manufacture, and it cannot be taken for granted that the fraction exported bears the same relation to the whole industry in each of two countries so differently situated.

As regards the *qualitative* differences between the exports of the two nations, the tables may be left to speak for themselves.

In conclusion, I wish to record my obligations to Mr. Wood, of the Customs Statistical Office, and Mr. Worthington, of the Commercial Intelligence Branch, for the liberal help they have given to an amateur in a rather intricate inquiry.

DISCUSSION.

Mr. SPILLER, being called upon by the Chairman, said he had not had in recent years much experience in export trade, but thought Mr. Evershed had done useful service in bringing before the Society some of the anomalies in these published trade tables. It was important to be able to make an absolute comparison between the productions and exports of different countries, and they liked sometimes to be placed *vis à vis* with their principal competitor, so that a clear inference could be drawn. He felt rather encouraged than otherwise at learning that England made such a good show after all, for evidently she was not hopelessly beaten in this comparison if the figures were

13,500,000 against 18,000,000. They must all hope for further progress, that they might eventually see the English figures rising considerably. It was rather comical to find soda-compounds and other bodies classified in such a singular manner. One line occurred to him as extremely anomalous; soda ash, which was exported from the United Kingdom to the extent of 282,000*l.*, while from Germany the exports of soda ash were 230,000*l.* Manifestly, therefore, England did not send it to Germany, but, wherever it went, it was evident that England did a better trade in soda than their freinds on the Continent. As to the hopeless item of "other coal-tar dyes" and the undescribed dyes, and the grouping of that class of bodies, in which he was particularly interested, it must really be left open for further inquiry. It was exceedingly difficult to institute any comparison between the one table and the other. The broad fact, however, remained, that whereas England appeared to export some dyes and to import others, they found on the German table that the export of dyes was a very considerable item, and in fact it constituted one of the leading features of superiority on the part of the continential manufacturer.

Mr. **Thomas Tyrer** said he thought fault ought not to be found with the authorities, who were brought up in a particular school. He thought that the direction in which the authorities might improve was to become a little more open-minded as to the relative value of facts The mode of presenting statistics in France and Germany was better than our own, and less should be put under the head of "unenumerated," in our own. In the course of the present month statistics would be presented in an improved form. If the facts were presented to the heads of the Board of Trade in an intelligent form, improvement would soon take place; but the officials wanted the facts. It must not be forgotten that the officials had not been trained except perhaps in statistics. If by discussion in that Society and in chambers of commerce all over the country they could get the Board of Trade to secure an intelligent system of statistics invaluable results would be secured. In the matter of spirit, fifteen years ago pretty nearly all that could be said to-day was strongly urged, and yet the various authorities were only now beginning to see the importance of correct statistics. For information as to the uses to which spirit was applied they had mainly to look to foreign sources. There was undoubtedly a very great change in the official attitude towards manufacturers from what it was even five years ago. This was one of the most hopeful signs. One was reminded by the tables given by the author that enumeration was distinguishable by products dutiable and non-dutiable, the former being those interesting to the official statistician.

Mr. **Charles G. Cresswell** said Mr. Evershed was not quite correct in stating that Medicines were classified with Peruvian bark, as the latter was under "Raw Materials for non-textile industries," but it was true that they were classed on the import side among "Miscellaneous Articles."

In 1899 he had a communication from the head of the Commercial Intelligence Department of the Board of Trade stating that in future the intention was to reduce the "Miscellaneous" amount very considerably and to give separate expression to every article of which the trade (" Export" or "Import") amounted to 50,000*l.* during the year.

That showed the change which had taken place in 10 years. With reference to classification, there was a classification into two parts, dutiable and non dutiable. Then there was an arbitrary classification of the type shown in the tables. Next there was a certain natural classification, an instance of which would be seen under soda compounds. The Monthly Trade Returns had been done on the arbitrary system. The Annual Statement of Trade was not thus classified; it was an alphabetical list with a certain natural classification of the type of the soda compounds. With reference to the objection raised by the Board of Trade about hindering trade if more particulars were required, surely, if the presence of a dutiable article, such as saccharin, were suspected in a case described as "miscellaneous chemicals" would not the Customs demand a very accurate statement of what was in that package? But the Government were not entirely fitted, without outside help, to decide what was important to the public. Small things were often of great importance; for instance, in the Annual Statement of Trade for 1901, for the first time, were entered imports of saccharin and small chemicals such as ethyl bromide, ethyl chloride, and other esters, many of which were only imported to the extent of 250*l.* in the year. Why should not they also have a certain amount of detail for the sake of the trader? Who was to be the judge of what was interesting? It was a great help to a man of business to know what were the imports and exports of the particular articles with which he was concerned. Only three years ago for the first time were they able to ascertain what were the imports of soap and soap powder, yet for some years before that the imports had approximated to 217,000*l.*, as described in one of the letters he had read. Mr. Evershed had alluded later to nitrate of soda, which he had omitted when he referred to the absence of certain compounds in the soda compound list. This was originally in the chemical class. There were many chemical substances outside the chemical class: the miscellaneous class now even included many matters of interest to the chemist. In fact there was hardly a class in the Monthly Trade Returns which did not contain something of interest chemists, and that was why he objected to this arbitrar classification. It would be very much better to give all the things in alphabetical order with a few natural classifications, and then leave each industry to select the substances which interested them, in the same way as the Society had done in the abstract which appeared last October from the Annual Statement of Trade, which was drawn up on the right lines and might well be repeated in the Monthly Trade Returns.

Mr. **Peter MacEwan** thought that the whole question resolved itself into two considerations, namely, what was politic, and what was practicable. He did not think it politic, having regard to individual interests and industries in this country, to give too much information to the world at large, and that was a point to be considered when dealing with the unenumerated statistics and medicines. On the practicable side he did not see how it was possible, without considerably interfering with transit and executi of business, to divide the headings much further. What possible benefit was it to this country to reveal that tw or three makers of quinine had exported 51,000*l.* worth during the past year? Medicinal preparations are, h said, an exceedingly miscellaneous item, incorporating perhaps, from 500 to 600 different articles. The item "medicinal preparations" in the Board of Trade Return was year by year increasing in a most gratifying manner largely owing to what was done with regard to the draw back on spirit. But a large part of that item include tinctures and various alcoholic medicines and extract which might be taken as one group. Another sectio included pills, compressed tablets, lozenges, &c. A thir might be made up of powdered drugs including many chemicals. Another class (which formed a very larg item in "medicines") was malt extract, with its variou combinations; and still a further, increasing one, medicine ready packed up in bottles to sell over the counter. Whil one might have individual exports of these items sufficien for specifying in the returns, the greater part consisted o parcels of these items mixed, and the attempt to separat all those would introduce very great difficulty. He did no think it would be much advantage to the country to sho our competitors abroad what we were doing in variou parts of the world. He did not see that we had benefite ourselves by separating the alkali statistics, but it woul undoubtedly be a great advantage to have a bette classification of existing items, and in this direction committee of the Society might do good.

Mr. **A. Gordon Salamon** said if these tables were t teach anything prepared as they were, they showed th our chemical imports consisted largely of raw materia If they excepted the soda compounds and bleach, whic were both unimportant, and the aniline dyes and alizarin which were extremely important, and the carbide of calciu for the production of which a large amount of Britis ipital had been subscribed, they saw that the import list as really made up, subject to the classification of unenumerated items, of raw materials which were employed the manufacture of chemical products in this country, ıd that, compared with the export list, such as it was, hich consisted almost wholly of manufactured articles ppeared to show a state of affairs which need not give rise despondency. With regard to the Export Table pre-ired in Germany, a large proportion of what was before iem constituted what might be called the Stassfurt idustry, and could not be taken as showing that the ermans were beating us in the export trade. Again, he id not know that pencils and crayons ought to count gainst us in chemical products, and if they subtracted these ems he did not think the account came out so much to our etriment as had often been suggested.

Mr. Grant Hooper said he should have liked to hear omething from the actual importers and exporters of some f these "unenumerated" articles with which they had een dealing. He rather gathered from information which e had reason to believe was trustworthy, that there was a istinct disinclination on the part of importers and exporters furnish any more information than was absolutely neces-ary, and a still greater disinclination to that information eing published. Many of those present were of an quiring mind, but not specially interested in the question, ut if his information was correct those actually engaged in ie trade felt they had some interest in concealing particu-ırs with reference to their business. That was a point pon which they had heard nothing, but which might ossibly have much to do with the actual statistics published. Ie felt quite sure there was a general and sincere desire n the part of officials to further the interests of their ountry, and that they were at least as much interested in s prosperity as anybody else. Another point, with refer-nce to the detail which was so marked in connection with ie French and German returns. In those countries there as in a very large majority of cases a specific duty, and nder those circumstances the articles were specifically efined. In our own case we had very few specific duties. Vhere we had, such as those alluded to by Mr. Cresswell, ie precise figures were given, and in other cases the articles ere grouped in large classes, in some instances because iis tended to the convenience of the manufacturer, for precise detailed classification were insisted on, it also ieant that precise detailed examination had to be made at iore or less enhanced cost and some hindrance to the erson whose business was under control.

Dr. Divers thought that it would be easy to collect together chemicals," soaps, explosives, and other such articles in ie Board of Trade list for comparison with the German st of chemicals. In the English list, classification followed ie uses to which the articles were put, which was perhaps etter than that adopted in the German list, of classifying verything as chemical that was prepared by chemical iethods. To the Board of Trade, chemicals meant articles repared for use as medicines or in chemical laboratories egarded as being little else than pharmaceutical laboratories.

Mr. L. Weeple said he understood Mr. Evershed to say iat the French and German customs authorities were much iore precise than the English, and in that he should agree ith him, but he wished they were not quite so scrupulous. Ie had recently some experience in exporting a quantity of iaterial to France, and although it was entirely of English iake, from raw materials, they were surprised to hear from ie shipping agents that the French authorities would not llow the goods to pass at the English tariff. They said iat an examination of the package gave proof that the oods were of American origin, and consequently would ave to pay on the American tariff. He must admit that he goods were packed in American turpentine barrels, ut he did not see that that was any reason why they should ay the American tariff for English goods.

The Chairman said Dr. Divers had emphasised the point aised in the paper, that the same word did not in all cases iean the same thing. They knew on the authority of an minent diplomatist that language was intended to conceal ne's thoughts, and it seemed to him as if some statistics ere made to hide the facts. There was no reason, so far as he could see, why the classification, even so far as it already existed, should not be more in accord with the chemical industry and needs of the country. It seemed to him that one annual meeting was rather a short allowance of time for the officials to deal with a matter of such national importance as the statistics of the trade of the country. Two meetings in the year would be an improvement; but at any rate if they would, at this annual meeting at which the classification was altered, receive a deputation from the Council of that Society, he was quite sure they would get the whole of these figures into a condition which would contain some useful information. He did not think Mr. Grant Hooper could say that the tone throughout the discussion had been at all inimical to the officials; on the contrary, they all recognised that they were doing their best under extremely difficult circumstances. What they were anxious for was to hold out a friendly hand and assist them in every possible way, and by no means to shake a clenched fist in their faces. The officials of this country, whether influenced by our form of government or not, were at a great disadvantage. In Germany, in getting up these headings and arranging statistics, the Government had been wise enough to enlist the sympathies of all the trades in the country. Since 1884 each trade had been organised as a guild; they had the "Gewerbsgenossenschaften," and when the Government wanted to do anything in connection with a trade, they did not at first initiate legislation and then wait for the trade to find fault because it had been done on insufficient information, but they went at once to the "Genossenschaft" and said they wanted to initiate legislation on such and such a matter and would be glad to have their views; and in this way they put their heads together and did not have these complaints. In German technical literature one never heard that the public was not sufficiently informed of what was going on; on the contrary, we ourselves went to the German returns to find out things about our own trade. Surely it would be an advantage to us if we ourselves knew what was going out of our own country. Whether we could do it by simple documentary evidence from the exporters or by examination (in any case examination would have to take place now and then, if there were any doubt), it was distinctly to our advantage to know what we were doing. Knowledge was power in every way, and especially in trade matters. There was a great deficiency in the organisation of our statistics. For instance, explosives did not figure in this list at all, yet we had the most accurate statistics as to the explosives that we imported, because that came through a different department. One department of Government did not always co-operate fully with another department; we did not get the statistics as a whole. They had them all in the Journal of the Society, but they had to find them, and it seemed to him that it ought to be the office of a Government department to put these statistics together so that any Englishman could find out what was being done in his own country. The foreigner knew it already.

Mr. Grant Hooper (interposing) said explosives were given both in the annual and in the monthly returns.

The Chairman said he had not noticed them in the monthly returns, but he knew they got them annually from another department very fully indeed—a totally different department, which had control of the importation of these articles. But that was a minor point. The main point was that those figures they did get should be presented so that they should be available to everyone. Whether it was an advantage that the foreigner should know what we were doing or not was another question; but he contended that the foreigner did know very well, because he got the information from the import returns from the countries with which we traded. The Germans had a most elaborate intelligence department, which worked out all these things, and each trade guild in its official publication got the full particulars. We could not hide anything by not putting it down in our exports, because nearly every other country had such a number of duties that all articles were examined as they came in and were classified, so that we gained nothing by hiding a few exports which were not specifically mentioned. A further classification would give an idea whether the trade in one article or another was diminishing or increasing, and that was an advantage. They might be content to take medicines as a whole, and he did not think they need mention one maker's tabloids and another's tinctures. Probably they would be satisfied with the general heading, although the sums might be considerable. Such returns could not give much manufacturing information to our rivals. With regard to colonial imports, all the colonies had much more extensive data than we had, and could give information on many of the subjects which we could not find information about in our export returns. If anything could be done in the matter, he thought the next step would be for the Council to approach the officials and offer them all the help they could in the classification of those particular goods in which they were interested. He thought they might do so in a generous open-minded way which might commend itself to the officials and might possibly be a help to them as well as to their own members.

Mr. Evershed having briefly replied,

The Chairman then proposed a vote of thanks to Mr. Evershed, which was carried unanimously.

Two papers on the standardisation of analytical methods by Mr. W. H. D. Richmond and Mr. A. R. Ling were postponed.

Addendum.

Mr. Alfred J. Wood, Principal of the Customs Statistical Office, and a member of the Revision Committee, was not able to take part in the discussion, but in a subsequent interview with Mr. Evershed expressed great willingness to meet the wants of chemical, as of all other traders, so far as it was possible to do so, having regard to the additional cost, and to the fact that the present staff could not undertake more work. While quite admitting the desirability of placing more chemicals on the lists, and so reducing the unenumerated, he drew attention to certain difficulties. The Custom House is almost entirely dependent, for descriptions and values, on the declarations of importers and shippers. Imports, it is true, are regularly examined, so far as is necessary, to detect dutiable articles, but exports are not examined. Attempts are made to get full and accurate declarations, and some thousands of inquiries are sent out from the London Custom House in the course of a year to obtain additional particulars of goods insufficiently described or apparently wrongly described or valued. The Custom House is, however, very often not in touch with the actual exporter or manufacturer, but only with an agent, who has little or no knowledge of the nature of the goods. From the examination of imports, it is believed that a large proportion of chemicals unenumerated consists of cases containing various kinds of chemicals packed together. No doubt others are in bulk, but the Statistical Office has no means of knowing which are the principal unenumerated chemicals exported or imported. Notwithstanding these difficulties, there is no need to despair of making some further improvements.

Recent additions to the chemicals on the lists have invariably been made at the request of firms interested in the particular articles. It will be noticed that every article recently added has been placed both on the import and export list, in accordance with an idea of his (Mr. Wood's) that the two lists should be assimilated. Some weekly lists are evidently copied from the Bills of Entry, which are only imperfect summaries of the original declarations on which the national statistics are based. Descriptions of goods are frequently abbreviated in the published Bills of Entry, or even, at the request of exporters, suppressed, and the goods entered as undescribed. In his opinion, statistics generally must necessarily be read subject to error, but this need not invalidate comparisons of one year with another, because the same error may be presumed to affect all the years alike.

SESSION 1902—1903.

Monday, May 4, 1903. Dr. J. Lewkowitsch. "Problems in the Fat Industry."

Monday, May 25, 1903 (instead of June 1st, Whit-Monday). Messrs. J. H. Coste and E. T. Shelbourn. (1) "Neatsfoot Oil. (2) "The Nitric Acid Test for Cotton-seed Oil."

Nottingham Section.

Meeting held at Nottingham, on Monday, March 30th, 1903.

MR. L. ARCHBUTT IN THE CHAIR.

EXAMINATION OF THE ATMOSPHERE OF THE CENTRAL LONDON RAILWAY.

BY FRANK CLOWES, D.Sc.

Complaints have frequently been made of the effect upon passengers of the atmosphere of the Central Railway, and this led the London County Council to institute a chemical and bacteriological examination of the air in different parts of this railway. At the time when the air was being tested the Company had commenced a system of ventilation, which consisted in passing fresh air by means of fans througho t the length of the "tube" during the hours of cessation of traffic, and an opportunity was thus afforded of ascertaining the effect of this tentative ventilation. Arrangements hav since been made for carrying out this displacement of the atmosphere on a larger scale and in a more satisfactory manner. There is no doubt that a system of mechanical ventilation is desirable, since, owing partly to the existence of communicating passages between the "up" and the "down tube" at the stations, the trains always travelling in the same direction in the same tube do not displace the atmosphere as completely as was anticipated.

It will be understood that, owing to the absence of combustion in the locomotives and in the illumination the pollution of the atmosphere is almost wholly due to th respiration and to the excretion from the surface of the ski of the passengers and staff; hence the increase of carbon dioxide may be considered to imply an increase of organi matter excreted from the human body, and must be considered to be more pernicious to health than that whic arises in the tunnels of other underground lines from the working of steam locomotives and illumination by gas.

The samples of air for the chemical tests were collecte in a glass bottle of about $5\frac{1}{2}$ litres capacity. The air o the bottle was displaced by the air of the locality by mean of bellows.

The carbon dioxide was estimated in the usual manner by the Pettenkofer method, using saturated lime-water as a absorbent, and centi-normal hydrochloric acid with pheno phthalein as indicator for titrating the calcium hydroxide.

The readily oxidisable organic matter was estimated b allowing 50 c.c. of very dilute potassium permanganate o known strength, acidified with dilute sulphuric acid, to ac upon the air in the bottle for a period of four hours. Th unchanged permanganate was then estimated by adding small quantity of potassium iodide solution, and titratin with standard sodium thiosulphate solution. 50 c.c. of th original permanganate were then similarly titrated, and th excess obtained indicated the amount of oxygen absorbe by the organic matter in the 5·5 litres of air.

The details of the results obtained are published by th London County Council in their report upon the examinatio and may be summarised as follows:—

Speaking generally, the proportion of carbon dioxid was highest in the air of the carriages; the smalle amount, 9·6 per 10,000 by volume, was found in an empt carriage; the highest was 14·7, and the mean of 17 estima tions was 11·8, the average amount in the outside air, a the same times and places, being 3·6. These results seem t indicate that better ventilation of the carriages is desirabl since the air of the tunnel and of the passages was les impure than that found in the carriages.

The proportion of carbon dioxide in the air of the lifts a the stations showed an average of 10·5 volumes, an varied between 15·2 and 7·4. In the tunnel itself th average was 9·3 with a minimum of 8·2 and maximum o 10·4; and in the passages at the stations a mean of 8· with extremes of 5·9 and 11·1, was obtained. The averag ount of carbon dioxide found in the external street air at same times was 3·7.

t is noteworthy that the average proportion of carbon xide regularly decreased in passing from the Bank end the tunnel towards the Shepherd's Bush terminus, where least amount was obtained.

The above observations, to the number of over 80, were ally made on samples of air taken between 11 a.m. and on; but several pairs of samples were collected at other es in order to test the value of the tentative system of tilation then in use. In each case one of these two nples was collected a few minutes after midnight when traffic ceased, and another shortly after 4 a.m. when the nel had been ventilated by the passage of a current of sh air and the next day's traffic had not commenced. irs of results thus obtained ran as follows: May 10th, 8·6 1 6·8; May 30th, 7·4 and 4·5; Oct. 24th, 10·3 and 1·4. A progressive improvement is noticeable in the efficiency the ventilation, as the date of collection was later. ere can be no doubt that the proposed extension of the tilation, which consists in exhausting by a large fan at epherd's Bush, and driving in a current at the Bank, l still further improve the atmosphere, since it is stated t by these means the whole air of the tunnel will be laced three times during the cessation of traffic.

Comparing the atmosphere of the Central Railway with atmospheres of other underground lines the following nbers were obtained, the samples being collected in each e just before noon in empty open carriages as they passed ough the tunnels :—

	Vols. per 10,000.
Central Railway	10·0
City and South London Railway	14·1
District Railway, between the Mansion House and Temple	15·3
Metropolitan Railway, between Edgware Road and Portland Road	16·0
Metropolitan Railway, between Baker Street and Gower Street	28·8

Attention has already been drawn to the fact that the nificance of the proportion of carbon dioxide is not due to injurious character *per se*, but to the objectionable anic substances which accompany it when it is the duct of respiration or excretion from the surface of the n. This objection does not apply to carbon dioxide en it is the product of combustion.

The readily oxidisable matter present in the atmosphere. measured by acidified permanganate, probably consists inly of the products of excretion from the interior surfaces he lungs and from the exterior surface of the skin. Its ntity is stated only relatively to that found at the same e in the air of the streets, since the method of estimation s not afford any absolute measure of the amounts.

The numbers returned represent grammes of oxygen orbed by 100,000 c.c. of the air. It will be seen that se numbers varied widely. The mean of the 89 estimas made on the air of the Central Railway was 0·0024, maximum being 0·0156, and the minimum being 0·0001. e average number for the street air was 0·0022, the ximum being 0·0081, and the minimum being 0·0004.

This attempt to obtain some indication of the relative ounts of organic matter present in air in different places only a rough approximation, and probably under the ditions of this investigation the measurement of the portions of the carbon dioxide furnished a more certain ication of the relative organic pollution than was obtained m the permanganate.

The average humidity of the air in the railway as comed with the average humidity of the external air at the e times and places was determined. It was felt that this ght be of importance, more especially in connection with bacterial investigation. The percentage numbers were follows :—

——	Average.	Maximum.	Minimum.
the railway	68·6	83·5	55·5
ternal air	67·5	88·6	48·5

The temperature within the tunnel was found to be remarkably constant, the extreme variations between March 10 and Oct. 24 ranging only between 16° and 22° C., with a very frequent temperature of 20° C. The external air varied between 7° and 24°, and fluctuated constantly. Temperatures were taken almost invariably just before noon.

Dr. F. W. Andrews has summarised the results at which he arrived from the simultaneous bacterial examination of the air of the tube in the following words :—

(1) Micro-organisms were found present in the air of the Central London Railway in a somewhat greater proportion than in the fresh air outside. Taking all the results together, the exact proportion was as 13 to 10.

(2) The number of micro-organisms found was high in proportion to the concentration of human traffic; highest in the railway carriages, platforms, and lifts. Elsewhere I found it low.

(3) The air of the railway does not, in its bacterial content, compare unfavourably with that known to exist in inhabited rooms generally.

(4) No pathogenic germs, other than those commonly present as saprophytes upon the normal body, were detected in such small volumes of the air as could be submitted to analysis under the conditions of the investigation.

(5) The number of organisms capable of growing at the temperature of the human body was considerably greater in the air of the Central London Railway than in the fresh air, but the excess was due to non-pathogenic sarcinæ and allied species.

(6) The number of micro-organisms in the air of the railway was found to be generally proportional to the degree of chemical contamination, but this rule was subject to striking exceptions.

(7) The species of micro-organisms found were in the main identical with those occurring in the fresh air.

It may be stated generally that the method employed for the bacterial examination was in principle that introduced by Percy Frankland. It consisted in drawing a known volume of the air through a sterilised glass tube containing sterilised pulverised glass-wool mingled with sugar powder. Cultures were then made from the contents of these tubes.

Recommendation.—It would appear desirable that no sample of air taken at any part of the Central Railway should contain more than twice the amount of carbon dioxide which is present in the external air, and that 8 vols. per 10,000 should be a maximum permissible proportion. If this is considered a stringent limit, it must be remembered that the carbon dioxide is entirely of human origin, and is accompanied largely by objectionable excretory matter; this carbon dioxide is therefore an index of atmospheric pollution of a serious nature.

The above examination of 89 samples showed that 22 per cent. contained less than 8 vols. of carbon dioxide and 34 per cent. less than 12 vols.; it will be seen therefore that no very considerable improvement in the ventilation is required to make the atmosphere conform to the proposed standard.

Yorkshire Section.

Meeting held at Queen's Hotel, Leeds, on Monday, February 3rd, 1903.

MR. THOMAS FAIRLEY IN THE CHAIR.

TARTARIC ACID AND TARTRATES: THEIR POLARIMETRIC ESTIMATION.

BY F. W. RICHARDSON AND J. C. GREGORY.

Having frequently had occasion to estimate tartaric acid in the presence of citric acid, we found ourselves resorting to the polarimeter not merely as a guide to the presence, but also as a means of estimating the amount of the former optically active substance.

We have since found that the polarimetric process can be extended with excellent results to tartrates in general, and indirectly to the estimation of alkaline carbonates and bicarbonates, by utilising their property of forming soluble alkaline tartrates in reaction with the almost insoluble potassium bitartrate.

Some weeks after having announced our intention of reading this paper there appeared summaries of an article by the Messrs. Kenrick upon the same subject. As we have not been able to procure the Journal of the American Chemical Society containing Messrs. Kenrick's paper, we have had to rely upon the condensations given in English chemical journals, and we must confess that we have not been able to extract a good working process from these descriptions.

As our methods vary in very important particulars from those given by the authors referred to, and as we apply the polarimetric process to a wider range of more complex substances, we feel fully justified in submitting our paper to the notice of chemists in general, and analysts in particular.

Of all the various salts we have tried as to their power of increasing the optical activity of tartaric acid and tartrates none has given us such satisfaction as ammonium molybdate, $(NH_4)_6Mo_7O_{24}+4OH_2$, and our results are very closely in line with those of Landolt, whose classical work upon polarimetry has proved of invaluable service.

The alkalis increase the optical activity of tartaric acid over threefold, and we make good use of this fact; but ammonium molybdate in proper proportion increases the activity some sixtyfold, and furnishes a means of detecting and estimating very small amounts of tartaric acid.

Tungstates, beryllium salts, and boric acid are all inferior to molybdates with respect to the formation of tartaric compounds with high polarimetric powers, and we hope to make use of these in certain cases where the use of molybdates is impracticable.

At the outset of the investigation we were met with the threefold difficulty proceeding from the facts that tartaric acid in aqueous solution gives not only a small polarimetric reading, but this reading is difficult to take, and when taken gives a figure varying considerably with the degree of concentration.

We have overcome the difficulty in making the observations by utilising a light-screen composed of 12 units of red and three units of yellow taken from Mr. Lovibond's admirable selection of colour-glasses. With this combination interposed between the light and the instrument we abolish the differently coloured halves always seen on the disc, and are able to obtain a good shadow with a record on the scale easily legible to one-fifth of a degree, equal to one-fourteenth of a degree absolute. We first tried a sodium flame, but with our half-shadow Schmidt-Haensch instrument we obtained much too little illumination. For the molybdate readings the interposition of such a colour-screen as the one described seems absolutely essential for accurate work.

At 20° C. our results give for pure tartaric acid:—

P.C. $C_4H_6O_6$	$[\alpha]_D$	Or nearest Reading with 2-decimetre Tube in Schmidt-Haensch Polarimeter.
25	11·04	16·0
20	11·58	13·4
15	12·16	10·6
10	12·96	7·5
5	13·63	3·95
2½	14·00	2·60

Our formula for calculating the percentages in solutions containing from 2½ to 25 per cent. of tartaric acid is as follows:—14·00 — p. 0·1316, while that of Landolt is 15·06 — 0·1321 p. Pribram gives 14·77 — 0·1321 p. No doubt these figures are all correct for the instruments and the lights used therewith. It will be observed that the concentration factor is practically the same in the three cases. The curve on the diagram represents our results for tartaric acid using a Schmidt-Haensch half-shado instrument and a coloured-light screen.

For the determination of small amounts of tartaric acid in solution direct polarimetric estimation would fail to furnish sufficiently accurate results. A solution containing 1 per cent. of tartaric acid would only give a reading of four-fifths of a degree in a 2-dcm. tube and a difference of one-fifth of a degree from the true figure would mean an error of 0·25 per cent. out of 1·0 per cent., and this might occur under the ordinary conditions of working Conversion into neutral tartrate seemed to offer a remedy against such a possible error.

We find that the alkali ions Na, K, and (NH_4) and Li, als magnesium in combination with the tartaric radical, act in very similar manner. As regards their effect upon polarise light, different observers have found:—

	P.C.	t° C.	$[\alpha]_D$ for $C_4H_6O_6$
Neutral Tartrates of—			
Sodium	9·946	20	41·0
Potassium	11·597	20	42·7
Ammonium	9·433	20	42·0
Lithium	8·305	20	38·8
Magnesium	8·818	20	41·1
Compound Neutral Tartrates of—			
Potassium and sodium	8·41	20	41·5
„ ammonium	10·51	20	42·5
Sodium and ammonium	9·69	20	41·1
Acid Tartrates of—			
Sodium	4·409	20	27·5
Potassium	0·615	20	28·5
Ammonium	1·712	20	28·6

If we make due allowance for differences of concentratio and errors which may possibly creep in, due to variatio in the degrees of purity of the salts and to inefficienc in observation, it would seem that the alkali ions least act in an almost identical manner in this series compounds.

Were we to use soda, potash, or ammonia to neutra the 1 per cent. solution of tartaric acid instead of four-fift of a degree we should obtain a reading of about 2⅗th of a degree and an error of one-fifth of a degree wou mean a discovery of 1·08 or may be 0·92 instead 1·00 grm. of tartaric acid—still an insufficiently accura result.

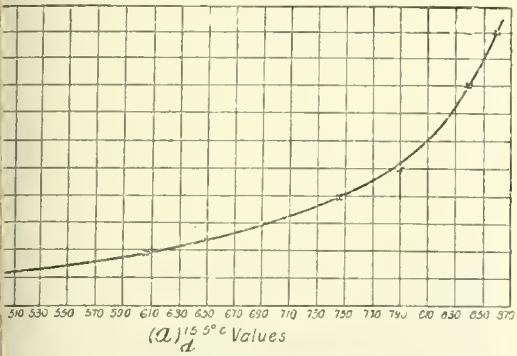
Were we to add ammonium molybdate in varyi proportions to the 1 per cent. solution of tartaric acid, should find the readings increase with every addition of t molybdate until a little over 3 per cent. of the salt had be added; further additions of molybdate would steadi decrease the optical activity of the compound.

The highest figure is obtained when to every thr molecules of tartaric acid one molecule of ammoniu molybdate, $(NH_4)_6Mo_7O_{24}$4aq, has been added, or, Rosenheim and Itzig have found (Berichte, **23**, 707, &c "the maximum is reached, as in the case of paratungsta when a bivalent tartaric acid ion occurs with a univalc alkali ion."

The very accurate method which we now recommend the estimation of tartaric acid in small or large quant in aqueous solution depends upon the prelimin approximate estimation of tartaric acid by means of dir polarimetry, or if convenient by neutralisation of a port with alkali before making the reading. A volume of original tartaric acid or a weight of the acid itself cor sponding to 0·125 or 0·25 or 0·625 grm., the latter preference, is put into a 25 c.c. flask with three times much ammonium molybdate as acid. Finally the solut is made to mark, and a reading taken in the 1 dcm. tu at 15½° C., with light filtration through a very red ora screen, such as the one described. The following ta gives our data for solutions containing from 0·5 to 5·0

t. of tartaric acid with three times the weight of molybdate ammonia, in each case at $15\frac{1}{2}$° C. :—

$C_4H_6O_6$.	Am. Molyb.	Schmidt-Haensch 100 mm. tube.	$[\alpha]_D$ of the $C_4H_6O_6$ present.
		Degree.	
0·5	1·5	6·8	470·5
1·0	3·0	17·55	606·7
2·0	6·0	43·25	747·6
2·5	7·5	57·15	790·0
4·0	12·0	97·20	839·5
5·0	15·0	62·35 (50 mm. tube)	861·8



rve representing the variation in rotatory power of tartaric a solutions containing three times as much ammonium molybd as tartaric acid, with different percentages of tartaric acid.

s the complex molybdate compound undergoes hydro- s on dilution, and as the readings vary with the p portions of molybdate present, it is obviously necessary t ascertain approximately the amount of tartaric acid p ent in the first instance, or it would be impossible to o in even reasonably accurate results.

lso it is to be noted that the compound undergoes e iderable dissociation with temperature elevation ; as n h as 3·16 $[\alpha]_D$ for every 1° C., assuming 100 per cent. t ric acid, therefore the polarimetric value must be o ined at some constant temperature or the necessary a vance must be made.

ith 2·5 per cent. tartaric acid, 6·9, 7·7, and 9·0 grms. of a onium molybdate give the same figures within a quarter of per cent. ; therefore the estimation of the tartaric acid in e first instance in the case of an actual 2·5 per cent. s tion would not furnish a bad result if it were recorded at e outset as 2·3 per cent. or even 2·6 or even 3 per cent., and with so much tartaric acid the alkaline ta ate process would scarcely allow of a greater deviation th 0·08 per cent. of the acid actually present.

different observers we have submitted solutions made by urselves containing known amounts of pure tartaric ac and the results by this molybdate process do not differ fr the truth more than by a small figure in the second de nal place.

us it seems that the process offers considerable a ntages over the ordinary titration method, which would al st certainly miss small amounts of other acids, such as ox c or citric, the higher acidities of which might be m ked by saline or organic substances. For example, a xture of 64 grms. of citric acid with 11 grms. of sugar, or 3 grms. of oxalic acid with 12 grms. of a similar ne ral organic substance, would give the same acidity, or th ame amount of alkaline carbonate, on ignition of the ne al salts, as 75 grms. of tartaric acid ; therefore, one m t be mistaken for the other, unless an actual estimation of e tartaric acid were made.

idlitz Powders.—Public analysts are frequently called up to analyse Seidlitz powders, and we find that the co lete chemical examination, apart from the question of co mination by lead or copper, can be made by means of po imetric processes.

The contents of the white paper should consist of tartaric acid, and all that is necessary for the test as to strength is to dissolve 1·25 grms. of the sample with 3·75 grms. of ammonium molybdate in a little water, and make the solution to 50 c.c. at $15\frac{1}{2}$° C.

In an actual case the reading with the 1 dem. tube in the S.-H. instrument was 56·9; from the equation—

$$[\alpha]_D = \frac{A}{L.p.} = \frac{56·9 \times ·3455 \times 100}{1 \times 2·5 \text{ per cent.}} = 786·4.$$

(The Schmidt-Haensch degrees × ·3455 give the true angular rotation. L = the tube length in dem.)

In the table we have given, 100 grms. of pure tartaric acid under exactly similar conditions give $[\alpha]_D$ 790 : therefore—

$$\frac{786·4 \times 100}{790} = 99·55 \text{ per cent. of } C_4H_6O_6.$$

If the use of the somewhat costly ammonium molybdate is deemed inadvisable, all that need be done is to put $2\frac{1}{2}$ grms. of the acid into a 25 c.c. flask, and cautiously neutralise, or alkalinise with a strong solution of carbonate of soda.

Here is a case in illustration :—

The reading in 2-dcm. tube S. H. was 22·0, equal to $[\alpha]_D$ 38·15 upon the dry sample. With 38·25 for pure tartaric acid, under the same circumstances we obtain

$$\frac{38·15 \times 100}{38·25} = 99·70 \text{ per cent.}$$

According to our data, the $[\alpha]_D$ for tartaric acid as neutral sodium tartrate only changes 0·024° for every 1° C., and on this account the temperature under ordinary conditions is of little moment.

Neutral Tartrates.—All the neutral tartrates of the alkalies admit of very ready analysis by the polarimeter ; hence the blue-paper Seidlitz powders need only be dissolved in water, and be thus submitted to polarimetric estimation. The bicarbonate of soda (25 per cent.) does not interfere with the reading given by the Rochelle salt (75 per cent.).

Ten grms. of a Seidlitz blue-paper powder was dissolved in water, and the solution was made to 100 c.c. This gave a reading of 9·5 in the 2-dcm. tube, equal to 1·541 $[\alpha]_D$ for the 1-dcm. tube, or 16·41 for the salt itself.

The $[\alpha]_D$ for $KNaC_4H_4O_6 . 4OH_2$ is 22 ; therefore the salt contained $\frac{16·41 \times 100}{22} = 74·6$ per cent. of Rochelle salt ; as 23·06 per cent. of bicarbonate of soda was found by the ordinary acidimetric and gasometric methods, the total amounted to 97·66 per cent., leaving 2·34 for moisture and any impurities.

Indirect Estimation of Alkaline Carbonates and Bicarbonates.—In order to complete the analysis of the mixture of Rochelle salt and bicarbonate of soda entirely by polarimetry, we have devised a process which applies to the estimation of carbonates and bicarbonates singly, or in mixtures of themselves or with tartrates.

Potassium-hydrogen-tartrate is only soluble in cold water to the extent of ·6 per cent., and a cold saturated solution gives a reading of seven-tenths of a degree in a 2-dcm. tube (S.-H.).

$$(1)\ Na_2CO_3 + 2KHC_4H_4O_6 = OH_2 + CO_2 + \underbrace{2 . KNa . C_4H_4O_6}.$$

$$106 + \underbrace{\overset{2 \times 188}{}}_{376} = 18 + 44 + 420.$$

Therefore one part of Na_2CO_3 will give 3·962 parts of anhydrous or 5·321 parts of hydrous Rochelle salt. (KNaT . 4Aq.).

$$(2.)\ NaHCO_3 + \underbrace{KH . C_4H_4O_6} = OH_2 + CO_2 + KNaC_4H_4O_6.$$

$$84 + 188 = 18 + 44 + 210.$$

Therefore 1 part of $NaHCO_3$ will give 2·50 parts of anhydrous or 3·356 parts of hydrous Rochelle salt.

The differences in the amounts of Rochelle salt given by the carbonate and bicarbonate of soda are very considerable, and these differences are easily determined by the aid of the polarimeter.

We have applied the process to the Seidlitz blue-paper powder above referred to, as follows :—

Five grms. were put into a conical flask with 50 c.c. of water, and the solution was heated to boiling. Cream of tartar powder was added a little at a time, with a few moments boiling after each addition, until further portions caused no effervescence, a change easily perceptible. The solution was put into a 100 c.c. flask and made to mark and well cooled and again made to mark.

After filtering through a dry filter a reading of 9·8 was obtained in a 2 dem. tube; this gave 1·693 $[\alpha]_D$ for the 1 dem or 33·86 $[\alpha]_D$ for the salt examined. 33·86 ÷ 0·22 = 153·9 of Rochelle salt (hydrous). As 74·6 Rochelle salt was previously found, no less than 79·3 per cent. represents the double tartrate due to the action of the bicarbonate of soda upon the cream of tartar.

$$79{\cdot}2 \times \frac{84}{282} = 23{\cdot}6 \text{ per cent. of } NaHCO_3.$$

23·06 per cent. $NaHCO_3$ was found by eudiometry; but when we remember that eudiometric processes for readily estimating CO_2 are far from being exact, it is quite possible that the polarimetric result may be nearer the truth. Seidlitz powders may therefore be completely analysed by polarimetric methods alone.

If Na_2CO_3 were used instead of $NaHCO_3$ the fact would soon become evident, as the yield of Rochelle salt would be so great that the total percentages would very largely exceed 100. If 23·6 per cent. of Na_2CO_3 (soda ash) had been used in place of 23·6 per cent. of $NaHCO_3$ by the above process, no less than 37·4 per cent. of $NaHCO_3$ would have been recorded, and this, with 71·7 per cent. of Rochelle salt, would give a total percentage of 112·1. The method is therefore in itself a safeguard against mistaking mono- for bi-carbonate.

We would lay emphasis upon the fact that alkaline carbonates and bicarbonates in the presence of tartrates cannot be accurately estimated by titration with normal acid, using methyl orange as an indicator. The tartrates always render it impossible to obtain a good end reaction. Nothing remains therefore but to add excess of normal sulphuric acid, boil, cool, and add phenolphthalein and titrate with normal soda, free from carbonate. In addition, the alkalinity of the ash and the amount of carbonic acid must be accurately determined, a matter not by any means easy of accomplishment. Even with these three data rather large amounts of other acids in conjunction with saline and organic substances could easily be overlooked.

Cream of Tartar.—For the analysis of cream of tartar 5 grms. are boiled in a small flask with about 30 c.c. of water, and powdered carbonate of soda is added until there is no further effervescence; a further addition of about a quarter of a grm. of the carbonate is made, and the boiling is continued for two minutes to decompose the calcium tartrate. After cooling and filtering and making to 50 c.c., a reading is taken. Calcium is determined in the usual way.

One part of $CaCO_3$ = 1·88 of $CaC_4H_4O_6$ = 2·82 parts of Rochelle salt.

Example.

Reading in 2 dem. (S.-H.)	18·8
The 5 grms. gave 0·150 grm. $CaCO_3$ = reading in 2 dem. (S.-H.), due to tartrate combined with calcium	1·0
Reading for potassium bitartrate	17·8

$$\frac{17{\cdot}80}{2} \times 0{\cdot}3455 = 3{\cdot}076\ [\alpha]_D \times 10.$$

$$= 30{\cdot}76\ [\alpha]_D \text{ on 100 of salt.}$$

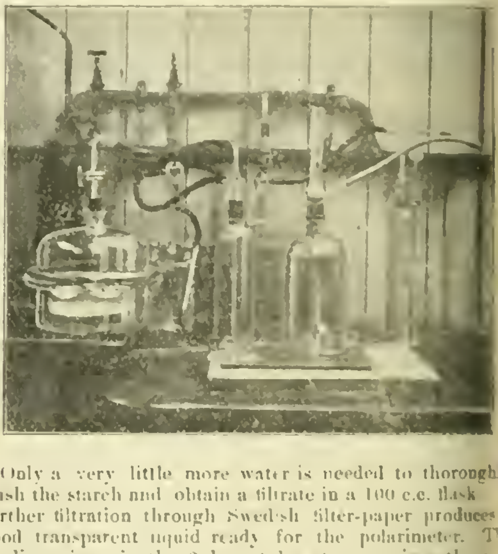
	Per Cent.
30·76 ÷ 0·22 = 139·8 per cent. Rochelle salt = potassium bitartrate........................	93·18
3·0 per cent. of $CaCO_3$ × 1·88 = calcium tartrate	5·64
	98·82

Tartar Emetic.—The trioxide antimony ion very largely increases the opticity of any tartrate in which it finds a place. Thus, pure tartar emetic $(K.SbO.C_4H_4O_6)_2.OH_2$ has an opticity of $[\alpha]_D$ = 138·3 in 5 per cent. solution at 20° C.; such a liquid gives a reading of 10·0 degrees in the 2 dem. tube (S.-H.) If potassium bitartrate should be present it may be estimated as previously described after obtaining it as an insoluble residue through the use of a saturated solution of cream of tartar. The bitartrate readily dissolves in hot weak solutions of carbonate of soda and furnishes Rochelle salt.

Baking Powder.—Baking powders consist of rice-flour, and tartaric acid with more than sufficient bicarbonate of soda to neutralise the acid when the mixture is treated with water.

As we find that neutral sodium tartrate gives a value of 38·3 $[\alpha]_D$ for the tartaric acid used in its manufacture, the Schmidt-Haensch reading in 2 dem. tube would amount to 221·7 for 100 grms. of $C_4H_6O_6$; therefore 15·1 grms would give a reading of 100·0 degrees. We therefore take 45·3 grms. of the powder for analysis. This quantity is put into a 20-oz. conical flask, and 60 c.c. of water is used t moisten the powder and finally dissolve out its salin constituents.

We make use of a vacuum pump to extract the pasty mass, which is poured on to a filter composed of a layer of asbestos fibre covered with another layer of cotton wool, the whole being contained in a chloride of calcium t with bulb, as in the illustration



Only a very little more water is needed to thorough wash the starch and obtain a filtrate in a 100 c.c. flask further filtration through Swedish filter-paper produces good transparent liquid ready for the polarimeter. T reading given in the 2-dem. tube at once gives the centage of total tartaric acid in the baking powder. T filtrate may be further examined for bicarbonate or c bonate of soda by the cream of tartar process alre described.

We have attempted to estimate the free tartaric acid baking powder by using absolute alcohol and ether solvents—applying them in Soxhlett's apparatus as well directly at a boiling heat. We obtain about two-thirds the acid in the form of white crystals, but so far we h been baffled in our attempts to recover the other th This is no doubt due to the presence of very sm amounts of water in the powder and in the solvents us We have dried the powder *in vacuo* over sulphuric ac and have rectified our ether in various ways, but we alw obtain an extracted residue containing neutral tartrate soda equivalent to the missing amount of tartaric acid.

As old baking powders contain neutral tartrate it desirable that the free tartaric acid should be determin and we are of opinion that once all traces of moisture eliminated from the powder, and the ether, a Soxh extraction should readily remove the acid, leaving a substance in the filter cone ready for the estimation neutral tartrate as above described. The amount of tart in a baking powder represents bygone efficiency or loss keeping.

t an early date we hope to publish data with reference be theory of the optical peculiarities of tartaric com- ıds, with suggestions for further and wider applications olarimetric processes.

Discussion.

r. Fairley, in welcoming the method of estimation gested by Mr. Richardson, referred to the curious tionships between the rotations of the acid tartrates and neutral tartrates respectively, and again between the rotation of tartar emetic and that imparted to tartaric by ammonium molybdate, and asked if any explaon could be given. He also enquired if Mr. Richon's process would be applicable to the estimation of aric acid combined with organic bases. In regard to discrepancies found in the analysis of baking powder, as possible that there might be a small quantity of er present, which could only induce action between the onate and the acid when dissolved in the ether or other acting material. The baking powder might be dried ious to extraction by the aspiration of dry air ugh it.

r. Branson, with reference to baking powder, suggested ing air or oxygen from cylinders through the powder, hese gases were usually very carefully dried before ng. Tartrate of morphia was at present used to a conrable extent, and some means of estimating the exact percentage of tartaric acid in commercial samples was desirable.

Mr. Davies asked whether the somewhat empirical method of determining the quantity of molybdate to be added was likely to influence the accuracy of the results.

Mr. Richardson in reply referred to experiments which showed that accurate results could be obtained even when the quantity of molybdate added for a given quantity of tartaric acid varied between fairly wide limits, but this was clearly stated in the paper. He hoped to extend the method of estimation to tartrates of organic bases and to ultimately overcome the difficulties in connection with the analysis of baking powder.

Dr. Patterson pointed out that the identity of the molecular rotations of the neutral tartrates amongst themselves in dilute solution was ascribed to the dissociation of the electrolyte into an active tartaryl ion and inactive metal ions, and since this tartaryl ion was the same whether the salt be one of potassium, sodium, or ammonium the molecular rotation must also be the same. A similar consideration applied to the acid tartrates. It seemed to have been fairly definitely shown that the antimonyl group in tartaric emetic replaced one of the alcoholic hydroxyl groups in the tartaric acid, and since this produced a high rotation, it seemed probable that the molybdic oxide acted in an analogous manner.

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rench.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3e).

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

tar and Muller for Grinding, Crushing, and Mixing res, Chemicals, and other Substances. T. Breakell, irksworth, near Derby. Eng. Pat. 4479, Feb. 22, 02.

rotary pan or mortar of the machine is driven by ion from a positively driven rotary pestle or muller nted eccentrically within the pan, the diameter of the ling surface of the pestle being slightly greater than the diameter of the grinding surface of the pan. (See Eng. Pat. 18,637 of 1901; this Journal, 1902, 596.) —R. A.

ing Liquids or Gases; Apparatus for ——; applicable so to Evaporative Condensers. S. Zylberlast, Chorlton-Medlock, Manchester. Eng. Pat. 4693, Feb. 25, 1902.

or more cooling devices, each receiving a separate ly of air, are arranged in distinct chambers one above the other. The water or other liquid to be cooled, or to be used as a cooling liquid, is conveyed to the hurdles or equivalent cooling devices through gutters or channels formed in the apparatus. A partition, which is formed with one or more side channels for the passage of the air, is provided, to separate the space below the gutters or channels from the space above. This partition is used in combination with the tower or other outlet for the escape of air from the cooling devices of the apparatus and the gutters or channels.—R. A.

Gas Densifying or Rarefying Apparatus. V. Schwaninger, Mannheim, Germany. Eng. Pat. 5110, Feb. 28, 1902.

In gas densifying and rarefying apparatus in which liquid valves are employed, the suction or compression of the gas is effected by the movement of the sealing liquid within a pressure chamber, in which the liquid is alternately subjected to and relieved from the action of a pressure agent, such as air or steam.—R. A.

Distilling; Impts. in and Apparatus for ——, and especially for Distilling Salt Water. F. Fonché, Paris. Eng. Pat. 9996, April 30, 1902.

The apparatus is especially designed for the production of fresh water from salt water.

The liquid to be distilled is heated by exhaust or other steam, which is supplied to a jacket surrounding the apparatus, stirring mechanism being provided "for promoting a motion of the liquid on the heating surfaces." The apparatus may be combined with a preheater and a condenser. When arranged in multiple-effect, the liquid in each vessel is evaporated by the steam from the preceding vessel, the steam from the last vessel of the series being conducted to an air condenser.—R. A.

Filter Press. C. Kolb, Maxéville, France. Eng. Pat. 19 619, Sept. 8, 1902.

The pressure plates and frames of the press are constructed so that they support the filtering cloths in oppositely located undulatory positions, whereby two adjacent cloths form a number of tube-like channels.—R. A.

Filters. G. M. Kneuper, New York, U.S.A. Eng. Pat. 886, Jan. 13, 1903.

The apparatus is especially designed for the rapid filtration of syrups, tinctures, fruit juices, extracts, perfumes, &c., and for straining sauces, herbs, jams, &c. The fluid material is introduced through a self-closing valve into a closed pervious vessel, containing an expansible impermeable pouch, which is expanded by a suitable medium under pressure to force the liquid from the vessel into an outer receptacle.—R. A.

United States Patents.

Distilling [Rectifying] Apparatus. N. H. Hiller, Carbondale, Pa. U.S. Pat. Reissue 12,092, March 3, 1903; original No. 667,522, Feb. 5, 1901.

A series of drip-pipes are connected with the condensing coil or equivalent at different heights, and with a header or receiver, in which the condensed liquid is collected, and from which it is returned to the still for redistillation. The return pipe from the header is so connected to the latter that the drip-pipes are sealed by the liquor, thus preventing by-passing of the gas.—R. A.

Mixing Liquids; Apparatus for ——. S. A. Smith, Providence, R.I. U.S. Pat. 721,974, March 3, 1903.

An open-ended tube or cylinder is supported within the liquid-containing vessel, so that a space is left below and around the cylinder for the circulation of the liquid. The liquid is circulated and mixed by a series of sets of propeller blades, mounted and rotated within the cylinder. Alternate sets of the blades are perforated.—R. A.

French Patent.

Distillation; Process and Apparatus for Fractional ——. H. Müller. Second addition, dated July 26, 1902, to Fr. Pat. 316,753, Dec. 10, 1901.

Condensers are interposed between different rectifiers or between different sections of the rectifying column.

—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Alcohol; Use of ——, for Industrial Purposes. Chem.-Zeit., 1903, 27, [18], 197.

The question of the industrial use of alcohol was discussed in several of the papers read at the general meeting of the Society of German Spirit Manufacturers held at Berlin on Feb. 13 last. Of apparatus designed for the use of alcohol, W. Wittelshöfer stated that in equal periods of time (four months) in 1901 and 1902 there were sold in Germany the quantities shown in the accompanying table.

	1901.	1902.
Cooking appliances	21,900	28,100
Flat-irons (spirit heated)	3,000	8,800
Lamps	7,200	17,000

E. Meyer gave a comparison of alcohol with petroleum and benzine (petroleum spirit) as a combustible for explosion motors:—1 kilo. of 90 per cent. (by vol.) alcohol costs 20 pf. and develops 5,500 calories; 1 kilo. of benzine costs 21 pf. and develops 10,300 calories; 1 kilo. of petroleum costs 22 pf. and develops 10,300 calories; so that 1 000 cals cost 3·6 pf. from alcohol, 2·3 pf. from benzine, and 2·1 pf from petroleum. On taking into account, however, the superior efficiency of alcohol in explosion motors, it is found to be no dearer than benzine or petroleum. In th best steam engines, only 15 per cent. of the heat generate is converted into useful work, but in modern spirit motor 33 per cent. of the heat is converted into work, as compare with 21 per cent. in benzine motors and 18—19 per cent in petroleum motors.

In a paper on the use of alcohol for illuminating purpose Wittelshöfer stated that the Auer lamp yields wit 125 grms. of alcohol (cost, 3 pf.) a light of 50 H.-K (Hefner candles). A petroleum lamp with 100 gram of petroleum (cost, 2 pf.) yields a light of 24 H.-K., thi being the case at the price ruling in 1896—1897 At th present time lamps are constructed which yield a light 20 H.-K. with 50 c.c. of alcohol, whilst a light of 10 H. K can be obtained with 11—15 c.c. of alcohol.—A. S.

Gasification of Carbon by the Hot Blast in Generators A Contribution to the Theory of Production of Wate Gas. W. Wielandt. J. für Gasbeleucht., 1903, 4 [11], 201—206.

The author arrives at the following conclusions as to t distribution of heat in the generator:—

1. Since in the lower layers of fuel an exothermic reacti ($C + O_2 = CO_2 + 96$ cals.) takes place, whilst in that lay in which the last per cent. of carbon dioxide is formed, th changes more or less suddenly to an endothermic reacti ($CO_2 + C = 2CO - 39$ cals.), the temperature of t lower layers continually increases up to the layer in whi the last per cent. of carbon dioxide is produced, but fro that point onwards continually decreases. The temperatu of a generator in operation will, therefore, neither with short nor with a long "blow" be the same in all par as is the view of Strache, but it will be at a maximum the zone of the last per cent. of carbon dioxide. In t Dellwik generator, therefore, in which the "blow" stopped when the last carbon dioxide zone is reach the highest temperature is at the top, whilst in the Strac generator, in which the "blow" is continued to the form tion of carbon monoxide, the top part is cooler and t maximum temperature occurs in the lowest decimetre of height, since Bunte has shown in 1879 that under norm conditions of pressure, in a bed of coke 50 cm. high, t conversion of carbon dioxide into carbon monoxide p ceeds till only a very few per cent. of the former remain.

2. On "blowing" the cold generator, the reacti maximum, *i.e.*, the zone of formation of the last per ce of carbon dioxide, is some distance from the place of en of the compressed air; as the generator becomes hot, this zone of maximum reaction travels towards the inlet till a condition of stability is attained, in which cooling by the cold air and the walls of the generato counterbalanced by that portion of the heat of react acting backwards and sideways, whilst the remain portion of the heat of reaction is the sole heating ag for the gases. In the Dellwik process, therefore, tendency of the zone of maximum reaction to travel ba wards must be met by a continual increase of the velo of the blast during the blowing process, and thus the m complete utilisation of the fuel attained.—A. S.

Natural Gas at Heathfield, Sussex; Analysis of the —. H. B. Dixon and W. A. Bone. Proc. Chem. Soc., [262], 63.

When the possibility of the industrial application of Heathfield natural gas was brought before the R Commission on Coal Supplies, one of the authors d to visit Heathfield and examine the nature of the on behalf of the Commission. It had the following position :—

Carbon monoxide	1·00
Methane	93·16
Ethane	2·94
Nitrogen, or other inert gas (by difference)	2·90
	100·00

English Patents.

t for Fuel Purposes; Treatment of ——. A. Duclos, Montreal. Eng. Pat. 22,524, Oct. 16, 1902.

y peat is mixed with about 5½ per cent. of petroleum, il or fatty matter containing solid paraffin or resin, and 6 per cent. of caustic alkali, preferably caustic soda. mixture is dried by moderate heat, preferably in a ble-bottomed pan, and pressed into briquettes.

he caustic soda serves to increase the conductivity of mass, and, in processes where the mass is partly onised, it is said to lessen the production of smoke.

cases where it is not desired to carbonise the mass, caustic soda can be omitted.

e also U.S. Pat. 709,664 of 1902; this Journal, 1902,).—T. F. B.

ducer Gas; Manufacture of Compound ——. La ompagnie du Gaz H. Riché, Paris. Eng. Pat. 27,533, ec. 13, 1902. Under Internat. Conv., Dec. 14, 1901.

improvement in the manufacture of mixed producer- by the combustion of bituminous fuel and subsequent age of the gases through incandescent coke, which sists in providing, between the fuel and coke chambers, rizontal passage or chamber long enough to form a free e between the fuel and coke. An additional air supply dmitted to this space. In this way the tarry matters the raw fuel are more completely burnt and destroyed; the clinker is deposited, thus preventing the clogging f the column of coke.—H. B.

candescence Bodies for Gas Lighting; Self-lighting —. T. Peters, Düsseldorf. Eng. Pat. 609, Jan. 9, 1903.

tinum-black is applied to one or more points at the of the mantle, and lines are drawn therefrom with inum solution, which decreases gradually in strength ards the ends of the lines.—H. B.

United States Patent.

icks; Manufacture of Slow-burning ——. R. Esché, Arion, Belgium. U.S. Pat. 722,091, March 3, 1903.

material is impregnated successively with solutions of um silicate, sodium hyposulphite and ammonium bichro- e; it is dried between each treatment, and finally coated ly with vegetable wax.—T. F. B.

French Patent.

; Briquette ——. H.-A. Besnard. Fr. Pat. 322,992, July 11, 1902.

briquettes are composed of: close-burning fine coal, kilos.; hydraulic lime, 20 kilos.; and 50 kilos. of the wing mixture: gelatin, glucose or molasses, 50 grms.; t tar oil, 14 grms.; petroleum residue, 14 grms.; ssium nitrate, 12 grms.; sodium acetate, 4 grms.; tallised sodium carbonate, 4 grms.; hydrocarbon, such etroleum, 2 grms.—J. W. H.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Coal Tar; Acetophenone and other Ketones in ——. R. Weissgerber. Ber., 1903, **36**, [4], 754—757.

presence of acetophenone in the "heavy oil" from l tar was detected by the following process. Baeyer and Villiger have shown that the ketones have basic properties, and to extract these compounds the heavy oil was shaken with 78 per cent. sulphuric acid. The acid was then diluted, and the dissolved ketones were blown over with steam. From the oil obtained acetophenone-*p*-bromophenylhydrazone (m. pt. 113°—115° C.) was obtained.—J. McC.

Coal-Tar Pitch. E. Donath and M. Asriel. Chem. Rev. Fett- u. Harz-Ind., 1903, **10**, [3], 54—56.

Three different kinds of pitch of the same origin gave the following results on analysis:—

Pitch.	Carbon.	Hydrogen.	Nitrogen.	Sulphur.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Soft	91·89	4·62	..	..
Medium	91·32	3·68	0·148	0·77
Hard	93·16	4·36	..	..

The oxygen here only amounts to 0·78 to 3·5 per cent., and the authors consider that the proportion of 16 per cent. found by Habets is very improbable.

On extracting coal-tar pitch with petroleum spirit almost the whole of the anthracene present is dissolved, and on evaporating the solution from hard pitch, the authors obtained a viscid residue impregnated with red crystals. This was found to contain 2·19 per cent. of anthracene by Luck's method.

The residue, on further extraction with benzene and carbon bisulphide, left a black powder of the following composition:—Carbon, 89·2; hydrogen, 2·3; nitrogen, 0·70; ash, 0·67; and oxygen (by difference), 7·13 per cent. Hence the substance giving the black colour to the pitch was relatively the richest in oxygen. In the authors' opinion, part of this insoluble residue was a secondary product formed during the distillation of the pitch.

The following table gives the amounts of the fractions thus obtained by the successive extractions of the three kinds of pitch:—

Pitch.	Petroleum Spirit Extract.	Benzene Extract.	Carbon Bisulphide Extract.	Residue.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Soft	25·05	44·98	6·57	22·82
Medium	15·14	40·03	7·10	38·06
Hard	15·51	39·43	15·21	29·39

—C. A. M.

English Patent.

Distilling Tar, Oil, and the like; Apparatus for ——. F. G. Holmes, Liverpool. Eng. Pat. 7319, March 26, 1902.

The tar or oil to be distilled is led down a gently inclined spiral way, broken so as to form a series of steps. This spiral is enclosed in a hollow cylinder, round the interior and exterior of which the furnace gases circulate, the tar or oil being thus heated more at the lower part of the still than at the top, where a means of exit is provided for the distillate.

For fractional distillation several of these stills are used, the tar and furnace gases passing through them successively in opposite directions.—T. F. B.

French Patents.

Distillation, Continuous or otherwise, of Crude Petroleum, Tar Oils, &c. A. von Gröling. Fr. Pat. 322,789, July 4, 1902.

The still is connected with a plate dephlegmating column of special construction, dephlegmating condenser, and final condensers. A water injector controls and reduces the pressure at the top of the plate column, and, by its water spray condensing the volatile gases, prevents considerable loss; a vessel for the separation of the condensed vapour

and the water is provided. The liquid of lower boiling point is removed from the base of the plate column, direct steam or a steam jacket being used at this point of heating.
—J. W. H.

Paraffin from Mineral Oils and Mineral Hydrocarbons; Extraction of ——. Separation and Extraction of the Oxidation Products and Preparation of Lubricating Oils. L. Singer and R. Paul. Fr. Pat. 322,986, July 11, 1902.

See Eng. Pat. 12,565 of 1902; this Journal, 1902, 1181.
—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Dimethyl Sulphate as an Alkylating Agent; Application of——. F. Ullmann. Annalen, 1903, **327**, [1], 104—119.

Dimethyl sulphate is very generally useful as an alkylating agent in place of methyl iodide. It is best prepared by allowing anhydrous methyl alcohol to flow slowly from a dropping funnel, provided with a long narrow stem, into chlorosulphonic acid at −10° C. The temperature of the mixture must not rise above −5° C. The methylsulphuric acid is then distilled under diminished pressure, and the dimethyl sulphate washed with ice-water. Great care should be exercised in using this reagent, as the vapours from it are extremely poisonous.

When primary amines are boiled with dimethyl sulphate, reaction takes place according to the equation—

$$(CH_3)_2SO_4 + 2RNH_2 = RNH_2.CH_3HSO_4 + RNHCH_3.$$

In ethereal solution aniline gives aniline methylsulphate and monomethylaniline; *o*- and *p*-toluidines react in the same way. In aqueous solution, aniline, the toluidines, the xylidines, and mesidine readily give monomethyl derivatives, and the yield increases as the series is ascended. Hinsberg's method of methylation by means of *p*-toluene sulphonic chloride and dimethyl sulphate, gives a good yield of monomethylaniline.

Secondary and tertiary amines can also easily be methylated by dimethyl sulphate. Dimethyl-*o*-toluidine is converted into trimethyl-*o*-tolyl-ammonium-methyl sulphate. *p* Dimethylaminoazobenzene in nitrobenzene solution gives a trimethylaminoazobenzene salt, and diphenylamine gives methyldiphenylamine.

With *m*-nitraniline it is easy to alkylate to the monomethyl or dimethyl derivative, according to the quantity of dimethyl sulphate used and the temperature to which the mixture is heated.

Phenols can be alkylated by dimethyl sulphate even more easily than amines. The dihydric phenols give a mixture of monomethyl and dimethyl ethers. Pyrogallol gives pyrogallol trimethyl ether, and both naphthols can be almost quantitatively methylated by this process.

The methyl ethers of aromatic sulphonic acids can be better prepared by heating the sodium salt of the sulphonic acid with dimethyl sulphate than by the action of methyl alcohol on the sulphonic chloride. Dimethyl sulphate has also proved extremely useful in alkylating cyclic bases containing nitrogen, such as quinoline, quinaldine, and phenylacridine.

2.3-Diaminophenazine gives, after boiling with dimethyl sulphate and treatment of the product with nitric acid, the nitrate of 2.3-diaminophenazonium methylate in the form of dark green needles, which dissolve in water with a red colour. The alcoholic solution shows a greenish fluorescence.—J. McC.

p-Toluene Sulphonic Esters as Alkylating Agents; Application of ——. F. Ullmann and P. Wenner. Annalen, 1903, **327**, [1], 120—124.

p-Toluene sulphonic methyl ester is easily obtained by boiling methyl alcohol with *p*-toluene sulphonic chloride. It melts at 28° C. Like dimethyl sulphate (see preceding abstract) it can be used for methylation, as has been proved in experiments with the naphthols, phenylacridine and 3-acetamino-2-methyl-1.2-naphthacridine.

When 2-methyl-3-amino-3-dimethylaminophenazine (Toluylene Red) is boiled in nitrobenzene solution with *p*-toluene sulphonic methyl ester and, after distilling off the nitrobenzene in a current of steam, the liquid is made alkaline with ammonia, and potassium nitrate added, green crystals of trimethyldiaminophenazonium methyl nitrate are deposited. These dissolve in water, giving a red solution.

As diethyl sulphate is not easily available, and as *p*-toluene sulphonic chloride readily gives the ethyl ester when treated with ethyl alcohol, this ethyl ester may very conveniently be used for ethylation purposes.—J. McC.

Triphenylethane; Preparation of (1 : 1 : 1) ——. M. Kuntze-Fechner. Ber., **36**, [2], 472—475.

Triphenylethane (1.1.1) can be prepared by the reaction of zinc methyl upon triphenyl-methyl bromide in benzene solution. The new body is formed in good yield and crystallises from alcohol in white needles melting at 95° C. The triphenylethane shows very great similarity with triphenylmethane; the nitro derivative obtained from it has nearly the same m. pt., and its reduction product gives also the same well-known Magenta reaction when burned on platinum foil. It can be distinguished by its crystalline form, which seems to be monoclinic, but especially by the behaviour of the nitro body with alcoholic potash, which does not produce the violet coloration of the trinitrotriphenylmethane.

Oxidising agents, like permanganate of potash, chromic acid, or bromine, have no action.

Nitric acid converts the triphenylethane into a trinitro body; m. pt. 200°—202° C. Reduction with tin and hydrochloric acid yields a triamino body, which crystallises from alcohol in rose-coloured plates melting at 191°—192° C.

Experiments undertaken with zinc ethyl and chlorotriphenylmethane gave, not a homologue of triphenylethane but simply triphenylmethane, ethylene being separated.
—E. N.

m-Azophenol. K. Elbs and W. Kirsch. J. prakt. Chem 1903, **67**, [5 and 6], 265—273.

For the preparation of *m*-diaminoazobenzene, commercia *m*-nitraniline is recrystallised from 40 to 50 per cent. alcoho and 40 grms. of it, dissolved in 400 c.c. of 96 per cen alcohol to which an aqueous solution containing 3 grms. crystallised sodium acetate is added, is used as cathod liquid. The electrolytic reduction is carried out in a ta beaker, the bottom of which is covered with nickel wi gauze. A porous cell fits into the beaker so as to leav only a narrow annular space. A cylindrical nickel wi gauze cathode is used, whilst a bent lead plate is placed the porous vessel as anode, the anode liquid being a col saturated sodium carbonate solution. A current density 1 to 6 ampères per sq. dcm. is used. After the electrolys the cathode liquid is poured into another beaker, and current of air is blown through it for some minutes; the on adding 500 c.c. of water, the *m*-azoaniline is deposite The current yield is about 90 per cent.

By diazotising the *m*-azoaniline in dilute sulphuric ac solution, then boiling with dilute sulphuric acid, *m*-azophen (*m* dihydroxyazobenzene) is formed. It can be recry tallised from dilute alcohol. It forms brownish-yello plates which melt at 205° C. It is soluble in alcohol, ethe acetone, or acetic acid, but almost insoluble in benzene water. Alkalis dissolve it with a red colour, and it gives soluble yellow barium salt. With acetic anhydride it giv diacetyl-*m*-azophenol, which crystallises in yellow needl and melts at 137° C. The Schotten-Baumann reaction lea to dibenzoyl-*m*-azophenol, which forms yellowish-brow plates and melts at 129° C.

On nitrating *m*-azophenol or its diacetyl derivative, nitro group enters the ortho position with respect to t azo group, and the para position with respect to the hydrox group. Nitro-*m*-azophenol, obtained by nitrating *m*-az enol in acetic acid solution with nitric acid (sp. gr. 1·48), ystallises in brown needles which melt at 205° C. It ms an easily soluble yellow sodium salt.

Diacetylnitro-*m*-azophenol forms yellowish-brown plates ich melt at 141° C. It is insoluble in dilute alkali solu- ns, but when its alcoholic solution is boiled with potassium droxide, it is decomposed and nitro-*m*-azophenol is formed.

When *m*-azophenol is boiled with water and zinc dust, the our disappears, and probably *m*-hydrazophenol is formed, t this has not been isolated. *m*-Dihydroxybenzidine is med when 1 grm. of *m*-azophenol is boiled with 40 c.c. water and 6 grms. of zinc dust are gradually added. hen this is boiled with acetic anhydride, tetraacetyl-*m*-ıydroxybenzidine is formed, which melts at 128°. When dihydroxybenzidine hydrochloride is diazotised in sul- uric acid solution, a diazo sulphate is obtained which uples with R-salt to a deep red dyestuff. The dyestuff is posited as a dark reddish-brown powder on adding dilute drochloric acid. It is soluble in water, and in an alkaline th it dyes unmordanted cotton bluish-violet, the colour anging to pure blue with hydrochloric acid.

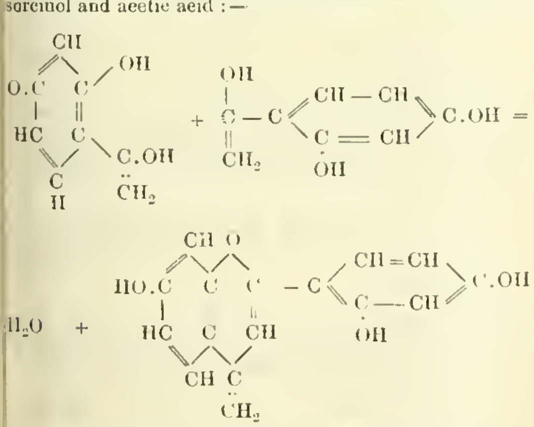
Nitro-*m*-azophenol, treated in the same way, gives *m*-di- droxyaminobenzidine which does not melt when heated 340° C. The hydrochloride is easily soluble, and when izotised it couples with alkaline solution of R-salt, giving ed solution which dyes unmordanted cotton blue.

—J. McC.

esacetein," $C_{16}H_{12}O_4$*: Constitution of Nencki and Sieber's* ——. C. Bulow. Ber., 1903, **36**, [4], 739—736.

HE resaceteïn is best prepared by heating a mixture of part of resorcinol, 2 parts of glacial acetic acid, and parts of anhydrous zinc chloride to 160° C. for two hours. hen cold, the mixture is poured into a large volume of ter, and a greenish resin deposits. The resin is washed th water, then dissolved in alcohol, and the solution ded to dilute ammonia solution. By carefully making id with dilute acetic acid, a mixture of resacetein and etofluoresceïn is separated. The latter is dissolved out several small fractions of alcohol, and the resacetein is t as a solid substance.

It dissolves in alkalis with a red colour ; with acids, it rms well-crystallised salts. On acetylation it gives a -acetyl derivative, $C_{16}H_9O_4(C_2H_3O)_3$, which melts at 9° C. When the properties of resacetein are compared th those of the 1.4-benzopyranol derivatives recently idied by the author (Ber., 1901 and 1902), a very striking nilarity is observed, and it is deduced that resaceteïn is (2′.4′)-dihydroxyphenyl-4 - anhydromethyl - 7 - hydroxy- 4-benzopyranol, formed according to the following uation from the resacetophenone first produced from the sorcinol and acetic acid :—



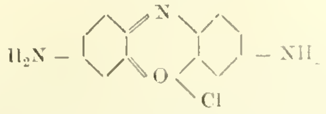
The decomposition of resacetein by alkali into resorcinol d resacetophenone confirms this view of its constitution.

From phenol and acetic anhydride with zinc chloride, phenaceteïn" is obtained. In the formation of this it is sumed that *o*-hydroxy- and *p*-hydroxyacetophenone are rmed, and these, under the influence of the zinc chloride, condense to phenacetein or 2.(4′)-hydroxyphenol-4-an- hydromethyl-1 : 4-benzopyranol.

In the same way, orcinol gives "orcaceteïn," or 2(2′.4′.6′)-methyldihydroxy-4-anhydromethy -5-methyl-7-hydroxy(1 . 4-benzopyranol).—J. McC.

Phenoxazines ; Nitro Derivatives of ——. *Analogue of Lauth's Violet in the Series of the Oxazines.* F. Kehrmann and A. Saager. Ber., **36**, [2], 475—484.

THE authors have prepared the hitherto unknown 3 : 6-di- aminophenoxazine. The dyestuff derived from this new substance is the analogue of Lauth's violet in the series of oxazines, and is constituted as follows :—



While the nitration of thiodiphenylamine occurs easily, phenoxazine is mostly decomposed, yielding besides a small quantity of tetranitrophenoxazine ; no difficulty, however, is experienced if the nitration is carried out with acetyl- phenoxazine, which is converted almost entirely into acetyl-3 : 6-dinitrophenoxazine, a little acetyltetranitro- phenoxazine being also formed.

The separation of the two substances can easily be effected by crystallising from benzene. The tetranitro body, being only slightly soluble, crystallises first, the mother-liquors depositing, after concentration, the acetyl- dinitrophenoxazine in brownish-yellow needles, m. pt. 192° C.

The free dinitrophenoxazine is obtained by treatment of the acetyl derivative with an alcoholic solution of caustic potash. It crystallises from acetic acid in red needles of no definite melting point and decomposing above 200° C.

The reduction of the 3 : 6-dinitrophenoxazine can be effected with stannous chloride and hydrochloric acid in alcoholic solution. A colourless solution is obtained, which, when sufficiently concentrated, deposits a double compound of tin chloride and diaminophenoxazine. In order to prepare the dyestuff, this tin salt is decomposed with sulphuretted hydrogen, and the solution oxidised by means of a current of air at a temperature of about 70° C. The solution finally obtained shows a bright red-violet coloration and a vivid red fluorescence. The chloride of the dyestuff is very soluble in water, and forms green needles. Caustic soda decomposes the salts of the dyestuff, precipitating the free oxazonium base, which is soluble in benzene. with a yellowish coloration.

The new compound dyes mordanted cotton blue shades, which are much redder than those obtained with Lauth's violet.

The tetranitro body above mentioned possesses the nitro groups in the 1 : 3 : 6 : 8 positions. It can be prepared by nitrating 3 : 6-dinitro- or 1 : 3-dinitrophenoxazine. As intermediate product, the latter yields 1 : 3 : 6-trinitro phenoxazine, which is converted afterwards into 1 : 3 : 6 : 8-tetranitrophenoxazine.

Both of these nitro derivatives form with caustic soda blue-coloured sodium salts, which are very soluble in water. The reduction and subsequent oxidation of the tetranitro- phenoxazine gives a dyestuff which dyes cotton similar shades to Mauveïn ; the trinitro body yields a red-violet dyestuff. The aqueous solutions of both dyestuffs show no fluorescence.—E. N.

Purpurogallin ; Formation of ——, *by the Electrolytic Oxidation of Pyrogallol.* A. G. Perkin and F. M. Perkin. Proc. Chem. Soc., **19**, [262], 58.

THE methods hitherto employed for the production of purpurogallin give only a poor yield, but recent experiments made by the authors on the electrolytic oxidation of pyrogallol have shown that, in general, the quantity of purified product amounts to 37—45 per cent. of the calculated amount. The purified substance had all the properties of purpurogallin, and its acetyl derivative gave, on analysis, figures which established its identity with this colouring matter.

The composition of the electrolytic bath has been frequently varied, and recently a solution containing 28 grms. of pyrogallol, 10 c.c. of normal sulphuric acid solution, and 50 grms. of sodium sulphate in 500 c.c. of water has been found to be most effective. The best results have been obtained by using a rapidly rotating anode of platinum-iridium and a cathode of lead or graphite. The current density was 4—6 ampères with an E.M.F. of 8—10 volts.

Anthranilic Acid; Sublimation of ——. B. Scheuermann. XX., page 437.

English Patents.

Blue Colouring Matters containing Sulphur; Production of ——. I. Levinstein, H. Levinstein, and Levinstein, Ltd., Manchester. Eng. Pat. 7871, April 4, 1902.

Sulphide dyestuffs giving bright blue shades on unmordanted cotton are obtained by heating *p*-hydroxy-*m*-chloro-*p*-aminodiphenylamine with sodium sulphide and sulphur either at a high temperature or preferably in aqueous solution under a reflux condenser. The *p*-hydroxy-*m*-chloro-*p*-aminodiphenylamine $(1.1)NH_2.C_6H_4.NH.C_6H_3.Cl.OH(1.3.4)$ may be obtained by one of three methods:—(1) reducing the chloroindophenol prepared by oxidising equimolecular proportions of *o*-chlorophenol and *p*-phenylenediamine in alkaline solution with sodium hypochlorite; (2) heating together equimolecular proportions of *o*-chloro-*p*-aminophenol hydrochloride and *p*-phenylenediamine: or (3) by boiling together in aqueous solution equimolecular proportions of *p* nitro-chlorobenzene *o*-sulphonic acid and *o*-chloro-*p*-aminophenol in presence of two molecular proportions of sodium acetate and reducing the *p*-nitro-*p*-hydroxy-*m*-chloro-diphenylamine *o*-sulphonic acid so formed to the corresponding amino compound having the formula $(4.3.1)NH_2.SO_3H.C_6H_3.NH.C_6H_3.Cl.OH(1.3.4)$. This product is then heated in an autoclave with dilute sulphuric acid for some hours, when it loses the sulphonic acid group. These two latter operations, reduction and hydrolysis, may be performed in the reverse order. The new compound *p*-hydroxy-*m*-chloro-*p*-aminodiphenylamine crystallises from water in colourless short silky needles melting at 153° C., sparingly soluble in cold water and turning blue on exposure to air. The substance is also very sparingly soluble in alcohol, but it dissolves in cold dilute mineral acids, from which solution it can be precipitated by soda. The alkaline aqueous solution turns blue rapidly on exposure to air, the indophenol being precipitated in coppery indigo-blue flakes. —T. A. L.

Monoformyl α_1-α_2 *Naphthylenediamine*-β_3 *or* β_4-*Monosulphonic Acid; Production of* ——. F. Gaess, Freiburg, Germany. Eng. Pat. 8195, April 8, 1902.

See Fr. Pat. 320,263; this Journal, 1903, 22.—T. A. L.

Yellow and Orange-Yellow and Red Dyestuffs of the Acridinium Series [Acridine Dyestuff]; Manufacture of ——. O. Imray. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a Main Eng. Pat. 9126, April 19, 1902.

See Fr. Pat. 320,570; this Journal, 1903, 23.—T. A. L.

Anthraquinone Series [Anthracene Dyestuff]; Production of New Derivatives of the ——. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 9195, April 21, 1902.

See Fr. Pat. 320,821; this Journal, 1903, 141.—T. A. L.

Green, or Greenish, Colouring Matters containing Sulphur [Sulphide Dyestuff]; Manufacture of ——. G. W. Johnson. From Kalle and Co., Biebrich-on-Rhine. Eng. Pat. 9619, April 25, 1902.

See Fr. Pat. 320,701; this Journal, 1903, 141.—T. A. L.

Mellitic or Pyromellitic Acids; Condensation Products Manufactured from ——, *and Derivatives of the Condensation Products.* O. Silberrad, Shooters Hill, Kent. Eng. Pat. 28,638, Dec. 27, 1902.

Mellitic or pyromellitic acid is heated with phenols or derivatives of phenols, such as resorcinol or dimethyl-*m*-amino-phenol, with or without condensing agents.

The halogen and nitro derivatives of the bodies are direct dyestuffs for animal fibres and readily yield lakes.—J. F. B.

French Patents.

Phenylglycine-o-Carboxylic Acid [Indigo Dyestuffs]; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Supplement, dated July 12, 1902, to Fr. Pat. 306,302, Dec. 15, 1900.

Equimolecular proportions of glycocoll and an alkali salt of *o*-chlorobenzoic acid are boiled together in presence of an alkali carbonate. —T. A. L.

Mono- and Di-brom- and Mono- and Di-chlor-Indigo, Manufacture of ——. A. Rahtjen. Second Supplement, dated July 30, 1902, to Fr. Pat. 310,926, May 18, 1901.

Indigo in the dry state or suspended in bisulphide or tetrachloride of carbon is treated with hydrobromic acid or bromine and chlorine in the cold. See also Eng. Pat. 21,040 of 1902; this Journal, 1903, 90.—T. A. L.

Dry Indigo in Lumps; Manufacture of ——. Badisch Anilin und Soda Fabrik. Supplement, dated June 11 1902, to Fr. Pat. 317,926, Jan. 20, 1902.

The substances mentioned in the chief patent (this Journal 1902, 1391) for mixing with Indigo may be replace wholly or in part by others such as sugar, molasse glycerin, glue, various farinas, insoluble sulphates, phosphates, carbonates, or silicates, or laminaria powder. I the case of the last mentioned, dry Indigo may be employe and compressed with the laminaria powder alone or i combination with some other substance, the resulting lump disintegrating and yielding a thin paste when moistene with water.—T. A. L.

Indigo Dyestuffs; Manufacture of Brominated —— Badische Anilin und Soda Fabrik. Fr. Pat. 322,86 July 7, 1902.

Indigo white, its homologues or analogues, is treated wit bromine in presence of a neutral or acid solvent, th resulting product being a brominated Indigo.—T. A. L.

Indigo from Indigofera: New Method for Obtaining —— C. Kurz. Fr. Pat. 323,036, Oct. 27, 1902.

The liquid obtained by macerating Indigofera plants treated with tannin, which combines with the indigot contained in it. The resulting product on treating wit soda or dilute sulphuric acid yields pure Indigo.—T. A. L

Dyestuff [Azo] Insoluble in Water; Manufacture of ——, *from m-Dinitro-p-dimethoxydiphenylmethan* Badische Anilin und Soda Fabrik. Fr. Pat. 322,9 July 11, 1902.

Dinitrodimethoxydiphenylmethane obtained by t action of formaldehyde on *o*-nitranisol in presence of condensing agent and probably having the formula—

$$1.2.4.CH_3O.NO_2.C_6H_3.CH_2.C_6H_3.NO_2.OCH_3.4.2.1$$

gives on reduction the corresponding diamino compoun The product gives a very stable and easily soluble tetra derivative, which readily combines with β-naphthol either itself or when padded on the fibre, giving a bluish-r insoluble disazo dyestuff. Used as a lake, the shade still more bluish.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, 'RINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

digo; Determination of the Dyeing Value of ——. W. B. Bridgett. J. Soc. Dyers and Colourists, 1903, **19**, [3], 63.

ᴇ author states that the percentage of indigotin and indi- bin in a sample of indigo, as indicated by the permanga- te process, is not a true indication of the dyeing power the sample. He has made comparative dyeing tests with large number of samples of various kinds of indigos, :luding paste, with the result that in no cases were the ults obtained by the permanganate process fully con- med. In one experiment, comparative dyeing tests were de with four samples of indigo, prepared in different tories but each costing the same price, and each contain- ; 60 per cent. of indigotin and indirubin combined; the ed patterns obtained, were all of different shades.—A. S.

Raw Silk; Adulteration of ——, with Fat. R. Gnehm. Färber-Zeit., 1903, **14**, [5], 69.

ᴇ author has recently examined several samples of raw k which contained an unusually high proportion of fat. r example, in 20 samples of Japanese tram, two contained to 8·5 per cent of fat, whereas the normal percentage fat is 0·036—0·060. The addition of fat must be garded as fraudulent weighting, and the author recom- nds, in all cases, a direct determination of the fat by traction with benzene or ether.—A. S.

lk; Formation of Stains on ——. R. Gnehm. Zeits. für Farben- u. Textil-Chem., 1903, **2**, [5], 92—95.

ɪᴇ author points out that Sisley's results (this Journal, 1902, 28) in the main confirm those previously obtained by him- f in conjunction with Roth and Thomann (this Journal, 02, 968). Sisley, however, states that the active chemical ent concerned is sodium chloride. The author spotted ed fabrics with 2 per cent. and 15 per cent. solutions of mmon salt, 10 per cent. solutions of magnesium chloride d sulphate, and 10 per cent. solution of butyric acid, but uld not obtain any formation of stains after storing for a ig time. He then made experiments with a piece dyed silk supplied him by Sisley. The remarkable sult was that on the same specimen on which, in the nds of Sisley in Lyons, a 15 per cent. solution of dium chloride produced a reddish-brown stain after out four weeks, in the author's hands in Zürich, th the same reagent, no action could be observed after weeks. Similar conflicting results have been communi- ted to the author by other investigators. The author is able to account for these differences, but he points out, perhaps having some bearing on the matter, that most the goods which show these stains have either been epared or stored for some time in southern or hot untries. Cases are known, indeed, where pieces sent to southern country became defective, whilst other pieces of same material showed no defects even after a longer riod of time.

The author still maintains that the root of the evil is to found in the weighting, and especially in the excessive eighting, of the silk.—A. S.

urkey-Red Oils on Cotton Tissues; Decomposition of ——. H. von Niederhäusern. Bull. Soc. Ind. Mulhouse, 1902, **72**, [Nov.], 389—394.

ɪᴇ author confirms Driessen's statement (this Journal, 02, 545) that the fatty matters, which result from the composition of sulpholeates, possess, in common with ose produced in the native Indian process of oiling tissues, e property of strongly attracting and fixing alumina from neutralised solutions of alum. The sodium and ammonium lphoricinoleates do not decompose to form fatty mordants en at a temperature of 100° C., when the tissues prepared th them are kept moist, but when these are dried, they so rapidly and at relatively low temperatures. Oxygen d carbon dioxide gases have no influence on such decomposition. A Turkey-red may be obtained by the following short process:—(1) Oiling, which is effected better with ammonium than with sodium sulphoricinoleate; (2) drying at the ordinary or a higher temperature; (3) washing; (4) immersion in a solution of alum at the ordinary temperature; (5) washing; (6) dyeing in a bath of alizarin without other addition; (7) washing. The usual operations of steaming, brightening, soaping, &c., are without any useful effect on the colour. Operations (4), (5), and (6) may be combined in one by the employment, in the dye-bath, of aluminium compounds suitable for use in the single-bath method of dyeing. The red thus produced, is very fast to acids, but is only moderately fast to alkalis and chlorine.—E. B.

Aniline Black on Wool and Half-Wool and the Preliminary Treatment with Acids. F. Reisz. Chem.-Zeit., 1903, **27**, [20], 215—217.

The author contests Schmid's view (Chem.-Zeit., 1902, **26**, 245, 261, 271), that wool requires to be treated with chlorine before the application of Aniline Black so as to destroy the reducing power of the wool-fibre. Instead of treating with chlorine, it is advantageous to soak the wool in potassium permanganate solution. This acts as an efficient oxidiser, and as manganese peroxide is deposited, this aids in the formation of the Aniline Black. In place of manganese peroxide, oxide of iron, copper, &c., may be employed. The wool, after washing, is treated in a bath containing 3 to 4 per cent. of sulphuric acid, to which 6 to 7·5 per cent. of potassium permanganate is added gradually. The wool is then dried and immersed in a cold acid bath of aniline or aniline oil. The process may be carried out in one operation by using a bath of 80 to 100 grms. of aniline salt (hydrochloride, sulphate, tartrate, or lactate), 28 to 34 grms. of sodium chlorate, 10 to 15 grms. of tartaric acid, 20 to 30 grms. of ammonium chloride, 30 to 40 grms. of copper sulphide (or other oxygen-carrier), and 15 to 20 grms. of glycerin in 1 litre. The wool, after dyeing and drying, has a greenish appearance; it is oxidised for 14 to 16 hours, then steamed, in presence of a little ammonia, for 1 to 2 minutes. If these conditions are not adhered to a brownish-black is obtained, but when properly carried out the desirable blue on the black is obtained.

The author claims priority over Bethmann for the preliminary treatment of the wool with sulphuric acid. It has been proved that wool not so treated does not take on the Aniline Black properly, but when the wool has been treated with sulphuric acid a good fast black is obtained.

It is further claimed that the most rational process is to treat the wool with acid and an oxidising agent simultaneously, and, particularly for half-wools, the permanganate method is the best.—J. McC.

English Patents.

Artificial Horsehair; Method and Means of Treating Cocoanut and other Fibrous Material for the Manufacture of ——, and the like. C. N. Holmes, Clapham. Eng. Pat. 4379, Feb. 20, 1902.

The cocoanut or other fibre, after boiling with dilute alkali (about 2 per cent. for caustic soda), is immersed in a bath approximately consisting of—

Logwood extract	20 lb.
Sumach extract	30 lb.
Persulphate of iron solution (about B.P. strength)	95 lb.
Water	500 galls.

The temperature of the bath is maintained for a few minutes at 100° to 150° F., and then allowed to fall, the fibre being left in for 6 to 12 hours, after which it is hydro-extracted and dried at about 150° F. It is now teased and combed, and then passed through a bath containing—

Glue	50 lb.
Water Black (Water Nigrosine)	10,000 grains,
Acetic acid	3 pints.
Oleic acid	1 pint.
Water	80 galls.

The fibre is immersed for a few minutes at 80° to 100° F., when it is drained and dried.—T. F. B.

Mercerising Cotton Yarns in Hank Form, applicable also for Dyeing, Bleaching, Drying, and otherwise Treating such Yarn or Yarns of other Fibrous Material by Analogous Processes; Apparatus for ——. T. Pratt, Shipley. Eng. Pat. 23,181, Nov. 16, 1901.

The machine contains a reel for carrying the yarn, consisting of two rollers, which can be rotated at will, and can also be moved horizontally away from or close to each other so as to modify the tension of the yarn. A device is provided to cover the reel, or portions of it, it necessary; it can be hermetically sealed, and is provided with inlet and outlet for the liquids in use.

A means of removing the yarn mechanically is also indicated.—T. F. B.

Cotton Fabric; Treatment of ——, *for Imparting a Silk- or Wool-like Appearance thereto.* P. Edlich, Triebes, Germany. Eng. Pat. 894, Jan. 13, 1903.

The yarn to be treated, is stretched before mercerising to that excess of width which it will lose in the bath. Whilst still stretched it is mercerised in the usual way, and is subsequently subjected to powerful pressure perpendicular to its surfaces, and at the same time conducted over heated metal cylinders. It is now again stretched to the original excess of width, and caused to travel over a long path while still impregnated with lye and stretched. It is finally rinsed, squeezed out, and dried.

The machine for carrying out this process consists of an ordinary stretching machine immediately before the mercerising bath. The yarn is afterwards pressed by passing between metal rollers, one of which is heated, then to a second stretching machine, and finally to the washing apparatus.—T. F. B.

Fulling or Milling, and Dyeing and Scouring of Woollen Fabrics. H. J. Haddan, London. From A. Elosegui, Tolosa, Spain. Eng. Pat. 371, Jan. 6, 1903.

The operations of "fulling" and dyeing the wool are performed simultaneously in a fulling trough, or a dyeing machine if this be adapted to fulling.

The process may consist of three stages—

(1) Preliminary fulling;
(2) Scouring and continuation of fulling;
(3) Dyeing and completion of fulling.

Or it may be modified to suit treatment required, the drying and fulling in all cases being carried out simultaneously.—T. F. B.

Black Shades on Wool; Process for Obtaining Fast —— H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 18,139, Aug. 18, 1902.

Wool, dyed with certain azo dyestuffs, is treated with chromium compounds which react as oxidising agents.

The dyestuffs to be used, are obtained by combining the diazo compounds of *o*-aminophenol sulphonic acids, aminohydroxybenzoic acids, or aminohydroxybenzylsulphonic acids (containing the hydroxyl and amino groups in ortho position to each other) or their derivatives, with certain dihydroxynaphthalenes or aminonaphthols, *viz.*, 1—4′, 1—2, 2—3′, dihydroxynaphthalenes 1—4′, 1—2′, 2—3′, 2—1′, a_1 aminonaphthols or the monosulphonic acids of dihydroxynaphthalene, and 1—4′, and 1—2′ amino-naphthols.

As an example of the process:—The wool is immersed in a bath containing 3—6 per cent. of sulphuric acid, 10 per cent. of Glauber's salt, and 6 per cent. of the dyestuff, made by combining diazotised orthoaminophenol-*p*-sulphonic acid with 1—4′-dihydroxynaphthalene. The bath is brought slowly to the boil and boiled for 45 minutes.

The reddish-violet shade thus obtained, is changed to a deep black by boiling for half an hour in a bath containing 3 to 4 per cent. of potassium bichromate and 3 to 6 per cent. of sulphuric acid.—T. F. B.

Colour Effects on Embroidery; Production of ——. C. R. Eichhorn, Plauen, Germany. Eng. Pat. 24,964, Nov. 13, 1902.

The invention consists in the production of two-coloured embroidery with shuttle embroidery machines. These coloured effects are obtained by touching those parts of the fabric, where the effects are to be produced, with bleaching agents (chlorine for example), which attack the colours.—E. N.

Dyeing and Printing in Aniline Black. F. Cleff, Barmen-Ritterhausen, Germany. Eng. Pat. 28,142, Dec. 20, 1902.

A mixture of formic acid and aniline is employed instead of the aniline hydrochloride usually employed as the basis for forming Aniline Black.

For instance, a bath for woven silk and cotton fabric may consist of 40 grms. of potassium chlorate, 25 grms. of copper nitrate, and 20 grms. of salammoniac, dissolved in 700 grms. of water. To this is added 100 grms. of anili e and 200 grms. of formic acid (26 per cent.).

For printing, 25 grms. of copper nitrate dissolved in 15 grms. of water, 100 grms. of aniline, and 200 grms. of formic acid (26 per cent.) are added to a mixture o 120 grms. of wheaten starch, 50 grms. of dextrin, and 45 grms. of sodium chlorate.

The printing and steaming are carried out as usual.

Wool is stated to require a preliminary treatment with chloride of lime potassium permanganate, &c.—T. F. B.

United States Patents.

Fabrics; Process of Manufacturing ——. A. Oesterbel , Germany. U.S. Pat. 722,246, March 10, 1903.

A fabric of alternate layers of fibre and adhesive su stance is manufactured by covering an endless band w th adhesive material, blowing fibres in all directions thereove by means of a blast of warm air, slowly drawing the same through an air chamber to successively dry each layer material, then calendering the material thus formed, a applying strong pressure. The material is sprayed aga with adhesive, a further layer of the fibre is applied, an the whole subjected to pressure.—E. N.

Dyeing Machine. J. A. Willard, Assignor to The Vacuu Dyeing Machine Co., Chattanooga, Tenn. U.S. Pat 721,630, Feb. 24, 1903.

Warp yarns are passed in the form of separate threads in a continuous manner around fluted, tubular, perforate rollers, mounted parallel to one another in a tank, wher they are dyed by the admission of dye liquor to the through the perforations in the parts of the rollers wi which they are in contact.—E. B.

Printing Cotton; Process of ——. F. Schaab, Trier, Germany. U.S. Pat. 722,050, Mar. 3, 1903.

The fabric, after being printed with a resist contain metallic salts, is sprayed with a solution of an alka carbonate, dried, and dyed with a sulphur dyestuff. It subsequently dyed with indigo in an alkaline bath, with without a final treatment with a bichromate solution. —T. F. B.

French Patents.

Ramie; Process of Retting ——, *with Sea Water.* Depetro. Addition, dated May 14, 1902, to Fr. P 317,501, Nov. 23, 1901.

A supplementary patent referring to the employment solutions of salts of approximately the same composition sea water, or of that of sea water concentrated by evapor tion, in effecting the retting of ramie and similar fibres (U.S. Pat. 707,907; this Journal, 1902, 1183).—E. B.

Yarns in Hanks; Machine for Dyeing ——. E. Dattm Addition, dated Aug. 9, 1902, to Fr. Pat. 315,6 Nov. 6, 1901. (See this Journal, 1902, 547.)

(1) In the framework of the machine, the corner uprig are extended some distance below the lower, movable p of the frame and are bound together by cross stays. T frame is thus rendered more rigid, and can consequently constructed of larger dimensions, enabling larger quanti of yarn to be dyed at a time. (2) Instead of woo bank-carrying rods, gas-piping encased in indiarub sleeves is used.—E. B.

extile Fibres; Apparatus for Dyeing ——. H. Rossler. Fr. Pat. 323,003, July 12, 1902.

HE textile materials to be dyed are enclosed between the lse top and bottom of a tank. Below the false bottom a ace is left for the reception of dye liquors. after these ive passed downwards through the tank. The liquors hen pass outwards through one or more pipes to the same umber of vertical conduits, up which they are driven by eam jets. At the top of the conduits they overflow into utters placed a little distance above the false top of the nk and are thus conveyed back into the tank. When the nk and conduits are full of liquor, very little steam, it is ated, is required to effect a circulation.—E. B.

eveloping Dyeings from Sulphur Dyestuffs. Actien-Gesellschaft für Anilin Fabrikation. Addition, dated July 23, 1902, to Fr. Pat. 321,652, May 31, 1902. (See this Journal, 1903, 295.)

ISULPHITES, free sulphurous acid, and sulphites in adixture with small quantities of copper or zinc salts, *e.g.*, dium sulphite and zinc chloride, sodium sulphite and pper bisulphite, sodium sulphite and sodium zincate, are nployed in the same manner as neutral sulphites to effect e oxidation of dyeings from sulphur dyestuffs, such as ulphur Black T extra, which are converted into blues by ich action.—E. B.

rinting Sulphur Dyestuffs, Process of —— Chem. Fab. vorm. Weiler-ter Meer. Addition (second), dated June 20, 1902, to Fr. Pat. 322,147, June 9, 1902.

. HYGROSCOPIC agent, *e.g.*, glycerin or glucose, is added to e printing mixture already described (see U.S. Pat. 08,429; this Journal, 1902, 1231).—E. B.

ndigo; Application in Dyeing and Printing of the Product obtained by Precipitating Reduced ——, with Tannin. C. Kurz. Fr. Pat. 323,035, July 17, 1902.

HE fact that indigo-white forms a compound with tannic id is made use of in calico printing both directly (1), the nnin indigo compound being in this case mixed with a itable thickening agent, and printed, the printed tissue ing then dried, steamed, passed through a bath of tartar netic, soaped, rinsed and dried; and indirectly (2), in the oduction of white and coloured resists under Indigo, hen a mixture containing tannic acid, with basic dyestuffs r coloured resists, is printed, the printed tissue dried, eamed, and either dyed in the vat as usual with Indigo, padded with an Indigo printing mixture. (See this ournal 1902, 545.)—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Dyeing Leather. P. Kauschke. Collegium, **48**, March 7, 1903.

HE advantages possessed by coal-tar dyestuffs in their plication to leather are, (1) that they require no mornts, and therefore, owing to the absence of injurious etallic salts, there is no liability to deterioration of the ather. (2) They are easy of application, and (3) No fficulties are experienced with regard to the varied conntration of the dye-bath, as is the case when employing tural dyestuffs.

In dyeing blacks on bark-tanned leather, basic dyestuffs e most useful, though several of the "acid" dyestuffs ay be employed, such as Naphthylamine Black.

In applying Chrome Leather Black C to leather, the ins are first prepared by brushing over with an alkaline fat liquor" and are then dyed in the drum at a temperature 60° C., adding a suitable amount of acetic acid to the ebath after the dyestuff has completely penetrated the ather, and continuing the drumming until the goods are yed black; if necessary, a small amount of Naphthol Blue is added in order to accentuate the black produced.

—M. C. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Sodium Hydroxide; Electrolysis of Fused ——. R. Lorenz. XI. A., page 424.

Sodium Carbonate; Decomposition of Dissolved ——, into Carbon Dioxide and Sodium Hydroxide. F. W. Küster and M. Grüters. Ber. **36**, [4], 748—752.

NORMAL sodium carbonate solution was boiled in a vessel provided with a reflux condenser (of silver), and a stream of electrolytic gas was passed through the apparatus; the issuing gas was passed through a measured quantity of baryta-water of known strength, and the amount of barium carbonate formed, was determined by back-titration. After 38 hours' boiling, 83·8 per cent. of the sodium in the solution existed as carbonate, 16·2 per cent. as hydroxide The rate of evolution of carbon dioxide steadily diminished as the proportion of sodium hydroxide increased, but solutions containing 40 per cent. and 60 per cent. of their sodium as hydroxide still gave off carbon dioxide when boiled, and extrapolation of the curve of results seemed to indicate that ultimately complete decomposition of the carbonate would occur. Further experiments at 90° C., in which the volume of the evolved carbon dioxide was compared with that of the electrolytic gas in which it was diffused, showed that the pressure of the carbon dioxide evolved at that temperature from normal sodium carbonate solution (during 358 hours, the evolution-rate being practically uniform and the carbonate ultimately reduced to 98·3 per cent. of its original amount), was 0·055 mm. of mercury-column, while that of the gas from a normal solution, 90 per cent. of which was carbonate and 10 per cent. hydroxide, was 0·019 mm. That sodium carbonate solutions boiled in the air do not lose carbon dioxide, but rather absorb it to form bicarbonate, is clearly due to the fact that the pressure of the atmospheric carbon dioxide is so much greater than the dissociation-pressure of sodium carbonate. The observation of Leighton (Chem. News, **87**, 64) that boiler feed-waters containing sodium carbonate show the presence of hydroxide after long boiling, and thus accelerate corrosion, finds its explanation in these facts.—J. T. D.

Alkali Chloride Solutions; Theory of the Electrolysis of ——. F. Foerster and E. Müller. Zeits. f. Elektrochem., 1903, **9**, [9], 171—185; and [10], 195—208.

FROM time to time the authors, among others, have contributed to the elaboration of a theory to explain the electrolysis of alkali chloride solutions. (See this Journal, 1899, 690; 1899, 830; and 1899, 1028, &c.) The experiments are described in detail in the present communication, and the authors claim that their theory is capable of explaining the more important technical applications of alkali chloride electrolysis, *viz.*, the manufacture of bleaching liquors and chlorates, and the processes involving the use of a diaphragm and of an inverted bell.

The theory, which refers principally to the phenomena taking place in the neighbourhood of the anode, is now summarised as follows:—

I. During the electrolysis of solutions containing chlorine ions, these ions are set free at the anode as free chlorine—

$$^{*}Cl' + Cl' + 2\oplus \rightarrow Cl_2.$$

II. In addition to this, hypochlorous acid and hypochlorite are formed at the anode, either as primary products, according to the equations—

$$Cl' + OH' + 2\oplus \rightarrow HOCl, \text{ and}$$
$$Cl' + 2OH' + 2\oplus \rightarrow ClO' + H_2O,$$

or, by the action of free chlorine on hydroxyl ions present in the neighbourhood of the anode, thereby giving rise to the balanced actions—

$$Cl_2 + OH' \rightleftarrows HOCl + Cl', \text{ and}$$
$$HOCl + OH' \rightleftarrows ClO' + H_2O.$$

Any increase in the ratio OH'/Cl' at the anode, *i.e.*, any increase in the alkalinity or dilution of the solution, will therefore cause a greater production of hypochlorite.

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[*] The symbol $\oplus$, is employed to denote one positive unit of electrochemical quantity of electricity; *i.e.*, 97,540 coulombs, or the quantity of electricity associated with one univalent gram-ion.

III. Besides the formation of hypochlorite in this way at the anode, there is also the production of this substance in the body of the electrolyte by the interaction of free alkali and chlorine.

IV. Since the hypochlorite ion, ClO', is more easily discharged than the chlorine ion, Cl', and since by its discharge it is destroyed, it follows that the hypochlorite formed in the immediate vicinity of the anode is incapable of finding its way, to any appreciable extent, into the main body of the electrolyte. The further its formation from the anode, however, the greater is its chance of remaining in the electrolyte; but the possibility of its existence in a chloride solution, traversed by a current, is in any case strictly limited.

V. Chlorate, or chloric acid, is produced from previously formed hypochlorite, ClO', in one or other of two ways, *viz.*, either as a primary product at the anode, thus—

$$6ClO' + 3H_2O + 6\pm \rightarrow 2ClO_3' + 4Cl' + 6H^{\cdot} + 3O,$$

or, as a secondary product in the main body of the electrolyte, thus—

$$ClO' + 2HClO = ClO_3' + 2H^{\cdot} + 2Cl'.$$

VI. The anodic formation of chlorate always takes place with the simultaneous evolution of oxygen. As a necessary condition for its production there must be a certain ClO' concentration corresponding to the given anode potential due to the concentration of the chloride, the alkalinity of the solution, and the nature of the electrodes.

VII. For a definite potential a sufficiency of ClO' ions can be obtained either directly at the anode by increasing the alkalinity, by diluting the solution, or by adding dilute hydrochloric acid, or indirectly from the hypochlorite in the main body of the electrolyte, *e.g.*, in the case of strong neutral solutions. In the first instance, chlorate is formed from the very commencement of the electrolysis, while in the second case it can only be produced after the electrolysis has been in operation for a certain time.

VIII. In strongly alkaline, neutral, or acid, very dilute chloride solutions, evolution of oxygen occurs at the anode both by the discharge of ClO' and of OH' ions.

IX. The secondary formation of chlorate takes place without the evolution of oxygen. This occurs to a great extent when hypochlorous acid and hypochlorite can exist together in a large body of the electrolyte, that is to say, when the chloride solution is slightly acidified.

These theoretical views are based on the following more important facts, *viz.*:—

1. During the electrolysis of strong hydrochloric acid, free chlorine and only very minute quantities of oxygen are evolved.

2. With increasing dilution of the hydrochloric acid, the amount of oxygen evolved, increases, and at the same time chloric acid (and from this perchloric acid) is formed.

3. In neutral alkali chloride solutions, the electrolyte in the vicinity of the anode becomes saturated with chlorine, which is developed at the commencement of the electrolysis.

4. In hydrochloric acid, as in neutral chloride solution, the anode potential necessary for rapid electrolysis is at least as great as that required for the electrolysis of chlorine-saturated solutions with an unattackable electrode.

5. In practice, this lowest value of the anode potential is approached closely only when black platinised anodes are employed, and may exceed it by 0·56 volt and more if the anodes be polished.

6. Where free admixture of the cathode and anode liquors is possible, hypochlorite, as well as hypochlorous acid, is formed from neutral solutions in the neighbourhood of the anode. The concentration of the hypochlorite goes on increasing up to a certain point, and then remains constant, when oxygen is evolved at the anode, while the current is utilised in forming chlorate.

7. The production of hypochlorite and the commencement of the formation of chlorate, produce no noticeable change in potential in the case of a platinised anode, provided that the current density is not too great.

8. The concentration of the hypochlorite which is reached in neutral alkali chloride solutions, is higher the greater the current density, the stronger the solution, and the lower its temperature.

9. More hypochlorite is formed with a platinised than with a polished anode.

10. The evolution of oxygen at the anode and the corresponding current yield of chlorate is scarcely affected by the conditions of experiment, provided the neutral chloride solution is not too dilute. In general, the anodic evolution of oxygen represents about one-third, and the formation of chlorate about two-thirds of the work of the current.

11. The evolution of oxygen is, however, diminished if hypochlorite be reduced at the cathode or if it be converted by secondary reactions within the electrolyte into chlorate.

12. In very dilute chloride solutions the anodic evolution of oxygen may represent considerably more than one-third of the work of the current.

13. In the event of carbon anodes being employed, this means the electrolysis of very dilute chloride solutions within the pores of the anode.

14. When the alkali produced at the cathode, is maintained separate from the anode liquor, then along with the chlorine formed at the anode there are produced either traces, or considerable quantities, of oxygen, depending on whether the electrolyte be concentrated or dilute. Corresponding to this, hydrochloric acid is produced and chlorate is formed.

15. When, as in the case of diaphragm processes, a limited amount of alkali enters the anode compartment, hypochlorous acid is formed as well as the chlorine which is evolved.

16. Slight acidification of the chloride solution (as by the addition of hydrochloric acid, bicarbonates, bichromate, or by the production of a lime or magnesiu diaphragm on the cathode, when the electrolyte contains calcium or magnesium chloride) gives rise to the secondary production of chlorate, diminishes the concentration of the hypochlorite which may ultimately be reached, suppresses the anodic evolution of oxygen, and increases the yield of chlorate.

17. After electrolysis has proceeded for some time in a neutral solution, the addition of acid causes an almost theoretical current yield of chlorate when platinised anodes are employed.

18. The addition of alkali to the chloride solution diminishes the maximum obtainable concentration of hypochlorite.

19. In strongly alkaline alkali chloride solutions the anode potential is conditioned by the potential required for the anodic evolution of oxygen from the alkali hydroxide, which rises considerably during the progress of the electrolysis.

20. In the case of normal alkali solutions the lowest potential required for the evolution of oxygen produce traces of hypochlorite from the chloride present.

21. The higher the increase in the anode potential, the greater is the amount of chloride electrolysis in a solutio containing normal alkali, and the greater is the amount o chlorate formed from the commencement, while the production of hypochlorite is less.—J. S.

Potassium Iodide; Electrolysis of Solution of —— F. Foerster and K. Gyr. Zeits. f. Elektrochem., 9, [11] 215—226.

The results of this research are summarised as follows:— 1. While a neutral normal solution of potassium iodid needs, according to Nernst, a minimum anode-potential c 0·52 volt, a lower value is sufficient in the presence c alkali. 2. The primary result of the electrolysis of potassium iodide, at the anode, is iodine. In alkaline solutio there appear also at the anode, possibly also as the resu of primary reaction, hypoiodous acid and hypoiodite. 3. I neutral solution, small amounts of free iodine and alkali, i equilibrium with hypoiodous acid, remain throughout an after the electrolysis; but most of the hypoiodous ac originally formed is converted into iodate. 4. In alkalin solution the hypoiodite is more stable, but is converted wit increasing rapidity as its concentration increases, into iodat chiefly, if not entirely, through secondary reactions. 5. A the result of this, the concentration of the hypoiodit reaches a limit, conditioned by the current strength, ten erature, iodide- and alkali-content of the solution, &c. Vhen this limit is reached, further electrolysis yields only odate. 6. In very dilute alkaline solutions, especially with smooth anode, oxygen is also liberated, in quantity in-reasing as the iodide-concentration decreases, and (for onstant iodide-concentration) as the alkalinity increases nd the current-density and temperature rise. 7. Periodate formed, if at all, only in very minute quantity.

For the electrolytic preparation of iodates, the following onditions should be observed :—The iodide solution should e at least of normal strength, if possible stronger; it ould be made about semi-normal with free alkali, and ·2 grm. of potassium chromate should be added per 00 c.c. The anode, of platinum foil, should hang between e two platinum wire-trellis cathodes, distant 1·5—2 cm. n either side, the three electrodes being a few cm. from e bottom of the vessel. Electrolysis should go on, with current density of about 0·01 ampère per sq. cm., the quid being constantly stirred, till the potential at the inding screws exceeds 2 volts, and oxygen is freely volved. Then the iodate is removed from the solution, hich can be used again to dissolve more iodide. To get e best yield from a given amount of iodide, the operation ould be carried on till about 10 per cent. more than the eoretically necessary current is being used.—J. T. D.

odium Sulphate; Properties of the Solution of ——. C. Marie and R. Marquis. Comptes rend., **136**, [11], 684—685.

HE author has determined the solubility of sodium chloride t different temperatures in a solution of sodium sulphate o dilute as to remain unsaturated (with sodium sulphate), ven in presence of the salt with a common ion, at all he temperatures employed. From 14·8° to 34·3° C. between which points the dissociation of the salt $a_2SO_4.10H_2O$ occurs) the curve of solubility of the sodium hloride was absolutely continuous. Had there been at ny point a liberation of $10H_2O$ due to the dissociation of he crystallised salt in solution, the increased amount of odium chloride dissolved, would have indicated it. The onclusion is that when a crystallised salt exists in solution he crystallisation water does not form an integral part of e molecule of the dissolved salt.—J. T. D.

Cuprous Sulphate; Note on ——. A. Joannis. Comptes rend., 1903, **136**, [10], 615.

 a previous note (Comptes rend., **125**, 948), the existence solution of a combination of carbon monoxide with uprous sulphate was pointed out. The peculiarity of this olution is that it dissociates into cupric sulphate and copper, film of the metal being formed on the surface of the liquid.

By evaporating the solution in an atmosphere of carbon onoxide, the author has obtained small white crystals, florescent and very unstable in air, which, on analysis, orrespond with the formula, Cu_2SO_4, 2CO, H_2O. This ompound gives off all its carbon monoxide on gently heat-g *in vacuo*. From the fact of the decomposition of this ody into cupric sulphate and copper, the author concludes hat cuprous sulphate cannot exist by itself at ordinary mperatures, but it does exist in combination with carbon onoxide, as with ammonia.

Carbon monoxide was found to reduce cupric solutions uch more rapidly in the presence of ammonia, carbon ioxide being formed.

Where no ammonia was present, carbon monoxide was ound to decolorise solutions of copper nitrate, formate, and cetate in presence of metallic copper.—T. F. B.

opper Salts; Products of the Reduction of ——, by Means of Hydroxylamine. E. Péchard. Comptes rend., 1903, **136**, [8], 504—506.

HE reduction, in ammoniacal solution, of copper salts by ydroxylamine has been used by the author as a means of reparing cuprous compounds of oxygenated acids, two of hich he now describes.

Cuprous acetate, $(CH_3CO_2)_2Cu_2$, is prepared by adding, rop by drop, hydroxylamine sulphate to a hot mixture of mmoniacal cupric acetate with a large excess of ammo-ium acetate, until the liquid is decolorised; excess of acetic acid is then quickly added, after which the cuprous acetate is soon precipitated in white, acicular crystals. It oxidises quickly in the air, yielding a basic cupric acetate, and water partially decomposes it into cuprous oxide and acetic acid. Ammoniacal cuprous sulphate, $Cu_2SO_4.4NH_3$, is prepared by the reduction of copper hydrocarbonate in ammonia solution by hydroxylamine sulphate, all the operations being carried out in an atmosphere of pure hydrogen; it is decomposed by water.—T. H. P.

luminium; Sulphates of ——. O. Schmatolla. Zeits. angew. Chem., **16**, [9], 202—205.

It is well known that the precipitates formed in aluminium sulphate solutions by the action of alkali hydroxides or carbonates always retain sulphuric acid. The author has shown that there is a series of these substances, and has obtained the following, the composition of which he has ascertained both by gravimetric analysis and by alkalimetric titration :—$Al_2O_3(SO_3)_1$, by action of calcium carbonate, cold. $Al_2O_3(SO_3)_{\frac{1}{6}}$, by action of caustic alkalis, cold. $Al_2O_3(SO_3)_{\frac{1}{12}}$, by action of ammoniacal ammonium salts, cold. $Al_2O_3(SO_3)_{\frac{1}{24}}$, by action of caustic alkalis, boiling. $Al_2O_3(SO_3)_{\frac{1}{48}}$, by action of strongly ammoniacal ammonium salts on very dilute aluminium sulphate solution.

The presence of ammonium sulphate appears to be the factor which prevents the complete decomposition of aluminium sulphate by ammonia; for though the salts obtained as above are perfectly stable when washed on the filter with water free from ammonia, the addition of ammonia to the thoroughly washed precipitate determines its decomposition, with formation of ammonium sulphate and pure aluminium hydroxide.

When lead acetate is added to aluminium sulphate solution till no further precipitate forms, the filtered aluminium acetate solution contains no lead, but always some sulphate, which can be precipitated by barium acetate; the amount of this sulphate corresponds with a salt nearer in composition than the lowest of those on the foregoing list to aluminium hydroxide.

The salt $Al_2O_3(SO_3)_{\frac{1}{12}}$ dissolves in a quantity of acetic acid so small that the compound formed, still has a basic formula. If to this solution calcium acetate be added, no decomposition of the salt occurs, for no precipitation of calcium sulphate occurs, though addition of a drop of free sulphuric acid causes immediate formation of precipitate. If the amount of acetic acid used to dissolve the salt, however, be greater than that needed to form normal aluminium acetate, the addition of calcium acetate causes a gradual precipitation of calcium sulphate. Here, apparently, the salt $Al_2O_3(SO_3)_{\frac{1}{24}}$ remains in solution.

Aluminium acetate solution was prepared from definite amounts of aluminium sulphate, calcium carbonate, and acetic acid, according to the directions of the German Pharmacopœia. Analyses of the solution showed that it contained sulphuric acid (in addition to the small quantity present as dissolved calcium sulphate) enough to form $Al_2O_3(SO_3)_{\frac{1}{24}}$ with the whole of the alumina present; and the solution yielded with ammonia a hydroxide containing sulphuric acid. These reactions show that the incomplete decomposition of aluminium sulphate does not depend on the insolubility of the aluminium compound produced, but that its cause is to be looked for in the molecular structure of aluminium sulphate itself. This the author considers to be $Al_2O_3.(SO_3).(SO_3)_2$, which furnishes, by separation of $(SO_3)_2$, the substance $Al_2O_3(SO_3)$. But this in turn he looks on as $Al_2O_3.(SO_3)_{\frac{1}{3}}(SO_3)_{\frac{2}{3}}$, and this can similarly give $Al_2O_3.(SO_3)_{\frac{1}{3}}$. From this again, regarding it as $Al_2O_3.(SO_3)_{\frac{1}{12}}(SO_3)_{\frac{1}{6}}$, $Al_2O_3(SO_3)_{\frac{1}{12}}$ is obtainable; and starting from this substance, the normal sulphate would be formulated as $Al_2O_3.(SO_3)_{\frac{1}{12}}.(SO_3)_{\frac{1}{4}}.(SO_3)_{\frac{2}{3}}.(SO_3)_2$. Obviously, this idea can be carried further, to any desired extent.

The addition, to the basic acetic acid solution of $Al_2O_3(SO_3)_{\frac{1}{12}}$, of calcium acetate, lessens the action of lead acetate on the solution; when 2 mols. of calcium acetate are present to 1 mol. of alumina, lead acetate does not react at all on the mixture. Oxychlorides of alumina cannot be prepared similarly to these sulphates, for when the ammonium salts are washed out, the precipitate gradually dissolves to an opalescent solution, from which it is again precipitated by neutral salts.

When ordinary aluminium sulphate with $18H_2O$ is treated with strong sulphuric acid a white precipitate falls, which, when washed with glacial acetic acid and dried at 100° C., is found to be $Al_2O_3.(SO_3)_3.6H_2O$. This is an exceedingly light powder, almost insoluble in cold water, but soluble in boiling water, and giving off its $6H_2O$ at 200° C.—J. T. D.

Lead Tetrachloride; Preparation of Ammoniacal ——. A. Seyewetz and P. Trawitz. Comptes rend., **136**, [11], 686—687.

Lead chloride ($PbCl_2$) is suspended in water, hydrochloric acid added (16 HCl for $PbCl_2$), then ammonium persulphate dropped in ($(NH_4)_2S_2O_8$ for $PbCl_2$) 15—20 grms. at a time, with agitation; the temperature must not rise above 30° C. The action is finished when the solid product is completely and readily soluble in water. The substance is drained by aid of the pump, afterwards on a porous tile. The yield is almost quantitative and the product is pure. Lead sulphate may be used equally well instead of the chloride, but the proportion of hydrochloric acid must then be doubled.—J. T. D.

English Patents.

Nitric Acid and Oxides of Nitrogen; Manufacture of ——. W. Ostwald, Leipzig, Germany. Eng. Pat. 8300, April 9, 1902.

Supplementary to Eng. Pat. 698 of 1902 (this Journal, 1902, 518). See Addition to Fr. Pat. 317,514 of 1902; this Journal, 1903, 93.—E. S.

Graphite or other Forms; Process and Apparatus for Converting Carbon into ——. A. B. F. Ludwig, Mülheim, Germany. Eng. Pat. 5482, March 5, 1902.

The apparatus consists of a suitably framed vertical metallic cylinder, closed at the top and bottom by "shutters that can be wedged home," the carbon to be converted being placed, in asbestos or other packing, within the cylinder. Air is expelled from the cylinder by hydrogen or other indifferent gas, and the "apertures being closed gas-tight" the internal pressure is raised to about 1,200 atmos. An electric current is sent through the carbon, and as the resistance increases, the strength of the current is suddenly augmented, so as to fuse the carbon, when it becomes non conducting, and then (on solidifying) again conducting. The carbon is thus repeatedly fused. It is stated that, with slow cooling, the carbon thus treated, is converted into graphite; with rapid cooling, a very hard carbon results; and if the cooling is sudden through the whole mass, "transparent diamond" is formed.—E. S.

United States Patent.

Lime; Process of Treating ——. E. Eldred, Brookline, Mass., U.S.A. U.S. Pat. 721,871, March 3, 1903.

Quicklime is slaked with sufficient water to form a putty, which is then dried by incorporating ground quicklime to absorb the excess of water. By this means a dry, pulverulent, completely hydrated lime is obtained.
—W. H. S.

French Patents.

Hydrochloric Acid, Sulphates, and Various By-products; Manufacture of ——. L. Fauchenx. Second Addition, dated May 10, 1902, to Fr. Pat. 307,359, of Jan. 23, 1901.

A chloride is heated with sulphuric acid, in proportion to form either a neutral or an acid salt, in a closed vessel, which may revolve, stones, chains, or other bodies being enclosed with the charge to prevent agglomeration. Methods of condensing the hydrochloric acid evolved are described. When the material is dry, and before decomposition is complete, it is transferred to a horizontal closed cylinder, enclosed within a casing to which hot or cold air or gases may be admitted as required; or the cylinder may be heated internally, but below the point of fusion of the charge, by filtered fire-gases or heated air, carrying the acid fumes to suitable condensers (the gases passing into and out of which are finely subdivided by small orifices), or to pass through the first-described apparatus in which the preparatory process is conducted. Heat-regenerating chambers are provided in connection with the furnace. The process may be modified by producing bisulphates and certain by-products described in the original patent and in the first addition thereto, a claim being here made for liquefying the sulphurous acid set free by the action of bisulphate on thiosulphates. When the apparatus is used in the production of aluminium sulphate from the phosphate, the mineral is heated with potassium chloride and sulphuric acid, the hydrochloric acid evolved, is collected, alum is crystallised out of the product, and the mother-liquor is used as crude phosphoric acid, to enrich superphosphate manure or the like. Other applications of the process and apparatus are described, one of which relates to the attack of copper or cupreous minerals with sulphuric acid, followed by passage of the gases from a pyrites burner; and another, to the preparation of ferrous sulphate and of other sulphates by aid of sulphur dioxide and oxygen. Among the miscellaneous claims, is one for the internal lining of iron tubes intended for conveying hydrochloric acid gas by "electric carbon," or a mixture of coke, resin, and tar, fixed by heating the tube with its lining.—E. S.

Nitrogenised Substances; Production of ——. F. E. Polzeniusz. Fr. Pat. 323,032, July 17, 1902.

The carbide of an alkaline earth metal (such as calcium carbide) is mixed with the chloride of an alkali, alkali-earth, or other metal, and heated in an atmosphere of nitrogen t obtain a nitrogenised product.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

Glass; Manufacture of ——. B. Becker, Gelsenkirchen Germany. Eng. Pat. 28,955, Dec. 31, 1902.

To prevent the charge of glass metal crumbling on exposur to the heat of the electrical smelting furnace, the batch mixed to a thick pulp with water and allowed to harden i moulds of suitable dimensions, at a temperature of 40 —50 C
—C. S.

Translucent Enamels; Application of ——, *on Har Porcelain Surfaces.* V. Viltard, E. Viltard, and G Collet, Paris. Eng. Pat. 3849, Feb. 14, 1902.

A flux, *e.g.*, crystal flux, consisting of 10 parts of borax 20 parts of white lead, 40 parts of minium, and 30 parts o litharge, is first applied to the surface of the porcelain, an heated. The enamel is then applied and fired, when i melts in the flux and adheres to the porcelain.—A. G. L.

French Patents.

Porcelain; Manufacture of ——. R. H. M. C. Ritzman C. J. A. Franzek, and F. X. Weigl. Fr. Pat. 323 081 July 16, 1902.

The use of felspar and quartz in the manufacture porcelain may be wholly or partly replaced by pulverise schists or siliceous slate, employed in equal proportion wit kaolin.—C. S.

Ceramic Products that Retain their Volume unchanged o Baking. C. F. Boehringer und Soehne. Fr. Pat. 323,08 July 16, 1902.

Shrinkage of porcelain ware in baking is prevented by th employment of natural corundum or fused alumina (prefe ably that obtained by the Goldschmidt process) as a con stituent of the porcelain body. For example, 64 parts granular alumina are passed through a sieve of 60 mesh per sq. cm., and then incorporated with 37 parts of potter clay, 9 parts of corundum powder, and a sufficiency of wate to form a plastic mass, the whole being then moulded int ware and baked. For electrolytic diaphragms, the alumin and kaolin are mixed in equal proportions.—C. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ricks ; *Basic Fireproof* ——. Rochmanow. Thonind. Zeit., **27**, 108. Chem.-Zeit., **27**, [18], Rep. 61.

MESTONE or chalk is pulverised, and classified, by sifting, to two grades: 1—1·5 mm. and 0·5—1 mm. diameter. ual parts of these are taken, and 80 parts are mixed with parts of freshly slaked lime, containing 10 per cent. of uminous fireclay, the whole being moulded with water. e bricks are fired at a high temperature, and are said to ssess great tensile strength. If afterwards treated with ter, the lime granules undergo hydration, and the pores come filled with hydrate, thus increasing the closeness of ture. By using limestone composed of 50 per cent. of O, 49 per cent. of CO_2, and 1 per cent. of other materials, gether with a fireclay approaching the composition of re clay, the bricks will consist approximately of 94·7 r cent. CaO, 1·6 per cent. Al_2O_3, 1·8 per cent. SiO_2, and 9 per cent. supplementary matters. Dolomite with 3—7 r cent. of clay, forms a good raw material, and the product specially adapted for lining the clinkering zone in cement lns.—C. S.

ortars ; *Experiments on the Porosity of some ——, and their Behaviour towards Sea-Water.* Bied. Réunion des Membres Franc. de l'Assoc. Internat. pour l'essai des Materiaux de Construction, Oct. 25, 1902, 5.

IE experiments were made to see whether mortars made th coarse or finely-ground cement are more porous, different nds of cements being used, mixed in various proportions th sand. After being gauged, the briquettes were first aced in ordinary water for different periods, and then in solution of calcium polysulphide for a time depending on eir previous immersion, being afterwards placed in a lution of lead acetate for about ten minutes. Contrary to e general supposition, it was found that the most finely-ound materials are the least porous, and also that the use too little binding material increases the porosity, 600 to 0 kilos. per cb. m. of sand being the minimum for ment.—A. G. L.

ortars ; *Experiments on the Decomposition of* ——. Bauchère. Réunion des Membres Franc. de l'Assoc. Internat. pour l'essai des Materiaux de Construction, Oct. 25, 1902, 6.

one series of experiments, water saturated with calcium lphate was made to filter through blocks of mortar made om fine sand and Portland cement or hydraulic lime ntaining very little alumina. None of the blocks showed y fissures, but the mortar made with cement stood the tion of the calcium sulphate best.

In two other series of experiments, blocks made with ment and lime, after hardening for five or six days in air, re placed up to one-third of their height in solutions ntaining, on the one hand, 0·07 grm. of calcium rbonate, 0·65 grm. of calcium sulphate, 1·08 grms. of dium sulphate, 1·67 grms. of magnesium sulphate, and ·55 grms. of sodium chloride per litre, and, on the other 025 grms. of calcium sulphate per litre. The vessels ntaining the blocks were left in an exposed place, so as give effect to the daily variations in temperature, the ter lost by evaporation being replaced from time to time. The results obtained, show that the mortars made with draulic lime were decomposed, and buckled shortly ter their immersion, whilst those made with cement ntaining 7 to 8 per cent. of alumina, showed no sign of saggregation under the same condition.—A. G. L.

uzzuolanas ; *Decomposition of ——, by Sea-Water.* Bied. Réunion des Membres Franc. de l'Assoc. Internat. pour l'essai des Materiaux de Construction, 25 Oct., 1902, 3.

HE author has examined the action of water containing 5 grms. of magnesium sulphate, 0·5 grm. of calcium lphate, 1 grm. of sodium sulphate, and 15 grms. of dium chloride per litre—this representing the composition of Hodna water—on prisms cut from the interior of a number of briquettes of different composition, which were broken after 15 days' hardening in sweet water. The saline solution was renewed every 48 hours. The briquettes were made of pure cement, mixtures of cement with 1, 2, 3, or 4 parts of grit, clay, or trass, and of hydraulic lime, and mixtures of this with grit, clay, or trass. It was found that the blocks of pure cement or lime stood the test well, as did also the mixtures of one part of cement with three or four parts of clay, while the other mixtures were more or less rapidly decomposed, according to the proportion of trass or grit present.

To show the extent to which the salt water penetrated the prisms, they were dipped first into a solution of lead acetate, from which lead sulphate is precipitated on those places where there was calcium sulphate, and then into a solution of polysulphide of lime, which blackens the lead salt. This reaction may not be used if any free lime is present in the briquettes, as this also precipitated lead salts.

In another series of experiments, in which the salt solution was renewed less frequently, the only briquettes showing signs of decomposition were those consisting of pure lime; one part of cement and three parts of clay; pure cement; one part of lime and four parts of grit; and one part of cement and four parts of grit.—A. G. L.

English Patents.

Stone, Artificial; Manufacture of ——. W. E. Evans London. From H. Crozier et Cie., Paris. Eng. Pat. 4644, Feb. 24, 1902.

Supplementary to Eng. Pat. 18,058, Sept. 6, 1899. See addition, dated May 31, 1902, to Fr. Pat. 308,548, Feb. 27, 1901 ; this Journal, 1903, 299.—W. H. S.

Bricks, Tiles, and Terra-cotta ; Apparatus for Making ——. D. F. Cooksey, Reading. Eng. Pat. 6601, March 18, 1902.

To produce a sanded or glazed face, the articles are moulded as usual, and whilst plastic, subjected to an air-blast carrying sifted sand or a colouring or glazing material. The blast is spread out by means of a plate set at a suitable angle in its path. The surface of the article may be rendered softer by making small jets of water impinge on it during the action of the blast. The machine for carrying out the process is also claimed.—A. G. L.

Building Blocks, Bricks, and other Articles ; Manufacture of ——. J. C. Sellars, Birkenhead. Eng. Pat. 7647, April 1, 1902.

Any suitable mineral waste materials, such as waste from quarries, mines, or shale beds, with or without the addition of ordinary sand or furnace slag, are ground to a fine powder and mixed with "air-fallen" hydraulic or ordinary lime and sufficient water to form a stiff putty. After allowing this putty to stand for some time, it is pressed or moulded into the required shape, either alone or mixed with stones, &c., the articles so formed being then air-dried, and hardened by supplying water or a solution of silicate of alkali gradually in small quantities for several weeks. Portland cement (5 to 10 per cent.) may also be added to the raw materials, and the articles made may be toughened by being steeped in a solution of tar, gum, glue, &c., in a suitable volatile solvent (or, in some cases, in an alkali). To expedite the chemical reactions occurring during the process, a current of electricity may be passed through the articles at any convenient stage in the manufacture.
—A. G. L.

Muffle Kilns [for Fireclay, &c.] ; Impts. in and connected with ——. H. E. Cliff, Leeds. Eng. Pat. 28,855, Dec. 31, 1903.

A number of muffle kilns are connected together by means of flues, so that the process of burning may be made continuous, the waste heat from one muffle being used to give a preliminary heating to others, whilst the air necessary for combustion is heated in its passage through kilns which have been fired recently. Coal, gas, or liquid fuel may be used.—A. G. L.

Cement; An Improved ——. A. Landverlin and J. Chipaux, Sille-le-Guillaume, France. Eng. Pat. 28,810, Dec. 30, 1902. (Under Internat. Conv., May 30, 1902.)

The cement, which is to be used for the joints of steam and similar engines, consists of a mixture of about 50 per cent. of very finely-powdered schist, with about 50 per cent. of white lead, either alone or mixed with linseed oil, hempen threads being added during the mixing. Any argillaceous stone may replace the schist, and minium or oil alone the white lead.—A. G. L.

United States Patent.

Stone, Artificial; Manufacture of ——. C. W. Stevens, Harvey, Ill. U.S. Pat. 722,164, March 10, 1903.

The liquid stone mixture is forced into a closed mould provided with a permeable wall, the liquid portion of the mixture being forced through the permeable wall, with or without the use of a partial vacuum on the other side.
—A. G. L.

X.—METALLURGY.

Steels; Dilatation of Hardened ——. G. Charpy and L. Grenet. Comptes rend., 136, [2], 92—94.

Mild steels (carbon under 0·5 per cent.) hardened in oil or in water from temperatures between 700° and 1,000° C. are unaffected in their coefficient of expansion. Steels containing from 0·6 to 1·0 per cent. of carbon are also unaffected when hardened in oil from any temperature, or in water from temperatures below 900° C.; but when hardened in water from above 900° C. the dilatation curve shows a contraction about 300° C. Steels containing above 1·0 per cent. of carbon behave similarly, but show contractions not only at 300° C., but also about 150° C., and exhibit also at 700° C. the ordinary contraction corresponding to the critical point a_1. These results are not satisfactorily explained by the usual hypothesis that hardening results from the carbon being retained in the state of solid solution, or the iron being in an allotropic form; they require actions of quite different character
—J. T. D.

Steel; Theory of the Hardening of ——. A. Le Chatelier. Comptes rend., 136, [11], 664—667.

The author points out that he has already given expression to the view, lately enunciated by Charpy and Grenet, that the theory of the hardening of steel which attributes it to the maintenance of the carbon in solid solution, or of the iron in an allotropic form different from the form which is stable in the cold, is inadequate to account for the known phenomena of hardening. The only proved allotropic form of iron is the non-magnetic one, the existence of which has been studied in nickel- and manganese-steels, and which has at about 15° C., a coefficient of expansion almost double that of non-magnetic steel. Hardening does not preserve the iron in ordinary steels in this condition; but the transformation to the magnetic state occurs at a temperature, T^1, which is lower as the hardening is more severe, and is accompanied by a dilatation of two-fold character: (1) that due to the normal transformation at the temperature of equilibrium; (2) another, equal in magnitude to and compensating for the excess of contraction, from the temperature of equilibrium down to T^1, of the non-magnetic over that of the magnetic metal. The latter part of the dilatation will obviously be greater, the lower T^1 is, that is to say, the more sudden and severe the hardening. These changes of state and dilatations are experienced successively by the different parts of the piece of metal, which cool at different rates; and to this is due the condition of intense internal stress characteristic of hardened steel. This theory of hardening still remains in accord with all the known facts; and the recent results of Charpy and Grenet, as well as the earlier ones of Howe, seem to show that the influence of carbon in the steel consists, first, in its tendency to lower the temperature of the zone of transformation, and, second, in that it increases the intensity of the internal stresses produced.—J. T. D.

Steels; Theory of the so-called Rapid- and Natural Hard ——. J. Spüller. Chem.-Zeit., 1903, 27, [16], 165.

Rapid- and natural hard steels are alloys of iron with varying amounts of carbon and varying larger amounts of chromium, tungsten, titanium, molybdenum, or boron When forged and cooled in the usual manner, the steel is quite hard, but can be bored and filed by good tools; on the other hand, when heated to 1100°—1200° C., and allowed to cool in cold air, or, first, quenched in a lead bath at 650° C., and then allowed to cool in cold air, it becomes harder than the best tool steel hardened in the ordinary way, and possesses the peculiar property—especially the rapid steel—of working (cutting, &c.) best at those temperatures at which the hardening carbon in ordinary hard tool steel becomes converted into carbide carbon, whilst the steel itself begins to become soft and useless for turning cutting, &c. These steels are used for tools, for rapi work, where the heat generated at the cutting surface i sufficient to heat the edge of the tool to a temperature o 500°—600° C.; under these conditions the edge of the too becomes extremely hard, whilst the other portion remain in the same condition as it was after forging, and can be cut with good tools. According to the author the explanation of this peculiar property of rapid and natural har steel, is that the iron, chromium, tungsten, &c. are al present as carbides, and in the steel after the normal forging and cooling, the predominant constituent is iron carbide which is relatively soft, and thus the steel can be bored and filed. On heating to 1000°—1100° or 1250° C., however, the iron carbide is decomposed, and the carbon combines with the chromium, tungsten, &c., to form higher carbides, which latter then form the preponderating part of the steel, and as these carbides are extremely hard, the steel is sufficiently so for cutting-tools without special treatment in water or oil. Chromium carbide appears to be the most important of these hardening carbides. Various facts are given in support of this theory, among which may be cited the different behaviour of the cutting edges and the oth portions of tools made of these steels, towards variou reagents; also the presence of chromium carbide in the cutting edges.—A. S.

Steel; Spontaneous Decarburation of ——. G. Belloc Comptes rend., 1903, 136, [8], 500—501.

When a hard steel spring is rapidly heated in a vacuum it becomes transformed into soft, grey metal which i non-sensitive to tempering. If, however, the steel be previously heated for some time (20 hours) at about 55 C. by which means the occluded gas is driven off, no decarburation occurs when the temperature is afterwards raise to above 800° C. It is to the occluded gases, then, tha decarburation of steel is due. In the absence of thes gases there occurs also a secondary action, namely, volatilisation of a portion of the iron; the excess of carbo combines with the remaining iron, yielding a super carburated steel.—T. H. P.

Nickel Steels: Variations of the Modulus of Elasticity C. E. Guillaume. Comptes rend., 1903, 136, [8], 498-500.

The author has examined samples of nickel steel containing various proportions of nickel, in order to find out ho their moduli of elasticity change as the temperature alter Results of the measurements made, are given. Alloy which show practically no variation of this modulus a ordinary temperatures are useful in preparing all kinds o springs in which it is important that the effort or momen exerted shall be independent of the temperature.
—T. H. P.

Nickel Steel: Influence of Various Treatments on th Micro-structure of ——. L. Guillet. Comptes rend 1903, 136, [8], 502—504.

The author finds that the transformations undergone b nickel steel on hardening, tempering, hammering, cooling cementation or decarburation can be more readily detecte by an observation of the micro-structure than by mechanica or magnetic tests.—T. H. P.

nalgams. N. Puschin. J. russ. phys.-chem. Ges., **34**, 856—904. Chem. Centr., 1903, **1**, [10], 562.

order to settle the question whether mercury forms mical compounds with zinc, cadmium, bismuth, lead, and the author determined the melting-point curves of the algams of these metals, measured their electro-motive es, and examined their micro-structure. He concludes t no compounds are formed, but that mercury forms hanical mixtures with zinc and bismuth, and isomorphous tures with tin, lead, and cadmium.—A. S.

er ; Influence of Bismuth on the Determination of ——, y the Crucible Test. K. Sander. XXIII., page 442.

English Patents.

quettes ; An Improved Process for Making ——, from ine Comminuted Metalliferous Materials without Foreign inding Substances. A. Rónay, Budapest, Hungary. ng. Pat. 5531, March 5, 1902.

metalliferous materials, in some cases after moistening water, are subjected to a pressure, applied progres-ly or on one or more sides, of about 1,000 atmospheres, orm briquettes, which are then exposed to the action ombustion gases, at a temperature insufficient to fuse the erials.—E. S.

s containing Copper ; Treatment of ——. W. Payne d J. H. Gillies, both of Orange, New South Wales. ng. Pat. 19,035, Aug. 29, 1902.

phide copper ores are roasted, and then saturated with olution of ferrous sulphate, or ferrous sulphate and ride, and, after addition of a small proportion of iron hide or sulphur, are subjected to a second roasting. onate and oxide ores are treated in the same manner, pt that a single roasting suffices. The treated ore is hed and the copper precipitated in the usual way, the e liquors being used in saturating fresh portions of —E. S.

-Friction Metals. G. G. M. Hardingham, London. om H. Pearse and E. F. Jevers, both of Las Barrancas, mpana, Buenos Aires. Eng. Pat. 8590, April 12, 02.

U.S. Pat. 708,580, Sept. 9, 1902; this Journal, 1902, .—E. S.

Z and other Metals ; Extracting ——, from Ores and like. G. C. Marks, London. From The Waring hemical Co., Webb City, Mo., U.S.A. Eng. Pat. 28,925, c. 31, 1902.

U.S. Pat. 718,554, Jan. 13, 1903 ; this Journal, 1903, —E. S

United States Patents.

Ir and Steel; Cleansing and Improving the Quality of —. F. C. Weber, Chicago, Ill. U.S. Pat. 722,270, rch 10, 1903.

iron or steel to be improved, is melted, and a "ternary c" is added, in proportion chemically equivalent to the rities present. Or ternary and binary metal borides be added, with iron alloys, or with "the basic metals said borides or alloys," whereby the impurities are to be eliminated, and the metals of the borides ed with the iron or steel.—E. S.

lten Iron ; Treating ——. H. Buderus, Hirzenhain, Germany. U.S. Pat. 721,282, Feb. 24, 1903.

ten slag is run into the mixing chamber of a blast ce, fuel is added, the combustion of which maintains ag in a molten condition. Molten iron is next introd from the furnace, and also, with continued addition el, suitable purifying agents. The molten iron may be run into moulds to form castings, the facilitation s process being the object of the invention.—E. S.

Iron and Titanium ; Alloy of ——. A. J. Rossi, New York, Assignor to J. MacNaughton, Tahawus, N.Y. U.S. Pat. 721,467, Feb. 24, 1903.

The alloy contains not less than two, nor more than five per cent. of titanium, and some carbon, and is fusible at the fusing-points of iron and steel. Compare Eng. Pat. 3582, 1901 ; this Journal, 1901, 588. Also U.S. Pat. 700,244 and 713,802, 1902 ; this Journal, 1902, 863 and 1537.—E. S.

Steel. C. H. Halcomb, New York. U.S. Pat. 722,504, March 10, 1903.

Three descriptions of high-grade steel are claimed, all containing less than 1·20 per cent. of carbon, and from 6 to 15· per cent. of molybdenum. In addition to these constituents, the second description contains from 2·50 to 6 per cent. of chromium, and the third description the same, but with less than 2 per cent. of silicon.—E. S.

Gold ; Precipitating ——, from Cyanide Solutions. A. Prister, Gradisca, Austria-Hungary. U.S. Pat. 722,455, March 10, 1903.

To the acidified cyanide solution, a solution containing salts of mercury and copper is added, with a small proportion of the cyanide solution discharged from the ordinary zinc-precipitation boxes.—E. S.

Solder. W. D. Baldwin, Washington, Administrator to H. W. Neild, deceased, and F. Campbell, Kent, England. U.S. Pat. 722,273, March 10, 1903.

See Eng. Pat. 4713, 1901 ; this Journal, 1902, 976 ; and Fr. Pat. 321,677, 1902 ; this Journal, 1903, 215.—E. S.

Smelting [Sulphide Ores] ; Process of ——. E. Knudsen, Sulitjelma, Norway. U.S. Pat. 721,311, Feb. 24, 1903.

See Eng. Pat. 20,566, Oct. 14, 1901 ; this Journal, 1902, 123.—E. S.

Blast Furnace. R. Berg, Assignor to F. Wenig, both of Pittsburg, Pa. U.S. Pat. 721,417, Feb. 24, 1903.

A bosh shell, having interior horizontal ribs supporting fire-brick lining provided with channels, has openings into the furnace, which is encircled by a main pipe in its lower part, connected with a source of compressed and cooled air, and having valved branch pipes for supplying such air through the openings in the shell into the furnace.—E. S.

Blast Furnaces; Apparatus for Preventing Top Explosions in ——. R. Berg, Assignor to F. Wenig, both of Pittsburg, Pa U.S. Pat. 721,418, Feb. 24, 1903.

In order to cool the upper working parts of the furnace, the coke and ore chamber is provided with a "delivery bell" and with a pipe supplying to it compressed and cooled combustion gas derived from the smoke stack, the pipe, having, in its connection to the gas storage chamber, a pressure-reducing valve, so controlled as to simultaneously actuate the delivery bell and force out atmospheric air in the same, and prevent it from entering the furnace. The cooled gases are supplied to the chamber as the bell is periodically opened. See also the preceding abstract. —E. S.

Metals, Metalloids, and Alloys ; Producing and Refining ——. E. Straub, Nuremberg, Germany. U.S. Pat. 721,638, Feb. 24, 1903.

The raw metal, metalloid, or alloy, is heated in a tube or channel in a furnace, and the vapour is passed through a contiguous fused zone of a combination of the same metal &c. with oxygen, and is condensed in a recess or mould beyond, formed in a loose, non-fused mass of the same combination, whence the condensed substance is withdrawn in a molten state.—E. S.

Aluminium ; Alloys of ——, Producing. A. Manhardt, Vienna. U.S. Pat. 721,814, March 3, 1903.

See Eng. Pat. 19,403, Sept. 28, 1901 ; this Journal, 1901, 1219.—E. S.

Mattes [Copper]; Method of Converting ——. R. Baggaley, Pittsburg, Pa., U.S.A. U.S. Pat. 722,198, March 3, 1903.

An air-blast is supplied beneath the surface of a bath of molten copper, and near the close of the converting operation, a flame is caused to impinge upon its surface, and is so regulated as to maintain the temperature whilst driving floating impurities to a suitable place for removal.—E. S.

French Patents.

Cast-Iron, Semi-Steel, Iron, and Steel; Manufacture of ——. F. Bartos. Fr. Pat. 322,978, July 2, 1902.

Molten iron in a cupola furnace is subjected to a blast of compressed heated air, simultaneously with the introduction of silicon in crystals, which combines with the iron, and burns with development of much heat.—E. S.

Steel and Other Metals; Process for Refining or Annealing ——. W. F. L. Frith. Fr. Pat. 322,980, July 5, 1902.

See Eng. Pat. 23,939, 1901; this Journal, 1903, 34. Also Eng. Pat. 13,352, 1900; this Journal, 1901, 1218.
—G. H. R.

Oxidation during the Heating of Non-Precious Metals; Process for the Prevention of ——. M. Dunkelsbühler and H. Wachwitz. First addition, dated July 10, 1902, to Fr. Pat. 311,534, June 6, 1901.

The metals to be united are rubbed with aluminium whilst in the form of plates or blocks of a certain thickness, and are then covered over with a thin sheet of aluminium, after which they are rolled to the desired thickness. If aluminium itself be one of the metals to be joined together, it is only the other metal that undergoes the process described. (See also Eng. Pat. 20,657 of 1901; this Journal, 1902, 176.)—G. H. R.

Anti-friction Metal. The Francis Eyre Co., Ltd. Fr. Pat. 322,883, July 8, 1902.

See U.S. Pat. 708,580, Sept. 9, 1902; this Journal, 1902, 1234.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Sodium Hydroxide; Electrolysis of Fused ——. R. Lorenz. Zeits. f. Elektrochem., **9**, [8], 155—160.

Le Blanc and Brode in their paper on this subject (this Journal, 1902, 1235 and 1401) insist on the use of nickel electrodes; and maintain that the previous work of Sacher is vitiated through the use of iron electrodes. The author points out that Sacher investigated the conditions under which an iron anode becomes passive in fused caustic soda, and only worked under these conditions, the existence of which he tested before each set of measurements by galvanometric trials against an auxiliary electrode. Moreover, Sacher found the same results as with iron electrodes when he worked with electrodes of nickel, silver, and platinum. Sacher, working with a large and a small electrode, referred to the method of Nernst and Glaser. Le Blanc and Brode point out that Glaser's large electrode was kept constantly polarised, while Sacher's was not; but, as a matter of fact, when the large electrode was anode, it behaved as an "air-electrode," analogous to a Nernst-Glaser electrode (as Le Blanc and Brode themselves have shown), and the "kink-points" in the curve of potential so obtained, are rightly looked on as measuring the tension of cathodic discharge. When the large electrode is cathode, it begins as an "air-electrode," but ultimately becomes polarised with hydrogen, and the anodic discharge-point observed at the small anode is therefore measured against a hydrogen electrode. This turned out to be almost identical with that found by other methods for the reaction H′ + OH′, and the increase of potential was not carried further.
—J. T. D.

Platinum; Electrolytic Solution of ——, with Alternating Currents. R. Ruer. Zeits. f. Elektrochem., 1903, **9**, [12], 235—239.

Platinum electrodes are not dissolved in sulphuric acid by alternating currents of high frequency provided that the current intensity is the same in both directions and that air or oxidising agents are absent from the electrolyte.—J. S.

Chlorine and Carbon; Direct Combination of ——. W. v. Bolton. Zeits. f. Elektrochem., 1903, **9**, [10], 209—210.

It was shown by the author (this Journal, 1902, 483) that when an arc is maintained between carbon terminals in a large volume of chlorine, the chief product is hexachloroethane, C_2Cl_6. By allowing the arc to act for six hours on chlorine contained in a small (half-litre) vessel, 0·25 grm. of a substance was obtained, which on analysis was found to be hexachlorobenzene, C_6Cl_6.—J. S.

Permanganic Acid; Electro-chemistry of ——. J. K. H. Inglis. Zeits. f. Elektrochem., **9**, [11], 226—230.

Permanganic acid can be reduced to manganese peroxide and then to a manganous salt. According to Luther (this Journal, 1901, 1119), a definite oxidation-potential corresponds to each of these stages, and the potential corresponding to the complete reduction from permanganic acid to manganous salt is not necessarily the sum of these two. Bancroft obtained the value 1·76 volts from the potential which, he assumed, corresponded with this last reaction; and Tower, who investigated very completely the reduction of manganese dioxide to manganous salt, obtained th figure 1·63 for the corresponding potential. The autho has repeated Tower's determinations, and has also mad determinations of the oxidation-potentials corresponding t the reductions $MnO_4' \rightarrow MnO_2$ and $MnO_4' \rightarrow Mn''$. Fr o his results the author concludes that the reactions—

$$MnO_4' + 4H^{\cdot} = MnO_2 + 2H_2O + 3\oplus, \text{ and}$$
$$MnO_2 + 4H^{\cdot} = Mn^{\cdot\cdot} + 2H_2O + 2\oplus$$

go on till such concentrations of MnO_4', Mn'', and H', ar reached that the potentials due to all the three stage ($MnO_4' \rightarrow MnO_2$, $MnO_2 \rightarrow Mn''$, $MnO_4' \rightarrow Mn''$) are equa so that the same potential should be shown, whether platinum or a manganese dioxide electrode be immerse He has not actually obtained this state of things, but think that is because the required Mn'' concentration is so sma that the highly polarisable platinum electrode considerabl alters the position of equilibrium.—J. T. D.

Pyrochemical Reactions; New Method of carrying o ——. E. Rasch. Zeits. f. Elektrochem., **9**, [8], 16 —164.

The present means of attaining very high temperatur are the electric arc between carbon poles, as in Moissa electric furnace, and the discharge of currents of hi tension. The chief defect of the former lies in the strong reducing atmosphere of the furnace, which makes oth than reducing actions almost impracticable: and th applies also to high tension discharges, for the electrod are almost always of materials which at the hi temperature of the discharge exert strong reduci actions.

The author proposes in both these methods to u electrodes of oxidised substances such as magnes alumina, zirconia, thoria, &c., and to heat them artificia beforehand (as in the Nernst lamp) until their resistan is sufficiently reduced. Melted metallic oxides might used in this way, and themselves be submitted, at the hi temperatures attained, to the action of gases or oth reagents.—J. T. D.

Alkali Chloride Solutions; Theory of the Electrolysis ——. F. Foerster and E. Müller. VII., page 417.

Potassium Iodide; Electrolysis of Solutions of —— F. Foerster and K. Gyr. VII., page 418.

English Patents.

tteries; Galvanic ——. The Halsey Electric Generator Co., Ltd., Edinburgh. From the Halsey Electric Generator Co. of N.J., U.S.A. Eng. Pat. 28,806, Dec. 30, 1902.

E battery has a removable cover which carries gearing mpart a motion to a porous revolving electrode formed a receptacle for containing a depolarising liquid, and ch is placed with a fixed electrode in an exciting fluid. the movable electrode may be surrounded by a porous containing depolarising solution, and immersed in an citing fluid. (See also U.S. Pat. 719,659, 1903; this rnal, 1903, 304.)—G. H. R.

te; Storage Battery ——, *and Method of making the me.* P. A. Newton, London. From C. Coster, New ork. Eng. Pat. 334, Jan. 6, 1903.

U.S. Pats. 717,607, and 717,608, 1903; this Journal, 3, 148.—G. H. R.

ductors; Flexible Electric ——. Siemens Bros. and Co., ondon, and W. Dieselhorst, Old Charlton. Eng. Pat. 357, Feb. 20, 1902.

: conductor is made up of fine copper wire covered with incombustible material, such as asbestos, over which ound one or more layers of non-hygroscopic material as ribed in Eng. Pat. 8813 of 1894. The whole is covered nother layer of asbestos, and is suitably protected by ouring.—G. H. R.

Insulating Materials or Composition. F. Basenau, msterdam, Holland. Eng. Pat. 8071, April 7, 1902.

Fr. Pat. 320,198 of 1902; this Journal, 1903, 34. —R. L. J.

zone; Production of ——. J. F. Hoyne, Dublin. Eng. Pat. 2174, Jan. 27, 1902.

NE is produced by a brush discharge in a generator isting of a series of glass tubes through which the air or gen to be ozonised, is forced by means of a fan. The s are connected in series by short lengths of rubber- g, and water is circulated through them to cool them prevent cracking. They are each provided with a al conductor connected to a terminal on the outer g, and with a spiral conductor on the outside, wound a relatively small section, so that spaces are formed h do not make contact with the tubes, and an effective -discharge results. A receiver is arranged round the ive pole of the cell for the reception of the oxygen off, which is conducted to the fan casing, and is elled with the air through the glass tubes in which the en is subject to discharges, for its conversion into .—G. H. R.

isers. A. Vosmaer, Watergraafsmeer, and A. Lehret, trecht, Holland. Eng. Pat. 6642, March 18, 1902.

der to prevent the formation of an arc, and to assist roduction of silent discharges in ozonisers, a condenser ounted in shunt in the secondary circuit of a trans- r which is connected with the ozonising apparatus, ne or more choking coils are joined up to the terminals secondary circuit.—G. H. R.

hite or other Forms; Process and Apparatus for nverting Carbon into ——. A. B. F. Ludwig. Eng. 5482, March 5, 1902. VII., page 420.

ids [*Water*]; *Electrical Purification of* ——. C. Marks from C. McC. Chapman. Eng. Pat. 1335, . 19, 1903. XVIII. B., page 436.

United States Patent.

ry; Reversible Galvanic ——. T. A. Edison, wellyn Park, N.J. U.S. Pat. 721,682, March 3, 3.

eversible battery with an alkaline electrolyte the active ial of the depolarising electrode consists of nickel hydroxide, whilst that of the oxidisable element is composed of cobalt which is oxidised on discharge, mixed with metallic mercury and metallic copper to preserve electrical contact between its particles.—G. H. R.

French Patents.

Anode; Rotatory ——, *for Electrolytic Baths.* H. Welte and F. Riegger. Fr. Pat. 322,953, July 11, 1902.

The anodes consist of a plate fastened at its upper part to a shaft supported freely by a copper bar placed above the electrolytic tank. The shaft turns in a socket attached to the copper bar, being supported by a fixed cup wito ball bearings, and is moved by any motive power by means of toothed pinions and a shaft also supported by the copper bar, so that two adjacent anodes turn inversely to each other in the bath, preserving an uniform concentration throughout it, and freeing it from foreign bodies. A lead pipe, insulated to prevent any deposits on its surface, passes through the tank to heat the bath when a certain temperature is requisite to effect deposition. An electro-magnet placed below the tank attracts any foreign or magnetic bodies, and causes them to deposit on the perforated ribs and grooves which form the bottom of the vessel. One form of anode consists of a cylinder with projecting ribs, the edges of which are coated with a varnish to protect them from the action of the electrolyte, and to prevent them from wearing away.—G. H. R.

Hydroxylamine; Electrolytic Manufacture of ——, *with the simultaneous Production of Chlorine.* La Compagnie Parisienne de Couleurs d'Aniline. Fr. Pat. 322,943, June 18, 1902.

Nitric or nitrous acids, or their salts or other derivatives, are electrolysed in the presence of hydrochloric acid, with or without the addition of a metallic salt.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Copper and Nickel; Electrolytic Production of ——, *from Copper-Nickel Alloys* [*also Pigments*]. V. Kügelgen. Zeits. f. Elektrochem., 1903, **9**, [12], 239—243.

The author briefly describes Ulke's process for the electrolytic treatment of copper-nickel alloys (this Journal, 1902, 486, 779) and then gives a full account of the process worked out by Günther in Borchers' laboratory.

The alloy treated, contained 26·43 per cent. of copper, 50·18 per cent. of nickel, and 21·23 per cent. of iron, together with small amounts of sulphur and carbon. Two anodes of this alloy were suspended in an electrolyte containing 38·4 grms. of copper and 62·7 grms. of free sulphuric acid per litre. The copper was deposited on a sheet copper cathode placed between the anodes and about 5 cm. distant from them.

So long as the concentration of the copper in the electrolyte exceeded 1 per cent., the solution was simply agitated by means of a current of air led through it. Circulation of the electrolyte was, however, adopted, when the amount of copper present, fell below 1 per cent. At first an E.M.F. of 0·56 volt was required, soon rising to 1·16 volts. The current-efficiency was 95—97 per cent. of the theoretical, the current density being 175—200 amp. per square metre.

Electrolytic copper of best quality was obtained (99·97 per cent. of Cu and 0·05 per cent. of SiO_2). It is not advisable to continue the electrolysis much beyond the point at which the copper in the electrolyte has been reduced to 1 per cent. With care, however, and, if necessary with a lower current-density, a good non-spongy deposit of copper may be obtained with as little as 0·5 per cent. of copper in the electrolyte.

Since the amount of copper contained in the anodes is insufficient to supply the total amount of copper deposited, the difference must be made up by supplying a liquor rich in copper sulphate but which may also contain nickel and iron as impurities. Such a liquor is easily obtained in practice; it should not contain too much free acid.

The remainder of the copper must then be separated from the electrolyte by chemical means. Iron and finely-divided nickel may be employed for this purpose, but the author considers precipitation by hydrogen sulphide the cheapest and simplest method.

After the removal of the copper the liquor now contains the nickel and iron. In order to separate these, recourse may be had to Borchers' process which consists in the addition of ammonium sulphate and crystallising out the nickel ammonium sulphate. If the ratio of iron to nickel be 1 : 15, this may be accomplished easily and almost quantitatively, and even when the ratio rises to 1 : 2, over 90 per cent. of the nickel can be obtained. The presence of free sulphuric acid is necessary and the iron must be in the ferrous state.

Experiments were then made on the production of nickel by electrolysing solutions of nickel ammonium sulphate using insoluble lead anodes. At the ordinary temperature the nickel obtained was unsatisfactory. At 70° C., however, nickel of good quality was obtained, the electrolyte containing 0·3 per cent. of acetic acid. With a current-density of 200 ampères per square metre, the initial E.M.F. required was 3—5 volts, but this gradually rose until, after 8—10 hours' duration, an E.M.F. of 5—6 volts was necessary. The increase in the E.M.F. required, is ascribed to the formation on the lead anode of a badly conducting crust consisting of a mixture of lead peroxide and lead sulphate. The current efficiency was also low. In Günther's opinion the electrolysis of nickel ammonium sulphate solution is unsuitable for the technical production of nickel chiefly on account of its low solubility. Solutions containing only 1 per cent. of nickel are apt to crystallise out on a slight alteration of temperature.

It is therefore suggested that if nickel ammonium sulphate be produced in the process, it should be converted into nickel sulphate, care being taken to recover the ammonia. The nickel sulphate solution is then to be electrolysed, using soluble anodes together with a suitable electrolyte in the anode compartment.

In carrying out this process special attention must be paid to the following points : —

1. The conditions of experiment must be so chosen that a good deposit of nickel is obtained. For this purpose a high current-density must be employed and the electrolysis must be carried out at a high temperature.

2. The products occurring or formed at the anode must not interfere with the chemical process at the cathode.

3. The anode and the electrolyte in the anode compartment must for technical reasons be cheap, and the product formed must find a ready market at a price which at least covers its cost of production.

Details of experiments are given in which the soluble anodes employed, were lead, copper, and zinc. Various electrolytes were employed in the anode compartment comprising sodium chlorate, sodium sulphate, sodium chloride, sodium chromate, sodium bichromate, caustic soda, &c. The principle underlying the process in which a soluble anode is used is that one salt is employed for the purpose of dissolving the anode while another salt acts as a precipitating agent. For example, when a lead anode is used in conjunction with an electrolyte (in the anode compartment) consisting of sodium chlorate as dissolving salt and sodium sulphate as precipitating salt, the whole electrochemical process is represented by the equation—

$$\mathrm{Pb} + 2\mathrm{NaClO_3} + \mathrm{Na_2SO_4} + \mathrm{NiSO_4} = \mathrm{PbSO_4} + \mathrm{Ni} + 2\mathrm{NaClO_3} + \mathrm{Na_2SO_4}.$$

It will thus be seen that the dissolving and precipitating agents are always regenerated, provided that the sodium sulphate is produced or regenerated in the anode compartment. This, however, is apparently not the case. Sodium sulphate tends to accumulate in the cathode compartment and only 50 per cent. is regenerated in the anode part of the cell. Nickel of good quality was obtained, with a 90 per cent. current efficiency, but the lead sulphate was not always pure white. When sodium chromate was used as the precipitating agent, a good nickel deposit was formed with the same current-efficiency, the current density being 175—300 ampères per sq. metre, and the E.M.F. 2·5—4·2 volts. The pigment obtained however, was not satisfactory, and was usually contaminated with lead sulphate.

Other experiments which are given in detail gave similar results. In all cases nickel of good quality was obtained, the current efficiency being satisfactory and the E.M.F. required being moderate. The bye-products or pigments comprising lead sulphate, lead chromate, white lead, Malachite Green, zinc white, lithopone, &c. in all cases were unsatisfactory from one reason or another, but this Günther believes to be due to errors in the conditions of experiment

In a further set of experiments the pigments were precipitated in a separate vessel outside of the anode compartment whereby some of the difficulties were overcome.

Altogether about 1,000 grms. of nickel were deposited on two cathode plates, the thickness of the deposit being 10 mm. in general and 15 mm. at the edges. An analysis of the deposit showed it to contain 99·90 per cent. of Ni, together with traces of iron, copper, and an insoluble residue. — J. S.

English Patents.

Iron, Steel, Nickel, and the like; Manufacture of ——. R. W. Wallace, London. Eng. Pat. 7352, March 26. 1902.

The electric furnace has an open hearth with an inclined bed, the lower part of which is provided with a lining of carbon blocks, or of magnetite, with or without a sma amount of carbon, forming the cathode over which the reduced metal accumulates. Anodes composed of blocks of part of the ore to be reduced, combined with sufficient carbon to give conductivity, are fed into the furnace, good contact between adjacent blocks being secured by hydraul c or other means, and the remaining ore to be reduced being fed in the usual manner into the furnace around the anodes One or more additional electrodes may be employed abov the pool of molten metal to strike an arc so as to maintain i in a fluid condition.—G. H. R.

Iron; Electrolytically Coating —— with Zinc. E. Goldberg, Moscow. Eng. Pat. 7923, April 4, 1903.

For this purpose a compound containing nitrogen attache directly or indirectly to an organic radical is added to th electrolyte.—G. H. R.

United States Patents.

Furnace; Electric ——. P. L. T. Héroult, La Prai Assignor to Soc. Electro-Metallurgique Française, Froge France. U.S. Pat. 721,703, March 3, 1903.

A crucible adapted to carry a bath of molten metal has tw electrodes supported above it and connected in series. voltmeter is in shunt between one of the electrodes and conductor, consisting of a rod passing through the refractor material of the crucible and projecting outside and in-i of it, so that the portion of the rod which is melted replaced by molten material, which fills up the space, a thus ensures good conductivity.—G. H. R.

Furnace; Electric ——. A. A. Shade, Assignor to E. Moore, Chicago, Ill. U.S. Pat. 722,411, March 1903.

The furnace has a passage sloping from the upper to t lower end of it, and provided in its bottom wall with trough like depression, through which the material to acted on passes by gravity. A number of horizontal el trodes, consisting of detachably-jointed sections, ext into the passage with their inner ends located above t bottom of the trough so as to form a number of arcs in t passage, and each pair of electrodes is provided w a magnet for deflecting and elongating the arcs into t depression towards the material as it passes successiv between the pairs of electrodes. A spout connected wi the lower end of the passage projects outside the furn for the withdrawal of the molten material from it. Rotat shafts, mounted in bearings supported on the furnace wa are provided with screw-threaded sections, which m with the spiral elevations and grooves on one side of ea electrode, and feed the latter into the passage as they consumed. Brackets on the outer walls of the furn support the electrodes, the rotation of which is prevented nterlocking connections arranged longitudinally between hem and the brackets. A spiral conveyer feeds the naterial to the upper end of the passage, and means are rovided for heating the material while passing through he conveyer, and pipes deliver a burning mixture into a assage for a further heating before it reaches the elecrodes. The conveyer is surrounded by a chamber, between he walls of which and the conveyer-shell a number of adial partitions extend, dividing it into several compartments, some of which communicate with each other through penings in certain of the partitions, and one of them as an exhaust passage for discharging the gas from the hamber.—G. H. R.

ron ; Process of Reducing ——, from its Ore. M. Ruthenburg, Philadelphia, Pa. U.S. Pats. 722,253 and 722,254, March 10, 1903.

The comminuted ore is delivered continuously, by mechanical means, from a shelf located in the upper part of a urnace, into the lower and more highly heated part thereof, ntil it reaches the base, where the particles form a path or an electric current, and the metal, reduced from its oxide without fusion) in the upper zones, is thereby fused, when t may be tapped. (See Eng Pat. 13,867, July 8, 1901 ; his Journal, 1901, 1218. Compare also U.S. Pat. 720,490, 903 ; this Journal, 1903, 369.)—E. S.

ilver Plating or Gilding Process. J. Schiele, Brussels. U.S. Pat. 722,148, March 3, 1903. (See Eng. Pat. 9438, 1902 ; this Journal, 1902, 917.)—G. H. R.

XII.—FATS, OILS, AND SOAP.

Fatty Acids ; Action on ——, of Metals at High Temperatures. A. Hébert. Comptes rend., **136**, [11], 682—684.

The author has extended his experiments (see this Journal, 1901, 513), and finds that oxidisable metals in general (sodium, magnesium, aluminium, iron, tin) give similar results to zinc when heated with fatty acids of high molecular weight, while less oxidisable metals (copper, silver, &c.) appear to be without action. Unsaturated acids (oleïn) gave similar products to those obtained from saturated acids. It is probable that (as observed by Jahn in the case of fatty acids of lower molecular weight) ketones are formed as intermediate products ; for though the author was unable to isolate stearone, when treating stearin with zinc *in vacuo* at as low a temperature as possible for reaction, yet stearone itself when heated with zinc yielded the same products (hydrogen, carbon dioxide, and olefines higher and lower in the series than C_{18}) as did stearin.—J. T. D.

Glycerides of Fatty Acids (Simple and Mixed) ; Synthetical Preparation of ——. F. Guth. Zeits. für Biol., **44**, 78. Biochem. Centralbl., 1903, **1**, [5], 181—182.

Prior to the author's work only simple glycerides of fatty acids have been synthetically prepared, but he has now prepared both the simple and mixed glycerides of butyric, iso-butyric, oleic, palmitic, and stearic acids by the use of new methods. The mono- and di-glycerides of these higher fatty acids were obtained by treating the respective sodium salts with mono-chlorhydrin, α-dichlorhydrin and β-dibromhydrin, whilst the triglycerides were prepared by heating the diglycerides under greatly reduced pressure with the corresponding fatty acids, and also by treatment of the sodium salts with tribromhydrin. The compounds obtained by either method agreed in their physical and chemical properties.

Mixed glycerides containing stearic and palmitic acids and also glycerides containing certain higher fatty acids and benzoic acid were prepared in an analogous manner.

In almost every instance the melting points of the glycerides were higher than those of the fatty acids employed, a result that is contrary to the experience of Berthelot. The phenomenon of double melting point (this Journal, 1899, 377, 590, 693) was never shown by the synthetical crystalline triglycerides. The author has noticed that when two melting points are observed, heat is liberated at the moment of the first melting, and hence attributes the so-called double melting point to an over-cooling of the substance, which has solidified after melting without again becoming crystalline. (See this Journal, 1901, 1003, 1121.)—C. A. M.

Oleaginous Seeds ; Presence of Saccharose in ——, and its Rôle in the Formation of the Oil. C. Vallée. J. Pharm. Chim., 1903, **17**, [6], 272—277.

By the use of Bourquelot's method (this Journal, 1902, 1244) the author has succeeded in identifying saccharose in all the oleaginous seeds that he has examined.

The following results were obtained :—

——	Saccharose.	Reducing Sugars.
	Per Cent.	Per Cent.
Sweet almonds	2·97	0·09
Bitter almonds	2·94	0·12
Castor	1·06	0·12
Pumpkin	1·37	0·12
Pistachios	3·26	0·20
Sesamé	0·64	0·14
Indian berries	0·61	1·05

(See also this Journal, 1903, 149.)—C. A. M.

Olive Oil ; New Process of Extracting ——. A. Funaro. Staz. Sper. Agrar. Ital., 1902, [11—12], 916—921.

In 1899 A. Kuess devised a process (Fr. Pat. 291,559) of extracting the whole of the oil from olives in one operation. The olive pulp was treated with an equal weight of alkali carbonate solution (3° B.) at a temperature of 60° C., an emulsion being thus produced, from which the cellulose and gums were precipitated by the addition of a strong aqueous solution of alum. The separation was accelerated by the passage of an electric current, and a residue containing only a small proportion of oil was left at the bottom of the vessel.

The author has tried this method on a large scale at Monastier, in Tunis, but states that he has been unable to obtain satisfactory results by following the directions of the patent. By adopting, however, certain modifications in the temperature, strength of ley, and in the machinery, he has been able to render the new process practicable, and has taken out patents in Italy and Tunis (1902) for the modified method.

The olives are first crushed to a fine homogeneous pulp, the virgin oil that exudes being collected. Towards the end of the grinding, the pulp is moistened with a very dilute solution of sodium carbonate, and is then transferred to large vessels containing the dilute alkali lye, the temperature of which is not allowed to exceed 40° C., so as to prevent saponification. The mass is agitated by the introduction of air under pressure (Fr. Pat. 507, of 1902). After 6 hours of aëration the contents of the vessels are allowed to stand, and the oil and pulp rise to the surface in the form of an emulsion. This is treated with a very dilute solution of alum, whilst compressed air is introduced and an electric current passed through the liquid. After an agitation of some hours the liquid is allowed to stand for half a day, when the extractives and colouring matter will be found to have been carried down by the precipitated alum. The superficial layer of oil is then washed with water and filtered. The deposit in the vessels contains at most 4 to 5 per cent. of oil calculated on the dry pulp, and this can be readily recovered for soap manufacture by treatment with a hot soda ley.

The olive oil obtained by this process is of a uniform quality. It has a very slight odour and colour, and unlike the ordinary southern oils, does not solidify when chilled. It is quite free from acidity, and remains perfectly neutral on keeping. It is, however, wanting in flavour, and in particular lacks that more or less sharp taste that characterises olive oils extracted by the usual process. Notwithstanding this it has already been commercially successful in the North of France.

In illustration of the yields by this process in comparison with the ordinary method, the author gives the following typical example:—The olives used had the following composition:—Oil, 26·85; water, 39·75; and cellulose, pulp, &c., 33·40 per cent. The oil separated by the new process was 25·15 per cent., whilst the sediment contained an additional 1 per cent. Treated by the ordinary method of expression the same olives yielded the following results:—Oil of the first and second expressions 19·25 per cent.; *huiles d enfer*, 1·0 per cent.; and marc oil, 3·40 per cent.; total = 23·65 per cent.

Control experiments made by Bertainchand gave the following results:—Edible oil, 22·6, and marc oil, 1·2 per cent. by the ordinary method; as against 25·9 per cent. of oil by the new method

In addition to this advantage of about 8 per cent. of increased yield in favour of the new method, it has the further advantages of the suppression of hydraulic presses and the reduction of manual labour. In the factory at Monastier, 5,000 kilos. of olives can be treated daily by five workmen and one engineer.

The method can also be applied to the extraction of other edible oils.—C. A. M.

English Patent.

Esters of Fatty Acids; Process for the Decomposition of ——. W. Connstein, Charlottenburg, Germany. Eng. Pat. 22,111, Oct. 10, 1902.

The esters are subjected with or without previous emulsification, to the action of the fat-decomposing enzymes of plants in the presence of an acid or an acid salt. (See this Journal, 1902, 1541.)—C. A. M.

French Patents.

Oil; Method and Apparatus for Recovering —— [*from Condensed Steam*]. C. Kremer and R. Schilling. Addition, dated June 13, 1902, to Fr. Pat. 312,786, July 17 1901.

The separation of the oil is effected by the introduction of bubbles of gas or air into the tube receiving the condensation water, whilst the top of this tube, which is surrounded by a tank receiving the separated oil and water, has a horizontal ledge to prevent oil from being carried down to the bottom of the tank with the water. (See also Eng. Pat. 14,603 of 1901; this Journal, 1902, 917.)—C. A. M.

Soaps containing Petroleum; Manufacture of ——. Société Daum and Co. Addition, dated July 30, 1902, to Fr. Pat. 320,825, April 22, 1902.

The use of paraffin wax melted into an intimate mixture with a suitable proportion of soluble glass is claimed. (This Journal, 1903, 150.)—C. A. M.

XIII.—PIGMENTS, PAINTS, RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Copper and Nickel; Electrolytic Production of ——, *from Copper-Nickel Alloys* [*Electrolytic Production of Pigments*]. v Kügelgen. XI. B., page 425.

English Patent.

Paints; Antifouling ——, *for Coating Vessels and other Objects*. A. J. Boult, London. From the Denney Galvanic Paint Co., Cape Charles, Virginia, U.S.A Eng. Pat. 27,639, Dec. 15, 1902.

In this paint, which is stated to have no injurious effect upon metallic surfaces, the proportion of mercury is comparatively small owing to the absence of substances that would neutralise its action. (See U.S. Pat. 715,763 of 1902; this Journal, 1903, 102.)—C. A. M.

French Patent.

Oil ("Milleflorine") for General Use in Painting Manufacture of ——. E. Bourreau. Fr. Pat. 322,989 July 11, 1902.

An oil intended to replace linseed or poppy oil as a medium for paint, and consisting of a mixture of rectified minera oil, colophony, colza oil, and cotton-seed oil. It is state to mix perfectly with zinc white, and to give solid effects u outdoor work.—C. A. M.

(B.)—RESINS, VARNISHES.

Resins; Iodine, Saponification, and Acid Values o certain ——. A. Rudling. Chem. Rev. Fett- u. Har Ind., 1903, 10, [2], 51—53.

In the subjoined table of results obtained with differen resins employed in the spirit varnish manufacture, the iodin value was determined by dissolving 0·5 to 1·0 grm. i 25 c.c. of alcohol with 10 c.c. of chloroform, and titratin after six hours. The saponification value was determined by boiling 1 grm. of the resin for 15 minutes with 25 c.c. of N/2 potassium hydroxide solution under a reflux condenser, then diluting the liquid with 100 c.c. of alcohol, and titrating with standard acid; and the acid value by boiling 1 grm. resin for five minutes under a reflux condenser with 100 c of 96 per cent. alcohol, and titrating the liquid wh cold.—C. A. M.

Resin.	Water.	Substance in solution in Alcohol.	Iodine Value.				Saponification Value.				Acid Value.			
			1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.
	Per Cent.	Per Cent.												
Stick-lac	3·79	14·40	16·0	16·6	19·5	8·0	212·8	221·2	260·1	226·8	39·2	40·7	47·9	5
Seed-lac	2·63	10·69	7·5	8·7	8·6	3·6	218·4	224·2	251·9	224·0	53·0	54·5	61·1	56
Shellac (button-lac)	2·00	3·10	22·2	22·6	23·3	19·0	204·4	208·5	215·3	212·8	58·8	60·0	61·9	64
Yellow acaroid (xanthorrhea) resin.	5·65	0·93	176·2	186·6	188·6	160·0	98·0	103·8	104·9	106·0	82·3	87·1	88·1	61
Yellow acaroid resin (Adelaide).	4·50	3·52	176·2	184·5	191·5	160·0	100·8	105·5	109·5	106·0	67·2	70·3	73·0	67
Yellow acaroid resin (Victoria).	4·40	0·88	175·0	183·0	184·7	160·0	156·8	161·0	165·5	176·4	72·8	76·1	76·8	84
Red acaroid resin	1·90	5·26	164·5	172·9	183·1	156·7	64·4	67·7	71·7	106·0	18·5	19·4	20·0	25
Sandarac	2·00	0·54	91·8	93·6	94·2	98·7	152·4	165·7	166·7	170·8	137·2	140·0	140·8	137
Manila (spirit soluble)	2·14	2·30	106·0	108·2	110·8	94·0	187·6	191·6	196·2	187·6	136·6	139·5	142·8	150
Manila (hard)	1·68	3·39	86·0	87·4	90·6	..	215·6	219·3	227·1	..	138·9	141·3	146·3	..
White French resin	0·80	0·10	137·4	138·2	138·3	..	177·8	179·2	179·4	..	169·7	171·0	171·2	..
American resin	0·75	0·20	122·0	122·9	123·2	..	182·0	183·4	183·8	..	157·9	159·1	159·4	
Venetian turpentine (genuine).	..	..	148·5	..	..	..	121·8	..	..	..	73·9	..	..	
Venetian turpentine (spurious).	..	..	109·6	..	..	..	117·6	..	..	..	103·0	..	..	.
Elemi	0·2	0·1	83·6	83·7	83·8	..	28·0	28·0	28·0	..	22·4	22·4	22·4	

1.—Crude resin. 2.—Anhydrous sample. 3.—Anhydrous sample free from mechanical impurities. 4.—Resin separated from alco solution by means of steam, and dried at 100° C.

United States Patent.

Cleaning Smooth [Varnished] Surfaces; Composition for ——. M. Peryer, Christchurch, New Zealand. U.S. Pat. 722,454, March 10, 1903.

The composition consists of fire-clay, whiting, common salt, borax and potassium carbonate, to which sugar may be added.—E. S.

(C.)—INDIA-RUBBER, &c.

Caoutchouc; Cold Vulcanisation of ——. F. Boegel, Altötting, Upper Bavaria. Ger. Pat. 139,829, June 19, 1901. Chem.-Zeit., 1903, **27**, [22], 254.

Sulphur chloride is diluted with a light, but not volatile mineral oil, of sp. gr. 0·835—0·85, such as vaselin oil, spindle oil, or Thuringian paraffin oil, that is, with mineral oils ranging between the illuminating oils and the heavy lubricating oils. The articles to be vulcanised are dipped or laid in the diluted sulphur chloride, from one to five parts of sulphur chloride being employed to 100 parts of mineral oil.—J. F. B.

English Patent.

Caoutchouc, Vulcanised Gums, and Raw Gutta-Percha; Process for Regenerating or Treating ——. P. H. J. Chautard and H. Kessler, both of Paris. Eng. Pat. 8084, April 7, 1902.

The material (100 kilos.) is broken up and heated with commercial phenol (500 kilos.) or other solvent, at about 100° C., under reduced pressure (40—50 mm. of mercury) in a boiler fitted with a reflux condenser and a mechanical stirrer. When solution is complete, the solvent is distilled off, and sulphur is precipitated by means of solid lead acetate and allowed to settle out. The supernatant fluid is then drawn off and the phenol finally removed by alcohol or soda lye, or both. (See also this Journal, 1902, 357.)
—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

United States Patents.

Hides or Skins; Treatment of ——. S. K. Felton, jun., Philadelphia, U.S.A. U.S. Pat. 721,553, Feb. 24, 1903.

Hides and skins after being unhaired, either by the usual treatment or by painting the flesh side with a compost of lime and arsenic, are placed in a bath of sodium sulphide and then in a solution of sodium thiosulphate. A further treatment with lime and arsenic to remove sulphur completes the process.—R. L. J.

Glue; Process for Making ——. R. Arens, Marxloh, Germany. U.S. Pat. 721,852, March 3, 1903.

Bone is treated for some time with a solution of sulphur dioxide and afterwards with a concentrated solution of the same agent under pressure (1½—2 atmospheres) at an elevated temperature, until the lime salts are dissolved. The residue is then boiled for glue.—R. L. J.

XV.—MANURES, Etc.

Phosphoric Acid in Manures; Determination of the Available ——. W. F. Sutherst. XXIII., page 412.

United States Patent.

Citrate-Soluble Phosphates; Process of Making ——. W. Wolters, Magdeburg-Buckau, Germany. U.S. Pat. 721,489, Feb. 24, 1903.

A mixture of about 100 parts of phosphorite, 80 parts of chalk, and 84 parts of an alkaline-earth silicate, is heated until it becomes a "thin fluid molten glass," which, on cooling, is stated to be perfectly soluble in citrate solutions.
—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Gum Acacia; Physical Changes in ——. A. Goetze. Pharm.-Zeit., **18**, 119. Pharm. J., 1903, **70**, [1708], 417.

When gum arabic is first collected, the pieces are transparent and glassy, but on exposure to the sun (or to artificial heat), they dry and crack, the cracked pieces being nearly snow white in colour and very friable. Senegal gum is exposed to a less intense heat and the gum itself is less brittle; consequently, fewer cracked pieces and broken fragments are produced. Cape and Kordofan gums are easily disintegrated; Indian, Persian, Australian, and South American gums, on the other hand, dry less and are tougher.—A. S.

English Patent.

Starch; Process and Apparatus for Manufacturing ——. A. P. Murdoch, Oswego, N.Y., and The Improved Process Manufacturing Co., New York. Eng. Pat. 319, Jan. 6, 1903.

See U.S. Pats. 717,699, and 717,700, Jan. 6, 1903; this Journal, 1903, 153.—T. H. P.

United States Patents.

Sugar and Solutions thereof; Process of Purifying ——. C. A. Spreckels and C. A. Kern, New York. U.S. Pat. 722,157, March 3, 1903.

Claims are made for the various steps in the method of cleansing sugar from its impurities, which consists in mixing with the impure sugar a cleansing agent, which may or may not be mixed with a hydrocarbon oil, and containing either a sulphonated essential oil or other sulphonated compound including such oil, and then separating the cleansing agent and the impurities carried by it. (See also U.S. Pat. 698,150, April 22, 1902; this Journal, 1902, 715, and U.S. Pats. 699,933 and 700,099, May 13, 1902; this Journal, 1902, 784.)—T. H. P.

Sugar and Solutions thereof; Process of Purifying ——. C. A. Spreckels and C. A. Kern, New York. U.S. Pat. 722,158, March 3, 1903.

Claims are made for the different steps in the method of cleansing sugar from its impurities, which consists in treating the impure sugar with a compound containing hydrocarbon oil intimately mixed with a sulpho-oleaginous or other sulphonated body, and then separating the cleansing agent and impurities carried by it, from the sugar (see preceding abstract).—T. H. P.

Lump-Starch; Process of Making ——. J. M. Lyman, Chicago. U.S. Pat. 721,314, Feb. 24, 1903.

Eighty per cent. of pulverised starch and 20 per cent. of water are mixed together in a centrifugal machine, and the mixture is forced through a fine meshing for the purpose of making the starch fine and soft, and thoroughly mixing the same. The moistened starch is then heated to a temperature of 200° F., and afterwards introduced into cylinders in which the same high temperature is maintained and which are subjected to heavy pressure. The material is allowed to remain in the cylinders until adhesion takes place; it is then reduced to lumps, and finally maintained at a temperature of 90° F. for a period of 48 hours.
—T. H. P.

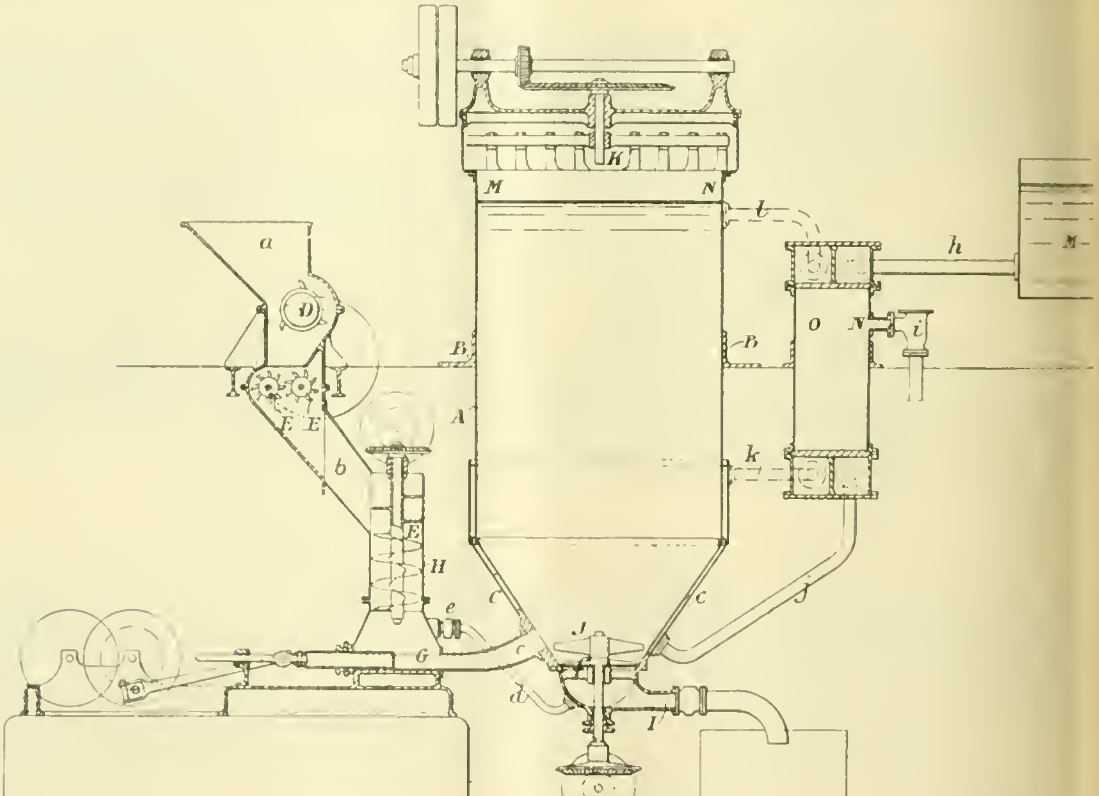
Sugar in Crystals; Process for Obtaining ——, *from Syrups, and Apparatus therefor.* H. Claassen, Germany. Addition, dated July 30, 1902, to Fr. Pat. 289,673, June 7, 1899. (See Eng. Pat. 5518, March, 23, 1900; this Journal, 1901, 489.)

This addition relates to a modification of the controlling apparatus described in the original specification made with the object of fixing the temperatures necessary during the boiling; to this end the apparatus is provided with a scale of degrees of vacuum, and with a table of boiling points which are so arranged relatively to one another that an

index placed against the degree of vacuum shows at once the boiling point necessary for each phase of the boiling.
—T. H. P.

Sugar in Dried Beetroot; Process for the Direct Refining of the Natural ——. J. Lafeuille. Addition, dated June 30, 1902, to Fr. Pat. 308,236, Feb. 18, 1901. (See this Journal, 1902, 416.)

The present addition relates to a special form of apparatus for the continuous extraction of the sugar from the dried beet slices in the form of syrup. The figure represents a longitudinal section of the diffuser, which consists of a vat A, furnished about half-way down with supports B, resting on the floor. About one-third of the vat is surrounded by a hot-water jacket C. The slices are introduced into the hopper *a* of a mill for breaking them up, from which they pass into a pipe *b*, leading to a screw F; the latter pushes the slices into the barrel of a pump G, which forces them through the tube *c* into the lower part of the vat A. By means of the tube *d* a certain amount of juice is kept in the barrel H and the pump G. The lower part of A is closed by a perforated plate *f*, which allows the syrup to flow out through the pipe I into a tank. A rotating axle with four vanes J keeps the opening of the pipe I open, and spreads the slices out and causes them to rise in the vat. When they reach the surface MN of the liquid in the diffuser, the exhausted slices form a layer, and are removed by a rotating rake K into a shoot not shown in the figure. The water used in the diffusion passes from the cistern M through the pipe *h* into a heater, which receives steam by means of the pipe *i*. Hot water from the heater proceeds to the diffuser along the pipe *l*, and to the hot-water jacket round the lower part of the vat by means of *j*; *k* is the return pipe for the cold water from the jacket. Claim is also made for another arrangement of the bottom part of the vat, a sketch of which also accompanies the specification.—T. H. P.



Sugar Juices; Defecation of ——. L. L. J. A. Wackernie. Fr. Pat. 323,046, July 18, 1902.

In this process for defecating sugar juices, the latter are heated with zinc sulphate, or a similar salt, and lime to just below the temperature (about 80° C.) at which sugar is inverted; baryta is then added to precipitate the sulphates, and the juice afterwards heated to 100° C. The filtered liquid is next treated with lime and saturated with carbon dioxide.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Torula Species with Racial Variations as regards its Fermentative Action on Maltose. (*Torula colliculosa, n. sp.*) M. Hartmann. Woch. f. Brau., 1903, **20**, [11], 113—114.

The species referred to, was isolated from a chalky-looking preparation of dried yeast, consisting mainly of rice starch, and containing the spores and gemmæ of *Mucor amylomyces*, together with a large proportion of cells of this torula yeast. The cells are spherical, with a vacuole and a few fat globules. The diameter of young cells may be as low as 1·7 μ, but the usual diameter is 3·5 μ; giant cells are produced in old cultures as large as 9·7μ. Two or three daughter cells may appear simultaneously on the same mother cell; cell chains occur with three or four members, the end cells always being smallest. The appearance of old colonies on solid media is very characteristic. Fig. 1 shows a giant colony on unhopped wort-gelatin with mole-hill excrescences. Fig. 2 shows a streak culture on wort-agar 11 months old, showing similar excrescences about the size of a pin's head appearing on the otherwise smooth shiny surface. These excrescences indicate the presence of a variety of much larger cells than the normal. Such giant cells are not due to infection, but constitute a acial variation or alternation of generations, the points appearing generally after about 12 days. Cultures five or six months old lose the property of forming these points, but regain it after a few cultivations in unhopped wort. The large cells of the excrescences again produce normal offspring in an adhesion culture. The most favourable temperature for the growth of this torula is from 25° to 30° C.; the limits of growth are 7° and 45° C. Both the large and the small varieties of cells behave towards most carbohydrates after the manner of top-fermentation yeast, with one important exception, *viz.*, towards maltose. The normal small cells of a young culture, which constitute the smooth portion of a culture on solid media, have no fermentative action on maltose; the large cells, constituting the xcrescences, do, however, effect a notable fermentation in wort and solutions of maltose. Both varieties may be taken rom the same culture. The fermentative power towards maltose may be increased fourfold by successive sub-cultivaions eight times in unhopped wort; 4·5 per cent. of alcohol an then be obtained. J. F. B.

Fig. 1.

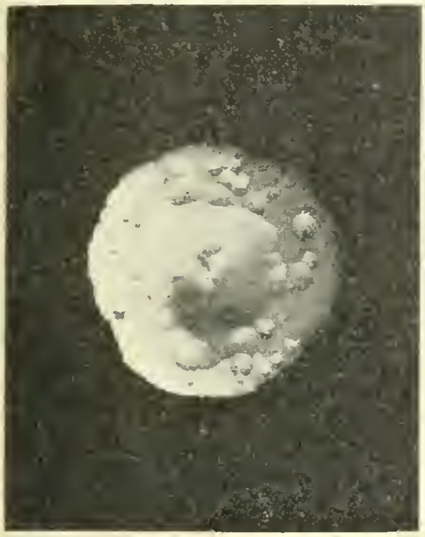
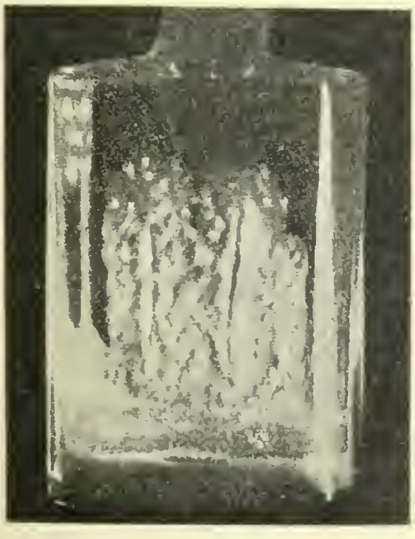


Fig. 2.



Distillery Yeasts, Races II. and XII.; Morphology of ——. W. Henneberg. Zeits. Spiritusind., 1903, **26**, [9], 91.

These two races of top-fermentation yeast are cultivated on the large scale by the Berlin Institute of Fermentation Industries. Race II. (No. 128 of the Berlin collection) was isolated in 1889 by Lindner; race XII. was obtained in 1902 by Matthes. The present comparative study of their morphological characters is illustrated by a series of photographic reproductions showing the appearance, both macroscopic and microscopic, of the two races under various conditions of growth. The giant colonies on unhopped wort-gelatin show in race II. shallow concentric and radial furrows; the surface is otherwise smooth, and the outline of the edges is fairly uniform. In race XII. the surface of the colonies is very rough, with deep irregular radial furrows and a very delicate ring-marking; the edges are serrated, owing to the projection of the radial ridges. Small colonies grown from a single cell show, in the case of race XII. when eight days old, a central depression. As the colony grows this depression deepens, and is subsequently covered over by the inward growth of the yeast on its edges. The centres of the colonies of race II. are only very slightly depressed. Streak cultures show similar differences as regards the surfaces and edges of the colonies. In these cultures race II. has generally liquefied the gelatin in 24 days, whereas race XII. never liquefies it in so short a time. Race XII. grows more rapidly than race II., and its colonies of the same age are larger. In a hanging drop, race II. showed a maximum of 37 descendants from a single cell in 24 hours; race XII. gave a maximum of 55. The budding branches of race II. are less defined and more loosely connected than those of race XII. This is especially noticeable in the lactic-acid wort of practice (Lufthefe process); race XII. shows a very marked tendency to form budding aggregates, whilst race II. shows almost none.

Race XII. at 28° C. forms a film on liquids in six days, whilst race II. only shows a distinct film after 13 days. The film of race XII. breaks up, on agitation, into visible fragments which sink to the bottom in masses, the film cells hanging together; the film of race II. breaks up in the form of a turbidity.

The froth of race II. is higher and contains smaller bubbles and more yeast than that of race XII.; the fermenting wort with the latter is less turbid than with race II., owing to the difference in the tendency to aggregation. The sediment of race II. is less in quantity and coherence than that of race XII. Race II., as a rule, possesses longish egg-shaped cells, whilst those of race XII. are rounder, and the vacuoles of the latter are less distinct. No certain distinction can be made by measurements of the cells; the spore formation also shows no characteristic differences. As regards glycogen formation, race II. generally shows more than race XII.—J. F. B.

Yeast; Some Notes on ——. R. E. Evans. J. Fed. Inst. Brewing, 1903, **9**, [1], 35—50.

After some general remarks on the temporary and permanent variations of yeast, the author deals with the influence of the nitrogenous nutrition. When yeast was grown in Pasteur's solution containing nitrogen only in the form of ammonium tartrate, it was found that the non-ammoniacal nitrogen in the liquid after fermentation amounted to 0·017 per cent. The influence on the yeast of the composition of the wort is shown by the fact that, if yeast be imported from another district, it produces from the local wort a beer having the flavour of its origin, but after a few brewings the distinctive flavour disappears, and the local wort re-asserts its character. The actual substances which impart the flavour of beer may be so small in amount as to be beyond recognition. In this connection it was found that additions to beer of 0·0002 per cent. of oil of aniseed, 0·0002 per cent. of creosote, 0·0005 per cent. of iron, and 0·002 per cent. of quinine were quite sufficient to spoil the flavour. The system of fermenting under pressure, as carried out at Burton, probably has an important influence in determining the flavour of the beer.

Examination of Yeast and Beer Deposits.—The vigour of the yeast may be tested by shaking it with dilute iodine solution Old debilitated cells become stained a deep brown; vigorous healthy cells take a much lighter colour, and budding cells are not stained at all; very old cells in beer deposits are stained blue. A method of testing the purity of the yeast consists in incubating it in a solution of lactose, which favours the growth of bacteria and sarcina, but is not available for the growth of the yeast.

The Nitrogenous Constituents of Malt and Worts.—The nitrogenous constituents of worts may be divided into two classes; those available for yeast nutrition, and those not available.

These are tested by nitrogen determinations before and after fermentation. Generally the best malts are those which show the greatest removal of nitrogenous matter during fermentation; satisfactory beers contain less nitrogen than unstable beers. The yeast food in a wort is strictly limited. If maltose and yeast be added to a fermented wort from which the alcohol has been removed, a second alcoholic fermentation does not occur, but lactic fermentation sets in.

Purification of Yeast.—Infected yeast may be purified by washing either with water or, preferably, with a dilute solution of salicylic acid or calcium bisulphite, which do not injure the yeast. The system of "natural" pure cultivation gives good results; the "single cell" system presents the drawback that characteristic fermentations are often dependent on suitable mixtures of several races. Artificial yeast foods frequently give good results in the revivification of yeast.—J. F. B.

Yeast; Cultivation of ——, in Mineral Solutions.
J. Henry. Ann. de la Brass., **6**, [2], 27—28.

Yeast was successfully cultivated in Wildiers' mineral solution with 5 per cent. of pure saccharose, as far as the third dilution, three drops from the previous culture (starting with beer wort) being taken for inoculation in 500 c.c. of medium at each dilution. In this manner any "bios" originally present would be in a greatly attenuated state in the third dilution; nevertheless the yeasts exhibited great vigour of growth and reproduction. The assertion of Wildiers, that reproduction is delayed until the decay of other cells has liberated the necessary "bios," is disproved by the fact that the staining test revealed the presence of not more than a dozen dead cells in the sediment from the third culture. The author concludes that yeast is able, when supplied with proper nutrient materials, to elaborate its own protoplasm without extraneous assistance from organic substances; and that, though Wildiers' "bios" may exist, its functions are merely stimulative, not indispensable for the growth of the yeast.—C. S.

Yeast Expressed Cell-Juice [Buchner's Zymase]; Alcoholic Fermentation with ——, in presence of Blood Serum.
A. Harden. Ber., 1903, **36**, [4], 715—716.

It has been found that the addition of the blood serum of the rabbit, pig, or horse to expressed yeast cell-juice has a remarkable effect in restricting the activity of the proteolytic enzyme contained in the juice. This effect is demonstrated by determinations of the precipitable albumin before and after digestion. The blood serum of the horse inhibits almost entirely the proteolytic action, that of the rabbit or pig restricts it very considerably, whereas egg albumin has no such effect.

It has been suggested that the reason why the cell-juice of yeast only ferments a relatively small proportion of the sugar added to it is, that the zymase is rapidly destroyed by the digestive action of the proteolytic enzyme. This view now receives confirmation, since fermentative experiments carried out in presence of blood serum showed no increased evolution of carbon dioxide to the extent of 80—90 per cent. —J. F. B.

Yeast; Treatment of Top-fermentation ——, in German and English Breweries.
D. Kleinke. Woch. f. Brau., 1903, **20**, [12], 125—126.

In the author's opinion the inferior position of the top-fermentation brewing industry in Germany is, to a large extent, due to the unsuitable treatment of the yeast. In Germany the yeast is washed and diluted with water, and then preserved under water or beer at the lowest convenient temperature. In England, on the other hand, it is not washed or diluted, but is preserved in the form of a thick mass just as it is obtained; only seldom is it preserved in the pressed state. The English method is strongly recommended to the German top-fermentation brewers. Th thick mass consists of yeast cells in preponderatin quantities, bacteria, hop-extract, albuminoids, and full attenuated beer. It is a mixture in which injuriou organisms have the smallest possible chance of development they are held in the quiescent state by the absence o mobility, the antiseptic action of the hop resins, and of th relatively high degree of acidity. The ratio between th yeast cells and bacteria is preserved substantially the sam as at the time the yeast was skimmed. In the Germa method the treatment with water dilutes the residual beer redissolves certain of the albuminoids and extracts other from the yeast, creating a favourable medium for th development of bacteria and wild yeasts. The antisept constituents, hop-extract, acids, and alcohol are partially o wholly removed, the yeast is weakened, and the foreig organisms become acclimatised by their activity in th yeast-water. The cleanliness of English yeast is greatl helped by the stronger hopping, the employment of hop backs, and the use of spent hops as a filter-bed; also by th higher gravity of the wort affording a longer period fermentation and cleaner cropping of the yeast. Great car is devoted to the separation of the cooler sediment. I Germany top-fermentation beers are brewed from lo gravity, weakly hopped worts with short and hurrie fermentation.

The English method is the only one by which a slightl higher acidity can be obtained during fermentation withou endangering the product. The pasty yeast should be kep in tin-lined copper vessels provided with lids and stored a low temperature. If desired, the yeast so preserved migh with advantage be washed with ice-cold water just befor use.—J. F. B.

Denatured Alcohol. Preparation of ——, by Ferment tion.
G. Péreire and G. R. Guignard. Ger. Pat. 139,38 Nov. 23, 1901. Chem.-Zeit., 1903, **27**, [20], 223.

The mash containing sugar is run into a vat provided wit a water heating pipe. Excess of calcium carbonate is add and the temperature raised to 40° C. An amylozym ferment is added, and the fermentation, during whic acetic acid, butyric acid, ethyl alcohol and amyl alcohol a produced, allowed to take place until the sugar is abo half used. The temperature is then reduced to 24° C., an ordinary fermentation induced. On rectifying by mea of a column, alcohol and a denaturing oil are obtaine If these be mixed, a spirit is obtained containing 90 vo per cent. of alcohol.—J. McC.

Beer Wort; Contraction of ——, on Cooling, from 18° a 14° R. to 4° R. (22·5° and 17·5° to 5° C.).
F. Cern Allgem. Zeits. Bierbrau. und Malzfab., 1903, 136; throu Woch. f. Brau., 1903, **20**, [11], 123.

The following table shows the contraction of beer wort various concentrations in cooling from the ordinary te peratures to 5° C., the usual pitching temperature for lag beer. The importance of the figures lies mainly in the f that totally erroneous values have somehow crept into t various German table-books.

Saccharometer.	Contraction from 17·5° to 5° C.	Contraction from 22·5° to 5° C.
Degrees Balling.	Litres per 100 hl.	Litres per 100 h
20	24	37
18	22	35
16	20	33
14	19	31
12	18	29
10	17	27
8	16	25
6	14	23
4	12	21
2	10	19
Water	9	17

—J. F. B.

Top-fermentation Beers; The Chilling and Filtering of——. II. N. Van Laer. J. Fed. Inst. Brewing, 1903, **9**, [1], 63—83.

FOR the preparation of bottled beers without artificial carbonation, two processes are available: the natural and the forced processes of conditioning. The former method is, however, for the lighter types of ale, unreliable and costly. The forced process consists in forcing on a vigorous after-fermentation by means of priming or "kräusen" added to the beer in the chip cask at a temperature of 58° F. This method is of American origin.

The usual proportion of "kräusen" added is from 8—10 per cent., but it may extend to 25 per cent. for special purposes. The "kräusen" may be taken from wort in the ordinary course of brewing operations, about 36 hours after pitching, or it may be specially prepared from a sugar wort for the purpose. The tendency of large proportions of "kräusen" is to impair the durability of the beer; proportions above 10 per cent. are apt to impart an unpleasant yeast-bitter flavour and rawness to the beer. Artificially carbonated beer contains from 1·1 to 1·5 times ts volume of carbon dioxide. The employment of 10 per cent. of "kräusen" yields a beer containing 1·7 vols. of gas, whilst 2 pints of priming syrup, added per barrel, yield beer containing 1·6 vols. A method is described for the determination of carbon dioxide in bottled beer. In the author's opinion 10 per cent. of "kräusen" can safely be used without altering the character of the beer.

In case closed tanks are available for conditioning and chilling, the use of "kräusen" is very simple; it is desirable, however, to introduce the "kräusen" at the bottom of the tank, without allowing it to become mixed up with the beer. In this way the absorption of the gas s more efficient. Finings are not applicable for beers which have to be filtered, as the gelatin soon clogs the filter; clarification should therefore be effected by means of chips (either wood or aluminium). The chief item is the possession of suitable vessels capable of withstanding high pressures; glass-enamelled tanks are eminently suitable, and if these be provided with cooling arrangements, the complete process of conditioning, clarification, and chilling can be done in one vessel. The time required for the whole treatment is about 14 days.—J. F. B.

Iron as a Cause of Alterations of Colour and Taste of Beer. D. Kleinke. Woch. f. Brau., 1903, **20**, [12], 126—127.

THE author had occasion at one time to carry out some xperimental brewings in plant constructed of cast iron instead of copper. In the case of a pale beer, the wort came way with a slight blackish tint and a "raw" flavour. After fermentation with a top yeast, the beer was casked with dry hops; isinglass finings were added, and the beer was left to mature. The finished beer was perfectly bright, nd in no way below the mark in colour or flavour. The nfluence of the iron vessels was therefore disregarded. ubsequently a very dark beer was brewed in the same lant. No abnormal qualities were discernible after ermentation, and the beer was casked with hops in the sual way, but without finings. When ready for consump-on the beer appeared to be perfectly right. A few bottles were filled with it, with the addition of a little sugar.

It was found that the beer in these bottles gradually eveloped an unpleasant flavour, finally acquiring the taste f ink. It is suggested that the difference between the ehaviour of the pale beer and the dark was due to the act that the former was treated with finings, whilst the atter was not. The isinglass might combine with the iron-annin compound, removing it by precipitation. In the case f the dark beer it is assumed that the iron originally xisted in a tasteless form, and was gradually converted nto the objectionable form by the action of the tannin erived from the hops.—J. F. B.

Beer; Iron in——, and its Connection with the Iron-Content of Cask Pitch. J. Brand. Zeits. ges. Brau., **26**, 133—135. Chem.-Zeit., **27**, [19], Rep. 61—62.

EXPERIMENTS conducted in a brewery have traced the onnection between iron bung fittings on trade casks and the presence of iron in beer, the amount of the latter ranging from 0·1 to 0·3 grm. per hectolitre (0·5 grm. maximum). The author recommends the thiocyanate reaction as the best test, since it will reveal the presence of as little as 1 part in 10 millions, whereas not less than 1 part per million can be detected by the taste.

Attempts made to trace the source of the iron to ferruginous cask pitch failed, no iron being extracted by the beer on storage for four weeks in pitch-lined glass bottles. The author characterises as erroneous the assumption that, because iron is found in the ash of such pitch, an intentional addition for colouring purposes has been made. Pitch that has been purified in iron vessels contains iron oxide, but dissolves completely in ether, whereas when the same oxide has been added intentionally, it remains undissolved by the ether treatment.—C. S.

Red-Brand on Vine Stocks. H. Müller-Thurgau. Cbl. Bakt., Abth. II., **10**, 8, 48, 81, 113. Chem.-Zeit., **27**, [19], Rep. 59.

THE infection is due to a thread fungus, infesting the veins and vessels of the foliage. It usually forms thin hyphæ, sparingly septate, and characterised by an undulating, or more frequently spiral growth. No spores could be detected on artificial cultures; but old leaves from infected districts revealed apothecia, which, when moistened, rapidly developed asci and spores, the latter germinating into the characteristic hyphæ. The name *Pseudopeziza tracheiphila* has been bestowed on the organism. The best preventive remedy against attack is the maintenance of a certain percentage of moisture; the root development of the plant should be stimulated, and care taken that the soil is sufficiently retentive of moisture. To combat the fungus, the vines should be sprinkled with Bouillon Bordelaise at the end of May and beginning of June.—C. S.

Saccharomyces acclimatised to the Volatile Toxic Principles of Beet Molasses; Use of——, in Distilling. H. Alliot. Comptes rend., 1903, **136**, [8], 510—511.

THE author enumerates the practical advantages of using yeasts which have been acclimatised to the toxic constituents of molasses from beetroot sugar, thus rendering denitration, &c. of the molasses unnecessary. They are as follows: Economy of heat, cooling water, and labour; diminution of the time required for fermentation by one-fifth to one-quarter; diminution of the initial free acid required to 0·2 grm. of sulphuric acid per litre, and a corresponding increase of the potassium carbonate in the salts obtained. Further, the yeast multiplies very abundantly, and successfully suppresses all bacterial growth.
—T. H. P.

Brandy; Report of Special Analytical Commission on——. Lancet, 1902, 1503—1518; through Analyst, 1903, **28**, [324], 72—75.

THE technical methods of producing brandy are described. The wines are distilled, and the first runnings (*tête de brouillis*) are returned to the next distillation; the middle portion (*cœur de brouillis*) is reserved for a second distillation; the tailings (*queue de brouillis*) are returned to the next distillation; the residue is worked up for the recovery of tartaric acid. The *cœur de brouillis* is redistilled, and the first runnings (*tête d'eau de vie*) are returned to fresh wine; the middle portion (*cœur de distillation*) is brandy; the tailings (*queue* or *secondes*) are either returned or used for making ordinary brandy.

Tables are given showing (1) analyses of all the above products; (2) analyses of vintage brandies, matured but not diluted or blended; (3) analyses of genuine brandies bought in the market; (4) comparative analyses of grain and beet spirits, rum, whiskey, gin, and brandy; (5) analyses of spirits sold as brandy to the public. The determinations comprise the alcohol, extract, acids (as acetic), aldehydes, furfural, esters (as ethyl acetate), and higher alcohols, the sum of the five last constituents being classed as "total secondary products." During maturation the furfural tends to diminish, and the other secondary products, especially acids and aldehydes, tend to increase. The market brandies represent the matured spirit, diluted, coloured, and blended; the constancy of chemical composition obtained by blending is remarkable. For the determination of sophistication the following characteristics may be noted:—Brandy contains at least 250 grms. of total secondary products per 100 litres of absolute alcohol present, and generally about 300 grms. Of these the esters and higher alcohols exist in about equal proportions of about 100 grms. each, any divergence usually taking the form of an excess of higher alcohols over esters. Grain and beet spirits are comparatively free from secondary products, furfural especially being absent; gin is also poor in secondary products. Rum is very high in esters, and contains larger proportions of acids and furfural than brandy. Whiskey resembles brandy more closely, but the furfural is high, and the higher alcohols are about three times as abundant as the esters, a ratio never found in brandy.—J. F. B.

Wine; Detection of Impure Glucose in ——. F. Witthle. XXIII., page 443.

ENGLISH PATENT.

Beer and the Like; Process for Brewing ——. M. Malotaux, Brussels. Eng. Pat. 4788, Feb 25, 1902.

SEE Fr. Pat. 318,899; this Journal, 1903, 221.—J. F. B.

Fermented Liquors; Manufacture of ——. J. Schneible, New York, U.S.A. Eng. Pat. 1428, Jan. 20, 1903.

THE fermented liquor is separated from the yeast while the albuminous matters are in solution or semi-solution therein; the liquor is then charged with the fresh gaseous and volatile matters given off by fermenting liquor; the temperature is lowered to promote the absorption of the gaseous matters and the action of such matters on the liquor; the latter is finally rested while coagulation and separation of the albuminoids takes place. (See also Eng. Pat. 4152, 1902; this Journal, 1902, 716.)—J. F. B.

UNITED STATES PATENT.

Non-Intoxicating Beverages; Manufacture of ——. A. Nilson, Assignor to Wahl and Henius, all of Chicago, U.S.A. U.S. Pat. 721,383, Feb. 24, 1903.

SEE Eng. Pat. 26,588, 1902; this Journal, 1903, 223.
—J. F. B.

FRENCH PATENTS.

Yeast without Lactic Acid Fermentation; Preparation of ——. M. Buebeler. Addition, dated July 1, 1902, to Fr. Pat. 308,703, March 5, 1901. (See this Journal, 1901, 1128.)

THE process described in the original specification may be varied in the following manner:—After the addition of the mineral acid, the wort is cooled to a temperature of about 50° C., and is maintained at that temperature for a period of four to six hours, according to the nature of the material, in order to effect a modification of the albuminoid constituents. The process is applicable to all kinds of distillers' wash.—J. F. B.

Yeast Cells; Process for Obtaining the Contents of ——. Pharm. Inst. L. W. Gans. Addition, dated July 16, 1902, to Fr. Pat. 310,349, April 27, 1901. (See Eng. Pat. 8722, 1901; this Journal. 1902, 491.)

THE extraction of the cell contents of yeast by the addition of certain indifferent organic substances takes place far more rapidly if the yeast be first mixed with a quantity of water equal to or half the weight of the yeast.—J. F. B.

Alcohol; New Method and Apparatus for Producing ——. F. Billet. Addition, dated June 28, 1902, to Fr. Pat. 319,770, Mar. 20, 1902. (See this Journal, 1902, 1547.)

THE process described in the main specification is extended to the treatment of other materials, such as sugar-cane, sorghum, maize, artichokes, &c., the materials being preferably employed fresh and chopped into small pieces.
—J. F. B.

Wines or Phlegms; Apparatus for the Continuous Rectification of ——. E. A. Barbet. Second Addition, dated July 22, 1902, to Fr. Pat. 317,024, Dec. 19, 1901.

THE improvements relate to a special form of hood for us in rectifier columns; these hoods have conical tops an longitudinal slits in the sides; the central pipes which reac to the top of the hoods have deeply-serrated edges affordin an outlet area equal to the section of the pipes. Thes hoods are specially suitable for thick washes.—J. F. B.

Alcohol; Apparatus for Continuous Rectification of —— E. A. Barbet. Ninth Addition, dated July 22, 1902, t Fr. Pat. 296,750, Feb. 1, 1900.

A SAFETY overflow pipe is provided in the observatio vessels, communicating directly with the excisable outlet fo the spirit.

The pressure of the vapours in the columns is regulate exactly by means of an overflow pipe, the level of whic can be altered inside the column according to the indication of a lever situated outside. (See also this Journal, 190 164.)—J. F. B.

Denaturing Alcohol: Process for ——. G. Hach Addition, dated Aug. 7, 1902, to Fr. Pat. 320,592 April 22, 1902. (See this Journal, 1903, 108.)

THE denaturation of alcohol treated by the process claim (*loc. cit.*) is rendered more certain by the addition to th spirit of from one to ten per cent. of heavy or ligh benzene.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Albumin Reactions with Acids. F. Mylius. Ber., 1903, **36**, [4], 775—778.

EGG-ALBUMIN in aqueous solution is not precipitated orthophosphoric, orthotelluric, boric, oxalic, acetic, form and benzoic acids. It is precipitated even in very dilu solutions by the following acids and acid salts, which regarded as reagents for albumin:—Hydrogen platin chloride, hydrogen mercuric iodide, hydrogen bismuth iodi hydrogen ferrocyanide, metaphosphoric acid, molybd phosphomolybdic, tungstic phosphotungstic, allotelluric a tannic acids. The non-precipitating acids all have in sol tion simple molecules, whilst those of the second class have complex molecules, which seem to be essential for t precipitation of albumin. Most other acids occupy a positi between these two groups and precipitate albumin when concentrated condition, but fail to do so in dilute solution. table is given showing the limits of concentration of cert acids required to produce an immediate precipitate at 18° (me and temperature, however, are important factors, a precipitates can be obtained at far lower concentratio Within the limits of concentration of the acids at wh albumin is precipitated, the conductivity and other physi determinations indicate the existence of paired molec In such solutions there exist the monomolecular hydra forms and the polymolecular, more or less dehydra forms. The precipitation of albumin probably const a test for these latter forms. Whilst formic and ace acids do not precipitate albumin, their presence materi assists its precipitation by other acids, possibly owing to formation of complex molecules. The albumin is cipitated apparently in the form of salts, which decomposable by water, but there is also frequently permanent dehydration of the albumin which remains in insoluble form even after all the acid has been washed o
—J. F.

Margarine (Clarified); Manufacture of ——. P. Polschek. Chem. Rev. Fett- u. Harz-Ind., 1903, **10**, [53—54.

THE clarified butter-fat of commerce consists of the separated by melting from the water and casein. clarified margarine is now extensively used in Central South Germany. This is prepared from the fa garine in the same way as the butter-fat, though it is frequently obtained by churning the fat with milk, then (without cooling with ice) pumping the mixture the melting vessel, where the fat is again separated. latter process, though cheaper, yields a product of rior flavour and aroma. Margarine prepared with hir milk gives a butter-fat of excellent aroma. Margarine is also manufactured without the use of milk, by simply ing the volatile flavouring and aromatic compounds lehydes, &c.) to the melted fat.

he fats chiefly used in the manufacture are "premier " lard, cocoanut oil, cotton-seed oil and cotton-seed-rine, and sesamé and earthnut oils.—C. A. M.

pper Dairy Utensils; Action of Lactic Acid on ——. I. Siegfeld. Milch-Zeit., 1902, **31**, 401—403; through eits. Unters. Nahr.- u. Genussm., 1903, **6**, 223.

rs of tin, copper, and copper half-coated with tin were jected to the action of a 1 per cent. solution of lactic l, and also to the action of sour milk, for periods ying from 24 to 48 hours, both at the ordinary tempera- and at 35° to 40° C. At the former temperature no per was dissolved, and only a trace at the higher perature. The tin was attacked to some extent. Sour at a temperature of 35°—40° C. dissolved from a of copper having a surface of 100 sq. cm. 2·7 mgrms. in hours. As all the dissolved copper entered into com-tion with the curd, the author calculates that one kilo. he latter would contain 0·00122 per cent. of copper—an gnificant quantity—and comes to the conclusion that no ger attends the use of copper pans in dairies and cheese ories.—W. P. S.

English Patent.

s; Process for Preserving ——. H. H. Lake, London. rom Aktieselskabet "Progress," Christiania. Eng. Pat. 949, Feb. 15, 1902.

U.S. Pat. 709,583, 1902; this Journal, 1902, 1291.
—W. P. S.

United States Patents.

ein; Production of ——. A. D. Charles. Bellows alls, Vt., U.S.A., Assignor to the Casein Company of merica, New Jersey. U.S. Pat. 721,999, March 3, 903.

k is precipitated with hydrochloric acid at about 120° F., curd is washed with dilute sulphuric acid heated to —140° F., pressed, and then dried at about 130° F.
—R. L. J.

French Patents.

ein; Pure Solutions of ——. J. R. Hatmaker. Ad-tion, dated Aug. 4, 1902, to Fr. Pat. 308,455, Feb. 25, 01.

mmed milk heated to about 38° C. is treated with huric acid, the precipitated casein washed, dissolved n alkaline solution, reprecipitated by means of dilute ochloric acid, the casein again washed, and finally olved in an alkaline solution.—R. L. J.

ilisation [of Food]; Process of ——. L. Maussion. ddition, dated July 17, 1902, to Fr. Pat. 319,034, Feb. 25, 02.

substances are treated with alcohol in closed recep-s, carbon dioxide being afterwards forced in to replace alcohol. Articles which cannot be moistened with hol are preserved in an atmosphere of carbon dioxide rated with alcohol vapour. (See this Journal, 1902, .)—W. P. S.

(*B.*)—SANITATION.

ter Pollution; The Causse Tests for ——. S. Rideal. J. San. Inst., 1902, **23**, [4], 505—507.

: author, after a careful investigation of Causse's "ystal Violet" test (this Journal, 1902, 642), has come e conclusion that it is valueless for determining the ty of a water. A solution made by dissolving Methyl et in water saturated with sulphurous acid, according to directions, gave no colour with a number of pure waters, including some specially prepared by distillation with alkaline and acid permanganate, then with ignited baryta, and finally alone. Excess of sulphurous acid was then removed by passing carbon dioxide through for four hours, when only a little sulphurous acid remained, the liquid still being colourless. On adding this to different waters of known quality, the results did not in the least agree with Causse's contention. Some pure deep-well waters gave a strong reaction at once, but no colour was obtained with ordinary distilled water, nor with water purified as above. Moreover, waters known to be polluted gave an immediate colour, as did also distilled water containing 4 parts per 100,000 of caustic soda or ammonia, while, on standing in a half-filled bottle for some hours, the tint developed in all cases without any addition. The coloration, therefore, seemed to be due to loss of free sulphurous acid by oxidation or neutralisation, rather than to the purity of a water.—W. H. S.

Water, Pure; Characteristic Reaction for ——. Brand. Zeits. ges. Brau., **26**, [6], 91—92.

H. Causse (this Journal, 1902, 642) recently proposed the use of hexamethyltriaminotriphenylcarbinol (Crystal Violet) for testing the purity of water, the reagent being prepared by dissolving 0·25 grm. in 250 c.c. of cold water saturated with sulphur dioxide. In contact with pure water this reagent is said to produce a violet ring, afterwards extending throughout the liquid and increasing in depth of colour, when warmed, to 35°—40° C.

The author, however, finds that the reagent furnishes the same reaction with water containing 1 per cent. of urine, and is therefore unreliable; whereas Griess' reagent (para-diazobenzene sulphate) will reveal 1 part of horse urine in 50,000 of water.—C. S.

Water Sterilisation by means of Ozone; Recent Developments of ——. B. Proskauer. Biochem. Centralbl., 1903, **1**, [6], 209—213.

After Fröhlich had devised the means of preparing ozone from the air in concentrated form (this Journal, 1895, 164), installations for the treatment of their water supply were erected by different towns. The apparatus invented by Otto (this Journal, 1897, 1082) was investigated by Loir and Fernbach, and is stated to have given good results in practice. The first installation on a large scale, at Blankenberghe, in Belgium, was capable of sterilising 2,000 cubic metres of water per day; but, as the results in practice did not come up to expectation, it was soon abandoned.

The plant erected by Abraham and Marmier at Lille (this Journal, 1899, 1148) was found by a Commission presided over by Calmette to be capable of sterilising 35 cubic metres of water per hour, even the spores of *B. subtilis* being destroyed; for reasons unknown to the author, it also has been abandoned. Another installation still at work at Schiedam, near Rotterdam, is stated to furnish 20 cubic metres of sterilised water per hour.

A plant capable of sterilising 10 cubic metres of water per hour was constructed by Siemens and Halske for Martikenfelde (Berlin). This was tested by Ohlmüller and Prall, who infected the Spree water with cholera vibrios and typhus bacilli prior to ozonisation, and found that these micro-organisms were completely destroyed by the process. They also came to the following conclusions:—(1) The treatment of water with ozone gives much better results as regards the removal of bacteria than sand filtration; (2) The chemical characteristics of the water are only affected to the extent that the oxygen absorption is reduced and the free oxygen increased; (3) The ozone dissolved by the water is rapidly transformed into oxygen, and is thus without influence on health; (4) Colouring matters are destroyed; (5) No foreign taste or odour is introduced.

The author's experiments with this process gave unfavourable results so long as the sterilising tower contained the original large-sized packing used by Weyl and by Ohlmüller and Prall in their experiments; but by using fine granular packing, pathogenic bacteria were invariably destroyed. He found that in the Martikenfelde plant such organisms in the water were killed by the passage of

25 cubic metres of air containing 3·4 to 4 grms. of ozone per cubic metre, the rate of passage of the water being 1 cubic metre in 8½ to 9 minutes. The oxygen absorption of the water was reduced by 0·05 to 0·92 mgrm. (and in one case by 2·24 mgrms.) per litre.

The author confirms the statement of Ohlmüller and Erlwein that the oxygen absorption of the water must be taken into account. Thus, in the Wiesbaden ozonising plant only 0·9 to 1·8 grm. of ozone per cubic metre of air is required to effect the same results on water with an oxygen absorption of 1·7 mgrms. per litre as require an ozone concentration of 3·4 to 4 grms. per cubic metre of air in the case of the Martikenfelde plant, where the oxygen absorption of the water ranges from 4·6 to 8·08 mgrms. per litre.

The Wiesbaden plant is the first large installation of the kind in Germany. A smaller one just completed at Paderborn yields 50 to 60 cubic metres of potable well water per hour. (See this Journal, 1890, 851; 1897, 765.) —C. A. M.

Microbes in Water; Action of Zinc on ——. F. Dievert. Comptes rend., **136**, [11], 707—708.

When granulated zinc is agitated with water containing microbes, especially *Bacillus Eberthi and B. coli communis*, the water is sterilised after a few hours, even with 5 grms. of zinc to the litre of water. Further experiments showed that the minute quantity of dissolved zinc oxide formed is not the active agent, though it probably causes the microbes, when left at rest, to collect at the bottom of the vessel; but the microbes actually corrode and consume the zinc, by which they appear to be poisoned.—J. T. D.

Ammonia in Water; Diaminophenol as a Reagent for Traces of ——. Manget and Marion. XXIII., page 441.

English Patents.

Liquids [*Water*]; *Electrical Purification of* ——. G. C. Marks, London. From C. McC. Chapman, New York. Eng. Pat. 1335, Jan. 19, 1903.

The water is first heated to a temperature of 80° F. in a cylindrical vessel, and then passes into the electrolyser. The latter is also cylindrical, and contains a series of discs, alternately forming cathodes and anodes. Its interior walls are coated with insulating material and the ends are removable. The anodes are composed of a mixture of aluminium, nickel, and tin, as described under U.S. Pat. 691,933, 1902 (this Journal, 1902, 485), whilst the cathodes consist of zinc or carbon. The water finally passes through a filtering tank.—W. P. S.

Filtering Apparatus [*Water*]. G. C. Marks, London. From C. McC. Chapman, New York, U.S.A. Eng. Pat. 1336, Jan. 19, 1903.

A perforated drum covered with filtering material is journalled in the removable heads of a holding tank, to which the liquid is supplied. The drum has a hollow perforated shaft, which extends outside the tank, the liquid entering the drum through the filtering material from the tank, and being discharged through the shaft. The shaft has an external wheel, by which the drum can be rotated for cleaning purposes, the removal of the deposited matter being effected by a brush or brushes secured to the tank, and adapted to bear yieldingly on the surface of the drum. —R. A.

French Patent.

Filter; Sterilising, Single or Multiple Effect ——. D. Rojat. Fr. Pat. 322,470, June 25, 1902.

The filtering takes place radially in an upright cylindrical vessel, the porosity of the medium decreasing from the centre outwards. Arrangements are described for making the vessel "tight," and boiling the liquid in a connected compartment, with a view to the sterilisation of the contents of the filter. (See also U.S. Pat. 703,833 of 1902; this Journal, 1902, 1126.)—J. W. H.

(C.)—DISINFECTANTS.

English Patent.

Formaldehyde Gas Generator. R. W. Carman and F. M. Lawrence, New York, U.S.A. Eng. Pat. 28,797, Dec. 30, 1902. Under Internat. Conv., Feb. 4, 1902.

See U.S. Pat. 699,944 of 1902; this Journal, 1902, 870. —J. F. B.

United States Patents.

Disinfecting or other Purposes; Composition for ——. H. S. Blackmore, Mount Vernon, N.Y. U.S. Pat. 12,084 (re-issue), Feb. 24, 1903.

A mixture containing an essential oil, such as camphor oil, and formaldehyde.—W. P. S.

Sheep Dips; Process of Making ——. F. S. Clark, New York, and E. A. Harris, Fargo, Ga. U.S. Pat. 721,153, Feb. 24, 1903.

The process consists in fractionally distilling pine oil, to remove ill smelling oils, saponifying, eliminating all the light hydrocarbon oil, and treating the water-soluble black residue with an "intermediate" oil, rosin, and caustic alkali. The emulsion thus formed is mixed with a light oil to bring it to a proper consistency.—W. P. S.

French Patent.

Disinfection by Means of Formaldehyde; Process and Apparatus for ——. W. E. Decroné. Fr. Pat. 323,041, July 17, 1902.

A solution of formaldehyde is allowed to fall through a tapped opening from the upper part of a reservoir on to quicklime contained at the lower part of the same. The heat produced by the slaking of the lime evaporates the formaldehyde, the vapours escaping by a side opening. —W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose; Preparation of ——, *by Means of Phenols.* F. A. Bühler. Chem. Ind., **26**, [6], 138—140.

It has been found that phenols, at temperatures above 150° C., dissolve the resins, ligneous materials, and other so-called incrusting substances of wood, and leave a residue of cellulose. Wood tar, provided it contains 50—60 per cent. of phenols, is quite effective as a solvent. Iron vessels are rapidly attacked, and give the resulting cellulose pulp a dark colour; copper vessels are the best. In contact with the phenol, cellulose undergoes no change, even at 230° C., while when heated in air or in water it rapidly alters at 170°—200° C. The solvent action of the phenols is accelerated by increase of pressure; 1 part of wood requires, on the laboratory scale about 8 parts, on the industrial scale about 4 parts, of phenol. Straw and rushes are completely extracted in about five hours; smooth, straight fir wood requires 6—8, resinous, dense wood, 10—12, hours. Branches as well as stems are attacked, and yield almost as good a product, only a little shorter in the fibre. After the operation as much as possible of the surplus fluid is removed by pressure, and the remainder is washed out by a solvent, using one which will not reprecipitate the dissolved substances. With ordinary tar-oils, using benzene as a solvent, the cellulose obtained is light brown; but it is occasionally possible to obtain a light-yellow product, very easily bleached. Nearly the whole of the cellulose contained in the wood is obtained. The used oil is distilled off from the lignin, &c., and leaves a residue which has a high value as fuel.—J. T. D.

English Patent.

Celluloid, Explosives, and the like; Improvements relating to the Manufacture of ——. R. Robertson and W. Rintoul. Eng. Pat. 25,994, Dec. 19, 1901. XXII., page 441.

United States Patent.

per ; Method of Preparing Paraffin or Waxed ——. I. Goessmann, Worcester, Mass. U.S. Pat. 721,963, larch 3, 1903.

e claims cover extensions of Eng. Pat. 10,535 of 1901 is Journal, 1902, 362). The process there given con- ed in treatment with a glutinous material, and then in ermaldehyde bath, drying, subjecting to the action of water or steam, and again drying.

n the present patent the treatment with moisture is owed by a treatment with a volatile alkali solution amonia solution forming part of one claim). Another thod consists of treatment with hot or cold moisture and cerin, with or without subsequent treatment with monia.

n every case the finished fabric is treated with paraffin wax.—T. F. B.

French Patent.

per ; Preparation of Pulp for Manufacture of ——. l. de Montessus de Ballore. Fr. Pat. 322,921, July 12, 902.

parto is first crushed by passing between fluted rollers l dusted ; it is then placed in vats and steeped in saline ter. The mass is then subjected to a process of fermen- on by means of a bacterium, existing on the esparto, ich evolves sulphuretted products. In the course of nt 11 days, during which the temperature must not fall ow 18° C., the non-cellulose matter is decomposed and ass is treated with milk of lime and salt water. The e precipitates the pectic matters, and the pulp is purified washing by decantation in vessels with conical bottoms. —J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Sodium Sulphite ; Official Quantitative Test for ——. W. Garsed. Pharm. J., 1903, **70**, [1707], 391.

om the results of a number of experiments with pure stallised sodium sulphite, the author concludes that the P. test, according to which 1 grm. of the sample dissolved 5 c.c. of distilled water should decolorise not less than 7 nor more than 81·7 c.c. of a N/10 solution of iodine, is no means reliable. The result is distinctly influenced : (1) The dilution of the sulphite solution ; (2) The rate which the iodine solution is run in ; and (3) The presence excess of mineral acids or alkaline salts.

iles and Shearer (this Journal, 1884, 197) recommended olving the powdered sulphite in excess of undiluted N/10 ine solution, and determining the excess of iodine by ation with N/10 thiosulphate solution. In three experi- nts, using 0·3 grm. of sodium sulphite and a varying ess of iodine, a constant percentage of 98·9 was ained, and the author considers that the method should e the place of the present official test.—A. S.

Collargol. M. Hanriot. Comptes rend., **136**, [11], 680—682.

llargol is a preparation of colloidal silver, which comes commerce as a therapeutic agent. It dissolves in water red-brown solution, which gives the known reactions colloidal silver. Silver nitrate solution precipitates it : en added in proper quantity, no silver remains in solu- n, either from the collargol or the nitrate. The precipi- is not simply metallic silver, but contains the grouping racteristic of collargol. Weak acetic acid throws down n collargol solutions a black precipitate which exhibits tinctly acid characters, dissolving in alkalis to coloured utions. It is this substance which is deposited on the ode during the electrolysis of collargol or other colloidal er solutions—a deposit which has hitherto been regarded spongy metallic silver. Collargol is probably the monium salt of this (*collargolic*) acid.—J. T. D.

Chloral ; Preparation of a Solid Polymeric Form of ——. E. Erdmann. Ger. Pat. 139,392, Dec. 22, 1901. Chem.-Zeit., 1903, **27**, [20], 223.

Seven parts of anhydrous aluminium chloride are added to 100 parts of well-cooled anhydrous chloral, care being taken that the temperature does not rise above 10° C. In the course of an hour the whole mass solidifies. After 24 hours the hard mass is broken up and extracted with cold dilute hydrochloric acid, then washed with alcohol and dried at a moderate temperature. It is insoluble in alcohol, water, or acids, but soluble in sodium carbonate solution. On warming with alkali it gives chloroform. It is tasteless and possesses narcotic properties.—J. McC.

Glycocol Compounds of certain Phenols [Guaiasanol, Preparation of]. A. Einhorn and Heutz. Arch. der Pharm., **240**, [8], 631.

A number of new glycocol compounds of phenols have been obtained in the course of an investigation on the action of the monochloracetic esters of phenols with the secondary amines of the fatty series. Guaiasanol, diethylglycocol-guaiacol hydrochloride,

$$C_6H_4.OCH_3.O.CO.CH_3N(C_2H_5)_2HCl,$$

formed by the union of chloro-acetylguaiacol with diethylamine, and the subsequent combination of the base with hydrochloric acid, promises to be the most important of these compounds, from a therapeutic point of view. Chloro-acetylguaiacol is first prepared by treating a mixture of guaiacol monochloro-acetic acid and pyridine with phosphorus oxychloride. The ester $C_6H_4.OCH_3.O.CO.CH_2Cl$ is thus obtained in white needles, melting at 58—60° C. This combines directly with diethylamine to form diethylglycocolguaiacol. Three grms. of diethylamine and 43 grms. of chloro-acetylguaiacol are mixed and kept cool, with constant stirring when a strong reaction takes place, and the chloracetylguaiacol melts. After the reaction has proceeded for two hours the diethylglycocolguaiacol is separated from the gelatinous mass as a yellow oily fluid. The yield is about 80 per cent. The product is dissolved in alcohol and saturated with alcoholic hydrochloric acid, when the hydrochloride, *guaiasanol* is obtained by recrystallisation from a mixture of alcohol and ether, in the form of prismatic needles, readily soluble in water, which melt at 184°—189° C. It is decomposed by alkalis, even when very dilute, with the liberation of guaiacol.—J. O. B.

Anthranilic Acid ; Sublimation of ——. B. Scheuermann. Chem.-Zeit., 1903, **27**, [22], 245—246.

Anthranilic acid can be sublimed without decomposition, provided the pressure be maintained sufficiently low, from 0 to 1 mm. of mercury. The dried and powdered substance is introduced into one limb of a suitable sublimation apparatus, and this limb is immersed in a heating bath, whilst the other limb, which serves for the collection of the sublimate, is surrounded by a freezing mixture. The receiver is connected by way of a tube filled with phosphorus pentoxide with a manometer, a mercury vacuum-pump, and a water-pump. The apparatus is first evacuated without the application of heat, and the vacuum should maintain itself at less than 1 mm. of mercury all night. The bath is then heated to the desired temperature. The most favourable temperature for the sublimation lies between 115° and 150° C.—J. F. B.

Formaldehyde ; Action of ——, on certain Ketones. C. Goldschmidt. Chem.-Zeit., 1903, **27**, [22], 246.

When formaldehyde is caused to act upon *p-aminoacetophenone* in neutral solution, a very finely divided white precipitate is produced, which, when crystallised from alcohol, melts at 170° C.; it is *methylene-p-aminoacetophenone*, $C_6H_4.(NCH_2).COCH_3$. If the reaction be performed in presence of concentrated hydrochloric acid and the solution be boiled for 15 minutes, a reddish solution is produced, from which water precipitates the *anhydro-alcohol*, $[C_6H_3(NH)(CH_2)COCH_3]n$. This is soluble in chloroform, and is reprecipitated by ether as a brownish-red amorphous powder of high melting point. When excess of 40 per cent. formaldehyde solution is heated with *trihydroxyacetophenone* (*gallacetophenone*) in presence of hydrochloric acid for half an hour, a crystalline precipitate is formed, which, after repeated crystallisation from alcohol, appears as yellowish-white needles melting at 265° C. It is a diphenylmethane derivative, *ditrihydroxyacetophenone methane*, $COCH_3.(OH)_3.C_6H.CH_2.C_6H(OH)_3.COCH_3$.

From hydroxyketones of the aromatic series no alcohols appear to be formed, but only diphenylmethane derivatives. These are formed the more readily the greater the number of hydroxyl groups present in the molecule. For instance, *p-hydroxyacetophenone* yields only a resin; from *resacetophenone* a diphenylmethane derivative is obtained, but only after long boiling; it melts above 250° C., and is similar in constitution to the product obtained from the trihydroxy-compound.—J. F. B.

Mesotane. J. Pharm. Chim., 17, [1], 26.

MESOTANE, $OH.C_6H_4.CO.OCH_2.OCH_3$, is obtained by treating sodium salicylate with mono-chlordimethyl ether, thus:—

$$OH.C_6H_4.CO_2Na + ClCH_2.O.CH_3 = NaCl + OH.C_6H_4.CO.OCH_2.OCH_3.$$

It forms a yellowish oily liquid, with a slight pleasant odour. It is insoluble in water. It is decomposed slowly by cold, and rapidly by boiling water, according to the equation—

$$OH.C_6H_4.CO.OCH_2.OCH_3 + H_2O = CH_2O + CH_3OH + OH.C_6H_4.COOH.$$

—J. O. B.

Formaldehyde. C. Goldschmidt. Chem.-Zeit., 1903, 27, [20], 218.

WHEN formaldehyde reacts on aromatic amines five classes of substances may be formed:—diphenylmethane derivatives; in presence of alcoholic potash, compounds of the type $CH_2(NH.C_6H_5)_2$; methylene derivatives; in presence of hydrochloric acid, anhydroaminobenzylalcohols, which are characterised by their easy solubility in cold chloroform and which may be used for making dyestuffs fast on cloth: with excess of formaldehyde in presence of hydrochloric acid or hydriodic acid, insoluble high molecular bases formed by condensation of 2 mols. of amine and 3 mols. of aldehyde.

Hydroxyaldehydes and hydroxyacids condense with formaldehyde in presence of hydrochloric acid. The action of aromatic ketones and oxy-ketones on formaldehyde is at present under investigation.—J. McC.

Formane. Répertoire de Pharm., 1903, 120. Chem. and Druggist, 1903, 62, [1208], 472.

FORMANE, or chloromenthyl methyl ether, $C_{10}H_{19}O.CH_2Cl$, is the condensation product of menthol and formaldehyde in presence of gaseous hydrochloric acid. When treated with warm water it readily decomposes into menthol, formaldehyde, and hydrochloric acid.—A. S.

Antipyrine; Action of Mercurous Nitrate and of the Neutral Mercuroso-mercuric Reagent on ——. A. Moulin. Bull. Soc. Chim., 1903, 29, [5], 201—203.

Mercurous Nitrate.—If antipyrine be treated with mercurous nitrate, both being dissolved in a saturated aqueous solution of potassium nitrate, *nitromercurate of antipyrine*, $C_{11}H_{12}N_2O(NO_3)_2Hg$, is precipitated in the form of crystalline colourless needles. After being recrystallised from boiling 60 per cent. alcohol, the product is sparingly soluble in water, but soluble in dilute nitric acid, sodium hydroxide, and ammonia; sulphuric acid also dissolves it with a red coloration.

Neutral Mercuroso mercuric Reagent.—This is prepared by dissolving 50 c.c. of mercury in a litre of a mixture of strong nitric acid and water in equal parts. To 100 c.c. of this solution 400 c.c. of saturated aqueous potassium nitrate solution are added, and the mixture is heated on the water-bath with excess of yellow mercuric oxide and filtered. When this reagent is added gradually to a solution of antipyrine, and the mixture heated on the water-bath, a yellowish-red crystalline precipitate is finally produced. From this precipitate three bodies have been isolated by extraction with nitric acid: *nitroso-mercurous antipyrine*, a red powder sparingly soluble in strong nitric acid, having the formula $C_{11}H_{12}N_2O(NO_2)_2Hg_2$; *nitroso-mercuric antipyrine*, a yellow crystalline powder soluble in nitric acid, having the formula $C_{11}H_{12}N_2O(NO_2)_2Hg$; and the *nitromercurate* described above.

The two nitroso compounds decompose with explosion when heated to 205° C.—J. F. B.

1-Phenyl-5-Methyl-3-Pyrazolone and its Derivatives; Preparation of ——. K. Mayer. Ber., 1903, 36, [717—718.

THE author finds that, by a slight modification of the method of Stolz, 3-pyrazolones can now be prepared with satisfactory yields as easily as the 5-pyrazolones. For the preparation of *1-phenyl-5-methyl-3-pyrazolone*, 15 grms. of monoacetylphenylhydrazine (or 21 grms. of the corresponding benzoyl compound) are mixed with 13 grms. of ethyl acetoacetate, and 14 grms. of phosphorus trichloride are then added, gradually, and with agitation. Vigorous reaction sets in with evolution of hydrochloric acid, necessitating frequent cooling. The syrupy product is finally poured into water. It is then dissolved in ammonia and the solution is filtered, the 3-pyrazolone being precipitated by neutralising with acid; yield 8—10 grms. The primary by-products of the reaction are water and ethyl acetate or benzoate.

1-Phenyl-5-methyl 3-pyrazolone, when heated at 205° C. with phosphorus oxychloride in a sealed tube, yields the corresponding 3-chlorpyrazole, a liquid boiling at 295° C., which can be readily methylated, and from which isoantipyrine and isothioantipyrine can be prepared.—J. F. B.

Terpene Series; Oxides in the ——. F. W. Semmler. Ber., 1903, 36, [4], 764—770.

DIHYDROCARVEOL, like terpineol, when oxidised with potassium permanganate, yields a trihydric alcohol or glycerol, $C_{10}H_{20}O_3$, *dihydroxydihydrocarveol*.

Such glycerols, on dehydration, may yield either a double unsaturated alcohol, an unsaturated oxide, or a ketone; terpineol-glycerol yields carvenone.

Dihydrocarveol-glycerol was dehydrated by adding it gradually to dilute sulphuric acid, through which a current of steam was maintained. The product obtained, $C_{10}H_{16}O$, was neither an alcohol nor a ketone, since metallic sodium had no action upon it. It is therefore regarded as an oxide, *dihydrocarvoxide*, which is unsaturated, and combines with two atoms of bromine by addition. It forms an additive compound with hydroxylamine, $C_{10}H_{19}NO_2$, which is a base melting at 113°—114° C. This base is split up on heating with alcoholic potash, first into a nitrile, and subsequently into a hydroxyacid, $C_{10}H_{18}O_3$.—J. F. B.

Bornylene. J. Kondakow. J. prakt. Chem., 1903, 67, [5 and 6], 280—281.

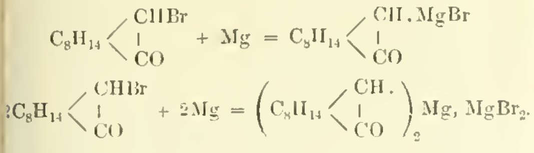
THE borneol ester of xanthogenic acid decomposes when heated, giving a hydrocarbon which has been described as bornylene. With hydrochloric acid in light petroleum solution it gives a hydrochloride which possesses the odour of camphor, melts at 123°—125° C., and has $[\alpha]_D$ = 36·4
On crystallising from petroleum it gave two kinds of crystals, one melting at 120°—122° C., and the other at 123°—124° C. From the behaviour on heating with water it is deduced that bornylene hydrochloride is not identical with pinene hydrochloride. When bornylene is boiled with alcoholic potassium hydroxide for 10 hours, there is apparently a partial change into camphene.

It has been proved also that the bornylene prepared from the xanthogenic ester is a mixture of bornylene and isobornylene (camphene).—J. McC.

Acetylcamphor Derivatives; General Method for Preparing ——. S. M. Malmgren. Chem.-Zeit., 1903, 27, 20 221.

WHEN magnesium bromocamphor is treated with the corresponding ester, acetyl, propionyl, or butyryl camphor is obtained.

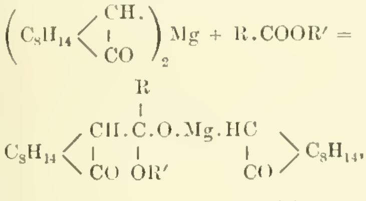
The action of magnesium on bromocamphor in ethereal olution takes place in the two following ways :—



$$C_8H_{14}\left\langle\begin{matrix}CHBr\\ |\\ CO\end{matrix}\right. + Mg = C_8H_{14}\left\langle\begin{matrix}CH.MgBr\\ |\\ CO\end{matrix}\right.$$

$$2C_8H_{14}\left\langle\begin{matrix}CHBr\\ |\\ CO\end{matrix}\right. + 2Mg = \left(C_8H_{14}\left\langle\begin{matrix}CH.\\ |\\ CO\end{matrix}\right.\right)_2 Mg,\ MgBr_2.$$

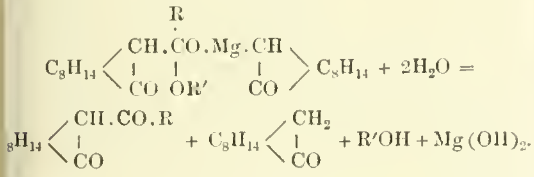
In presence of an ester the latter compound enters into ıe reaction :



$$\left(C_8H_{14}\left\langle\begin{matrix}CH.\\ |\\ CO\end{matrix}\right.\right)_2 Mg + R.COOR' =$$

$$C_8H_{14}\left\langle\begin{matrix} & R & \\ & | & \\ CH. & C.O.Mg. & HC\\ | & | & |\\ CO & OR' & CO\end{matrix}\right\rangle C_8H_{14},$$

ıd on treatment with ice water, to which some acid has ɜen added, hydrolysis takes place:



$$C_8H_{14}\left\langle\begin{matrix} & R & \\ & \cdot & \\ CH. & CO.Mg. & CH\\ | & | & |\\ CO & OR' & CO\end{matrix}\right\rangle C_8H_{14} + 2H_2O =$$

$${}_8H_{14}\left\langle\begin{matrix}CH.CO.R\\ |\\ CO\end{matrix}\right. + C_8H_{14}\left\langle\begin{matrix}CH_2\\ |\\ CO\end{matrix}\right. + R'OH + Mg(OH)_2.$$

The first magnesium bromocamphor also acts on the 'er to form an intermediate compound which forms an ɜyldicamphoryl carbinol on hydrolysis, which latter readily es water to form an ether.

The acetyl, propionyl, and butyryl camphors can be tilled under diminished pressure : acetyl camphor at 7° C. (11 mm.); propionyl camphor at 138·5° C. l mm.); butyryl camphor at 146° C. (12 mm.).

They are colourless oils, but soon assume a yellow our, and in the course of a few weeks they are transrmed into white amorphous solids.—J. McC.

tronella Oil ; Standards for ——. E. J. Parry and C. T. Bennett. Chem. and Druggist, 1903, **62**, [1206], 408.

E authors have previously (this Journal, 1903, 163) ıwn attention to the fact that a large amount of citronella adulterated with resin spirit is on the market. In view the fact that some of the samples of adulterated oil will uply with Schimmel's test, the authors have examined oples of pure citronella oil, pure oil mixed with resin it and petroleum spirit, and commercial adulterated oils. ey suggest the following standard for pure citronella :—

. The oil must dissolve either clear, or at most with slightest opalescence, in 10 vols. of 80 per cent. alcohol a 0° C.

. The first 10 per cent. obtained by distilling the oil ler reduced pressure (20—40 mm.) must have a sp. gr. below 0·858 and a refractive index at 20° C. not ow 1·4570.—A. S.

rejar Oil. Haensel's Quarterly Report, Jan. 1903, 11.

UDE Indian frejar oil gives, on rectification, a colourless ıpy oil with a characteristic odour. The rectified oil has t following constants. Sp. gr. 0·9097 at 15° C., $[\alpha]_D =$ 1′ at 20° C. Readily soluble in petroleum spirit, ether, c roform and absolute alcohol. Solubility in 96 per cent. a hol, 1 : 100. Since the oil is low in price, it is suggested t it may find useful application in perfuming soaps.

—J. O. B.

ugreek ; Essential Oil of ——. Haensel's Quarterly Report, Jan. 1903, 10.

T crushed seeds of *Trigonella fœnumgræcum*, yield only 0 14 per cent. of a light brown, neutral, volatile oil, possessing the distinct odour of the seeds. It has the sp. gr. 0·870 at 13·5° and the $[\alpha]_D = +8°$. It is readily soluble in absolute and 90 per cent. alcohol, but its solubility in 80 per cent. alcohol is only 1 : 460.—J. O. B.

Condurango ; Test for ——. R. Firbas. XXIII., page 143.

English Patent.

Vanillin and other Analogous Bodies ; Manufacture of ——. E. L. Froger Delapierre, Courbevoie, France. Eng. Pat. 4909, Feb. 26, 1902.

The oxidising action of air saturated with vapours of terpenes, sesiquiterpenes, or turpentine is utilised for the preparation of aldehydes from phenolic bodies, such as eugenol or safrol and their isomers.

For the production of vanillin a current of purified air is passed through oil of turpentine heated to 30°—35° C. ; it is then passed into an apparatus furnished with baffles, heated at 80°—90° C., and thence at a velocity of 125 litres per hour over a layer of iso-eugenol maintained at 100° C. The phenol may be held in plates of porous material or may be sprayed constantly over vertical glass plates.

—J. F. B.

Hydroxylamine ; Manufacture of ——. G. W. Johnson, London. From C. F. Boehringer und Söhne, Mannheim. Eng. Pat. 10,094, May 1, 1902.

See Fr. Pat. 318,978, 1902 ; this Journal, 1902, 1458.

—G. H. R.

United States Patents.

Alkali-caffeine-methylene Disalicylate. S. L. Summers, Philadelphia. U.S. Pat. 721,923, March 3, 1902.

An aqueous solution of an alkali salt of methylene disalicylic acid (see U.S. Pat. 716,591 of 1902 ; this Journal, 1903, 110) is heated with caffeine and the solution evaporated. White, somewhat deliquescent crystals separate out, soluble in water, moderately so in alcohol, insoluble in ether and benzene, having the formula $C_{15}H_{10}O_6(2R')C_8H_{10}N_4O_2$.—T. F. B.

Benzoic Acid Ester of Methylene Diguäiacol, and Process of Making same. S. L. Summers, Philadelphia. U.S. Pat. 721,924, March 3, 1903.

The benzoic acid ester of methylenediguaiacol is prepared by passing gaseous formaldehyde through a mixture of benzoic acid, guaiacol and phosphorus oxychloride dissolved in a suitable solvent ; the product is isolated from the mother liquor and washed.

The compound forms an amorphous, pea-green powder, having the empirical formula, $C_{24}H_{18}O_4$. soluble in acetic acid, hot alcohol, and ether, and insoluble in water. It has a melting point at about 54° C.—T. F. B.

Methylene Citric Acid ; Process of Making ——. R. Berendes, Elberfeld, Germany, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 722,275, March 10, 1903.

Methylene-citric acid is prepared by heating citric acid with chloromethylic alcohol.—J. F. B.

Sulphonic Acid Salt, and Process of Making same. L. O. Helmers, Assignor to Ichthyol Gesellsch. Cordes, Hermanni & Co., both of Hamburg, Germany. U.S. Pat. 722,506, March 10, 1903.

The sulphonic compound obtained by the action of sulphuric acid upon hydrocarbons free from sulphur is neutralised by a suitable base (*e.g.*, lime). The precipitate is removed by filtration and the filtrate is evaporated to dryness. The residue is dissolved in water, the sulphonic acid is liberated by precipitating the base, the solution is oxidised, the oxidised sulphonic acid is neutralised by a metallic easily reducible base (*e.g.*, silver oxide), and the solution is evaporated to dryness. The salts are obtained in the form of reddish-brown amorphous powders, giving permanent solutions in water and no coloration with ferric chloride (see also Eng. Pat. 6795 of 1901 ; this Journal, 1902, 364).—J. F. B.

Sulphonic Acid Salts of Alkaline Earthy Metals and Metals proper, and Process of Making same. L. O. Helmers, Assignor to Ichthyol Gesellsch. Cordes, Hermanni, & Co., both of Hamburg, Germany. U.S. Pat. 722,507, March 10, 1903.

In the preparation of the sulphonic acid salts specified in the preceding abstract, the oxidation may be effected directly upon the product of sulphonation before proceeding with the preparation of the salts.—J. F. B.

Still [Ether]. G. F. Ahlers, Covington, Ky., Assignor to Hoffman, Ahlers & Co., Cincinnati. U.S. Pat. 722,071, March 3, 1903.

A conduit leads from the top of the distilling vessel to the bottom of an alcohol condenser, and is connected by a valve-controlled conduit with the ether condenser, a water seal being arranged in the alcohol condenser to shut off communication between it and the distilling vessel, during the primary operation in which the ether is supplied to its separate condensing system. Means are also provided for supplying hot compressed air to the distilling vessel, for supplying water to, and draining water from the alcohol condenser, and for separately collecting the condensed ether and alcohol.—R. A.

French Patent.

Ammonium Ichthyol Sulphonate; Process for Making ——. A. C. McLaughlin. Fr. Pat. 323,021, July 15, 1902.

See Eng. Pat. 21,838, 1901; this Journal, 1902, 1553.
—T .F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Filter transmitting only Ultraviolet Light and its Use in Spectro-photography. R. W. Wood. Philos. Mag., 5, [6], 257—263. Chem. Centr., 1903, **1**, [10], 553.

Nitrosodimethylaniline has the property of absorbing the greater part of the visible spectrum, but allows of the transmission of the ultraviolet rays (beyond the H- and K-lines to the extreme cadmium lines). The rays of the visible spectrum (in the red, yellow, and green) which pass through can be removed by means of cobalt glass and suitable green glass. The author describes different methods of using the nitrosodimethylaniline (in gelatin, in glycerin solution, on glass or quartz plates, &c.). If a suitable combination be selected, the ultraviolet rays may be made to converge by means of a lens, and a crystal of uranium nitrate becomes luminous if placed in the focus. Reproductions are given in the original illustrating the manner in which this property of nitrosodimethylaniline may be applied in spectro-photography.—A. S.

Photography; Some Physical Considerations of ——. T. T. Baker. Photog. J., 1903, **43**, [2], 27.

When a photographic emulsion, of uniform chemical composition, is prepared in successive batches, the smaller those batches are the more does the finished material vary in its practical qualities. The greater similarity between the larger single batches depends on the fact that various secondary conditions affect each batch more seriously the smaller it is. These minor interfering causes include the specific heat of the gelatin, the specific heats of the salts used, their heats of combination, the capacity for heat of the vessel in which the emulsion is made, and the specific heat of the finished emulsion. The specific heat of gelatin is best determined by preparing a hot 5 or 10 per cent. solution and diluting it with cold water, in known proportion, in the calorimeter. Since the specific heat of a hard gelatin is generally greater than that of a soft material, if two brands of emulsion are to be made of the same sensitiveness, they must be "cooked" for different lengths of time according to the specific heats of the two gelatins employed.

The effect of the various heats of combination of the salts used in preparing an emulsion is comparatively small; but the effect of heat upon the sensitive salt itself is frequently apparent, especially in the case of silver chloride, and all such salts as change visibly on exposure. If silver chloride is emulsified with gelatin at a low temperature, the colour on exposure is redder than if a high temperature is employed; and, moreover, if exposed to the spectrum, the portion acted upon by the red rays is redder than that affected by the blue rays.

Silver chloride precipitated in presence of gelatin with *m* phenylenediamine hydrochloride becomes plum- or ruby-red on exposure, and is more sensitive than if lithium chloride is the precipitant; barium chloride yields a comparatively insensitive emulsion, which changes to a violet-brown on insolation; ethyl chloride gives about equal sensitiveness, and a yellowish-red image. Silver bromide prepared by precipitating an alcoholic solution of the nitrat with ethyl bromide deposits slowly, is fine in grain, and appears whiter than when ammonium bromide is th reagent; the latter yields a bromide which becomes greye on exposure. With uranium bromide, the silver salt becomes dark grey almost directly it is exposed, an darkens further very rapidly. Silver bromide precipitate with ammonium bromide yields very similar colours i treated with nitrous oxide.

A gelatino-citrate emulsion made at 27° C. gives a brick red print; at 32° a plum-red; and at 48° a bluish-re print on exposure. The temperature of emulsification als affects the colour of an exposed bromide emulsion. Unles the temperature during emulsification is raised above 27° C it is impossible to prepare a bromide emulsion having an rapidity; but such low temperature products give ver clear images, and might be useful for interference colou photography. Bromide, chloride, and citrate emulsions ar more sensitive at a high temperature of exposure than at low one.

Two strips of chloro-citrate emulsion paper, one with the other without, free silver nitrate, were exposed side b side under a set of red, green, and blue-violet light filters On examination the paper containing the silver nitrate w found to have given a reddish-violet image under the blu violet screen, a red under the red, and to have remained whi under the green; the paper with no free silver nitrate becam blue-violet under the blue, plum-red under the red, and lu a faint indefinite colour under the green. A gelatin bromide plate bathed in eosin solution, and exposed to t spectrum gives two maxima of sensitiveness; at E and a stained chloride plate gives two maxima at D $\frac{3}{4}$ E a F $\frac{1}{2}$ G, just under this latter maximum being the minimu of the bromide curve.

The author believes that the effect of exposure is produce compounds of the character $Ag_m Br_n$ or $Ag_m Cl$ where *m* is greater than *n*, but it is "absurd" to call two or four and *n* one after a change which is clearly mo physical than chemical.—F. H. L.

Platinum Wastes [Photography]; The Saving of —. A. J. Jarman. Wilson's Photog. Mag. **40**, 3; throu Photog. J., 1903, **43**, [2], 61.

When working the "platinotype" process, old oxal developers, the first acid clearing baths, and all soluti liable to contain platinum should be collected in a large ves containing 5 or 6 lb. of scrap zinc for every 6 or 8 gall (American) capacity. After a time the deposit of iron a platinum is separated by filtration and worked up. T author states that the first acid bath contains m platinum than the spent developing solution.—F. H. L.

English Patents.

Photographic Films; Manufacture of ——. Soc. An des Produits Photographiques. Asnières, France. F Pat. 23,551, Nov. 20, 1901. (Under Internat. Co., May 3, 1901.)

See U.S. Pat. 717,793 of 1903; this Journal, 1903, 164
—T. F.

Photographic Emulsion. Y. Schwartz, Hanover. Eng. Pat. 9993, April 30, 1902.

See Fr. Pat. 320,151 of 1902; this Journal, 1903, 44.
T. F.

Photographs on Post-Cards, &c.; Apparatus and Process for the Rapid Production of ——. H. Lauterbach, Cologne-on-Rhine. Eng. Pat. 25,942, Nov. 25, 1902.

The negative, preferably developed in a solution consisting of hydroquinone, 150 grms.; potassium metabisulphite, 300 grms.; potass. bromide, 18 grms.; water, 5,000 grms., and fixed in a solution containing 2 kilos. of "fixing sodium," and 100 grms. of potassium metabisulphite in 5 kilos. of water s inserted in the wet state in a projecting camera fitted on a baseboard which carries a holder for the post-card; the positive image is developed in a bath consisting preferably of metol, 50 grms.; sodium sulphite, 500 grms.; potash, 250 grms.; potassium bromide, 12 grms.; water, 5 kilos.

Another apparatus consists of a chamber containing a ource of light and an inclined reflector so arranged that he light can, at will, be thrown through a hole in one of the walls of the chamber on to the glass top of a second adjoining chamber. The glass top of this second chamber is inished off so as to form a cell to contain water, the negative and post-card being laid on the glass top so as to ntercept the light as it passes through the glass.

A third process consists in developing the negative, preferably in the solution described above, and, without ixing, hardening it in a solution of acetic acid (about 5 per ent.), and then immersing both the unfixed negative and post-card in a solution of alcohol (about 5 per cent.); the post-card and negative are now pressed together, exposed o light, and developed preferably in the solution mentioned n the first process.

The last process may be varied by omitting the acetic cid and alcohol treatments, and merely interposing a mica late between the unfixed negative and the post-card and hen exposing to "an electric light in a transparent celluloid acking."—T. F. B.

French Patent.

Photographic Plates in Daylight; Process for Developing ——. J. N. Ludwig. Addition, dated June 24, 1902, to Fr. Pat. 318,193, Jan. 29, 1902; this Journal, 1902, 1412.

The claim is revised so as to embrace any material which to receive a photographic image; the material is uniformly oloured by some substance which absorbs actinic rays, and hich can be removed from the material by washing. (See lso Eng. Pat. 3023, 1902; this Journal, 1902, 639.)
—T. F. B.

Printing Plates; Process for Preparation of ——. B. Gisevius. Fr. Pat. 323,023, July 15, 1902.

PLATE of metal or other material is coated with a layer of substance which has been rendered insoluble by exposure nder water to light (*e.g.*, bichromated gum). It is now xposed under the negative or design, and developed. It is hen coated with a second layer of substance made insoluble y light (preferably albumin containing a chromium salt). his layer is covered with a film of ink or colouring atter containing grease, and the superfluous albumin and um removed by means of dilute acid, which does not touch bumin which is in contact with the metal. Thus a coloured yer of albumin in the form of the original design is left on e plate.

Asphaltum is used, among other things, for colouring the bumin before the acid treatment.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

itrogen in Nitrates and Nitric Esters [Nitroglycerin]; Determination of ——. A. Wohl and O. Poppenberg. XXIII., page 442.

English Patents.

xplosives, Celluloid and the like; Impts. relating to the Manufacture of ——. R. Robertson and W. Rintoul, Waltham Abbey, Essex. Eng. Pat. 25,994, Dec. 19, 1901.

process for the recovery of acetone used as a solvent in e manufacture of explosives, &c., and which exists in the drying stoves in a state of comparatively great attenuation, mixed with air. After being saturated with moisture, the vapour from the stoves is led into a special scrubbing tower (this Journal, 1903, 85), through which a 30 per cent. solution of sodium bisulphite trickles. The acetone so absorbed is recovered from the bisulphite solution by direct distillation and condensation, without the addition of alkali, as practically all the acetone distils over before the bisulphite begins to decompose, and the latter can therefore be utilised again. On cooling the solution any sulphate formed crystallises out.—G. W. McD.

Smokeless Powder Grains; Improvements in ——, *and in Cartridges and Charges especially adapted for use in Large Guns, and in Methods of making the same.* H. Maxim, Brooklyn, U.S.A. Eng. Pat. 9481, April 24, 1902.

A process for making smokeless powder which consists in forming the material into rods or bars suitable for powder grains, while in the plastic state, then evaporating a portion of the contained solvent, and then piercing the rods or bars with perforations. The material is perforated from opposite sides to a depth which will leave such a thickness of material between the bottoms of the perforations, as will just be burned through before the projectile leaves the gun. The material between the bottom of opposite holes should be the same thickness as that between the sides of adjoining holes. The cartridge case is filled with such rods or bars, having rounded edges, of varying cross-sectional dimensions, but perforated in such a manner as to effect the simultaneous consumption of all parts of the charge. (See also this Journal, 1901, 1141.)—G. W. McD.

Detonation of High Explosives. F. M. Hale, London, and G. W. Bell, Ipswich. Eng. Pat. 13,348, June 12, 1902.

Picrate of lead, prepared by neutralising picric acid with lead carbonate, is used as a detonating agent for wet guncotton, lyddite, &c. It is stated to be non-sensitive to shock, friction, and concussion, but is detonated by a percussion cap.—G. W. McD.

Detonating Compositions. J. Führer, Vienna. Eng. Pat. 24,812, Nov. 12, 1902.

A substitute for fulminate consisting of potassium nitrate (45·5), potassium bicarbonate (30), sulphur (16), and aluminium (8·5). To be effective, the composition must be enclosed in an air-tight chamber, and is ignited by a slow-burning agent such as black powder. The compound is compressed to a density between one and two, and is used either in the granulated form, or in plates or wafers some 2 mm. thick.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Ammonia in Water; Diaminophenol as a Reagent for Traces of ——. Manget and Marion. Annales de Chim. Analyt., **8**, [3], 83.

Diaminophenol, known commercially as "amidol," affords a very sensitive reagent for the detection of free ammonia, so that its solution may be usefully substituted for "Nessler's reagent" for the colorimetric determination of ammonia in drinking water. It is said to be definitely more sensitive than "Nessler's reagent," the tint given by a dilution of free ammonia 1 : 1,000,000 being very marked, and the colour reaction distinct in even higher dilution.
—J. O. B.

INORGANIC—QUANTITATIVE.

Ferrocyanide of Potassium; Analysis of ——. W. Kielbasinski. Zeits. f. Farben- u. Textil-Chem., 1903, **2**, [6], 114—115.

In the titration of potassium ferrocyanide with potassium bichromate, or with potassium permanganate, using ferric chloride as indicator, some difficulty is experienced in observing the final reaction. The author, therefore, proposes to perform the titration with N/10 potassium permanganate solution with addition of indigo sulphonic acid as indicator. The disappearance of the green coloration of the solution marks the end of the reaction. The permanganate used for the oxidation of the indigo sulphonic acid has to be determined previously to the titration, and is to be taken into consideration in the calculation.—E. N.

Bismuth; Influence of ——, in the Determination of Silver by the Crucible Test. K. Sander. Berg- u. Hüttenmänn.-Zeit., **62**, 81. Chem.-Zeit., **27**, [19], Rep. 54.

Contrary to previously expressed opinions, the author finds that the presence of bismuth has no influence on the results of the silver determination, the average loss of silver being 3·17 per cent. with bismuth and 3·27 per cent. without. To determine bismuth in lead ores, he fuses 20 grms. in an iron crucible, precipitates the lead, from nitric acid solution, with sulphuric acid, treating the filtrate with ammonia, dissolving the precipitate (lead and bismuth) in a minimum of hydrochloric acid, and diluting with water. On cupellation, the bismuth is revealed as a circular brown spot under the silver button.—C. S.

Phosphoric Acid in Manures: Determination of the Available ——. W. F. Sutherst. Analyst, 1903, **28**, [324], 66—71.

For the estimation of the available phosphoric acid in manures, the author has compared the solvent action of the acid potassium salts of certain organic acids with that of the standard reagent, citric acid (1 per cent. solution), in view of the fact that the former bodies more nearly represent the acid constituents of the root-sap of growing plants than the latter. Potassium binoxalate, bitartrate and bimalate were thus investigated. One grm. of various phosphate materials was digested with a quantity of the potassium salts, equivalent in acidity to 1 grm. of citric acid and dissolved in 100 c.c. of water (except the bitartrate for which 300 c.c. of water were required). The dissolved phosphoric acid was then determined. Potassium binoxalate and bitartrate yielded results practically identical with those obtained with citric acid, whilst the bimalate showed a very much weaker solvent action. Further, since the phosphates of the soil are continually subjected to the action of fresh quantities of root-sap, owing to transpiration, the author studied the result of repeating the digestion of the same quantity of fertiliser with fresh quantities of 1 per cent. citric acid. It was found that each subsequent digestion effected the extraction of gradually decreasing quantities of phosphoric acid until the whole was exhausted. He concludes that the whole of the phosphoric acid in fertilisers is available for plant food, but that in some it is more readily assimilable than in others, as is indicated by the quantity extracted in the first digestion.
—J. F. B.

Nitrogen; Determination of ——, in Nitrates and Nitric Esters. A. Wohl and O. Poppenberg. Ber., **36**, [4], 676—684.

Schlösing's method requires a very long time, especially with "gelatinised" explosives, and cannot be used with powders containing nitroglycerin on account of the volatility of the latter. Lunge's nitrometer requires a considerable quantity of mercury, and the stopcock readily becomes blocked when introducing those substances which swell on mixing with sulphuric acid; while in Lubarsch's modification of Lunge's apparatus any carbon dioxide or monoxide, evolved by the action of the acid on carbonates, or on easily decomposable organic compounds, is measured as nitric oxide. The author utilises Crum's reaction, but carries out the process in the manner described in his former paper on gas analysis (this Journal, 1902, 1413). The flask is globular, approximately 100 c.c. in capacity, neck 6 cm. long and 16 mm. diameter. It is closed by a ground hollow stopper carrying a narrow tube and stopcock, the latter grooved in the key so as to facilitate very gradual opening. The clearway through the tube and stopcock bore is 3 mm., and the length from inner end of stopcock bore to open end of tube is 59 mm., so that the pressure due to the contained column of sulphuric acid is equivalent to that of 8 mm. of mercury (*h, loc. cit.*). To carry out a determination, place the weighed substance in the flask, pour over it 10 c.c. of strong sulphuric acid, and shake till dissolved. (Inorganic and organic nitrates, collodion, guncotton, nitroglycerin, &c. With substances that do not readily dissolve, leave them overnight with the acid, or raise the temperature to 50° C. If any substances are present that will react with

Table I.

Correction to be applied for Variation of the Amount of Substance from the Normal Weight.

Variation from Normal Weight.	10 per Cent.	10·5 per Cent.	11 per Cent.	11·5 per Cent.	12 per Cent.	12·5 per Cent.	13 per Cent.	13·5 per Cent.	14 per Cent	14·5 per Cent.	15 per Cent.
Mgrm.											
1	0·032	0·034	0·035	0·037	0·039	0·04	0·04	0·04	0·05	0·05	0·05
2	0·064	0·068	0·071	0·074	0·078	0·08	0·08	0·09	0·09	0·10	0·11
3	0·096	0·102	0·107	0·111	0·116	0·12	0·13	0·13	0·13	0·15	0·16
4	0·128	0·136	0·142	0·148	0·155	0·16	0·17	0·17	0·18	0·19	0·21
5	0·160	0·170	0·178	0·186	0·194	0·20	0·21	0·21	0·22	0·24	0·26
6	0·192	0·204	0·213	0·223	0·232	0·24	0·25	0·26	0·27	0·29	0·32
7	0·225	0·238	0·249	0·260	0·271	0·28	0·29	0·31	0·32	0·34	0·37
8	0·257	0·272	0·285	0·298	0·310	0·32	0·34	0·35	0·36	0·39	0·42
9	0·289	0·306	0·320	0·335	0·349	0·36	0·38	0·39	0·41	0·44	0·48
10	0·320	0·340	0·355	0·372	0·388	0·40	0·42	0·43	0·45	0·49	0·53

Table II.

Correction to be applied for Variation of Temperature from 20° C.

Variation from 20° C.	10 per Cent.	11 per Cent.	12 per Cent.	13 per Cent.	14 per Cent.	15 per Cent.	16 per Cent.
0·5	0·017	0·018	0·021	0·022	0·024	0·026	0·028
1·0°	0·034	0·037	0·041	0·044	0·048	0·051	0·055
1·5°	0·051	0·056	0·062	0·066	0·072	0·077	0·082
2·0	0·068	0·075	0·082	0·088	0·096	0·102	0·109
2·5	0·085	0·094	0·103	0·111	0·120	0·128	0·137
3·0	0·102	0·113	0·123	0·133	0·143	0·154	0·164
3·5°	0·119	0·131	0·144	0·155	0·167	0·179	0·191
4·0	0·136	0·151	0·164	0·178	0·191	0·205	0·218
4·5	0·153	0·170	0·185	0·200	0·215	0·230	0·246
5·0°	0·170	0·110	0·205	0·222	0·240	0·256	0·272

nitrous acid and form oximes, add 0·1—0·2 grm. of chromic acid.)

Connect the flask, upright, to the pump, and exhaust, best always to a constant pressure, say, 700 mm. on the manometer. (Experiments have shown that no nitric oxide is ever contained in the air thus extracted from the flask; if any is formed, it is oxidised during the shaking, and dissolved in the acid.) Now fill the capillary tube with mercury, and introduce 10 c.c. of mercury into the flask; shake violently for one or two minutes, and then cool in water to the room temperature. Connect the inverted flask with the manometer (see diagram, *loc. cit.*), and exhaust till the whole of the mercury is removed and the level of the acid has sunk to the inner end of the stopcock bore, and read the pressure.

If p_1 and p_2 be the manometer readings before and after the reaction, $B-p$ is the pressure of the $(100-10=)$ 90 c.c. of air in the flask at the beginning; the nitrogen from this, therefore, at the end, expanded to 100 c.c., exerts a pressure of $0{\cdot}79 \times 0{\cdot}9\ (B-p) = 0{\cdot}7\ (B-p)$. The total pressure at the end is $B-(p_2+h)$, h being the mercury-equivalent of the acid in the capillary of the flask, and the partial pressure of the nitrogen dioxide is, therefore, $B-(p_2+h)-0{\cdot}7\ (B-p_1)$, which if p_1 be always 700, becomes $700+0{\cdot}3\ (B-700)-(p_2+h)$. To facilitate calculation, a "normal weight" of the substance is used:—0·3004 grm. of nitrogen dioxide, corresponding to 0·1404 grm. of nitrogen, would occupy at 20° C. and 1000 mm. pressure, 183·1 c.c., so that, working at 20° C., if the volume of the flask be 183·1 c.c., the pressure of the gas from 0·1104 grm. of the substance, expressed in cm., will read the percentage of nitrogen in the substance. The corresponding weight of substance for the flask of volume v c.c. is, of course, $\frac{v}{183{\cdot}1}\ (0{\cdot}1404)$ grm. The corrections for the volume of sulphuric acid wetting the drained flask, and for the absorption of nitrogen dioxide by the sulphuric acid used, are conveniently expressed as affecting the volume of the flask:—Say that the calibration of the flask has given its volume as 100·7 c.c. The dried tared flask is weighed again after introducing and sucking out sulphuric acid, and the volume of the remaining acid thus determined once for all—say, 0·79 grm. = 0·43 c.c. Sulphuric acid absorbs 0·35 c.c. of nitrogen dioxide per 10 c.c. Hence the *effective* volume of the flask is $100{\cdot}7 - 0{\cdot}43 + 0{\cdot}35 = 100{\cdot}62$ c.c., and the weight of substance to be used $\frac{100{\cdot}62}{183{\cdot}1} \times 0{\cdot}1404 = 0{\cdot}0772$ grm. In practice, to get convenient readings, four times this quantity is taken, and the result divided by four; moreover, the author weighs off the substance accurately when he has adjusted the amount to within a centigramme of the "normal," and corrects by the first of the two following tables for the variation from the normal weight. The second table is used to correct for variation of temperature from 20° C. In both tables, the variation and the consequent correction of the percentage have opposite signs.

A number of test analyses are given which show close concordance with the theoretical numbers where these are available, and with the results by Schlösing's method and by Lunge's nitrometer.—J. T. D.

ORGANIC—QUALITATIVE.

Wine; Detection of Impure Glucose in ——. F. Wirthle. Chem.-Zeit., 1903, 27, [22], 246—247.

The detection of the employment of impure glucose for the fortification of wine is based on the presence of a residue of unfermentable dextrins. Honig has recently shown that the unfermentable matter of starch glucose consists not of isomaltose but of dextrins soluble in alcohol (see this Journal, 1902, 1100). The most convenient procedure is to apply Nessler's method of polarisation. For this purpose 210 c.c. of wine are evaporated down to 5 c.c. after the addition of a few drops of a 20 per cent. solution of potassium acetate. To the residue are added 200 c.c. of 90 per cent. (by vol.) alcohol. On the following day the solution is filtered and the filtrate is evaporated to 10 c.c., a little water being added towards the end of the operation. The residue is treated with 1 grm. of animal charcoal and filtered, the charcoal being washed until the filtrate measures 30 c.c. This solution is then polarised and the cupric reducing power is determined volumetrically; if the dextro-rotation exceed that corresponding to the glucose found, the employment of impure starch glucose may be inferred. Since the use of both cane-sugar and starch-glucose in the same wine is highly improbable, the above procedure is generally sufficient. The conclusion may, however, be confirmed by gravimetric determinations of the reducing sugar after inversion of any possible cane-sugar and after saccharification of the dextrins. For this purpose 300 c.c. of wine are evaporated to about 100 c.c., 10 c.c. of basic lead acetate are added, and the volume is made up to 150 c.c.; 100 c.c. of the filtrate are treated with excess of sodium phosphate, made up to 200 c.c. and filtered the next day. Inversion and saccharification are carried out in the standard manner by hydrochloric acid upon two lots of 75 c.c. each of the filtrate, and the difference in the glucose found is calculated as dextrin.—J. F. B.

Condurango; Test for ——. R. Firbas. Oesterr.-Zeits., 41, 57. Pharm. J., 1903, 70, [1708], 417.

The fluid extract is freed from alcohol by gently warming, and the crude glucoside, condurangin, is precipitated by the addition of a saturated solution of sodium chloride. The precipitate is exhausted with chloroform, and the extract treated with a mixture of equal volumes of sulphuric or hydrochloric acid and alcohol (Lafon's reaction). On warming, the mixture acquires a green colour which changes to greenish blue on the addition of a trace of ferric chloride. The reaction is also given by adonidin, oleandrin, sapotoxin, and digitoxin, but none of these is likely to be present with condurangin.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Fluorine; Solidification of ——, and Combination of Solid Fluorine with Liquid Hydrogen. H. Moissan and J. Dewar. Comptes rend., 136, [11], 641—643.

By sealing up dry gaseous fluorine in glass tubes and immersing these in liquid hydrogen, the authors have succeeded in first liquefying and then solidifying the fluorine. The melting point of solid fluorine is above that of solid oxygen, and is estimated by the authors at − 223° C. (40° abs. zero). The solid fluorine, which is yellow near its melting point, becomes white when cooled to − 252°·5 C. (20°·5 abs. zero). A tube with a capillary end, containing 40 c.c. of fluorine gas, was cooled in liquid hydrogen to − 252°·5 C., when the fluorine solidified in the capillary end. On now breaking this off, so as to bring the solid fluorine into contact with the liquid hydrogen, a violent explosion occurred, which shattered the glass containing-vessels, and the heat evolved was so great that the excess of hydrogen took fire in the air. It is thus proved that, whatever may be the case at the absolute zero, chemical affinities are by no means extinguished at temperatures within 20° of abs. zero of that point.—J. T. D.

Phosphorus; Heat of Transformation of White into Red ——. H. Giran. Comptes rend., 136, [11] 677—680.

The generally admitted figure (19·2 cal.) for this transformation does not appear to rest on any verifiable authority, and is very different from the figure (1·9 cal.) in the corresponding case of arsenic. From thermodynamical considerations, applying Clapeyron's formula to Troost and Hautefeuille's results, the author calculates 3·71 cal. instead of 19·2; and two methods of experimental determination—the combustion of the two varieties of phosphorus in oxygen, and their solution in bromine—have confirmed this, giving respectively 3·70 and 4·22 cal. Incidentally he has ascertained that the change from red amorphous phosphorus to violet crystalline phosphorus evolves 0·5 cal., so that these two forms are really distinct.—J. T. D.

Plumbic Acid; Combinations of ——, with Organic Acids. A. Colson. Comptes rend., **136**, [11], 675—677.

Finely-powdered red lead was kept for some hours agitated with 10—12 times its weight of glacial acetic acid, first at the ordinary temperature, then at 35° C. The liquid, filtered and cooled to 12° C., deposited white needle-like crystals, the analysis of which gave figures corresponding with the formula $Pb(C_2H_3O_2)_4$. They are decomposed by water, forming lead peroxide and acetic acid. Similar compounds are formed by propionic and the two butyric acids.—J. T. D.

Gold; Precipitation of Metallic ——, in a Crystalline Condition by means of Formaldehyde. N. Awerkijeff. J. russ. phys.-chem. Ges., **34**, 828—835. Chem. Centr., 1903, **1**, [10], 562.

The gold chloride solution used must contain at least 0·05 per cent. of gold and must be strongly acidified with nitric or hydrochloric acid: under these conditions the gold is completely precipitated by commercial formaldehyde (about 10 c.c. to 300 c.c. of the solution). The reaction is accelerated by warming. Gold bromide does not give such good results. Gold can be quantitatively separated by this means from salts of copper, antimony, mercury, zinc, lead, manganese, tin, arsenic, and of metals of the first and second groups. Platinum is precipitated, but so slowly that a separation from gold is possible. The precipitated gold forms crystals of a size of 0·2—0·9 mm., mostly a combination of octahedron and cube; its specific gravity is 19·43095. Iron in neutral solution is also precipitated in a crystalline form by formaldehyde.—A. S.

Reduction of Potassium Bichromate by Sulphurous Acid; Mechanism of the ——. H. Bassett, junr. Proc. Chem. Soc., **19**, [262], 54.

Berthier, who investigated the action of sulphur dioxide on solutions of potassium bichromate and potassium chromate (*Ann. Chim. Phys.*, 1843, [iii], 7, 77), stated that in both cases a mixture of sulphate and dithionate was formed.

The reaction has now been studied more fully, and the results show that 94—95 per cent. of sulphate and 5—6 per cent. of dithionate are formed, when potassium bichromate, potassium chromate, or chromic acid is reduced by sulphurous acid; the amount of dithionate produced being independent of the temperature.

English Patent.

Fire-extinguishing Powder; Improved Manufacture of ——. B. Vorwerk, Berlin. Eng. Pat. 1312, Jan. 19, 1903.

Sodium carbonate or bicarbonate is intimately mixed with small proportions of lime, clay, and oxides of iron and manganese, and the mixture is exposed in thin layers to a temperature of 40° C. for at least 20 hours.—E. S.

New Books.

The Principles of Dyeing. By G. S. Fraps, Ph.D., Assistant Professor of Chemistry, North Carolina College of Agriculture and Mechanic Arts. The Macmillan Co., New York, U.S.A. Macmillan and Co., Ltd., London. Price 7*s.* nett.

This volume contains 263 pages of subject matter, with 22 illustrations, and an alphabetical index. The matter is subdivided and treated under the following heads:—I. Introduction. General Laws; Fibres, &c. II. Congo Red. Primuline. III. Fuchsine. IV. Biebrich Scarlet. Alkali Blue. V. Logwood. VI. Indigo. Chrome Yellow. VII. Vegetable Fibres. Cotton. VIII. Linen, &c. IX. Animal Fibres. Wool. X. Silk. XI. Operations Preliminary to Dyeing. Bleaching Cotton and Linen XII. Wool and Silk Scouring and Bleaching. XIII. Dyeing Machinery and Manipulations. XIV. General Observations on Dyeing. XV. Direct Cotton Colours. XVI. Basic Colours. XVII. Acid Colours. XVIII. Mordant Dyestuffs. XIX. Insoluble Colours. XX. Mercerisation. Artificial Silk. XXI. Dyeing of Union Goods. XXII. Dye Mixing. Dye Testing.

Technical Mycology: The Utilisation of Micro-organisms in the Arts and Manufactures. A Practical Handbook on Fermentation and Fermentative Processes for the Use of Brewers and Distillers, Analysts, Technical and Agricultural Chemists, Pharmacists, and all interested in the Industries dependent on Fermentation. By Dr. Franz Lafar, Professor of Fermentation-Physiology and Bacteriology in the Imperial Technical High School, Vienna. Translated by Charles T. C. Salter. Vol. II. Eumycetic Fermentation. Part I. Charles Griffin and Company, Ltd., Exeter Street, Strand, London. 1903. Price 7*s.* 6*d.*

This is the 2nd volume of the work, which appeared in 1898, in its 1st volume, and forms an 8vo volume, containing 189 pages of subject-matter, with 68 illustrations (see this Journal, 1898, 504). The general subject is dealt with under the following subdivisions:—X. Rudiments of the General Morphology and Physiology of the Eumycetes. XI. Fermentation by Zygomycetes. XII. Form, Structure, and Chemical Composition of the Yeast Cell.

Trade Report.

I.—GENERAL.

Pharmacy Bill.

In Parliament.—Session 1903.

The objects of this Bill are—

(*a*) To check the modern and growing practice on the part of a duly qualified person to open and carry on divers shops for the sale of poisons whereby adequate protection is not afforded to the persons frequenting the same, by providing that every such shop shall be under the *boná fide* personal conduct and supervision of a duly qualified person:

(*b*) To put an end to the abuses at present attending the hawking of poisons, and to better regulate the sale of the same by providing that no poison shall be sold except in a shop which shall first have been duly registered:

(*c*) To provide for the maintenance of a register of shops where poisons may be sold, and also a register of the duly qualified chemists *boná fide* conducting each such shop, and to enable the registrar from time to time to make corrections in and additions to the same:

(*d*) To provide that the compounding of prescriptions shall be in the hands only of persons duly qualified to sell "poisons":

(*e*) To require that companies keeping open shops for the sale of poisons shall be managed by duly qualified chemists as directors:

(*f*) To extend to corporate bodies certain of the provisions of the Pharmacy Acts, 1852 and 1868, from which they are at present exempt by reason of the decision of the House of Lords in the case "The Pharmaceutical Society *v.* The London and Provincial Supply Association, Limited" (Law Reports, 1880, Appeal Cases, 857):

(*g*) To facilitate the examination of persons desiring to qualify as chemists and druggists, and to enable the Pharmaceutical Society to accept certain certificates of kindred bodies in lieu of examination.

Cork in Italy.

Foreign Office Annual Series, No. 2936.

Sardinia and Sicily alone produce the greater part Italian cork. The Calabrian forests have been almost ntirely destroyed, the trees having been burnt for charoal, and even Sicily imports a considerable quantity of cork oth at Trapani and Marsala, and exports it from Catani.

The trees may be reckoned to produce 13 lb. at 30 years f age, 53 lb. at 50 years, and at 90 years as much as a undredweight. If, therefore, a tree is stripped every even years, a better interval than five years, there would e a crop of bark from the same tree 10 times between the ges of 30 and 93, that is to say, on the average the tree ould produce 6 cwts. of cork in 60 years. The trees will roduce cork in continually increasing quantity until they re over 200 years old.

In the year 1830 nearly all the cork used in the United Kingdom came from Italy, but since then the destruction f the cork woods has caused us to seek other markets. The two principal causes of the destruction have been the naking of the trees into charcoal, and their destruction y fire to produce potash, of which the wood contains a arge proportion.

Large forests containing a majority of cork trees are ontinually being released from the forest laws, and there s a great risk that the production of cork in Italy will oon be a thing of the past. In these days, when vast uantities of cork are used in the making of linoleum and in hipbuilding, its supply is a matter of primary importance. The great desideratum for the trees is land which contains otash, and the volcanic soil of Italy contains this in large uantities; so that land if not otherwise suitable might be repared by manuring it with volcanic ash.

Nothing yet known can replace cork. The linoleum ndustry is closely associated with the cork trade. There re some 50 manufactories, of which 30 are in the United Kingdom, employing 2,500 hands with a capital of over 1,000,000*l.*, 10 in Germany, nine in the U.S.A., and one n Italy. The value of the linoleum exported from the United Kingdom in 1899 amounted to 1,200,000*l.*

British India Valuation Tariff.

See Bd. of Trade J., March 19, 1903, 585.

II.—FUEL, GAS, AND LIGHT.

Alcohol; Power Use of ——, in Austria.

Engineer, March 6, 1903.

A Government Commission has been appointed to study the whole question of the utilisation of alcohol for industrial purposes, and is to create a commercial organisation for the supply of spirit at a low and uniform price throughout Austria. The international exhibition of apparatus for consuming alcohol and the like, which was to have been held in Vienna this year, is postponed to the early summer —May to July—of 1904, and the Government has promised a contribution of 150,000 kronen towards the expenses. (See also this Journal, 1903, 356.)—A. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Sales; London Quarterly ——.

Chem. Trade J., March 28, 1903.

Messrs. Millward and Co. report as follows, under date March 23 :—

The final distribution of the new crop from Calcutta, in comparison with last season, is given as follows :—

——	1902-3.	1901-2.
	Chests.	Chests.
United Kingdom	2,800	6,714
Germany	1,000	3,613
France	600	1,873
Italy	500	676
Russia	500	981
America	2,500	3,154
Suez Ports	1,300	3,092
Japan	1,500	854
Total	10,700	20,957

Deliveries from London from January 1 to March 18 were 1,723 chests, against 1,486 chests, whilst stocks in London on March 19 were 5,446 chests, against 7,583 chests. The statistical position is unprecedentedly strong, and, notwithstanding the competition of artificial colours, prices are steadily hardening.

VII.—ACIDS, ALKALIS, Etc.

Copper Sulphate in Italy.

Foreign Office Annual Series, No. 2935.

Several manufactories of sulphate of copper have been started in Italy, and there is an important one at Padua. British, German, and American sulphates are also imported. Although foreign sellers claim their sulphates to be 98 to 99 per cent , they cannot compare with the British products of the best marks. Competition with the foreign produce could, therefore, be easily overcome by selling small shipments to the agricultural committees ("Comizi Agrari") through some responsible person on the spot. Agriculturists frequently object to buy from local merchants who naturally want to dispose of their sulphates at higher prices. The quotations should, as far as possible, be moderate and firm, samples forwarded in time, through the representative, to all the "Comizi Agrari" in the different districts, giving prices in francs f.o.b. at Italian ports, offering to send them trial lots, and granting credit, if necessary, as the "Comizi" are corporate bodies.

Lead Waste: U.S. Customs Decision.

On February 19 the Board of General Appraisers considered the dutiable character of a substance described as lead waste. This consists of the impure sulphate of lead formed on the walls of sulphuric acid chambers, and had been assessed for duty at $2\frac{1}{8}$ c. per pound as lead dross, under paragraph 182 of the Tariff Act. The Board decided the article to be in fact waste, and as such dutiable at 10 per cent. *ad valorem* under paragraph 463.—R. W. M.

Potassium Cyanide: U.S. Customs Decision.

The Board of General Appraisers, March 4, 1903, held that a certain chemical, consisting of cyanide of potash, 26·95 per cent., sulphide of potash, 4·29 per cent., and common salt, 68·76 per cent., could not be considered commercial potassium cyanide and dutiable as such at $12\frac{1}{2}$ per cent. *ad valorem* under paragraph 66 of the Tariff Act of 1897. They accordingly affirmed the assessment of duty at 25 per cent. *ad valorem* as a chemical salt under paragraph 3.—R. W. M.

Barium Carbonate: U.S. Customs Decision.

The United States Circuit Court has decided that barium carbonate prepared by precipitation is free of duty under paragraph 489 of the Tariff Act. This decision reverses the action of the Board of General Appraisers, who held that the above paragraph which reads "baryta, carbonate of, or witherite," covered only witherite, the native carbonate of baryta, and had assessed duty at 25 per cent. *ad valorem* as a chemical salt under paragraph 3.—R. W. M.

IX.—BUILDING MATERIALS, Etc.

Mineral Substances: U.S. Customs Decision.

On March 10, the Board of General Appraisers decided the dutiable character of certain mineral substances as follows :—

Ground feldspar assessed for duty at 35 per cent. *ad valorem* under paragraph 97, to be dutiable at 20 per cent. *ad valorem* under section 6 as a manufactured article unenumerated.

Ground Cornish stone assessed for duty at 35 per cent. *ad valorem* under paragraph 97, and held also to be dutiable at 20 per cent. *ad valorem* under section 6.—R. W. M.

Asphalt. U.S. Customs Decision.

The Board of General Appraisers, on February 9, 1903, rendered a decision on imported asphalt which had been assessed for duty at 3 dols. per ton under paragraph 93 of the Tariff Act, as "crude asphalt advanced in value by drying," and was claimed by the importers to be dutiable under the same paragraph at 1 dol. and 50 cents. per ton.

An analysis of the sample showed the presence of 18·10 per cent. of water, and the evidence also showed that no manipulation in the way of drying, either by artificial or solar heat, had been done since the material was taken from the bed. Accordingly the claim of the importer was sustained. This case was of particular interest, as the definition of crude asphalt in the Tariff Act requires it to be "crude, not dried, or otherwise advanced in any manner." Some drying must take place by ordinary evaporation between the time of mining and arrival at destination, but from the above decision it is evident that such drying is not considered sufficient to incur the higher rate of duty.
—R. W. M.

X.—*METALLURGY.*

Nickel-Plated Zinc Sheets: U.S. Customs Decision.

The Board of General Appraisers, March 9, 1903, decided that zinc sheets plated with nickel are dutiable at 45 per cent. *ad valorem* as manufactures of metal, under paragraph 193 of the Tariff Act of 1897, and not at 2 cents per pound as zinc in sheets under paragraph 192
—R. W. M.

Mercury Production of California.

Chem. and Druggist, March 28, 1903.

The present annual output of Californian mines is about one-fourth of the world's entire yield. Mercury was produced in California in a primitive way as far back as 1845, and the official report of the Director of the United States Geological Survey, covering a period of 50 years—from 1850 to 1900—shows the total production of the California mines to be 1,830,447 flasks of 76½ lb. each. The average price during this period was 47·25 dols. per flask, showing the value of the total output of this State to be over 86,000,000 dols. A half-dozen or more prominent mines, of which the new Almaden stands at the head with a yield of nearly 50,000,000 dols. worth of mercury, have contributed mainly to this output. According to these figures, the average annual production of California since 1850 is 36,609 flasks. The production of 1900 was 26,317 flasks, or 10,292 flasks below the average. This decrease of production applies, not only to the mines of California, but of the world, while the demand is constantly increasing.

Mercury in Russia.

Eng and Mining J., March 11, 1903.

During the year 1902 the only mercury mines worked in Russia were those owned by A. Auerbach and Company. These mines reported for the year a total output of 25,424 poods, equal to 416,441 kilos. of quicksilver, or 11,974 flasks.

XI.—*ELECTRO-CHEMISTRY, Etc.*

Carbons, Electric: U.S. Customs Decision.

The United States Circuit Court has decided that carbon sticks designed to be cut into electric light carbons are dutiable at 35 per cent. *ad valorem* under paragraph 97 of the Tariff Act, as "articles composed of carbon."

This decision reverses the action of the Board of General Appraisers, who held them dutiable under paragraph 97, as electric light carbons at 90 cents per 100, the number being taken on that of the electric light carbons they would make after being cut to the proper length.—R. W. M.

XII.—*FATS, OILS, Etc.*

Linseed Oil in Italy.

Foreign Office Annual Series, No. 2936.

The demand for linseed oil in Italy is increasing very rapidly, and is met mainly by importation. In 1877, the amount imported was 9,616 tons. In 1900, it amounted to 26,710 tons, valued at 400,000*l.*, most of which was imported from the United Kingdom.

These figures do not include indirect imports of linseed oil required for such substances as printing ink, which Italy imports in large quantities, none being made in the country. In 1900, Italy imported, almost entirely from Germany, printing ink to the value of 5,227*l.*, and exported, chiefly to Turkey, the same article to the insignificant amount of 160*l.* Of ordinary ink, Italy imported to the value of 5,000*l.*, and re-exported none. There are only three ink factories in Italy, amounting in all to 38 h.p., and the native ink made by them is of very poor quality. Carbonised cork and linseed oil enter largely into the manufacture of inks, though the black for some ink is procured by the burning of resinous or bituminous compounds, all of which are procurable in Italy. Of these substances 3,000*l.* worth were imported in 1900. Linseed oil is further employed largely for waterproofing purposes, and when mixed with sulphur and chemicals, with other desiccating oils, forms an elastic material similar in many of its properties to india-rubber. This material, "Faktis," is used as a substitute for rubber.

In 1889, the United Kingdom (the largest importer of linseed oil in Europe) paid 3,417,801*l.* for seeds of flax and hemp, and 4,439,813*l.* for imports of linseed oil. To this must be added 233,694 tons of linseed cake for cattle food, valued at 1,605,700*l.*

Wool Grease; Refined ——: U.S. Customs Decision.

The Board of General Appraisers, following a decision of the United States Circuit Court, decided that certain refined wool grease, classified by the collector of customs at 25 per cent. *ad valorem* as a rendered oil under paragraph 3 of the Tariff Act, was properly dutiable at ½ cent per pound under paragraph 279. While the refining which the merchandise has undergone had removed the mineral matter and odour, and made it to differ from the ordinary brown wool grease of commerce, it was still in fact wool grease, and not known in trade by any other name, on which ground the Board arrived at the above decision.
—R. W. M.

XIV.—*TANNING, LEATHER, GLUE, SIZE, Etc.*

Agar-Agar: U.S. Customs Decision.

Certain Japanese isinglass, also known as agar-agar, was decided by the Board of General Appraisers, March 10, 1903, to be dutiable as isinglass at 25 per cent. *ad valorem*, under paragraph 23 of the Tariff Act of 1897. Duty had been assessed as a prepared vegetable at 10 per cent. *ad valorem* under paragraph 241, which action was overruled by the Board.—R. W. M.

Casein: U.S. Customs Decision.

The United States Circuit Court decided that casein is free of duty under paragraph 468 of the Tariff Act of 1897, as "albumen not specially provided for," reversing the decision of the Board of General Appraisers, who had assessed duty at 20 per cent. *ad valorem* under section 6, as a "manufactured article, unenumerated."—R. W. M.

XVI.—*SUGAR, STARCH, Etc.*

Sugar Refining in Japan.

U.S. Cons. Reps., March 16, 1903.

Sugar has been produced in Japan from very early times (since about A.D. 900, it is said), but formerly the sugar was used without being refined and the present conditions of the industry have developed within the last 30 years. The climate, even in the southern part of the Japanese group, is too cold for sugar cane to grow throughout the year, and it does not blossom within the six months suitable for growth, nor does it produce sugar in such abundance as when raised under more favourable conditions. The annual production, exclusive of Formosa, is now reported at a little less than 4,000 tons, almost a negligible quantity in ɜw of the importation of 152,000 tons of raw sugar and 6,000 tons of refined.

There are many sugar refining companies in Japan, ɔst of them situated in the southern part of the islands, ɛ total capital invested in this industry being about ,000,000 yen.* Except in Formosa—which, although w a part of the Japanese Empire, has separate officers d laws—the industry receives no direct aid from the ɔvernment, and has been very unfavourably affected by the unty system in vogue in Europe. The capital invested s yielded a rate of about 5 per cent. profit, which is very w as compared with current interest rates in this Empire, t the outlook for the business is much more hopeful now consequence of the agreement by the representatives of ɛ sugar-producing countries to the Brussels convention of t summer.

In 1901 the average import price of refined sugar was cents per cwt. higher than that of the unrefined, and the ty on refined up to No. 20 Dutch standard was 19·5 cents r cwt. more than on unrefined. On upward of No. 20 tch standard the duty was 60·7 cents more than on unined, making a difference of 1·145 dols. and 1·557 dols. : cwt, respectively, on these grades, to cover the working penses and profits of the Japanese refineries. The tariff the unrefined sugar has since been raised and that on the gher grades has been decreased, so that the refineries now ve less protection than formerly.

Besides the above duties, a law was passed last year ɔviding for an internal revenue or consumption tax on gar, as follows:—

	Dols.
Below No. 8	0·375
No. 8 to No. 15	0·60
No. 15 to No. 20	0·825
No. 20 and above	1·05

The numbers refer to the Dutch standard in colour, and : amount of duty is given per cwt. Sugar, molasses, or up, taken delivery of from a manufactory, the Customs, a bonded warehouse, is subject to this duty, unless ɛnded for export or manufacture. If so intended, it st be exported or manufactured within six months after ivery is taken, or the tax becomes due as if intended for ısumption.

This law did not go into effect until more than six months er it was enacted, and consequently large importations of gar were made in anticipation; but the refineries were ıble to hasten their deliveries, and when the law came force they found themselves obliged to pay the conaption tax and, at the same time, to sell in competition h imported sugars which had escaped this impost. The ious losses resulting have been very discouraging to m.

The Japan Sugar Refining Company produces sugar which nds as high as No. 25 Dutch standard, and manufactures ɔ as a by-product. The company claims to be the only iller of rum in this country.

The greater part of the refined sugar imported is brought n Hongkong and Germany, and that from the latter ntry pays a conventional tariff of 28 cents on sugar from . 15 to No. 20, inclusive, and 31 cents on sugar above latter grade, Dutch standard, in addition to the general ff named above. The Philippine Islands, Hongkong, tch India, China, and Germany furnish most of the efined sugar, the countries being named in the order heir importance with reference to this import.

XVII.—BREWING, WINES, SPIRITS, Etc.

ALCOHOL QUESTION IN FRANCE; THE ——

A. Kraus. Chem.-Zeit., 1903, **27**, [16], 172.

t is estimated that two-fifths of the soil of France is ated with crops intended for distilleries, yet statistics w in the year 1901-02, together with an unconsumed ess of 954,000 hectolitres of alcohol, a consumption of 00,000 hectolitres of petroleum, of the value of 44 millions of francs. A large company, "Cie. des Alcools Français," with a capital of 10 million francs, is in process of formation, with the avowed object of effecting a kind of alliance between industry and agriculture in order to further the consumption of alcohol for industrial purposes. The company intend to purchase distillery alcohol at the current price, mix it with a certain proportion of the so called chemical alcohol, produced by the "Cie. Urbaine d'Eclairage par l'Acétylène," and sell the mixture for 35 francs instead of the present price of 40—50 francs. It has acquired a monopoly for the purchase, at 12 frs. per hectolitre, of the "chemical alcohol," with a right of limiting the production; and also the exclusive rights for the employment of a new carburetting agent, costing 10 frs. per hectolitre. It is estimated that the company will be able to sell denatured alcohol at 35 frs. (profit, 6 frs.) per hectolitre, and carburetted alcohol at 30 frs. (profit, 10 frs.) per hectolitre.

—A. S.

XVIII. B.—SANITATION.

ROYAL COMMISSION ON SEWAGE; THIRD REPORT OF THE ——.

(*See also this Journal*, 1901, 863; 1902, 1166.)

The third report of the Commissioners appointed in 1898 to inquire and report what methods of treating and disposing of sewage may properly be adopted has been issued as a Blue-book [Cd. 1486]. The present report deals with the following aspects of the inquiry:—(1) The relations between local authorities and manufacturers in regard to the disposal of manufacturing effluents; and (2) the need of setting up a central authority for the settlement of differences between manufacturers and local authorities; the general protection of sources of water supply; and the collection of facts and the scientific investigation of questions of general importance relating to the protection of water.

In connection with the relations between local authorities and manufacturers, the report gives the text of correspondence in January last between the Commission and the Local Government Board, as to the rights of manufacturers to discharge trade effluents into sewers, the Local Government Board stating the effect of the law officers' opinion to be that a local authority is not generally bound under the Public Health Act, 1875, to provide such sewers as may be necessary to carry off all trade effluents and liquid refuse coming from manufactories in their district, and that their obligations in this respect are defined by the Rivers Pollution Prevention Act, 1876, section 7, and are subject to the limitations therein stated. The report, however, states that, while the existing law is apparently precise, the difficulties attendant on its application in any particular case render uncertain the position and rights of any manufacturer. One of the results of this uncertainty has been that the work of enforcing the purification of manufacturing effluent has been considerably hampered and delayed. Moreover, the attitude of local authorities towards manufacturers has differed widely, and many manufacturers have been seriously handicapped. The report continues:—

> "We are satisfied that, unless the law is altered, differential treatment of manufacturers will continue, and that as a consequence trade will continue to be seriously hampered, if not indeed injured. We fully share in the view which has been pressed upon us from all sides, that as far as practicable all manufacturers should be placed on an equal footing. This is desirable, not only in fairness to manufacturers, but also in the interest of river purification. We think that it is practicable to secure far greater uniformity than at present exists, and we therefore now proceed to indicate by what means this end may be secured."

In considering what remedies are available, the Commissioners found it necessary to determine whether the purification of sewage when mixed with trade effluents is practicable, a point on which they took a considerable amount of evidence, arriving at the conclusion that, while sewage containing trade effluents is generally more difficult to purify than ordinary sewage, it is practicable in the great majority of cases to purify the mixture, if the manufacturers adopt reasonable preliminary measures. On this point the report says :—

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* 1 yen = 2s. 1d.

Purification of trade effluents by the local authority is, in the great majority of cases, practicable; purification by the manufacturer is in some cases difficult, if not impracticable; while purification by the manufacturer would generally be more costly than purification by the local authority. It also appears that the local authorities, as well as the manufacturers, are of opinion that there should be laid on the local authority a distinct obligation to receive trade effluents.

On the question of the alteration of the law, the report says :—

"We are therefore of opinion that the law should be altered so as to make it the duty of the local authority to provide such sewers as are necessary to carry trade effluents as well as domestic sewage, and that the manufacturer should be given the right, subject to the observance of certain safeguards, to discharge trade effluents into the sewers of the local authority if he wishes to do so. We do not think it possible to provide by direct enactment what these safeguards should be. In each district it would probably be desirable that the local authority should frame regulations which should be subject to confirmation by a central authority. In most cases, however, these regulations could provide definite standards for the different manufacturers as regards preliminary treatment, and it appears from the evidence that manufacturers would much prefer to have standards to work to. Power to vary the standards or to dispense with them altogether in special cases would be necessary."

The remainder of this part of the report is taken up with the consideration of such questions as riparian rights, special rate charges on manufacturers who discharge trade effluent into sewers, prescriptive rights, and borrowing powers.

On the question of the setting up of a central authority for the settlement of differences between local authorities and manufacturers the report says :—

"In our opinion a properly equipped central authority is essential, and we unhesitatingly recommend the creation of such an authority. In the interests of river purification as well as of the trade of the country we consider it is of the highest importance that the changes in the law which we have recommended should be made. But these changes would not in our opinion be of much use apart from the creation of a central authority for the determination of differences between the local authority and the manufacturer. If the settlement of these differences be left to the ordinary Courts, differential treatment of manufacturers, with all the objections to it, will be certain to continue. The central authority should have the following permanent chief officers :—(1) An administrative head; (2) a bacteriologist having special knowledge of the bacteriology of sewage, trade effluents, and water supply; (3) a chemist having special knowledge of the chemistry of sewage, trade effluents, and water supply; (4) an engineer having a special knowledge of geology and water supply: it should also be provided with a laboratory. The officers of the central authority must be clothed with the necessary powers to conduct inquiries, to call witnesses, to enter premises to take samples of the trade effluent, and generally to do such acts as are necessary for the proper performance of their duties. At any inquiries which may be held neither counsel nor expert witnesses should be heard except with the special permission of the central authority. The work of the central authority will be so intimately connected with the work of the Local Government Board that it will be desirable to make it a new department under the Local Government Board rather than an entirely separate department."

The recommendation is then made that certain cases might very properly be referred to the River Boards already in existence—the Mersey and Irwell Joint Committee, the Ribble Joint Committee, and the West Riding Rivers Board—in the first instance, power being given to either party to appeal to the central authority. The Commissioners, however, do not consider that the central authority should take the place of local bodies in regard to the protection of rivers and other sources of wate supply, and they think local power should be utilise to the fullest extent possible. They express the opinio that such powers can be fully utilised only by the formatio of river boards throughout the country. They therefor recommend that such boards should be formed. One o the first duties of the central authority would be t ascertain what grouping of counties would be mos effective, and then to take steps to constitute river board for those areas. With regard to the functions of th central authority the report says :—

"The central authority should exercise a general superi tendence over the whole country in regard to the preventio of pollution of water. They should direct any inquiries o investigations which they may consider desirable, an generally they should stimulate and encourage rive boards to an active exercise of their powers. As regar dangerous pollution of public water supplies, it shoul be the duty of the central authority to investigate case brought to their notice by the river boards, and in an case in which they are satisfied that the conditions ar such as to render the supply dangerous to health the should bring the facts to the notice of the company local authority which is supplying the water. We sh hope that this would usually suffice and that the supp in authority would willingly take such steps as might b necessary to remove the danger. But it is perha necessary to provide for other cases, and we therefo recommend that the central authority should be empowere after local inquiry, to order the purveyors of the wate or other responsible parties, to adopt such means as the opinion of the central authority are reasonable an necessary for removing or diminishing the danger. Su orders should be enforceable by *mandamus*. Power enter at all times gathering grounds and waterworks an to take samples of water should be conferred on the offic of the rivers boards and of the central authority."

The report deals with the present position of the inqu giving a general outline of what remains to be done. is signed by Lord Iddesleigh, the chairman, Lieutena Colonel C. Phipps Carey, Sir Michael Foster, Lieutena Colonel T. Walter Harding, Sir William Ramsay, Dr. J Russell, Mr. W. H. Power, and Mr. T. J. Stafford, w was appointed to the Commission on May 7, 1902, a Mr. F. J. Willis, the secretary.

XVIII. C.—DISINFECTANTS.

Preservatives; Antiseptic.

U.S. Customs Decision.

The Board of General Appraisers, on Feb. 6, held certain preservative, consisting of a mixture of borax a boric acid, to be dutiable at five cents per pound, accordi to the rates imposed upon either component, by paragra 1 and 11 of the Tariff Act. The importers had claimed merchandise to be properly dutiable, either at 25 per ce *ad valorem* as a chemical compound, under paragraph 3, as a borate material containing more than 36 per cent. anhydrous boric acid at four cents per pound un paragraph 11.—R. W. M.

XX.—FINE CHEMICALS, Etc.

Oxidised Turpentine: U.S. Customs Decision.

The Board of General Appraisers, March 4, 1 decided that oxidised spirits of turpentine was not free duty as turpentine under paragraph 688 of the Tariff Ac 1897, but dutiable at 25 per cent. *ad valorem* under pa graph 68, as a medicinal preparation not containing alco

—R. W.

Zuckerin ["Saccharin"]: U.S. Customs Decisio

The merchandise in question, marked "zuckerin puri" was assessed for duty as saccharin at one dollar and a a pound, and 10 per cent *ad valorem*, under paragraph of the Tariff Act of 1897. It was claimed by the impo to be dutiable either at 25 per cent *ad valorem* u paragraph 3 as a chemical salt, or at 20 per cent *ad val* as a coal-tar preparation under paragraph 15. An ana h ng established its identity with saccharin, the Board of G eral Appraisers, March 10, 1903, affirmed the assessm t of duty.—R. W. M.

FRUIT OILS AND FRUIT JUICES : U.S. CUSTOMS DECISION.

he Board of General Appraisers, March 10, 1903, d ded that certain alcoholic extracts of fruit ethers were d able as alcoholic compounds under paragraph 2 of the T ff Act, at 60 cents per pound, and 45 per cent. *ad rem*, not being either essential oils or the fruit juices of c merce as claimed by the importers.—R. W. M.

TARTARIC MATERIALS FROM ITALY; EXPORT OF FROM OCT. 1, 1901, TO SEPT. 30, 1902.

Dipl. and Cons. Reps.

Foreign Office Annual Series, No. 2936 (*Italy*).

Article.	Exported to	Quantity.	Total.	Approximate Value.
		Tons.	Tons.	£
1. alf-refined tartar....	United States of America.........	2½		
	United Kingdom .	200		
	Germany.........	399		
	France...........	137		
	Austria - Hungary and other countries............	192	930½	50,500
2. zaccia argols....	United States of America........	955		
	United Kingdom .	272		
	Austria - Hungary and other countries............	953	2,180	103,500
3. ude argols	United States of America........	2,268		
	United Kingdom .	40		
	Germany.........	130½		
	Austria - Hungary and other countries............	480	2,918½	122,500
4. inc lees ..	United Kingdom .	350		
	Germany.........	280		
	France...........	590		
	Austria - Hungary and other countries............	1,213	2,433	34,000
Total ...	.. ..	..	8,462	310,500

XI.—*PHOTOGRAPHIC MATERIALS, Etc.*

BLUE-PRINT PAPER : U.S. CUSTOMS DECISION.

Feb. 27 the Board of General Appraisers decided that b print paper is datiable at 15 per cent. *ad valorem* under p graph 396 of the Tariff Act of 1897.—R. W. M.

Patent List.

3.—In these lists, [A.] means "Application for Patent," and [ ], "Complete Specification Accepted."

ere a Complete Specification accompanies an Application, an a isk is affixed. The dates given are (i) in the case of Applicati for Patents, the dates of application, and (ii) in the case of C plete Specifications Accepted, those of the Official Journals in ich acceptances of the Complete Specifications are advertised. mplete Specifications thus advertised as accepted are open to i ection at the Patent Office immediately, and to opposition w in two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

.] 6077. Kelly. Apparatus for delivering measured quantities of liquid, especially mercury. March 16.

[A.] 6372. Kestner. Apparatus for concentrating liquids March 19.

„ 6435. Blakesley. Spectroscope. March 19.

„ 6694. Peterson. Centrifugal extracting machines.* (U.S. Appl., March 24, 1902.) March 23.

„ 6766. Hargreaves. Concentrating and evaporating frothy, viscous, or syrupy liquids. March 24.

„ 6847. Deininger and André. Evaporating apparatus.* March 24.

„ 6925. Marchéville. Hydro-extractors. March 25.

[C.S.] 8973 (1902). Radcliffe. Drying apparatus. March 25.

„ 11,450 (1902). Longsdon. Centrifugal drying machine. April 1.

„ 14,615 (1902). Lynes. Appliance for removing the fumes from vessels employed in various processes. March 25.

„ 25,960 (1902). Haddan (Edson). Removing gases from material which is being dried, rendered, &c. April 1.

„ 26,792 (1902). Seiffert. Producing constant, previously determined, low temperatures. April 1.

„ 2560 (1903). Wheelwright and Fiske. Apparatus for separating liquids from solids. April 1.

II.—FUEL, GAS, AND LIGHT.

[A.] 6050. Hartridge. Manufacture of artificial fuel. March 16.

„ 6142. Baughan. Acetylene gas generator.* March 17.

„ 6668. Moyes. Acetylene gas generators. March 23.

„ 6685. Grafton. Argand burners for gas-testing. March 23.

„ 6814. Williams. Utilising the heat of waste gases, &c. March 24.

„ 6845. Schwartz. Mantles for incandescent lamps.* March 24.

„ 7198. Schmidt. Regulating the supply of air to Bunsen burners. March 27.

„ 7272. Booth. Acetylene gas generators. March 28.

[C.S.] 3641 (1902). Warren. Acetylene generators. March 25.

„ 3643 (1902). Warren. Acetylene generators. March 25.

„ 6167 (1902). McNamee. Artificial fuel. March 25.

„ 7694 (1902). Horton. Kilns or calcining apparatus. April 1.

„ 9070 (1902). Smith and Albright. Purification of coal-gas and recovery of by-products. March 25.

„ 9974 (1902). Willshear. Furnace for the combustion of organic materials, &c. March 25.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[C.S.] 28,516 (1902). Lenders. Deodorising naphtha and the products of its distillation. April 1.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 6068. Abel (A.-G. für Anilinfabr.). Manufacture of mordant-dyeing azo-dyestuffs. March 16.

„ 6078. Ellis (Soc. Chim. des Usines du Rhône). Manufacture of sulphurised colouring matters. March 16.

„ 6419. Johnson (Bad. Anil. u. Sodafabr.). Manufacture of indoxyl and indoxylic acid. March 19.

[A.] 7025. Imray (Soc. Chem. Ind. in Basle). Manufacture of condensation products from nitrosooxy-compounds or quinonechlorichlorimides and aromatic amines of leucoindophenols therefrom, and of sulphurised dyestuffs derived from these.* March 26.

[C.S.] 11,666 (1902). Newton (Bayer). Colouring matters of the acridine series. March 25.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 5998. Ashworth. Agent for cleansing fibres or fabrics of vegetable origin. March 16.

" 6094. Johnson (Bad. Anil. u. Sodafabr.). Printing cotton, &c., with indigo in combination with other colouring matter. March 16.

" 6246. Mitchell. Cleansing and bleaching cotton-waste, &c. March 18.

" 6478. Dreher. Dyeing and printing textiles. March 20.

" 6516. Imray (Becke). Waterproofing fabrics, &c. March 20.

" 6731. Lake (Mattei). Apparatus for dyeing silver and other textile fibres.* March 23.

" 7054. Medley. Conditioning, colouring, or loading yarns during spinning. March 27.

" 7060. Dargue. Apparatus for dyeing or washing fibrous materials. March 27.

" 7089. Harrison and Burdick. Apparatus to facilitate the application of colours to surfaces. March 27.

[C.S.] 8911 (1902). Climpson. Apparatus for steaming textiles, &c. March 25.

" 9620 (1902) Perkin and Whipp Bros. and Todd. Treatment of raw cotton and flax, and cotton and woollen goods to reduce the inflammability thereof. April 1.

" 11,438 (1902). Bleachers' Association and Morris. Apparatus for damping textile fabrics and materials. March 25.

" 11,687 (1902). Schemel. Apparatus for examining dyed cloth, &c. April 1.

" 11,790 (1902). Depetro. Decortication and separation of the gum, &c., from ramie and other fibrous substances. March 25.

" 26,281 (1902). Wojciechowski. Apparatus for printing in different colours. March 25.

" 4142 (1903). De Pass (Vacuum Dyeing Machine Co.). Dyeing machines. April 1.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 6903. Milton. Method of colour printing. March 25.

" 7206. Maunsell-Smyth. Colouring, decorating, and treating paper, fabrics, &c. March 27.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 6087. Knudsen. Liquefying air and other gases. March 16.

" 6090. Burschell. Removing sulphuretted hydrogen from gases with simultaneous recovery of sulphur. March 16.

" 6180. Boult (Soc. Romana Solfati). Obtaining alum and other aluminous salts. March 17.

" 6458. Spence, and Spence and Sons, Ltd. Manufacture of aluminium sulphate. March 20.

" 6824. Clark (Ferguson). Manufacture of sulphuric anhydride.* March 24.

" 6857. Rowe and Bickerton. Treatment of waste galvanising pickle liquors. March 24.

[A.] 6873. Pochin and Richardson. Production of su phate of alumina. March 25.

" 6933. Descamps. Production of hydrosulphites metals.* March 25.

" 6948. Rowe and Bickerton. Preparation of hydr gen. March 25.

[C.S.] 8759 (1902). Hemingway. *See under* X.

" 9327 (1902). Howard and Hadley. Treatment spent acid from galvanising works and the lil and manufacture of zinc white and ferric oxi March 25.

IX.—BUILDING MATERIALS, CLAYS, MORTAR AND CEMENTS.

[A.] 6155. Bower and Gauntlet. Substitutes for lith graphic stones. March 17.

" 6247. Mageus. Treatment of concrete, &c., where the setting of the same after mixture may arrested. March 18.

" 6436. Chapman. Continuous kilns for bricks, &. March 20.

" 6669. Sellars. Substances for the manufacture bricks, blocks, &c. March 23.

" 6695. Bushe. Manufacture of cement. March

" 6848. Haddan (Crozier). Glazed bricks.* March

" 6849. Haddan (Crozier). Making bricks or art cial stone.* March 24.

" 6920. Hastie. Non-conducting coverings for pip March 25.

" 7211. Jenkins. Manufacture of bricks, artific stone, &c. March 27.

[C.S.] 26,258 (1901). Ford. Manufacture of artifici stone bricks. April 1.

X.—METALLURGY.

[A.] 6021. Mollard. Soldering aluminium or ot metal. March 16.

" 6204. Payne and Gillies. Treatment of ores c taining copper.* March 17.

" 6283. Gröndal. Reducing iron ore to iron spon. March 18.

" 6334. Briggs. Recovery of gold and other preci metals from solutions. March 19.

" 6515. Guye. Treatment of lead sulphide or c containing it, to obtain volatile produ March 20.

" 6545. Richardson and Wren. Concentration separation of ores. March 20.

" 6724. Marks (Broken Hill Prop. Co.). Appara for use in extracting sulphides from or March 23.

" 6729. Dawes. Magnetic ore separators. March

" 6811. Campbell. Treatment of ores.* March

" 6818. Rawson and Littlefield. Refining me March 24.

" 6950. Soc. Electro-Métallurgique Française. oxidising and carburising molten iron and ste (Belgian Application, March 25, 1902.) March

" 7016. Pelletier and Sempruu. Solder for alumin or aluminium alloys.* March 26.

" 7027. Bloxam (Soc. Métall. Française). Produc of iron and steel. March 26.

" 7041. Trivick. Extraction of metals from t ores. March 26.

" 7092. Marchant. Rapid production of open he steel of constant proportions of carbon and all March 27.

[C] 6486 (1902). Thiel. Ore hearths or reverberatory furnaces. March 25.

6727 (1902). Joukoffsky and Strouvé. Treatment of iron and steel. March 25.

8759 (1902). Hemingway. Stripping tin from tinned iron, recovering the respective metals, and obtaining nitric acid as a by-product. April 1.

14,017 (1902). Meehan. Blast furnaces. April 1.

24,366 (1902). Vosbaugh. Reduction furnaces. March 25.

28,396 (1902). Gilmour, Lindsay, Myers, and Bradfield. Tempering or hardening of cast steel. March 25.

1019 (1903). Stavenow. Manufacture of stereotype metal. March 25.

I.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[ ] 6060. Blondel. Manufacture of electrodes for arc lamps.* (U.S. Appl. April 8, 1902.) March 16.

6061. Blondel. Electrodes for arc lamps.* (Belg. Appl. April 24, 1902.) March 16.

6145. Fennel and Perry. Storage batteries. March 17.

6338. Harrison and Stevenson. Electrolytes used in the deposition of metals. March 19.

6537 Moore. Electric lamps with rare earth filaments. March 20.

6954. Diamant. Forming lead peroxide on plates of electric accumulators. March 25.

[ ] 4208 (1903). Heys (Hutchison Acoustic Co.). Cells of primary and secondary electric batteries. April 1.

XII.—FATS, OILS, AND SOAP.

[6590. Knox. Improvements in soap. March 21.

[C.] 8828 (1902). Pierce and Warrick. Perfuming soap tablets by absorption. April 1.

11,410 (1902). Barclay. Treatment of cod-liver oil to make it more easily assimilable as food. April 1.

18,393 (1902). Pfestroff and Gillon. Substitute for linseed oil. March 25.

27,889 (1902). Zadig. Manufacture of soap. April 1.

XI—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—*Pigments, Paints.*

[ ] 6521. Armbruster and Morton. Making pigments.* March 20.

C] 9327 (1902). Howard and Hadley. *See under* VII.

1582 (1903). Brasington. Paint. March 25.

B.—*Resins, Varnishes.*

[ ] 6823. Blumer. Synthetical production of resinous substances. March 24.

7134. Carolan (Gen. Electric Co.). Coating and impregnating porous materials with oils, varnishes, &c. March 27.

C.—*India-rubber, &c.*

] 2939 (1903). Gray. Vulcanisation of rubber. April 1.

V.—TANNING, LEATHER, GLUE, AND SIZE.

[C] 6738 (1902). Charles. Agglutinant composition. March 25.

[C.S.] 7088 (1902). Lederer. Manufacture of artificial horn, &c. March 25.

" 17,077 (1902). Arledter. Manufacture of resin size. (Int. App. Jan. 25, 1902.) April 1.

" 20,800 (1902). Cormack and Lowson Manufacture and treatment of gelatine. March 25.

" 27,041 (1902). Lake (Christensen and Henckel). Manufacture of artificial leather, &c. March 25.

" 28,257 (1902). James (Casein Co.). Casein compound. March 25.

" 2456 (1903). Peyrusson. Preparation, purification, and preservation of tannic and other tinctorial extracts. April 1.

" 2949 (1903). Hall. Casein solution. March 25.

XVI.—SUGAR, STARCH, GUM, ETC.

[C.S.] 8685 (1902). Robin-Langlois. Rapidly refining white sugars. April 1.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 6604. Schidrowitz and Kaye. Manufacture of products from waste brewery and distillery yeast. March 21.

[C.S.] 4218 (1903). Meyer (Meyer and Arbuckle). Apparatus for distilling spirits and the like. April 1.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—*Foods.*

[A.] 6667. Jörgensen. Process for preserving eggs. March 23.

[C.S.] 8876 (1902). Donard and Labbé. Manufacture of nutritious product from maize. March 25.

" 10,903 (1902). Budde. Sterilising articles of food and other perishable organic substances at a low temperature. April 1.

" 11,410 (1902). Barclay. *See under* XII.

C.—*Disinfectants.*

[A.] 7201. Van Wesirum. Sprinkling medium for roads, &c. March 27.

" 7208. Leiser. Sanitary medium for extirpating dust. March 27.

[C.S.] 6439 (1902). Bollé (Fleming). Means for destroying noxious insects on trees. March 25.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 7023. Stearn. Manufacturing filaments from cellulose.* (U.S. Application, April 3, 1902.) March 26.

" 7058. Atkins. Manufacture of nitrated cellulose. March 27.

[C.S.] 8083 (1902). Thiele. Manufacture of filaments from cellulose solutions. March 25.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 6525. Mills (Berbier.) Manufacture of saccharin. March 20.

" 6817. Crispo. Extraction of salicine from the bark of the red osier.* March 21.

[C.S.] 11,522 (1902). Imray. (Meister, Lucius und Brüning). Manufacture of products soluble in water from orthonitro-phenyl-β-lactic acid methyl ketone. March 25.

„ 11,882 (1902). Newton (Bayer). Production of pharmaceutical compounds. April 1.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 6356. Reichel. Producing light-proof photographs in natural colours on paper, &c.* March 19.

„ 7163. Mills (Soc. A. Lumière). New photographic developer. March 27.

[C.S.] 9992 (1902). Schwartz. Paper for photograp purposes. April 1.

„ 10,690 (1902). Clarke. Taking coloured phot graphs. April 1.

„ 28,284 (1202). Bauer. Solution for treating phot graphic papers. April 1.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 6409. Selwig. Quick removal of the acid fr guncotton, nitrates of cellulose, &c. March 1

„ 7269. Nathan and Thomson. Manufacture explosives, celluloids, &c. March 28.

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SESSION 1902—1903.

Monday, May 4, 1903. Dr. J. Lewkowitsch. "Problems in the Fat Industry."

Monday, May 25, 1903 (instead of June 1st, Whit-Monday). Messrs. J. H. Coste and E. T. Shelbourn. (1) "Neatsfoot Oil." (2) "The Nitric Acid Test for Cotton-seed Oil."

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N.B.—The names in *italics* are those of members of Committee who retire from their respective offices at the end of the current sess

Notices.

CONGRESS OF CHAMBERS OF COMMERCE AT MONTREAL.

The fifth Congress of Chambers of Commerce of the mpire will be held at Montreal, Canada, from the 17th the 20th August 1903, and the General Secretary will e glad to hear from any member who is disposed to attend.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held at Bradford, orks, on Wednesday, July 15th, and following days. ull particulars will appear in a subsequent issue.

In accordance with the provisions of Rule 18 of the ye-laws, notice is hereby given that those Members whose ames are printed in *italics* in the list of Council will tire from their respective offices at the forthcoming nnual Meeting.

Sir William Ramsay has been nominated to the office of resident under Rule 8; Prof. P. Phillips Bedson, Mr. E. arey, Mr. W. H. Nichols, and Prof. H. R. Procter have een nominated Vice-Presidents under Rule 8; and Mr. van Levinstein has been nominated a Vice-President under ule 11.

The Hon. Treasurer and Hon. Foreign Secretary have een nominated for re-election to their respective offices.

Members are hereby invited to nominate fit and proper ersons to fill four vacancies among the ordinary Members f the Council. Forms for this purpose can be obtained, n application, from the General Secretary, or from the on. Local Secretaries of the Canadian and New York ections.

Extract from Rule 18:—"No such nomination shall be lid unless it be signed by at least ten Members of the ociety who are not in arrear with their subscriptions, nor less it be received by the General Secretary, at the ociety's Office, at least one month before the date of the nnual General Meeting at which the election to which it fers takes place. Nor shall any such nomination be lid if the person nominated be ineligible for election der Rules 12 or 15. No member shall sign more than e nomination form."

COMMUNICATIONS.

Authors of communications read before the Society, or y of its Local Sections, are requested to take notice that der Rule 43 of the Bye-laws the Society has the right of iority of publication for three months of all such papers. fringement of this Bye-law renders papers liable to be jected by the Publication Committee, or ordered to be stracted for the Journal, in which case no reprints can furnished to the author.

FTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, 1903.

The attention of Members of the Society is called to the ct that the International Congress of Applied Chemistry ll meet in Berlin, during Whitsuntide week of this year. committee of this Society has been formed to co-operate ith the other British Chemical Societies in endeavouring secure an adequate representation of British Chemical dustry, and it is requested that the names of those proposing to attend the Congress be forwarded to the General cretary, in order that a formal invitation from the ganising Committee in Berlin may be sent to them.

The aim of the Congress is to introduce uniform standard ethods and rules throughout the world; to provide uniform ethods of commercial analysis, thus removing one of the ain causes of dispute; to throw light upon points which y assist governments and others in framing regulations ncerning transport and duties; and to improve acquaint- ce with Patent Law.

The Congress is also intended to provide opportunities for mutual exchange of ideas on different branches of chemical work.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers. The subjects to be treated are classified as follows:—

- I. Analytical Chemistry. Apparatus and Instruments.
- I. Chemical Industry. Inorganic Products.
- III. Metallurgy and Explosives.
- IV. Chemical Industry. Organic Products:—
  - *Subsection A.*—Organic Preparations, including Tar Products.
  - *Subsection B.*—Dyestuffs and their Uses.
- V. Sugar Industry.
- VI. Fermentation Industries and Starch Manufacture.
- VII. Chemistry of Agriculture.
- VIII. Hygiene. Chemistry of Medicinal and Pharmaceutical Products. Foodstuffs.
- IX. Photo-chemistry.
- X. Electro-chemistry and Physical Chemistry.
- XI. Legal and Economic Questions connected with Chemical Industry.

Programme.

Tuesday, June 2.—Reception in the Palace of the Imperial Parliament.

8 p.m.—Address by the President of the Organising Committee in the Hall. Supper will be served in the galleries.

Wednesday, June 3.—10 a.m. First General Meeting.

Afternoon.—Sectional meetings.

7 p.m.—Banquet in the Restaurant of the Zoological Gardens. Members may bring ladies.

Thursday, June 4.—Sectional meetings continued.

7.30 p.m.—Reception of the Congress in the Town Hall by the Municipal Authorities. (For gentlemen only.)

9.30 p.m.—"Commers" in the "Philharmonie" building. The boxes will be reserved for ladies.

Friday, June 5.—10 a.m. Second General Meeting. Address by the President of the fourth Congress, Prof. H. Moissan.

7 p.m.—Performance in the Royal Opera House.

7 p.m.—Reception of the German Chemical Society in the gardens of Prof. C. D. Harries at Charlottenburg, Berlinerstr. 36.

Saturday, June 6.—Sectional meetings continued.

Visits to various factories and museums.

Sunday, June 7.—Special trains from the Potsdamer Bahnhof at 9.55 a.m. and 10.15 a.m. to Wannsee, for a trip on the lakes.

Luncheon at Wannsee at 2 p.m.

Monday, June 8.—Sectional meetings concluded.

Afternoon.—Third General Meeting, for bringing the business of the Congress to a close.

Ladies tickets, price 15*s.* each, can be obtained on application to the Secretary of the Congress. A ladies' committee has been formed to provide entertainment for ladies during the business hours of the Congress.

Travelling and Hotel Arrangements.

Parties of 30 and over, travelling together, may obtain a reduction of 50 per cent. on fares on all lines of the Royal Prussian Railway, by application to the head office of the division in which the journey is commenced.

Karl Stangen's Reise-Bureau will arrange such parties. Information can also be obtained as to hotels in Berlin, also any information concerning the journey to Berlin, by enclosing amount for return postage to Karl Stangen's Reise-Bureau, 72, Friedrichstr., Berlin, W.

A Congress Daily Paper will be published by the Committee during the Congress week.

The number of tickets for the social arrangements is limited to :—Banquet, 1,500; Reception in Town Hall, 750; "Commers," 1,000 gentlemen, 200 ladies; Performance at Royal Opera, 900; Reception of German Chemical Society, 800; Excursion to Wannsee, 1,500.

Applications will be considered in order of priority.

As formal invitations are now being sent out, applications to join the Congress, accompanied by a remittance of 1*l.*, should be sent in to the General Secretary without delay.

List of Members Elected

23rd APRIL 1903.

Anspach, Dr. R., 37, George Street, Cheetham Hill, Manchester, Chemist.

Baty, E. J., 76, Trenton Road East, Birkenhead, Chemical Student.

Binns, John H., Thornfield, Mystic Pond, Methuen, Mass., U.S.A., Dyer and Finisher.

Boral, Robin, Rhodes Mount, Rhodes, near Manchester, Works Manager.

Burgess, John A., 52, St. George Street, Toronto, Canada, Gas Expert.

Fleming, Jno. A., Vulcan Copper Works, 465, East Front Street, Cincinnati, Ohio, U.S.A., Civil Engineer.

Frerichs, F. W., Herf and Frerichs Chemical Co., St. Louis, Mo., U.S.A., Manufacturing Chemist.

Gottschalk, Dr. L., Salem Depôt, New Hampshire, U.S.A., Chemist.

Heald, Henry I., Cliffe House, Kilnhurst, near Rotherham, Yorks, Manager of Earthenware Factory.

Herreshoff, J. B. F., 40, West 69th Street, New York City, U.S.A., Chemical Engineer.

Hewitt, H. R., 329, Bradford Road, Manchester, Chemical Works Manager.

Hill, Chas. Alex., 64, Park Street, Southwark, S.E., Wholesale Druggist.

Hunter, J. B., Dennery Factory, St. Lucia, West Indies, Sugar Works Manager.

Kingman, Wm. A., 164, Central Street, Leominster, Mass., U.S.A., Chemist.

Knight, Harley F., 64, Amhurst Park, Stamford Hill, N., Analyst.

Ledoux, Aug. D., 68, Beaver Street, New York City, U.S.A., Importer of Pyrites.

Lindmueller, C., c/o The Ohio Farmers' Fertilizer Co., Columbus, Ohio, U.S.A., Chemist.

Llewellyn, I. P., c/o Peter Spence and Sons, Ltd., Manchester Alum Works, Manchester, Chemist.

Mooney, F. M., 118, Pembroke Road, Dublin, Chemical Manure Manufacturer.

Mote, S. C., 28, Breakspears Road, St. John's, S.E., Engineer.

North, Henry A., 159, East 36th Street, New York City, U.S.A., Chemist.

Phelan, J. W., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Chemist.

Shacklady, T. G., Addiscombe Villas, Cliffe at Hoo, Rochester, Technical Chemist.

Sheldon, Dr. N. L., 12, St. Paul's Road, Kersal, Manchester, Works Manager.

Skoglund, Jean V., Salem Depôt, New Hampshire, U.S.A., Chemist.

Sykes, Walter F., 85, Water Street, New York City, U.S.A., Chemical Merchant.

Wainwright, J., 15, Bolton Road, Port Sunlight, near Birkenhead, Soap Works Manager.

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Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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Ewell, E. E., l/o Washington; German Kali Works, $22\frac{1}{2}$, S. Broad Street, Atlanta, Ga., U.S.A., Chemical Works Manager.

Fox, J. Wesley; Journals to 7, Bushell Street, Wapping, E.

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Herstein, Dr. B.; Journals to 118, Humphry Avenue, Bayonne, N.J., U.S.A.

Jones, A. O., l/o Muswell Hill; c/o Carr and Co., Caldewgate, Carlisle.

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Miller, Geo., l/o Halewood; 54, Ramilies Road, Sefton Park, Liverpool.

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Liverpool Section.

Meeting held at University College, Liverpool, on Wednesday, March 25th, 1903.

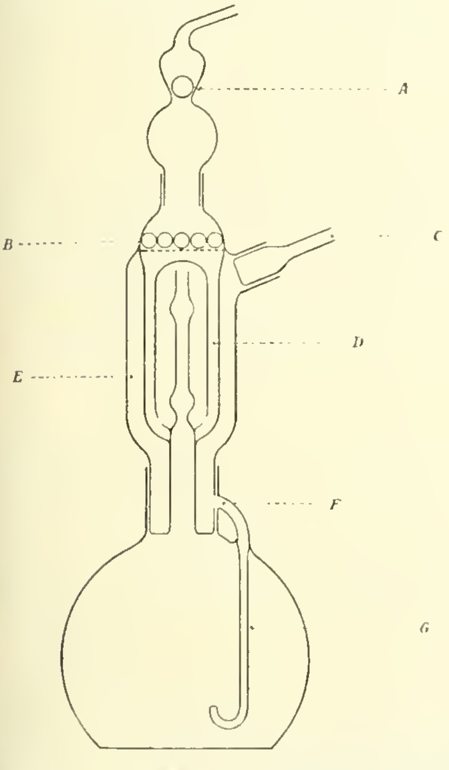
MR. FRANK TATE IN THE CHAIR.

A NEW CARBONIC ACID APPARATUS.

BY E. DOWZARD, F.C.S.

The determination of CO_2 by treating the substance under examination with dilute acid, the loss in weight being taken as CO_2, has up to the present not yielded accurate results, owing to defects in the apparatus employed. The great defect in all apparatus used for the ove work has been the inefficient drying arrangements. The st appliance which has so far been devised is the Schrötter paratus, which, however, is liable to give high results, ving to the faulty drying chamber; it has also other fects of a mechanical nature, which make it rather umsy to work with.

These defects have been remedied in the apparatus out to be described. The CO_2 instead of being dried ce is dried three times, twice with strong sulphuric acid, d once with calcium chloride; the drying chamber and ntainer for dilute acid, instead of being separate, are closed in one circumference; the flask is connected to e upper parts by a ground joint, which is a great nvenience, as it can easily be cleaned and charged with e sample under examination. The outlet at the top ntains a ball valve, which prevents the outside air from tering the drying chamber and reducing the efficiency of e drying materials.



A. Ball Valve. B. Glass Beads on perforated Shelf. C. Tap topper. D. Sulphuric Acid Drying Chamber. E. Dilute Acid hamber. F. Delivery Hole. G. Delivery Tube.

The apparatus is used as follows:—The drying chambers re first dried; the glass beads are then placed on the erforated shelf, and strong sulphuric acid is poured over hem until the lower chamber is about half full; a plug of otton wool is placed in the hollow stopper, which is then lled with granulated calcium chloride (the calcium chloride hould be kept in an atmosphere of dry CO_2 for several ours before being used), and a small tuft of asbestos wool placed in the neck of the hollow stopper to prevent the alcium chloride from falling into the sulphuric acid hamber. From 2 to 4 grms. of the sample are placed n the flask, together with about 10 c.c. of water; the pparatus is then connected up, care being taken that he outlet of the dilute acid chamber is not opposite the elivery tube; this chamber is now nearly filled with 0 per cent. H_2SO_4 or HNO_3 (about 15 c.c. should be sed), the tap stopper is inserted, and the apparatus s weighed. The tap stopper is now turned to allow air o enter the acid chamber, and the top portion of the pparatus rotated so as to bring the outlet opposite to he delivery tube, small quantities of acid being allowed to enter flask at a time in the usual manner. When the carbonate has been decomposed the liquid in flask is brought to the boiling point, at which it is kept for a few seconds. The tap stopper is turned on, and the outlet of the acid chamber connected with the delivery tube; the flask is then half immersed in cold water and about 800 c.c. of dry air aspirated through the apparatus at a fairly rapid rate. The flask is dried and weighed.

This apparatus possesses the following advantages:—

1. It is possible to make about five or six accurate determinations of CO_2 without recharging the drying chambers.

2. The flask being detachable is more easily cleaned and filled than in Schrötter's appliance.

3. Owing to the ball valve the outside air cannot enter the drying chamber unless there is a partial vacuum inside; this prevents increase of weight by the absorption of moisture from the air.

4. The drying and dilute acid chambers are in one piece.

5. By means of the tap stopper air may be allowed to enter the acid chamber without removing the stopper; and the tube attached to the stopper makes it easy to connect with an apparatus for delivering dry air.

This apparatus may be obtained from Gallenkamp and Co.

STUDIES ON THE CLAUS REACTION.

(A.)—THE HEAT REACTIONS, THEORETICALLY CONSIDERED, OF DIFFERENT GASEOUS MIXTURES.

(B.)—EXPERIMENTS WITH MANGANESE OXIDES AS CONTACT MATERIAL IN PLACE OF FERRIC OXIDE.

BY R. FORBES CARPENTER AND S. E. LINDER, B.SC.

Historical and Preliminary.—Since the year 1893, when Mr. J. W. Kynaston read a paper before this Section (this Journal, 1893, 319—324) on the waste gases of the Chance-Claus sulphur recovery process, with suggestions as to their treatment for utilising their sulphur contents, the Journals of our Society have contained no further references to the chemistry or physics of the Claus reaction until last year, when, also before this Section, Dr. Conroy devoted some consideration to the Claus sulphur recovery process in his review of catalysis and its applications to manufacturing operations (this Journal, 1902, 305).

The first application of the patents of the late Mr. C. F. Claus was in connection with desulphurising gas liquors for use in the removal of sulphur impurities from crude illuminating gas. The process differed from the earlier attempts of Laming, Hills, and Sir George Livesey, in adding ammonia *gas* to the crude coal gas in place of scrubbing the latter by caustic ammonia *liquor*. The preparation of both caustic ammonia gas or liquor involved the desulphurisation of large volumes of resultant gas liquor by heat, with evolution of sulphuretted hydrogen and carbon dioxide (*cf.* 36th Annual Report, Alkali, &c., Works, pp. 28, 29). Mr. Claus set himself to solve in a practical way the problem of recovery of sulphur from these gases. In Mr. A. M. Chance's paper, read before the London Section of the Society in March 1888, the various patents of 1882 and 1883, taken out by Mr. Claus, are rehearsed (this Journal, 1888, 164, 165); the process thenceforward received a much larger extension in its application to the recovery of sulphur from the sulphuretted hydrogen produced in Mr. Chance's own process.

It is essential, however, to note that the principal gas accompanying the sulphuretted hydrogen in the desulphurisation of gas liquors is carbon dioxide, while in the Chance process this is replaced by nitrogen. This difference has considerable effect on the heat reaction in the Claus kiln, seeing that the specific heat of carbon dioxide rises so very much more than that of nitrogen at high temperatures, and as in many gas works the proportion that the sulphuretted hydrogen bears to the carbon dioxide removed from the crude gas by the scrubbing operations is extremely low, a point is not unfrequently reached when the gases are too weak in sulphuretted hydrogen for the heat reaction in the Claus kiln to develop sufficiently high a temperature for successful decomposition. It has for some years been recognised that if the percentage of sulphuretted hydrogen falls below 15, the remainder being carbon dioxide, stoppages of the process are liable to occur, by masses of sulphur solidifying in the base of the kiln in place of a steady flow of liquid sulphur being maintained to the first bay of the "flowers" chamber.

Students of the alkali reports may remember the experimental work on a small Claus kiln constructed to observe reactions conducted on laboratory scale, the results of which are described in the 36th Annual Report for 1899, pp. 181–4. From the conclusions at which we arrived Dr. Conroy quoted the chief and most important in his paper above mentioned. The gases then experimented with contained 8 to 12 per cent. of sulphuretted hydrogen, the remainder being carbon dioxide. In the 38th Report, pp. 147–51, are given the results of tests obtained from the working of a large plant, where the gases treated contained from 7—8 per cent. only of sulphuretted hydrogen, the balance being carbon dioxide, and where the heat requisite to maintain the decomposition of the sulphuretted hydrogen was supplied by waste fuel gases (from steam boilers) which circulated around the annular-shaped kiln on their passage to the chimney. Loss of heat by radiation was thereby prevented. Experiments showed that the temperature of the contact material in the kiln, within the limits of efficient reaction, is determined by the energy of chemical reaction, rather than by the temperature of the furnace gases circulating in the surrounding jacket.

Mr. W. Ralph Herring, the engineer and manager to the Edinburgh and Leith Gas Commissioners, has kindly given permission for the communication of the details of plant and results that appear in this paper.

The dimensions of the kiln at the Granton Works are as follows:—(1) Cross section, an annulus; large diameter, 17 ft.; smaller, 5 ft. (inside measurements). Superficies of this, 207 sq. ft. (2) Height of kiln, 7 ft.; and of the packing, to whose composition we will refer later, 2 ft. 6 ins.

(*a*) *The Heat Reactions, theoretically considered, of different Gaseous Mixtures.*—It appeared of interest, in view of the conclusions as to heat supply previously mentioned, to ascertain by calculation what would be the maximum temperature attainable from the reactions in the kiln by the passage of a mixture of gases of known composition, and these are set out in the accompanying Table I.:—

TABLE I.

Heat Reactions in the Claus Kiln theoretically considered.

	Reacting Mixture.						Temperature of Reaction – ° F.		
							Calculated.		Found
	Temperature.	Composition per 100 Vols.					100 parts of Sulphur as Sulphuretted Hydrogen oxidised to		
		CO_2.	H_2S.	O.	N.	Aqueous Vapour.	100 Free S.	50 Free S, 50 S as SO_2.	
A.—Hypothetical Mixtures.	F.								
1. Dry gas contains 20 per cent. H_2S, 80 per cent. N	90	Absent	9·53	9·53	76·27	4·67	(*b*) 960	(*b*) 1,750	..
2. Dry gas contains 6·67 per cent. H_2S, 93·33 per cent. N	90	Absent	4·77	4·77	85·79	4·67	(*a*) 680 (*b*) 550	(*b*) 1,010	..
3. Dry gas contains 2·86 per cent. H_2S, 97·14 per cent. N	90	Absent	2·38	2·38	90·57	4·67	(*a*) 400 (*b*) 330	(*b*) 570	..
4. Dry gas contains 20 per cent. H_2S, 80 per cent. CO_2	90	38·18	9·53	9·53	38·14	4·67	(*b*) 775	(*b*) 1,350	..
5. Dry gas contains 6·67 per cent. H_2S, 93·33 per cent. CO_2	60	68·83	4·92	4·92	19·66	1·67	(*a*) 515 (*b*) 425	(*b*) 725	..
B.—Jacketed Claus Kiln Granton.								22 per cent. S as H_2S. 17 per cent. S as SO_2.	
6. Moist gas contains 7·6 per cent. H_2S, 83·4 per cent. CO_2, 9·0 per cent. air	60	56·2	5·1	7·4	29·7	1·6	(*a*) 545 (*b*) 450	(*a*) 555 (*b*) 495	570

See Table, p. 149—150, line 2, 38th Annual Report, 1901.
NOTE.—(*a*) Sulphur assumed to be in liquid state. (*b*) Sulphur assumed to be in state of vapour.

The data necessary for the thermo-chemical calculations involved were collected from various sources; we have thought it well to specify the authorities, as there are some notable divergencies in the values given by various experimenters. The greatest differences in specific heats at high temperature occur in the cases of carbon dioxide and water vapour, two of the products most frequently occurring in processes where thermo-chemical calculations are applied as an aid in following the course of reactions. The steady rise in the specific heat values will be noted in the figures tabulated in the data at the end of the paper (p. 462).

In the hypothetical gaseous mixtures tabulated above twice the volume of air required for perfect decomposition was supposed to be present. The calculations of thermo-chemical reactions were extended beyond the stage of complete decomposition to combination of the residual oxygen with half the sulphur produced. The column "50 Free S, 50 S as SO_2" shows the rise of temperature resulting from this second stage of reaction.

In gasworks practice, as shown by example 6, it is not unfrequently found that there is a considerable excess of air present over that demanded by the equation $H_2S + O = H_2O + S$. With dilute gas it does not at all follow that the whole of this excess appears later as sulphur dioxide; doubtless, at high temperatures with gases of 20 per cent. sulphuretted hydrogen and upwards, the remainder being nitrogen, this would be the case, for with the Chance-Claus gases tested on leaving the kiln or the flowers chambers it is usual to obtain negative test for presence of oxygen. With the gases of the composition of examples 2, 3, and 5, it is proved by the Granton experiments that both sulphur dioxide and oxygen pass away together from the kiln. It appears probable that if the sulphur is in the liquid state, and not in that of vapour, the heat in the kiln being comparatively low and much below the boiling point of sulphur, the opportunities for combination are lessened.

The temperatures given are calculated to Fahrenheit scale, as that in ordinary works' use.

The two hypothetical mixtures taken with 20 per cent. sulphuretted hydrogen, varying the diluent remainder (1) as nitrogen, (2) as carbon dioxide, are shown in examples 1 and 4 of the table. The first might be described as a weak Chance-Claus kiln gas, apart from small percentages of carbon monoxide, carbon dioxide, and oxygen; the cond is a gas of composition frequently met with in the laus kiln plants attached to gasworks manufacturing lphate of ammonia. The effect of carbon dioxide in wering resultant temperature is extremely marked. This also noticeable in comparing examples 2 and 5.

Example 3 is calculated to show the limit of application ' the Claus process; the percentage of sulphuretted ydrogen being only 2·86, the resultant maximum tempe-ture approaches that regarded from the experiments ; the critical temperature, 400° F. A kiln would need be very carefully constructed with adequate heat jacket to aintain the heat of reaction in the contact zone sufficiently gh to prevent solidification of sulphur before the flowers hamber was reached.

Example 6 is calculated from one of the experiments ecorded in the 38th Report, where, in the gases leaving the lphur chamber, 1 cb. ft. of permanent gases measured in e aspirator was accompanied by 7·2 grains of sulphur as lphuretted hydrogen and 5·6 grains as sulphurous acid, iving a loss of 39 per cent. of sulphur. The temperature lculated for this example (*a*) agrees very well with that bserved from the higher reading of one of two thermometers a tube placed well down in the contact mass.*

It will also be noted that a large amount of heat is used p in vaporising the sulphur resulting from the decomposition. he latent heat of vaporisation of sulphur at 316° C. (601° F.) as been ascertained to be 362 calories; this is the figure sed as a basis for the calculations in this table, and in the ne that follows. In examples 2, 3, and 5, both values are iven, of sulphur in the state of liquid and of vapour, as, in e case of such a large volume of accompanying permanent gases, sulphur vapour might well be carried in conderable amount at a lower temperature than that named above. At the same time we have above given our reasons for the probability that, in such cases, the sulphur is largely in the liquid form.

The calculations of example 6 are set out in extended form, following the data (p. 463), as showing the application of the data to this particular case.

It may be stated that the aim of the management at Granton, in installing this plant, was less for sulphur recovery than decomposition of sulphuretted hydrogen, the sulphur dioxide produced being removed by passage of the gases through a limestone tower flushed with water, especially designed with this view, and of larger dimensions than is usual in gasworks Claus plants. Hitherto at this work considerable difficulty has been experienced in making the sulphur produced settle in the right place ; it persists in following the gases, not settling to any material extent in the flowers chamber, but passing on to the limestone tower, where it forms a closely adhering coat on the rough limestone, almost as if it had assumed the viscous condition ; certainly, to the eye without aid of a magnifying glass, the crystalline structure cannot be detected. This obstinate adherence to the limestone materially interferes with the efficiency of the tower in removing sulphur dioxide from the gases, and is clearly one that must be met by interposing some apparatus for making this finely divided sulphur carried with the stream of gases aggregate and drop before the limestone tower is reached.

In Table II. are set out from examples in actual practice the maximum temperatures in Claus kilns dealing with gases from the Chance process of treatment of alkali waste for sulphur recovery. We are much indebted to those manufacturers who have supplied us with these figures for permission to make use of them for this paper.

TABLE II.

Work.	Holder Gas per 100 Volumes.					Reacting Mixture per 100 Volumes Moist, 60° F.						Exit Gases, Sulphur.			Temperature of Reaction Calculated.	
	H_2S.	CO_2.	CO.	O.	N.	H_2S.	CO_2.	CO.	O.	N.	Aqueous Vapour.	Grains per cb. ft. of Permanent Gases, 60° F. As H_2S.	Grains per cb. ft. of Permanent Gases, 60° F. As SO_2.	Per Cent. of Total Sulphur entering Kiln as H_2S.	° C.	° F.
A	35·0	2·5	1·5	0·5	60·5	18·2	1·3	0·8	9·5	68·5	1·7	11	6	11·5	905	1,660
B (i)...	30·0	0·8	1·5	0·8	66·9	16·2	0·4	0·8	9·3	71·6	1·7	8	10	13·5	900	1,650
B (ii) ..	30·0	0·8	Absent	0·8	68·4	16·5	0·4	Absent	9·1	72·3	1·7	8	10	13·5	855	1,570
C	22·0	2·0	0·5	2·5	73·0	14·4	1·3	0·3	8·3	74·0	1·7	5	9	12·5	805	1,480

In A the inert gases, during the sulphydrating stage of the process in the Chance carbonators, are drawn off, and do not pass to the gasholder supplying the Claus kiln. In B and C they do so pass. Considerable attention is given in this process to keeping down the percentage of carbon monoxide in the gases of the lime kilns supplying carbonic acid for the decomposition of the waste in the carbonators, and this, on account of the rise of temperature in the Claus kilns produced by combustion of the monoxide to dioxide, oxidation of CO to CO_2 being accompanied by evolution of heat amounting to 67,960 calories.

Example C has been set out in detail (p. 464) to show the method of applying the data for the calculation of heat evolved in the reactions, and the temperature of the resulting products. This particular example does not illustrate so well as others the influence on temperature of presence of carbon monoxide in quantity; this, however, is illustrated in B (i), (ii), where (ii) represent a condition occasionally obtaining, while (i) represents the usual analysis of holder gases. In A the effect is more apparent, the calories evolved by oxidation of 0·95 grm. of carbon monoxide to dioxide being 2,310, against 2,250 proceeding from oxidation of 1 grm. free sulphur to sulphur dioxide; these being the quantities per 100 litres of moist gases reacting (60° F.).

Attention may now be directed to the question of influence of temperature on the loss of sulphur proceeding either (*a*) from non-decomposition of sulphuretted hydrogen, and from oxidation of some of the sulphur produced by the air present, or (*b*), by the counter reaction, $2H_2O + 3S = 2H_2S + SO_2$. In many works the aim of the management is to keep the sulphur escaping as sulphuretted hydrogen decidedly in excess of that escaping as sulphur dioxide. Mr. Kynaston, in 1893, in the paper already quoted, stated that the yield of sulphur is undoubtedly greater when sulphuretted hydrogen predominates to the extent of 9 grains of sulphur in this form to 7 as sulphur dioxide per cubic foot of permanent gases escaping.

It is difficult, when there are so many varying factors, to trace the influence of temperature on percentage loss of sulphur, nor can the results set out above be said to give any clear indication; *e.g.*, in example A, with the gas richest in sulphur contents, the maximum temperature attainable is at its highest, while the percentage sulphur loss is the lowest of the three, which, indeed, all closely approximate; there would be required, in addition, comparison of the volumes passing per square foot superficies, or per cubic foot of contact material in the kiln in a given time, assuming radiation was a constant. We are only able to supply this figure approximately in the case C, where the rate was 0·27 cb. ft. of holder gases, corresponding to 0·41 cb. ft. of mixed reacting gases (60° F.) in the kiln per square foot of superficies per minute. This rate is lower than that of the gases in the Granton kiln (0·54). Moreover, in deducing any inferences as to the influence of temperature in promotion of the counter reaction between water vapour and sulphur, these should proceed from actual measurement in the kiln itself that is experimented on. The tables can only, as regards temperature, indicate the maxima attainable, not working temperatures varying with the conditions in each work.

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* As the reading of the second thermometer situated on the other side of the kiln showed only 280° F., there is strong reason to believe the reaction in the hotter zone was much more perfect than the average figure would appear to indicate.

We are not able to present any figures of sulphur loss corresponding to those in Table II. for ordinary gasworks Claus plants (composition of gases, 20—25 per cent. sulphuretted hydrogen to 80—75 per cent. carbon dioxide); but such figures as are contained in the Alkali Reports from 1884 onwards indicate that the losses are lower, especially in sulphur as sulphur dioxide. Probably the counter reaction between water vapour and sulphur is much less active at the lower temperatures induced by presence of so much carbon dioxide.

With sulphuretted hydrogen, 100 per cent., the theoretical maximum temperature rises to 1,150° C. (2,100° F.). Here the influence of water vapour, at the high specific heat attributed to it at the above temperature, is quite as great as that of the nitrogen present in absorbing the heat evolved in the reation, the equation reading—

$$(t - 16)\;[\underset{\text{Nitrogen.}}{18{\cdot}85} + \underset{\text{Water vapour.}}{19{\cdot}07} + \underset{\text{Sulphur.}}{3{\cdot}04}] = 46384.$$

(b) *Experiments with Manganese Oxides as Contact Material in place of Ferric Oxide.*—In his paper on catalysis already quoted Dr. Conroy states, as regards the Claus reaction, "A curious fact in connection with this process is, that the oxide of iron originally filled into the kiln becomes changed during constant use to pyrites, a fact evident both from its appearance and composition. Now, although the pyrites so formed allows of the ready restarting of a kiln, a filling of ordinary pyrites is quite worthless for this purpose; there is some property lacking, namely, the catalytic." In this latter Dr. Conroy includes, to a certain extent, we believe, the physical property of condensing gases, as possessed, for instance, by platinum black or finely divided carbon, and in enhancing this latter, the physical condition of the iron bisulphide into which the ferric oxide is eventually transformed must exercise a very material influence. In one instance, on emptying the filling of a Claus kiln, idle for some years, and spreading the material on the ground, the rate of oxidation was so rapid as to cause ignition of the iron bisulphide.

It was with the view of obtaining contact with material in a very fine state of division that the use of Weldon mud suggested itself to us in 1899, as an alternative to ferric oxide, with the possibility, if not probability—judging from the comparison of manganese with iron in other processes—of obtaining a more intense reaction and more perfect decomposition of gases weak in sulphuretted hydrogen. We were already aware of the value set upon Weldon mud in removing the last traces of sulphuretted hydrogen from coal-gas, as applied in Salamon and Hood's patents, whose process was described by the patentees (this Journal, 1888, 3—9). Here, however, we proposed to apply the Weldon mud as a more active catalyte. It is curious that Claus, in his patent 5070, 1883 (this Journal, 1884, 114), appeared to look upon manganese oxides as among those bodies as retarding, not promoting, decomposition. The patent indicates that he could never have tried them experimentally, or he would have become aware that the catalytic action of Weldon mud begins to influence decomposition at a temperature lower than that of ferric oxide. Mr. Claus's aim in 1883 was to prevent matting and fusing together of his filling material under the influence of the high temperature prevailing in his kiln, a result probably due to formation of the more fusible ferrous sulphide, as in pyrites kilns.

When, during the summer of 1902, the usual annual stoppage of the sulphate of ammonia plant at Granton took place, an opportunity occurred for obtaining samples of the filling material. Proceeding from the bottom, this consisted of three layers of burnt pyrites of 8 ins. thickness each, each successive layer graded finer than the one immediately below, and 6 ins. of Weldon mud on the top. Mr. Herring kindly had these taken and forwarded for our examination. The three bottom layers of iron oxide had undergone apparently little change, its appearance being that of ordinary purple oxide in lumps. Analysis, however, revealed the fact that in the top layer (the only one of the three tested) conversion to ferric sulphate had proceeded to such an extent that the mass contained over 30 per cent. of this substance calculated as $Fe_2(SO_4)_3$. It was seen that the Weldon mud had completely changed in appearance, looking in the bulk of a pale colour, but exhibiting no material physical change, except here and there throughout the mass were scattered small semi-crystalline but irregular-shaped granules. Later on in the investigation these were discovered to be metallic iron; analysis of the original Weldon mud charged showed the latter (as it should do) only to contain traces of iron, while, as drawn, 8·2 per cent. of metallic iron was extracted by the magnet. Mr. Herring endorses the suggestion that, in making rust joints on the cover of the kiln, a fitter must have spilt his tray of iron borings just where the sample was subsequently taken. The presence of metallic iron was certainly a puzzle until the comparison could be made with the material as charged.

Analysis of Samples of Weldon Mud before and after Use in Claus Kiln Reaction.

Constituents.	A. Laboratory Kiln. Recorded Temperature Range = 360°—500° F.		B. Granton Kiln. Recorded Temperature Range = 195°—570° F.	
	Before.	After.	Before.	After.
(a) Soluble in Boiling Water.				
Moisture (loss at 105° C.)	..	..	..	1·75
Combined water (260°—270° C. *in vacuo*)	..	..	..	5·00*
Manganous sulphate	..	2·32	..	42·63
Calcium sulphate	..	21·28	..	16·22
Magnesium sulphate	..	0·30	..	0·90
Alkalis as sulphates	..	3·95	..	5·45
Organic matter	..	..	..	Slight oily scum.
(b) Insoluble in Boiling Water.				
Organic matter	..	..	..	1·00
Manganese monoxide	2·67	21·69	4·35	3·89
„ dioxide	46·48	11·91	35·59	Absent
„ sulphide	..	Absent	..	„
Calcium oxide	..	0·62	..	0·90
Alumina	Traces	Traces	0·46	0·90
Ferric oxide				5·71
Metallic iron (by magnet)	..	..	..	8·21
Sulphur (by carbon bisulphide)	..	21·26	..	Traces
Silica, &c.	0·73	0·81	0·78	6·55
	..	..	..	99·11

* 42·63 manganous sulphate $MnSO_4$ = 47·71 hydrated sulphate $MnSO_4H_2O$ containing 5·08 H_2O.

While, in the Claus kiln, ferric oxide is converted into iron bisulphide, manganite of manganese and manganite of calcium are converted into manganous and calcium sulphates. The stage of manganese sulphide appears to be of very temporary duration; no trace of this could be found by us. The manganous sulphate is in the form of monohydrate.

It appeared of interest to ascertain if the Weldon mud, as used in the experimental Claus kiln in the laboratory, and remaining in stock from the experiments of 1899, had also undergone similar change. The analysis is set out in the table above, and shows that this is so, but in far less degree, as the experiments were not long continued, and the maximum temperature reached (500° F.) was much lower than that obtained at Granton (600° F.). In appearance both samples were much alike, but, in the case of the experimental kiln filling, the light shade was given by presence of a large percentage of sulphur, arising from the reaction, but solidified and remaining in the mass of contact material.

Apparatus employed and Methods of Analysis.

1) *Apparatus:* (1) *Gas Reservoir.*—A glass, bolt-h flask, capacity 13 to 14 litres, with paper scale c orated by experiment. The neck was fitted with two-he d rubber cork carrying glass tubes, one admitting w r to the bottom of the flask from a small glass cistern w constant flow adjustable at any desired level, the other c ected with the reaction tube through ½-in. water seal.

he correct proportions of gas and air were determined b rial for each set of experiments, solution of the gas in w r being prevented by a layer of oil. Experiment sl ved that no appreciable alteration of strength took pl e on allowing the gaseous mixture to stand over-night.

(2) *Reaction Vessel:* (*a*) *Heat Jacket.*—A copper glycerin bath, heated by Argand burner, and jacketed with asbestos card to lessen radiation.

(*b*) *Reaction Tube.*—A U-tube with 1-in. bulbs on the two limbs. Dimensions as follows:—Length of contact substance, 5 ins.; volume of contact substance, 25 c.c.; whence average diameter = 0·58 in. = 0·048 ft.

The working temperatures were given by thermometers arranged with their bulbs immersed in the glycerin and contact material respectively; the excess of the reading shown by the latter thermometer over that shown by the former being taken as rise of temperature due to chemical reaction whenever identity of readings was established over a sufficiently long period previous to the passage of the

TABLE III.

Reaction of Dilute Sulphuretted Hydrogen with Manganous Sulphote.

ontrolling Factors.	Contact Substance.								
	Temperature, ° F.				Reacting Mixture.			Air required by Theory for Reaction.	
	Glycerine Bath.	Contact Substance at Inlet.	Difference.	Rate of Flow. Cubic Feet per sq. ft. per Minute.	100 Volumes contain			$H_2S + O = H_2O + S = 2·5\ H_2S$.	$H_2S + O_3 = H_2O + SO_2 = 7·5\ H_2S$.
	(*a*)	(*b*)	(*b*—*a*)		H_2S. (*c*)	CO_2. (*d*)	Air. (*e*)	2·5 × (*c*).	7·5 × (*c*).
—Temperature.									
1. r = 6·10 H_2S.......	401	**410**	..	1·01	5·0	64·5	30·5	12·5	37·5
2. = 6·12 H_2S.......	322	**320**	..	0·97	4·9	65·1	30·0	12·3	36·9
B.—Air Supply.									
3. r = **2·58** H_2S....	390	407	17	1·86	12·2	56·3	31·5	30·5	91·5
4. = **3·23** H_2S....	396	407	11	1·39	11·0	53·5	35·5	27·5	82·5
5. = **3·64** H_2S....	394	408	14	1·17	7·7	64·3	28·0	19·2	57·6
6. = **6·10** H_2S....	400	412	..	1·36	5·0	64·5	30·5	12·5	37·5
—Rate of Flow.									
7. r = 3·68 H_2S......	393	404	11	**0·72**	7·6	64·1	28·0	19·0	57·0
8. = 3·64 H_2S......	395	411	16	**1·63**	7·7	64·3	28·0	19·2	57·6
9. = 6·10 H_2S......	403	410	..	**0·65**	5·0	64·5	30·5	12·5	37·5
.. = 6·10 H_2S......	400	412	..	**1·36**	5·0	64·5	30·5	12·5	37·5
Granton Kiln.	Furnace Gases.								
Air 7·24 H_2S...........	395	280 (pt. A.) 570 (pt. B.)	..	0·54	5·2	57·1	37·7	13·0	39·0

Controlling Factors.	Gases leaving Tube.				Efficiency.		
	Sulphur Grains per Cubic Foot.				H_2S per Cent. of Total entering.		
	As H_2S.	As SO_2.	As Free S, &c. (by diff.)	Total.	Escapes	Oxidised	
					As H_2S.	To SO_2.	To Free S, &c.
A.—Temperature.							
= 6·10 H_2S..............................	5·4	13·9	12·2	31·5	17·1	44·1	38·8
= 6·12 H_2S..............................	13·5	5·1	12·2	30·8	43·8	16·6	39·6
B.—Air Supply.							
3. = **2·58** H_2S..............................	25·4	0·9	49·9	76·2	33·3	1·2	65·5
4. = **3·23** H_2S..............................	23·3	3·1	42·1	68·5	34·0	4·5	61·5
= **3·64** H_2S..............................	9·8	4·9	33·0	47·7	20·5	10·2	69·3
= **6·10** H_2S..............................	6·4	11·1	14·0	31·5	20·3	35·2	44·5
C.—Rate of Flow.							
= 3·68 H_2S..............................	6·4	5·3	35·5	47·2	13·6	11·2	75·2
= 3·64 H_2S..............................	13·1	4·4	30·7	48·2	27·2	9·1	63·7
= 6·10 H_2S..............................	4·5	16·7	10·3	31·5	14·3	53·0	32·7
10. = 6·10 H_2S..............................	6·4	11·1	14·0	31·5	20·3	35·2	44·5
Granton Kiln.							
Air = 24 H_2S..............................	7·2	5·6	19·8	32·6	22·1	17·2	60·7

NOTE.—(1) Each set of results, 1, 2, &c., is the mean of several experiments.
(2) In the above calculations no correction is made for contraction of volume due to reaction.

gaseous mixture, or during the use of carbon dioxide in its place. Where this identity was not so established, a blank mark (..) is left in the table.

(3) *Absorbing Vessels:* (*a*) *Sulphur Chamber.* — A 200 c.c. bulb blown on the exit from the reaction tube.

(*b*) *Iodine Vessels.*—Two pairs of Drechsel's bottles with inlet tubes reduced to 1 mm. diameter; gaseous stream divertible through either pair at will, without disturbing the working pressure.

(*b*) *Analysis of Gases:* (1) *Before Reaction.*—100 c.c. of the reacting mixture are rapidly withdrawn through a side tube into a Bunte burette, the water remaining, after exact adjustment of volume, removed by suction, 10 c.c. of strong caustic soda free from nitrites admitted, followed by distilled water as absorption proceeds. Contraction gives $H_2S + CO_2$, volume per cent.

The solution in the burette is run into a flask containing slight excess of N/10 iodine acidified with sufficient hydrochloric acid to more than neutralise the soda employed, and the excess iodine determined by N/10 thiosulphate, starch indicator. Volume of N/10 iodine reduced × 1·12 = H_2S, volume per cent.

(2) *After Reaction.*—Gases bubbled through two Drechsel's bottles in tandem. No. 1 bottle, 10 to 15 c.c. N/10 iodine + equivalent of N/10 bicarbonate; total volume, 100 c.c. No. 2 bottle, 1 to 2 c.c. N/10 iodine; total volume, 30 c.c.

The stream of gas is passed until the iodine in No. 1 bottle is exactly decolorised, gentle agitation of the contents being maintained throughout to ensure absorption of the sulphur compounds. The contents of the two bottles are then titrated separately; No. 1 bottle with N/10 $NaHCO_3$, methyl orange indicator, giving SO_2 as SO_3; No. 2 bottle with N/10 thiosulphate, starch indicator, giving traces of H_2S that have escaped absorption in bottle No. 1.

The volumes of N/10 iodine neutralised and acidity found afford the necessary data for calculating the amount of sulphur present as H_2S, SO_2 in the volume of gas used, sulphur in the free state, &c., being got by difference.

The results obtained are set out in Table III., which has been drawn up on lines very similar to those observed in presenting the results of experiments made at the works in 1901 (38th Alkali Report, pp. 149, 150). They can also be compared with the laboratory experiments of 1899 (36th Alkali Report, pp. 183, 184).

From the results given in the table, the following conclusions are drawn respecting the working conditions most favourable, under the special conditions chosen, of gases low in sulphur contents, for maximum decomposition of sulphuretted hydrogen, accompanied by highest yield of sulphur in the free state, apart from other considerations (*vide supra*, p. 459).

(1) *Working Temperature of Contact Substance.*—This should not fall below 400° F. Compare Experiment 2, 320 F. 39·6 per cent. as free sulphur; 43·8 per cent. H_2S escaping unoxidised. Experiment 1, 410 F. 38·8 per cent. as free sulphur; 17·1 per cent. H_2S escaping unoxidised.

A higher temperature results in oxidation of the sulphur formed to sulphurous acid, especially if excess of air be present. Compare Experiment 9. Air, 6·10. 53 per cent. H_2S oxidised to SO_2. Experiment 19. Air, 6·10. 35·2 per cent. H_2S oxidised to SO_2. See also, for effect of temperature, 36th Report, pp. 183, 184, temperature rising to 500 F.

(2) *Air Supply.*—The proportion of air present in the reacting mixture should not exceed 3½ to 4 times that of the sulphuretted hydrogen present [2½ times being the theoretical minimum for complete decomposition to sulphur and water; 7½ times for complete oxidation to sulphurous acid and water]. Compare Experiment 7. Air, 3·68: H_2S, 75·2 per cent. to free sulphur; 13·6 per cent. H_2S escaping unoxidised. Experiment 9. Air, 6·10: H_2S, 22·7 per cent. as free sulphur; 11·3 per cent. H_2S escaping unoxidised.

(3) *Rate of Flow of Reacting Mixture.*—This should not much exceed ¾ cb. ft. per minute per square foot of superficies. Compare Experiment 7. Rate, 0·72 cb. f 75·2 per cent. as free sulphur; 13·6 per cent. H_2S escapin unoxidised. Experiment 5. Rate, 1·17 cb. ft. 69·3 pe cent. as free sulphur; 20·5 per cent. H_2S escaping un oxidised. Experiment 8. Rate, 1·68 cb. ft. 63·7 pe cent. as free sulphur; 27·2 per cent. H_2S escapin unoxidised.

Theoretical Temperature attained in Claus Kiln by Products of Reaction.

Data for Calculation—(*a*) Specific heats (water = 1 constant pressure):—

Carbon dioxide, calculated by means of equatio Molecular heat (average between 0° C. and $t°$ C.) = 8·272 + 0·012012 t — 0·0000023628 t^2. (Kramers from Le Chat lier.)

Water vapour, calculated in the same way. Molecul heat average between 0° C. and $t°$ C. = 7·56 + 0·006552 (Kramers from Le Chatelier.)

Oxygen, nitrogen, carbon monoxide, calculated fro equation given in Nernst's "Theoretical Chemistry" (trans by C. S. Palmer), p. 35.

Cp = 6·5 + a T, where Cp = molecular heat at consta pressure, a is constant = 0·0010 for H_2, N_2, O_2, C T represents the absolute temperature, whence, averag specific heats between 0° and 1,200 C.

Temperature.	Calculated from Le Chatelier's Equations.		Calculated from Nernst's Equation.	
	Carbon Dioxide.	Water Vapour.	Oxygen.	Nitrogen and Carbo Monoxid
° C.				
0	0·188	..	0·212	0·241
200	0·240	0·49	0·218	0·249
300	0·265	0·53	0·221	0·252
400	0·289	0·57	0·224	0·256
500	0·311	0·60	0·227	0·259
600	0·332	0·64	0·230	0·263
700	0·353	0·68	0·233	0·266
800	0·371	0·71	0·236	0·270
900	0·390	0·75	0·239	0·274
1,000	0·407	0·78	0·242	0·278
1,100	0·423	0·82	0·245	0·282
1,200	0·438	0·86	0·248	0·285

Somewhat different values are assigned to the speci heats of carbon dioxide and water vapour by other observe The values adopted are those calculated from equati given by Dr. Kramers "Water Gas Manufacture in The and Practice," Abstract of translation of communicati (published in 1901 in "Het Gas"), Journal of Gas Lightu May 20, 1902, and are stated by E. Blass, Stahl und Eis 1892, No. 20, Zur Berechnung von Flammentemperatur to hold up to 1,700 C. or even 2,000° C. No similar c firmatory evidence is available with regard to the form of 1887, quoted by Nernst (p. 36) *supra*, and that of Mall and Le Chatelier of 1890 refers to mean molecular heat constant *volume* between 0 and t; at the temperatures question it may not be safe to apply the factor of conver to constant *pressure* $\frac{C_p}{C_v}$ = 1·4053.

Sulphur dioxide, 0·1544. (Regnault.) Sulphuret hydrogen, 0·2423. (Croullebois, *vide* Watts.) Sulp solid, 0·1774 = 0·18 approx. (Regnault.) Liquid, 0· (*Chemiker Kalender.*) Vapour, 0·08. Calculated fr assumed molecular heat. Latent heat of vaporisation 316 C. (at other and lower temperatures, value dedu from this by calculation) = 362. (Landolt and Bornste) Latent heat of fusion, 9·368 = 9·40 approx. (*Watts' Di*)

Heats of Reaction.—(i) $H_2S + O = H_2O + S$. 34 grm + 16 grms. = 18 grms. + 32 grms. Whence at 0 C.,

Absorbed—

	Calori
To decompose H_2S to amorphous sulphur (Watts). =	4,7
To vaporise H_2O at 0° C. (Regnault) .... =	10,91
	15,5

volved—

	Calories.
y oxidation of H_2 by O to liquid water at 0° C. (Regnault)	= 68,317
Net heat evolved	= 52,660*

) $S + O_2 = SO_2$. 32 grms. + 32 grms. = 64 grms.

nce at 0° C.,

olved—

	Calories.
y conversion of amorphous to rhombic sulphur (Watts)	= 900
y oxidation of rhombic sulphur to SO_2 (Thomsen)	= 71,070
otal evolved, oxidation of amorphous S to SO_2	= 71,970

i) $CO + O = CO_2$ 28 grms. + 16 grms. = 44 grms.

,960 calories. (Thomsen.)

e gaseous mixture reacting in the kiln in the results d in Table I. is assumed to be saturated with aqueous ur at temperatures 60° F. and 90° F., and to contain the amount of air necessary for exact oxidation of the uretted hydrogen to sulphur and water; in those stated able II. the air used is calculated from the composition e holder and exit gases.

e calculations in Table I. proceed in two stages: (1) perature reached by products on assumption that all sulphur is obtained in the free state — 100 per cent. . (2) Temperature reached on assumption that the s of oxygen present oxidises its full equivalent of ur to sulphur dioxide — 50 per cent. of sulphur ned in the free state — 50 per cent. of sulphur obtained e form of sulphur dioxide. Those in Table 2 proceed ely on the lines of practical working.

e following examples are given to illustrate the way ich the data are applied:—

Table I. (p. 458).

No. 6.—(Jacketed Claus Kiln, Granton.)

ge 1.—100 per cent. yield of free sulphur.

acting mixture — (60° F. moist).

	Vols.
H_2S	= 7·60
CO_2	= 83·40
Total air	= 55·00
	146·00

hence, by calculation, 100 vols. of moist reacting gases F.) contain:—H_2S = 5·1 per cent.; CO_2 = 56·2 per ; air = 37·1 (nitrogen, 29·7; oxygen, 7·4; giving oxygen in excess); water vapour = 1·6.

) litres of moist gas (16° C., 760 mm.) contain:—

$$N = 29{\cdot}7 \times 1{\cdot}255 \times \frac{273}{289} = 35{\cdot}22 \text{ grms.}$$

$$\text{) (in excess)} = 4{\cdot}8 \times 1{\cdot}430 \times \frac{273}{289} = 6{\cdot}48 \quad ,,$$

$$CO_2 = 56{\cdot}2 \times 1{\cdot}966 \times \frac{273}{289} = 104{\cdot}3 \quad ,,$$

$$H_2S = 5{\cdot}1 \times 1{\cdot}523 \times \frac{273}{289} = 7{\cdot}34 \quad ,,$$

$$H_2O = 1{\cdot}6 \times 0{\cdot}805 \times \frac{273}{289} = 1{\cdot}22 \quad ,,$$

ence, heat evolved per combustion of 100 litres of reacting mixture—

$$= \frac{7{\cdot}34}{34} \times 52{,}660 = 11{,}370 \text{ calories.}$$

oducts of Reaction.—Water produced = $\frac{7{\cdot}34}{34} \times 18$ = grms.; water carried = 1·22 grms.; total = 5·10.

lphur = $\frac{7{\cdot}34}{34} \times 32$ = 6·90 grms.

ygen in excess = 6·48 grms., see above.

Let t° C. be the final temperature reached by the products of reaction, then—

Rise of temperature = $(t - 16)$° C.

Nitrogen absorbs $(t - 16) \times 0{\cdot}252 \times 35{\cdot}22 = (t - 16) \times 8{\cdot}87$.

Oxygen in excess $(t - 16) \times 0{\cdot}220 \times 6{\cdot}48 = (t - 16) \times 1{\cdot}42$.

Sulphur—

	Per Grm.
To raise to 115° from 15·6° C. = 100 × 0·18	= 18·0
To melt at 115°	= 9·4
Total approximate	= 27·4

Hence, to melt 6·9 grms. at 115° = 27·4 × 6·9 = 189.

To raise the liquid sulphur from 115° to t° = $(t - 115) \times 0{\cdot}3 \times 6{\cdot}9 = (t - 16) \times 2 - 198$.

Water vapour = $(t - 16) \times 0{\cdot}52 \times 5{\cdot}10 = (t - 16) \times 2{\cdot}65$.

Carbon dioxide = $(t - 16) \times 0{\cdot}263 \times 104{\cdot}3 = (t - 16) \times 27{\cdot}43$.

Whence, equating heat evolved to heat absorbed, we get—

$$(t - 16)[8{\cdot}87 + 1{\cdot}42 + 2{\cdot}00 + 2{\cdot}65 + 27{\cdot}43] - 198 + 189 = 11{,}370.$$
$$(t - 16) \times 42{\cdot}37 = 11{,}379.$$
$$t = 285° \text{ C.} = 545° \text{ F.}$$

Stage 2 (i).—50 per cent. of free sulphur oxidised to sulphur dioxide.

Proceeding as before, we have, for combustion of 100 litres of moist reacting mixture—

	Calories.
Net heat evolved by combustion to sulphur and water = $\frac{7{\cdot}34}{34} \times 52{,}660$	= 11,370
Not heat evolved by combustion of 3·45 grms. of sulphur to sulphur dioxide = $\frac{3{\cdot}45}{32} \times 71{,}970$	= 7,760
Total evolved	= 19,130

Products of Reaction. — Water = 5·10 grms., total sulphur = 3·45 free, 3·45 as sulphur dioxide = 6·90 SO_2, leaving excess oxygen = 6·48 − 3·45 = 3·03.

Let t' be final temperature reached by products of reaction, then—

Rise of temperature = $(t' - 16)$° C.

Nitrogen absorbs $(t' - 16) \times 0{\cdot}256 \times 35{\cdot}22 = (t' - 16) \times 9{\cdot}01$.

Sulphur—

To raise to 115° C. and melt	= 27·4 cal. per grm.		
To raise melted sulphur to 316° C. = 201 × 0·30	= 60·3	,,	,,
To vaporise at 316° C.	= 362·0	,,	,,
Total	= 450·0 per 1 grm. approximately		

Hence total per 3·45 grms. = 450 × 3·45 = 1,552.

To raise vapour from 316° C. to $t' = (t' - 316) \times 0{\cdot}08 \times 3{\cdot}45 = (t' - 316) \times 0{\cdot}28 = (t' - 16) \times 0{\cdot}28 - 84$.

Water vapour $(t' - 16) \times 0{\cdot}57 \times 5{\cdot}10 = (t' - 16) \times 2{\cdot}91$.

Carbon dioxide $(t' - 16) \times 0{\cdot}29 \times 104{\cdot}3 = (t' - 16) \times 30{\cdot}25$.

Sulphur dioxide $(t' - 16) \times 0{\cdot}1544 \times 6{\cdot}9 = (t' - 16) \times 1{\cdot}07$.

Oxygen in excess $(t' - 16) \times 0{\cdot}224 \times 3{\cdot}03 = (t' - 16) \times 0{\cdot}68$.

Whence, equating heat evolved to heat absorbed, we get—

$$(t' - 16)\ [9{\cdot}01 + 0{\cdot}28 + 2{\cdot}91 + 30{\cdot}25 + 1{\cdot}07 + 0{\cdot}68] - 84 + 1{,}552 = 19{,}130.$$
$$(t' - 16) \times 44{\cdot}20 = 17{,}662.$$
$$t' = 416° \text{ C.} = 781° \text{ F.}$$

---

[*] e heats evolved for reaction at 16° C. and 32° C. approximate ely to that at 0° C. as to render it unnecessary to expand the ent given here in its simplest form.

Stage 2 (ii).—Calculation made on basis of amounts of sulphur dioxide and sulphuretted hydrogen actually present in gases leaving kiln.

As before, reacting mixture per 100 volumes, moist (60° F.) contains—

H_2S	5·1
CO_2	56·2
O	7·4
N	29·7
Aqueous vapour	1·6
Entering	100·0

Permanent gases—

CO_2 = 56·2 Sulphur as SO_2 — 5·6 grs. per cb. ft.
N = 29·7 „ H_2S = 7·2 „ „
Excess O = 4·5
Aqueous vapour = 1·5
Leaving = 91·9 approximately.

Whence per 100 litres of reacting mixture entering (16° C., 760 mm.).

$$\textit{Entering},\ N = 29{\cdot}7 \times 1{\cdot}255 \times \frac{273}{289} = 35{\cdot}22 \text{ grms.}$$

$$\text{Total } O = 7{\cdot}4 \times 1{\cdot}43 \times \frac{273}{289} = 10{\cdot}0 \quad ,,$$

$$CO_2 = 56{\cdot}2 \times 1{\cdot}965 \times \frac{273}{289} = 104{\cdot}3 \quad ,,$$

$$H_2S = 5{\cdot}1 \times 1{\cdot}523 \times \frac{273}{289} = 7{\cdot}34 \quad ,,$$

$$H_2O = 1{\cdot}6 \times 0{\cdot}805 \times \frac{273}{289} = 1{\cdot}3 \quad ,,$$

$$\text{Excess } O = 4{\cdot}5 \times 1{\cdot}43 \times \frac{273}{289} = 6{\cdot}1 \quad ,,$$

Grms.

$$\textit{Leaving},\ \text{sulphur as } H_2S = \frac{7{\cdot}2}{15{\cdot}432} \times \frac{1}{28{\cdot}32} \times 91{\cdot}9 = 1{\cdot}52$$

calculated as $H_2S = 1{\cdot}61$.

$$,, \quad ,, \quad \text{as } SO_2 = \frac{5{\cdot}6}{15{\cdot}432} \times \frac{1}{28{\cdot}32} \times 91{\cdot}9 = 1{\cdot}18$$

calculated as $SO_2 = 2{\cdot}36$.

and,

H_2S entering ...	7·34		
„ leaving.....	1·61		
	Grms.		
Reacting to free sulphur......	5·73	$\times \frac{16}{34} =$ 2·7 oxygen.	
Calculated as sulphur......	5·40		
Reacting to SO_2..........	1·18	= 1·2	Do., hence 10·0 entering 3·9 reacting.
Net free sulphur	4·22	3·90	6·1 grms. excess to exit.

Whence, per combustion of 100 litres of moist reacting mixture (16·6 C.).

Heat evolved—

Sulphuretted hydrogen to free sulphur	$\frac{5{\cdot}73}{34} \times 52{,}660 = 8{,}875$
Free sulphur to sulphur dioxide	$\frac{1{\cdot}18}{32} \times 71{,}970 = 2{,}654$
Total	11,529

Products. —Free sulphur, 4·22 grms; sulphur dioxide, 2·36 grms.; sulphuretted hydrogen, 1·61 grms.: water, $\frac{5{\cdot}73}{34} \times 18 = 3{\cdot}0$ grms.; add water carried, 1·3 grms., total for water, 4·3 grms.

First, assume sulphur in state of vapour, then—

Rise of temperature = $(t - 16)$ C.

Nitrogen absorbs $(t - 16) \times 0{\cdot}252 \times 35{\cdot}22 = (t - 16) \times 8{\cdot}87$.

Sulphur, 4·22 grms. vapour.

	Calories per 1 grm.
To raise to 115° C. and melt	27·4
To raise to 250° C. from 115° × 135 = 0·3.	40·5
To vaporise at 250° C.	376·5
Total	444·4

Whence, $444 \times 4{\cdot}22 = 1{,}873$.

To raise vapour from 250° C. to t = $(t - 250)$ $0{\cdot}08 \times 4{\cdot}22 = (t - 250) \times 0{\cdot}34 = (t - 16) \times 0{\cdot}$ $- 80$.

Sulphur dioxide, $(t - 16) \times 0{\cdot}1544 \times 2{\cdot}36 = (t - 16)$ $0{\cdot}36$.

Sulphuretted hydrogen, $(t - 16) \times 0{\cdot}242 \times 1{\cdot}61$ $(t - 16) \times 0{\cdot}39$.

Carbon dioxide, $(t - 16) \times 0{\cdot}255 \times 104{\cdot}3$ $(t - 16) \times 26{\cdot}59$.

Oxygen in excess = $(t - 16) \times 0{\cdot}220 \times 6{\cdot}$ $(t - 16) \times 1{\cdot}34$.

Water vapour = $(t - 16) \times 0{\cdot}52 \times 4{\cdot}3 = (t - 16$ $2{\cdot}24$.

Equating we get—

$$(t-16)[8{\cdot}87 + 0{\cdot}34 + 0{\cdot}36 + 0{\cdot}39 + 26{\cdot}59 + 1{\cdot}34 + 2{\cdot}24] - 80 + 1{,}873 = 11{,}529.$$

$$(t-16) \times 40{\cdot}13 = 9{,}736.$$

$$t = 258^\circ \text{ C.} = 496^\circ \text{ F.}$$

Second, assume sulphur in state of liquid; then—

Rise of temperature = $(t'-16)^\circ$ C.
Sulphur = 4·22 grms. liquid.
To melt at 115° C. = $27{\cdot}4 \times 4{\cdot}22 = 115{\cdot}6$.
To raise to $t' = (t'-115) \times 0{\cdot}3 \times 4{\cdot}22 = (t'-11$ $\times 1{\cdot}27 = (t'-16) \times 1{\cdot}27 - 126$.

Whence, equating we get—

$$(t'-16) \times 42{\cdot}11 - 126 + 116 = 11{,}529.$$

$$(t'-16) \times 42{\cdot}11 = 11{,}539.$$

$$t' = 290^\circ \text{ C.} = 554^\circ \text{ F.}$$

TABLE 2.—WORK C.

Entering kiln:—

Holder gas—		
H_2S	22·0	
CO_2	2·0	
CO	0·5	
O	2·5	
N	73·0	
Air	43·8	O = 8·8 N = 35·0
Aqueous vapour	2·6	
Reacting mixture	146·4	

Reacting mixture per 100 vols., 16° C.:—

Holder gas—		
H_2S	14·4	
CO_2	1·3	= 1·6 CO_2
CO	0·3	
O	8·3	
N	74·0	
Aqueous vapour	1·7	
	100·0	

Leaving kiln—

Sulphur as H_2S = 5 grains per cubic foot of perma gases (16° C.).

Sulphur as SO_2 = 9 grains per cubic foot of perma gases (16° C.).

Volume of permanent exit gases per combustio 100 vols. entering gases—

CO_2	1·6
N	74·0
Aqueous vapour	1·2
	76·8

ıence, per 100 litres of reacting mixture entering (1 C. 760 mm.).

tering—

$N = 74{\cdot}0 \times 1{\cdot}255 \times \frac{273}{289} = 87{\cdot}7$ grms.

$O = 8{\cdot}3 \times 1{\cdot}430 \times \frac{273}{289} = 11{\cdot}2$ „

$CO_2 = 1{\cdot}6 \times 1{\cdot}966 \times \frac{273}{289} = 3{\cdot}0$ „

$CO = 0{\cdot}3 \times 1{\cdot}251 \times \frac{273}{289} = 0{\cdot}35$ „

$H_2S = 14{\cdot}4 \times 1{\cdot}523 \times \frac{273}{289} = 20{\cdot}7$ „

$H_2O = 1{\cdot}7 \times 0{\cdot}805 \times \frac{273}{289} = 1{\cdot}3$ „

ınd

aving— grms.

Sulphur as $H_2S = \frac{5}{15{\cdot}43} \times \frac{1}{28{\cdot}32} \times 76{\cdot}8 = 0{\cdot}88$,
calculated as $H_2S = 0{\cdot}93$.

Sulphur as $SO_2 = \frac{9}{15{\cdot}43} \times \frac{1}{28{\cdot}32} \times 76{\cdot}8 = 1{\cdot}58$,
calculated as $SO_2 = 3{\cdot}16$.

	Grms.			Grms. Oxygen.
H_2S entering	20·7			
„ leaving	0·9			
Reacting to free sulphur..	19·8	$\times \frac{16}{34}$	....	9·3
Calculated as sulphur....	18·6		CO, as oxygen ..	0·2
Reacting to SO_2..........	1·6		SO_2 „ ..	1·6
Net free sulphur.....	17·0		Calculated..	11·1
			Taken	11·2

hence, per combustion of 100 litres of moist reacting m ıre (16° C.).

ɜat Evolved—

$_2S$ to free sulphur, $\frac{19{\cdot}8}{34} \times 52{,}660$................	= 30,670
ree sulphur to SO_2, $\frac{1{\cdot}6}{32} \times 71{,}970$................	= 3,598
O to CO_2, $\frac{0{\cdot}35}{28} \times 67{,}960$........................	= 849
Total heat evolved	= 35,117

oducts.—Free sulphur, 17·0 grms., net: sulphur di de, 3·2 grms.; sulphuretted hydrogen, 0·9 grm.; w : = $\frac{19{\cdot}8}{34} \times 18 = 10{\cdot}5$ grms.; add vapour carried = 1· grm. = 11·8 grms. total.

t $t°$ be final temperature reached by products of re ion, then—

se of temperature = $(t - 16)°$ C.

trogen absorbs $(t - 16) \times 0{\cdot}27 \times 87{\cdot}7 = (t - 16) \times 23{\cdot}68$.

rbon dioxide, $(t - 16) \times 0{\cdot}37 \times 3{\cdot}0 = (t - 16) \times 1{\cdot}11$.

ater vapour, $(t - 16) \times 0{\cdot}71 \times 11{\cdot}8 = (t - 16) \times 8{\cdot}38$.

lphur—

To raise to 115° C. and melt, then to 316° C. and vaporise = $450 \times 17{\cdot}0 = 7{,}650$.

To raise from 316° to $t° = (t - 316) \times 0{\cdot}08 \times 17{\cdot}0 = (t - 316) \times 1{\cdot}36 = (t - 16) \times 1{\cdot}36 - 408$.

phur dioxide, $(t - 16) \times 0{\cdot}1544 \times 3{\cdot}2 = (t - 16) \times$ 0·.

lphuretted hydrogen, $(t - 16) \times 0{\cdot}242 \times 0{\cdot}9 =$ (t 16) $\times 0{\cdot}22$.

ıating, we get—

$$(t\ \ 16)[23{\cdot}68 + 1{\cdot}11 + 8{\cdot}38 + 1{\cdot}36 + 0{\cdot}49 + 0{\cdot}22] - 408 + 7{,}650 = 35{,}117.$$

$$(t - 16) \times 35{\cdot}24 = 27{,}875.$$

$$t = 805°\ C. = 1{,}480°\ F.$$

THE ACTION OF SULPHURIC ACID ON PLATINUM.

BY JAMES T. CONROY, B.SC., PH D.

The present state of our knowledge regarding the action of sulphuric acid on platinum is by no means satisfactory, in fact the subject is one about which considerable uncertainty appears to exist. Thus Lunge in his work "Sulphuric Acid and Alkali," Vol. I (2nd edition), p. 140, states "While *pure* sulphuric acid has practically no action whatever on *platinum*, even at its boiling point, there is some action exercised by the impurities never absent from commercial acid."

In Thorpe's "Dictionary of Applied Chemistry," Vol. 3, p. 256, we read "At a high degree of concentration *pure* boiling sulphuric acid will dissolve platinum."

The *italics* are not mine, they are to be found in the orignals.

The works containing these contradictory statements are so generally regarded as standard "Books of Reference" that a recital of the statements to be found elsewhere in this connection becomes unnecessary.

The point is one of some importance to manufacturers of high-strength sulphuric acid who adopt the method of concentration in platinum pans and, for this reason, I venture to bring before the Society an account of certain laboratory experiments on the subject.

A very full description of this branch of the sulphuric acid industry is to be found in Lunge's volume quoted above, and further interesting information, together with a comparison between this, and other modes of concentration, is contained in a paper read before this section in 1894 (Vol. 13, p. 206) by our present chairman, Mr. Frank Tate.

It is here only necessary to say that the manufacture is usually carried out by concentrating the purified chamber acid as far as possible (say to 140° Tw. = 77 per cent. H_2SO_4) in leaden pans, and finishing the concentration in a couple of hooded shallow platinum pans, placed in series. The acid, which flows in a continuous stream, leaves the first pan at a strength of some 150° Tw. (81 per cent. H_2SO_4), and after passing through the second pan, emerges as 94—95 per cent. H_2SO_4, or stronger acid according to the working.

During such concentration of commercial acid destruction of the platinum pans invariably occurs. The platinum loss in the first pan is usually extremely small; practically the whole of the loss takes place in the second pan, which is working at the higher temperature and delivering the stronger acid. Much of our present knowledge as to the extent of such action is due to Scheurer-Kestner, who states (Comptes rend., 1875, p. 892) that the loss of platinum varies (1) with the purity of the acid concentrated, and (2) with the concentration of the acid produced, being lower the purer the acid, and increasing at a rapid rate after a strength of 95 per cent. H_2SO_4 has been reached.

These conclusions, I ought to state, are based on figures obtained in the actual manufacture.

As a rule acid is not concentrated in platinum vessels further than a strength of 95 per cent. H_2SO_4, and for such strength of acid the platinum loss, according to various Continental authorities, ranges from 0·75 to 2 grms. per 1,000 kilos. acid (say 12 to 30 grs. per ton) when the acid rectified is free from nitrogen compounds.

Mr. Mannington informs me that in this country the losses over lengthened periods of work range from 5 to 25 grains of platinum per ton of 95 per cent. acid, and that, in his opinion, the variation is to be ascribed—at least, in part—to the nature of the platinum of which the pan is made.

The figures above quoted are average figures, and, whilst the low loss of 5 grains is seldom attained, it sometimes happens that, over short periods, the higher limit of 25, or even 30 grains, is considerably overstepped.

The occurrence of one of these abnormal periods in a works of the United Alkali Company reopened the whole question as to the cause of such destructive action, and the investigation of the problem fell to my lot.

Naturally, the first point investigated was the purity of the acid employed, and, although the acid certainly contained traces of several impurities, it was found to be purer in every respect than an acid employed in a second of the Company's works, and with which the loss was low and normal. The composition of the two acids is shown in Table I.

TABLE I.

Impurities.	Works I. Per Cent. of H_2SO_4, 94·56. Loss Abnormal.	Works II. Per Cent. of H_2SO_4, 96·07. Loss Normal.
	Per 100 Parts Real H_2SO_4.	
$PbSO_4$	0·026	0·053
Fe_2O_3	0·0025	0·0052
N	0·0018	0·004
Cl	Nil.	..
Se	Nil.	Nil.
As	Nil.	Doubtful trace.

In connection with the analysis I may say that the nitrogen oxides could not be detected by the ferrous sulphate reaction, but their presence was indicated by the reactions with diphenylamine, potassium iodide, and indigo solutions. An attempt was made to estimate the quantity present by means of this latter reagent, but the result was not satisfactory. The method finally adopted was that of reduction to ammonia by means of aluminium foil in alkaline solution, and treating the distillate with Nessler's reagent as in water analysis, due allowance being made for the nitrogen compounds present in the water, and caustic soda employed. To judge from the power of the acids to decolorise a small quantity of permanganate solution, the nitrogen compounds were probably present, at least in part, as nitrogen trioxide (N_2O_3).

The impurities were thus small in amount and comparison of the two analyses showed that the abnormal loss was not apparently attributable to any of the impurities found, nor could it be ascribed to the degree of concentration of the acid produced which was only 94·56 per cent., as against 96·07 per cent for the less pure acid giving normal loss. Experiment further showed that there was nothing in the composition of the pan—which was a new one—to account for the loss, and it was also found that, as was to be expected, any electrolytic action likely to be set up between the pan and other metallic portions of the apparatus would tend to save the platinum.

Whilst the above points were being settled, and it became apparent they afforded no help of a positive nature, I determined to try whether on a small laboratory scale any difference could be detected between the rates at which the acids from the two works attacked platinum. I may say that very little in the nature of a profitable result was expected, and this because of the small value usually obtaining for the platinum loss. Thus a loss of even 30 grs. of platinum per ton of acid corresponds to a loss of only 1 mgrm. when the quantity of acid is reduced to 250 c.c. The results obtained were startling, for whilst they showed that the actions of the two acids were equal it was found that instead of the loss amounting to 1 mgrm. per 250 c.c., it approached 2 centigrms. working with only 100 c.c. of acid. In other words, the loss of platinum corresponded to over 1,500 grs. per 1 ton of acid.

The experiments were carried out as follows:—100 c.c. of acid were placed in a beaker 9 cm. deep and 4½ cm. diameter, and a piece of platinum foil, 13·4 cm. × 5·25 cm., rolled to cylindrical form, was immersed on end in the acid. The 100 c.c. of acid filled approximately three-quarters of the beaker and were rather more than sufficient to cover the platinum. The beaker was covered with a watch glass and heated to and maintained at the desired temperature. The temperature employed in the experiments was about 250° C., this being approximately that existing in the "strong acid" pan in the works. A number of determinations showed that under the conditions of experiment practically no alteration in the weight or strength of the acid occurred, that is, the losses given below were really brought about by acid of the strength shown, and were not to be ascrib to the action of a stronger acid produced as a result concentration.

The detailed results of two series of experiments wi the works acids, performed at the temperatures 250– 260° C., and about 280° — 300° C. respectively, are co tained in Table II., the platinum loss from the start of t experiment to the stage indicated being expressed milligrams.

TABLE II.

Duration, in Hours.	Temperature 250°–260° C.		Temperature 280°–300° C.	
	Acid I.	Acid II.	Acid I.	Acid II
2½	..	..	14·0	11·5
3½	10·5	12·5	..	..
9½	..	..	17·5	17·5
10½	17·0	17·2	..	..
12½	..	..	19·5	19·0
13½	18·0	18·6	..	..
19½	..	..	26·7	21·0
20½	20·0	20·0	..	..

As already shown, the above two acids were very fr from impurity, still traces of impurities were present a amongst these oxides of nitrogen. Now Scheurer-Kestn states that "platinum is acted upon to any apprecial extent by sulphuric acid only when this contains nitro acid, but that small quantities of these (0·01 per cen suffice for starting such an action by serving as oxyg carrrier from sulphuric acid upon platinum" (Lung p. 727). In view of this statement, I considered it advisal to repeat the experiments, using an acid free from objecti in this respect. As a matter of fact two such acids we employed, the first a pure acid for laboratory purposes su plied by Towers, of Widnes, the second prepared by mys by distilling sodium pyrosulphate and hydrating t sulphuric anhydride so obtained.

The latter acid was tested both by diphenylamine a brucine, the former only with diphenylamine—in neith case could nitrogen compounds be detected.

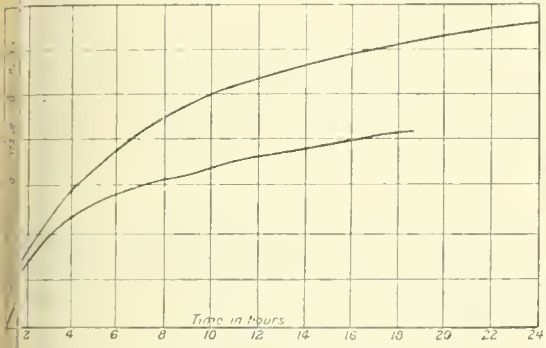
The results of experiments performed at a temperatu of 240°—260° C. under the conditions already describ are contained in Table III.

TABLE III.

Duration. in Hours.	Tower's Acid, 94·5 per Cent. of H_2SO_4 Mgrm. Pt. Dissolved.		SO_3 Acid, 95·5 per Cent. of H_2SO_4 Mgrm. Pt. Dissolve	
	1.	2.	1.	2.
2½	..	..	..	9·0
3	13·0	13·0	..	..
4	..	..	16·0	..
5½	..	..	..	11·6
6½	22·0	21·5	..	..
7	..	..	20·5	..
10	..	..	23·5	..
11½	..	..	..	23·5
12½	28·0	25·5	..	..
16	..	..	30·5	..
17½	31·5	28·0	..	29·0
20½	32·0	28·5	..	..
22	..	..	36·0	..
23½	..	..	..	33·0
28	..	..	40·0	..

This series of experiments proves that action takes pl even when nitrogent compounds are absent, and it to appears to indicate that the action is stronger the purer acid, in other words, that the impurities present in c mercial acids exercise a retarding effect on the solv action.

Examination of the figures contained in Tables II. d III. show that the rate of action, at first rapid, gradu with apparent regularity becomes less and less, finally roaching a limit which is probably determined by the ibility value of the platinum in the acid employed. ıs, if we consider the action taking place during a period 21 hours, we find that about half of the platinum dis- ved is taken up during the first three to four hours, about three quarters during the first seven to eight hours. s is clearly shown in the accompanying curves.



INFLUENCE OF IMPURITIES.

hese experiments having shown that the method adopted ld lead to definite results, it thus became possible to estigate, in the laboratory, the action of the various urities likely to be met with in the manufacture. With object in view, different substances were added to the ious acids and the heating then carried out at 240°— as usual. I will deal with these additions individually.

ead Sulphate.—Lead sulphate in quantities of 0·5, 1·0, 2·0 grms. were dissolved in 100 c.c. of each of the eral hot acids, and the platinum sheets then immersed. results obtained varied with the different acids and e not always concordant for the same acid although, as dc, they pointed in one direction. Speaking generally, ay be said that the presence of lead sulphate entirely cked the action in the case of Tower's acid for a time hours), after which action set in at the normal rate. h acid from works 2, the solvent action appeared to be ffected, whilst with acid from works 1, the results were rmediate between the above extremes.

ron Sulphates.—The results of experiments with ferrous ferric sulphates are contained in Table IV.; it will be that they do not differ much from those obtained for pure acid.

TABLE IV.

Duration, in Hours.	Ferrous Sulphate, 0·5 Grm. $FeSO_4 7H_2O$ per 100 c.c. Acid.		Ferric Sulphate, 1·0 Grm. $Fe_2(SO_4)_3$ per 100 c.c. Acid.
	1.	2.	
2	..	..	7·0
5½	14·7	16·0	..
6	..	..	13·5
9	..	..	19·0
10½	22·2	24·0	..
12	..	..	21·5
13½	24·7	25·8	..
19	33·7	36·0	..
23	35·2	38·5	..

litrogen Compounds.—The statements as to the harmful ct of these impurities are very definite, and, as I have wn, the destructive action is supposed to be *directly* ibutable to their presence. My experiments indicate nitrogen oxides do not cause direct loss of platinum. ıs, experiments were made by adding (*a*) 0·5 c.c. of ing nitric acid to 100 c.c. of Tower's acid, (*b*) 1 grm. $NaNO_2$ to 100 c.c. of Tower's acid, (*c*) 1 grm. of $NO_3)_2$ to 100 c.c. of Tower's acid, that is, the quantity nitrogen oxides so introduced was very much above likely to occur in practice. In the first case the platinum loss was *nil* after 6 hours; in the second it amounted to 10·3 mgrms. in 4½ hours; and in the third to 10 mgrms. in 5 hours. Both the latter losses are below the normal. Experiments in which smaller quantities of nitrogen oxides were employed were made on the works acids after these had taken up the 20 mgrms. shown in Table II.

To 100 c.c. of each of these acids was added 0·2 c.c. of HNO_3 (say 0·003 N per 100 H_2SO_4) and the heating continued for five hours. No further loss of platinum was found to result. There was then further added 0·5 grm. of KNO_3 to each acid, and again, after five hours' heating, no loss in weight could be detected. Finally, to each bath 0·10 grm. of $NaNO_2$ was introduced, and it was again found that the weight of platinum was the same after three hours' heating as at the start.

The acids, after these experiments, were found to contain nitrous acid in considerable quantity, thus showing that the nitrogen oxides were present throughout, and that the lack of action was not to be ascribed to volatilisation of these during the early period of the heating.

It would thus appear that neither nitrous nor nitric acids increase the action (in fact, nitrous acid retards action). This result receives support from the fact that although nitrogen compounds were undoubtedly present in the works acids, the action of these was less than that occurring with pure acid.

That ammonium sulphate, sometimes added to the vitriol to decompose any nitrogen oxide present, is also without effect should be mentioned in this place (see Table V.).

From the same table it will be seen that sodium chloride is without influence; with platinic chloride, on the other hand, the action seems to be strongly increased. This increase is probably due to dissociation of the platinic chloride, followed by direct action on the metal of the chlorine so set free. In proof of this I might mention that the platinum sheet was very much corroded after this experiment, and it was further found that platinum was deposited on heating a solution of platinic chloride in sulphuric acid similar to the above.

TABLE V.

100 *c.c. Tower's Pure Acid and Impurity as shown.*

Duration.	Pure.	$NaNO_2$ 1·0 grm.	Am_2SO_4 1·0 grm.	NaCl 1·0 grm.	$PtCl_4$ 2 c.c. = 0·07 grm. Pt.	Sodium Arsenate 1·0 grm.
Hours.	Mgrms.	Mgrms.	Mgrms.	Mgrms.	Mgrms.	Mgrms.
2½	..	0·3	..	5·5	..	..
4½	..	10·3	..	9·5	..	..
5	..	..	..	..	..	27·5
6	21·0	..	21·0	..	36·5	..

Arsenious Oxide.—Although this impurity is very carefully guarded against in the manufacture, and, when present, exists as a rule only in minute traces, it was still felt advisable to make experiments as to the effect its presence would produce.

In the first experiment, 1 grm. As_2O_3 was dissolved in 100 c.c. of the hot pure acid (Tower's) and the heating carried out as usual. The experiment was done in duplicate, and in neither case could loss of platinum be detected after seven hours. Experiments were then tried with diminishing quantities of arsenious oxide, and it was found that with 0·5, 0·25, and 0·1 grm. As_2O_3 per 100 c.c. acid, no loss occurred during six hours, whilst with 0·05 grm. As_2O_3 there were dissolved in two experiments, of the same duration, 6 and 7 mgrms. respectively, a standard acid worked alongside producing a loss of 17 mgrms., which is about the normal figure. In all these experiments the As_2O_3 had been weighed out and dissolved in the respective lots of acid. In a further experiment with 0·05 grm. As_2O_3, in which, instead of weighing the As_2O_3, the acid containing the 0·1 grm. As_2O_3 was, after the six hours' heating, diluted with 100 c.c. of pure acid, and divided into two equal portions, there resulted in six hours losses of 18·5 and 16 mgrms. The first heating had apparently for some reason diminished the power of the arsenious oxide. A similar diminution of the retarding effect was also noticed in the case of the two works acids, where, although 0·1 grm. As_2O_3 entirely checked action during the first six hours, losses of 7·5 and 9 mgrms. Pt for Works I. and II. respectively were found to occur during a second similar period.

The results of these and other experiments carried on for a still longer time are contained in Table VI.

TABLE VI.

As_2O_3 added. Grms. per 100 c.c.	Duration in Hours.	Pure Acid.	Work I. Acid.	Work II. Acid.
0·5	21½	0·0	..	..
0·2	21½	0·0	..	..
0·1	6	0·0	0·0	0·0
0·1	12	..	7·5	9·0
0·1	24	15·0	25·0	30·0
0·05	6	6·0	..	..
0·05	6	7·0	..	..
0·0	6	17·0	..	..

From this it would appear that in all cases the presence of arsenious oxide has a marked effect in retarding the solvent action of sulphuric acid on platinum. Such retardation, however, only persists for a certain time, the length of which is greater the larger the amount of A_2O_3 present.

The benefit arising from the presence of arsenious oxide cannot be ascribed to the arsenic it contains, since an experiment in which sodium arsenate was added to the pure acid led to a loss higher than the normal (see Table V.). The good effect is therefore due to the chemical nature of the compound As_2O_3, and the first thought that suggested itself was that the well-known reducing properties of this substance were the determining factor. This view has been amply confirmed by experiment.

Other Reducing Agents. — The reducing substances employed were carbon, sulphur, and sulphurous anhydride. The results may be summarised as follows. With carbon no loss occurred during six hours' heating with either pure or works acid, and the same holds true for sulphur when the quantity present is 1 grm. per 100 as acid. Experiments made with pure acid showed that whilst 1·0, 0·5, 0·25, and 0·1 grm. sulphur per 100 c.c acid effectually prevented action, a loss of 6 mgrms. Pt resulted in six hours when only 0·05 grm. sulphur had been added.

No loss occurred with any of the acids during six hours when a slow current of SO_2 was bubbled through the liquid.

Further experiments showed that both with carbon and SO_2 no loss occurred even after 24 hours' heating.

Effects of Concentration and Temperature.—The experiments so far described are practically confined to one concentration (95 per cent.) and one temperature (250° C.). How far these factors affect the result I will now proceed to say.

Concentration.—The range over which experiments on acids of various concentrations can be carried out at a temperature of 250° C. is very limited, being in fact determined by the boiling points of the acids. With an acid below 88 per cent. H_2SO_4 concentration takes place under the conditions of experiment described. Experiments of six hours' duration, carried out with acids of 92, 96, 98·2, and 99·4 per cent. H_2SO_4, in which the beakers were heated in a specially constructed air bath and consequently were under identical conditions as to temperature, led to practically uniform losses.

From a strength of 92 per cent. H_2SO_4 upwards, the loss is independent of the concentration of the acid.

Temperature.—Several experiments have shown that up to 200° C. the action of 95—96 per cent. H_2SO_4 on platinum is extremely slight, and first becomes marked at a temperature of 220° C. Above this point it increases rapidly, and up to 280° C. appears to double itself with approximately each 20° rise in temperature.

It would thus appear as if the heavy losses resulting the manufacture of high-strength acid—Scheurer-Kestn quotes 100 grains per ton for 97—98 per cent. H_2SO_4—we due, not to any greater action of the concentrated acid, b rather to the higher temperature necessary to attain t higher strength, coupled with the slower passage of the ac through the pan, and, arising from these factors, the oxid tion of the greater bulk of any of the reducing substanc originally present.

In connection with the use of gold-lined pans and pans iridio-platinum, I may say that, working with a gold-lin dish, no loss could be detected in six hours, and that from number of experiments made with platinum and a 10 p cent. iridio-platinum alloy the weights dissolved were in tl ratio of 100 : 39. Heraus found the ratio 100 : 58 whe the metals were heated in a pan concentrating acid in tl works.

SUMMARY.

(1) Sulphuric acid, even when pure, exerts a mark solvent action on platinum. The action is most rapid the start, and tends towards a limiting value. The quant of platinum so taken up (equivalent to 3,000 grains per 1 to by a given weight of acid many times exceeds that resultı in practice.

(2) Above 92 per cent. H_2SO_4, the concentration of tl acid has little effect on the rate of action.

(3) The rate of action is strongly influenced by temp rature; below 200° C. it is barely measurable, at 250° (it is pronounced.

(4) The rate of solution is influenced by certain im purities, but remains unaffected by others.

(*a*) Substances without effect on the rate are ammoniur sulphate, ferrous and ferric sulphates, sodium chloride an nitrates.

(*b*) Compounds which have been found to increase th solvent action are sodium arsenate and platinic chloride.

(*c*) Substances which check the action are carbon, arsen trioxide, sulphur, and sulphurous anhydride. Nitrous ac would also appear to come in this group. These, it will noted, are all of a reducing character, and it is, witho doubt, upon this that their beneficial action depends.

That the presence of SO_2 is beneficial has, I find, bee proved by Scheurer-Kestner and by Hasenclever. Dire confirmation as to the value of reducing agents has al been obtained in special experiments carried out in tl works referred to as Works I. The abnormal loss occurrir in this works was, in fact, due to conditions which tende to preclude the presence of reducing agents in the acid and I feel I am safe in saying that the variation in tl platinum loss in manufacturing operations generally mainly due to variation in the quantity of reducing ma terial present in the acid, and, coupled with this, the rate working.

I should also state that although my experiments sho that nitrogen oxides are without direct influence on tl solvent action of the acid, they are not necessarily oppos to the general view that such compounds are prejudicia nor to the figures quoted by Scheurer-Kestner on this poin To my mind the influence of these nitrogen oxides indirect, and arises from their oxidation of the reduci substances usually present in the dearsenicated vitriol co centrated in platinum vessels. In other words, they destro the only constituents whose presence is beneficial.

In conclusion I would wish to express my thanks to tl directors of the United Alkali Company, to whom I a indebted for the opportunities granted in the performan of the work above described, and for permission to bri this paper before you.

London Section.

Meeting held at Burlington House, on Monday, April 6th, 1903.

MR. WALTER F. REID IN THE CHAIR.

HE PRODUCTION OF IODINE FROM NITRATE LIQUORS.

BY DR. WM. NEWTON.

Iodine was originally extracted from the ash of sea weeds lled in England "kelp," in France "varec." This lustry is now almost moribund, and the little remaining ade could be killed at once if the Chili nitrate companies shed to do so. However, apparently it pays them better keep up the wholesale price of iodine to 6*d*. per oz , ich just allows a small profit to the last of the kelp tractors. The total amount of iodine produced has en during the past three years about 8,000 cwts. This ludes a small amount from Scotland and France, but bulk of it is extracted from the "mother liquors" (in anish "aqua vieja") of the nitrate works in Chili.

This industry, which is now practically a monopoly of nitrate works, is carried out on the line of factories sting on the nitrate belt within 30 to 35 miles of the cific coast, and almost parallel to it. The centre of the rate fields is about 22° South of the Equator (see p, this Journal, 1900, 412). Geologically it is necessary state that the coast line is one of granitic cliffs, rising most perpendicularly 2,000 feet. The country between coast and the nitrate fields is absolutely bare, granitic ls rising to 3,000 feet. This line of hills completely cuts from the sea the enormous plain of Tamarugal, whose tern boundary is the high Andes. The nitrate deposits ich contain the iodine lie at the inland base of the coast e of hills.

For the purposes of this paper it will, perhaps, be better first describe the practical details of the extraction of ine in Chili, and at the end discuss the scientific formulæ which the process depends.

The process is usually carried out under the guidance of aperior native called the "chimico" or chemist.

The first proceeding is to mix impure nitrate and fine l intimately together in a moist state, 15 parts of coal 85 of nitrate. This is built up into a conical-shaped und, surrounded by a trench. The moistening is, of rse, to prevent the mass burning with explosive violence.

When just moist enough it is set on fire and burns idly, with heavy fumes of volatile matter from the combtion of the coal, nitrous compounds, &c.

When the fire is burnt out the remains consist of a crude bonate of soda called "sal natron." It contains as urities common salt, sulphate of soda, undecomposed rate, &c. The impure nitrate used can be obtained tly or entirely in two positions in the manufacture of rate. The raw material of nitrate, called "caliche," is led with water and mother liquor from previous operas and the liquid is run out to cool in crystallising ks; on its way it is sometimes allowed to stand for an r in tanks called "chulladores," chiefly for the susded common salt and other solids to deposit. After liquor is run off to the crystallising tanks, the solid he chulladores is crude nitrate of varying composition ording to the length of standing. The longer the hot or or "caido" has stood in the chulladores, the greater he proportion of nitrate to impurities. Impure nitrate also obtained in the mother liquor wells (aqua vieja) r the hot liquid has cooled for six or seven days in the stallising tanks, from which the liquor is run off to a vieja wells or reservoirs, the lowest position of the ina. The liquor standing in these receptacles for a few s deposits further nitrate, but impregnated with salt sulphate of soda.

Nitrate from either of these two sources is either again put through the same process as the raw material or used for making the sal natron as mentioned.

The sal natron when made is carried up to the iodine house and dissolved in water to a saturated solution. The insoluble impurities and the excess of undissolved sal natron are allowed to settle and the more or less clear liquid is run off into a second tank, from which it is pumped up to a large closed iron cylinder at the top of the iodine house.

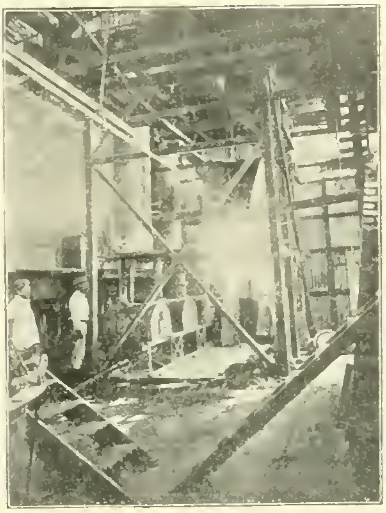


Fig. 1.—Sulphur Ovens in Iodine House.

This cylindrical tank is three-quarters filled with the alkaline liquid. To the top of this tank is fixed a steam blower. The steam jet creates a partial vacuum in the cylinder, which draws sulphur dioxide from the sulphur furnaces through the liquid. The sulphur dioxide rises by an iron flue direct from the furnaces, and is delivered by a pipe passing below the surface of the liquid. The suction should be continued till the carbonate of the liquid is all converted into an acid sulphite of soda.

The sulphur furnace is a plain iron oven with a chimney to it reaching up to the cylindrical tank above mentioned. The sulphur is put in on an iron plate and ignited, and the door closed, but aperture is given for enough air to enter to keep the sulphur burning slowly.

When the sulphiting is supposed to be completed the liquor in the top tank is run down into reservoir tanks which stand a few feet above the level of the large wooden tanks in which the treatment of the mother liquor for the extraction of iodine takes place. The crucial part of the operation then begins.

The wooden tanks in the iodine house are about two-thirds filled with the mother liquor of aqua vieja from the reservoir, and the sulphurous liquor is turned on. At this point the chimico is working without knowing the composition of his liquors. He does test his original carbonate of soda liquor and his sulphurous liquor with a hydrometer, but a hydrometer can give him hardly any information owing to the large amount of impurities from the ash of coal and impure nitrate in the burning for sal natron. The three simple tests for estimating the alkali in the sal natron, the sulphurous acid in the liquor and the amount of iodate in the aqua vieja are unknown to the native chimico. So he proceeds to run the sulphurous liquors into the aqua vieja till he hits the right point as near as he can guess.

As the sulphurous liquor is run in to the aqua vieja the liquid is stirred either by wooden paddle-wheels or by air forced up through the liquid from perforated pipes at the bottom of the tanks. The stirring by the air is much quicker and more efficient, but it needs a good air-pump worked by steam power, and it also carries away enough iodine to make the atmosphere of the iodine house unbearable.

The advantage of a quick and thorough stirring is, however, very valuable to the "chimico." His tests are simple but effective. He has three glasses or tumblers. When he has run in to the aqua vieja what he judges to be a fair proportion of sulphurous liquid, he dips in the tank and takes out some of the mixture. In one of the other tumblers he has sulphite liquor, in the third he has ordinary untouched aqua vieja. If on adding a little sulphite liquor to his dipping glass he gets a further precipitation or rather colouration of iodine, he knows the tank requires more sulphite liquor. If on the other hand the contents of his dipping glass produce a colouration of iodine in the glass containing aqua vieja, he knows he has overshot the amount of sulphite liquor in the tank, and he proceeds to run in more aqua vieja to the wooden tank to equalise matters.

Now, with a good chimico and supposing his sulphite liquor is all right, the right point is easily reached. But an ignorant chimico will pass from one excess to the other till he gets his tank full and the process uncompleted.

The result of the running in of the sulphite liquor is to precipitate the iodine. Firstly, the iodine exists as iodate of potash or soda in the raw material usually to not more than 0·02 per cent. In the mother liquors the percentage may rise to about 0·3 of iodine; this is good iodine liquor. If acid, either sulphuric acid or sulphurous acid is added to these liquors, iodic acid is liberated. In the presence of sulphurous acid or a sulphite this iodic acid can be reduced either entirely or in part to hydriodic acid. The object of the process under consideration is to reduce it in part to hydriodic acid.

The proportions for the reaction are as follow:—

$$3H_2SO_3 + HIO_3 = 3H_2SO_4 + HI$$
$$3Na_2SO_3 + HIO_3 = 3Na_2SO_4 + HI.$$

The second and completing reaction is that between iodic acid and hydriodic acid which react on each other and form water and free iodine—

$$5HI + HIO_3 = 3H_2O + 3I_2.$$

The object, then, of adding sulphurous acid or a sulphite is to deoxidise sufficient of the iodic acid to obtain the proportion of hydriodic acid which will form water and iodine with the remaining iodic acid.

The acidity of the sulphurous liquor is usually in excess of that necessary to liberate the iodic acid from the iodate.

This sulphurous acid, oxidised by the reaction into sulphuric acid, is neutralised by adding sal natron liquor, and again well stirring by the paddle-wheels or air-blower. The tank is then allowed to stand for some time, and the iodine, for the most part, sinks to the bottom. Any little that remains floating is removed by a calico bag at the end of a stick.

During these operations the atmosphere of the iodine house is extremely trying, and especially when the blowers are going: the purple acrid fumes of iodine give a feeling of suffocation, and are very painful to the eyes. The men at work keep handkerchiefs tied round the mouth and nose.

When the liquid (now called "aqua feble" or dilute mother liquor) has cleared, an outlet pipe is brought into use. Normally the pipe stands up in the liquid, with its mouth several inches above the surface of the liquor, but the pipe has a swivel joint, and can be bent down to the level of the liquid, and gradually lowered as the liquid runs out through it till it gets down to the level of the iodine layer at the bottom of the tank.

The aqua feble thus run off runs down by gravity to reservoir tanks below the level of the iodine house floor; thence it is pumped up to the main aqua feble reservoir above the level of the caliche boiling tanks, into which it is run, to carry on the round of nitrate extraction and crystallisation again.

The iodine layer at the bottom of the wooden tanks is swept out through a plug-hole, and down a short wooden spout, into a small wooden tank, in which is a filter cloth. The iodine is here washed with water to remove nitrate and other saline constituents.

Iodine is very insoluble in water—said to be 1 in 7,00 of water—but I doubt if it is even this unless time is given for some of the iodine to form into hydriodic acid, which it does slowly if allowed to stand too long in contact with water.

After the iodine is well washed it is put in filter cloth under a screw press, and the water pressed out of it, when it forms into cakes; these cakes are removed from the press, and put in the retort, which is a simple horizontal cast-iron cylinder, tapering at the further side in a conical shaped form, with a delivery hole of about 6 ins. diameter.

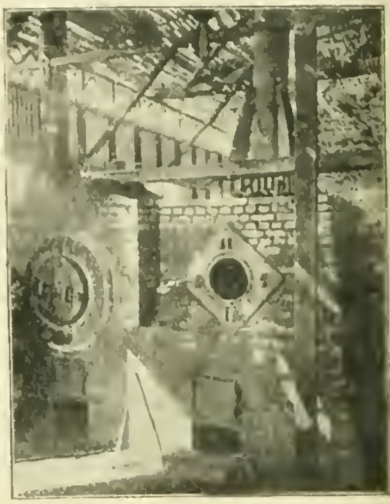


Fig. 2.—Subliming Retort in Iodine House.

Against the outlet of this cylinder 8 or 10 large ordinar pottery drain-pipes are luted with clay. After the retort i filled with the iodine cakes from the press, the front i clamped on, and the fire underneath started slowly.

As a rule, the iodine distills quietly and satisfactori Occasionally, however, explosions have taken place. Th retort has been blown to pieces, and the iodine dispersed n magnificent purple cloud. These explosions have bee attributed by some to the formation of iodide of nitroge from the presence of ammoniacal salts in the iodine. Thi however, is doubtful, as it is difficult to see where th ammonia could come from. It is more likely that th explosions have been due to the iodine condensing the delivery nozzle of the retort into a solid mass, th sealing the outlet. This would be due to the bad setting the retort over the fire, allowing the nozzle end to rema cold. The retort, when cool, can be unclamped and charge

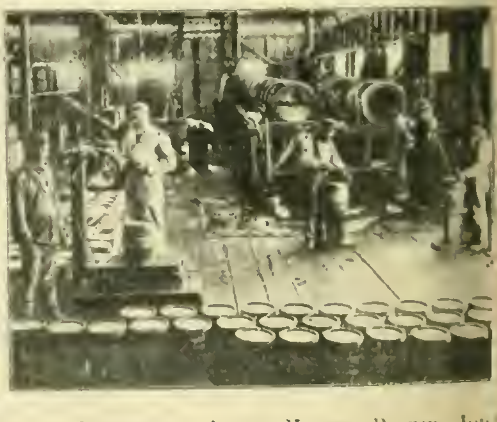


Fig. 3.—Interior of Iodine House: Packing Iod in Kegs.

w fresh cakes, and the operation repeated till sufficient io ne is obtained in the drain-pipe condensers.

he iodine is found condensed mostly in the first three or f r sections of pipe, the end sections containing scarcely a . The last one is closed with a wooden disc. On o ning up these pipes, the iodine is found in brilliant c stals almost pure—about 99·80 per cent. The iodine is s ped out from the pipes and rammed into small kegs c taining about 1 cwt. each. These kegs are tightly sewn u in raw hide, and the hide branded and shipped off to E ope.

here is an export duty on iodine from Chile of 4*l.* 10*s.* p quintal of 100 lbs., which works out about two-thirds of a nny per oz.

any developments in chemistry might come through io ne if it were cheaper. The sale of iodine is in the hands o n English trust; if it were an American enterprise some p entage of the enormous profits would be used in a mpts and experiments to develop new outlets for iodine. T English trust has only one idea for keeping up their la e profits, that is by restricting the output. They do not c how much iodine is lost to the world in unextracted a vieja as long as they can keep the price up 6*d.* per oz. 4 per quintal, or nearly 900*l.* per ton.

Discussion.

r. R. **Messel** was inclined to believe that the explosions r rred to were due to iodide of nitrogen, the ammonia r ired for the formation of which might result from the c used in the production of the carbonate of soda or f the reduction of the nitrate when preparing the s hide solution. The high atomic weight of iodine was a nst its technical application except for special purposes.

r. **Dvorkovitz** remarked that iodine might be largely u . to remove sulphur compounds from crude petroleum, i which, whilst oxidising the sulphur compounds, it ex- e ed little effect on the hydrocarbons. If it were pos- s to secure iodine at a reasonable price the petroleum i stry would absorb a considerable quantity. There was n question about iodine acting as a most powerful disin- f nt, and it would be used on a much larger scale if the p e of it were reduced. He remembered that in 1877–8 (sso-Turkish War) he had under his care the disinfecting o he Princess of Oldenburg's Hospital. He used a dilute a holic solution of iodine with most satisfactory results i mparison with permanganate of potash, chlorine, and o r disinfectants. When Americans formed trusts they d it for the purpose of increasing production and s ng the goods at a reasonable price. English trusts g rally restricted the production, and tried to make profit b utting a prohibitive price on the goods manufactured b hem. In England combination was, as a rule, addended w reduction of profits, whilst in America it was the re rse.

r. **Rowland Hart** said he was interested in the io e industry, and pointed out that their great difficulty was t nd some fresh use for that element. A certain amount w d always be used in medicine, and when the price d ped the demand for that purpose would not increase v much. It was desirable to find some application in t rts where it could be used, not by the ounce, but by th pound or cwt. The author had pointed out that the w le of this industry was in the hands of a trust. That w so, but there was more than sufficient iodine to meet the d nds. Although the nitrate manufacturers could easily m e iodine, it was more expensive than making nitrate, a of course their chief aim was to make nitrate cheaply. Io ne attacked screws and brass work and the machinery w e it was made, and that was an important point. If th price were brought down to, say, 3*d.* an ounce, the q tion was, how much more could be sold. They pro- b y knew that until a few years ago it was 9*d.* per ounce, b t that price there was competition from Scotland and Ja n, and even now Japan was turning out a large q tity of iodine. If the price went down to 4*d.*, no more w d be sold, because there was not the use for it. Those w produced iodine would be only too pleased if the Society c d suggest a new outlet for it; and if a new field were fo d for it, the price would come down.

Dr. O. J. **Steinhart** said he believed that in Germany the mother liquor from Stassfurt salts was treated by the electrolytic method, and possibly a similar process would be cheaper than the cumbersome sulphurous acid method which had been described. The manufacture carried on in South America was very crude. If the price of iodine were reduced, no doubt wider use could be made of it. There was chlorine and bromine—and why not iodine?—for gold extraction. Surely in South America, with all its gold mines, there might be an opening. The price, however, would have to come down very much to compete with chlorine, which was still largely used for certain classes of gold ores. Who, for instance, would have thought that cyanide, which was a comparatively expensive salt when the cyanide gold-extraction process was first put into use, would have been so extensively employed?

Mr. **Blount** thought the kernel of the matter had been put by the last speaker but one. The trouble with iodine was that there was no use for it. For any electrolytic process it would be precisely on all fours with other processes, as the value of the product was measured by the use which could be made of it.

Mr. **Kynaston** said he did not know whether members were aware of the large consumption of iodine in the extraction of silver from copper liquor. The process began with pyrites, of which there was treated in this country some half-million tons containing about one ounce of silver and about five grains of gold per ton. The burnt ore from that pyrites was calcined with common salt, and chloride of copper was produced. The cupreous solution, obtained by leaching with water, containing also the silver and the gold, was precipitated by iodide. The silver and gold precipitate so obtained by treatment with zinc yielded soluble iodide of zinc; the iodine was recovered and used over again for precipitating more silver. Notwithstanding the recovery of the iodine, the cost was something like 4*d.* or 5*d.* per ton of burnt ore. Of course, in the past, when silver was worth 4*s.* an ounce, things were very different; now the price was about 2*s.*, and a cost of 4*d.* or 5*d.* for iodine per ton of ore treated was a serious charge. There was probably a great field for the extension of the use of iodine in separating silver in minute quantities from weak copper liquors.

The **Chairman** said, with regard to the solubility of the iodine in water, that it was not water they were dealing with in this case, but a very strong saline solution, in which possibly iodine might be less soluble than in water. With regard to the explosion, he was inclined to agree with what Dr. Messel said. Ammonia might result from the coal used. If they were as careless about the quality of the coal they used as they were about the nitrate, the impure carbonate obtained might contain ammonia too. Had Dr. Newton ever found traces of nitrate of ammonia in the Caliche? On the other side of the Andes, he had occasion to test nitrate of soda, and found strong traces of nitrate of ammonia in it. With regard to the uses of iodine, the extraction of the precious metals seemed to be the chief outlet suggested at present. From the remarks which had been made, the great obstacle seemed to be that the iodine manufacturers wanted too much gold for it, whilst the other people wanted it cheap in order to get more gold. But if the producers were to let it be generally known that they could supply it in a definite quantity at a low price, he believed an outlet might be found, but it would not do to rely on the medical uses. There were so many substitutes in that direction that it was not at all surprising, even if the price went down considerably, if it were still supplanted by other materials. In the case of surgical operations, he himself had introduced another material which acted in a totally different way and, he was told, was more efficient. The original plan was to use iodoform dressings, put on from day to day, which excluded germs from the air, and the strong smell of the iodoform was partly, he understood, the cause of its efficiency. The modern method was to take a transparent film and cement it down on each side of the wound, excluding air and consequently germs completely. That remained on until the wound healed. The surgeon could see through it what was going on underneath, and if there was any local irritation or anything requiring removal, it was removed only from the part in question and not from the rest. A discharge tube was put in, and there was no infection possible, and the wound was completely healed up. There was no odour and no removal of the dressings, which itself irritated wounded surfaces. If they could only hear from the iodine manufacturers that it could be obtained cheaply, there might be openings found for it, and that Society was particularly one which would be capable of finding such openings. He hoped the time was not far distant when they would hear that it could be produced at 3*d.* per ounce or even a lower price. It certainly would be better than throwing it away.

Dr. Wm. Newton, in reply, said that Mr. Hart had referred to its being rather more expensive to make nitrate when iodine was also being extracted. That might be true, but there was another point to be remembered:—Some of the caliche or raw nitrate contained perchlorate of potash in small quantities, but even in small quantities perchlorate was very deleterious in the nitrate for agricultural purposes. In extracting iodine, in the process the perchlorate was reduced to harmless chloride. Another point raised was that there were no other outlets at all for iodine. That was a very bold statement, especially for a scientific body to make. It was suggested that there were no means of utilising iodine except as at present; but that was a retrograde idea altogether. He said distinctly that if it were an American trust, a part of the enormous profits, which they acknowledged they were making (if it were only 5 per cent.), should be used in endeavouring to find new outlets for the product. At present the rich iodine trust only stated: "If you will find an outlet we will deal with you;" which he thought was putting the cart before the horse. It was for them to employ people to find some further outlets, and so see what could be done if all the iodine available were produced for the market. The trust ought to put it before the scientific world properly; if not, their time would soon come to an end, because the Chilian Government would not stand their waste of iodine much longer. There were other sources which would be found, and if they neglected their opportunity now, they would go to the wall sooner than they imagined.

COFFIGNIER'S PRUSSIAN BLUE REACTION: A FURTHER MODIFICATION, AND A POSSIBLE APPLICATION.

BY WATSON SMITH.

Wyrouboff recorded the fact, in 1876, that Prussian blue is soluble in strong hydrochloric acid on heating, (Ann. Chim. Phys., 1876, **8**, [5], 472). But Coffignier (Bull. Soc. Chim., **27**, [13], 696) adds a further very interesting observation, viz., that the solubility of Prussian blue is considerably augmented by the addition of about an equal volume of an alcohol of the aliphatic series, for example, ethylic, propylic, iso-butylic, or amylic alcohol. However, "solubility" would appear to be a questionable term to use here, since in dissolving, the Prussian blue loses its colour, yielding a light yellow clear liquid, from which, on addition of a little water, Prussian blue is at once re-precipitated. Wyrouboff (Bull. Soc. Chim., **27**, [18—19], 941) suggests as a possibility, that the loss of blue colour is due to the formation of a colourless hydrochloride of ferrocyanide of iron. Abstracts of these two papers will be found in this Journal, 1902, 1032 and 1337.

Coffignier points out, further, that whereas hydrochloric acid alone, strong and hot, will only "dissolve" about 2 grms. per litre of Prussian blue, to give a permanent solution, that on repeating the attempt with the addition of an equal volume of ethylic alcohol, a "solution" is obtained of about 5 grms. per litre, permanent for about two days, when a deposit begins to form. A very small quantity of lead chloride will increase the solvent action of the acid and ethylic alcohol. Propylic, iso-butylic, and amylic alcohols, with hydrochloric acid, effect a much greater "solution" (as much as 20 grms. per litre of Prussian blue being dissolved).

After trying these reactions, I found that there was, as Coffignier shows, much greater "solvent" action when the higher alcohols were used, than when ethylic alcohol is employed, and with methylic alcohol the action is still feebler. But I further observed that there appears to be distinct advance for each step in the aliphatic series, as I shall presently demonstrate.

It next occurred to me to try the action of the aliphatic series of organic acids, in conjunction with hydrochloric acid under similar conditions as to temperature, this being an entirely new observation. I found that a similar action occurs, for on substituting for equal volumes of methylic, ethylic, propylic, isobutylic, and amylic alcohols, similar volumes of formic, acetic, propionic, and butyric acids, I observed an increasing degree of solvent action, as the steps of the series were ascended. This I will also demonstrate.

It now occurred to me, that if the addition of either an aliphatic alcohol or acid thus promotes the peculiar quasi "solution referred to," in the presence of strong hydrochloric acid, it would amount to nearly the same thing, if an aliphatic ester, say, amyl acetate, were employed. This anticipation was fully verified. (*Experiments shown.*)

Returning to the alcohols and their co-operative action with hydrochloric acid, the following comparative trials of "solubility" were made, and with the results given. A quantity of Prussian blue was mixed with strong hydrochloric acid to a thin paste, and poured into a burette standing on foot. Of this thin paste, after shaking up well, 5 c.c. were taken for each experiment, and, after heating nearly to ebullition, the volume of aliphatic alcohol observed which was just required to clear the liquid, yielding a yellowish solution.

Thus, 2 c.c. of amylic alcohol were required, but at the same time miscibility was not perfect, since after a short period of standing a layer formed of a dark reddish brown colour, on the top of the light yellowish solution. This, separation indicates, I take it, only partial contact, and doubtless diminished action in consequence. Isobutyli alcohol was next tried, and of this only 1 c.c. was required but solution here was perfect. Of propyl alcohol, 2·5 c.c. were required, whilst of ethyl alcohol 8 c.c. were insufficient and a further addition of 2 c.c. of strong hydrochloric were necessary, to effect the "solution" and change.

Of methyl alcohol, 8 c.c. were insufficient, and 5 c more hydrochloric acid were additionally required.

With regard to the relative action of the aliphatic acids Of butyric acid 0·7 c.c. was required for the same thi paste of Prussian blue and hydrochloric acid. Propion acid, 0·8 c.c., acetic acid, fully 1 c.c., whilst of form acid, 8 c.c. were insufficient, and 12 c.c. additionally o hydrochloric acid were required.

Of amyl acetate, 1·5 c.c. was required, and a layer o reddish-brown colour was formed after standing.

Now, seeing that on heating such a strongly acid liqu as this mixture of Prussian blue with hydrochloric acid along with amyl acetate, considerable decomposition c the acetate must take place, amyl chloride being formed an acetic acid being set free, it struck me as probable tha a solution in which the hydrochloric acid was in par replaced by acetic acid and in part diluted by that weake acid, cotton might stand the treatment with such a liqu without perceptible damage. This surmise was confirme and I found that I could readily and permanently dy cotton, by immersion in this colourless acid "solution" Prussian blue, followed by a further immersion in wate On dipping and rinsing in water the Prussian blue becam precipitated in the fibre of the cloth and the latt permanently dyed.

I have dyed some silk in a similar manner. This is o of the few cases in which water may be said to act both a mordant and as a washing agent simultaneously.

Having proceeded thus far I commend the whole subj to the further investigation of those who have more t for an interesting scientific inquiry than I have.

Discussion.

Mr. Grant Hooper said that in connection with t very interesting subject Mr. Watson Smith had broug before them, it might be worth while recalling the comm experience that the solubi ty of Prussian blue in ordina ethylic ether appeared to be appreciably increased by t co-solution of a glyceride. When extracting the oil fr a Brunswick green paint by ether it was usually fou hat a considerable proportion of the Prussian blue also issolved, but if petroleum ether were substituted there was o solution of the blue pigment. It was true, however, iat in such a solution as he referred to there was no such ecolorisation or decomposition of the Prussian blue as they ad just been shown, with the immediate restoration of the olour on the addition of a drop of water.

Manchester Section.

Meeting held on Friday, April 3rd, 1903.

MR. IVAN LEVINSTEIN IN THE CHAIR.

THE MANUFACTURE OF SULPHURIC ACID BY THE CHAMBER PROCESS.

BY B. HART AND G. H. BAILEY.

In the following notes we describe a modification in the iamber process which has been worked regularly now for 'er a year, and kept under observation during the whole ' the period.

The structural addition which we are about to refer to as originally adopted with the idea not so much that it ould increase the capacity of the plant, but rather that it ould have the effect of steadying the process, and of ducing the fluctuations to which all chambers are more ' less subject. It has achieved, however, much more an had been anticipated, and we place this contribution fore the Society as a record, which we hope will not be thout interest in regard to the sulphuric acid process. ie plant referred to throughout is a set of three ambers, having a total capacity of 178,000 cub. ft., the mensions being:—

First chamber, 105 ft. by 30 ft.; second chamber,) ft. by 30 ft.; third chamber, 11 ft. by 30 ft.; id in each case the height of the chambers is 29 feet. he set has been in operation for several years, and was uod capable of dealing with from 7 to 8 tons of 50 r cent. ore per day, though when the charge reached the gher limit, considerable attention was necessary. The erage percentage of nitre over a period of 67 weeks evious to the addition of the towers and trunk was 3·5, it since the installation of these (68 weeks) with much rger charges, the average consumption of nitre is easily pt below 2·5 per cent.

Description of the Addition to the Plant.

Between the first and second chambers was fitted (1) a wer 10 ft. high and 4 ft. by 5 ft. in section, through which iere pass vertically 25 tubes or columns open to the air as own in the diagram.

Each column is 4 ins. in diameter and constructed of in. lead, the walls of the tower being of somewhat thicker lead. The exit gases from the end of the first chamber are led to the top of this tower and pass downwards and thus in the opposite direction to the induced currents of air which rise through the columns. The importance of this method of leading the gases must be insisted upon as well as the provision that the gases must be drawn off from the middle of the chamber wall. The main operation in this tower is, as we shall see, that of scrubbing out the sulphuric acid mist, a considerable amount of which is condensed and run off by a pipe at the base of the tower. Notwithstanding the heat set free by this condensation there is, however, in this tower, a marked reduction in the temperature of the gases.

FIG. 1.

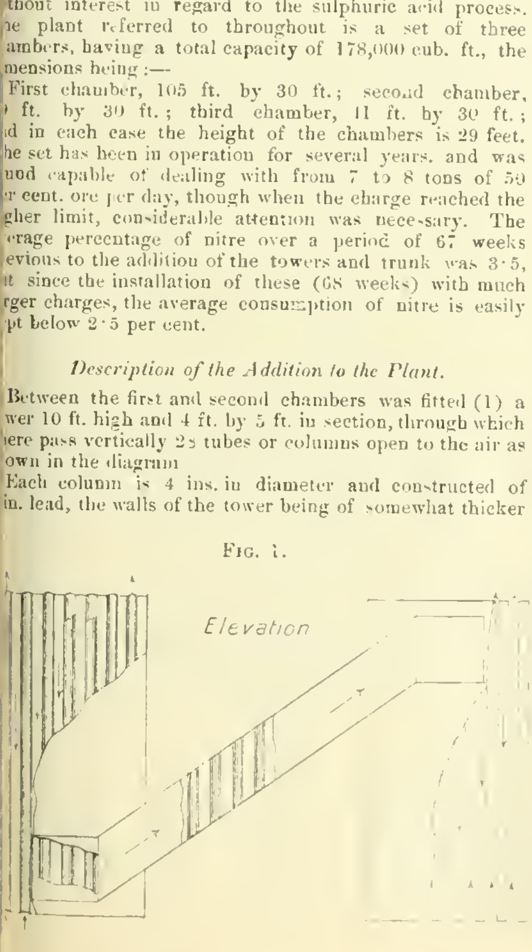
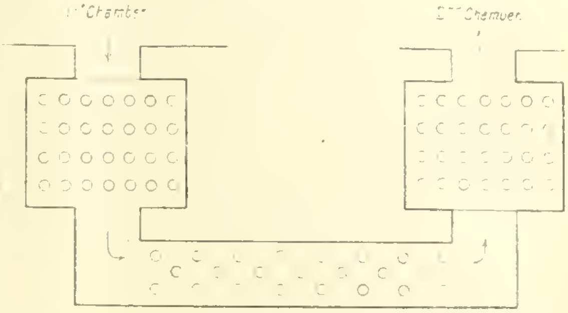


FIG. 2.—PLAN.



(2) A lead trunk 2 ft. square in section and 40 ft. long, which carries the gases from the base of this tower to the top of a second tower, rising thus about 10 ft. in its course. This trunk is also perforated with vertical air columns 98 in number evenly distributed throughout its whole length.

(3) A second tower similar in all respects to the first, down which the gases pass before delivery into the second chamber.

Effect upon the Chamber Gases.—An examination of these additions to the chambers and of the continuous records show that though the internal area of the towers and trunk is only about $\frac{1}{400}$ of that of the chambers they bring about the condensation of 5 per cent. of the whole of the acid produced, they cool down the whole of the gases nearly 40° C., and enable a charge of 60 per cent. greater to be worked with perfect ease, *i.e.*, they secure an increase of 60 per cent. in the output of acid. These results are so extraordinary that it seemed to us a matter of interest to examine by means of tests, and by determinations of the heat concerned what was really going on in this plant, and how far the change might be attributable to mere cooling, or to the perfect admixture of gases or how far even acid was being formed in the apparatus itself. It will be evident at once that in passing through the towers and trunk the velocity with which the gases must travel is not only considerable, but varies in different parts of the system, and that owing to this and to the presence of the tubes, especially those in the trunk which run transversely to the flow of the gases, a very thorough admixture of the gases must ensue. It might be held, of course, that the obstructions so presented, and the forcing of the gases downwards would unduly impede the gases in their passage, but a further consideration of the problem presented will show that this is not so. In addition to the continuous observations of temperature at various points in the series, and of the amount and strength of acid condensed, &c., we have recently made a number of special tests in order to form some estimate of the amount of heat dissipated in passing through the towers and trunk, and in order further to ascertain whether owing to greatly increased surface any considerable formation of acid goes on in this part of the plant.

Determinations were made of the amount of SO_2 and oxygen, and of the acidity at the entrance and exit of each of the towers. The charge that was being worked during the period over which the experiments extended was 10·2 tons per day. The particular results relating to the analytical determinations need not be referred to in detail, since, though there were of course variations from time to time, these were inconsiderable, and the conclusion to which they point cannot be in doubt. The average amounts were as follows:—SO_2 in grains per cb. ft. at entrance of first tower, 23·2; at exit of first tower, 22·7; at exit of second tower, 25·0. Acidity as grains of SO_3 per cb. ft. at entrance of first tower, 30·8; at exit of second tower, 27·4.

It will be seen by these numbers, taken in relation to the further determinations given later on, that the essential function of the towers and trunks is the condensation of the suspended acid mist, and that the amount of acid actually formed in passing through the apparatus is not considerable. In this connection it may be added that the prevailing conditions are of a reducing nature.

The rapid cooling of the gases, the precipitation of weak acid consequent thereupon, and the increasing relative volume of SO_2, all tend towards a liberation of nitrous acid and support the contention of Sorel (this Journal, 1890, 175) that this liberation of nitrous acid is the main change occurring during the passage of gases along connecting pipes. It is further to be remarked that the acid thrown down in the towers is almost free from nitrous acid and gives no reaction except on the addition of the most sensitive reagents.

The advantages already apparent as arising from the presence of the towers are indeed:

(1) The effectual mixing of the gases.

(2) The removal of a large amount of a diluting agent in the form of sulphuric acid mist which interferes with the progress of the reaction.

(3) The liberation of nitrous gases and their presentation in a form advantageous to further activity.

We should therefore expect that when the gases pass from the exit of the second tower into the second chamber chemical action would be renewed, and this view is also supported by the fact that a considerable rise of temperature takes place on their entry into that chamber which often amounts to over 20° F., and is greater when the charge being worked is larger. Doubtless this is an important factor in regard to the increased output of acid consequent on the addition of these towers and implies that the second chamber (and even the third) performs an increased duty in the total production.

With the object of further confirming the conclusions arrived at, and of arriving at a definite measure of the work performed, we now devoted our attention to the heat actually dissipated by the plant. This could be measured in two ways: (1) by estimating the amount of the gases passing through the towers, the extent to which they were cooled, and the heat resulting from condensation and cooling of the sulphuric acid mist; or (2) by estimating the heat transmitted and radiated into the surrounding air from the surfaces of the tubes, &c. By balancing these two accounts against one another it would then be possible to ascertain how far the view that the essential function of the towers is that of acting as condensers or scrubbers should be confirmed, for, whilst the heat of formation of sulphuric acid in the chambers on working condition is nearly 1,000,000 great calories per ton of ore burnt, that due to condensation and cooling is about one-fifth of this. Hence, if any large amount of acid were actually formed in the towers, this would become evident from the temperature records.

The Heat of Cooling of the Gases.—The composition of the gases entering the chambers is liable, of course, to slight variations, but was estimated as:—SO_2 8·5 per cent. by volume; O 9·5 per cent. by volume; N 82·0 per cent. by volume, expressed as dry gas and neglecting the oxides of nitrogen, which would hardly affect the result. The work performed by the Glover tower is also left out of account, for, as we are not specially dealing with what takes place in the first chamber, it is not material to the question under consideration.

The volume of the (dry) gases estimated from this, and in relation to the charge worked, was found to be 1,450,000 cb. ft., or 41,200 cb. m. per day.

By the time the gases had reached the end of the first chamber, the SO_2 had fallen to 2 per cent. by volume, and the oxygen 6 per cent., reducing the volume of the gas to 37,100 cb. m. Assuming these gases to be saturated with moisture, and making due allowance for temperature, we are able to ascertain the volume they would occupy as they pass into the first tower. In doing so it is to be borne in mind that the vapour tension of the moisture in such gases is much lower than that of water vapour, depending on the presence of sulphuric acid in suspension. The actual vapour tension is calculated from the results of experments made by Regnault and stated in the following table:—

Specific Gravity of Condensing Acid.	Twaddell Degrees (Approximate).	Vapour Tension in Relation to Water as Unity.
1·22	44	0·84
1·249	50	0·70
1·288	58	0·63
1·341	68	0·49
1·419	84	0·33
1·475	95	0·21
1·547	110	0·13
1·651	130	0·06

We have then for the volume of the moist gas

$$V = \frac{v \times 760 \times (273 + t)}{(P - s) \times 273}$$

where v = volume of dry gas at 0° C. and 760 mm. pressure.
t = temperature of moist gas.
P = pressure "
s = vapour tension "

The mass of the moisture and acid suspended by this gas at its entry to the towers may, assuming it to be saturated, be approximately calculated as equal to

$$\frac{1}{3}\left(V \times 1\cdot3 \times \frac{273}{273 + t} \times \frac{s}{760}\right)$$

The volume occupied by the moist gas passing into the chambers (neglecting the Glover tower) thus works out to approximately 55,600 cb. m., that is about 11 times the chamber content for a charge of 10·2 tons of 50 per cent ore. This is about 15·6 cb. ft. of chamber space per lb. of sulphur per 24 hours. Lunge quotes 8·9 times chambe content for a consumption equal to 20 cb. ft. of chambe space per lb. of sulphur per 24 hours.

It may be here added as will be seen from the tabl below that the chambers fitted with towers worked quit smoothly at 12·7 cb. ft. per lb. of sulphur, *i.e.*, a charge o 12·6 tons of ore.

The volume occupied by the gas which passed into the towers averages 50,000 cb. m. for the 10·2 ton charge The total mass of water carried down with the acid per day in the first chamber in combination and by dilution amount to nearly 10,000 kilos.

The following table shows a record of the temperature observed and other details over a continuous period durin the past month. It will be noticed that the charge ha been varied several times, and it may be added that fro the 5th up to the 12th February an additional 12 pyrit kilns were connected up to the chambers, 24 kilns havin been usually employed. Notwithstanding such a tryin ordeal the working of the chambers was unaffected and th nitre and exits were both very low, the latter being usuall slightly over 1 grain SO_3 per cb. ft., and never exceedin 1·9 grain.—

Date.	Charge in Tons.	Temperature at Entry of 1st Tower.	Temperature at Entry of 2nd Tower.	Nitre used.	Per Cen Nitre o Sulphu
		° F.	F.	Lb.	
Feb. 5....	11·7	153	90	295	2·25
" 6....	11·7	147	84	295	2·25
" 7....	11·7	152	88	275	2·09
" 9....	12·0	158	95	305	2·27
" 10....	12·6	162	98	305	2·16
" 11....	12·6	162	93	305	2·16
" 12....	12·6	170	100	295	[illegible]
" 13....	10·8	173	106	285	2·35
" 14....	10·8	164	97	265	2·19
" 16....	10·2	179	100	253	2·21
" 17....	10·2	168	102	235	2·06
" 18....	10·2	175	98	235	2·06

In order to estimate the cooling effect of the plant the emperature was taken (1) at the entrance of the first tower, verage. 76°·2 C.; (2) at the exit from first tower, average, 5°·0 C.; (3) at the entrance of the second tower, average, 3°·4 C.; (4) at the exit from second tower, average, 6°·6 C.

The mass of the gases entering the first tower daily was stimated at 55,000 kilos., and taking the specific heat as ·24, we have a measure of the amount of heat that must e dissipated in cooling through one degree centigrade. viz., n great calories—

Cooling effect in first tower	147,840
„ in trunk	285,120
„ in second tower	89,540
Total	522,500

In consideration of the fact that a reduction of about ,000 kilos. takes place in the mass of the gases during heir passage, 517,000 may be taken as the net result. It s evident that the trunk is a most efficient cooling agent, ut it must be remembered that whilst its content is somewhat smaller than that of one of the towers, its surface is elatively nearly one third greater, and also that a large mount of condensation takes place in the first tower, with he evolution of much heat.

The lowness of the result in the second tower is due to he smaller difference between the temperature within it as ompared with the outside air, being less than half that hich prevails in the first tower.

Heat of Condensation of Acid.—The mass of sulphuric cid mist present in the gases at their entry to the towers nd at the various points in the circuit may be approximately measured from the data on the assumption that hey are in a saturated condition. Such an estimate shows hat at their entry there is between 2,500 and 3,000 kilos. per day of such acid vapours held up, whereas the results of nalysis of the gases shows that, owing evidently to the resence of excess of steam, the actual amount present is bout 7,000 kilos. The concentration of acid scrubbed out y the towers varies, according to the prevailing conditions, between 90° and 120° Twaddell, and its amount is usually bout 1,000 kilos., one-tenth of which approximately condenses in the second tower. This vapour is evidently carried along by the gases in minute vesicles and all the evidence we have gathered leads to the conclusion that the chemical union of the constituents of sulphuric acid is already practically complete, and that any heat evolved is due to the condensation of the ready formed acid, which in presence of sufficient water yields acid of the strength already mentioned.

A continuous series of observations showed that the amount of H_2SO_4 present in the condensate from the first tower and trunk varied between 470 and 560 kilos., and that from the second tower varied between 50 to 70 kilos.

The average was 520 kilos. in tower and trunk and 59 kilos. in second tower.

Taking into account the specific gravity of these acids, and calculating the amount of heat due to the dilution with water, we obtain by Thomson's formula—

$$Q = \frac{n}{n + 1·86}\ 18 \text{ calories},$$

where n is the number of molecules of water present, we estimate that in the first tower and trunk (chiefly in the tower) the heat *evolved* during the condensation is approximately 57,200 great calories, and for the second tower 6,500 calories. The temperature of the condensate is about 33° below the mean temperature of the towers, and this involves the dissipation of 13,800 calories in the first tower and trunk, and about 1,600 calories in the second tower. The heat that is to be dissipated under these heads is summarised in the foregoing table.

—	First Tower and Trunk.	Second Tower.
Cooling gases	429,000	88,500
Condensation	57,200	6,500
Cooling condensed acid	13,800	1,600
	500,000	96,600

We have thus as a measure of the total heat dissipated 596,600 great calories.

Heat carried off by Air.—The rate of passage of air through the columns and the increase of temperature were both measured. The velocity of the air current passing up the columns in the first tower was usually 7 to 8 ft. per second, and the increment in its temperature at times amounted to 15° C. though it was usually between this and 12° C. Below we give a typical and average statement of the determinations.

Temperature of Gases in Towers, &c.

First tower:—	°C.
Entry	68·5
Exit	61·0
Second tower:	
Entry	38·0
Exit	35·0
Acid from first tower and trunk	800 kilos. at 102° Tw.
Second tower	125 kilos. at 114° Tw.

Air Records at Exits of Columns.

—	Temperatures.	Volumes in Cb. Ft. per Minute.
	C.	
First tower	23·5	1,180
Trunk	20·5	1,200
Second tower	16·0	800

The temperature of the surrounding air was 10·5° C. The amount of heat carried off by the air passing up the tubes was thus measured, and with the addition of that emitted from the surfaces of the chamber and trunk as estimated by Péclet's formulæ the value corresponding to the measures already quoted for cooling, &c., worked out to 549,000 kilos. The heat evolved in the towers at any rate with such a charge is therefore very nearly in correspondence with that calculated on the assumption we have made. Clearly the efficiency of the towers and trunk is due largely to the surface presented to the cool outer air, and it is worthy of note that the surface in relation to volume is 25 times greater than that offered by the walls of the chambers, whilst the actual volume of free space is 490 cb. ft. or about $\frac{1}{380}$ part of the whole space in the chambers. The time occupied by any portion of the gas in traversing the towers and trunk must be less than half a minute, the velocity in the trunk being between 5 and 6 ft. per second.

In the Journal of the Society for 1899, page 459, appears a paper by P. S. Gilchrist, read before the New York Section, in which there is described an arrangement of tubes with the object of cooling the gases, but in his system the tubes are of much smaller diameter. There are nearly 300 tubes in each tower, and two towers are placed between each chamber (except the last where one is used). The friction of course in this case must be very great, and assistance is necessary to promote the requisite draught.

No information is given as to the exits, and this would be of interest in view of the fact that the temperatures in the first chamber as well as the last is some 30° to 40° F. higher than that which prevails in normal chambers, whilst the oxygen varies between 3 and 6 per cent. The nitre is also very high and is nearly double that employed in well-managed chambers.

On the other hand, after the intoduction of these very simple towers the charge worked has been increased 60 per cent., whilst the nitre has been brought down from 3·5 per cent. to almost 2·0 per cent., and at the same time there is no interference with draught, and the chambers have been so steadied in their working that less attention is required than formerly. Whether the limit of working charge has been reached we cannot say at present, but judging from the results given and from the fact that the temperature of the first chamber was well within safe conditions, we have no reason to doubt that still higher charges might be worked without impairing the life of the chambers.

The use of fans for hastening the progress of the gases through the towers or for promoting mixture, and of condensing surfaces of glass or lead, and the details relating to the "plate towers" of Lunge are given in one or other of the following papers :—Maclear (this Journal, 1884, 228) ; Lunge and Naef (this Journal, 1884, 33) ; Sebertel (this Journal, 1889, 283) ; and finally there 6is much interest in the paper by Sorel (this Journal, 1890, 175). We quote these for the convenience of reference of those members who may be desirous of examining what has been achieved by such modifications in plant. In conclusion it may be may be added that the action of the towers accommodates itself to the charge that is being worked for with higher charges, the temperatures are higher, the amount of cooling greater, and the velocity of the air currents is increased, whilst with lower charges the reverse is the case.

Discussion.

Mr. R. Forbes Carpenter said that he had had the opportunity of seeing the plant described by Dr. Bailey and Mr. Hart, as well as of hearing of its working from the date of its inception, and all that he had both seen and heard had increased his interest in the paper. The subject was no new one to the Manchester Section, as in December 1894, when he was chairman of the section, he had been instrumental in securing a paper from Mr. Peter S. Gilchrist, on the introduction of pipe columns in the Southern States of the United States of America, where temperature conditions differed widely from those prevailing in Great Britain (this Journal, 1894, 1150). Later, in 1899, Messrs. Gilchrist and Hacker read a paper before the New York Section, detailing further progress with the working of the towers with which their names were connected (this Journal, 1899, 459). It was interesting to compare the ratios of tower to chamber space in both these systems. It would be noted that Gilchrist and Hacker also applied the system of having short chambers, and more of them, the towers intervening. It had always seemed to him that the theory of the second half of every chamber doing but little work, was one that could not be driven too hard, as its logical conclusion would be two sheets of lead in close approximation. Gilchrist and Hacker had adopted what seemed reasonable dimensions for testing this theory, the lengths of these five chambers in example quoted, 1899, being 50 ft., 60 ft., 50 ft., 50 ft., and 10 ft., width and height uniform, 30 ft. × 24 ft. In the case of the chamber working, and its added towers, which was the subject of Messrs. Bailey and Hart's towers, the width and height of chambers were also uniform ; but No. 1 exceeded in length the sum of that of Nos. 2 and 3. The figures given to him by Mr. Hart were : No. 1, 105 ft. ; No. 2, 54 ft. ; No. 3, 41½ ft.

In the absence of direct measurement of acid made in the three chambers (which would have been of material assistance in discovering the effect realised by addition of the towers) especially of that made in Nos. 2 and 3, under both sets of conditions, and with the three rates of working mentioned in the paper, he had applied the method detailed in Dr. Hurter's paper, read before the Liverpool Section of the Society in 1882, entitled "A Dynamic Theory of Sulphuric Acid Manufacture," where Dr. Hurter showed good grounds for the belief suggested by theory, that the reduction in sulphurous acid takes place in geometric ratio, the figures of practical working obtained by Mr. Macteau going some way to justify the truth (within limits) of the contention there advanced. Making a diagram and curve as indicated by Dr. Hurter, in the present case 94·8 per cent. of the total acid would be made in No. 1, 3·6 per cent. in No. 2, and 1·2 per cent. in No. 3, allowing, as Dr. Hurter did, the same very moderate ratio of loss of sulphur of 4 per cent. going to the exit in proportion to that entering the system. Working these out for the three quantities of ore charged as described in the paper, the foregoing figures resulted

—	No. 1 Chamber Acid as H_2SO_4.	No. 2 Chamber Acid.	No. 3 Chamber Acid.
	Tons.	Tons.	Tons.
Former working 8 tons Pyr. in 24 hours	11·66	0·44	0·15
Medium quantity in the towers, 10·2 tons Pyr. in 24 hours	14·8	0·56	0·19
Maximum quantity in the towers, 12·6 tons Pyr. in 24 hours	18·3	0·7	0·23

From this would be seen the amount of acid in excess of normal working before the towers were installed that would by Dr. Hurter's theory have resulted from their introduction. Though this increase of make in Nos. 32 and 33, according to Dr. Hurter's formula, was not large in absolute amount, the saving in chamber space effected was undoubted, and he was quite prepared to learn that actual measurement would indicate that the formula required revision to accord with actual facts. Indeed, taking the figures in the paper that there was 2 per cent. by vol. of sulphurous acid entering and leaving the towers, and assuming that all sulphuric acid was then scrubbed out, and that the gases from the burners were 8 per cent. by vol. of SO_2, the proportion converted in No. 1 chamber was decidedly less than theory indicated. One had to remember that the volume of inert gases measured in the aspirator in making these determinations of acid contents was the standard basis of mere comparisons, and that the water vapour was present at different degrees of tension in the various chambers tested and compared, so that actual per cent. determination was difficult to reach with accuracy.

The condition and composition of the acid scrubbed out of the towers, made in the first chamber, but not dropped there, was of special interest to him, since the statement in the paper that it contained, as shown by ferrous sulphate test, practically no nitrous compounds. With Mr. Hart's and Mr. Porter's help this had been, since March, still further investigated. If not nitrous, then the sulphazolised bodies that had been described in his joint paper with Mr. Linde before the London Section in December last, might possibly be found to be in existence. Experiment had shown that on keeping a sample of this acid in a closed bottle not completely filled, evidence of both sulphurous acid and of red fumes of nitrous compounds was obtained notwithstanding the presence of the latter, which are fatal to hydroxyamido acid if the former are in excess. Mr. Porter had been able to obtain evidence of traces of the latter by the alkaline copper sulphate test, but only of traces.

DRAUGHT AND CURRENTS IN VITRIOL CHAMBERS.

BY HERBERT PORTER, F.I.C.

The principal object of this paper is to throw some light upon the draught and circulation in vitriol chambers, as I venture to think this subject has not before been discussed or studied from quite the same point of view.

Many papers on this subject have been read and printed in journals of societies and different publications too numerous to go into fully in a paper of this description, and I will therefore only consider a few of those researches that have a direct bearing on this subject.

I have in the past had to consider this question from quite a different standpoint—that is, liquids instead of gases—and the experiments then made with reference to the admixture of liquids leads me to think that somewhat similar characteristics may exist in the case of gases

Many men of note have contributed their ideas as to the actions and reactions of the gases that take place in a vitriol chamber, and so far as I have been able to discover observations have only been made on analytical and not on optical lines, that is to say the evidence of what goes on in vitriol chambers has only been demonstrated by sampling the gases at different points from the outside of the chamber.

Most of those present will be acquainted with the difficulties of sampling gases from a vitriol chamber, so as etain those gases within your apparatus at the time of lysis, under the same conditions that they were when in the chamber.

ondensation, cooling, friction, and time will all assist conversion into other forms than those in which they inally existed.

unge and Naef, in April 1884, in this Journal, state "at the hot gases entering from the Glover towers do not at first to the top of the chambers, and gradually sink ooling, but mix thoroughly at once in the nearest part he chamber. Oxidation of the sulphurous acid is, efore, very energetic as far as the middle of the first nber, after which it decreases." Further, they state, "at the composition of the chamber gases in a vertical on of the first chamber was found to be very uniform."

hertel, in April 1889, this Journal, mentions "that the tion takes place in the front half of the chamber, and the gases pass into the second chamber, an energetic ion sets in again, which again diminishes as soon as gases pass into the second half of the second chamber." xplains this, unlike Lunge and Naef, by thinking that nist of nitro-sulphonic acid in the second half of the iber remains undecomposed, owing to the want of n, and consequently there is a scarcity of nitrous acid e gases.

edenführ, August 1898, this Journal, gives tables and ts of experiments, and states "that the active gases l more quickly through the system, leaving the inactive n the so-called dead space of the chambers, the phenon goes on until a definite limit has been attained. tendency to lag is less with small chambers, but he ions that a large number of small chambers is an asing disadvantage."

re we have definite statements as to what is going on e chambers, and the most important, for the moment, last remark, that the active gases travel more quickly, he less active have a tendency to lag, and are left in ead spaces of the chamber.

w what causes the dead spaces in the chamber, and hould the less active (chemically active) gases lag?

ter on I will more fully explain the probable reason, or the present I will simply state that the currents re set up within the chamber cause the dead spaces.

ere have been many inventions for mixing the gases, ising them to take various routes, instead of following ie of least resistance through a chamber.

rtman, in 1897, introduced a number of al tubes into the first chamber, which d to the gases surfaces for impact and nsation.

ver patented, in 1899, a plant for giving ises a spiral movement, by the arrangeof the inlet and outlet pipes to condensaambers which are circular or polygonal ss section; by this means he claims 30 to cent. increase on the old system.

Pratt Process Company, in 1899, took patent for "returning the practically gases from any part of the plant towards ir, back to the front thereof by means an, the object being to accelerate and se the production within a given space"; er words, to more intimately mix the

as been shown, by Lasne and Benker, e cool sides of the chamber cause the isation of acid, and thus produce a lraught down the sides of the chamber, condensed gases again rising, thus forming kind of circular motion extending for 10 ft. into the chamber, in a chamber vide.

is undoubtedly so to a great extent, as I will our to demonstrate, and at the same time show there ier currents which play a most important part in the of the gases in the chamber. Fig. 1 shows the ient at the side of the chamber by the arrows, and in flow of the gases is shown by the centre of awing. The velocity of the centre of this core will be the maximum velocity of the flow of the gases, and the outer skin or fringe of the core is constantly mixing and eddying with other gases of lesser velocity, and even with gases moving in another or opposite direction, as will be seen later on.

So far I have endeavoured to show what are, up to the present, the general ideas of the internal movements, and actions within the chambers; and I will now explain the model by which the movements, about to be explained, were arrived at.

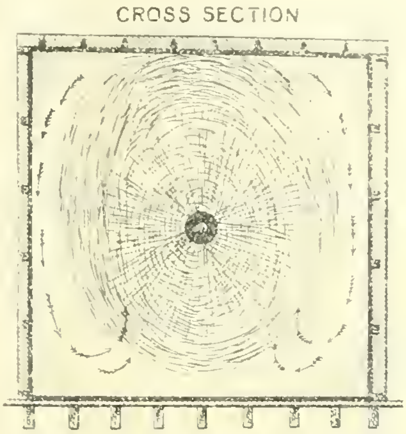
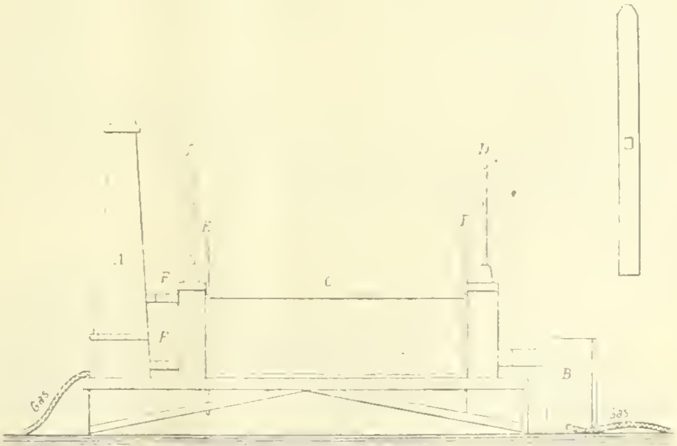


Fig. 1.

Middle of Chamber.

The diagram shown below represents a vitriol chamber made in glass. B is a tin box which acts as the burners for producing gas in some form for the experiment, and this tin is connected with a small tower by a flue; the tower is not intended to represent a Glover tower altogether, but is in reality a valve box fixed to the end of the chamber. In the end of the chamber is an opening from the top to the bottom communicating with the tower, and between the tower and the end of the chamber is a slide damper in which is a hole to admit the gases. By this slide the gases can be admitted at any point between the top and the bottom of the chamber.



A. Chimney. B. Burners. C. Vitriol Chamber of Glass. D. Thermometer. E. Sliding Dampers. F. Dampers.

At the other end of the chamber is an exactly similar arrangement, and this second tower is connected with the chimney by means of two trunks, in each of which is a damper for regulating the draught. The upper trunk gives only a slight draught, and for this reason the lower one was constructed. Being below the small spirit lamp in the chimney, a better draught is thus obtained.

The fumes or gases are produced in the tin box or burners by burning tobacco, brown paper, or by evaporation of hydrochloric acid and ammonia, or, in fact, anything that will produce a visible gas. If a wet gas is produced the sides of the glass chamber soon become covered with moisture, and the view of the interior soon becomes obscured.

Objections may be raised that this model, when working, is not under the same conditions that would exist in a vitriol chamber: that is so, but I think the conditions will be sufficiently near to give a fair idea as to the draught and currents that do exist in a vitriol chamber.

I may mention that I have tried this model with various kinds of gases, both wet and dry: the former act practically in the same manner as the latter, but owing to rapid condensation the view becomes rapidly obscured. As illustrating this, I have twice had to take the chamber to pieces to clean it, and so strong was the deposit, even after drying on the glass, that a damp cloth employed to clean the glass was rapidly destroyed owing to the presence of acid.

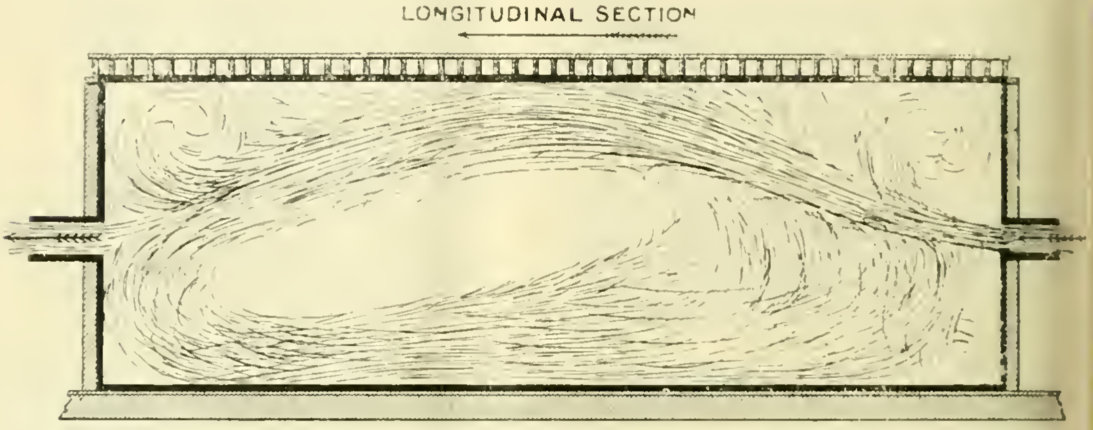


Fig.2.

The material for producing the gas which gives the best results, is brown paper steeped in a strong solution of potassium nitrate and dried.

Each "charge" is the same size; the reason of this I will explain later.

The model is built to scale, ¼ in. to the foot. The gas enters the chamber in the centre of the end of the chamber as shown in Fig. 2, and for about 2 to 3 ins. the core of gas goes straight into the chamber and then rapidly widens out like a funnel, at the same time rising.

The centre core of gases continues to rise until it reaches the top of the chamber, before it has gone half the length of the chamber, and then slowly descends to the exit. Th outer part of this core of gas rapidly declines in velocit and gradually reaches the sides and top of the chamber.

The most remarkable feature of these experiments i that when the centre core of gas arrives at the end of th chamber with its attending outer fringe of gases of lowe velocity, it is quite impossible that all the forward-movin gases can pass out of the exit, consequently these gases h the end of the chamber and are turned back again chiefl along the bottom, though also at the top, to a point about quarter of the distance from the inlet end of the chamber.

To express it in other words, these gases of lower velocit return three-quarters of the distance they have alread come, and meet the fresh incoming gases as they sprea out and are again caught up and again turned to tra along the outer fringe of the centre core or gases of hig velocity.

This turning movement can be most distinctly seen wh the chamber has been filled with gas, and air is then admit through the burner, a small gas jet within the bur keeping the temperature constant.

The heavy gas at the bottom of the chamber can be s moving slowly backward against the draught because i under the draught currents, and rising as they meet incoming air and gas in the first one-third of the chamb

The centre core of gas is not a straight stream of gase particles, but a kind of rolling cloud or wave, always rota on an axis that is moving in the direction of the draught.

As the gases enter the chamber they appear to b rings one behind the other, such as are sometimes s issuing from a locomotive funnel or as can be produced the mouth with tobacco smoke.

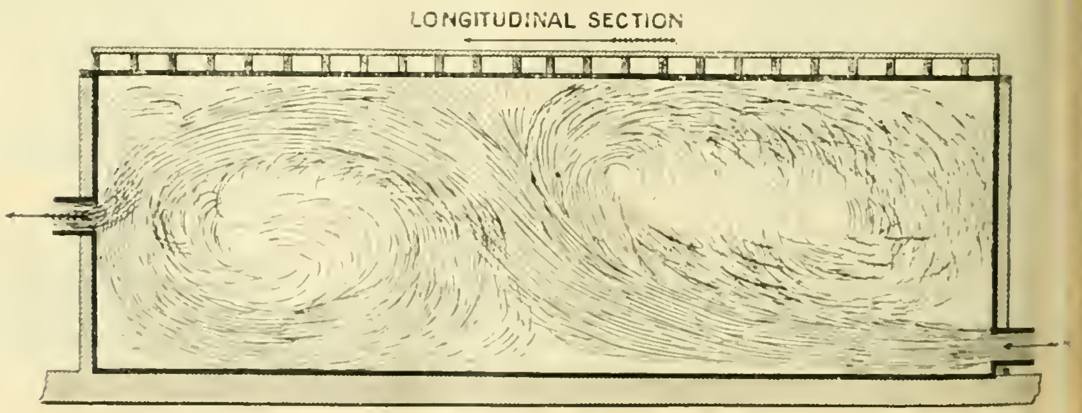


Fig 3.

Fig. 3 shows a very different result. Here the gases are mitted at the bottom of the chamber over the top of the id, and it will be seen that the centre core of gas rises a point exactly in the middle of the chamber from end end, where it splits up into two streams, one turning ckward along the roof of the chamber and down against e first end of the chamber above the inlet, the other lf going forward and down towards the exit, and those ses that do not pass out, turn backwards and down- ırds along the bottom of the chamber until they meet e incoming gases and are turned upwards and again rwards.

This movement requires a close inspection in order to e it distinctly, as the density of the gases is far more iform than in the former case, as seen in Fig. 2, and ere is less dead space in the chamber, and further the locity of the different streams or currents is far more iform.

Fig. 4 shows the gases admitted into the chamber at the p. The result is practically the same as in Fig. 2, except at the returning bank of gases along the bottom of the amber is decidedly longer, that is going back still rther to the front end of the chamber.

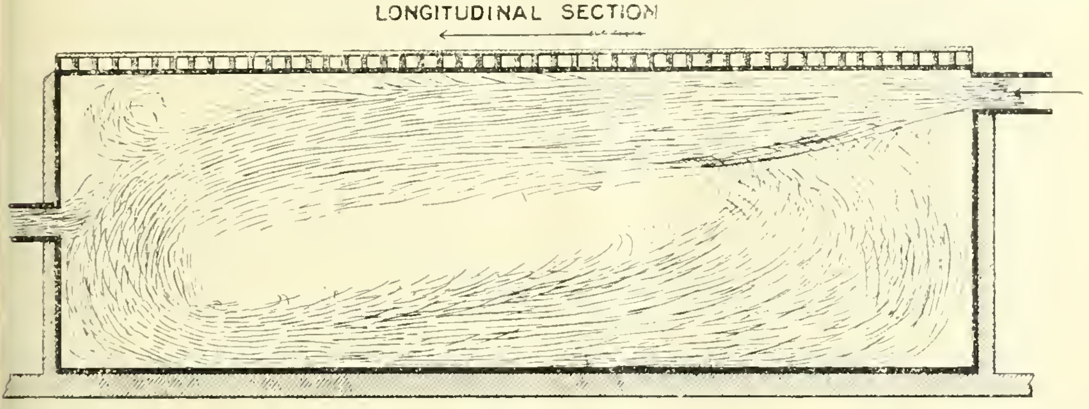


Fig. 4.

In order to show that the gases in Fig. 3 move at a more iform speed, and therefore the density is more constant roughout the chamber, time experiments were made in ch case—that is with the inlet at the bottom, middle, and p of the chamber.

Table A gives the results obtained by burning in each se the same size charge, and the time taken from the oment the charge was lighted until the chamber was ite clear and free from gas. The draught, dampers, &c., re exactly the same in each case.

It will be seen that in the case of Fig. 3, where the gases e admitted at the bottom of the chamber, that practically lf the time was taken to remove all the gas than was ken in the other two experiments. And as we can stinctly see the direction of the currents, and the general nsity of the gases, as well as the uniform clearing of the amber, I think it is a reasonable conclusion that the locity of the draught currents is very much more iform, and mixing more perfect. If the velocity of the rrents is more uniform as well as the density, and as th halves of the chamber appear to have an equal amount circulation, it seems probable that more acid would be oduced in the second half of the chamber than in the se of Fig. 2, where the chief mixing takes place in the st half of the chamber.

Also, if the steam is admitted at the side of the chamber points one-quarter and one-half the distance from the ont end of the chamber, as is usual when admitted at the le, the returning gases in both halves of the chamber urn to the points where the steam jets are.

If, on the other hand, steam is admitted at the ends of the amber, as is sometimes the case, both portions of the urning gas would get the steam as they turn. Also that by the better circulation in the second half of the chamber more effect would be got in condensation at the sides of the chamber at the latter end, which does not appear to be the case in Figs. 2 and 4.

In the case of Figs. 2 and 4 the extra time taken to clear the chamber is almost all occupied in removing the slowly returning dense bank of gases in and about which there is very little mixing. The experiments I think fit in with those researches and statements made by Lunge and Naef and Niedenführ, also Schertel.

Niedenführ has stated that the active gases travel more quickly than the inactive gases, and from what can be seen from Figs. 2 and 4 it would appear to be so.

Schertel, we have seen, thinks that the bulk of the reaction takes place in the front half of the chamber because the mist of nitro-sulphonic acid in the second half of the chamber remains undecomposed for want of steam, steam being usually admitted into the middle of the chamber and in the front half.

Lunge and Naef are also of the opinion that the bulk of the work is done in the first half of the chamber, and if we look again at Fig. 2 we can see that this can easily be accounted for.

The chief mixing takes place in the first half of the chamber, and those gases that do not pass out of the chamber move very slowly backward along the bottom towards and below the steam jet, so that their chances of getting steam are not great until they have mixed again with the fresh incoming gases, and have again risen and move forward.

Making a rough measurement of this bank of gas as seen in the model, it represents 15,080 cb. ft. out of a total of 90,000, which is the capacity of the chamber.

It may be contested that no account has been taken in these experiments of the steam entering the vitriol chamber under a pressure of 20 to 30 lb. as a disturbing element to these currents already described, and there may be a good deal to be said on this point; but while admitting that this may be so to some extent, I do not think that a small jet of steam passing into a chamber 30 ft. wide, which contains a denser moving gas, could disturb or divert the gaseous currents very far.

To put it another way, the disturbing influence of the steam would not be felt in the middle of the chamber. There would undoubtedly be a local disturbance around the steam jet, but the gases would probably return rapidly to the main direction of the draught currents (see p. 478).

To continue with the experiments, Fig. 5 shows in plan what can be seen when looking down through the chamber top in Fig. 2 experiment, and it is distinctly seen that the gases are constantly branching off to the sides of the chamber, while there is still a centre core or maximum velocity to be noticed passing to the exit.

If we study this movement in plan, and also that in Fig. 1, it would appear that the downward side movement is not more than a few feet in thickness from the sides of the chamber, and if we study the returning bank of gas in Fig. 2 we are also forced to this conclusion, as this returning bank is almost the entire width of the chamber.

Fig. 6 shows, as nearly as can be drawn, what this side action is as seen in the glass model. The gases descend the sides of the chamber, and on reaching the bottom creep along the floor in heavy waves, and are drawn into the heavy bank of returning gases to be carried back with them.

PLAN OF CHAMBER.

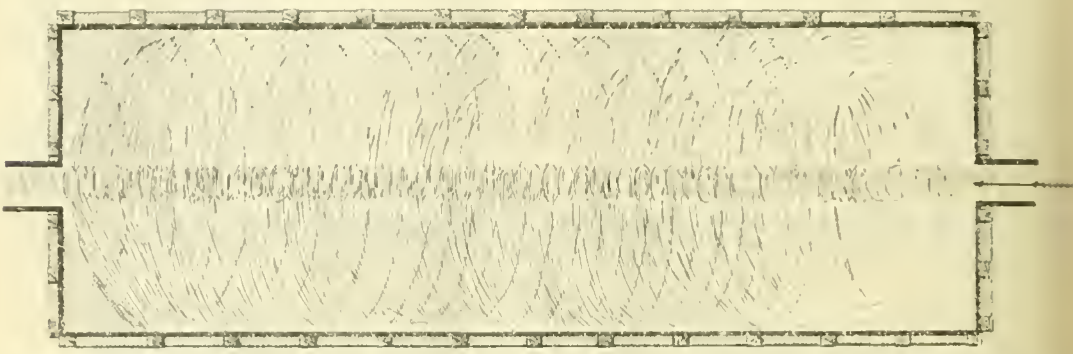


Fig. 5.

Another reason why the downward movement at the sides of the chamber is probably not very extensive or very great in thickness is because both drips on a No. 1 chamber are practically the same, notwithstanding that it is generally admitted that most of the work is done in the first half of the chamber.

There are two kinds of drips, as most of you are aware—those that are attached to the side of the chamber and those that are detached; in the former case only surface action is recorded.

The distance through which a ½-in. jet of steam under 30 lb. pressure will affect the surrounding air is about 7 to 10 ft., according to the amount of steam emitted, and the tendency is for the steam to rise and not fall.

CROSS SECTION

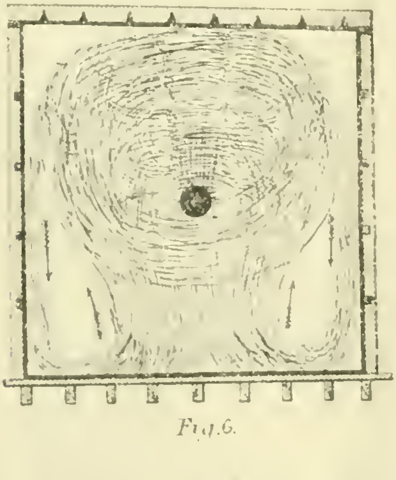


Fig. 6.

A ½-in. jet under 50 lb. pressure will affect the surrounding atmosphere about 21 ft.

Where, as is frequently the case, a ½-in. steam tap is only open one-third, the distance at which the steam will affect the surrounding gases will probably be only 4 to 5 ft. from the side of the chamber.

The conclusions arrived at are that the gases should be admitted into the chamber at the bottom, and that the steam should be admitted at either end in such a way as to intermix with the centre core of both incoming and outgoing gases.

Discussion.

Mr. R. Forbes Carpenter said that Mr. Porter's paper and illustrating experiments were very suggestive, and would, he hoped, be the means of inducing manufacturers to carry on experiments on the large scale of working, where such could be effected without undue cost. As yet he had not a clear idea in his mind whether the better mixing of the gases, giving greater uniformity of composition, as indicated by Experiment 8, would have a marked effect on the rate of formation of acid in the first chamber. He inferred from Mr. Porter's description that in the first two cases the gases made a greater travel through the effect of the recoil, before leaving the chamber than in the case where the hot gases entered at the bottom of the chamber: and, therefore, that this longer distance of trav and consequent greater number of opportunities for inter-action would compensate in some degree for the les uniform composition of the mixture, which would undoubtedly in itself be favourable for reaction.

Nottingham Section.

Meeting held at Nottingham, on Monday, March 30th, 1903.

MR. L. ARCHBUTT IN THE CHAIR.

EXAMINATION OF THE ATMOSPHERE OF THE CENTRAL LONDON RAILWAY.

BY FRANK CLOWES, D.SC.

(This Journal, 1903, 404—405.)

Discussion.

Prof. F. Stanley Kipping said that Dr. Clowes h referred to the injurious emanations which were given o together with carbon dioxide, but which did not appear t contain microbes. Had he any idea as to the nature these emanations? The great thing which struck o visiting the Central London Railway was the beautif cleanliness of the walls.

Mr. J. Golding considered that the hot, sickly a noticeable on the railway, even when it was first opene was worse than the more pungent smells of the Metropolit Railway. From what Prof. Clowes had said, he gathere that the percentage of carbon dioxide was lower on t tral London Railway than on some of the other under- und railways; also that the number of bacilli in the air less, while the amount of excreted matter, as shown in results, was about the same. These facts raised the rather resting problem suggested by Prof. R. Meldola in *ture*, in 1902, *viz.*, "Can carbon dioxide be vitalised?" d Prof. Clowes formed any opinion on the question?

r. R. M. **Caven** observed that the question raised by . Golding was a very difficult, almost a revolutionary ; but one could not, in these days, afford to ignore any stion, even though it might appear almost outrageous. question was whether there might not be something of oisonous nature given out with the carbon dioxide by sons who are shut up in a room. Carbon dioxide, ious bacilli, and particles of organic matter were given from the body. Did these account for the feeling depression by people shut up in a confined space, or there a compound given off which we did not yet lerstand?

Ir. S. F. **Burford** asked Dr. Clowes for detailed information as to the method adopted in taking the samples air. He supposed the air was pumped in when they e taken. Were glass or rubber stoppers used, and what orbent was employed?

r. **Clowes**: I used lime water.

Ir. **Burford** added that he was surprised to find the perature so uniform. He had examined samples of er air, and found the temperature to vary considerably different months of the year. For collecting sewer air filled a Winchester quart bottle with water, which was ptied out, and, of course, air out of the sewer took its ce. He had taken duplicate samples which gave 13·8 15·7, and in another instance 13·0 and 14·7, per 10,000 s. respectively. These show a variation of 13 per cent. total amount—rather a large variation. Was this due variations at time of sampling? Would Dr. Clowes sider such a method of filling bottles in a sewer isfactory?

Ir. R. **Stewart** asked whether the carbon monoxide ever been determined in the atmosphere of the tropolitan Railway. One would not expect to find the air of the "Tube," but it would be likely to occur, ing to imperfect combustion, on the Metropolitan. phuretted hydrogen and sulphurous acid were also met there, but neither of these gases, even when present fairly large traces in ordinary air, produced headache. uld sulphur dioxide exert any appreciable antiseptic ct, and tend to reduce the number of micro-organisms he atmosphere?

he **Chairman** said that on the few occasions when he travelled by the "Tube," he had found the air very pleasant, and he recollected on one occasion getting a unpleasant whiff when passing one of the stations on top of a 'bus.

rof. **Kipping**: That was the disinfectant they use, was ot?

he **Chairman**, continuing, said the smell was not gestive to him of any disinfectant. It struck him that determinations which had been made did not account everything, and that there must be something in this which they had not yet succeeded in finding. Had Clowes allowed the air to act upon hot permanganate? so, had tubercle bacilli been detected in the air?

r. **Clowes**, in reply, said the original report gave a list the organisms found, and the tubercle bacillus was not ongst them. Special mention was made in the report, vever, that the small quantities of air which were lected were insufficient probably to enable them to detect scattered pathogenetic organisms. They must not take absence of these pathogenetic organisms from the ults of the examination as meaning very much. Dr. pping had referred to the clean walls of the "Tube'; bably he had seen clean walls because he had only ked at them in the stations, but if he examined the ube" as he went through it, he would find there was y the iron surface, which there had been no attempt to ot or glaze in any way. They had thought that the face might be in a very undesirable condition, and had taken washings of it, expecting to find that some oxidised matter or bacteria would be present, but no such result was found. During the last few days the engineer of the Boston and New York Railways called in to discuss the matter with him, and expressed astonishment that Englishmen, who usually liked to do things thoroughly, should be satisfied with an iron tube, unprotected on the inner surface. He said all their subways were lined with glazed bricks throughout, so as to present an easily washable surface. Probably Prof. Kipping was correct in saying that the surface of the "Tube" was clean, but it was quite untouched, and in course of time one could imagine it might become undesirably dirty, and act as a sort of collecting ground for dirt generally. That would not be the case with glazed bricks. (Mr. **Ward** here stated that the "Tube" was tarred inside.) He did not know that it was tarred. The iron was not smooth; it was quite rough, and no tar was detected in the washings. Their examination did not satisfactorily indicate the organic matters. They did not find any remarkable difference between the air of the "Tube" and the outside air as regards organic matters. They had not succeeded by the acidified permanganate method in obtaining any indications; the method was carried out at the temperature of the laboratory, which would be about 60° F. He reported these results for what they were worth; he did not think they were conclusive. Passengers complained of the air making them drowsy. What particularly struck him was the peculiar foul smell of the air. In answer to Mr. Golding, he would quote some old experiments of Dr. Angus Smith, who shut himself in a sealed room and introduced into the air chemically prepared carbon dioxide. He found he could breathe and work in this atmosphere without bad effect until the gas extinguished a candle-flame. Benjamin Ward Richardson found in experimenting on animals that air coming from the lungs of human beings was rapidly fatal to them. This rather carried out the idea that there seemed to be something of a poisonous nature in the air exhaled from the lungs other than carbon dioxide.

In answer to Mr. Burford, the bottles used for taking samples were closed with rubber stoppers. They were rolled on their sides upon a flat surface at intervals, so as to cover the surface with the lime water during at least 30 minutes. They took the temperature, but only to correct their volumes by. He had not considered the proportion of carbon dioxide in relation to the temperature. He did not know whether there was any connection. It would be difficult to prove it unless they worked always from the same spot. They found in the sewage of the sewers that the temperature was almost uniform; summer and winter it was the same. He could not say anything about the air, but the liquid was always the same. He could not see any fault in the method of obtaining samples by emptying water out of the bottle; it was the method used by engineers in collecting samples in coal mines. There was no source they could imagine of carbon monoxide in the "Tube." Carbon monoxide was found in perceptible traces in the Metropolitan by a special method. Sulphur dioxide would certainly be inimical to the bacterial life, but bacteria would have a free course in the "Tube" in the absence of sulphur dioxide.

In conclusion, Dr. **Clowes** observed that, many years ago, he had felt that the college should, as far as possible, connect itself with applied science and the local industries. Centres for technical education were being formed in other towns; but Nottingham had only the college. It seemed to him that the college should do its utmost to connect itself with the applications of chemistry, and promote intercourse between those interested on the one hand in pure science, and on the other hand in its applications.

Yorkshire Section.

Meeting held at the Midland Hotel, Bradford, on Monday, March 30, 1903.

MR. JAMES E. BEDFORD IN THE CHAIR.

THE ABSORPTION OF NON-TANNING SUBSTANCES BY HIDE-POWDER, AND ITS INFLUENCE ON THE ESTIMATION OF TANNIN.

BY H. R. PROCTER AND F. A. BLOCKEY.

(Contribution from the Leather Industries' Laboratory of the Yorkshire College. Leeds.)

It has long been recognised that some substances which do not tan (and especially that gallic acid) was absorbed by hide-powder; and the advocates of the method of estimation by shaking, as opposed to that by filtration through a column of hide-powder have always claimed that the lower results obtained by the former method were the more correct, as being less affected by this error.

Experiments were undertaken last year by the writers to test the truth of this assumption, and a verbal communication on the subject was made to the conference of the International Association of Leather Trades Chemists in September, 1902, but circumstances have delayed the completion of the work, and the latter part has been carried out by one of us in the laboratories of Herold's Institute by the kind permission of the governors of the institute, and of Dr. J. Gordon Parker. The results, which are tabulated in this paper, show clearly that the error is a very serious one, and that it is common to all the present methods in which hide-powder is used, though in most cases the shaking methods are less affected than that by filtration. It is, however, questionable whether it is worth while on this account to encounter the great inconvenience which a change from the filter-method would involve, as the error, even in the shake-methods, is still very large, and in some respects it is easier to allow for cases in which practically the whole of the impurity is estimated as tannin, than for those in which an uncertain quantity (which may exceed 50 per cent.) is absorbed. The only satisfactory solution of the difficulty lies in the introduction of some new method, and to this end the efforts of all leather trade chemists should be directed; but in the meantime, where gallic acid is present in considerable quantities, as in sumach and myrobalans, much truer results will be obtained by acting on the resolution of the International Association permitting the use of the chromed hide powder method on condition that its use is stated in the report: and in the case of used and acid liquors it is imperative that this should be done. In this connection it is only fair to state that the contention of the American Association of Official Agricultural Chemists as to the superior accuracy of the shake-method, and that of the Vienna Research Institute as to that of the use of chromed hide-powder are fully confirmed by these experiments.

The principle of the experiments recorded is that if a tannin solution, preferably containing as small an amount of non-tannins as possible, is determined by any given method, and the same solution is again estimated by the same method after the addition of known quantity of a non-tanning substance, any apparent increase in the tannin is due to the co-estimation of the non-tanning matter. For this purpose the purest gallotannic acid obtainable was chosen as a type of the pyrogallol tannins, and a purified quebracho extract (in which the non-tannins are naturally low) as that of the catechol tannins. In the earlier experiments the purification of the quebracho tannin was effected by shaking out a liquid extract with ether to remove matters soluble in this menstruum, and then shaking out the tannin, after addition of salt, with acetic ether B.P., which was distilled off, and the last traces removed by evaporation with ether. As the operation was somewhat troublesome, and the resulting tannin still not wholly freed from impurities insoluble in water, a further portion which was required was prepared by simply treating dry powdered quebracho extract with acetone, filtering and evaporating the solution. Though not quite so pure as the first, the difference was inconsiderable, and as the results are in each case calculated in percentage of dry soluble matter, and on the basis of the actual tannin determinations by each process, the results remain comparable. The actual analyses will be found in Nos. 1 and 8 of Table II. The solutions used were not absolutely clear, but were not filtered to avoid errors of filtration, and because only comparative results were required, any slight excess of tannin so estimated being of course common to all determinations.

The corresponding analyses of the two samples of gallotannic acid employed will be found in Table I., Nos. 1 and 8. With regard to the first of these it may be mentioned that it was also used as a standard in a series of Löwenthal determinations with gelatin precipitation, which showed a percentage of non-tanning matters calculated as gallic acid of 11·2 per cent.

As in most cases the exact nature of the non-tanning impurities present in a tanning material are unknown, several tannin derivatives and analogous substances such as catechol and quinol were selected, and although the experiments were not extended, as was originally intended, to protocatechuic acid, pyrogallol, and some other similar bodies, it may be inferred with considerable certainty that all derivatives of the polyhydric phenols, whether acid or not, are likely to be absorbed in large quantity by hide-powder. With regard to catechol, it may be observed that the determinations are subject to some uncertainty, as this body appears to be slowly volatile *in vacuo* at 100°, under which conditions all dryings were carried out.

Experiments were also made with catechin, which stands in a different relation from the other non-tanning substances to tannins, since the catechins are not tannin derivatives, but rather the root substances from which the catechol tannins themselves are derived by abstraction of water. It will be seen that the catechin experimented with was practically wholly absorbed by the hide-powder in the filter method, but this can hardly be considered an error, since it is probable that during the tanning process the catechin becomes gradually dehydrated and converted into an actual tannin. The specimen used was obtained as pure from Merck, and was white and crystalline, but showed itself more soluble in cold water than is usually stated to b the case. A saturated solution in cold water showed decided tanning properties, producing an under-tanne yellowish leather. These tanning properties were distinctly increased by boiling the solution for some hour before use, and both the solution itself and the leathe produced became decidedly redder in colour. One of proposes to investigate this point more completely, as it of considerable practical importance in view of the larg quantity of catechin contained in gambier and cutch.

The tables perhaps need a little explanation. The fir column gives the matter as weighed out for each experiment the second, the weight of residue from 100 (twice 50) c.c evaporated; from which the dry, or at least the non volatile matter can obviously be calculated. The followin seven columns give the "total soluble," the tannins, an non-tannins, in percentage of the dry "total soluble" the *tannin* employed, and obviously in each case the effe of the added non-tannins will be obtained separately b deducting the corresponding figure given by the dete minations of tannin alone (Nos. 1 and 8). Colum 10, 11, and 12, give the proportion of the added n tanning substance estimated as tannin by the respecti methods, calculated on the actual dry non-tanning matter i excess of the 100 per cent. reckoned for the "total soluble of the "pure" tannin.

One or two special remarks must also be made particular figures. In several cases the amounts of gluco and dextrin absorbed appear as quantities. This probably due to the fact, which has been previous observed, that these carbohydrates exert some solve ect on the hide powder, though it is also possible that ty interfere with the proper absorption of tannins. The c of acetic acid (Nos. 5 in both tables) is also interesting. T only one of the three methods used by which it was psible to proceed in its presence was that with chromed he-powder, unchromed powder becoming excessively sllen, and absorbing the tannin incompletely. It is iresting to note that a small quantity adheres otinately to the residues, even after drying *in vacuo.* l sibly this might be removed by repeated moistening w alcohol or ether in the course of drying.

'reiberg hide-powder was used throughout the experints, and the hide-powder filtrations were conducted sctly in accordance with I.A.L.T.C. rules. The chromed pder was chromed with 3 grms. chrome alum per 1 grms. powder, as directed by the Vienna Versuchsanstalt für Lederindustrie, and the American Association of Official Agricultural Chemists. It was washed till free from soluble sulphates, and squeezed, and used in fresh condition, no formaldehyde being added.

Although, no doubt, the chromed hide-powder process answers well where a sufficient number of analyses are done daily to warrant a very frequent chroming of powder, it was found extremely troublesome for occasional work, as, even with formaldehyde, the powder does not keep well in a wet condition, and its absorbency for tanning is distinctly varied by the amount of water left in it. With Freiberg powder not less than two days' washing with a very soft and pure tap-water was found necessary to free it from traces of soluble sulphates. It is probable that this time might be abridged by using a basic chrome solution in place of normal chrome alum, or by "neutralising" with borax or

Table I.

Effect of Addition of Various Non-tannins to Gallotannic Acid.

laterial employed.	Grms. per Litre.	Grms. Dry Soluble per 100 c.c.	Percentage on Dry Gallotannic Acid taken.							Percentages of Dry Non-Tanning Substance estimated as Tannin.		
			Total Soluble.	Filter Method.		Chromed Powder.		Washed Powder.				
				Tannins.	Non-Tannins.	Tannins.	Non-Tannins.	Tannins.	Non-Tannins.	Filter Method.	Chromed Powder.	Washed Powder.
Gallotannic acid ...	4·6	0·498	100·0	95·1	4·9	90·1	9·9	87 4	12·6	..	..	..
Gallotannic acid ... Gallic acid	4·6 4·4	0 808	198·0	180·0	18·0	139·6	58·4	130·6	67·4	86·6	50·6	44·0
Gallotannic acid.... Dextrin	4·6 4·5	0·812	199·0	104·6	94·4	86·9	112·1	85·6	113·4	9·6	− 3·2	− 1·8
Gallotannic acid ... Glucose	4·6 2·5	0·627	153·6	95·5	58·1	90·3	63·3	88·5	65·1	0·7	0·4	2·0
Gallotannic acid ... Glac. acetic acid....	4·6 3·0	0·420	102·8	..	..	92·0	10·8	..	..	..	67·9	..
Gallotannic acid ... Quinol	4·6 2·5	0·500	122·5	117·3	5·2	101·4	18·1	101·9	20·6	98·7	63·6	64·4
Gallotannic acid ... Catechol	4·6 2·5	0·526	128·9	120·5	8·4	113·7	15·2	112·7	16·2	87·9	81·7	87·5
Gallotannic acid ...	5·0	0·438	100·0	95·3	4·7	86·3	13·7	85·8	14·2	..	..	..
Gallotannic acid ... Catechol	5·0 2·5	0·651 0·574?	148? 131?	140·8	8·0	132·0	16·8	128·8	20·0	93·2	93·7	88·1
Gallotannic acid ... Gallic acid	5 0 2·5	0·657	150·1	142·2	7·9	110·3	39·8	111·2	38·9	93·6	48·1	48·9
Gallotannic acid ... Gallic acid	5·0 1·25	0·540	123·4	116·5	6·9	96·9	26·5	99·0	24·4	90·6	45·7	56·4
Gallotannic acid ... Catechin	5·0 2·5	0·660	159·7	145 6	5·1	124·2	26·5	118·6	32·1	99·2	75·0	64·7

Table II.

Effect of the Addition of Various Non-tannins to Quebracho.

Material employed.	Grms. per Litre.	Grms. Dry Soluble per 100 c.c.	Percentage on Dry Quebracho Tannin taken.							Percentages of Dry Non-Tanning Substance estimated as Tannin.		
			Total Soluble.	Filter Method.		Chromed Powder.		Washed Powder.				
				Tannins.	Non-Tannins.	Tannins.	Non-Tannins.	Tannins.	Non-Tannins.	Filter Method.	Chromed Powder.	Washed Powder.
Quebracho tannin .	5·0	0·442	100·0	96·1	3·9	93·9	6·1	92·0	8·0	..	..	..
Quebracho tannin.. Gallic acid	5·0 4·4	0·837	189·4	173·1	16·3	138·2	51·2	135·2	54·2	89·4	49·6	48·3
Quebracho tannin.. Dextrin	5·0 4·5	0·843	190·8	101·0	89·8	88·3	102·5	88·3	102·5	5·4	6·2	− 4·1
Quebracho tannin.. Glucose	5·0 2·5	0·651	147·2	94·2	53·0	90·6	56·6	90·1	57·1	− 1·0	− 7·0	− 4·0
Quebracho tannin . Glac. acetic acid....	5·0 3·0	0·470	106·3	..	.	97·5	8·8	..	..	..	57·0	..
Quebracho tannin . Quinol	5·0 2·5	0·556	125·9	121·3	4·6	112·8	13·1	115·0	10·9	97·3	73·0	88·8
Quebracho tannin.. Catechol	5·0 2·5	0·584	132·2	125·1	7·1	128·2	11·0	120·0	12·2	90·4	106·5	87·9
Quebracho tannin..	5·0	0·440	100·0	94·9	5·1	88·6	11·4	89·1	10·9	..	..	..
Quebracho tannin.. Catechol	5·0 2·5	0·536	126·4	117·8	8·6	110·9	15·5	108·2	18·2	86·7	84·5	72·3
Quebracho tannin.. Gallic acid	5·0 2·5	0·668	151·8	144·3	7·5	115·2	36·6	118·4	33·4	95·4	51·4	56·0
Quebracho tannin.. Gallic acid	5·0 1·25	0·540	122·7	115·3	7·4	98·8	23·9	100·7	22·0	89·9	44·9	51·1
Quebracho tannin.. Catechin	5·0 2·5	0·646	146·8	139·8	7·0	117·0	29·8	122·4	24·4	95·9	69·7	71·2

sodium sulphite before washing, but in either case a smaller quantity of chrome should be used, as more would be retained in the powder, the continued loss of sulphates arising from gradual hydrolysis of the chromium sulphate with loss of an acid, and formation of a basic salt.

Experiments were made on the use of formaldehyde instead of chrome alum to insolubilise the hide-powder. It was found that better absorbency and a more satisfactory filtrate were obtained when formaldehyde solution was merely diluted with water, than when it was rendered alkaline with sodium carbonate, though the latter method gave a whiter and better looking powder. The exact strength of formaldehyde solution seems unimportant; 50 grms. of powder treated with quantities varying from 1 to 4 c.c. of 40 per cent. formaldehyde solution in 1 litre of water gave approximately identical results when used in the estimation of tannic acid, but 2 c.c. per litre for 50 grms. powder seems a convenient quantity. The preparation of the powder is very simple,—three hours' treatment with the solution seems sufficient, and washing is only needed to remove the natural solubles of the powder. The solubles are very low in the washed powder; 20 grms. of powder containing about 70 per cent. of water shaken with 100 c.c of distilled water gave a solution of which 50 c.c. only left a residue of 0·0045 grm. on evaporation. Powders prepared with 1, 2, and 4 c.c. of formaldehyde solution per litre were dried with warm air, and re-ground, and used to determine tannin by shaking in the solution of the same sample of gallotannic acid as was analysed in Table I., No 1, giving results of 9·4, 7·2, 10·2, 10·0, and 8·4 per cent of non-tannins respectively. The absorption is thus shown to be satisfactory, but not so constant in different experiments as is to be desired. Probably with further study of the conditions of preparation and analysis this difficulty coul be overcome, and the powder is much more convenient than the chromed powder, but is probably liable to the same errors of absorption of non-tannins as the other hide powder methods. Nevertheless the use of formaldehyd seems worthy of further study, at least as compared with the use of chromed powders, and while we may pursue it further, we have no desire to deter others from also experimenting.

Journal and Patent Literature.

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French.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3e).

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Bottles or Carboys for Conveying and Storing Acid, Inflammable or Valuable Liquids, and the like; Means for Packing ——. A. Mauser, Cologne-Ehrenfeld, Germany. Eng. Pat. 11,695, May 22, 1902.

The bottles or carboys are packed in suitably strengthened thin-walled sheet-metal vessels, in which they are held by an elastic filling material, or, in lieu of such material, by a spring bottom and separate standing or hanging spring insertions, &c. The vessels are provided with carrying handles, and with lids which have an elastic attachment to the necks of the bottles, &c.—R. A.

Drying Apparatus [Electric Cables, Sugar, &c.]. J. Radcliffe, London. Eng. Pat. 8973, April 17, 1902.

The materials or goods to be dried are enclosed in a chamber provided with a series of U-shaped tubes, through which steam, hot air, or other heating agent is circulated, the ends of the tubes being connected to inlet and outlet compartments formed by dividing a channel provided at near one end of the chamber. For drying sugar, &c., t chamber may be provided with a series of revolving tray &c., for the material.—R. A.

Fumes and Gases Evolved from Vessels Employed Metallurgical, Chemical, and Analogous Operation Appliances for Abstracting or Carrying off the —. W. Lynes, Birmingham. Eng. Pat. 14,615, July 1, 19

A portable appliance, consisting of a detachable ho cap, or cover, adapted to be applied to the mouth of t crucible or other vessel, and having a tubular outlet adapt to be connected by a flexible pipe to a chimney sh or other means for producing an exhausting draught. —R. A.

Mercury Vacuum Pump; Automatic ——. S. R. Miln Sheffield. Eng. Pat. 493, Jan. 8, 1903.

The ordinary Töpler vacuum pump is converted into portable automatic instrument by employing a fix mercury reservoir a few centimetres only below the pu chamber, instead of the usual chamber of baromet eight, and an electrically worked three-way tap, for onnecting the space above the mercury in the reservoir ternately to the atmosphere and to a water vacuum pump. he water-pump causes the mercury to rise and fall in the ump chamber, expelling the air from it into an external acuum chamber previously evacuated by the water-pump. —R. A.

entrifugal Separators [*Salt, Sugar, &c.*]. M. Guttner, Chemnitz, Germany. Eng. Pat. 693, Jan. 10, 1903.

continuously acting machine, comprising sieve baskets vided into compartments and having a planetary motion. supply-pipe and screen extend into each basket in such manner that the material entering the compartments is ied in the latter during the rotation of the basket, and is en by centrifugal force thrown out of the compartments ainst the screen.—R. A.

ondensing Apparatus [*Stills, Reducing Furnaces, &c.*]. C. W. Stanton, Mobile, Alabama, U.S.A. Eng. Pat. 1397, Jan. 20, 1903.

he outlet from the condenser is connected to the bottom a closed receptacle provided with a liquid seal. The eptacle has an outlet near the bottom, and another near top, for the discharge, respectively, of condensates of eater and less specific gravity than that of the sealing uid. A third outlet, connected to the top of the eptacle, serves for the discharge of uncondensed gases, . A filling pipe for the sealing liquid is also connected the top of the receptacle, this pipe and the various lets being provided with controlling valves.—R. A.

United States Patents.

entrifugal Separator. R. A. Lucas and O. Jeppson, Hilo, Hawaii. U.S. Pat. 722,522, March 10, 1903.

e drum of the separator is made in the form of two ncated cones with the bases adjacent, the bottom of the er cone or portion being closed, and the top of the per portion open. A ring having valve-controlled outlets, connected at the junction of the two portions of the m, and a second series of valve-controlled outlets ormed in the upper portion, means being provided for ultaneously regulating the valves in the junction-ring lets. A barrel is arranged vertically within the drum, partitions between them, the drum and barrel being able of adjustment with relation to the shaft on which y are mounted. Fixed troughs are provided for receiving materials discharged through the outlets and the upper of the drum.—R. A.

aporating-Pan. E. R. Shaw, Ontario, Cal. U.S. Pat. 722,636, March 10, 1903.

revolving pan of spiral form, with closed sides, is ended and held between hollow hubs with radiating es, between which removable shutters are fitted. The is supported in a horizontal position on cradles formed anged wheels, &c., and rotated. The liquid is delivered inuously into the outer or charging end of the pan, and, assing to the inner or discharging end, develops a film he liquid over its inner concave surface, where it comes ontact with the air or other evaporating medium, which ensed to travel with a high velocity in the opposite ction through the pan. Means are also provided for ying away the partially condensed liquid from the pan. —R. A.

rying Apparatus. J. Radcliffe, London. U.S. Pat. 723,547, March 24, 1903.

Eng. Pat. 8973 of 1902, page 484.—R. A.

French Patent.

Gases; Liquefaction of ——. G. Claude. Fr. Pat. 324,097, Aug. 28, 1902.

pparatus for the liquefaction of gases with external from expansion, certain details of improvements are introduced, having relation to the operation of heat-angers. See also addition to Fr. Pat. 296,211, Jan. 16, ; this Journal, 1903, 298; and Eng. Pat. 12,905, ; this Journal, 1901, 1018.—E. S.

II.—FUEL, GAS, AND LIGHT.

English Patents.

Peat for the Production of Fuel; Treatment of ——, *and Utilisation of the By-products obtained.* E. K. Carmichael and C. A. Sahlström, Edinburgh. Eng. Pat. 6153, March 13, 1902.

The peat is first subjected to a continuous squeezing process, then dried under conditions tending to preserve the vapours evolved at the higher temperatures. The powder is afterwards separated from the fibre, and the latter is boiled with an alkali, the powder being progressively heated in such a manner as to conserve the vapours and gases given off during the various stages of the operation, and moulded into briquettes when fully carbonised.

The squeezing machine consists of two endless chains of plates, which are forced against the peat by hydraulic pressure. The drying apparatus is formed of a series of cylinders with constricted ends. They are provided with internal screw conveyors and revolving cylinders, so arranged in relation to a source of heat, that the material is progressively heated, the air space of each cylinder being isolated from those of the others; and the products from each can be withdrawn and stored separately. The carbonised peat powder is enriched by passing the vapours of distillation through the mass; and the hot carbonised peat is cooled by passing steam through it and forming water-gas.—C. S.

Carbonisation of Animal and Vegetable Substances; Process for the ——, *with or without the Production of By-products.* O. Ricklefs, Oldenburg. Eng. Pat. 100, Jan. 2, 1903.

The substance to be carbonised is introduced into a bath of suitable molten material, the temperature being raised as required, and the distillation products collected by means of a hood communicating with condensers. For instance, peat may be carbonised by introducing it into molten lead; bones, by introduction into fused aluminium; any adherent metal being removed from the substance after cooling.—H. B.

Fuel in Furnaces and Kilns; Combustion of ——. R. Thomson, Glasgow. Eng. Pat. 24,514, Dec. 2, 1901.

The furnace is provided, above the hearth, with a number of bell-mouthed air inlets directed downwards and of sufficient length to conduct the incoming air downwards on to the burning fuel. The fuel itself is fed through these inlets, and thus distributed uniformly over the hearth; when liquid fuel is used, it is sprayed or delivered into the air inlets in such a manner as to be vaporised in the lower portion of same, and thus thoroughly commingled with the incoming air. The mutual proportions of the air inlets and the discharge apertures for the gases of combustion are so adjusted as to produce a maximum of induced draught. —C. S.

Fuel; Bunsen Burners for Use with Liquid ——. W. M. Simpson, Hastings. Eng. Pat. 5912, March 11, 1902.

The burner is provided with a mixing chamber, fitted with baffles between the inlet tube and the burner tube; the supply pipe for the liquid fuel is in one piece with, or in metallic contact and connection with the burner tube; passages are provided, in one piece with, or intimate metallic connection with the burner tube, both for the passage of the fuel to the gasifying pipes and for the passage of circulating water. Three modifications of the burner are shown.—C. S.

Fuel; Utilisation of Carbonaceous Liquids as ——. F. Cotton, Hornsby, N.S.W. Eng. Pat. 20,234, Sept. 16, 1902.

The heavy carbonaceous residuum of petroleum, or other liquid of like nature, is mixed with steam under pressure, and projected through a vaporising chamber into the furnace. For instance, the carbonaceous liquid and steam may be supplied to a horizontal mixing chamber, which has a retort-like extension over the fire of the furnace; the retort has an orifice at its inner end, and the mixture of oil and steam, passing through the retort is vaporised and issues through the orifice.—H. B.

Generators; Gas ——. A. J. Boult, London. From G. Viarmé, Paris. Eng. Pat. 3343, Feb. 10, 1902.

The lining of the generator is built up of rings of refractory material, arranged in a sheet-metal jacket to simplify repairs. Air and water are drawn into an annular heating chamber of cast steel, situated at the top of the furnace, and the mixture of steam and hot air produced, is drawn down a pipe with a second addition of water, into an annular superheating chamber of cast steel, arranged at the bottom of the furnace, whence the steam and air pass up through the incandescent fuel. The arrangement of the two heaters acts as a temperature-equalising device, and permits of opening the ash-pit without interference with the generation of gas. Fuel is fed to the generator through a hopper, the bottom plate of which can be closed gas-tight by the action of one fixed and one rotatable cam sleeve, the latter of which presses upwards on a spring, surrounding the spindle to which the hopper plate is attached.—H. B.

Retorts; Impts. in Gas ——. G. C. Trewby, London. Eng. Pat. 9622, April 25, 1902.

In order to enable ⌂, or oval retorts to be made of much greater width and capacity than is at present the case, the arched top (and, if desired, the bottom) of the retort is provided externally with transverse ribs or projections arranged at right angles or diagonally to the length of the retort. The ribs may also be connected by ribs extending lengthwise through the retort.—H. B.

Water-Gas; Process and Apparatus for the Manufacture of ——. G. Harrison, London. From the Soc. Internat. du Gaz d'Eau Brevets Strache, Brussels. Eng. Pat. 28,177, Dec. 20, 1902.

A process of generating water-gas, consisting in so regulating the temperature that, during the blow-up period, only 6—12 per cent. of carbon dioxide and at least 15 per cent. of carbon monoxide are contained in the gas given off, whilst during gasification, the velocity of the steam supply is so adjusted to the velocity of the water-gas produced, that for 1 vol. of steam about 2 vols. of gas flow from the apparatus. To measure the velocities of the steam and gas, pressure-gauges are employed which indicate the difference of pressure of the steam and gas in front of and behind narrow passages of certain definite sections, in the pipes through which the steam and gas respectively flow. Preferably the sections of the passages are so chosen that the two differential gauges indicate the same point on the scale when the rates of flow are correctly adjusted.—H. B.

Carburetting [Air]; Process for ——, *and Apparatus therefor.* B. de Laitte, Paris. Eng. Pat. 28,408, Dec. 23, 1902.

An exhauster, rotating within the bell or casing of a small gas reservoir, draws atmospheric air through a carburetter and delivers the carburetted air immediately beneath the top of the bell of the reservoir, whence it is driven to the main reservoir.—H. B.

Gas; Purification of ——, *for Illuminating, Heating, Power, or similar Purposes.* H. G. Hills, Broadbottom, Cheshire. Eng. Pat. 7956, April 5, 1902.

Carbon dioxide and ammonia are eliminated from gas manufactured from carbonaceous material, "by bringing the gas into contact, by any suitable means and in any convenient way, with a solution consisting of chloride of sodium and water," then filtering off the precipitated sodium carbonate, and recovering the ammonium chloride from the solution.—H. B.

Acetylene Generators. W. P. Warren, London. Eng. Pat. 3641, Feb. 12, 1902.

A small carbide-feed generator of the central hopper type. The feed gear consists of a conical valve partly supported by a flexible diaphragm, which is normally pressed downwards away from its seat (thus allowing carbide to fall into the water) by the action of a spring, but which is pressed upwards again when the pressure is sufficiently high to lift the diaphragm. A further increase of pressure inside the apparatus lifts the diaphragm still higher, and then a second spring-closed valve is opened to form a vent for the surplus gas. A flared pipe surrounding the main valve stem relieves the valve from the weight of the carbide in the hopper, and so keeps the force required to open or close it practically constant. The hopper is attached to the decomposing vessel by means of a screwed union, which is undone when the latter is to be cleaned out and refilled with water.—F. H. L.

Acetylene Gas; Production of ——, *and End Products suitable for use as Metal Polish and the like.* W. P. Warren, London. Eng. Pat. 3643, Feb. 12, 1902.

Instead of using plain water in a carbide-to-water generator it is proposed to employ a solution of sodium carbonate and treacle, or of soap, glycerin, &c., with or without an additio of some "essence" to disguise the odour of the gas, the object being so to control the speed of the reaction tha the temperature is maintained lower than usual, an the acetylene claimed, nearly odourless and of bette "quality" than usual. The proportions of the ingredient may vary from 5 parts of sodium carbonate per 1 of treac to 15 parts of carbonate per 85 of treacle, with a quant of water suited to the size of the (granulated) carbid employed. If preferred, the reagents may be mixed togeth in paste form, and diluted when required for use. Th sludge is said to be a useful detergent.—F. H. L.

Lamps; Mercury-Vapour Electricity ——. E. Schattne London. Eng. Pat. 3259, Feb. 8, 1992.

The body of the lamp is formed of quartz, or of compound of it, such as "quartz and platinum," with th object of modifying the greenish hue of the luminou vapour.—G. H. R.

United States Patents.

Furnace. W. H. Fenner, Chicago. U.S. Pat. 722,827, March 17, 1903.

A furnace is described, with feeding device, for burni fine fuel in suspension. Blasts of fine fuel directed upwar are projected into the combustion zone of a combusti chamber provided with a discharge opening in the botto in the path of the blasts and beyond the zone of init combustion, the opening being connected with a water s beneath the chamber. Connected with the combusti chamber is a fuel chamber, axially mounted within whi is a vibrating valve, controlling the feed and dischar openings, and serving as a partition for dividing t chamber into two non-communicating compartments. T valve is caused to vibrate so as to alternately open a close the feed and discharge ports.—H. B.

Combustible Fluid; Process of Producing ——. C Kuenzel, jun., Hoboken, N.J. U.S. Pat. 721,9 March 3, 1903.

Air is compressed, and a portion used to force oil int mixing chamber, where the oil is mixed with anoth portion of the compressed air at a high temperature.
—T. F. B

Gas Producer. F. W. Matthiessen, Lasalle, Ill. U.S. P. 723,224, March 17, 1903.

A gas producer of which the fuel chamber consists o bottom plate, is mounted on a vertical rotating shaft cylindrical casing is mounted on the bottom plate and an enlarged upper extension; a stationary cover with independent support extends over the chamber; als water-seal connection is arranged between the cover and outer rim of the enlarged upper part of the chamber. flue extends downwards through the enlarged part o and communicates with the cylindrical part well below bottom of the enlarged portion. Fuel is fed throug spout, which passes through the cover, on to the botto t enlarged upper part of the chamber, and is then caused t pass down into the cylindrical portion, scrapers being a nged to sweep the bottom of the enlarged part and the b tom plate of the cylindrical portion.—H. B.

French Patents.

eat Briquettes. C. Schlickeysen. Fr. Pat. 323,358, Aug. 1, 1902.

T peat is freed from the bulk of the contained water, by c rifugalising or other means, and is then disintegrated, t remaining moisture being driven off by evaporation. T remaining felt of dry peat is afterwards incorporated w wood fibre, coal, or tar (10—25 per cent.), and suitable b ing materials, the whole being heated, and compressed in briquettes.—C. S.

el from Slate or Bituminous Shale. F. Huppenbauer. Fr. Pat. 323,379, July 31, 1902.

S TE or bituminous shale is broken into lumps, and h ed to incandescence in a still, to drive off the volatile c tituents and render the mass porous. The residual p uct is then impregnated with the vapours of tar, resins, oi &c.—C. S.

; Artificial ——. A. J. M. Bonnot. Fr. Pat. 323,493, Aug. 4, 1902.

C IUM carbonate, incorporated with 10 per cent. of clay, is turated with crude petroleum by spraying, and then m d with molten pitch, asphaltum, or tar. The product is terwards gradually stirred in with slaked lime in a m r, the homogeneous liquid paste thus formed, being h d until the hydrocarbons have been completely a bed and the mass has become of a bright black colour, li coal, whereupon it is cast into moulds.

higher calorific power, for metallurgical purposes, &c., m be imparted by replacing 5—10 per cent. of the ca um carbonate by a similar quantity of aluminium oxide an erric oxide in equal proportions, or by oleates or " margaes " of iron, aluminium, or copper, or metallic soaps. T coal paste may also be mixed with one to three times its n weight of dry sand, and made up into briquettes, in wh condition it is as hard as natural coal.—C. S.

G Manufacture [*Vertical Retorts for* ——]. J. Bueb. Fr. Pat. 323,712, July 8, 1902.

T nventor proposes to revert to the use of vertical retorts fo e manufacture of coal-gas, said retorts being formed w a continuous exit throughout their entire length, or w a number of superposed exits, so that gas may escape f the vessel immediately it is formed.—F. H. L.

Ac lene ; Generation of ——. P. N. Lucas-Girardville. Fr. Pat. 324,069, Aug. 27, 1902.

A YLENE is evolved by causing a mixture of denatured al ol and water to drip upon calcium carbide. The pro rtion of spirit in the liquid varies from 50 per cent. by olume if the generator be not fitted with a holder, to 3 r cent. if a holder be employed. The method is la ed to give a product of constant composition, con ting always of acetylene mixed with a certain pro- o n of alcohol vapour, which may be regulated to an a nt equal to four-fifths by weight of the gas. Thus r red, the gas is stated to be free from phosphorus, an herefore specially suitable for incandescent lighting. Ace ne may be used similarly.—F. H. L.

Inc descence Mantles from Filaments of Nitrocellulose ; P cess for Obtaining ——. J. A. Boullier. Fr. Pat. 3 ,959, Aug. 23, 1902.

FIL ENTS of nitrocellulose, for the production of mantles, are bmitted to a preliminary treatment with nitric, formic, or etic acid, or with any other substance capable of cau g them to swell without dissolving them, so as to ren them capable of absorbing solutions of the illuminating ts. The washed moist filaments are then impregnated, den fied by means of ammonium hydrosulphide, washed, and eated as usual.—H. B.

Incandescence Mantles. L. G. Babillot. Fr. Pat. 324,030, July 4, 1902.

To prevent the flame from passing through the stitches at the lower part of the mantle, and to cause it to fill the whole interior of the latter, the stitches of the fabric, which are of the usual arrangement at the top, are made more and more closely set towards the lower portion of the mantle.—H. B.

Electrodes for Electric Arc Lamps. A. Blondel. Fr. Pat. 323,813, Aug. 18, 1902.

The electrodes are formed in three concentric zones of different composition, and consist of a cylindrical body of mineralised carbon, containing more than 10 per cent. of photogenic mineral substances, such as the salts or compounds of calcium or any others, and surrounded by a very thin external protective covering of pure or slightly mineralised carbon, the thickness of which is regulated so that it is worn away a little faster than the principal body. The core may be simple or multiple, circular in section, star-shaped or otherwise, and contain carbon or other conductive substance with an agglomerant and an ample amount of exciting mineral materials.—G. H. R.

Carbons for Electric Arc Lamps. A. Blondel. Fr. Pat. 323,924, Aug. 23, 1902.

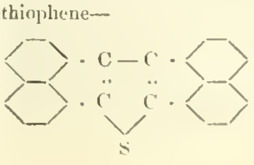
The electrodes of compressed carbon are perforated longitudinally with several parallel holes filled with a mixture of an agglomerant (with or without the addition of carbon) and mineral substances having the property of increasing the light of the arc or of concentrating and fixing it. The total section of the holes is regulated in such a way with respect to the section of the electrode that the mass burns almost as fast as the mineral substances of the core vaporise, and consequently the arc is always formed of carbon vapours mixed with mineral ones. A mixture of carbon and of 20 to 75 per cent. of calcium is preferred for the main body of the electrodes, the multiple cores of which contain 20 to 75 per cent. of borate of potassium, or of an analogous exciting salt which has the property of concentrating the arc with the production of a maximum brilliance. Any mineral substances may be added to the paste of the main body of the electrode, especially those that give light. The electrodes are surrounded by a protective envelope of carbon or other material.—G. H. R.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Decacyclene (Trinaphthylenebenzene), a New High-molecular Aromatic Hydrocarbon, and Dinaphthylenethiophene, a Red Thio-compound. K. Dziewoński and P. Bachmann. Ber., 1903, **36**, [5], 962—971.

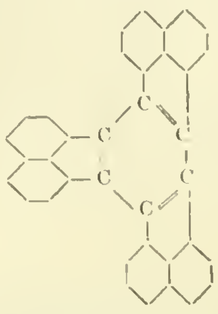
100 grms. of acenaphthene and 23 grms. of powdered sulphur are intimately mixed and heated in a round-bottomed flask. At 205° C. reaction takes place, and much sulphuretted hydrogen is evolved, whilst the molten mass gradually becomes reddish-brown. The melt is finally heated for some time at 290° C. The mass is extracted several times with benzene, and, on evaporating the benzene, crystals appear; these on recrystallisation from toluene, separate in red needles. The residue, insoluble in benzene, is extracted once with toluene, then crystallised from cumene, from which solutions small golden-yellow needles separate.

The red substance is almost insoluble in alcohol or ether slightly soluble in hot chloroform or carbon bisulphide, easily in benzene, toluene, and other hydrocarbons, and very easily in aniline or nitrobenzene. It melts at 278° C. and sublimes. It dissolves in concentrated sulphuric acid with a violet colour. The substance appears to have the formula $C_{24}H_{12}S$, and its behaviour leads to the conclusion that it is dinaphthylenethiophene—



On oxidation with chromic acid, naphthalic anhydride is formed.

The yellow substance is insoluble in alcohol or ether. It is slightly soluble in hot benzene, toluene, phenol, xylene, and pyridine; more so in aniline, diphenylamine, toluidine, and cumene, and easily in nitrobenzene. Dilute solutions show a fine green fluorescence. It is insoluble in concentrated sulphuric acid, and differs therefore from picene. Analysis and molecular weight determination by rise of the boiling point of aniline and nitrobenzene prove that the substance has the formula $C_{36}H_{18}$, and its constitution is concluded to be that of trinaphthylenebenzene :—



or, to indicate the 10 rings, decacyclene. It is extremely stable towards oxidising agents.

The action of sulphur on acenaphthene may be represented by the equations—

$$2C_{12}H_{10} + 5S = C_{24}H_{12}S + 4H_2S.$$
$$3C_{12}H_{10} + 6S = C_{36}H_{18} + 6H_2S.$$

—J. McC.

Petroleum; Points on the Technology of Grosny ——. K. W. Charitschkow. Westnik. shirow. weschtsch., **3**, 303. Chem.-Zeit., **27**, [25], Rep. 77.

Colour.—The Stammer colorimeter is employed, and the colour standard is fixed at 2·5°, but that of the commercial oil is usually $2\frac{1}{4}$—$2\frac{3}{8}$.

Purifying with Quicklime.—The use of quicklime in refining, eliminates certain acids ("A-acids") that caustic soda is incapable of removing. The sulpho-acids formed in the acid process can be largely modified by washing with water, and this treatment diminishes the consumption of alkali. The author's experiments show that milk of lime gives better results than lime water, and entirely removes all traces of acid (which is difficult to effect in the ordinary process of refining), in addition to reducing the consumption of caustic soda to one-fourth, the product being also lighter in colour and of increased stability. The quicklime should be ground fine, preferably in a semi-slaked condition, and be employed in the proportion of 3—5 parts per 100 of water. It is run into the distillate whilst the latter is being stirred, the agitation being continued until complete neutrality is attained. The pasty mass quickly subsides, and the final traces of lime soap can be removed by washing. The crude distillate is very moist, and must be dried by means of an air blast for 8—10 hours. This operation is combined with that of purifying with lime, a 5 per cent. milk of lime being stirred in for three hours, followed by washing after the removal of the sludge; air is then blown in for eight hours, and the oil is dried. The influence of redistillation is to raise the sp. gr. from 0·7819 to 0·7933, reduce the consumption of acid and alkali by one-third (from 0·75 per cent. to 0·5 per cent.), and lower the colour from 1·75 to 1·5°.

Sulphur Content.—Distillates prepared on a large scale contained 0·067—0·0868 per cent. of sulphur. On purification with sulphuric acid, caustic soda and lead oxide, the sulphur content fell to 0·03796 per cent., and to 0·02 per cent. in presence of scrap copper. On this account, the author recommends that copper scraps should be placed in the stills, and that the sieves in the dephlegmators should be constructed of that metal, a change being made every three months.

Utilising the Alkali Sludge.—This may be added to soap, the objectionable smell being eliminated by prolonged treatment with steam. The naphtha acids may be converted into copper salts and used for impregnating railway sleepers. The manganese and lead compounds of the petroleum acids may serve as driers for varnish. Other uses are: conversion into alizarin oil, and for scouring wool, also other technical operations not requiring the use of the more expensive soaps from animal and vegetable fats.

—C. S.

English Patents.

Extracts Soluble in Water contained in Tar ; Process fo Obtaining in one Operation ——. M. C. M. Tixier, Paris Eng. Pat. 8515, April 11, 1902.

See U.S. Pat. 722,336 of 1903; see below.—T. F. B.

Ammoniacal Liquors ; Apparatus for the Distillatio of ——. G. Wilton. Eng. Pat. 24,832, Dec. 5, 1901 VII., page 494.

United States Patent.

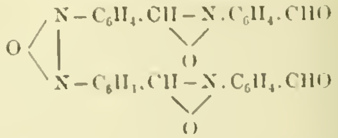
Tar Extract: Process of Obtaining ——. M. C. M Tixier, Paris. U.S. Pat. 722,336, March 10, 1903.

Alkali carbonate is added gradually to tar until a effervescence ceases; the mixture is heated to betwee 60° and 100° C., and allowed to cool. Sufficient water i now added to dissolve out the soluble portion of th mixture, and the extract thus obtained, is decanted an precipitated by an acid, the precipitate obtained bein treated, hot, with further quantities of alkali carbonat until effervescence ceases.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Nitrosobenzaldehyde: Preparation of —— F. J. Alwa Ber., 1903, **36**, [5], 793—794.

When zinc dust is added to an acetic acid solution p-nitrobenzaldehyde, three substances are formed, namel the N-p-formylphenyl ether of p-nitrobenzaldoxime, a insoluble red substance of the formula—



$$O\left\langle\begin{matrix} N-C_6H_4.CH-N.C_6H_4.CHO \\ \quad\quad\quad\quad\diagdown\diagup \\ \quad\quad\quad\quad O \\ N-C_6H_4.CH-N.C_6H_4.CHO \\ \quad\quad\quad\quad\diagdown\diagup \\ \quad\quad\quad\quad O \end{matrix}\right.$$

and a yellow substance, the composition of which has not been determined. These same substances are produced the electrolytic reduction of p-nitrobenzaldehyde in co centrated sulphuric acid. The proportion of the l substance is greatest if the zinc dust be added quick. whilst if it be added slowly in the cold, the first compou is produced in greatest proportion. Using excess of z leads to the production of the greatest quantity of the substance.

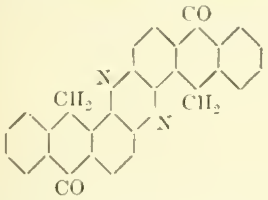
All three substances, on oxidation with chromic ac, yield p-nitrosobenzaldehyde.

m-Nitrobenzaldehyde behaves similarly.—J. McC.

Indanthrene. F. Kaufler. Ber., 1903, **36**, [5], 930—933.

The blue dyestuffs Indanthrene and Indanthrene C have b examined. They are produced from β-amidoanthraquino, and are best purified by dissolving in concentrated sulph c acid: the solution is placed under a cover along with wa, and as the acid becomes dilute, the dyestuff deposit blue needles with a metallic lustre. Analysis shews t Indanthrene ($C_{28}H_{12}O_4N_2$) is the azine derivative of anthraquinone, whilst Idanthrene C is the dibromo deri- tive of Indanthrene.

On reduction of either of these dyestuffs with hydr ic acid at 250°—280° C. for four hours, and purification of e product by sublimation under diminished pressure, n extraction with hot nitrobenzene, red needles are obt ed wi a metallic lustre. Concentrated solutions of this s stance are red, whilst dilute solutions show a yellow-g en fluorescence. It is soluble in concentrated sulphuric a , but insoluble in dilute solutions of acids or of alkalis. T same substance is produced by the reduction of I anthrene C. Analysis shows that it has the composit $C_{28}H_{16}O_2N_2$, and it is deduced that its constitution is r esented by—



he behaviour of Indanthrene indicates that it is the te iketone corresponding with this formula.—J. McC.

Flavaniline ; Formation of ——. C. Goldschmidt. Chem.-Zeit., 1903, **27**, [24], 279.

B heating acetophenone-oxime to 60° C. with an excess of p sphorus pentoxide, flavaniline is formed, and may be s ted by rendering the solution alkaline and extracting w ether. The oxime first undergoes intramolecular n rangement into acetanilide, which the phosphorus p oxide then converts into flavaniline.—T. H. P.

I go ; Synthesis of ——, from Thiocarbanilide. T. Saudeyer. Zeits. f. Farb. Text. Chem., 1903, **2**, [7], 129—7.

T nitroso-compound obtained by the condensation of tr loro-ethylidine-diaminodibenzene with hydroxylamine, d olves in cold concentrated sulphuric acid, and as the ion is warmed, the colour changes and isatin is prod d, as well as α-isatinanilide. A similar result is o ined by dissolving the product of the action of chloral h ate, hydroxylamine hydrochloride, and aniline in s huric acid. According as the sulphuric acid was a ved to act, whether as an accumulative or a dehydrati agent, so the aldoxim group $-CH:NOH$ would either p into the acid amido group $-C:O(NH_2)$ or into the c ide group $-CN$. The cyanide in question must then b entical with that already prepared by Laubenheimer, a

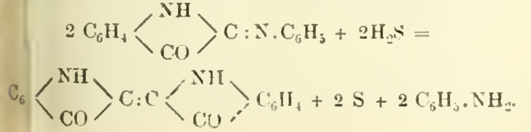
ydrocyanocarbodiphenylimide—

$$C_6H_5.N:C(NH.C_6H_5).C\vdots N,$$

w h is formed by slowly warming a mixture of 70 grms. of p sium cyanide in 200 c.c. of water, 300 grms. of basic le carbonate, 200 grms. of thiocarbanilide, and 500 grms. of irit to 50°—60° C. After some time the mixture is fil ed, and the solid residue, on extraction with ether or al ol, gives long yellowish prismatic crystals. When th substance is treated with yellow ammonium sulphide, cr als of thio-oxamindiphenylamidine—

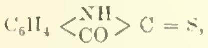
$$C_6H_5.NH.C(.C(NH_2):S):N.C_6H_5,$$

a ormed, which melt at 161°—162° C. This substance, on eatment with warm sulphuric acid, gives α-isatinanilid which separates from benzene or carbon bisulphide in s t crystals, melting at 126° C. ; from alcohol it separates in ange-red plates. The α-isatinanilide is easily soluble in t alcohol, ether, benzene, or carbon bisulphide, or in so ions of acids. On reduction it gives indigo: 400 grms. of 10 per cent. solution of sulphuretted hydrogen contain- ome ammonium sulphide are quickly run into a warm so on of 200 grms. of α-isatinanilide in 600 grms. of sp . Indigo quickly separates from the solution in cr als with a coppery lustre, from which the sulphur de ited at the same time, is extracted with carbon bis hide.



$$2\,C_6H_4\left\langle{NH \atop CO}\right\rangle C:N.C_6H_5 + 2H_2S = C_6\left\langle{NH \atop CO}\right\rangle C:C\left\langle{NH \atop CO}\right\rangle C_6H_4 + 2\,S + 2\,C_6H_5.NH_2.$$

The indigo is practically free from indigo purpurin (Indigo red), and if it be desired to produce an indigo containing indirubin, this is easily attained by adding to the α-isatinanilide some isatin before reduction. The indigo is deposited in crystals, which are not readily reducible. An easily reducible indigo is, however, obtained by the following process. By the action of sulphuretted hydrogen on an acid solution of α-isatinanilide a voluminous, insoluble precipitate of α-thioisatin—



$$C_6H_4\left\langle{NH \atop CO}\right\rangle C = S,$$

is formed, which, in presence of alkalis, decomposes into indigo and sulphur. The process is carried out by saturating 240 grms. of a concentrated solution of sodium hydroxide with sulphuretted hydrogen, then adding 1 litre of water. A solution of α-isatinanilide, obtained from 200 grms. of the thioamidine in 800 grms. of concentrated sulphuric acid, and the solution of sodium hydrogen sulphide are simultaneously poured into 6 litres of ice-water. α-Thioisatin is precipitated ; it is filtered off, then rubbed to a paste with water, and made slightly alkaline with sodium carbonate. The production of the indigo may be accelerated by warming. The indigo is formed as a dark-blue, extremely finely-divided powder, and the sulphur may be extracted from it by means of carbon bisulphide.

Methyl indigo dyestuffs can be produced in a similar manner. The author describes many intermediate products which have been obtained during the synthesis of some of these methylindigos.

o-Dimethylindigo can be easily sulphonated. It dyes wool and cotton a greener shade than indigo. *p*-Dimethylindigo can only be sulphonated by means of fuming sulphuric acid ; the colour it imparts to cotton or wool cannot be distinguished from that imparted by indigo.

—J. McC.

English Patents.

Naphthacene ; Production of Derivatives of ——, and Intermediate Products for use therein. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 9038, April 18, 1902.

See Fr. Pat. 320,327 ; this Journal, 1903, 22.—T. A. L.

Anthraquinone Derivatives [Anthracene Dyestuffs] ; Production of New ——. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 9194, April 21, 1902.

See Fr. Pat. 320,481 ; this Journal, 1903, 23.—T. A. L.

Dyestuffs of the Anthraquinone Series [Anthracene Dyestuffs] ; Production of ——. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 11,403, May 17, 1902.

See suppl. to Fr. Pat. 243,315 ; this Journal, 1903, 209.

—T. A. L.

Colouring Matters [Acridine Dyestuffs] of the Acridine Series ; Impts. relating to ——. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 11,666, May 22, 1902.

See Fr. Pat. 321,272 ; this Journal, 1903, 209.—T. A. L.

Brown Colouring Matters [Sulphide Dyestuffs] containing Sulphur ; Manufacture of ——. G. W. Johnson. From Kalle and Co., Biebrich-on-the-Rhine. Eng. Pat. 10,187, May 2, 1902.

See Fr. Pat. 321,329 ; this Journal, 1903, 209.—T. A. L.

Azo Dyestuffs ; Manufacture of ——. O. Imray. From Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 10,243, May 3, 1902.

See Fr. Pat. 320,879 ; this Journal, 1903, 141.—T. A. L.

Bromo-Indigo-White and Bromo-Indigo [Indigo Dyestuffs] ; Manufacture of ——. O. Imray. From The Farbwerke vorm. Meister, Lucius und Bruning, Hoechst a/Main. Eng. Pat. 10,516, May 7, 1902.

See Fr. Pat. 321,002 ; this Journal, 1903, 141.—T. A. L.

Ortho-Nitrophenyl-β-Lactic Acid Methylketone [Indigo Dyestuffs] or its Homologues; Manufacture of Products soluble in Water from ——. O. Imray. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 11,522, May 20, 1902.

The product obtained by condensing o-nitrobenzaldehyde with acetone in presence of small quantities of dilute alkalis, o-nitrophenyl-β-lactyl methyl ketone, yields indigo on treatment with an excess of alkali. It is, however, only sparingly soluble in water, but the patentees find that, on mixing this substance or one of its homologues with benzylaniline (or toluidine) sodium sulphonate, a product is obtained which is readily soluble in water and fulfils all requirements for dyeing and printing indigo on decomposition with an alkali.—T. A. L.

Acridine Series [Acridine Dyestuffs]; Production of Colouring Matters of the ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 11,711, May 22, 1902.

See Fr. Pat. 321,393; this Journal, 1903, 210.—T. A. L.

Indol [Indigo Dyestuffs] and Derivatives thereof; Manufacture of ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen. Eng. Pat. 14,606, June 30, 1902.

See Fr. Pat. 322,387; this Journal, 1903, 360.—T. A. L.

Blue Sulphur Dyestuff, and Process of Making the Same. I. Levinstein, H. Levinstein, and Levinstein, Ltd., Manchester. Eng. Pat. 12,229, May 29, 1902.

Certain alkyl-leucindophenols, when treated with sulphur and sodium sulphide, yield blue cotton dyestuffs, which, however, are not very fast to light or washing. The patentees find that similar dyestuffs, but superior in fastness to light and washing, are obtained from chlorinated alkyl leucindophenols, formed by oxidising, for example, ethyl-o-toluidine and o-chloro-p-aminophenol (m. pt. 153° C.) in aqueous solution with potassium bichromate in presence of sulphuric acid. The resulting product, after being precipitated with "soda," is filtered off, washed, and reduced in the cold with sodium sulphide. After heating to 70° C. and filtering, sodium bicarbonate precipitates p-ethylamino-m-tolyl-p-hydroxy-m-chlorophenylamine, which, when heated with sulphur and sodium sulphide in aqueous solution at 115° C. for about 24 hours and subsequently oxidised with air, gives a blue dyestuff. The dyestuff is soluble in concentrated sulphuric acid with a blue, and in caustic soda lye with a reddish-violet colour, whilst the solution in sodium sulphide is colourless. It dyes unmordanted cotton bright indigo-blue shades from a bath containing sodium sulphide. Very similar products are obtained by employing o-toluidine, p-xylidine, or methyl- or other alkyl-o-toluidine in place of the ethyl-o-toluidine.—T. A. L.

United States Patents.

Yellow Sulphur Dye, and Process of Making Same. C. Ris and A. Mylius, Assignors to Aniline Color and Extract Works, formerly J. R. Geigy, Basle. U.S. Pat. 722,630, March 10, 1903.

Formyl derivatives of m-tolylenediamine are fused with sulphur and benzidine. The products are light brown powders soluble in hot dilute caustic soda lye or sodium sulphide solution, and dye unmordanted cotton yellow from a bath containing sodium sulphide.—T. A. L.

Wool Dye [Azo Dyestuffs], and Process of Making Same. M. Kahn, Elberfeld, Germany, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 722,715, March 17, 1903.

The diazo compound from o-aminophenol-p-sulphonic acid is combined with 1.5-dihydroxynaphthalene. The product gives violet-red shades on wool from an acid bath, which become deep black on subsequent treatment with chromium compounds. (See Eng. Pat. 18,569 of 1902; this Journal, 1903, 359.)—T. A. L.

Wool Dye [Azo Dyestuffs], and Process of Making Sa M. Kahn, Elberfeld, Germany, Assignor to Farb fabriken of Elberfeld Co., New York. U.S. Pat. 722,7 March 17, 1903.

The diazo compounds from o-aminocresol sulphonic ac are combined with 1.5-dihydroxynaphthalene. (See E Pat. 18,569 of 1902; this Journal, 1903, 359.)—T. A. L

Anthracene Derivatives, and Process of Making Sa M. Kugel, Wiesdorf, Germany, Assignor to Farb fabriken of Elberfeld Co., New York. U.S. Pat. 722,7 March 17, 1903.

A crystalline compound, readily soluble in boili pyridine, is obtained by oxidising with chromic a 1-p-tolylamino-2.4-dihydroxyanthraquinone.—T. A. L.

Blue Polyazo Dye, and Process of Making Same. I. Lev stein and C. Mensching, Assignors to Levinstein, L Manchester. U.S. Pat. 722,860, March 17, 1903.

A diazotised amino-azo compound is combined w benzylnaphthylamine sulphonic acid. (See next abstra —T. A. L

Benzylnaphthylamine - Sulphonic Acid, and Process Making Same. I. Levinstein and C. Mensching, Assign to Levinstein, Ltd., Manchester. U.S. Pat. 722,8 March 17, 1903.

A new benzylnaphthylamine sulphonic acid is obtained heating together 1.8-naphthylamine sulphonic acid w benzyl chloride. The dyestuffs obtained by combin this acid with diazotised amino-azo compounds are m brighter and bluer than those produced from the benzylated acid.—T. A. L.

Reducing Indigo. R. Müller and O. Schwab, Assig to Farbwerke vorm. Meister, Lucius und Brüni Hoechst a/M. U.S. Pat. 723,007, March 17, 1903.

Indigo in presence of a warm (60°—100° C.) sulph solution is reduced without a diaphragm by the action of electric current. (See Eng. Pat. 5277 of 1902; Journal, 1903, 293.)—T. A. L.

Green Anthracene Dye, and Process of Making Sa O. Bally, Assignor to Badische Anilin und Soda Fab Ludwigshafen, Germany. U.S. Pat. 723,125, March 1903.

Paratoluidine is condensed with a halogenised sul-anilino-anthraquinone. The product can be further phonated, and the resulting compound in either case c chrome-mordanted wool green. (See Eng. Pat. 10,8 of 1901; this Journal, 1902, 608.)—T. A. L.

Blue Sulphur Dye, and Process of Making S R. Herz, Assignor to L. Cassella and Co., Frank a/M. U.S. Pat. 723,154, March 17, 1903.

Phenylaminohydroxydiphenylamine is heated with p sulphides. The products dye cotton indigo-blue sh fast to washing, acids, and light.—T. A. L.

Brown Sulphur Dye [Sulphide Dyestuffs], and Process Making Same. H. Ebeling, Assignor to Kalle and Biebrich. U.S. Pat. 723,448, March 24, 1903.

Amino derivatives of m-tolylene-diamine are fused sulphur and sodium sulphide at 200°—220° C. until melt has become dry. The product dyes cotton redd brown, fast to soap and light, and can be diazotised on fibre. (See Eng. Pat. 22,222 of 1901; this Journal, 1 1327.)—T. A. L.

French Patents.

Dyestuffs [Sulphide Dyestuffs] containing Sulphur der from m-Tolylene Diamine; Manufacture of ——. J. R. Geigy and Co. Second Supplement, dated July 7, 1902, to Fr. Pat. 306,655, Dec. 27, 1900.

Yellow, orange, and brownish - yellow dyestuffs obtained by fusing mono- and diformyl-m-tolylene-diam formyl-o-nitro-p-toluidine, and formyl-p-nitro-o-toluid with sulphur and alkali sulphides or with polysulph

e products, which dye unmordanted cotton, are very fast washing, and become faster to light by a subsequent atment with potassium bichromate or copper sulphate.
—T. A. L.

phylamino-hydroxydialphylamines, and [Sulphide] Dyetuffs therefrom; Manufacture of ——. Manuf. Lyon. le Mat. Col. Fr. Pat. 323,202, July 23, 1902.

PHYL derivatives of *p*-amino-*p*-hydroxydiphenylamine and homologues are obtained by reducing the oxidation ducts of *p*-aminodiphenylamine with phenols, or of minophenols with diphenylamine. The following are of portance :—Phenylaminohydroxydiphenylamine melting 150° C., phenylaminophenylhydroxytolylamine melting at C., and phenylaminophenylhydroxyxylylamine melting 172° C. All these products, on heating with sulphur and ium sulphide, give blue dyestuffs, which are distinguished m those derived from alkylated amidohydroxydialphylines (Immedial Pure Blue) by their fastness to light.
—T. A. L.

azo Solutions [Azo Dyestuffs]; Manufacture of Stable ——. Manuf. Lyon. de Mat. Col. Fr. Pat. 323,981, Aug. 25, 1902.

E stability of certain diazo solutions, *e.g.*, nitrodiazoizene and α-diazonaphthalene is much increased by the lition of certain salts in the solid state, such as sodium phate, magnesium sulphate, potassium or ammonium oride, or saltpetre. The consequent lowering in temature also helps to retard decomposition. The most antageous salt on account of price is sodium sulphate, lst potassium chloride gives the most stable solution.
—T. A. L.

Green Sulphide Dyestuffs for Cotton. Kalle and Co. Fr. Pat. 323,489, Aug. 4, 1902.

fusing *p*-hydroxyphenylthiourea or *p*-hydroxythiocarblide with sulphur and sodium sulphide, bluish-green stuffs for cotton are obtained which are very fast to hing, soaping, and light. An after-treatment with omium salts increases the blueness of the shade.
—T. A. L.

lphide Dyestuffs; Direct Cotton ——. Kalle and Co. Fr. Pat. 323,490, Aug. 4, 1902.

E dithioureas of certain aromatic diamines, when heated h sulphur and sodium sulphide to temperatures ranging n 190°—280 C., yield substantive sulphide dyestuffs. example, *m*-phenylene diamine dithiourea gives at ° C. a greenish-olive; *m*-tolylene diamine dithiourea gives 00 —300° C. a reddish-brown, whilst at 250°—270 C. shade obtained is yellowish-brown.—T. A. L.

nazo Dyestuffs; Manufacture of New ——. Soc. Anon. des Prod. F. Bayer and Co. Fr. Pat. 323,808, ug. 18, 1902.

: Eng. Pat. 18,569; this Journal, 1903, 359.—T. A. L.

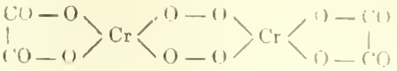
igo; Manufacture of Halogen Derivatives of ——. adische Anilin und Soda Fabrik. Fr. Pat. 323,977, ug. 25, 1902.

IGO, its homologues or analogues, can be converted into ono- or dibromo derivative by reacting with bromine on go in presence of hydrochloric, hydrobromic, sulphuric, hosphoric acid. Chlorine derivatives can be obtained similar manner.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, RINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

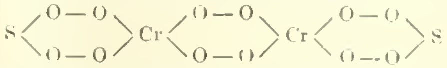
igo; Oxidation of ——, by Chromic Acid in Presence f other Acids. M. Prud'homme. Rev. gen. mat. col., 903, 7, [76], 98—100.

e author has proved that during the oxidation of oxalic l by chromic acid, ozone is formed. The chromic acid combines with the oxalic acid to form an unstable compound—



which then acts with more oxalic acid according to the equation $Cr_2C_4O_{12} + H_2C_2O_4 = O_3 + Cr_2(C_2O_4)_3 + H_2O$.

Chromic acid also combines with sulphuric acid to form—



which is much more stable than the corresponding oxalic acid compound. With excess of sulphuric acid it does not give ozone; but if indigo be added, partial oxidation takes place, and at the same time ozone is formed. The compound can also be decomposed by alkali according to the equation—

$$2Cr_2S_2O_{12} + 12NaOH =$$
$$O_3 + 2Cr(OH)_3 + 2Na_2CrO_4 + 4Na_2SO_4 + 3H_2O.$$

The author has also studied the rate of reduction of chromic acid by an excess of oxalic acid, and the results show that (1) the rate of reduction is proportional to the concentration, (2) the rate of reduction of variable quantities of chromic acid by a constant quantity of oxalic acid at constant volume is proportional to the weight of oxalic acid in excess of the 3 mols. required for the reduction, and (3) the same as (2) when a constant quantity of chromic acid is reduced by variable quantities of oxalic acid.—J. McC.

Chromic Acid; Oxidising Properties of Mixtures of ——, with various Acids. G. Rossel. Rev. gen. mat. col., 1903, 7, [76], 100—101.

THE author has studied the oxidising power of various solutions of chromic acid and sulphuric or oxalic acid on cellulose and on indanthrene. The extent of oxidation of the cellulose was determined by the action of Methylene Blue, which dyes oxycellulose but not cellulose. The extent of oxidation of the indanthrene was gauged by the depth of the green colour produced. The results show that oxalic acid greatly increases the oxidising power of chromic acid, whilst to increase the oxidising power by means of sulphuric acid, a very large excess of sulphuric acid is required. Hydroferrocyanic acid and hydroferricyanic acid only very slightly accelerate the oxidation. In the oxidation of indigo a better white is obtained by using only oxalic acid than by using a mixture of oxalic and sulphuric acids.

The results are in agreement with Prud'homme's view that oxalic and sulphuric acids combine with chromic acid to produce compounds which give up oxygen more readily than does chromic acid itself.—J. McC.

Silks; Spontaneous Stains which form on ——, and cause Corrosion. C. Marnas. Rev. gen. mat. col., 1903, 7, [76], 97—98.

SISLEY has shown that the red stains which form on silks are due to sodium chloride. Having incidentally noticed these stains in a pattern-book where the silk had been in contact with ink, the author was led to examine the action of ink on silk. Seven inks of different origin were examined, and it was found that only one, which was entirely free from chlorides, did not give rise to a red stain. The rate of development of the stain was entirely dependent on the quantity of chloride present, and thus Sisley's view is confirmed.—J. McC.

ENGLISH PATENT.

Fulling, Dyeing, and Scouring of Woollen Fabrics. H. J. Haddan, London. From A. Elosegai, Tolosa, Spain. Eng. Pat. 369, Jan. 6, 1903.

THE pure or mixed woollen fabric is fulled in a fulling trough, which is also adapted to contain the dye-liquor.

The fabric is now scoured if necessary, and then dyed in the same trough.

This process has the advantage that the movements of the fabric, given by the falling trough, render the penetration of the dye into the fibre more complete. (Compare Eng. Pat. 371 of 1903; this Journal, 1903, 416.) —T. F. B.

UNITED STATES PATENTS.

Textile Material Non-inflammable; Process of Rendering ——. W. Warr, Staleybridge. U.S. Pat. 723,088, March 17, 1903.

TEXTILE material is rendered non-inflammable by impregnating it with a solution of stannate of soda, drying, impregnating with a solution of a titanium salt, drying, fixing the titanium by means of an alkali bath or sodium silicate, washing, and drying.—T. F. B.

FRENCH PATENT.

Mordanting Wool; Quick Process of ——. E. Tong. Fr. Pat. 323,316, July 30, 1902.

THE ordinary mordanting agents for wool, bichromate of potash or chromic acid, can advantageously be substituted by sulphocyanide (thiocyanate) of chromium (normal or slightly basic), or a double compound of it, such as ammonium chromi-sulphocyanide. In order to precipitate some chromium chromate on the fibre, a soluble chromate is added to the bath and also a small quantity of nitrite, a soluble copper salt, and free acid. The presence of these substances is stated to facilitate the fixation of the dyestuff, especially in dyeing with logwood.

This new mordanting process is carried out at a temperature not exceeding 65° C.—E. N.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

UNITED STATES PATENT.

Cane; Process of Bleaching ——. H. C. Meyer and E. Besenbruch, Harburg-on-the-Elbe, Assignors to H. C. Meyer, jun., Harburg. U.S. Pat. 722,869, March 17, 1903.

CANE is prepared for bleaching by immersing it in a dilute alkali bath (using potassium hydrate, the strength is from 6—10 per cent.) at normal or moderate temperatures, under varying pressures.

This treatment does not remove the layer of silica from the cane, but opens the pores so as to permit the thorough penetration of the bleaching solution.

The material is then subjected to the action of a bleaching solution in the usual manner.—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Hydrosulphurous Acid. J. Meyer. Zeits. anorg. Chem., **34**, 43—61. Chem. Centr., 1903, 1, [12], 686—688.

FOR the experiments a pure solution of sodium hydrosulphite was prepared from a specimen of commercial sodium hydrosulphite containing about 55 per cent. of the anhydrous salt.

Composition of the Hydrosulphites.—From the results of analyses of the solid sodium salt, $Na_2S_2O_4.2H_2O$; determinations of the amount of oxygen required (1) for the oxidation of the hydrosulphite to sulphite (or thiosulphate); (2) the further oxidation to sulphate; and determinations of the molecular weight by the freezing-point method, the author confirms Bernthsen's formula of $H_2S_2O_4$ for hydrosulphurous acid.

Reducing Actions of Sodium Hydrosulphite.—By the interaction of sodium hydrosulphite and potassium nitrite in alkaline solution in presence of air, potassium amino-sulphonate is formed and crystallises out. Sodium bisulphite is first formed by the action of atmospheric oxygen, and this reacts with the potassium nitrite accordin to the equation—

$$KNO_2 + 3NaHSO_3 + H_2O = $$
$$NH_2.SO_3K + NaOH + 2NaHSO_4.$$

By the action of sodium hydrosulphite on potassiu nitrite in acid solution, a vigorous evolution of nitrou oxide is produced. Ammoniacal copper sulphate solutio is decolorised by sodium hydrosulphite. With a smal excess of the reducing agent, an intense yellow t orange coloration is produced, due to the separatio of metallic copper. Free hydrosulphurous acid in dilut solution is not altered for some time by cuprous salt In concentrated solution, the cuprous salt is rapidl reduced, with separation of copper, whilst with very dilut copper sulphate solution on gently warming, a red solutio of colloidal copper is produced. The copper hydros prepared in this manner is free from other colloid (see Lottermoser, this Journal, 1899, 703). Solution of other colloidal metals — silver, mercury, bismuth selenium—can be prepared in a similar manner.

Behaviour of Hydrosulphites on Oxidation.—Th reducing action of hydrosulphites depends on the fact th they are first oxidised to sulphites; under certain conditio other reaction products, such as sulphuric acid, dithioni acid, and thiosulphuric acid are formed. Oxidation b ammoniacal copper sulphate solution proceeds accordin to the equation—

$$Na_2S_2O_4 + 2CuSO_4 + 2H_2O = $$
$$2NaHSO_3 + Cu_2SO_4 + H_2SO_4.$$

By oxidation with hydrogen peroxide both in alkaline an acid solution, nearly the whole of the sulphur is obtaine as sulphuric acid, a small portion being converted fir into sulphite and then into dithionic acid. The author unable to confirm Schützenberger's statement (Ber., **6**, 67 that on shaking a hydrosulphite solution with air, exactl twice as much oxygen is taken up as is required for t formation of bisulphite. He found that the quantity oxygen absorbed is always greater than the theoreti amount, but remains more or less below double th quantity. The excess of oxygen is used in the productio of a certain proportion of sulphate. On shaking sodiu hydrosulphite with aerated water, the oxidation procee chiefly according to the equation—

$$H_2S_2O_4 + O_2 + H_2O = H_2SO_4 + H_2SO_3,$$

and to a lesser degree according to the equation—

$$2H_2S_2O_4 + O_2 + 2H_2O = 4H_2SO_3.$$

Decomposition of Hydrosulphurous Acid.—The reduci power of a hydrosulphite solution is diminished warming. At 45° C. the decomposition of the hydrosulphi is slow, at 60° C. and 80° C. it begins slowly, th rapidly increases, and finally, towards the end, aga becomes slower. The decomposition of sodium hyd sulphite by warming probably proceeds according to t equation $2Na_2S_2O_4 + H_2O = Na_2S_2O_3 + 2NaHSO_3$.

If hydrosulphurous acid be set free from its salts acids, it decomposes with copious separation of sulph Since in the decomposition no sulphuric acid and co sequently no polythionic acids (Bernthsen, Annal **208**, 148) are formed, the separation of sulphur must caused by the formation of either thiosulphuric acid of sulphur dioxide and hydrogen sulphide. (See also th Journal 1898, 1109; 1899, 451.)—A. S.

Pyrophosphorous Acid. V. Auger. Comptes rend., **136**, [13], 814—815.

WATER is allowed to act on an excess of phosphor trichloride, and the vapour of the trichloride, volatilised a stream of carbon dioxide, is passed through the resulti liquid for 20 hours; the thick, clear liquid obtained, in a desiccator over fused potash and phosphorus pentox gives a mass of crystals having the composition H_4P_2 The same substance is obtained by agitating continuou for five hours at 30°—40° C. a mixture of phosphor acid with excess of phosphorus trichloride. The py phosphorous acid so obtained melts at 38° C., is extrem iquescent, and is at once converted by water into osphorous acid. Probably this character explains Amat's lure to obtain it in the wet way. At 130° C. it gives phosphine, and at 45° C. in presence of phosphorus hloride it yields phosphorus and phosphoric or pyro- sphoric acid—the result obtained by Gautier on reacting h phosphorus trichloride on phosphorous acid. The ction between these two substances only begins when phosphorous acid is slightly moist, or when the iperature is raised.—J. T. D.

yanide of Potassium ; Commercial ——. A. Whitby.
Eng. and Mining J., 1903, **75,** [9], 333.

E author gives the results of the examination of five aples of commercial cyanide from four distinct sources, h the object of showing how widely the composition of aples may differ, whilst they still show, by the usual hod, the advertised percentage, say, of 98 per cent. erminations were made of the potassium, sodium, nogen, and carbonates, the following figures being ained :—

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
ssium	6·5	30·5	30·8	45·6	..
um	41·0	23·9	22·1	11·4	47·5
nogen.........	39·4	38·8	37·6	40·4	51·2
oonates (CO_3) .	7·5	3·0	4·7	0·3	Trace
letermined....	5·6	3·8	4·8	2·3	1·3
N + NaCN	78·0	85·6	83·5	94·8	98·7

o. 1 was in small rounded lumps and powder, very y-looking, and entirely different in appearance, from of the others. The figures show that there is more sufficient sodium to combine with all the cyanogen ent, whilst even by uniting the bases in the most favour- manner, the maximum amount of active cyanide is only per cent. No. 2 was in the usual irregular masses, white, with a slight greenish-blue tint. No. 3 was similar in earance to No. 2, but of a pure white colour. This ple, which had, however, been exposed, was guaranteed per cent. It was heavily charged with sulphides, and author mentions it as a typical example of how adul- ted samples are adjusted to comply with ordinary uirements. No. 4 was in coarse powder, pure white in ur. This is a sample of so-called chemically pure ssium cyanide, but, although bought at a very high e, contains 11 per cent. of sodium, and the impurities mon to commercial cyanide. No. 5 is a sample of mercial cyanide of sodium. It was in pure white talline masses, guaranteed 125 per cent. of potassium ide. With regard to the importance of the impurities, li carbonates tend to increase the alkalinity of the tions, and cyanates are eventually converted into car- ites. According to the author, sulphides are of least ortance; for example, No. 3, which is so heavily charged sulphides as to give a considerable precipitate with line lead tartrate solution, has been extensively used out complaint as to its effectiveness. In practice, the king solutions contain zinc, which precipitates the hides as zinc sulphide.

e author considers that, the effectiveness of mixed im and potassium cyanides being accepted, it would be r to adopt the use of sodium cyanide under its proper e, an efficiency of at least 50 per cent. of cyanogen g demanded; or if potassium cyanide be used, the int of sodium cyanide allowed to be present should be ed, merely to control the quantity of inactive bodies.
—A. S.

ide ; Impurities in Commercial ——. G. Doveton.
Eng. and Mining J., 1903, **75,** [13], 473.

author criticises Whitby's statement (see preceding act) with regard to the influence of alkali sulphides in ide. A sample of cyanide containing a considerable tity of soluble sulphides, yet in which the cyanogen ent was high (96—98 per cent. as potassium cyanide), freshly dissolved gave a solution of low extractive r, and in order to bring it up to a normal efficiency, the sulphides had to be completely removed. The working solutions to be re-standardised contained more than sufficient potassium zincate to precipitate the sulphides, but the precipitate of zinc sulphide was found to be as injurious as the soluble sulphides. Precipitation with lead salt was attended with the same result. To obtain the best results, it was found advisable to dissolve half a ton of the cyanide in sump solution in a small vat, with the addition of some slaked lime and the requisite amount of lead solution, and then, when the strong cyanide solution was required for re-standardising the mill solutions, to draw it off through a filter, in order to completely remove the precipitated sulphides.—A. S.

Persulphates ; Contribution to the Study of ——.
N. Tarugi. Gaz. chim. ital., **32,** [2], 383—392. Chem. Centr. 1903, **1,** [11], 616.

Quantitative Determination of Persulphates.—The methods of Leblanc and Eckardt (this Journal, 1899, 299), Grützner (this Journal, 1900, 276), and Mondolfo—titration of the iodine set free by persulphates—are stated to be unreliable. The author uses an acidimetric method based on the fact that solutions of persulphates, when heated, decompose according to the equation—

$$M_2S_2O_8 + H_2O = M_2SO_4 + H_2SO_4 + O.$$

A weighed quantity of the persulphate is dissolved in a definite volume of cold water, and the acidity or alkalinity of the solution determined. The solution is then boiled for 20 minutes, cooled, phenolphthalein added, and the acidity determined. In the case of ammonium persulphate, the solution is first made neutral and then a known excess of caustic soda added.

Action of Persulphates on Potassium Cyanide.—The action of persulphates is similar to that of potassium permanganate on potassium cyanide. If a mixture of monomolecular quantities of potassium persulphate and potassium cyanide and excess of ammonia be allowed to stand for one day in the cold and heated for ½ hour on the water-bath, potassium cyanate is formed, and is converted by the action of the ammonium salt into urea. The latter change only proceeds to the extent of 75 per cent. of the potassium cyanide present, and this proportion remains constant, independently of the amount taken. The end of the reaction can be recognised by the addition of a copper salt, and the reaction may be applied to the determination of potassium cyanide.

Action of Persulphates on Silver Nitrate.—If solutions of silver nitrate and potassium persulphate be mixed, a black insoluble compound is formed and nitrous acid is evolved. The same compound is produced if ammonia be added to the solutions, or if solutions of silver nitrate and ammonium persulphate be mixed, but in these cases nitrogen and not nitrous acid is evolved. The black compound is the unstable silver salt of Caro's acid, $SO_2.OAg.O.OAg$, and the reaction probably proceeds according to the equation—

$$2AgNO_3 + K_2S_2O_8 + H_2O =$$
$$Ag_2SO_5 + K_2SO_5 + HNO_2 + HNO_3.$$

—A. S.

Barium Sub-Salts. Guntz. Comptes rend., 1903,
136, [12], 749—751.

When calcium chloride is heated with excess of sodium, it is reduced to metallic calcium, but with barium haloids no such reduction takes place. The author finds that this is due to the formation of double salts of the type BaX, NaX, where X represents a halogen. All these salts decompose water readily, except the fluoride, with which the action is but slow. When heated in a vacuum at about 700° C. they split up into the barium haloid salt and sodium, which latter volatilises. When heated with mercury they yield barium amalgam, and with zinc and tin the corresponding alloys are obtained; if heated to redness in hydrogen or nitrogen, these double salts give barium hydride or nitride. The formation of such compounds explains why barium cannot be obtained by the electrolysis of the double chloride of barium and sodium.—T. H. P.

Silver Chloride; Solubility of ——, in presence of Mercury Salts. B. Finzi. Gaz. chim. ital., **32**, [2], 324—328. Chem. Centr., 1903, **1**, [11], 619.

In experiments with equivalent amounts of mercuric chloride and silver nitrate ($HgCl_2 : 2AgNO_3$), it was found, assuming the reaction to be complete, that the amount of silver chloride remaining dissolved, increases with the volume of the solvent, the quantity being about 0·05 grm. per 100 c.c. of liquid. The liquid separated from the silver chloride gives a precipitate with hydrochloric acid and chlorides, with silver nitrate, and with ammonium nitrate, sulphate, acetate, and citrate; this points to the fact that the silver chloride exists in the solution in a state of dissociation. In the reaction between silver sulphate and mercuric chloride (1 : 1), the amount of silver chloride which remains dissolved appears to be smaller. Alkali acetates do not further the precipitation of the silver chloride. The amount of silver chloride precipitated, is increased by adding an excess of either silver nitrate or mercuric chloride.—A. S.

Lead Tetrachloride; Ammoniacal ——. Seyewetz and Trawitz. Bull. Soc. Chim., **29**, [7], 261.

Peroxide of lead is first prepared by reacting with ammonium persulphate on lead nitrate, chloride, or sulphate in presence of potash or soda. This peroxide dissolves readily, without evolving chlorine, in hydrochloric acid cooled by a freezing mixture of ice and salt. To this solution is added the calculated quantity of ammonium chloride dissolved in 10 times its weight of water. The yield is 70 per cent. of the theoretical, against 63 per cent. by Friedrich's method. (See this Journal, 1903, 420)
—J. T. D.

Arsenic Sulphides; Action of Hydrogen on ——, in presence of Antimony, and on Antimony Sulphide in presence of Arsenic. H. Pélabon. Comptes rend., **136**, [13], 812—813.

Hydrogen was heated in sealed tubes with mixtures of arsenic sulphides and varying proportions of antimony, and with mixtures of antimony sulphide and varying proportions of arsenic, and the partial pressure of the hydrogen sulphide produced was measured (compare this Journal, 1903, 383). The results show that (1) Antimony displaces arsenic completely from its sulphides when they are melted together; (2) hydrogen, heated with a mixture of arsenic, antimony, and antimony sulphide forms hydrogen sulphide in proportions which increase with the proportion of arsenic in the mixture.—J. T. D.

Potassium Hydride and Carbon Dioxide; Combination between ——. H. Moissan. Comptes rend., 1903, **136**, [12], 723—727.

At temperatures lying between the limits −85 and +54° C. absolutely dry potassium hydride and carbon dioxide do not react with one another, but in the presence of the trace of water vapour given off by ice at −85°, combination begins and is rapidly brought to completion by the heat evolved. At a temperature equal to, or higher than 54° C., the perfectly dry substances are capable of reacting. Traces of hydrogen chloride or ammonia are not able to bring about the combination in the same way as small quantities of water vapour. Similar results are obtained with the hydrides of sodium, rubidium, and cæsium.—T. H. P.

Phosphorus; Investigations on ——. R. Schenck. Ber., **36**, [5], 979.

By boiling a solution of ordinary phosphorus (100 grms.) in phosphorus tribromide (1,000 grms.) under a reflux condenser for 10 hours, the author obtained a light red modification of phosphorus, containing, even after washing with carbon bisulphide, a large amount of phosphorus tribromide, from the greater part of which it may be freed by boiling with water. The last traces of phosphorus tribromide are obstinately retained, or are converted into oxy-acids of phosphorus. This red phosphorus is non poisonous, but chemically very active, reducing coppe salts, indigo, &c. energetically. The colour is darkene on heating. Alkalis rapidly dissolve it, with formation o phosphine and hypophosphites, the substance turning blac during the reaction. Organic bases also convert it into black or dark red substance, which on exposure to ai slowly changes back to the red modification, with evolutio of phosphine. When ground up with a 50 per cen solution of piperidine in water, a deep red solution and black residue are produced. From the solution acids prec pitate a dark grey body gradually turning yellow, whic after being freed from water by boiling with alcohol an subsequently drying over phosphorus pentoxide at 100 C gave the composition: P, 92·32 per cent.; H, 0·59 pe cent., corresponding with the atomic ratio $P_5 : H$. Poly meric phosphorus hydrides, one soluble and the othe insoluble in piperidine, are described.

The author also measured the potential difference betwee a piece of platinum foil immersed in an emulsion of the re phosphorus and another piece of platinum, the upper ha of which was placed in an atmosphere of hydrogen whi the lower half dipped into a mixture of 1 vol. of N/10 nitr acid and 2 vols. of piperidine, communication between th two electrolytes being established by a siphon tube fille with nitro-gelatin. The potential difference was found t be 0·168 V, the phosphorus being electro-negative towar the hydrogen.—A. G. L.

English Patents.

Natural Soda; Treatment of ——, for Rendering Possib the Production of Sodium Carbonate from the sam entirely free from the Discolouring Substances contain in the Raw Material. E. Naumann, Cologne, Prussi Eng. Pat. 6145, March 12, 1902.

Trona, or similar naturally occurring soda, containi sodium carbonate, chloride, and sulphate, is treated wi sufficient water to dissolve the sodium chloride, and "suitable soda solution," varying in composition accor ing to defined circumstances, is used to act upon t solid residue, to extract the remaining sodium sulpha Adherent liquor is displaced by water or by a solution soda. When the solid residue is liable to long exposu it is treated with a small proportion of a solution of sodiu chloride. Otherwise, it is formed into blocks and burnt i kiln to destroy organic matter.—E. S.

Ammoniacal Liquors; Apparatus for the Distillation ——. G. Wilton, London. Eng. Pat. 24,832, Dec. 1901.

The trays or chambers forming the tower are provided w narrow elongated steam openings, which extend nearly t width of the tray. These openings are provided w baffles or hoods which dip into the liquid, and mud ho are provided in the walls of the chambers opposite the e of these openings. Two or three of such openings may used in each tray. The inlet and outlet pipes for c veying the liquor between the trays, are of semicircular other convenient form, and are placed on opposite side the baffle against the sides of the trays, so that the liqu in passing through the tray, comes intimately into cont with the steam which passes through the baffle. Th pipes may also have mud holes provided in the walls of chambers to facilitate cleaning.—T. F. B.

United States Patents.

Sulphuric Acid; Process of Making ——. J. B. Herreshoff, New York, Assignor to General Chem Co., New York. U.S. Pat. 722,981, March 17, 1903.

Sulphuric acid of the strength which it is desired obtain, is subjected, in a vessel provided with a cool jacket, to a current, led to near the bottom, of sulphu anhydride, simultaneously with the introduction of a dilut agent in such proportion as to maintain the acid o constant strength. (Compare U.S. Pats. 719,332—3 Jan. 27, 1903; this Journal, 1903, 212.)—E. S.

ulphuric Anhydride; Apparatus for Making ——. W. C. Ferguson, Flushing, N.Y., Assignor to General Chemical Co., New York. U.S. Pat. 723,595, March 24, 1903.

HE apparatus comprises a number of contact chambers, a onnection pipe leading from the outlet of one chamber to e inlet of the next, and an air-supply device leading to e connection pipe, in order to mix air with the partially onverted gases while these are away from the contact aterial.—E. S.

ulphuric Anhydride; Process of Making ——. W. C. Ferguson, Flushing, N.Y., Assignor to General Chemical Co., New York. U.S. Pat. 723,596, March 24, 1903.

ULPHUROUS acid gas and air, or oxygen, are brought into ontact with catalytic substances in such proportion as to low of only a partial conversion into sulphuric anhydride. he partially converted gases are then mixed with cool air, with "a gaseous medium containing a larger proportion free oxygen than the original mixture," and are brought to renewed contact with the catalytic material.—E. S.

ickel Ores, &c.; Process of Treating ——. T. Jenkins. Webster, N.C., Assignor to W. S. Adams, Waynesville, N.C. U.S. Pat. 723,158, March 17, 1903.

ores containing nickel and iron, the iron is oxidised, and e material is subjected to the action of a concentrated acid "suitable solvent." The mass is washed with hot water, d calcium carbonate is added, and afterwards ammonia to ecipitate the iron as ferric hydrate. From the cleared lution, nickel is precipitated as sulphide, which is conrted into the oxide, and that, in some cases, into nickel lphate.—E. S.

ickel Ores, &c.; Process of Treating ——. T. Jenkins, Webster, N.C., Assignor to W. S. Adams, Waynesville, N.C. U.S. Pat. 723,159, March 17, 1903.

continuously obtain nickel oxalate from nickeliferous aterial, such material is acted upon by a concentrated id, and from the solution obtained by lixiviating the mass th hot water, nickel oxalate is precipitated by oxalic acid an oxalate, and is converted into oxide. Oxalic acid is covered from the filtrate, and returned to the original id solution. (Compare preceding abstract.)—E. S.

itanous Chloride; Manufacture of ——. H. Spence, Manchester. U.S. Pat. 723,217, March 17, 1903.

TANOUS chloride is prepared by electrolytically treating solution of titanic chloride in a cell, in which the anode d cathode are separated by a porous division, the titanic loride solution occupying the cathode portion, whilst the ode compartment contains a dilute acid solution.

The titanous chloride thus obtained is a powerful reducg agent; it is lilac in colour, and easily soluble in water. —T. F. B.

French Patents.

lphuric Acid; Manufacture of ——, *by the Lead Chamber Process.* A. L. Stinville. Fr. Pat. 323,252, July 11, 1902.

IE receptacles for the acid in the chambers have a small tlet into a tank containing a cooling worm, from which k the acid, somewhat diluted by admission of water from tap placed above, is pumped into an inclined trough ching to the opposite side of the chamber, and there livering the acid so as to establish a flow. Vanes are anged within the chambers to secure up and down culation of the gases.—E. S.

nitrating Apparatus [*Sulphuric Acid*]. R. Evers. Fr. Pat. 323,397, Aug. 1, 1902.

E apparatus for the separation of sulphuric and nitric ds from the mixed acids, consists essentially of a itrating tower connected to a condensing tower by series of long vertical pipes, leading from the top of former tower to the bottom of the latter. Both vers are divided into a series of chambers, filled with ups of tubes, ovoid in cross-section, of which the lower ends open in opposite directions. The spaces between the chambers are supplied with mixing apparatus, each consisting of a conical double tube furnished with lateral projections so inclined as to cause the cone to revolve on its axis from the impulse of the gases, such centrifugal movements being aided by the flow outwards of liquid condensed in a turbine-like horizontal tube at the base of the cone. Means for introducing heated vapours or gases into the denitrating tower are provided, and the sulphuric acid thus separated flows into a concentrating vessel, from which the steam liberated returns to the tower.—E. S.

Sulphuric Anhydride: Contact Apparatus for the Manufacture of ——. Société Verein Chemischer Fabriken in Mannheim. Fr. Pat. 323,491, Aug. 4, 1902.

The contact material is platinum network, layers of which are arranged, within removable iron frames, in superposed compartments, each group or pair of frames being capable of withdrawal, without stoppage of the process, through a lateral closed casing. Reference is made to Eng. Pat. 24,748, Dec. 12, 1899; this Journal, 1900, 1014.—E. S.

Nitric Acid; Process for the Manufacture of —— [*from Air*]. H. Pauling. Fr. Pat. 323,760, Aug. 12, 1902.

To a chamber of refractory material, serving as a furnace in which a series of arc lights with carbon poles are placed, atmospheric air is admitted, and after it has attained a high temperature (above that at which nitric oxide can be formed or can exist), steam and fresh air are passed in, or these may be replaced by hydrogen or a gas containing hydrogen, in which case the explosions produced, assist in raising the temperature. A system of heat-regenerating compartments, separated by a massive block into opposite ranges, is so constructed that the gases alternately enter and have exit through the opposite apertures. The process may be supplemented by sparking the air.—E. S.

Carbonic Acid; Manufacture of ——, *by means of Absorption* [*from Gases of Combustion*]. G. A. Schütz. Fr. Pat. 323,554, Aug. 7, 1902.

Gases of combustion are drawn to the bottom of a tower filled with coke or the like, on to which an alkaline lye is showered. The lye, having absorbed the carbon dioxide, is pumped into a boiler, in which it is heated under pressure; the carbon dioxide set free, with steam, is used to actuate a motor, and is then passed into a cooling vessel, in which the steam condenses, whilst the escaping carbon dioxide is received in a gasometer. The water of condensation is returned to the boiler. All working parts of the apparatus are lubricated by the lye instead of with oil.—E. S.

Ammonia; Apparatus for Absorbing ——. Osenbrück. Fr. Pat. 323,161, July 19, 1902.

See Eng. Pat. 15,667, July 14, 1902; this Journal, 1902, 1224.—E. S.

Limekilns, especially for Sugar-Works. P. Mortgat. Fr. Pat. 323,650, Aug. 11, 1902.

A vaporising chamber is arranged in the upper part of the kiln, in which the limestone can be slowly freed from water. Vertical and zigzag gas conduits are arranged in the upper part of the wall of the kiln, and receive the gases resulting from the calcining process, and convey these to a gas channel arranged in the upper part of the mouth of the kiln; these gas conduits serve to heat the kiln-wall, and through it the materials to be calcined, and also to remove the water contained in the materials. The water vapour is allowed to escape through orifices, which can be regulated or not. The grate is composed of bars of square cross-section, mounted on chairs bolted to cross-bars. Mounted in this way the grate bars can be rotated, and a regular discharge of calcined material thus obtained.—W. C. H.

Sodium Oxide; Production of ——. Soc. Badische Anilin und Soda Fabrik. Fr. Pat. 323,793, Aug. 16, 1902.

On heating sodium nitrate, or sodium nitrite, with sodium, the oxide Na_2O is produced, with liberation of nitrogen.

In practice, to 250 parts of sodium, heated in an iron crucible to 250°—300° C., 150 parts of sodium nitrate (or 220 parts of the nitrite) are added by small portions with stirring, access of air being avoided as far as possible. If the reaction is not complete, the covered crucible is heated to the point of fusion of its contents. (See also Fr. Pat. 321,416, May 26, 1902; this Journal, 1903, 212.)—E. S.

Calcining and Sulphating: Mechanism for ——. Société Verein Chemischer Fabriken in Mannheim. Fr. Pat. 323,492, Aug. 4, 1902.

The hearth or muffle of the calcining and sulphating furnace is entirely of cast-iron, firmly supported upon a cast-iron piece, resting on an iron framework, through the hollow axis of which the stirring apparatus is actuated, that apparatus also being independent of support from the brickwork, which serves only to direct the flames and concentrate the heat upon the muffle.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Electrical Manufacture of ——. Electrotekn. Tidsskr. Christiania, 1902, **15**, 177.

An electrical method of manufacture has been based on the capacity of glass to conduct electricity when in the molten state. A certain quantity of material is fused in any convenient manner, and an alternating current, either single-phase or polyphase, is made to traverse the molten mass. The process then becomes continuous, fresh material being added to the molten mass, and the fluid glass produced run off, care being taken to leave an amount sufficient to conduct the current.—A. S.

English Patents.

Kiln; An Annealing and Direct-Draught Continuous ——. H. de Witt, Brussels. Eng. Pat. 6134, March 12, 1902.

The chambers of the kiln are separated by perforated walls, and can be isolated by dampers; or double perforated division walls are arranged with a space between them, which can be filled, say, with sand. A horizontal grate or hearth extends across each chamber, and is composed of a series of refractory bars or slabs arranged with inclined passages between them to allow air to pass to the flues, and to prevent cinders from falling into the flues. The air enters through openings in the roof of the kiln, and is heated before it reaches the hearths by its passage through flues in the arch of the kiln. The gases pass from each hearth to a transverse flue, which communicates with the main hot-air flue, the passage to which is controlled by dampers, the hot-air flue forming a closed circuit. In the continuous kilns with double perforated division walls, an additional draught flue connects, with suitable dampers, each chamber with the hot-air flue; and the transverse flues are connected, by suitable dampers, with the smoke flue.—W. C. H.

Ceramic Ware; Kiln for Firing ——. E. de France, Raze, France. Eng. Pat. 6383, March 15, 1902.

The kiln, which is for subjecting articles first to an oxidising, and afterwards to a reducing flame, "to impart a metallic lustre or gloss to them," has a muffle the walls of which are composed of hollow bricks. During the oxidising process the combustion gases are drawn through the hollow conduits in the bricks by the chimney draught, the rate of flow and direction of the course of the gases being controlled by dampers. Openings are also provided from the hollow conduits of the bricks into the interior of the muffle, from which the reducing gases can pass out into vertical flues in the walls of the kiln, and thence through pipes into the smoke-box and chimney. After the glaze has been fused by the oxidising flame, the temperature in the muffle is allowed to fall somewhat, combustible material, rich in hydrocarbons, is fed into the grates, access of air is stopped, and the reducing gases are caused to pass into the muffle by closing the dampers in the flues which lead directly into the chimney, and by opening the dampers of vertical flues. The rate of flow of the reducing gases is slow, owing to the total area of the small openings into the interior of the muffle being two or three times greater than the area of the openings into the vertical flues.
—W. C. H.

United States Patent.

Earthenware; Manufacture of ——. E. G. Acheson, Niagara Falls, Canada, Assignor to the Acheson Co., Niagara Falls, N.Y. U.S. Pat. 722,791, March 17, 1903.

A new method of manufacturing earthenware by treating a "body" material with a modifying agent such as tannin, and then forming the mass into the desired shape. Such earthenware is said to possess increased strength and plasticity and decreased absorption of water, and to show less shrinkage in drying.—A. G. L.

French Patent.

Ceramic Products; Manufacture of Enamelled or Glazed ——. A. Bigot. Fr. Pat. 323,657, Aug. 11, 1902.

The moulding and the application of the enamel are carried out in one operation, and the article passed through the oven once. A wet or dry powder of the vitrifiable substance is placed at the bottom of the press mould to a suitable depth, and the necessary quantity of ceramic material (of burnt earth, faïence, stoneware, porcelain, &c.) applied as a wet or dry powder. The two layers are then pressed, and the article covered with a vitrifying substance and immediately put in the oven. The production by this process is also claimed of enamelled or glazed ceramic articles, either flat or in relief, of all shapes and sizes.
—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Cement for Marble. J. Franklin Inst., 1903, **155**, [3], 180.

Four parts of gypsum and one part of finely-powdere gum arabic are intimately mixed and made into a mortar-lik mass with a cold solution of borax. The cement sets in a fe days. For mending coloured marble, the cement may b tinted by adding a colouring matter to the borax solution.
—A. S.

English Patents.

Marble: Artificial ——, *or Marbling.* S. Guinet, Lyon France. Eng. Pat. 25,736, Nov. 22, 1902.

The aniline or alizarin dyestuffs, or the vegetable dyestuff obtained from wood, &c., generally employed to give th effect of artificial marble are mixed with a liquid compose of, for each kilo. of paint, 1—10 grms. of gold size, 250—500 grms. of water, and 750—500 grms. of sodium silicat This mixture is applied directly to wood, stone, cement, &c and is also applicable to glass, &c., especially if used in con junction with an alkaline earthy salt (*e.g.*, barium sulphat lime) capable of forming an insoluble silicate with th sodium silicate.—T. F. B.

Clay and other Insoluble Matters; Process of Separatin ——. M. W. Phillips, Philadelphia, Pa. Eng. Pa 28,788, Dec. 30, 1902.

In order to obtain only the most finely-divided portion the material, the clay or other insoluble substance is finel ground and suspended in water, the resulting liquid bei then passed across the face of a nearly vertical stationa screen, composed of some fibrous material, *e.g.*, silk, of t finest mesh. As soon as the screen is wetted, the fibr swell, and the size of the meshes is still further reduce with the result that only the very finest portions of t material can pass through the screen, on the other side which may be placed suitable deflectors which at on conduct the liquid away from the face of the screen.
—A. G. L.

United States Patents.

Silicon, Oxygen, and Carbon; Method of Produci Compounds containing —— [*Refractory Material* E. G. Acheson, Assignor to the Acheson Co. U.S. Pa 722,792, March 17, 1902. XI. A., page 500.

fractory Material. E. G. Acheson, Stamford Township, anada, Assignor to the Acheson Co., Niagara Falls, .Y. U.S. Pat. 722,793, March 17, 1903.

E material is composed essentially of silicon, oxygen, l carbon in chemical combination, and may be used, with without a binding agent, as a refractory lining, or for cks, crucibles, or muffles. It is "neutral towards acid or ic slags," insoluble in molten iron, and unaffected by nace gases. "It is also capable of reacting with lrofluoric acid."—A. G. L.

icks; Making Glazed ——. W. E. Jaques, Assignor o A. O. Crozier, both of Grand Rapids, Mich. U.S. Pat. 23,279, March 24, 1903.

E body portion of the brick is made of cement or entitious material, which is then covered with a layer ither silica or a silicate mixed with cement, a flux, and er or else with a solution of flux and a mixture of a allic oxide with cement and silica or a silicate. The layer llowed to set and dry, and is then fired.—A. G. L.

ne, Artificial; Making Cementitious Products or ——. V. E. Jaques, Assignor to A. O. Crozier, Grand Rapids, lich. U.S. Pat. 723,281, March 24, 1903.

OMPACT porous mass of unset cementitious material, or even parts by weight of sand and one of cement, is first le of the required form. A cementitious liquid, which y also contain colouring matter, is then confined externally he surface of the mass and pressure applied, in order to e the liquid into the pores of that mass, after which the duct is allowed to set and harden.—A. G. L.

nent, Acid-proof; Composition for ——. H. Galliowsky, Philadelphia, Pa., Assignor to W. Maguire, oronto, Canada. U.S. Pat. 723,263, March 24, 1903.

IBROUS material is impregnated with about equal parts nagnesium chloride and silicic acid, and the whole, after ng dehydrated by heating, is mixed with a basic cement. —A. G. L.

French Patents.

rble; Process for Making Artificial ——. E. Bartz and E. Benz. Fr. Pat. 323,356, Aug. 1, 1902.

ICA is mixed with sufficient sodium silicate to give a y mass, sufficiently liquid to be run into the moulds.

. portion of this paste is coloured with suitable colouring ter, and mixed with the remaining part of the paste l the coloured portion is distributed evenly throughout mass in the form of veins.

he whole is now run into moulds and allowed to set for ut 24 hours.—T. F. B.

Building Materials; Artificial ——. A. Seigle. Fr. Pat. 323,666, Aug. 11, 1902.

VARM dilute solution of calcium chloride is added to a ture of carefully sifted sand and quicklime, whereby a tic mass is obtained, which can be moulded and then hardened by steam under pressure. It is claimed that by this process, not only is the lime completely slaked, but the thermo-chemical effect due to the slaking, tends to promote the combination of the sand and lime, and also increases the plasticity and cohesion of the mixture to an extent sufficient to allow of working the mass. The cohesion may be further increased by the preliminary addition of powdered calcined calamine, or zinc oxide, to the powdered quicklime, from which zinc oxychloride is formed on the addition of the calcium chloride solution.—W. C. H.

X.—METALLURGY.

Steel; New Preliminary Fining Process in connection with the Bertrand-Thiel and Thomas Process. O. Thiel. Stahl u. Eisen, **23**, 306. Chem.-Zeit., **27**, [25], Rep. 79.

The efficiency of the furnace is increased by making the process continuous, by the use of heated ore and lime, and employing a series of tap-holes at different levels in the front and rear ends of the furnace, corresponding tap-holes for the slag being also provided. Only one-half the contents of the furnace are run off, and an equal quantity of molten pig-iron is then added to the remainder, the use of heated lime and ore (heated by blast-furnace gas) reducing the fining process from 2—2½ hours to 1—1½ hours. The product can be worked up to ingot iron either in a converter or in the furnace itself; and all classes of ore, minette, &c., are suitable. The economic superiority over the Thomas process is estimated at 5*s*. The process is claimed to be particularly suitable where phosphoretic iron is lacking. The silicon, carbon, and one-half the manganese are eliminated in an acid furnace, and the phosphorus is removed in the converter, the duration of blowing being diminished by 60 per cent. In this way pig-iron with 0·8—1 per cent. of phosphorus can be used. A yield of 98 per cent. in comparison with the ordinary Thomas process is obtained, with a profit of 3*s*. 6*d*. per ton of steel.—C. S.

Gold; Volatility of ——, *in admixture with Zinc.* K. Friedrich. Zeits. angew. Chem., 1903, **16**, [12], 269—271.

The author disputes the statements of Grünhut as to the volatility of gold admixed with zinc, and contends that the loss of gold observed by the latter in the recovery of zinc-precipitated gold in the MacArthur-Forrest process is due to mechanical dispersion of the finely-divided metal by the volatilised zinc. The author has carried out a series of experiments with alloys of gold and zinc prepared from pure zinc and commercial zinc with gold of 998 thousandths fine. Some difficulty was experienced in the preparation of the alloy, the zinc, when melted beneath a layer of powdered charcoal, becoming coated with a film of oxide; the trouble, however, was surmounted by melting the zinc beneath a layer of fused potassium cyanide, and subsequently adding the gold. Alloys were prepared in this

Alloy.			Excess of Zinc in terms of Gold.	Time of heating.	Temperature, ° C.		Weight of Alloy after Distillation.	Gold recovered.	Loss of Gold.
Gold.	Pure Zinc.	Commercial Zinc.			Measured.	Calculated.			
Mgrms.	Mgrms.	Grms.	Times.	Mins.			Mgrms.	Mgrms.	Mgrms.
179·17	..	2·7	15	20	1,070	..	205	179·12	0·05
212·66	..	4·9	23	30	1,085	..	280	212·32	0·34
23·44	..	83·0	3,541	150	1,050	..	Not weighed	23·28	0·16
1·72	..	30·0	17,442	120	..	1,200	6	1·71	0·01
179·44	..	1·452	8	5	1,389 to 1,420	..	..	178·86	0·58
49·30	..	5·70	116	10		..	..	48·75	0·55
48·90	..	8·75	179	15		..	..	48·60	0·30
3·24	..	18·0	5,556	25		..	..	3·05	0·19
0·88	..	18·86	21,432	25		..	..	0·86	0·02
9·01	101·0	..	11	3	..	1,500	..	8·92	0·09
1·18	14·8	..	13	1	..		..	1·16	0·02
618·05	..	4·7	8	6	..	above 3,000	..	244·48	373·57
37·95	..	2·66	70	3	..		..	19·54	18·41
8·28	..	6·12	739	10	..		..	6·01	2·27
44·56	520·0	..	12	2	..		..	23·40	21·16

way containing from 8,000 to 21,000 times as much zinc as gold.

The accompanying table gives the results of 15 experiments on alloys of gold with pure and commercial zinc under various conditions of volatilisation.

The heavy loss shown in experiments 12 to 15 is due to the zinc having been volatilised by means of the electric arc, the process proceeding so violently that visible particles of gold and even portions of the alloy itself were blown away with the volatilised zinc oxide. The author is convinced from his experiments that if loss of gold in presence of zinc take place at all, it can only do so when the zinc is volatilised with extreme energy, and is then carried off mechanically as gold or a zinc-gold alloy.
—H. F. C. G.

Ferro-Manganese; Technical ——. T. Naske and A. Westermann. Stahl u. Eisen, **23**, 243. Chem.-Zeit., **27**, [25], Rep. 78.

The manganese in ferro-manganese forms carbides analogous to those of iron; but owing to the different behaviour of the two classes of compounds, the determination of the forms of carbon in these alloys is a difficult matter. Manganese carbide, Mn_3C, is converted by water into the hydroxide, with liberation of methane and hydrogen, whereas the corresponding iron carbide is only slightly decomposed. In presence of moisture, high-grade ferro-manganese readily oxidises, liberates a combustible gas, and suffers disintegration.

The authors attribute the gaseous mixture furnished by ferro-manganese when treated with water, to three reactions, one being that already referred to, another from the action of water on the metal, and a third from its action on manganese nitride, nitrogen and hydrogen being liberated. A similar result is obtained by the action of acids, except that in this case hydrogen predominates.
—C. S.

Cyanide of Potassium; Commercial ——. A. Whitby. VII., page 493.

Cyanide: Impurities in Commercial ——. G. Doveton. VII., page 493.

English Patent.

Steel and Malleable Iron; Manufacture of ——. J. A. Hunter, Philadelphia, U.S.A. Eng. Pat. 28,240, Dec. 22, 1902.

See U.S. Pat. 719,117, Jan. 27, 1903; this Journal, 1903, 214.—E. S.

Spent Acid from Galvanising Works and the like: Treatment of —— : and the Manufacture of Zinc White and Ferric Oxide. H. E. Howard and G. Hadley, Halesowen, near Birmingham. Eng. Pat. 9327, April 22, 1902.

See U.S. Pat. 715,804, Dec. 16, 1902; this Journal, 1903, 97.—E. S.

Aluminium; Solder and Fluxes for ——. W. Shone, Chester. Eng. Pat. 9340, April 22, 1902.

The solder consists of tin, 82½; zinc, 15; and bismuth, 2½ per cent. The flux is an ammoniacal solution of potassium nitrate, with or without sodium nitrate.—E. S.

Alloy or Metal: New Metallic ——. T. W. Just and W. F. L. Frith, both of London. Eng. Pat. 9696, April 26, 1902.

To prepare the alloy, stated proportions of nickel, lead, tin, and zinc are successively added to melted copper in the order stated, the copper, nickel, and zinc being the principal constituents. Small proportions of palladium-sodium-chloride and of a vanadate are also added, as well as aluminium, preferably as a silicate. The alloy is stated to have the colour of silver, and not to be affected by the air or by sea-water.—E. S.

United States Patents.

Crucible Smelting-Furnace. O. Forsbach and E. Clerc, Mülheim-on-the-Rhine. U.S. Pat. 722,831, March 17, 1903.

The specification describes a crucible furnace having a crucible supported above the grate bars with a jacketed space surrounding the crucible; there is also a receiving-pot supported by the jacket above the crucible and communicating with the latter, but leaving a slight space between the lower end of the receiving pot and the top of the crucible. The fuel is fed into the space surrounding the crucible. The hot gases from the fuel flow up through the space between the crucible and the receiving pot, and pass through the material in the receiving-pot before escaping through the lateral outlet. (See also Eng. Pat. 22,777 of 1900; this Journal, 1901, 481.)—H. B.

Melting Furnace [for Steel]. F. H. Daniels, Worcester, Mass. U.S. Pat. 723,143, March 24, 1903.

The floor of the main chamber of the melting furnace for making steel, curves downwards, forming a melting-basin, between which and the exit flue is a bed of fire-bricks upon which a series of adjacent water pipes are longitudinally disposed, constituting a preheating chamber. Over these pipes miscellaneous scrap for the charge is impelled by a power-operated charging device. A mechanical charger is disposed opposite the feed door to the preheating chamber, for transferring into it the car load of material for the furnace.—E. S.

Steel; Process of Producing ——. P. Eyermann, Benrath, Dusseldorf, Germany. U.S. Pat. 723,594, March 24, 1903.

See Eng. Pat. 15,984, Aug. 8, 1901; this Journal, 1902, 709.—E. S.

Cast-Iron Alloys [with Nickel]: Manufacture of —— G. Grunauer, Berlin. U.S. Pat. 723,601, March 24 1903.

Cast-iron is melted in a suitable furnace, and to the molten metal, after tapping off, "one-half to forty per cent of nickel" is added to form the alloy.—E. S.

Metals; Separating Precious —— from Solvent Solution J. P. Schuch, Jr., Cripplecreek, Col. U.S. Pat. 722,762 March 17, 1903.

The solution is run into a column or tower containing a series of superposed compartments, the first of whicl contains crushed limestone, to neutralise any free acid the solution then passing successively through zinc wood ashes, asbestos wool or its equivalent, and charcoal then through zinc shavings, to precipitate the preciou metals, then through charcoal to act as a filter and retain proportion of the said metals, subsequently through limeston to precipitate the zinc, and then alternately through zinc charcoal, or coke and zinc, to effect complete separation o the precious metals and thorough filtration.—E. S.

Ores [containing Precious Metals]; Method of Treatin ——. F. R. Carpenter, Denver, Col., Assignor t J. H. Berry, Detroit, Mich. U.S. Pat. 722,809, March 17 1903.

Silicious ores containing precious metals ("mainl silver") are smelted with sulphur, copper, and a basic flux the matte produced is roasted, and smelted with a siliciou flux; lead is then added, and the mixture, subjected to a oxidising blast, yields a "coppery" litharge and a residu containing part of the precious metals. The copper litharge is smelted with a reducing agent for partial reduc tion, so as to produce a bottom of metallic lead, containin precious metal, and cuprous oxide, which latter, afte separation, is reduced to metallic copper. Or the ores ar "concentrated" in impure metallic copper, which, afte mixture with lead, is oxidised, and subjected to the befor described treatment. The "rich slag" obtained in th treatment with a silicious flux, in the first process, is adde to a subsequent charge of ore. Compare U.S. Pat 718,087-8-9, and 718,601, all of 1903; this Journal, 190 147 and 214.—E. S.

O s ; *Method of Treating* [*Amalgamating*] ——. P. A. nappe, Grantville, Ga., Assignor to American Amalgaating Co., Boston, Mass. U.S. Pat. 723,212, March 17, 903.

T process consists in continuously feeding pulp to a st er and gently agitating the same therein to cause se ration of the lighter from the heavier particles and a g ling of the same. The heaviest pulp particles are in nately mixed with mercury, and the non-amalgamable p ion thereof withdrawn and concentrated. Means are pr ided for continuously withdrawing each of the superin osed lighter strata before contact with mercury, the v es of the same being separately recovered. See also U Pats. 705,095, 705,096, 707,971 and 707,972, all of 1 2; this Journal, 1902, 1334.—E. S.

als [*Precious*] ; *Process of Extracting* ——, *from res.* S. Trivick, Clapham, England. U.S. Pat. 723,787, arch 24, 1903.

T he ore such proportions of dry chloride of lime and o ferric salt are added, as may result in the formation of f c hypochlorite and ferric chloride, which "will evolve n ent chlorine." The use of ferric sulphate is claimed, a vell as, generally, a metallic salt capable of acting si larly. Compare U.S. Pat. 706,365, of Aug. 5, 1902 ; t Journal, 1902, 1141.—E. S.

F Dust ; Process of Reclaiming ——. E. H. Williams, Sharon, Pa. U.S. Pat. 723,105, March 17, 1903.

I flue dust derived from iron ores is melted with silica in a ath within the range of the heat of a reverberatory fu ace, applied to the surface, and additional flue dust a silica are fed into the bath, below its surface, in such m ner as to maintain an excess of iron oxide. The slag f ed by the combination of the iron oxide and silica is r oved as the process proceeds.—E. S.

Silicated Flue Dust. E. H. Williams, Sharon, Pa. U.S. Pat. 723,106, March 17, 1903.

OMPOSITION consisting of uncombined iron oxide, t ther with a small proportion of iron silicate derived fr sand, binding the oxide into a slag. See the preceding s tract.—E. S.

French Patents.

l; Manufacture of ——, *by a New Process of raduated Molecularisation.* C. Dominé, H. J. Miller, d X. Nyer. Fr. Pat. 324,080, Aug. 27, 1902.

T produce steel of high quality by "a progressive and a sured transformation of the molecular structure of iron," s iron is fused in presence of magnesium silicate with s es from previous fusions.—E. S.

Melting Furnace. L. Keyling. Fr. Pat. 323,286, July 28, 1902.

A LATE of greater diameter than the mouth of the furnace, is spended at a certain distance over it, and jets of water, fr a suitably arranged pipe, are caused to impinge upon t upper surface of the plate, in such manner as to b rojected upwards thence against the sides of the u r continuation of the furnace. The ascending gases n ssarily pass through the spray thus formed, and the w r, charged with the dust from the flames, collects in a g ve, whence it is discharged through a channel.—E. S.

il] *Furnace for Fusing Metals, &c.* J. T. Shadforth. Fr. Pat. 323,725, July 22, 1902.

T furnace comprises a vaporising chamber, in which t oil is kindled and vaporised ; a combustion chamber, w hich the vaporised oil is burnt along with superheated s m and part of the hot chimney gases; and a series of c ubers, in which are the crucibles or other recipients, a through which the flames and hot products of comb ion pass. The steam is produced and superheated in b ers arranged along the sides of the combustion and h ing chambers, and a return flue from the main chimney t e combustion chamber furnishes a regulated proportion o e chimney gases to the latter.—H. B.

Metals ; Extracting ——, *from their Ores.* R. McKnight. First Addition, dated July 29, 1902, to Fr. Pat. 313,695, Aug. 22, 1901.

See U.S. Pat. 696,469, April 1, 1902 ; this Journal, 1902, 619. Compare also Eng. Pat. 21,623, 1900 ; and U.S. Pat. 693,982, 1902 ; this Journal, 1902, 481 and 411.—E. S.

Metals ; Separating Mixtures of ——. The Ajax Metal Co. Fr. Pat. 323,524, Aug. 6, 1902.

See Eng. Pat. 17,325, Aug. 6, 1902 ; and U.S. Pat. 707,551, 1902 ; this Journal, 1902, 1281 and 1185.—E. S.

Mattes and Crude Metals ; Process and Apparatus for the Industrial Treatment of ——. H. G. S. Thofehrn and B. de Saint-Seine. Addition, dated Aug. 1902, to Fr. Pat. 321,392 of May 21, 1902.

The process described in the main patent (see this Journal, 1903, 215) and in Eng. Pat. 10,101, May 15, 1901 (this Journal, 1902, 862) consists of blowing into or upon the charge in a reverberatory furnace steam and air, with or without sand, &c. The present addition relates to the introduction in the tuyères used for the blowing, of a central valved tube through which a hydrocarbon, such as a mineral oil or tar, is passed into or upon the molten mass, in order to maintain its fluidity. Alternatively, separate and independent tuyères may be used for the hydrocarbon injection. The process is stated to be not only available in the treatment of nickel mattes, requiring a high temperature, but also in puddling iron and in making steel from cast-iron.—E. S.

Zinc Ores and other Substances containing Zinc, with or without Cadmium ; Treatment of ——. F. Ellershausen and R. W. Western. Fr. Pat. 324,062, Aug. 6, 1902.

See U.S. Pat. 715,771, Dec. 16, 1902 ; this Journal, 1903, 97. Compare also U.S. Pat. 700,311, May 30, 1902 ; this Journal, 1902, 978.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Electrodes ; Bipolar ——. A. Brochet and C. L. Barillet. Zeits. f. Elektrochem., 1903, **9**, [13], 251—255.

The authors suspended a platinum plate between copper electrodes during the electrolysis of copper sulphate solutions. When a small current was employed, the platinum plate was not visibly affected ; but, on increasing the current strength above a certain value, a circular spot of copper was deposited on the side of the platinum plate facing the anode and the diameter of the spot increased with increased intensity of the current. The edges of the plate were unaffected, the current passing solely through the centre. By enlarging the plate it was found that the current density required became less the more nearly the plate filled up the whole cross-section of the cell, and finally when the plate divided the cell into two separate compartments the deposition of copper extended over its whole surface. The behaviour of such bipolar electrodes, both soluble and insoluble, is described and discussed.—J. S.

Electrodes ; Bipolar ——, *and Metal Diaphragms.* H. Danneel. Zeits. f. Elektrochem., 1903, **9**, [13], 256—260.

Instead of introducing a metallic plate between the two terminal electrodes (see preceding abstract), the author employed a piece of platinum wire. At a sufficient current strength one end of the wire was coated with metallic copper and oxygen was evolved at the opposite end, while the intermediate portion of the wire was not affected. The greater the current employed the shorter becomes the intermediate neutral portion, and it is shown that the P.D. between the ends of this portion remains equal to the decomposition potential of copper sulphate. When the current falls below a certain value, the whole wire is unaffected.

Supposing that the wire is flattened up to form a plate, what was formerly the ends of the wire will now be represented by the opposite centres of the plate, while the intermediate portion of the wire will correspond with the edges. It was shown that the current travels preferably round the edges of the plate in the electrolyte so long as the resistance of this path is less than the value of the quotient—

$$\frac{\text{decomposition potential}}{\text{current strength.}}$$

The author explains most or all of the peculiarities observed by Brochet and Barillet from this standpoint.

The paper also contains the results of a number of experiments and some general observations on metal diaphragms.—J. S.

Metals ; Anodic Oxidation of ——, and Electrolytic Evolution of Oxygen. A. Coehn and Y. Osaka. Zeits. anorg. Chem., **34**, 86—102. Chem. Centr., 1903, **1**, [11], 611.

The authors have prepared curves showing the anodic decomposition of metals which in normal caustic potash solution, either remain unaltered or form oxides. In the latter case, two breaks in the curve are to be expected ; the first corresponding to the oxidation-potential of the anode metal, and the second to the evolution of free oxygen at the oxidised electrode. The following values were observed :—

Metal.	Oxidation-Potential.	Evolution of Oxygen at the Metal or Oxide.
Gold	..	1·75
Platinum, polished	..	1·67
Palladium	..	1·65
Cadmium	0·48	1·65
Silver	1·18	1·63
Lead	1·40	1·53
Copper	0·46	1·48
Iron	..	1·47
Platinum, platinised	..	1·47
Cobalt	0·85	1·36
Nickel, polished	..	1·35
Nickel, spongy	..	1·28

A comparison of the oxygen over-charge ("Ueberspannung") with the values of the over-charge found by Caspari for hydrogen (see Nernst and Dolezalek, this Journal, 1900, 670), shows that the retardation of the evolution of gas depends not only on the nature of the metal but also on that of the gas.

A closer examination of the first portion of the decomposition curves, shows that in the case of platinum, gold, and nickel, a break occurs at 1·14 volts (at 1·08 volts according to Glaser), which is not dependent upon the nature of the anode metal and does not correspond to any evolution of gas. Thus at unalterable electrodes, three processes can come into operation:—At 1·1 volts, discharge of the O″-ions with formation of an oxidising agent in the solution ; between 1·28 and 1·67 volts (in the case of the metals examined), discharge of the O″-ions, with the formation of free oxygen ; and finally, from 1·67 volts to the discharge of the OH′-ions, with the formation of ozone. The second process is irreversible. With a nickel anode and platinum cathode, no ozone was formed with an E.M.F. of over 3 volts.

By using nickel electrodes in caustic potash solution, the electrolytic decomposition of water is accomplished with a smaller consumption of energy, than with platinum electrodes.

The authors believe that by making use of the varying over-charge required for the evolution of oxygen at different metals, it will be possible to perform organic oxidations in stages. (See also this Journal, 1903, 166.)—A. S.

Hydrogen Peroxide ; Contribution to the Knowledge of ——. K. Bornemann. Zeits. anorg. Chem., **34**, 1—42. Chem. Centr., 1903, **1**, [11], 615.

The author has examined the electrolysis of N/5 sulphuric acid, using an anode of platinised platinum plate, and a cathode (generally surrounded by oxygen) of polish platinum plate for higher and platinum gauze for low potentials. At the cathode, the formation of hydrog peroxide could be detected from a potential of 0 up to 0· volt, but no trace of this compound appeared at the anod With cathodes which have just previously been heated redness and which are strongly charged with oxygen, the is a high current strength and a relatively small formatio of hydrogen peroxide, but as cathodic polarisation proceed there occur concurrently a decrease in the current-streng and an increase (up to 100 per cent.) in the relative yiel of hydrogen peroxide. This is probably due to the fa that a platinum electrode charged with oxygen exercises greater catalytic action on the formation and still more the decomposition of hydrogen peroxide than an electrod free from oxygen.—A. S.

Electrolysis ; Influence of the Nature of the Cathode the Separation of Metals by ——. A. Hollard. XXIII page 512.

Zinc ; Electrolytic Separation and Determination of —— A. Hollard. XXIII., page 512.

Antimony ; Electrolytic Separation and Determination of ——. A. Hollard. XXIII., page 512.

English Patent.

Batteries ; Accumulators or Secondary ——. L. A. Génard, Páris. Eng. Pat. 15,312, July 9, 1902.

See Fr. Pat. 322,283, 1902 ; this Journal, 1903, 395. —G. H. R

United States Patents.

Silicon, Oxygen, and Carbon ; Method of produc Compounds containing ——. E. G. Acheson, Stamfo Township, Canada, Assignor to the Acheson Niagara Falls, N.Y. U.S. Pat. 722,792, March 1 1903.

A suitable mixture containing carbon and silica is heat electrically so as to form a product consisting of a chemic compound of silicon, oxygen, and carbon.—A. G. L.

Titanous Chloride ; [Electrolytic] Manufacture of —— H. Spence. U.S. Pat. 723,217, March 17, 1903. VI page 195.

French Patent.

Fusion by Electricity. P. Gabreau. Fr. Pat. 323,831 Aug. 19, 1902.

The receptacle containing the matter to be fused arranged so as to receive the heat of one or more elect arcs. These arcs may be fixed or movable so as to adn of the temperature being regulated ; the movements m be helicoidal, linear, or rotatory ; claim is made for applyi this method to any operation, and for coupling sever furnaces, also for any means of causing motion to t receptacle and arcs.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Electro-Galvanising. C. F. Burgess and C. Hambueche Elect. World and Engineer, 1902, **40**, 411—416.

The authors claim the following advantages for t electrolytic method :—(1) Greater uniformity and densi of the zinc coating. (2) Greater adhesion between the z and iron. (3) Greater purity of the zinc coati (4) Greater control over the thickness of the depo (5) Applicability to tempered articles, such as springs, a to engraved plates, or screws. (6) Greater economy, saving of 20 per cent. on the zinc employed being claim The disadvantages of the electrolytic process as compa with the older process are :—(1) Greater capital outlay, the plant for a given output must be larger. (2) Grea trouble and expense in preparing the articles for the z coating. (3) Greater expenditure on raw materials, as t zinc must be purer.

The authors recommend the use of aluminium sulph or of ammonia alum with zinc sulphate in the elect io bath, and they put forward the theory that the proved deposit of zinc obtained by this means is due to separation of aluminium ions at the cathode and to the position of zinc as the result of secondary or chemical ion. The coating of zinc obtained under such conditions ntains no aluminium.—A. S.

United States Patent.

n from the Surface of other Metals; Process of Removing ——. A. K. Eaton, New York, Assignor to H. M. Eaton, Brooklyn. U.S. Pat. 723,197, March 17, 1903.

-plate is heated in a bath of sodium bisulphate to m a compound of tin, the bath is cooled and the tin arated from it in metallic form by electrolysis. —T. F. B.

French Patents.

ectric Furnace for the Electrometallurgy of Iron or of ts Compounds. H. Harmet. First addition, dated uly 17, 1902, to Fr. Pat. 318,283, Feb. 1, 1902. (See his Journal, 1902, 1459.)

cording to this addition it is preferable to limit the ion of the current above the slag, properly so called, t is, to make it act on the pasty mixture of liquids and ds which is above the actual liquid bath.—G. H. R.

ss on Copper Wire or other Copper-covered Metal; Process and Apparatus for the Production of a Thin Coating of ——. H. Paweck. Fr. Pat. 323,901, Aug. 22, 902.

per wire is coated with zinc in a "galvanic bath," and r washing and drying, is heated to such a temperature nay cause the zinc coating to alloy with the underlying per surface, to form a brass covering. The heating is ferably effected electrically by causing the wire to travel tinuously over a pair of separated rotating spindles, nected respectively to opposite poles of a source of tricity, whereby the portion of wire at any moment ween the spindles is heated to redness. Apparatus for g this is shown, as well as a modified form of apparatus, hich the heated wire is cooled by passage through a er-bath.—E. S.

XII.—FATS, FATTY OILS, AND SOAP.

and Fats; Iodine Absorption of ——. L. M. Tolman d L. S. Munson. J. Amer. Chem. Soc., 1903, **25**, [3], 4—251.

authors give a long series of the results of comparative rminations of the iodine values of different fats and oils Hübl's method (3 hours), Wijs' method (30 minutes), Hanus' method (30 minutes) (this Journal, 1901, 1 5). From these it appears that in the case of oils and with an iodine value below 100, it makes but little rence which of the three methods is used; but that n the iodines values exceed 100 the difference is more ounced. Thus, in the case of poppy oil the comparative es were:—Hübl, 134·9; Wijs, 139·1; and Hanus, 1 4.

he greatest variations were obtained with mustard seed rape oils, *e.g.*:—

——	Hubl's Value.	Wijs' Value.	Hanus' Value.
ard oil	110·4	118·5	115·5
"	103·5	112·5	110·2
oil	101·3	105·7	105·2
	100·2	104·1	102·8

e Hanus figures throughout the determinations were a closer to the Hübl values than the Wijs figures, but e authors' opinion the difference between the two is of ractical importance, and they give the preference to Hanus solution on the grounds of its being more ily prepared.

The stability of the solutions does not obviate the necessity of making blank determinations, since an appreciable error might be introduced by a change of temperature, owing to the high coefficient of expansion of glacial acetic acid. A change of ± 1° C. causes a difference of + 0·11 c.c. of N/10 thiosulphate solution required to neutralise 40 c.c. of the iodine solution.—C. A. M.

Maize Oil; Is Cholesterol a Constituent of ——? A. H. Gill and C. G. Tufts. J. Amer. Chem. Soc., 1903, **25**, [3], 251—254.

It has been asserted by Hoppe-Seyler and more recently by Hopkins (this Journal, 1899, 152), that cholesterol is present in maize oil, though melting at 137°—137°·5 C., instead of 146°—147° C. like the ordinary cholesterol. In order to investigate this point the authors have separated the supposed cholesterol by extracting the oil with alcohol (95 per cent.), saponifying the extract, extracting the aqueous soap solution with ether, and purifying the compound by recrystallisation from alcohol. In this way characteristic crystals could be separated from 50 grms. of oil.

Altogether the authors treated about 4 kilos. of maize oil by this method, the yield of pure crystals being about 0·22 per cent. When dried at 100° C. the compound melted at 138°—138°·3 C., whilst when dried *in vacuo* its melting point was 137°·5—138° C.; after 18 months the melting point had fallen to 128°—130° C. Under the microscope the crystals appeared as thin laminæ with pointed ends. The acetate melted at 127°·1 C. and the propionate at 108°·4 C. The benzoate crystallised from ether in oblong rectangular plates melting at 142°—142°·5 C.

The original compound when dissolved in small quantity in chloroform and treated with sulphuric acid gave a bluish-pink colour, whilst the acid layer remained yellow. In a concentrated solution the acid layer was yellow and the chloroform blood-red changing to purple. A dilute solution of the alcohol in acetic anhydride gave a green coloration changing to yellow with sulphuric acid; whilst a concentrated solution gave a deep bluish-green colour.

These reactions resemble those given by wool-fat alcohols, but differences were observed in Salkowski's and Liebermann's tests. In the former the chloroform layer is blood-red with a concentrated solution of wool-fat alcohols, whilst the maize-oil alcohol gives a purple coloration. In Liebermann's test the maize-oil alcohol in dilute solution gives a clear green colour changing to a pure yellow, whilst wool-fat alcohol gives a bluish-green colour changing to reddish-yellow on standing.

From the results obtained in the investigation the authors conclude that the maize-oil alcohol is identical with the "sitosterol" separated by Burian from wheat and rye (Monatsh. f. Chem., 1897, **18**, 551), and that it is also probably identical with Reinitzer's "hydrocarotin" (*ibid.*, **7**, 597). The comparative melting points of the sitosterol and its esters from the different sources are as follows:—

——	From Wheat.	From Maize Oil.	Hydrocarotin.
	° C.	° C.	° C.
Sitosterol	137·5	138·0	137·4
„ acetate	124·5—127·0	127·1	127·6
„ benzoate	145·0—145·5	142·0—142·5	144·0
„ propionate	108·5	108·4	..

—C. A. M.

Betasterol. A. Rümpler. Ber., 1903, **36**, [5], 975—976.

The unsaponifiable portion of the fat of the sugar-beet consists of a cholesterol, with specific characters, to which the author gives the name of *betasterol*. It is extracted from the saponified solution by means of ether. Betasterin has the same composition as other cholesterols. It resembles these also in its colour reaction with chloroform, ferric chloride, and hydrochloric acid, also in that with nitric acid. Its behaviour towards solvents also resembles that of other cholesterols, and in carbon bisulphide solution it combines with bromine by addition. Betasterol differs from other cholesterols in being optically inactive; it crystallises from its solutions in ether mixed with rectified spirit in the form of anhydrous, branched, and starry needles; when the ethereal solution is evaporated slowly, arborescent deposits are formed on the walls of the vessel.

The colour reactions with strong sulphuric acid also differ somewhat from those of other cholesterols. A chloroform solution is coloured reddish-violet, whilst the acid layer becomes blood-red; the addition of a little water decolorises the chloroform solution. A solution in acetic anhydride is coloured dark violet-blue by sulphuric acid, the colour being instantly changed into brown on the addition of water. When sulphuric acid is added to a solution in light petroleum spirit, the acid layer is coloured brownish-red with a faint green fluorescence.

The behaviour of betasterol on repeated melting and re-solidification is peculiar; when melted for the first time it fused at 117° C., the second time it melted at 112° C., and the third time the melting point was lowered to 98° C.
—J. F. B.

Sitosterol, a Possible Test for Maize Oil. A. H. Gill and C. G. Tufts. XXIII., page 513.

Glycerin: Volatilisation of ——, in Steam. M. Nicloux. XXIII., page 514.

English Patent.

Soap-like Remedy from Fresh Water Lime Stone [Tuff-stone]; Process for Manufacturing ——. W. Fischer, Alt-Buchhorst, Germany. Eng. Pat. 28,717, Dec. 29, 1902.

A medicinal preparation for skin affections is obtained by "treating lime at an elevated temperature with fats or fatty acids," so as to form a soap "containing the organic constituents" of the limestone.—C. A. M.

French Patents.

Waxes: Extraction of ——, by means of Carbon Bisulphide. J. Bonnefoux and P. A. Meynieu. Fr. Pat. 323,303, July 30, 1902.

Residues from pressed wax, &c. are treated with carbon bisulphide, the solvent being distilled off from the extract in a current of steam.—C. A. M.

Glycerin from Spent Distillation Wash; Process of Extracting ——. E. A. Barbet. Fr. Pat. 323,373, July 19, 1902.

The spent wash (vinasses), e.g. from beet-root, is concentrated to 30°—40° B., and cooled in a current of air, after which it is mixed with 96 per cent. alcohol and subjected to osmosis. The glycerin readily passes through the parchment paper, whilst the other constituents, which are only slightly soluble in alcohol, remain behind. In this way an alcoholic liquid containing 10 per cent. of glycerin is obtained, and the residue of glycerin left after distillation of the alcohol contains only a very small amount of impurities.

Claim is also made for the simple addition of strong alcohol to the spent wash, but the glycerin carried to the surface is not so pure and the process more costly than that described above.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

French Patents.

White [Pigment] intended as a Substitute for White Lead and Zinc White. Guérin and Meynet. Fr. Pat. 323,242, July 5, 1902.

The use of asbestos as a basis of a white paint is claimed. The asbestos is thoroughly dried, powdered, and mixed with lime, barytes, or any other substance which will give increased "body."—M. J. S.

Copper Slag containing Zinc and Barium: Utilisation ——. F. Brünjes. Fr. Pat. 323,272, July 28, 1902.

See Eng. Pat. 16,272, July 22, 1902; this Journal, 190 1286.—E. S.

(*B.*)—RESINS, VARNISHES.

English Patent.

Ornamenting Metallic Surfaces; Method and Means f ——. C. Manners, Mansfield, W. H. Reddan, Man field, and H. G. Schumann, New Southgate. Eng. Pa 27,530, Dec. 13, 1902.

The decorative medium (paint, varnish, &c.) used ornament metals, is mixed with copal varnish, in the pr portion of 1 part by weight of copal varnish to 64 parts the pigment.

This mixing renders the paint, &c. proof against t action of acids used in "frosting" the metal, which c therefore be done after the application of the paint.
—T. F. B.

French Patents.

Printing Ink and Varnish ——. A. G. Wass. Additi dated June 28, 1902, to Fr. Pat. 322,398, June 20, 190

See Eng. Pat. 6061, 1901; this Journal, 1902, 1032.
—M. J. S.

Enamel Varnish. Briclot. Fr. Pat. 323,548, Aug. 7, 19

A mixture of 2 kilos. of copper and 2 kilos. of br filings is treated with nitric acid, the action being stopp before complete solution of the metal has taken place. T metallic residue is then withdrawn from the liquid, wash with strong eau de Javelle and then with water. Iron turni (2·5 kilos.) are treated with sulphuric acid in the sa manner, and the residue is washed with ammonia and w water. The products are dried, sifted, ground with benz and linseed oil, then enclosed in a bag and placed i boiler containing linseed oil which is "heated to a ve high "temperature." The metallic compound is absorb by the oil, and the product is the "metallic base" of varnishes. For these, two formulæ are given. Th consist of bitumen dissolved in linseed oil, phenol, pet leum, oil of turpentine, and a small proportion of "metallic base," and are coloured with lampblack, with addition, in one case, of a resinate of iron, or copper.
—M. J. S

Linoleum: Manufacture of ——, Mottled throughout entire Thickness. Soc. Bremer Linoleumwerke-Delm borst. Fr. Pat. 323,485, Aug. 4, 1902.

In the ordinary process of making linoleum, canvas, cove with the powdered linoleum composition, is passed horiz tally between compression rollers, one above the ot. With this arrangement, the surface layer of the compres composition undergoes greater displacement in the direct of travel than the layer in contact with the canvas backi so that coloured particles of composition, which are dra out into streaks, do not produce uniform marbling thro the whole thickness. This difficulty is obviated by arrang the rollers side by side, and feeding both the backing the composition from above.—M. J. S.

(*C.*)—INDIA-RUBBER.

Bossanga-Sap; Coagulation by Means of ——. C. O. Weber. Gummi-Zeit., 1903, **17**, [26], 565.

The statement in the first number of the "Moniteur Caoutchouc," that the white colour of Lopori, Equat Ruki, Lulonga, Ikelemba, and Sangha rubbers is due to coagulation being effected by Bossanga-sap, is errone the whiteness being distinctly traceable to moisture.

Henriques examined a sample of this sap and fo acetic acid to be the only coagulating principle pres The success attending its use where other organic inorganic acids failed, was owing to the acetic acid be present in very small quantities in the sap; a very di solution sufficing to produce coagulation, where often injudicious use of highly concentrated acids will fail.
—J. K.

United States Patent.

ums [*Rubber*]; *Devulcanizing* ——. P. H. J. Chautard and H. Kessler, both of Paris. U.S. Pat. 722,944, March 17, 1903.

E Eng. Pat. 8084, April 7, 1902; this Journal, 1903, 429. —A. S.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patent.

nning Substances; Extraction of ——, *and Apparatus therefor.* G. F. Bogel, Altona-Ottensen, Germany. Eng. Pat. 2303, Jan. 28, 1902.

chanical details are given of a plant consisting of a gle vertical conical drum with perforated sides, revolved a high speed. The bark, or other material to be racted, travels slowly down the drum to its wider end, t whilst descending is extracted at various altitudes by uors of various strengths or by pure water according the degree of exhaustion of the bark. These liquors, er percolating for a suitable distance are whirled out trifugally and passed back to an upper section of the m, or removed if of sufficient strength. The exhausted k is removed from the base of the drum. For materials t are not readily extracted, a series of cylindrical drums rked on a similar principle is employed.—R. L. J.

United States Patent.

nning Process [*with Titanium*]. M. C. Lamb, London, Assignor to P. Spence and Sons, Ltd., Manchester. U.S. Pat. 722,857, March 17, 1903.

E Eng. Pat. 11,902, May 30, 1901; this Journal, 1902, 6.—R. L. J.

XV.—MANURES, Etc.

Nitrification; Studies in ——. G. S. Fraps. Amer. Chem. J., 1903, **29**, [3], 225—241.

E following conclusions are drawn:—(1) The number of rifying organisms in a given soil varies according to the ditions to which the soil is exposed. (2) The activity the organisms is periodic, a period of rapid nitrification ng preceded and followed by periods of comparative ctivity. (3) The inoculation intensity of a soil provided h nitrogenous matter, that is, its power to induce ification in a sterilised soil, increased with the time ing the whole course of the experiment. (4) The ifying bacteria probably multiply continuously during inoculation experiment, but there are periods in which y nitrify very little. (5) It is possible to greatly rease the inoculating power of a soil. (6) The difference the rate of nitrification of cotton-seed meal and of moninm sulphate in different soils is due to a difference he organisms in the soils, since the same differences are wn in the same sterilised soil inoculated with different ifying soils. (7) There are two groups of nitrifying anisms in soils, one of which nitrifies cotton-seed meal e readily and the other ammonium sulphate. The tive numbers of one or the other group can be increased growing the organisms in a soil containing cotton-seed l or ammonium sulphate (8) Four groups of anisms take part in nitrification; those which convert anic matter into ammonium salts, those which convert nonium salts to nitrites, those which convert nitrites nitrates, and those which convert organic matter to ites or nitrates. (9) In order to compare the relative ie of the medium which different soils offer for the wth of nitrifying organisms, the soils to be compared st be kept under the same conditions, and each soil must tain the same number of nitrifying organisms, of the ie degree of activity.—A. S.

English Patent.

age Sludge, Treating ——, *for the Production of* *lanure.* R. England. Eng. Pat. 6021, March 11, 1902. VIII B., page 508.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Solutions; Behaviour of Pure and Impure ——, *on repeated Concentration.* H. Claassen. Zeits. Vereins deutsch. Zuckerind., 1903, **53**, [566], 333—344.

In experiments arranged for the determination of the boiling point of sugar solutions, it was observed that syrups and molasses after repeated boilings could no longer be concentrated to the same water content as before under the same external conditions. This behaviour seemed of interest and of sufficient importance to demand closer investigation, especially as on the large scale it is frequently remarked that some syrups boil to string proof for jellying with difficulty. This difficulty has never been cleared up, but has been attributed to viscosity, engendered by the action of heat and non-sugar.

Experiments were made by boiling in the open air in a jacketed copper vessel with steam at three atmospheres pressure, and a temperature of 144° C. The temperature of the boiling syrup being thus higher than when boiled in the usual vacuum pan would probably render the phenomena more marked. A coil of piping perforated with fine holes introduced dry open steam to ensure regular circulation of the boiling syrup.

The pure solutions of sugar contained 25 per cent. of water, the molasses 20 per cent., and after each concentration they were again diluted to the same strength. When molasses was boiled the first time, it concentrated to 10·5 per cent. of water and the highest boiling point reached was 127° C., or 17° lower than the steam used. After six boilings the boiling point rose to only 121°·7 C., the percentage of water being 13·25. In each case the heat was continued for 10 minutes without further rise of temperature.

First drainage syrups and first massecuite showed a fall in temperature of 23 to 29 and 20 to 27 degrees respectively after repeated boilings. Thus although the molasses is a less pure product, it concentrated more easily than these syrups. The non-sugars cannot therefore be the only or the most important cause of the increased difficulty of concentration.

Solutions of pure sugar made alkaline crystallised each time they were boiled, a neutral solution of sugar also crystallised at 133° C. at the first boiling, but not afterwards. On the seventh boiling the temperature reached was 127° C.

The differences in analysis before and after the experiments lay within experimental error, but in some solutions the difference between the direct and inversion polarisation became greater after boiling. The viscosity is practically unaltered.

A treatment of the molasses with lime and saturation with carbonic acid and sulphurous acid had no influence on the boiling. In all cases the loss of alkalinity was so small that the consequent alteration in composition can scarcely be regarded as the cause of the increased difficulty of boiling.

The results also indicate the necessity in practical boiling of maintaining a sufficiently high pressure of steam for heating.

The apparatus was also used to ascertain the difference of temperature of boiling water and solutions of common salt (28 per cent.) and calcium chloride (35 to 63 per cent.) from that of the steam used. These gave 6°—7°, 4°·7, and 2°·6 to 4°·0 respectively. The fall of temperature is therefore less for salt solutions than for water, and much less than for sugar solutions. This result may serve to explain why molasses with higher salt content concentrates more readily than the purer drainage syrups in which the action of sugar and organic non-sugar prevails. —L. J. de W.

Cane Sugar Syrups; Viscosity of ——. H. C. Prinsen Geerligs. Mededeelingen van het proefstation voor suikerriet in West Java "Kagok" te Pekalongan [60], 1—19. Chem. Centr., 1903, **1**, [11], 674.

The author has determined the viscosity, in the Engler viscosimeter, of a large number of cane-sugar syrups; as the direct examination of undiluted molasses presents some difficulty, samples of artificial molasses were prepared, consisting of mixtures of saccharose, invert sugar, potassium acetate, calcium chloride, and water. Experiments were also made to determine which constituent has the greatest influence on the viscosity of the syrups. It was found that the viscosity of molasses depends in the first place on their purity and on the temperature, but also in no small degree on their content in gummy matters and decomposition-products of glucose and similar substances, and on the presence of finely-divided solid matter. Since, on the one hand, to obtain a good separation of the syrup from the sugar, the viscosity of the former should be as low as possible, whilst on the other hand, for a high yield of sugar, the syrup must contain only a small proportion of the latter, which is a condition favourable to high viscosity, the aim in practice must be to obtain a syrup which, whilst not too viscous, contains as small an amount of sugar as possible. The presence of gummy matters, of accidental impurities, of decomposition products, and of minute crystals of sugar, must be guarded against, and care should be taken that the viscosity of the syrup is dependent, as far as possible, on natural causes. The temperature during centrifugalisation should never fall to 40 C. or below, the outside limit permissible being a temperature of 45 C. in the drums.—A. S.

Inversion [*Sugar*]. C. Kullgren. Zeits. Vereins deutsch Zuckerind., 1903, **53**, [566], 344—362.

The hydrolysis of inorganic salts of strong acids and feeble bases has been preferably determined by the inversion of sugar. As most salts liberate very small quantities of H ions, it is necessary to work at a high temperature (80° to 100° C.), at which temperature inversion proves an excellent indicator.

But inversion by heat alone gives an ever increasing inversion coefficient. The same relation holds for most salts. This has been explained by stating that cane sugar, and still more, invert sugar, act as acids. This explanation proved inadequate.

Fresh experiments showed that in inversion by heat alone at 100° C., a decomposition of the invert sugar occurred whereby acid was formed, the concentration of which is proportional to the quantity of invert sugar. An equation can thus be formed for the rate of inversion. The subsequent (increased) part of the course of inversion follows this equation very well. The inversion is started by the H ions of water (and of cane sugar). The upper limit of the degree of dissociation of water at 100° C. may be deduced therefrom.

In inversion by salts acids are also formed, and the course of inversion thereby accelerated. The more hydrolysed the salt is, the smaller the relative increase of the inversion coefficient.—L. J. de W.

English Patents.

Charcoal, specially applicable for use in Decolorising and Purifying Saccharine and other Liquids; Production of ——. C. A. Halse, Paris. Eng. Pat., 7,119, March 21, 1902.

Wood or similar material is heated with sulphuric acid to a temperature not exceeding 200° C., and the charred mass washed and dried. When spent it can be revivified by treatment with a smaller amount of sulphuric acid, and it has the advantage over bone black that it can be used in acid solutions.—C. A. M.

Sugar; Extraction and Instantaneous Crystallisation of ——, *from any Syrup, in Free Air and by Refrigeration, in Sugar Factories and Refineries.* J. V. P. Lagrange, Paris. Eng. Pat. 21,454, Oct. 2, 1902.

This process consists in the instantaneous crystallisation in air of a supersaturated syrup. The syrup is prepared in a vacuum apparatus or an open boiler, and is gradually concentrated until the temperature rises to 110°—115° C., or even higher, according to its sugar content, and is then poured into a jacketed pan or boiler A, provided with agitators BB¹, a thermometer M, inlets F and H, for water and steam respectively. Sugar, preferably powdered, i then introduced into the syrup under ordinary pressure, s that a supersaturation of the syrup takes place. The syru is then vigorously agitated and cooled by a stream of col water running through the jacket of the pan, which is shu off at the moment of running off. By a similar process o supersaturation, agitation, and refrigeration, the gree syrups can be transformed into an inferior crystallised suga suitable for consumption.—T. H. P.

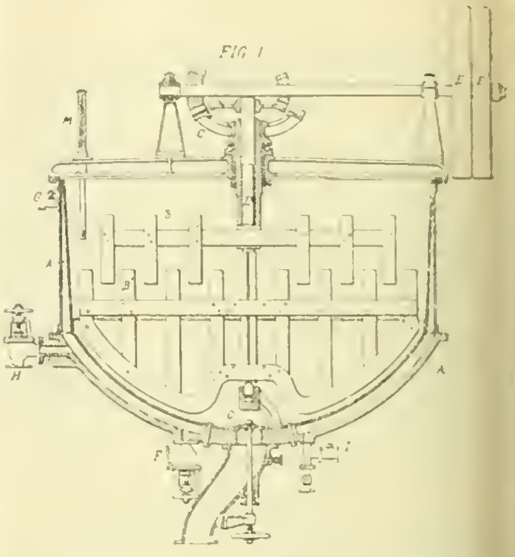


FIG 1

United States Patent.

Vacuum-Pan [*Sugar*]. J. Lang, M. Blake, and R. H. Smar all of Greenock, N.B. U.S. Pat. 722,519, March 1 1903.

See Eng. Pat. 11,812 of 1902; this Journal, 1902, 1189. —R. A.

French Patents.

Refined Sugar; Process for Working ——. H. Passbur Fr. Pat. 323,290, July 29, 1902.

See U.S. Pat. 713,916, Nov. 18, 1902; this Journal, 190 1546.—T. H. P.

Limekilns, especially for Sugar Works. P. Morga Fr. Pat. 323,650, Aug. 11, 1902. VII., page 495.

XVII.—BREWING, WINES, SPIRITS, Etc

Polysaccharides; General Laws of the Hydrolysis of — by Enzymes. E. Bourquelot. Comptes rend., 1903, **13** [12], 762—761.

The author enunciates the following propositions:—

(1) The different ether-like compounds formed by th condensation of two molecules of dextrose with the elimin tion of one molecule of water require each a separa enzyme to re-convert them into two molecules of gluco thus maltose, trehalose, gentiobiose and touranose a hydrolysed by maltase, trehalase, gentiobiase and tourana respectively.

(2) The same holds for the compounds formed dextrose with other monosaccharides, for instance, s charose, lactose, and melibiose.

(3) The enzymes which hydrolyse the hexobioses in t free state do not completely decompose hexotrioses, form from these hexobioses and a molecule of a monose, l give one molecule of a biose and one of a monose; th with invertase, gentianose yields levulose and a biose.

(4) Similar considerations hold for higher polys charides, the number of enzymes (not necessarily

ercent) required for the complete hydrolysis of these ng less by one than the number of condensed hexose lecules present.

5) Further, in the hydrolysis of the polysaccharides, enzymes must act successively and in a definite order.
—T. H. P.

rley; Influence of Bleaching Powder on the Germinating Power of ——. Ehrich. Der Bierbrauer, 1903, 12; through Woch. f. Brau., 1903, **20**, [14], 163.

E author communicates a further series of results of periments on the effect of a solution of bleaching powder he steep waters on the germinating power of barley.

The previous experiments were made by steeping the ley for 24 hours in a 1 per cent. solution of bleaching vder, and the effect on the germination was found to be rious.

In the present series, the barley was steeped for 12 hours water and for 12 hours in a 1 per cent. solution of aching powder. Thirteen samples of barley were tested; seven cases the bleaching powder was practically hout influence, in five cases it was favourable, and in case it was injurious to the germinating power.
—J. F. B.

menting Tuns; Comparative Experiments with ——, oated with Lacquer, Pitch, Brussels "Pechlack," and araffin. F. Smits. Zeits. ges. Brauw., 1903, 169; hrough Woch. f. Brau., 1903, **20**, [14], 162—163.

E author had three fermenting tuns coated internally, . 1 with lacquer, No. 2 with ordinary pitch, and No. 3 h Brussels "Pechlack." Comparative fermentations in three tuns took different courses. Fermentation started liest in tun No. 3, next in No. 2, and last in No. 1. In . 3 tun the fermentation was more intense and far more ling water was necessary than in the other two. The reak" of the yeast in No. 1 was excellent, in No. 2 re was no "break," but in No. 3 the condition of the ist was far worse. Fermentations in tun No 3 always wed attenuations from 5 to 8 per cent. higher than in other tuns. In fact the characteristics found in the e of tuns coated with Brussels "Pechlack" are intense, fermentations, absence of "break," turbid beer, high enuations, deficiency of "body." Subsequent experints with paraffined vats gave just the same results as se with the "Pechlack," and it is remarked that the er contains paraffin. The cause of these results is ibuted to the smooth nature of the surface imparted by echlack" and paraffin, and this is in accordance with observation that attenuation is always higher in freshly quered vats than in old ones. The differences recorded ve were almost eliminated by adding a little sterile sand h the pitching yeast and some more when fermentation t started. When the paraffined tun was cleaned and oated with lacquer it still retained its peculiarities for ne time; the paraffin penetrates into the wood and sequently mixes with the freshly applied lacquer.

On the whole, the author gives a decided preference to quer over pitch; the high temperature at which the latter applied damages the pores of the wood; beer deposits less easily removed from pitched tuns than from quered ones.—J. F. B.

Beer; Conditioning of ——, by Casking with Yeast. E. Rüffer. Woch. f. Brau., 1903, **20**, [14], 163.

E author recommends casking up the beer with yeast in ference to "Kräusen" in the lager cellar. In order to ain satisfactory results, however, only such beers should casked with yeast which have already been stored in the lar for some time and which are not fully attenuated. th short cellarage, casking with yeast is of no advantage, the carbon dioxide in such beers is not so firmly fixed in older beers and consequently the "head" is not so manent and the flavour is not sufficiently clean. In any e beers casked with yeast require a longer cellarage than se treated with "Kräusen" in order to acquire the same dition.

In beers casked with yeast, the cask-sediment always solid at the bottom, which is seldom the case with "Kräusen"; turbidity never occurs with the former when the cask is opened. This difference can be readily demonstrated by bottling samples comparatively with yeast and with "Kräusen." In conditioning by means of yeast, care must be taken to employ only fresh, sound, pure yeast, previously mixed with pure spring water, passed through a fine sieve and settled in a suitable vessel. The liquid with the suspended yeast is poured off and the sediment is mixed with a suitable quantity of beer and added to the cask, which is then tightly bunged. The yeast settles to the bottom and begins its activity and evolution of gas.

The mature beer can be racked off perfectly bright without filtering. The chief characteristic of beer so treated is the splendid condition of the "head," which is very thick, creamy, and permanent.—J. F. B.

Enzyme or Ferment-Action; Reversibility of ——. A. C. Hill. Proc. Chem. Soc., **19**, [264], 99.

It has been shown previously that the hydrolysis of maltose to glucose by yeast extract in concentrated solution is incomplete, the phenomena being due to polymerisation of the glucose by a reversible process, and a point of equilibrium is approached which varies with the concentration of the total sugar. In further publications, it was also pointed out that the polymerisation of glucose resulted in the formation of isomeric sugars, and somewhat different results were obtained when Taka-diastase and the pancreatic ferments respectively were used instead of yeast extract. In every case, it was possible, by diluting solutions of the synthetical products, to hydrolyse these compounds back to glucose by the enzyme used in their synthesis. Further, it had been found that the synthetical products of the action with yeast extract are hydrolysed by Taka-diataste, and those of the action with Taka-diastase by yeast extract.

When the products of the synthetical change obtained by the use of yeast ferment, whilst still mixed with unchanged glucose, are fermented with *S. Marxianus*, only this hexose is fermented; but when a yeast containing maltase is employed, a part also of the synthetical product is fermented. Again, if the synthetical products in dilute solution are submitted to the hydrolytic action of yeast extract and then treated with *S. Marxianus*, the whole is fermented. The sugar that is not fermented either by *S. Marxianus* or by yeasts containing maltase has been separated and proves to be a new biose, which is called *revertose*. The other sugar, which is fermented by all yeasts containing maltase but not by *S. Marxianus*, is believed to be maltose, for although it has not been obtained pure, yet on fractionating mixtures of this sugar with revertose, specimens have been obtained in which the former sugar preponderates and of which the optical and other properties approach those of maltose. Its osazone crystallises in plates, whilst the corresponding derivative of revertose separates in needles. Revertose is formed in larger quantity, and the equilibrium point of glucose ⇆ revertose is more favourable to the synthetical change than the equilibrium point of maltose ⇄ glucose, which favours the hydrolytic reaction.

The products of the synthetical change with Taka-diastase are equally fermentable in part by all maltase-containing yeasts and, as previously indicated (this Journal, 1901, 736) are readily rehydrolysed by the same ferments in dilute solution. These products have not been separated.

Since the first paper on this subject (this Journal, 1898, 684), further observations of a similar nature have been made by the author and others, and the number of ferments for which a reversible action has been noted has become extended. These results warrant the adoption of the hypothesis that all ferment actions are reversible.

French Patents.

Mash; System of Running off and Washing the ——. Soc. Strasbourgeoise de Constructions Mechaniques. Fr. Pat. 323,177, July 21, 1902.

The mash is run from the mash-tun into a perforated cylinder furnished internally with an Archimedean screw.

This screw may either have a smaller pitch at the exit end than at the entry, or else it may have a uniform pitch but a larger diameter at the entry than at the exit. The effect of either system is to subject the mash to pressure whilst transporting it along the perforated cylinder.

The liquid portions run away through the walls of the cylinder into a collecting trough, whilst the solid portions are delivered into a chamber, where they are broken up by a mechanical agitator and sprayed with hot water, before being passed on through three more similar cylinders with spargers in succession. The turbid wort is passed through a small filter-press before entering the copper, the spent grains being delivered at the end of the series of cylinders.
—J. F. B.

Clarifiers. A. Boake, Roberts & Co. Fr. Pat. 323,390. August 1, 1902.

The emulsion of fish-glue employed by brewers and the like for clarifying liquids is converted into a permanent form by adding salt to the emulsion, collecting the precipitate formed, compressing it into cakes containing about 40 per cent. of water, adding an acid, preferably boric acid, and an antiseptic if required. These cakes when required for use are steeped for about 12 hours with five times their weight of water, and then emulsified with about twenty times their weight of water. —J. F. B.

Alcohol and Yeast: Production of ——, from Molasses, Beetroots, and all Amylaceous Materials. J. Effront. Fr. Pat. 324,124, August 30, 1902.

See Eng. Pat. 19,354 of 1902; this Journal, 1903, 223.
—J. F. B.

Alcohol: Distilling Apparatus for the Production of Crude ——. E. Desmaziers. Fr. Pat. 323,681, August 13, 1902.

The fermented wash first enters a bundle of vertical tubes which form part of the condensing system of the still; thus heated, it passes into a chamber situated at the top of the distilling column and surrounds, up to a variable height, a number of dephlegmating tubes contained in the chamber, where it is further heated. The hot wash then passes into the distilling plate-column whence it is discharged from the bottom in the form of vinasse. The plates of the column are rectangular and are furnished with a series of parallel hoods with toothed edges, each hood being separated from the next one by a diaphragm extending right across the plate and of such a height that the wash has to pass successively under the edges of all the hoods before it reaches the overflow to the next plate. The alcoholic vapours ascend through raised openings underneath the hoods and are subdivided by passing under the toothed edges. The vapours are further concentrated by passing through the dephlegmator tubes which are fitted internally with analyser-discs for this purpose. The admission of steam is regulated by the pressure of the alcoholic vapours in the head of the distilling column.—J. F. B.

Glycerin from Spent Distillation Wash: Process of Extracting ——. E. A. Barbet. Fr. Pat. 323,373, July 19, 1902. XII., *page* 502.

Distillers' Spent Residues; Treatment of ——. C. V. Thierry. Fr. Pat. 323,755, August 12, 1902.

See Eng. Pat. 4008 of 1902; this Journal, 1903, 223.
—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Tea-Fermentation. G. Wahgel. Chem.-Zeit., 1903, 27, [24], 280—281.

On soaking black China tea in just enough sterilised water in a test-tube to give a solution of about the same concentration as the sap of the withered tea leaf and keeping the liquid at 27—30° C. for 3—5 days, the author finds that a growth of a certain yeast is obtained. The more expensive teas yielded this yeast alone, and the liquid assumed a pleasant and fairly strong tea aroma; the cheaper kinds, however, gave but few yeast cells, but many rod bacteria of which as many as three kinds were observed in some instances. Indian and Ceylon teas, which are dried at a much higher temperature, and much more completely than the Chinese, contain no micro-organisms. Caucasian tea yields fairly large rods. The author considers it possible, by means of pure cultures of the above-mentioned yeast, to produce in the Caucasus and in Ceylon, tea having the aroma of China tea.—T. H. P.

Pine Apples [Fresh and Canned]; Composition of ——. L. S. Munson and L. M. Tolman. J. Amer. Chem. Soc., 1903, **25**, [3], 272—280.

Tables are given of the analytical results given by 38 samples of fresh pine-apples and 42 samples of commercial pine-apples of different origin. The total solids were obtained by drying the substance with asbestos for 20 hours in a water-oven, whilst the solids in the syrup were calculated from the specific gravity by means of Ellion's table.

Reducing sugars were determined by Meissl's method, and the cane sugar calculated from the polarimetric results before and after inversion, by means of Herzfelt's formula.

The average results from all the samples of fresh pine-apples were as follows:—Total solids, 14·17; insoluble solids, 1·52; total ash, 0·396; alkalinity of ash as K_2CO_3, 0·370; acids (as H_2SO_4), 0·603; proteids (N × 6·25), 0·42; reducing sugars, 3·91; cane sugar, 7·59; and total sugars (as invert sugar) 11·90 per cent.

The average results from 21 commercial samples of Singapore pine-apples were:—Sp. gr. of syrup, 1·069, solids in syrup, 20·15; total solids, 21·03; insoluble solids, 1·17; total ash, 0·284; alkalinity of ash (as K_2CO_3), 0·225; acids (as H_2SO_4), 0·269; proteids (N × 6·25), 0·461; reducing sugars, 9·61; cane sugar, 7·88; and total sugars (as invert sugar), 17·86 per cent.

The authors state that their results do not confirm the common belief that more sugar is present in pine-apples grown nearer the equator than in those grown further north. The normal amount of sugar in Florida pine-apples was practically the same as in the Singapore fruit.

Since fresh pine-apples contain so much cane sugar the only means of detecting the use of a syrup containing about the same amount of sugar as the natural syrup of the fruit would be by determining the relationship between the amounts of sugar and total insoluble substances.

The results of the author's analyses show that canned pine-apples from Singapore and the Straits Settlements are preserved with the addition of cane sugar, whereas those from the Bahamas are, for the most part, preserved in their own syrup.—C. A. M.

Salicylic Acid: Occurrence of ——, in Fruits. F. W. Traphagen and E. Burke. J. Amer. Chem. Soc., 1903, **25**, [3], 242—244.

The occurrence of salicylic acid as a normal constituent of strawberries was recorded by Portes and Desmoulière (this Journal, 1901, 1229), and the latter authority has more recently detected it in raspberries, mulberries, and liquorice root. The authors have examined various fresh fruits at the Montana Experiment Station, and have found that salicylic acid is almost invariably present in a minute proportion. Thus they have detected it in strawberries, raspberries, blackberries, currants, plums, black cherries, apricots, peaches, grapes, crab-apples, apples, and oranges.

In some cases comparative quantitative tests were made by distilling the fruit with phosphoric acid, and extracting the salicylic acid with ether, with the following results:—Currants, 0·57; cherries, 0·40; plums, 0·28; crab-apples, 0·24; and grapes, 0·32 mgrms. per kilo. It was found however, by check analyses that the whole of the salicylic acid was not extracted from the fruit by this method. The reaction for salicylic acid was also given by tomatoes, cauliflowers, and string beans.—C. A. M.

Manioc; Food Products obtained from ——. Balland.
J. Pharm. Chim., 1903, **17**, [7], 316—319.

ANIOC (*Manihot utilissima*) is a plant indigenous to merica, being specially abundant in South America, here it is commonly known as *Yucca*. It is also found West Africa and some parts of Asia. Among the oducts obtained from manioc are couac, cassava, flour, arch, and tapioca, which are prepared as follows:—

Couac.—After removal of the outer pellicle, the roots are ashed, rasped, and then placed in a press, whereby a isonous liquid is separated. The pressed pulp is placed a warm iron plate, and stirred till dry, when it is passed rough sieves, giving various grades of couac, according size of granules. Thus prepared the product is white, it turmeric is sometimes added before drying to colour it llow.

Cassava.—This is also prepared from the pressed pulp, hich is pounded in wooden mortars to an even paste, then read out in thin round layers, as pancakes, on warm iron ates. When one side is cooked, it is carefully turned.

Manioc starch is obtained by soaking the rasped root in ater, leaving to settle, and decanting the turbid liquid, hich is again allowed to deposit. By sun-drying the irch is left in a more or less split condition. This starch, refully powdered and sifted, is used as a substitute for ce starch in toilet preparations.

Tapioca.—The moist starch is rapidly dried in the oven, ound and sifted, giving tapiocas of different grades.

Analyses are given of the different products, showing at they consist almost entirely of starch, together with)—14 per cent. of water, a little nitrogenous matter, and aces of fat. Cellulose was only found in appreciable iantity in improperly prepared products.—W. H. S.

heep's Milk; Composition of ——. Trillat and Forestier.
Bull. Soc. Chim., **39**, [7], 286.

AMPLES were analysed from 16 flocks fed on the milk of iore than 100 flocks spread over a large area; 171 samples, iken during February, March, and April, were tested.

Solids were estimated by evaporating 10 c.c. on a water-ath.

Sugar was determined by titration with Fehling's solution, alculating as lactose dried at 100°—110° C.; fat by xtraction with ether, and ash by evaporating on a sand-ath 50 c.c. of the milk, to which a drop of rennet had een added, and igniting.

Calcium was determined by precipitation with ammonium xalate, and acidity by decinormal alkali solutions, using henolphthalein as indicator.

Other writers on the subject indicate a mean comosition as follows:—Solids, 12·4 per cent.; fat, 4·2; ictose, 4; casein, 3·7; and ash, 0·7 per cent.

The author finds that the constituents vary as follows:—olids, 14·82 to 21·44 per cent.; fat, 4·13 to 9·21; ictose, 4·4 to 5·59; caseïn, 4·41 to 8·15; ash, 0·836 to ·162; lime, 0·219 to 0·977; acidity, 2·2 to 7·2 per cent.
—T. F. B.

English Patent.

Iilk Powder; Manufacture of ——. R. W. James, London. From the Casein Company of America, New York. Eng. Pat. 1306, Jan. 19, 1903.

IILK is heated to about 200° F., then rapidly cooled, ondensed at a temperature of 110° F. to a specific gravity f about 23° B., and the product mixed with an equal part f prepared milk powder. This mixture is finally dried nd powdered. (See also U.S. Pat. 718,191; this Journal, 903, 158.)—W. P. S.

United States Patent.

Butterin; Method of Making ——. A. Bergman, Chicago, Ill. U.S. Pat. 722,276, March 10, 1903.

IFTY parts of lard, 20 parts of tallow, and 30 parts of ggs are heated together and the mixture cooled, and orked in a butter-machine.—W. P. S.

French Patents.

Hæmoglobin; Preparation of a Food Product containing ——. F. Hanssen. Fr. Pat. 323,277, July 28, 1902.

A SOLUTION of hæmoglobin (de-fibrinated blood) is charged with carbon dioxide, a small quantity of an alcoholic solution of vanillin added, and the whole mixed with milk to form an article of food. Sodium carbonate or sodium bicarbonate may be added to the hæmoglobin solution, and the carbon dioxide liberated by the addition of a suitable acid.—W. P. S.

Flour of High Nutritive Value, known as "Farine d'isis lécithinée." L. Prat and G. Bassot. Fr. Pat. 323,398, Aug. 1, 1902.

FLOUR of various kinds is well mixed with a dry intimate mixture of lecithin and sugar obtained by heating and well shaking together an alcoholic solution of lecithin and powdered sugar until the alcohol evaporates.—T. H. P.

Malt Flour; Manufacture of ——. J. Bartl.
Fr. Pat. 323,415, Aug. 8, 1903.

KILNED malt is moistened and crushed, and then bolted several times; the groats so obtained are freed from bran, milled and bolted with a fine cloth. The flour resulting from both operations is mixed and employed for baking purposes.—J. F. B.

Feeding Cakes and other Compressed Fodders; Process of Preserving ——. Société Nouvelle des Raffineries de Sucre de Saint-Louis. Fr. Pat. 323,467, Aug. 2, 1902.

THE cakes, bread, fodder, or the like, are coated with a composition consisting of a hot solution of glue or gelatin neutralised with sodium carbonate and mixed with a certain amount of suet or lard and a little alum.—W. P. S.

Food Products; Process of Preserving ——.
W. D. Baker. Fr. Pat. 323,458, June 24, 1902.

SEE U.S. Pat. 709,432, 1902; this Journal, 1902, 1291.
—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Lead Poisoning and Water Supplies. Report to the Local Government Board by Dr. Houston. The Public Health Engineer, March 14, 1903, 275. (See Ackroyd, this Journal, 1900, 1130.)

OWING to the prevalence of lead poisoning, attributable to water supplies derived from moorland sources, a comprehensive investigation was made as to the ability of such moorland waters to act upon lead. The ratio between the degree of acidity and the plumbo-solvent power does not appear to be the same for all peaty waters, particular waters having, within limits, their own standards in this respect. Certain spring waters have the power of neutralising the acid of peaty water, so that a water of mixed origin may remain without action upon lead. In the case of a water supply habitually acid or liable to become acid, a process of neutralisation may be carried out, the most effective method being ordinary sand filtration with the addition of some neutralising agent (*e.g.*, a thin coating of lime on the surface of the sand with limestone under the sand) to the filter, and the subsequent addition of a trace of sodium carbonate to the neutral filtered water.—A. S.

English Patents.

Water; Materials and Apparatus for Softening ——. C. E. Challis, London. Eng. Pat. 7436, March 27, 1902.

THE materials claimed are the oxalates or binoxalates of soda, potash, or ammonia, with or without the addition of ammonium chloride. Soap powder may also be added, and the mixture put up in packets containing suitable quantities for softening definite volumes of hard water. To facilitate the treatment of large volumes of water, apparatus is described for automatically measuring or weighing definite proportions of water and of the mixture for softening it.
—L. A.

Filter Construction [Water, or Sewage] and Apparatus connected therewith. S. H. Adams, Harrogate. Eng. Pat. 22,213, Oct. 13, 1902.

A number of filters or filter compartments are arranged practically on the same level, and so that each shall empty its liquid contents, preferably by means of a siphon arrangement, into that adjoining, the various filters or compartments having one or more liquid outlets common to all. The siphon or other discharge apparatus may be controlled or timed, to ensure the proper periods of filling, standing full, or emptying. (See also Eng. Pat. 9920, of 1902; this Journal, 1902, 1149.)—R. A.

Liquid [Sewage] Distributor; Rotary ——. S. H. Adams, Harrogate. Eng. Pat. 24,680, Nov. 11, 1902.

Distributing gutter arms or troughs are attached to a revolving pipe, the troughs being of such depth that the efflux of liquid from several rows of perforations shall cause the apparatus to revolve. The connections are sealed by air locks, and the cushion of air serves the purpose of making the revolving part buoyant. (See also Eng. Pat. 22,923; this Journal, 1902, 1550).—W. P. S.

Sewage Sludge; Treating ——, *for the Production of Manure.* R. England, London. Eng. Pat. 6021, March 11, 1902.

The sewage sludge is mixed with concentrated phosphates of the kind which are insoluble in water, but largely or mainly soluble in solutions of ammonium citrate, such as calcined phosphate of alumina and iron; 4 to 5 cwts. of this phosphate in 1 ton of the finished product is a suitable proportion.—L. A.

French Patent.

Water; Removing Combined Sulphuric Acid from ——. H. Reisert. Fr. Pat. 323,212, July 24, 1902.

See U.S. Pat. 713,800, 1902; this Journal, 1902, 1550. —W. P. S.

(C.)—DISINFECTANTS.

French Patent.

Sterilization of Instruments, Tools, &c. A. Saurez de Mendoza. Fr. Pat. 323,210, July 24, 1902.

Air saturated with vapour of formaldehyde is drawn or forced through the receptacle containing the articles to be sterilized.—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

Nitrocelluloses; Constitution of ——. L. Vignon. Comptes rend., **136**, [13], 818—820.

The author has extended his experiments on the reduction of nitrocelluloses by ferrous chloride; two specimens, one prepared by Lunge's method for giving the highest nitration, and containing 13·89 per cent. of nitrogen, the other prepared by the author's method (this Journal, 1898, 791), and containing 13·4 per cent. of nitrogen, were reduced by ferrous chloride, and gave oxycellulose as the result. Direct experiment showed that this oxycellulose could not have been formed by the re-oxidation of reduced cellulose by nitrogen dioxide or ferric chloride formed during the reduction, for when cellulose was heated with ferrous chloride and nitric acid no oxycellulose was produced.

The difference in behaviour between cellulose and such polyhydric alcohols as mannitol, previously insisted on by the author, is thus confirmed. (Compare this Journal, 1900, 1039 and 1045; 1901, 1244.)—J. T. D.

English Patent.

Metallic Paper, which is Air, Water, and Grease Proof; and a Process for Making the same. W. P. Thompson, London. From the Suddeutsche Patentmetall-Papierfabrik, A. G., Fürth, Bavaria. Eng. Pat. 23,425, Oct. 27, 1902.

Parchment paper is coated with a solution of resin in a volatile solvent, such as ether or spirit, dried in a current of air, warmed to render the coating adhesive, and metallic powder is then applied. The prepared paper i intended to replace tin-foil or the like for packing purposes —E. S.

French Patents.

Tissue Papers; Crêped ——. Soc. Japanese Tissue Mills. Fr. Pat. 323,148, July 16, 1902.

In a crêped tissue paper a large number of mineral particle resembling crystals (*e.g.* flakes of mica) are incorporated which owing to the folds of the paper are exposed to ligh at different angles, imparting a sparkling appearance to th paper.—J. F. B.

Paper or Board Strengthened by a Network of Inserte Threads: Manufacture of ——. O. Hoffmann. Fr Pat. 323,225, July 25, 1902.

Threads or spun fibres are incorporated in a web of pap in the longitudinal direction at definite intervals. The we is then cut into sheets which are exactly square and thes sheets are applied to another web of paper, similarly prepared, in such a way that their edges are accurately i juxtaposition and their contained threads cross the other in a transverse direction.—J. F. B.

Paper or Millboard: Corrugated, Impermeable ——. A. W. Andernach. Fr. Pat. 324,085, Aug. 28, 1902.

Corrugated paper or millboard, such as is employed fo packing fragile goods, either plain or covered with one o two layers of flat paper, is rendered impermeable by coatin or steeping with asphalt, bitumen, resin, paraffin, or othe suitable substances. It is then employed as an insulatin material against damp, its action being assisted by the layer of air enclosed between the corrugations.—J. F. B.

Viscose; Process for Preparing Alkaline Solutions of —— Soc. Vereinigte Kunstseidefabriken A.-G. Fr. Pat 323,473, Aug. 4, 1902.

100 parts by weight of cellulose, converted into viscos by Cross and Bevan's process, are dissolved in abou 1,800 parts of a solution of soda or potash of sp. gr., 1·2 (*i.e.* caustic soda or potash, three to four times the weigh of cellulose used). This mixture is heated from 60° to 80° C until a drop of the mixture, on a glass plate, plunged in strong solution of ammonium chloride, forms a solid film transparent and colourless. This removes the inconvenienc experienced in using aqueous solutions of viscose, tha sulphurised by-products are precipitated, causing the visco to be turbid and of a yellowish tint, whereas, by this process it is obtained, on neutralising the excess of alkali, as a clea colourless substance.—T. F. B.

Cellulose; Process for making Films and Threads o Colourless ——. Soc. Vereinigte Kunstseidefabrike A.-G. Fr. Pat. 323,474, Aug. 4, 1902.

Solutions of viscose are caused to pass through narro openings into moderately concentrated sulphuric acid. film or thread is formed, to which the sulphur compound give a turbid appearance. The films or threads are rolle round bobbins, which are now immersed in a bath t remove the sulphur compounds from the cellulose. Solutions of sulphydrates, sulphides, sulphites, or bisulphites o alkalis or alkaline earths are used for this purpose. Concentrated solutions will work in the cold; but dilute solution (*e.g.*, 8 per cent.) at 60°—80° C. give good results rapidl When the film or thread has become clear and colourless it is washed in hot water and dried.

The usual process, involving the use of ammoniu chloride, was long, and the films had a tendency to brea off, owing to the reagent not having penetrated the film —T. F. B.

Alkali-hydrocellulose: Process for obtaining Solutions ——, *Stable and Easily Precipitated, for Industri Purposes.* Soc. Vereinigte Kunstseidefabriken A.- Fr. Pat. 323,475, Aug. 4, 1902.

Solutions of alkali-hydrocellulose are prepared by dissolving hydrocellulose in alkali solutions. For instance 10 parts of cotton are added to 100 parts of sulphuric acid

p. gr. 1·55, and stirred, and the mixture poured into a rge quantity of water. The hydrocellulose, which separates, . dissolved in 100 parts of caustic soda solution, sp. gr. ·12. Cellulose hydrate is obtained from this solution by recipitation with acids, acid salts, or ammoniacal salts.

Solutions of caustic potash or soda of 3 to 40 per cent. in be used, a 15—20 per cent. solution dissolving about 5 per cent. of hydrocellulose.

The solutions of alkali-hydrocellulose can also be mixed ith natural silk, caseïn, albumin, &c., the product obtained ing brilliant and strong. It may take the place of llulose solution in ammoniacal copper oxide, or zinc iloride, as well as solutions of viscose, collodion, or starch.
—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Camphor; Thio Derivatives of ——. H. Wuyts. Ber., 1903, **36**, [5], 863—870.

mixture of 20 grms. of camphor, 20 grms. of solid nmonium sulphide, and 8 c.c. of alcohol, was slowly heated a sealed tube in such a way that the temperature reached)0° C. in five hours, and 150° C. after 20 hours. The roduct was washed with water, and the residual camphor as removed by distillation with steam; the yield was bout 95 per cent. of the camphor employed. The product apparently a mixture of *camphor di-* and *trisulphides* $(C_9H_{16}.CH)_2S_2$ and $(C_9H_{16}CH)_2S_3$, which, however, could ot be separated by repeated crystallisation; it is dextro- tatory.

On distillation the mixture of sulphides breaks up at temperature of about 280°—285° C. into thiocamphor, nioborneol and sulphur; some of the disulphide distils nchanged, and more or less sulphuretted hydrogen is volved.

Thiocamphor, $C_9H_{16}CS$, is a red substance melting at 18° C. and distilling with slight decomposition at 228°—30° C. It readily yields camphoroxime and camphor- henylhydrazone; the thiocarbonyl group is a chromophor. 3·64 per cent. solution of thiocamphor in ethyl acetate nows a specific rotation of $[\alpha]_D = -41° 42'$.

Thioborneol, $C_9H_{16}CH.SH$, is colourless; it melts at 61°—2° C. and distils without decomposition at 224°—225° C. 3·64 per cent. solution in ethyl acetate shows a specific otation of $[\alpha]_D = +21° 5'$. Thioborneol may also be adily obtained by the direct reduction of the mixture of mphor sulphides by means of zinc dust and hydrochloric id in ethereal solution. A little sulphuretted hydrogen is volved, probably at the expense of the trisulphide. Here so, as in the case of distillation, the disulphide shows self more resistant than the trisulphide. The proportion the thiocamphor obtained by distillation considerably ceeds that of the thioborneol.—J. F. B.

lethylmonobromocamphor, Bromomethylcamphor, and Methylenecamphor. J. Minguin. Comptes rend., 1903, **136**, [12], 751—753.

ethylmonobromocamphor, $C_8H_{14}CO:CBrCH_3$, obtained the action of bromine on methylcamphor in carbon sulphide solution, melts at 61° C., and in alcohol has the ecific rotation $[\alpha]_D = +176·8$. When heated with coholic potassium hydroxide it loses hydrobromic acid, elding methylenecamphor, $C_8H_{14}CO:C:CH_2$, which melts about 30°—35° C. and has the specific rotation $[\alpha]_D =$ 27·5°; the increase in the rotatory power due to the ouble linking is here manifest, the $[\alpha]_D$ of the corre- onding saturated compound, methylcamphor, being only ° 65′. In acetic acid solution, methylenecamphor readily sorbs hydrogen bromide giving bromomethylcamphor, $H_{14}CO:CH.CH_2Br$, which melts at 65° C., and has the ecific rotation $[\alpha]_D = +150·5°$.—T. H. P.

ntonin; Fusion of Some Typical Derivatives of ——, *with Potash.* P. Bertolo. Gaz. chim. ital., **32**, [2], 371—379. Chem. Centr., 1903, **1**, [11], 639.

rom the results of experiments with the four known smotroposantonins, with hyposantonin, santonin, metasantonin, santonic acid, santonone and isomers, the author concludes that:—(1) All santonin derivatives in which the ketone group $-CH_2.CO-$ is converted into the phenolic hydroxyl group $-CH:C(OH)-$, give, when fused with caustic potash, *p*-dimethylnaphthol, melting at 135—136° C., as chief product. The four desmotroposantonins behave in this manner. (2) All santonin derivatives in which the ketone group is reduced to the methine group $-CH:CH-$, *e.g.*, hyposantonin, give when fused with caustic potash at 360° C., *p*-dimethylnaphthalene in almost theoretical yield. (3) All derivatives, such as santonin itself, which contain the ketone group $-CH_2.CO-$ give neither *p*-dimethylnaphthol nor *p*-dimethylnaphthalene, but compounds which are partially soluble in alkali carbonate solutions and are precipitated by dilute sulphuric acid.
—A. S.

Ononin. F. v. Hemmelmayr. Monatsh. f. Chem., 1903, **24**, [2], 132—154.

A modification in the method of extracting the glucoside ononin, which greatly simplifies the process of obtaining the substance in the pure state, has recently been worked out by a German firm. The portion of the alcoholic extract of the root, which is insoluble in water, is dissolved in spirits of wine and the solution, suitably diluted, is precipitated by basic lead acetate. The excess of lead is removed from the filtrate by means of sulphuretted hydrogen and the solution is evaporated to a syrup *in vacuo*. After standing for several days the ononin separates out and is purified by recrystallisation. The product so obtained contains as an impurity only onocerin, which can easily be separated, whereas the ononin prepared in the old way is largely contaminated with pseudo-ononin. Ononetin can only be prepared in the pure state by boiling onospin in very dilute solution (1:250) with sulphuric acid. A far more convenient method consists in boiling formononetin with baryta water, but the product is contaminated with resinified matter.

Formonetin when fused with potash yields 2·4 dihydroxybenzoic acid (β-resorcylic acid); ononin therefore contains in its molecule two hydroxyl groups in the meta position with a carbon side chain contiguous to one of the hydroxyls.—J. F. B.

Hops; Essential Oil of ——. A. C. Chapman. Proc. Chem. Soc., **19**, [263], 72—73.

Since the publication of the earlier results of the study of oil of hops (this Journal, 1893, 783; and 1895, 63), three more samples of oil of undoubted genuineness have been examined. These had the following specific gravities and specific rotations:—

——	Sp. gr. 15°/15°	Sp. gr. 20°/20°	$[\alpha]_D^{20°}$
No. 5	0·8676	0·8645	+ 0·30°
No. 6	0·8639	0·8610	− 0·20°
No. 7	0·8403	0·8357	− 0·08°

The fraction of lowest boiling point, obtained after prolonged fractional distillation under reduced pressure, consisted of a hydrocarbon, $C_{10}H_{16}$, which had the following properties: sp. gr. 0·8046 at 15°/15° and 0·8020 at 20°/20°; b. pt. 74°—75° (33 mm.) and 166°—168° (774 mm.), undergoing at the same time slight polymerisation. This compound is an aliphatic hydrocarbon, $C_{10}H_{16}$, and its properties are almost identical with those of myrcene; it absorbs oxygen from the atmosphere and readily undergoes polymeric change, becoming converted into a colourless resin.

The next fraction (b. pt. 120°—130°, 46 mm.) was a very small one, and gave on analysis numbers agreeing with the formula, $C_{10}H_{18}O$. It had a sp. gr. 0·8571 at 20°/20°, and consisted of inactive linalool mixed with a small quantity of some active substance.

The third small fraction (b. pt. 135°—150°, 46 mm.) consisted of an ester, and yielded on saponification *iso*nonoic acid, $C_9H_{18}O_2$, and linalool, together with a small quantity of geraniol.

The highest and largest fractions in all three samples of oil consisted of nearly pure humulene.

The essential oil of hops therefore contains the following compounds: myrcene, humulene, linalool, linalyl *iso*nonoate, with small quantities of a diterpene and probable traces of some ester of geraniol.

In all the freshly distilled samples of oil examined, the hydrocarbons myrcene and humulene were present to the extent of from 80 to 90 per cent.

Mercurous Nitrite; Decomposition of ——, by Heat. P. C. Rây and J. N. Sen. Proc. Chem. Soc., **19**, [26], 78.

When mercurous nitrite was decomposed by heat in a tube connected with a Sprengel pump, nitric oxide escaped mixed with very little nitrogen peroxide, crystals of mercurous nitrate were projected across the upper and cooler part of the tube, just over the decomposing salt, a very little metallic mercury and its basic nitrate were deposited at the sides, whilst a small quantity of amorphous, orange-coloured mercuric oxide was left in the place of the decomposed nitrite. Except when the greater portion of the nitrate which had formed at first had been decomposed by heating more strongly, the average amount of nitric oxide produced corresponded with only 3·3 out of the 5·7 per cent. of nitrogen contained in the nitrite.

The production of mercurous nitrate was evidently due to interaction between nitrogen peroxide and mercury vapour, nitric oxide being the other product.

Vanillin; Determination of ——, in Vanillas. A. Moulin. XXIII., page 514.

Morphine; New Reactions for the Detection of ——. C. Reichard. XXIII., page 513.

Caffeine and Theobromine; Separation and Determination of ——. H. Brunner and H. Leins. XXIII., page 514.

English Patent.

Methylanthranilic Acid; Manufacture of Esters of —— [Artificial Perfumes]. O. Imray. From the Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/M. Eng. Pat. 11,179, May 15, 1902.

See Fr. Pat. 321,121; this Journal, 1903, 111. The products are intended for the manufacture of artificial perfumes.

—T. A. L.

French Patent.

Dioxynaphthylmethane; Making a Preparation of ——, soluble in Water. Soc. Septoforma, G. m. b. H. Fr. Pat. 323,230, July 26, 1902.

Dioxynaphthylmethane, $(C_{10}H_7O)_2CH_2$, as prepared by condensing naphthol with formaldehyde in the presence of hydrochloric acid, is insoluble in water.

A soluble preparation of dioxynaphthylmethane is obtained by substituting potash soap for hydrochloric acid as a condensing agent.

A solution of 0·1 part of soap in 1·5 parts of alcohol is added to a mixture of 5 grms. of naphthol and 10 grms. of a 40 per cent. solution of formaldehyde. The whole is boiled for two or three hours under a reflux condenser until the solution changes from yellow to yellowish-red, when the reaction is complete.—T. F. B.

Organic Acids; Recovery of certain ——. J. Blanchier and J.-A. Mayet. Fr. Pat. 323,437, May 12, 1902.

The specification relates to the extraction of organic acids from the grape.

The process consists in extracting these acids by the aid of suitable bases, chiefly potash or lime, from the juice of the unripe grapes. Insoluble tartrates and bitartrates together with small quantities of salts of other organic acids (*e.g.* malic, oxalic) are formed.

This process of recovering the acids of the grape before the latter has ripened, forms the principal idea of the present patent. It is naturally worked when the acid content of the fruit is at its maximum, *i.e.*, about the time when sugar begins to be formed.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Acetone as Substitute for Alkalis in Developers; The u of ——. A. L. Lumière and A. Seyewetz. Moni Scient., April 1903, **17**, [736], 257.

Eichengrün, in a discourse at the 31st Congress of th German Union of Photographers, at Düsseldorf, declar that the theory brought forward by the authors concernin the chemical explanation of the action of acetone in con bination with sulphites in photographic developers (s this Journal, 1896, 920) is altogether erroneous.

The theory referred to is that a compound of aceto with bisulphite is formed, together with the sodium salt the developer. In the case of hydroquinone, the reacti would be—

$$2(CH_3)_2CO + 2Na_2SO_3 + C_6H_4(OH)_2 =$$
$$\underbrace{2NaHSO_3 + 2CH_3CO.CH_3}_{\text{Acetone-bisulphite compound.}} + C_6H_4(ONa)_2.$$

The arguments used by Eichengrün are, (1) analysis the bath containing hydroquinone, sulphite, and aceto shows no sign of the acetone-bisulphite compound, or the sodium salt of hydroquinone. (2) Eichengrün conside it possible to have an excellent developer containing on the acetone-bisulphite compound, acetone, and hydr quinone.

In reply to the first argument, the authors cite passag from their original paper, in which they stated that th had not been able to isolate the acetone-bisulphite compour it being probable that the reaction was reversible, and th the large excess of sulphite prevented the separation the alkali-bisulphite compound; but, when a mixture acetone, sodium sulphite and hydroquinone is evaporat to dryness *in vacuo*, and the resulting dry residue boil with excess of alkali, a small quantity of acetone liberated, whereas, working with sulphite and acetone alo negative results were obtained. Another confirmation the theory is, that, in the presence of acetone, less hyd quinone could be extracted with ether than if aceto were absent. In aqueous solution, the same quantity acetone has no effect on the solubility of the hydroquino in ether. The authors have carried out a series of exp ments to establish this last fact, and they find that, (1 large excess of acetone, in presence of excess of sulphi prevents the conversion of the whole of the hydroquinone the alkali salt. (2) In the absence of sulphite, the prese of acetone diminishes the solubility of hydroquinone in wat (3) The presence of sulphite and acetone together co siderably diminishes the quantity of hydroquinone extrac by ether. The authors consider these results to con their statements in the original paper.

Another series of experiments was carried out to m the second argument of Eichengrün; several different co binations of solution, containing acetone, acetone-bisulph compound and hydroquinone, were tried as developers, no image was obtained on a fully exposed plate after minutes. On the other hand, two halves of an expo plate were developed in baths each containing one part hydroquinone, one part of acetone-bisulphite compound, eight parts of acetone to 100 parts of water. To one these solutions 0·5 part of anhydrous sodium sulphite added with the result that an image appeared in 15 min while the other bath gave no result after 20 minutes.

The authors also refer to the action of trioxymethyl as being analogous to that of acetone, as was pointed ou a previous communication (see this Journal, 1903, 318) which it was shown that trioxymethylene hinders extraction of hydroquinone from aqueous solutions by et

—T. F

English Patents.

Actinometer and Exposure Meter, also a Machine Manufacturing the same, and Testing Photogra Plates, Papers and the like. G. W. Powell, Manche Eng. Pat. 5628, March 7, 1902.

The actinometer consists of an ordinary dry-plate or containing a duplicated series of densities; this is for exposing the plate to a series of eight geometrically ated light intensities parallel to its vertical edges, and n to the same series of light intensities parallel to its rizontal edges. This plate, when developed, will contain 8 light intensities are used) 64 partitions and 32 ferent densities ranging from 1 to 128 in intensity.

By this apparatus a double series of densities is obtained each exposure, thus affording a means for comparing cesses, papers, &c.

A machine for producing the actinometer is also de-ibed.—T. F. B.

otography in Natural Colours. E. R. Clarke, London. Eng. Pat. 9184, April 21, 1902.

E paper or other material to be printed on (which must be smooth) is mounted on glass by, for instance, lodion solution, and varnished with a material unaffected aniline dyestuff solutions. The varnished support is n coated with bichromated gelatin (enough chloral lrate or similar substance must be used to make the atin melt at about 70° F.) Fish glue or caseïn may be stituted for gelatin.

he support is now dried and printed behind one of the al three-colour negatives. After exposure, the soluble oid is washed away, preferably in a solution of the same oid, and the print immersed in a dye bath containing a our complementary to that of the screen through which negative was taken. When the print has absorbed icient dye, it is rinsed, dried, and varnished. It is then oated with bichromated gelatin, the second negative ced in register upon it, and printing and subsequent cesses carried out as before, the treatment being repeated the third negative.

A method is also described for determining the depth to ch dyeing must be carried in each operation, to avoid necessity for a fourth printing and dyeing in any he colours.—T. F. B.

United States Patents.

otographic Emulsion, and Process of making same. I. Lüttke, Hamburg. U.S. Pat. 722,238, March 10, 903.

ad sulphate is added to a silver emulsion, in which from to 50 per cent. of the total amount of silver in the lsion is combined with chlorine.—T. F. B.

ns on Plate Glass or other Transparent Bodies ; Production of ——. J. E. Reynolds and G. R. Grubb, ublin. U.S. Pat. 722,901, March 17, 1903.

Eng. Pat. 4420 of 1901 ; this Journal, 1902, 366.]
—T. F. B.

tographic Film. W. H. Smalley, London. U.S. Pat. 723,054, March 17, 1903.

upport is first supplied with a layer of sensitised tin, and on this is placed a thin covering layer of sparent, non-sensitised, hardened gelatin, or the film of itised gelatin may be enclosed between two thin pro-ing layers of transparent, non-sensitised, hardened tin.—T. F. B.

ting Surfaces ; Method of Producing ——. O. Förster, ondon, Assignor to Universal Chromephoto Engraving ompany, New York. U.S. Pat. 723,198, March 17, 903.

nting surfaces are produced on lithographers' stones etal plates by coating the base with "a sensitized film aining salts which, when the film is dry, crystallise out orm a fine even surface grain or stipple." A picture is ted on this surface through a negative, and the whole hed, inked, and etched.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

rocellulose and Nitrocellulose Powders ; Stability Tests r ——. A. P. Spy. J. Franklin Inst., 1903, **155**, 3], 161—180.

author gives a review of the more important stability , especially those used at the Frankford Arsenal, U.S.A. The Abel test is too much influenced by various conditions to be considered reliable. The zinc-iodide starch modification is more sensitive than the Abel test, and has all the weak points of the latter. Guttmann's diphenylamine test (this Journal, 1897, 283—290) is stated to give unsatisfactory results. Hoitsema's test (this Journal, 1899, 857) is too sensitive, and the reaction may be masked. The explosion test, which consists in gradually heating 0·1 grm. of the sample in a strong test-tube on an oil-bath until explosion occurs, can only be regarded as a rough guide to stability, but is of some value in conjunction with other tests. The Thomas test (this Journal, 1898, 1180) is stated by Aspinwall (this Journal, 1902, 687) to be open to the objection that the length of time required to obtain definite results is too great. The 135°, or German test, is regarded by the author as one of the best of the stability tests. The Vieille test (this Journal, 1902, 688) suffers from the defects :—(1) Only acid products of decomposition are shown. (2) It is practically impossible to get all the Vieille bottles equally tightly closed, and consequently the pressure varies in different experiments. (3) Varying results are obtained, unless the litmus papers be uniform. The Will test (this Journal, 1901, 609—617 ; 1902, 1470, 1554, 1555) gives unsatisfactory results, the defective features being as follows :—(1) The temperature of 135° C. is too high for stability testing purposes. (2) The decomposition is measured only by the nitrogen evolved. (3) It is not very clear where the line is to be drawn between a stable and an unstable product. (4) Since in the test the amount of unchanged material is constantly decreasing, it does not seem probable that, even with a perfect product, equal amounts of nitrogen would be evolved in equal intervals of time. (5) It is practically impossible to get carbon dioxide free from air, and as it is exceedingly difficult to pass the gas through the apparatus at a uniform rate, its air-content gives rise to serious errors. If the carbon dioxide be passed too quickly, it is not sufficiently heated in the preheating coil before it comes in contact with the sample, and it also may not be completely absorbed by the caustic soda ; if it be passed too slowly, the gases of decomposition are not carried away fast enough, and this may affect the course of the decomposition. (6) Quite unstable products are liable to explode.

At the Frankford Arsenal all nitrocelluloses and nitrocellulose powders are examined by the Abel test, the explosion test, the 135° C. test, and the Vieille test, and it is stated that a careful application of these four tests allows of the detection of an unstable product.—A. S.

Phosphorus Sesquisulphide. J. Mai and F. Schaffer. Ber., **36**, [5], 870.

The sesquisulphide of phosphorus, P_4S_3, made by heating red phosphorus and sulphur together in an inert atmosphere, is now extensively used as a substitute for yellow phosphorus in the manufacture of matches. In examining it for yellow phosphorus, from which it must be free, Mitscherlich's method is generally used. The author shows, however, that even perfectly pure phosphorus sesquisulphide will, when steam-distilled, give off a small sublimate, which smells somewhat like phosphorus, and glows in the dark at temperatures above 40° C., although the glow is different from that of yellow phosphorus. He also shows that if pure phosphorus sesquisulphide is heated to boiling in an atmosphere of carbon dioxide, a small quantity of free yellow phosphorus is formed, and that consequently, if the sulphide is heated too strongly (above 340° C.) in the process of manufacture, it will contain some yellow phosphorus.—A. G. L.

Phosphorus ; Investigations on ——. R. Schenck. VII., page 494.

English Patents.

Smokeless Powder Grains ; Improvements in ——, *and in Cartridges and Charges especially adapted for use in Large Guns.* H. Maxim, Brooklyn, U.S.A. Eng. Pat. 9480, April 24, 1902.

The rods of smokeless powder have longitudinal perforations extending through their whole length, and also latera vents connected with the same. The perforations facilitate the ignition of the charge, while the vents allow of the escape of the products of combustion, thus preventing disruption of the grain. The rods have also transverse indentations so arranged as to leave equal burning thicknesses between perforations, vents, and indentations. In a charge the rods are arranged about a core of quick-burning powder. See also Eng. Pat. 9181 of 1902; this Journal, 1903, 441.—G. W. McD.

Matches and Striking Compositions: Manufacture of ——, and Substances and Processes employed therein. F. Bale, Droitwich, Worcestershire. Eng. Pat. 10,655, May 9, 1902.

If naphthalene and phosphorus are brought together in presence of water at 80° C., a phosphide is formed, and this compound is used in the paste instead of phosphorus. The following composition is given as an example:—Potassium chlorate (53), manganese dioxide (15), naphthalene tetraphosphide (20), glue (35), water (43). Other hydrocarbons of this series may also be used.—G. W. McD.

United States Patents.

Explosives, Celluloid or the like; Manufacture of ——. R. Robertson and W. Rintoul, Waltham Abbey, England. U.S. Pat. 723,311, March 24, 1903.

See Eng. Pat. 25,991, 1901; this Journal, 1903, 441.

—G. W. McD.

Shrapnel Shells, &c.; Smoke-generator for ——. C. V. Schou, Copenhagen. U.S. Pat. 723,737, March 24, 1903.

The composition consists of sublimated zinc (65 parts) and flowers of sulphur (32 parts).—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Pigments derived from "Radix Anchusa Tinctoria," and their Use as Indicators. A. Gawalowski. Zeits. anal. Chem., 1903, **42**, [2], 108—109.

Alkanna-Red obtained from *radix anchusa tinctoria* by extraction with a mixture of alcohol and ether, is turned indigo-blue by alkalis and violet-blue by ammonia. It has the empirical formula, $C_{30}H_{28}O_8$, and is a very sensitive indicator. Anchusa-red, extracted from the root by means of benzene, has the formula, $C_{30}H_{39}O_7$, is changed by ammonia into a violet-green colour, and by other alkalis into a sap-green. Alkanna-green, $C_{34}H_{41}O_8$, is obtained by exposing alkanna-red to the action of light in the presence of alcohol, the action being, in part, due to other extractives from the root. These two latter pigments, anchusa-red and alkanna-green, are useless as indicators.

—W. P. S.

Organic Matter [Determination of Arsenic]; Decomposition of ——, by Caro's Acid. N. Tarugi. Gaz. chim. ital., **32**, [2], 380—382. Chem. Centr., 1903, **1**, [11], 668.

In order to avoid loss caused by the formation of volatile compounds in the destruction of organic matter previous to the determination of arsenic, the author recommends the use of per salts. For example, the organic substance is allowed to stand in contact with powdered potassium percarbonate and a few c.c. of water, for 12 hours, and the mixture then boiled for about one hour in a large dish, after, if necessary, a further addition of percarbonate. In this way arsenic compounds are oxidised to arseniates, whilst no loss by volatilisation occurs. After cooling, the supernatant liquid is decanted off, and the residue treated with a mixture of concentrated sulphuric acid and solid ammonium persulphate (Caro's acid). The mixture is heated till it is converted into a clear liquid, and further small quantities of ammonium persulphate are added till the solution is completely decolorised. The alkaline solution obtained previously, is evaporated to dryness, and to the residue is gradually added the acid solution of the completely decomposed organic matter. The quantities recommended are equal parts of organic substance an percarbonate, and about half the amount of water, als five parts (reckoned on the organic substance) of pu concentrated sulphuric acid and a similar amount ammonium persulphate. In a trial determination th author found 99·4 per cent. of the amount of arsenic take

—A. S.

Metals; Influence of the Nature of the Cathode on th Quantitative Separation of ——, by Electrolysis. Hollard. Bull. Soc. Chim., 1903, **29**, [6], 217—221.

In electrolytic analysis, metals may be divided into tw classes, according as to whether they can or cannot deposited on the cathode in strongly acid solution. Tho which cannot be deposited are those which require, cover the cathode, a higher tension than that at whi hydrogen commences to be evolved. Nernst and Wil more (Zeits. f. Elektrochem., Nov. 8, 1900,) have dra up a table showing the tensions of polarisation of vario metals as compared with that of hydrogen. From this appears that zinc, cadmium, iron, cobalt, nickel, tin, a lead cannot be deposited on the cathode. In analys however, these results are different, since platinum is usual cathode used, and the tension of hydrogen var with the metal used as a cathode. From this the auth sees the possibility, by varying the nature of the catho of separating metals from one another by choosing cathode such that the tension of hydrogen for that pa ticular one lies between the tensions of hydrogen for metals to be separated.

Caspari has drawn up a table showing the tensions hydrogen for many different cathode metals (Zeits. ph Chem., 1899, **30**, 89). In choosing the metal for catho the author points out that as soon as it gets covered w the metal under examination the nature of the cathode changed, and it behaves as a cathode of the metal w which it is coated, so that this metal must also have lower polarisation tension than that of hydrogen refer to the metal. The authors have found this method su cessful in separating zinc and cadmium by using cadmi or tin cathodes in acid baths. Platinum cathodes broug about no separation. The cathodes consisted of platin foil coated with cadmium and tin respectively.—T. F. B.

Zinc; Electrolytic Separation and Determination of ——. A. Hollard. Bull. Soc. Chim., **29**, [7], 266—269.

Two methods are given. 1. *Double cyanide of zinc a potassium with great excess of soda.* To the solution of z sulphate containing a slight excess of acid, sodium hydrox is added till alkaline, then 15 to 80 c.c. of the same so tion (density 1·12), and 10 c.c. of 20 per cent. potassi cyanide solution, the whole being made up to 300 c.c. current of 0·1 ampère is used, with the author's electrod, the gauze cathode having been previously coated elect lytically with copper. The deposit is of a fine bluish wh colour, and can be obtained of considerable thickness—1 g is easily deposited. Zinc is completely separated fr aluminium by this method. Iron, if present, is precipita by the soda. The precipitate is allowed to settle to bottom, the anode plunged into it, and all the zinc in so tion deposited. Then the cathode is taken out, the liq filtered from the precipitate, the latter dissolved in as li sulphuric acid as necessary, and re-precipitated by s The original filtrate is now added to this, the electrodes inserted after the precipitate has settled, and the zinc solved from the iron precipitate deposited over that alre on the cathode. Zinc cannot be separated from nickel this process. 2. *Sulphate of zinc with salts of orga acids and a slight excess of acetic acid.* This method c not be used in presence of iron; the latter deposits on cathode in a state of oxidation or of saline combination yet determined. Nor can aluminium be thus separated f zinc; alumina is precipitated by the reagents and ca some zinc with it. (Compare this Journal, 1897, 763.)

—J. T.

Antimony; Electrolytic Separation and Determinatio of ——. A. Hollard. Bull. Soc. Chim. **29**, [7], 262—

The author has already objected to Classen's metho of depositing antimony from the solution of the sulphid in icentrated sodium sulphhydrate solution, that the sodium npound dissolves perceptible quantities of copper sulde, if present, and the copper becomes deposited with the imony. He now finds that the conversion of the copper o complex cyano-cupric ions by the addition of potassium inide completely overcomes this difficulty. The addition the cyanide at the same time lessens the solvent effect the antimony of the polysulphides formed at the anode, ed by Ost and Klapproth, and renders unnecessary the ous diaphragm employed by those authors. The details the author's method are as follows:—Dissolve the antiny (as sulphide, or as oxide rendered slightly alkaline by la) in a mixture of 200 c.c. of sodium sulphhydrate of isity 1·220 to 1·325 and 40 c.c. of 20 per cent. potassium nide solution. Plunge the electrodes (see this Journal, 00, 562, but the cathode is preferably of gauze, not of) completely into the solution, and electrolyse with a rent of 0·1 ampère. Tin in quantities below 1 grm., and pper in quantities below 0·05 grm., do not interfere; nor s arsenic, provided it be present in the arsenic condition. —J. T. D.

sulphates; Contribution to the Study of ——. [*Determination of*]. N. Tarugi. VII., page 493.

ORGANIC—QUALITATIVE.

osterol, A possible Test for Maize Oil. A. H. Gill and . G. Tufts. J. Amer. Chem. Soc., 1903, **25**, [3], 54—256.

e fact that maize oil contains sitosterol (see under XII., e 501), whilst cotton-seed oil contains phytosterol, is gested as the basis of a method for detecting maize oil in on-seed oil. As phytosterol acetate is somewhat more ible in alcohol than sitosterol acetate, experiments were le to determine the possibility of recrystallising the mixed tates so as to obtain a portion with the same melting point sitosterol acetate. Pure cotton-seed oil and mixtures of on-seed oil with 10 and 20 per cent. of maize oil were onified with alcoholic potassium hydroxide, the dry soap, on evaporation, dissolved in 40—50 c.c. of water, and the tion extracted with 75 c.c. of ether and 3 c.c. of alcohol. extracts, after being washed with water and evaporated, e the following amounts of residue:—Pure cotton-seed 0·095 per cent.; mixture with 10 per cent. of maize 0·12 per cent.; and mixture with 20 per cent. of maize 0·164 per cent. In each case 50 grms. of the original were taken.

he crystals were boiled for an hour with an excess of ic anhydride in a beaker covered with a watch-glass taining a little water, after which the excess of acetic ydride was evaporated and the acetates recrystallised n dilute alcohol. After the sixth and subsequent retallisations, the melting points of the crystals dried at ' C. were as follows:—Pure cotton-seed oil, 120°— ' C.; 10 per cent. of maize oil, 121·5°—122·5° C.; 20 per cent. of maize oil, 124°—125° C. By dissolving e acetates in just sufficient hot 95 per cent. alcohol, and ing the solution, the melting point of the crystals from 20 per cent. mixture was raised to 126°—127° C., ist that of the acetate from the 10 per cent. mixture ained unchanged.

he crystals deposited by slowly cooling the solution in per cent. alcohol, were transparent flat needles in the of pure cotton-seed oil and in the mixture containing er cent. of maize oil, whilst the 20 per cent. mixture ded crystals which, in addition to these needles, also ained opaque, white granular forms.

n the authors' opinion this test is capable of detecting addition of 10 per cent. of an oil containing sitosterol to iytosterol oil.

ince Bömer and Winter have prepared acetates melting 28° C. and higher from linseed, rape-seed, and sesamé the authors point out that sitosterol is also probably ent in these and other oils, and that therefore the test only be regarded as conclusive of the presence of maize when the absence of other oils is assured by the usual sical and chemical determinations.—C. A. M.

Morphine; New Reactions for the Detection of ——. C. Reichard. Zeits. anal. Chem., 1903, **42**, [2], 95—100.

CONCENTRATED sulphuric acid is added, drop by drop, to a 1 per cent. solution of ammonium metavanadate until the yellow coloration at first formed, disappears. On adding morphine, preferably in the solid state, and warming, a bright green coloration is produced. With more dilute solutions, a bluish-green colour is obtained. The coloration is very stable. An acidified solution of sodium tungstate (0·1 per cent.) gives, with morphine, a violet coloration, which disappears after a time, whilst tungstic acid is deposited. Stronger solutions give no coloration. By dissolving titanic acid in concentrated sulphuric acid, cooling, and adding a morphine salt, a black coloration is produced at the points of contact. On shaking, the colour changes to blood-red. No water must be present, otherwise the coloration fails to appear.—W. P. S.

ORGANIC—QUANTITATIVE.

α- and β-Ethylnaphthylamines; Determination of ——. W. Vaubel. Chem.-Zeit., 1903, **27**, [24], 278—279.

FOR determining the content of α- or β-ethylnaphthylamine in the corresponding commercial product, the following methods give good results:—

(1) *α-Ethylnaphthylamine.*—Three grms. of the sample are dissolved in glacial acetic acid, and potassium bromide and sulphuric acid added to the liquid; the white sulphate which separates out does not interfere with the reaction. Standard potassium bromate solution is then run in until the colour of the bromine formed, persists. The bromine acts partly as a substituent and partly as an oxidising agent, the total reaction being expressed by the equation—

$$2C_{10}H_7.NHC_2H_5 + HBrO_3 + 5HBr =$$
$$NHC_2H_5.C_{10}H_5 : C_{10}H_4Br.NHC_2H_5 + 5HBr + 3H_2O.$$

(2) *β-Ethylnaphthylamine.*—In this case the course of the action is different; no sulphate is deposited, and the total reaction is expressed by the equations—

$$HBrO_3 + 5HBr = 3Br_2 + 3H_2O, \text{ and } 2C_{10}H_7NHC_2H_5 + 4Br_2$$
$$= NHC_2H_5.C_{10}H_6.C_{10}H_4Br_2.NBrC_2H_5 + 5HBr.$$

—T. H. P.

Glycerin; Determination and Organic Analysis of very Small Quantities of ——. M. Nicloux. Bull. Soc. Chim. 1903, **29**, [6], 245—249.

THE author proposes to estimate minute quantities of glycerin by the same method as he used for estimating methyl alcohol, formaldehyde, and formic acid. (See this Journal, 1897, 941.)

The method consists of titrating a mixture of 5 c.c. of the liquid containing glycerin (not more than 1 grm. per litre) and 5 to 7 c.c. of concentrated sulphuric acid (1·84 sp. gr.) with a solution of potassium bichromate (crystallised) containing 19 grms. per litre. The solution is heated strongly between each addition of bichromate, which is added till the blue-green colour changes to a permanent yellowish-green. The number of c.c. of bichromate solution used, divided by 2,000, gives the glycerin content in grms. per c.c.

The method may be checked by estimating the amount of carbon dioxide evolved in the oxidation. This consists in adding the mixture of glycerin solution and bichromate (the quantity of which is determined by titration as above) to 10 c.c. or more of concentrated sulphuric acid in a closed tube from which the air has been removed. The substances are mixed intimately by inclining the tube several times. The reaction is finished by immersing the tube in an oil-bath heated to 140° C.

The gases are now withdrawn by means of a mercury pump, and passed into a graduated vessel. Readings taken before and after the introduction of a piece of caustic potash, show, by difference, the amount of carbon dioxide produced.

These two methods gave, in the author's hands, very concordant results.—T. F. B.

Glycerin; Volatilisation of ——, in Steam. M. Nicloux. Bull. Soc. Chim., **29**, [7], 283—285.

For the volatilisation of glycerin the author uses steam at 100° C. in the vacuum of the mercury pump. The steam is generated in a flask of 1,500 c.c. capacity, provided with a tube once bent to deliver the steam, and one twice bent, dipping into mercury, to serve as manometer and safety-tube. The liquid is introduced into a 250 c.c. flask, provided with a drawn-out elbow tube reaching nearly to the bottom, to connect with the steam-supply, a capillary tube bent to an acute angle, and furnished with a thick rubber connexion and pinch-cock, for the introduction of the liquid, and a swan-neck tube connected by rubber-tube and pinch-cock with the condenser. The condenser is in turn connected with the pump. The end of the operation is ascertained by collecting separately 5 c.c., adding 0·1 c.c. of potassium bichromate solution (9·5 grms. per litre) and a little sulphuric acid; the persistence of the yellow colour shows the absence of glycerin. The collected distillates are concentrated by evaporation in a flask (which involves no loss of glycerin), and the glycerin is determined by the author's method. (See preceding abstract.)—J. T. D.

Vanillin; Determination of ——, in Vanillas. A. Moulin, Bull. Soc. Chim., **29**, [7], 278—280.

A colorimetric method, depending on the conversion by fuming nitric acid of the $:C_6H_3OCH_3$ group in vanillin into methyl picrate. A colorimetric scale is prepared by dissolving 0·5 grm. of vanillin in 20 c.c. of a mixture of 100 c.c. of acetic acid and 20 c.c. of sulphuric acid, adding a few crystals of potassium nitrate, warming for an hour on the water-bath at 60° C., and allowing to stand 12 hours. The liquid is then poured into a measuring tube, and made up, with the washings of the vessel and with water, to 100 c.c. Portions of 2, 4, 6, &c. c.c. of this, corresponding to 1, 2, 3, &c., centigrams of vanillin, are made up to 100 c.c., and form a comparison scale. To test a parcel of vanilla, a sample of 3 to 6 grms. is drawn from it, broken up finely, introduced into a stoppered flask, and exhausted with ether (150 to 200 c.c., in fractions of 50—60 c.c. at a time). The ethereal solution is decolorised by 10 grms. of animal charcoal, filtered, the charcoal washed with ether, and the filtrate and washings evaporated. The residue is dissolved on the warm water-bath in 20 c.c. of the sulphuric-acetic acid mixture, potassium nitrate added, and after warming and standing, the liquid and washings are made up in a measuring cylinder to about 75 c.c. The resinous precipitate that forms, is filtered off, and the filtrate and washings made up to 100 c.c. By comparison with the standard scale the amount of vanillin present is determined. Many trials, with known quantities of vanillin alone and mixed with other substances, as also comparisons of this and of the gravimetric method with vanilla samples, have shown that the method is accurate.—J. T. D.

Caffeine and Theobromine; Separation and Determination of ——. H. Brunner and H. Leins. Zeits. anal. Chem., 1903, **42**, [2], 117—118.

The substance, such as coffee, kola, cocoa, or maté, is boiled for 30 minutes, with 500 c.c. of water, under a reflux condenser. The solution is then precipitated with freshly-prepared lead hydroxide, until colourless, heated again to boiling for 15 minutes, and filtered. The residue is washed twice with 500 c.c. of water, the filtrate and washings being reduced, by evaporation, to a volume of 500 c.c. Carbon dioxide is led through the boiling solution, the precipitated lead carbonate is filtered off, and the filtrate evaporated on the water-bath, after adding some quartz-sand. The residue obtained, is extracted for eight hours with ether in a Soxhlet apparatus. After distilling off the ether, the residue is boiled out three times with 50 c.c. of water, and filtered, when cooled to 50° C. On evaporating and drying at 80° C., the two alkaloids are obtained as a white ash-free product.

Separation.—The mixed alkaloids are dissolved in hot water, precipitated with silver nitrate, the precipitate re-dissolved in 2—3 c.c. of ammonia, and the solution warmed to expel the latter, dust and a strong light being avoided. After cooling to 30° C., the precipitated silver-theobromi is collected on a weighed filter, washed, and dried 100° C. The substance has the formula $C_7H_7AgN_4O_2$.

The filtrate is treated with sodium chloride, filtered, a evaporated on the water-bath. The caffeine is extract from the residue with ether, the latter is evaporated, a the alkaloid dried at 100° C., and weighed.—W. P. S.

Glycuronic Acid; Determining ——. D. J. Naidt Dissert. St. Petersburg, 1903. Biochem. Centralbl., 19 **1**, [7], 258.

The best method of isolating glycuronic acid is in the fo of its normal salt, whilst the basic salt has not been fou suitable. The author also condemns the use of *p*-bron phenyl-hydrazine as a reagent. Glycuronic acid forms characteristic osazone (m. pt. 190°—192° C.) with phen hydrazine hydrochloride, which gives a suitable means identifying the acid. Other reactions can only be regard as affording confirmatory evidence.—C. A. M.

XXIV.—SCIENTIFIC & TECHNICAL NOTES

Colloidal Silver; Preparation of ——. Danlos a A. Cothereau. Bull. gén. de Thérap., **145**, Biochem. Centralbl., 1903, **1**, [7], 261.

A solution of 100 grms. of citric acid is treated w ammonia until just alkaline to phenolphthalein, and is th diluted to 500 c.c., and mixed with 500 c.c. of a solution 186 grms. of ferrous ammonium sulphate; the whole is th diluted with about 1½ litres of water. It is then trea with 100 c.c. of a 20 per cent. solution of silver nitrate, ad little by little with continual shaking, and the result brown precipitate transferred to a filter, washed as rapi as possible with a little water, and dried *in vacuo* over phuric acid, or in an oven at 50° C. The product, wh resembles the German *collargol*, contains 97 per cent. silver, with traces of iron and citric acid, and is complet soluble in water, and non-dialysable.—C. A. M.

Contact-Catalysis; A Periodic ——. G. Bredig a J. Weinmayr. Zeits. physik. Chem., **42**, 601— Chem. Centr., 1903, **1**, [12], 685.

If mercury be introduced into a solution of hydro peroxide, the latter is decomposed and oxygen is evol The evolution of gas is periodically stronger and weak; for example, in one experiment the amounts of hy gen peroxide decomposed in successive periods of minutes, were 0·24, 0·55, 0·33, 0·84, 0·18, 1·05, 0 0·83. In the purest 10 per cent. hydrogen peroxide, mercury becomes covered with a glistening, golden-bro coloured film, and the evolution of gas begins. Sudde the evolution of gas ceases, then begins again, and so till finally the reaction proceeds uniformly to the end; mercury is then found to be covered with a precipit probably of mercurous oxide. The periodicity is preve by alkalis, sodium sulphate, potassium nitrate, potass chlorate, and sodium carbonate, which cause a vio evolution of gas; and by acids, potassium chloride, potassium bromide, in presence of which the evolution gas is weaker.—A. S.

Dextrose; Compound of ——, with Aluminium Hydrox A. C. Chapman. Proc. Chem. Soc., **19**, [263], 74

The author has obtained a compound of dextrose w aluminium hydroxide by the following process:—

To a solution of 8 grms. of pure anhydrous alumin chloride in about 1,500 c.c. of 90 per cent. alcohol, powd dextrose was added until it no longer dissolved, after all ing the mixture to remain some time in a warm place. white, gelatinous precipitate immediately produced adding aqueous ammonia in slight excess to the filt solution, was collected, washed with 90 per cent. alcol. and dried until of constant weight in an exhau desiccator over sulphuric acid. It was not found pos repeated washing to remove the last trace of chlorine, small quantity invariably remaining, apparently in the m of a basic chloride.

It appears probable that the white, flocculent precipitate a compound of 3 mols. of dextrose with 5 mols. of minium hydroxide [$3C_6H_{12}O_6$, $5Al_2(OH)_6$], and that this npound, when dried in an exhausted desiccator over phuric acid, loses approximately 4 mols. of water.

This aluminium compound is a white, amorphous subnce, insoluble in water and alcohol, but dissolving in ute acids. It differs from the similar compounds of ctrose with the oxides of iron and chromium in being oluble in water when freshly precipitated; with boiling ter, it undergoes partial decomposition into aluminium ide and dextrose. On drying for some hours at 100° C., substance lost 12 per cent. of its weight and acquired a e yellow colour, but did not char appreciably at this nperature; it burned with extreme readiness when ated more strongly, yielding a mixture of the metallic de mixed with carbon, the final residue after prolonged ition consisting of aluminium oxide.

New Books.

nes and Quarries. General Report and Statistics or 1901. Part IV. British, Colonial, and Foreign Statistics. [Cd. 1506.] Price 1*s.* 7*d.*

is return, which is compiled annually in the Home ice, contains statistics and general information in regard the mineral output of various foreign countries and tish possessions, the figures given being brought down most cases to the year 1901. It appears from the tistics contained in the report that the number of persons gaged in mining and quarrying at home and abroad eeds 4,500,000, of whom, roughly speaking, one-fifth are ployed in the United Kingdom and one-third in the tish Empire. The total amount of coal produced in the rld amounted in 1901 to 789,000,000 metric tons, of ich the United States yielded rather more than one-third l the British Empire rather less than that proportion. e quantity of iron produced in 1901 amounted to over ,000,000 metric tons, to which total the United States tributed 16,000,000 metric tons, the British Empire 00,000, and Germany about 4,361,000 tons.

e Elektrochemie und die Metallurgie der für ie Elektrochemie wichtigen Metalle auf der ndustrie- und Gewerbe-Ausstellung in Düsseldorf, 1902. Von H. Danneel, Ph.D. Verlag von Wilhelm Knapp, Halle a. S. 1903. Price M. 6.

arto volume, practically reprint of Reports from the *eitschrift für Elektrochemie.*" It contains 81 pages of ject-matter, with 66 illustrations, followed by an alphaical index of subjects and names. The following jects are treated of:—A. Introduction. Minerals. rking up. Coal used. Ores. Smelting, &c. B. Inuction and Scientific Apparatus. C. Preparation of s. D. Ores worked up and Metals won. E. Prepara of Metals and Employment of same. F. Miscellaneous. ours. Inorganic Chemicals. Artificial Carbons and mps.

s Neue Institut für Metallhüttenwesen und lektrometallurgie an der Königlichen Techischen Hochschule zu Aachen. Dr. W. Borchers, rofessor für Metallhüttenkunde und Elektrometallurgie. bschnitt: Elektrische Messinstrumente. Bearbeitet on Dr. H. Danneel. Verlag von Wilhelm Knapp, alle a. S. 1903. Price M. 6.

arto volume, like the preceding, descriptive of the New titute for Practical Metallurgie and Electrometallurgy in Royal Technical High School of Aachen and its various artments. Sixty-one pages of subject-matter, with 89 strations, describing models and apparatus, &c.

Notes on Metallurgical Analysis. Arranged for Students in Metallurgical Chemistry. Selected Methods for the Analysis of Iron and Steel and of the Materials used in their Manufacture, including the Analysis of Gases, Fuels, Water for Boiler Supply, &c. Together with Explanatory Notes on the Manipulation and Chemistry of the Various Processes. By Nathaniel W. Lord, E.M., Professor of Metallurgy and Mineralogy at the Ohio State University, and Consulting Chemist of the Ohio Geological Survey. Second Edition, re-written and greatly enlarged. Columbus, Ohio, U.S.A. 1903. Price $2.50, post free.

The book contains 228 pages of subject-matter, with 17 illustrations of apparatus, &c. The leading subjects are as follows:—I. Obtaining and Preparing Samples for Analysis. II. Analysis of Limestones. III. Determining Iron in Ores. IV. Determination of Phosphorus; V. of Silicon in Iron; VI. of Manganese; VII. of Sulphur; VIII. of Carbon in Iron and Steel; IX. of Titanium; X. of Nickel in Iron and Steel; XI. of Tungsten and Chromium in Steel. XII. Analysis of Furnace and Flue Gas. XIII. Analysis of Blast Furnace Slags; XIV. of Fire Clays. XV. Determining Copper in Ores. XVI. Assay of Zinc Ores. XVII. Analysis of Alloys of Lead, Antimony, Tin, and Copper. XVIII. Examination of Water for Boiler Supply. XIX. Tables, &c.

Trade Report.

I.—GENERAL.

Mineral Production of Canada.

Eng. and Mining J., March 14, 1903.

The following approximate statistics have been issued by the head of the Mines Bureau of the Geological Survey. The quantities given are in short tons.

The total pig-iron production amounted to 357,903 tons, of which it is estimated 71,665 tons were obtained from Canadian ore, the remainder being imported.

Other metals produced were, lead 11,500 tons, nickel 5,350 tons, and zinc 83 tons.

Classed as "non-metallic" may be noted, asbestos 31,779 tons, coal 7,639,255 tons, coke 506,466 tons, Felspar 7,576 tons, gypsum 332,045 tons, limestone 293,108 tons, baryta 1,096 tons, ochre 4,955 tons, pyrites 35,616 tons, and salt 63,056 tons.

In addition to these, cement (natural rock) was produced to the extent of 124,400 barrels, and Portland cement, 594,594 barrels; while petroleum is reckoned at 521,485 barrels.

Lead, silver, and pig-iron (from Canadian sources) and petroleum show a decreased yield and value at the same time, whilst copper, nickel, and pig-iron (from all sources) among metals, and coal, coke, cement, gypsum, and salt, among minerals, showed increases in quantity.

The values of copper (metal), and asbestos, petroleum, and salt, showed decreases, whilst other minerals, notably cement, coal, and coke, showed increased values.

The total production in 1902 is valued at 65,000,000 dols. against 66,700,000 dols. in 1902.

The total metallic products show a decrease of over 15 per cent., whilst the non-metallic group shows an increase of over 20 per cent.—T. F. B.

Chemical Industry in Russia.

St. Petersburg Messenger, through U.S. Cons. Reps.

The feature of last year was the suspension of the import of chemical products and the decrease in their prices, due to competition and improvements in manufacture. The demand for mineral acids, salts, and alkali has been largely supplied by home manufacturers, the import being confined to small ports and frontier towns. In addition to the works at Warsaw and Moscow, a new plant, with modern improvements, was completed at St. Petersburg, which caused, during the last year, a reduction of 30 per cent. in the price of sulphuric acid and its by-products.

There has been a marked increase in the amount of sulphur and pyrites produced and a decrease in their import, viz.:—

—	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Sulphur	17,918	15,319	1,512
Pyrites	73,934	60,018	50,504

The price of sulphur and pyrites is gradually increasing, while that of nitric and hydrochloric acids has dropped from 75 and 80 kopecks (38·6 to 41·1 cents) to 65 and 70 kopecks (33·5 and 36 cents) per pood (36·112 lb.). The price of chloride of lime decreased from 2·25 rubles (1·16 dols.) in 1901 to 1·40 rubles (72·1 cents) at St. Petersburg, 1·30 rubles (67 cents) at Moscow, 1·45 rubles (74·6 cents) at Riga, and 1·6 rubles (82·4 cents) at Odessa. This decrease was due to the erection of a new factory in 1902, which used the electrolytic method. A comparison of the figures for the import of chloride of lime in 1902 and 1901—80,260,000 poods (1,305,040·5 tons) and 95,000 poods (1,544·7 tons), respectively—show that the prices of this product in foreign markets were less than those in Russia, and notwithstanding the duty—1·15½ rubles (59·5 cents) per pood—it was imported in large quantities, which import aided in decreasing the prices of the home product.

The trade in chemical products for manufacturing purposes shows a considerable increase of indigo and oxalic acid. The supply of the latter almost doubled during the last two years and now amounts to from 3,000 to 3,500 poods (48·7 to 56·4 tons) per month.

Competition and cheap varieties of foreign tannin have reduced the price of this product from 35 — 36 rubles (1·80 dols. to 1·85 dols.) to 30—31 rubles (1·55 dols. to 1·59 dols.) per pood.

A plant has been recently erected at Kinesha, in the Kostroma Government, for manufacturing benzol and aniline from petroleum.

Mineral Production of Germany in 1902.

Bd. of Trade J., April 2, 1903.

According to an advance statement of the Imperial Statistical Bureau showing the mineral and metallurgical production of the German Empire for the year 1902, published in the *Deutscher Reichs-Anzeiger* of the 24th March, there was a decrease of 1·6 per cent. in the output of coal, and of 3·3 per cent. in that of lignite.

The following table shows the quantity and value of other minerals and salts produced in the years 1901 and 1902:—

—	1901.		1902.	
	Quantity.	Value.	Quantity.	Value.
	Metric Tons.	Thousand Marks.	Metric Tons.	Thousand Marks.
Iron ore	16,570.182	71,999	17,963,595	65,736
Zinc ore	647,496	21,502	702,504	29,811
Lead ore	153,341	14,141	167,855	13,436
Copper ore	777,339	24,299	761,921	20,431
Silver and gold ore	11,577	1,551	11,624	1,384
Cobalt, nickel, and bismuth ores	10,479	742	12,435	752
Manganese ores	56,091	703	49,812	579
Pyrites	157,433	1,142	165,225	1,285
Asphalt	90,193	675	88,374	604
Petroleum	44,095	2,950	49,725	3,851
Rock-salt	985,050	4,529	1,010,442	4,684
Kainit	1,498,569	21,656	1,322,633	19,210
Other potash salts	2,036,325	21,703	1,962,384	20,796

The chief feature noticeable from the above figures is the increase of 8·4 per cent. in the production of iron ore.

The products of reduction works are stated to be a follows:—

—	1901.		1902.	
	Quantity.	Value.	Quantity.	Value
	Metric Tons.	Thousand Marks.	Metric Tons.	Thousa Marks
Copper ingots	31,817	46,309	30,590	34,164
Zinc	166,283	51,787	174,927	61,804
Lead, pigs, bars, &c.	123,098	32,233	140,331	31,341
Litharge	4,101	1,128	4,197	1,031
Pig-iron	7,880,087	491,774	8,529,900	455,693

The production of refined salts, and of various salts, refined or commercial form, is shown in the followi table:—

—	1901.		1902.	
	Quantity.	Value.	Quantity	Valu
	Metric Tons.	Thousand Marks.	Metric Tons.	Thousa Mark
Salt	578,751	15,730	572,846	15,611
Potassium chloride	294,666	35,129	267,512	31,54
Magnesium chloride	21,018	334	19,658	31
Glauber salts	76,065	1,968	83,973	2,174
Potassium sulphate	37,394	5,849	24,279	4,534
Potassium magnesium sulphate	15,612	1,146	18,147	1,40
Magnesium sulphate	46,714	687	39,262	541

Customs Laboratories in Costa Rica.

U.S. Cons. Reps., March 21, 1903.

Chemical laboratories have been established at the S José and the Punta Arenas custom-houses, for the inspe tion and classification of foods and drinks, drugs, medicin &c. Articles entered at Port Limon are forwarded to S José for inspection.

Thermometers: U.S. Customs Decision.

March 18, 1903.

Two classes of thermometers were considered, one co posed of blown glass, metal, and paper, the blown gl being the component material of chief value, and the oth composed of opal glass, blown glass, wood and metal, t opal glass being the component material of chief val Duty had been assessed at 60 per cent *ad valorem* und paragraph 100 of the Tariff Act of 1897, as "opal and oth glass ware." The importers claimed them to be dutial at 45 per cent *ad valorem* under paragraph 112, as "man factures of glass or of which glass is the compone material of chief value." In the light of a decision of t United States Court on cut glass atomisers, followed by t Board in numerous cases, the action of the collector w overruled and the claim of the importers sustained.

—R. W. M.

II.—FUEL, GAS, AND LIGHT.

Mineral Deposits in Trinidad.

(*Col. Rept. No.* 382.)

In a recently issued report for the year 1901–2, it is stat that 10 licenses were issued to prospectors to search petroleum and coal in Trinidad. It is now becoming realis that, besides its pitch lake, that island probably posses large deposits of coal, manjak, and asphaltic oil, a prospectors have recently been actively at work both crown lands and on private property.

Coal.—Coal has been found in several parts of the isla in most cases cropping out at the surface, but it is chie lignite of a quality which would be unable to compete w the imported coal. The borings for coal undertaken the Government have been so far successful as to warra further trials being made under expert advice.

Oil.—Petroleum has been found in considerable quantities a Canadian company, who hold an extensive concession the Ward of Guayaguayare. The company have spent y large sums of money in machinery and boring operans, and it is hoped that the industry will prove a success.

Manjak.—Manjak, in paying quantities, has been disvered on two neighbouring estates in the Naparima strict.

VII.—ACIDS, ALKALIS, Etc.

SULPHUR : U.S. CUSTOMS DECISION.

March 6, 1903.

In two cases of sulphur imported at Portland, Oregon, ty had been assessed at 8 dols. a ton, as refined or blimed sulphur, under paragraph 84 of the Tariff Act of 97. An analysis of the merchandise showed, in one case, fixed mineral matter, and in the other, seven hundredths one per cent. The Board held that the first lot was ined sulphur and dutiable as assessed, and the second lot ide sulphur, and free of duty, under paragraph 674.

—R. W. M.

HE MINERAL ACID, SODA, AND BLEACHING POWDER MARKET.

K. Reusch. Chem.-Zeit., **27**, [17], 185—189.

1. *Sulphuric Acid.*—The general industrial depression ected this manufacture, but the market has been satistory. The increased demand from superphosphate works s contributed to this; for the lessened production of Thomas-meal" has continued. The scarcity of sulphuric id of the past few years no longer exists, several new rks having been opened. Prices have lowered, and a wnward tendency is still noticeable. Foreign competition felt in this industry, for there is no import duty on lphuric acid. According to Witt there were, in 1900, in ermany, 75 sulphuric acid works, 58 making it as their in product, and 17 as a secondary product. They ployed 3,798 men, and turned out 849,900 tons, worth ,282,000 marks. In 1901 the production was 856,827 s, and last year 864,000 tons. There are now 10 works ing the "contact process." Last year's imports were, ,205 tons, and exports, 47,666 tons. In Austria-Hungary, ur new contact process works have been started within e last year or two. There is in that country an increasing mand, especially for the petroleum-industry, in Austriangary and in Roumania. A common understanding has en arrived at among the Silesian, Austrian, and Hungarian rks, to avoid the ruinous competition that was going on. Italy only one works uses the contact process, but a cond is projected. The Russian production steadily creases with the increase of naphtha works, and of the nufacture of mineral acids, and superphosphates. There but little imported into Russia, and none exported. ming acid (30 per cent. SO_3) is made in a Moscow work, d on a small scale also in Petersburg. The latter work oduces anhydride also. In Japan there are nine works, king annually 50,000 tons. Lately, considerable deposits sulphur have been discovered in Central Asia, said to ntain nine million tons. The already known Daghestan posits yield about 20 per cent. of pure sulphur, while the cilian deposits only yield 14—17 per cent. The following ble, from statistics where they are available, in other cases timated from the best available data, shows the world's oduction of sulphuric acid in 1902 :—

	Tons.
Great Britain	1,000,000
United States	1,000,000
Germany	855,000
France	750,000
Austro-Hungary	350,000
Italy	235,000
Russia	125,000
Japan	50,000
Belgium, Switzerland, Scandinavia, Spain, and other countries	75,000
Total	4,450,000

The total production in 1878 was estimated at 1,000,000 tons.

2. *Hydrochloric Acid and Sodium Sulphate.* — The market for hydrochloric acid has been poor, so that production has been restricted. In spite of this restriction, prices have fallen somewhat. Things have been better in the sulphate market, the stocks which had accumulated during the year before, in consequence of strikes in the glass trade, having been disposed of. Prices, however, have not risen. The difference in price between sulphate and carbonate is gradually lessening, so that the use of carbonate in place of sulphate for glass-making will probably soon become general, unless the cheapening of sulphuric acid, through improvements in the contact process, or through a fall in the price of pyrites, should further cheapen sulphate. Witt gives the inland consumption, in 1901, of sulphate as 266,169 tons, and of hydrochloric acid as 290,910 tons. In 1902 the imports were, respectively, 7,307 tons and 2,449 tons; the exports 52,688 tons and 12,307 tons. It is interesting to note that the great deposit of Glauber's salt of the Kana Bugaz Gulf, on the Caspian, 3,000 square versts in area and a fathom thick, will probably be worked very soon. This will greatly influence the import of sulphate and carbonate into Russia.

3. *Nitric Acid.*—This industry has suffered much from the great fluctuations in the price of nitre. In view of the future exhaustion of the Chili deposits, interest attaches to the discovery of deposits in other parts of the globe. A considerable deposit, easily workable, has been found in Texas; and deposits exist in California, said to be from 3 to 10 ft. in thickness, and to contain from 15 to 40 per cent. of nitre.

4. *Soda.*—Witt estimated the German production of 1901 at 300,000 tons, and the inland consumption at 237,671 tons, reckoned as calcined carbonate. The import and export figures in tons, for 1902, are :—

—	Bicarbonate.	Soda-Ash.	Soda-Crystals.	Caustic.
Imports	107·7	120·5	61·3	106·0
Exports	953·9	33,108·6	2,448 7	5,650·4

The export of soda-ash shows a considerable falling off from the figure (45,967 tons) for the previous year. It is difficult to forecast the influence on German industry of the increased foreign production of caustic soda electrolytically.

5. *Bleaching Powder.*—The United States take the greater part of the European exports of bleach—55,000 to 60,000 tons, of which England supplies about 40,000, and Germany the rest. According to Witt, the German production is about 55,000 tons, of which 20,000 are made by the Weldon and Deacon processes. Exports exceeded imports in 1902 by 29,643 tons. France produces about 30,000 tons of bleaching powder (and 10,000 tons of bleaching liquors); Russia about 12,000 tons, 6,600 by the Weldon process and the rest electrolytically. The Russian import is steadily diminishing; in 1899 it was only 2,164 tons. Italy supplies itself and will soon export; one electrolytic work has been going for nine months, and another will shortly start. The United States in 1900 made 10,979 tons, and probably made considerably more in 1902; yet for the financial year ending June 30, 1902, the imports were 10,000 tons more than in the previous year. After the United States, the largest customer for German bleach is England, who took 8,359 tons in 1902.

—J. T. D.

X.—METALLURGY.

BESSEMER STEEL PRODUCTION IN 1902 IN U.S.A.

Eng. and Mining J., March 21, 1903.

The American Iron and Steel Association has collected complete statistics of the production of Bessemer steel in the United States in 1902, and we give below its statement of the results shown.

Ingots and Castings.—The total production of Bessemer steel ingots and castings in 1902 was 9,306,471 gross tons, against 8,713,302 tons in 1901, an increase of 593,169 tons, or 6·8 per cent. The increase in 1901 over 1900 amounted to 2,028,532 tons, or over 30 per cent. The production of 1902 was the largest in our history. The following table gives the production of Bessemer steel ingots and castings in the last six years. Of the production last year, 10,166 tons were steel castings, against a production of 6,761 tons in 1901. The figures are in long tons :—

1897	5,475,315
1898	6,669,017
1899	7,586,354
1900	6,684,770
1901	8,713,302
1902	9,306,471

Below is given by States the production of Bessemer ingots and castings in the last two years :—

——	1901.	1902.	Changes.
Pennsylvania	4,293,439	4,379,516	I. 86,077
Ohio	2,154,846	2,528,802	I. 373,956
Illinois	1,324,217	1,443,614	I. 119,397
Other States	940,800	954,539	I. 13,739
Total	8,713,302	9,306,471	I. 593,169

There was no Clapp-Griffiths works in operation in 1902, and only two Robert-Bessemer plants were active. Five Tropenas plants were at work, as compared with seven in 1901. In addition one Bookwalter converter was running. All these works that were active were engaged in the production of steel castings only.

Rails.—The production of all kinds of Bessemer steel rails by the producers of Bessemer steel ingots in 1902 was 2,876,293 gross tons against a similar production in 1901 of 2,836,273 tons, in 1900 of 2,361,921 tons, and in 1899 of 2,240,767 tons. The maximum production of Bessemer steel rails by the producers of Bessemer steel ingots was reached in 1902, but the increase in that year over 1901 amounted to only 40,020 tons, or 1·4 per cent. As compared with 1887, 15 years ago, the increase in 1902 in the production of Bessemer rails amounted to only 831,474 tons, or 40 per cent., while during the same period the increase in the production of Bessemer ingots amounted to 6,370,438 tons, or almost 217 per cent. The total production of rails in 1902 will include rails made from open-hearth steel, rails rolled from purchased Bessemer blooms, re-rolled rails and iron rails. The total from all these sources in 1901 amounted to 38,366 tons.

The United States imported, in 1902, 63,522 tons of steel rails and exported 67,666 tons. In 1901, it exported 318,956 tons and imported only 1905 tons.

PLATINUM IN RUSSIA.

Eng. and Mining J., March 21, 1903.

The production of platinum in Russia in the year 1902 in poods was as follows : Société du Platine, of Paris, 159 ; Count P. P. Schouvaloff, 99 ; Prince Demidoff, 53 ; Kolli, 40 ; small exploitations, 15 ; offered in the market, 80 ; total, 446 poods ; equal to 7,306 kilos. The metal "offered in the market" was really stolen, or obtained by unauthorised workers. All of this platinum was produced in the Ural.

Only a small part of this metal is used in Russia. Nearly all of it is exported at once to London or to Hanau, Germany, where it is refined.

MANGANESE ORE FROM BRAZIL.

Eng. and Mining J., March 28, 1903.

Exports in 1902 were 143,320 metric tons, of which a large part came to the United States. Compared with 1901 the shipments have increased over 40 per cent. The grade of this ore varies from 48 to 50 per cent. manganese, but it is all sold on a basis of 50 per cent.

XII.—FATS, FATTY OILS, Etc.

COTTON-SEED OIL INDUSTRY IN INDIA.

Bd. of Trade J., April 12, 1903.

In the annual report of the Upper India Chamber of Commerce there is a section relating to the possibility of establishing a cotton-seed oil industry in India. It has often been asserted that Indian cotton-seed was unsuitable for oil making on a profitable basis, because of the relatively poor yield of oil, and the extreme tenacity with which the lint adheres to the capsules, rendering special machinery necessary, and the process over-costly. Experimental crushings in the United States do not support this view. One firm of machinery makers expressed the opinion that the "seed was very rich in oil, equal to, if not better than, the American." There seems therefore to be no insuperable obstacle to the establishing of the industry in India.

XIII. A.—PIGMENTS, PAINTS, Etc.

SAP BROWN : U.S. CUSTOMS DECISION.

March 16, 1903.

It was decided that sap brown, an analysis of which showed it to be a soluble organic colouring matter of a ligneous nature, and also called Van Dyke brown, was dutiable at 30 per cent. *ad valorem* as a pigment under paragraph 58 of the Tariff Act of 1897. The claim of the importer that it is a sienna earth, under paragraph 49, was overruled.—R. W. M.

HEMATITE PIGMENT IN SPAIN.

U.S. Cons. Reps., March 25, 1903.

A rich vein of oxide of iron ore—valuable chiefly for the manufacture of red paint for structural ironwork—has been discovered near Jaen, about 85 miles from Malaga. The Compania Mineralurgica has established a plant on the outskirts of this city, where the ore is refined and prepared for export. The ore is hematite, and is shipped both crude and refined.

Interest attaches to the industry, in view of the marked decrease—of 31 per cent.—in the production of hematite in the United States in 1901.

According to published reports, the price in 1901 for the American ore was 12·87 dols. per short ton. Last year, the Malaga product was invoiced here at 50 pesetas (approximately 6·80 dols. in United States gold) per short ton of crude ore, and at exactly double that price for the levigated or prepared material.

This article was the only new product that appeared on last year's list of exports from Malaga to the United States, and at this writing 400 bags of crude ore are awaiting shipment to New York. This will be the largest single shipment since the opening of the mines, about one year ago. At present, however, the ore finds its largest market in England.

XVI.—SUGAR, STARCH, Etc.

IMPOSITION OF SPECIAL IMPORT DUTIES ON SUGAR IN BRITISH INDIA.

Bd. of Trade J., April 9, 1903.

With reference to the notice published on p. 113 of the *Board of Trade Journal* for July 17, 1902, the Board have now received a copy of a Customs Circular (No. 4 of 1903), imposing, with effect from March 1, 1903), a *special* duty, under section 8B (1) of the Indian Tariff (Amendment) Act, 1902 (No. 8 of 1902), upon sugar imported into British India from the undermentioned countries.

The Act referred to, which is only to remain in force until Aug. 31, 1903, provides that *special* duties shall be levied on sugars imported into British India from countries in which the "surtax," or excess of import duty over internal duty, amounts to more than 6 francs per 100 kilos in the case of refined sugar, or 5 francs 50 centimes per 100 kilos. in the case of other sugars.

By the terms of the Circular in question, the following e the rates of the *special* duties to be levied on sugars ported into British India from the countries named, and e duties are to be levied without regard to whether the gar is imported directly from the country of production otherwise, or whether it is imported in the same con- ion as when exported from the country of production has been changed in condition by manufacture or other- se :—

Countries.	Kinds of Sugar.	Rate of Special Duty per Cwt.
		R. a. p.
ance.........	Refined sugar	0 9 8
	Unrefined sugar	0 8 5
nmark	Candy and sugar in whole or broken loaves, plates, cakes, &c., whatever the colour may be, and white polarised sugar which is lighter than the Amsterdam standard sample No. 18....................	0 8 10
gentine Republic.	Refined sugar..........................	5 7 5
	Unrefined sugar	4 0 8
ssia	Refined sugar..........................	*9 10 2
	Unrefined sugar	*5 15 10

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* These *special* duties are in lieu of the "additional" duties eviously in force, which have been cancelled by Customs Circular o. 5 of 1903.

XVII.—BREWING, WINES, SPIRITS, Etc.

DELIVERIES OF SPIRITS IN GERMANY.

Zeits. f. Spiritusind., April 16, 1903.

From the 1st October 1901 to the 30th September 1902 ere have in all been delivered in Germany, free of duty, 110,050 hectolitres of spirit (1 hectolitre = 22 galls.).

Of those quantities which have been imperfectly denatured, the denaturing was effected as follows :—

——	1900-01.	1901-02.
	Hectolitres.	Hectolitres.
ith vinegar	166,329	160,287
ith 5 litres of wood naphtha	21,492	20,404
ith ½ litre of pyridine bases............	210	509
ith 20 litres of shellac solution.........	1,684	1,586
ith 1 kilo. of camphor.....................	9,396	9,604
ith 2 litres of turpentine oil.............	5,001	4,935
ith ½ litre of turpentine oil.............	50,941	52,340
ith ½ litre of benzol.........................	1,144	2,356
ith 1 litre of benzol..........................	1,879	3,051
ith 10 litres of sulphuric ether	11,495	11,210
ith 0·025 litre of animal oil	66,748	75,831
ith 500 grms. of chloroform	296	671
ith 200 grms. of iodoform	356	324
ith 2 litres of wood naphtha and 2 litres of petroleum benzine...........	47	24
ith 1 litre of technically pure methyl alcohol and 1 litre of petroleum benzine	6	..
ith 1 kilo. of castor oil and 400 grms. of soda-lye	1,737	1,710
ith 5 litres of petroleum benzine	993	1,052

Of the quantities of spirit imperfectly denatured (exclusive f those destined for sale), the following have been ermitted :—

——	1900-01.	1901-02.
or the manufacture of vinegar..........	171,264	164,062
or the manufacture of glazing for brewers' casks	1,447	1,328
or the sizing of india-rubber cloth	235	258
or the manufacture of celluloid.........	15,797	16,684
or the manufacture of sulphuric ether..	48,265	55,747
or the manufacture of acetic ether......	145	415
or the manufacture of sundry articles mentioned in paragraph 4 of duty-free alcohol	28,070	32,610
or the manufacture of chloroform.......	478	760
or the manufacture of coloured lacquers	2,741	3,460
or the manufacture of stamping ink....	813	28
or the manufacture of ink	18	2
or use in glaziers' lamps................	108	120
or the sizing of silk bands...............	3	1
or cleaning trinkets and imitation jewellery	84	76
For the manufacture of iodoform	369	324
For the manufacture of lacquers of all kinds and polish........................	47,376	46,345
For the manufacture of scientific preparations for teaching purposes	22	..
For the manufacture of soda soaps	1,737	1,710
For the manufacture of wool fats (lanoline)	1,143	1,052
For other purposes	345	2,141

Of the spirits permitted free without any denaturing, the following quantities were permitted :—

To chemists and medicine manufacturers	12,883	38,087
To hospitals and asylums	1,841	2,011
To public scientific institutions	1,775	1,954
To gunpowder and fulminate of mercury manufacturers.........................	17,321	17,375

THE POTATO AS A SOURCE OF WEALTH IN GERMANY.

U.S. Cons. Reps., March 20, 1903.

An exposition is being held in Berlin under the joint management of the Union of Alcohol Producers and the Association to Promote the Industrial Uses of Alcohol, which includes all that relates to the culture and economic use of the potato (1) as human food, (2) as feed for domestic animals, (3) as material for the manufacture of alcohol, and (4) as material for starch and subsidiary products—starch sugar, syrup, dextrin, &c.

In the year 1901, out of 65,625,000 acres of arable land in the German Empire, 12·5 per cent. of the whole was planted with potatoes. For every 10,000 inhabitants there were planted in 1900, 160 acres of potatoes, as against 112 acres in Austria, 98 acres in France, 31 acres in Great Britain and Ireland, and 34·8 acres in the United States. The total area and product of potato culture in Germany have ranged during recent years from 32,329,000 metric tons, grown on 7,631,975 acres, in 1896 to 48,687,000 tons, grown on 8,297,080 acres, in 1901.

At the exposition there are displayed a collection of more than 600 samples of potatoes, grown at 28 farms and experiment stations in different parts of the Empire, each of which shows by this exhibit what has been accomplished with the 15 or 16 varieties of potatoes that are now accepted as standard in Germany. Each sample includes a peck of potatoes, not selected, but taken from the run of the pile, washed, analysed, and labelled with the yield per hectare, and the percentage of starch contained. Additional notes state the location of the fields, nature of soil, kind and quantity of fertiliser used, date of planting and harvest, &c. —a complete history of the whole process of cultivation and its results.

Through such means, the general yield per hectare has been raised by no less than 38 per cent. during the past ten years. The increase in the harvested crop from 1896 to 1901 was 16,350,000 tons, valued at 400,000,000 marks. Instances are reported where, by intensive cultivation under favourable conditions, 14·4 metric tons of potatoes have been grown on an acre of land, while 8 and 9 tons per acre are not unusual in practical agriculture.

As a result of these two fundamental conditions—the abundance of land adapted to potato culture and the steady increase of product through consummate scientific methods —the crop had reached in 1901 the danger point of overproduction; that is to say, the harvest of 48,687,000 tons of potatoes raised the serious problem of how to dispose of them without waste or so depressing the market price that there would be left in it no profit for the farmer. The first result was a tremendous increase in the production of potato alcohol during the autumn and winter months, a consequent oversupply of raw spirits on the market, and the exposition of February 1902, to illustrate, promote, and extend by all practical means the use of denaturised alcohol for technical and industrial purposes. The exposition has been repeated this year, and now covers not merely the alcohol industry, but the cultivation and the several principal uses of potatoes, which may be concisely summarised as follows :

(*a*) *As Human Food.*—Of the entire annual potato crop of Germany, one-half is consumed directly as human food. It is impossible to increase much the *per capita* rate of consumption, except in so far that the growth of population adds each year about 80,000 new potato eaters to the empire.

(*b*) *As Feed for Domestic Animals.*—As feed for cattle, &c., potatoes are used, both raw and steamed. But they deteriorate in storage and lose a large proportion of their nutritive properties after germination begins. This fact has given great importance to the drying of potatoes for feeding purposes.

(*c*) *Technical Products of Potatoes.*—Apart from alcohol, which forms a special category by itself, these are mainly starch, starch syrup, potato flour, dextrin, and starch sugar. In all these specialities the increase of both production and export has been rapid and steady during the past 10 years. The exports of dextrin and potato flour to the United States from three factories in the district of Berlin alone reach a total value of nearly 200,000 dols. per annum, and the whole German export of these products during the past three years were as follows :—

Exports of Potato Flour and Starch.

	Tons.
1900	21,792
1901	25,144
1902	45,970

Of the exports of potato flour and starch, 3,127 tons were shipped directly to the United States in 1902.

Exports of Dextrin.

	Tons.
1900	10,167
1901	11,152
1902	14,047

Dextrin to the amount of 2,351 tons was shipped to the United States in 1902.

There are 360 potato-starch factories in Germany, which are distributed mainly throughout Silesia, Brandenburg, and Mecklenburg. The latest convenient statistics are those for the fiscal year 1897–98, when the output was 78,000 metric tons of dry starch, valued at 15,000,000 marks. To this was added 7,200 tons of starch sugar and 19,000 tons of dextrin, so that the total value of the year's output of starch products was about 30,000,000 marks. Incomplete statistics for the working year 1901–2 show that the product of starch sugar was 9,941 tons, and of starch syrup 49,269 tons, and that the amount of potatoes consumed as raw material for starch, syrup, sugar, and dextrin was not less than 700,000 tons. The exports of such products in 1902 were 46,000 tons of dry potato starch, 10,600 tons of starch syrup and sugar, and 14,047 tons of dextrin. Great Britain is the largest purchaser of German potato starch, her imports last year being 23,827 tons, while 3,127 tons were taken by the United States, and the remainder was divided between Denmark, Italy, Finland, Switzerland and Spain.

Alcohol for Motive Purposes.—For two years past the Russian navy has been using alcohol boat motors up to 300 horse-power with successful results. More recently the internal-revenue tax has been removed from Russian alcohol when used for industrial purposes, and the Government has adopted the definite policy of making the potato, through conversion into denaturised spirits, a source of increased wealth to the peasantry.

A 50 horse-power alcohol engine, invented by Boris Loutzky, a Russian marine engineer, built by the Daimler Motor Company at Marienfelde, and exhibited at the recent exposition, attracted the special attention of the German Emperor. This engine may be used for marine or any factory purposes for which a motor of that size and horse-power is adapted. Its efficiency will be inferred from the tests, which showed its alcohol consumption to vary fron 0·45 to 0·5 litre per horse-power hour. At 650 revolution per minute it developed about 61 horse-power and ra with such steadiness that the difference between running light and with full load was only 3 per cent. This regulation is accomplished by means of a centrifugal regulator which, by creating a vacuum in the cylinder in proportio to the power exerted by the motor, regulates the consumption of fuel. Like many other alcohol motors, this i started and warmed up with gasoline, a lever changing th supply from gasoline to alcohol as soon as full speed has been attained. The ignition is by electric spark, and as a provision against all contingencies, both magneto-electric and accumulator currents are provided, and the former utilised by means of an inductor, the accumulato serving as a reserve in case the galvanic spark should fail. The moment of ignition, which is of great importance in explosion motors, can in this engine be adjusted to occur a the most advantageous part of the stroke, thus securing the maximum effect.

The use of alcohol for household purposes is manage by the Central Association for Alcohol Distribution, which keeps large depôts in Berlin and other German cities, wher everything that can use denaturised alcohol is kept on sale As another example of the efficiency of this organisatio may be cited its system of alcohol distribution to rura districts as a convenient fuel for motor purposes. I order to promote the substitution of spirit motors fo steam and horse power it was necessary to make alcoho cheap and easy to obtain by farmers in districts where n raw spirit is made. To meet this requirement the Centra Association undertakes to deliver free at any railroad statio in Germany denaturised alcohol of 90 per cent. purity, i quantities of 180 to 200 litres, for 15, 16½, and 17½ pfennig per litre according to the material with which it is denaturised. As the consumption of a modern alcohol moto for farming purposes is about 0·5 litre (costing abou 2 cents) per horse-power hour, it will be apparent that i this country at least benzine and petroleum have met serious competitor as fuel for motor purposes. The Hamburg-American Steamship Company has in service a harbou inspection launch which, with a 23 horse-power spirit eng makes a speed of 10 knots, and preparations are bei made to greatly extend the use of such motors in th launches and ships' boats of the German navy.

The exposition of this year confirms the impressio made by the display of 1902 that the law of 1887 governin the manufacture and use of untaxed alcohol for technica purposes was one of the wisest and most far-seeing enactments in the legislative record of the Empire. For ever dollar of direct revenue that was thus sacrificed, the peopl have profited manifold by the stimulus thereby given t potato culture and the important uses of cheap alcohol i chemistry and the industrial arts.

Alcohol from the Jerusalem Artichoke.

U.S. Cons. Reps., March 26, 1903.

The artichoke in France is worth about 35 frs. p 1,000 kilos. f.o.b. at the station of departure. Th culture is like that of the potato. The tubers a planted in February and ripen from September to Oct be They keep well and can be left in the ground and tak up as needed. The best soil for their cultivation is a de but light and sandy one, or a rocky or flinty soil. T artichoke needs nitrogen, phosphoric acid, and potas In dry countries irrigation must be employed. Abo 1,500 kilos. of tubers are planted to the hectare (2· acres), yielding from 44,092 to 66,138 lb. of roots, accordi to the season and soil. It is cultivated in rows, for co venience in working. The distillation of the artichoke like that of the beetroot. From 7 to 9 litres of alcohol 100° are obtained from 100 kilos. of tubers. The alcol industry from the artichoke is little developed, because certain difficulties in the case of the artichoke which are found in the beetroot. The alcohol obtained is, howev easily rectified and yields not only alcohol to burn, but al brandy.

XVIII. B.—SANITATION.

Committee on Sheep Dips.

Times, April 22, 1903.

The Right Hon. R. W. Hanbury, M.P., President of the ard of Agriculture, has appointed a Departmental Com-ttee to investigate experimentally and to inquire into and ort upon—

1. The composition and essential constituents of efficient s and other preparations for the treatment and dressing sheep, and their effect upon the animal treated or dressed l upon the parasites and other organisms for the struction of which they are used.

2. The methods in which such dips and other prepara-us should be employed, and the appliances and facilities uisite for the purpose.

3. The times and intervals at which sheep should be ated or dressed, regard being had (*a*) to the life-history l characteristics of the sheep-scab Acarus and of the ier parasites and organisms of sheep which require ternal treatment, and (*b*) to the practical conditions under ich sheep-farming is carried on in various parts of the ited Kingdom.

The committee consists of the following, *viz.*, Mr. Laurence rdy, M.P. (chairman); Sir Henry Hall Scott; Dr. T. E. orpe, C.B., F.R.S.; Mr. J. Bowen-Jones; Prof. J. R. mpbell, B.Sc.; Mr. A. C. Cope, M.R.C.V.S.; Mr. M. anagan, J.P.; Mr. M. Hedley, F.R.C.V.S.; and Dr. W. merville. Prof. Winter, M.A., will act as secretary to the mmittee.

XIX.—PAPER, PASTEBOARD, Etc.

Vellum and Parchment: U.S. Customs Decision.

March 18, 1903.

It was decided that the provision in paragraph 634 of the e list of the Tariff Act of 1897, covering parchment and llum, was not confined to such varieties as are designed r manuscripts. The action of the Collector of Customs New York in assessing duty at 20 per cent. *ad valorem* certain parchment designed for use in covering bottle ppers and for other commercial purposes was therefore erruled and the free entry of the goods sustained.

—R. W. M.

Wood Pulp from Canada: U.S. Customs Decision.

The Board of General Appraisers, on March 23, 1903, ve a decision on the dutiable character of wood pulp ported into the United States from Canada. One im-rtation consisted of unbleached chemical wood pulp, om the Province of Quebec, to produce 1,400 lb. of which cord of wood is necessary. Duty was assessed at one-xth of a cent per pound, dry weight, under paragraph 393 the Tariff Act of 1897, and a countervailing duty was so assessed at the rate of 25 cents for each cord of wood ed in the manufacture of the pulp, under the proviso in e above paragraph which requires, in case any country sesses an export duty on pulp wood exported to the nited States, an equal amount shall be assessed as duty fore being admitted into the United States. The stimony at the hearing showed that the Province of uebec owns certain public or Crown lands, licenses to t wood on which are issued, permitting the cutting of lp wood at the rate of 65 cents per cord, with a reduction 25 cents per cord when the wood is manufactured into per pulp in the Dominion of Canada.

Another importation was from the province of Ontario, here no wood is allowed to be cut on Crown lands except be manufactured into wood pulp in Canada.

The Board decided that the reduction of 25 cents per rd on wood used in making pulp in the Province of uebec was of the nature of a bounty, and affirmed the tion of the collector in assessing an additional counter-iling duty at this rate. In regard to the wood pulp roduced in the Province of Ontario, it was decided that no ditional duty should be assessed.—R. W. M.

XX.—FINE CHEMICALS, Etc.

Medicinal Preparations: U.S. Customs Decision.

March 4, 1903.

The Board considered the dutiable character of several French medicinal preparations as follows:—Vomi-Purgatif Le Roy, containing 12·2 per cent. of alcohol; Quinicum Labarraque, containing 16·35 per cent.; Elixir Tonique Antiglaireux, containing 41·6; and Proto Iodide Mercure pills. The first three had been classified at 55 cents a pound as medicinal preparations containing alcohol under paragraph 67 of the Tariff of 1897, which action was affirmed by the Board, on ascertaining by analysis the percentages above given, and the last has been assessed at 35 per cent. *ad valorem* as a mercurial medicinal preparation under paragraph 68, which was also affirmed by the Board.

—R. W. M.

The Italian Lemon Trade.

U.S. Cons. Reps., March 19, 1903.

The lemon industry of Italy has been for a long time in a deplorable condition. During the last few years it has been getting worse; lemons that a few seasons past commanded 15 lire per thousand on the trees are now hard to market at 3 lire. Three mass meetings have been held, at one of which over 50 thousand people were present, and the Government has been asked to obtain favourable treatment of citrus products in new commercial conventions; to see that customs exemption in Austria-Hungary be retained; and that better tariff rates be obtained in the United States and in Russia. New and modern lines of navigation, especially to Australia, are requested, and lower freight rates by sea and rail.

The lemon juice and essence trade has also been the subject of much discussion. The average annual production of the former varies from 12,000 to 13,000 pipes, and of the latter from 1,400,000 to 1,600,000 lb., of which the province of Catania produces seven-twentieths, Palermo five-twentieths, Messina four-twentieths, Syracuse one-twentieth, and Calabria three-twentieths. It is proposed to form a monopoly of this industry, which, it is said, could be done with a capital of 5,000,000 lire. While Catania produces 40 per cent. of the whole, none is exported directly; it all goes to Messina, where it is subjected to certain processes before being finally exported.

Morphia and Salts: Australian Customs Decision.

Commonwealth of Australia Gazette, Feb. 13, 1903.

In accordance with section 139 of the Customs Act of 1901, the duties to be levied on morphia and acetate of morphia, as opium, imported into the Commonwealth are laid down at 30*s.* per lb.

Monazite Sands in Brazil.

Bd. of Trade J., April 9, 1903.

A contract was entered into on the 31st of December, 1901, with certain concessionaires for working these sands. This contract fell through last year by the non-fulfilment by the concessionaires of the financial conditions attached to it.

In the Budget Law passed on the 29th of December, 1902, Congress authorised the Federal Government to let by public competition the working of these monazitic sands, or to revive, if they wish, the contract of the 31st December 1901, or to enter into arrangements with the Governments of the States of Bahia and Espirito Santo to work the same conjointly.

By telegrams since received from His Majesty's Minister in Brazil, it appears that tenders for the concession to work these monazite sands in a given area of the State of Espirito Santo for five years may be called for at any time. The particular conditions will probably be those of the contract above referred to, a copy of which may be seen at the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W

MEDICINAL AND TEXTILE PLANTS IN PARAGUAY.

U.S. Cons. Reps., March, 1903.

The following is a description of certain plants whose medicinal and industrial properties are commanding attention:—

Jaborandi can be obtained cheaply and in a reasonably large quantity.

Aybri-kaa.—This is a cure for bronchial catarrh, and is taken principally as a tea. It can be obtained in only one department of the Republic in a fair quantity.

Vetiver.—Some attention is being paid to the cultivation of vetiver.

Ipecacuanha.—This plant grows in Paraguay; its quality is not equal to that of Brazil.

Vegetable Silk.—This is produced by a tree about the size of a chestnut, bearing a boll $4\frac{1}{2}$ in. in diameter and 6 in. long. The silk is exceedingly light, and when the boll is picked to pieces it looks like down, except that it is glossy. Although it can be woven into thread, its chief utility would be for stuffing cushions, quilts, &c. Its characteristic quality is its extreme lightness. The trees abound in Paraguay.

The producers of these plants would be glad to furnish details.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 7328. David. Evaporation. March 30.

,, 7510. Feld. Crucibles or seggars for use in producing barium oxide, cyanides, &c. March 31.

,, 7519. Haddan (Edson). Rendering or reducing tanks.* March 31.

,, 7520. Haddan (Edson). Evaporating apparatus.* March 31.

,, 7641. Macfarlane (of Watson, Laidlaw, and Co.). Centrifugal machines. April 2.

,, 7860. Raynaud. Manufacture of solidified liquids. April 4.

,, 7957. Houghton and United Alkali Co. Apparatus for separating liquid from solid matter and partially drying the solid matter. April 6.

,, 8313. Lühne. Centralisation of every kind of chemical or industrial treatment of, and operation on, any kind of substances.* April 9.

,, 8587. Southey. Distilling apparatus. April 15.

,, 8599. Bitard. Filtering apparatus. (French Appl., Oct. 22, 1902.)* April 15.

,, 8602. Bogoiavlensky and Kronpovess. Distilling apparatus.* April 15.

,, 8671. Theisen. Centrifugal apparatus for treating gases.* April 16.

[C.S.] 7745 (1902). Bamber and Roger. Centrifugal machines. April 8.

,, 8856 (1902). Rossow. Drying machines. April 22.

,, 9123 (1902). Camus. Apparatus for discharging bottles or tubes of liquefied carbon dioxide, &c. April 8.

,, 4248 (1903). Hunt. Tanks for cooling liquids. April 22.

II.—FUEL, GAS, AND LIGHT.

[A.] 7347. Carpenter and Somerville. Treatment of gas for obtaining cyanogen compounds. March 30.

,, 7399. Gandy. Blast furnaces. March 30.

,, 7480. Landriset. Purification of acetylene. March 31.

[A.] 7770. Boult (Goldschmid). Manufacture of ga April 3.

,, 7838. Helbig. Substitute for lycopodium.* April

,, 7871. Agglument, Ltd., and Yeo and Foreste Manufacture of artificial fuel. April 6.

,, 7878. Everitt and Redman. Extraction of tar, &c from gas. April 6.

,, 8166. Carpenter and Somerville. Obtainin cyanogen compounds from gas.* April 8.

,, 8184. Wanicek. Treatment of producer gas, Dow son gas, &c. April 8.

,, 8287. Brunck. *See under* VII.

,, 8562. Monroe. Manufacturing coal briquette April 15.

,, 8590. Shaw and Paddon. Furnaces.* April 15.

,, 8724. Soul. Manufacture of artificial fuel. April 1

,, 8821. Dudgeon (Cockerill and Savage). Bla furnaces.* April 18.

[C.S.] 7925 (1902). Armstrong, Whitworth, and Ord Liquid-fuel furnaces. April 8.

,, 8199 (1902). Grobet and Bernasconi. Furnac April 16.

,, 8618 (1902). Clapham. Apparatus for use purifying coal-gas, oil gas, &c. April 8.

,, 8654 (1902). Railton, Campbell, and Crawfor Furnaces. April 22.

,, 9412 (1902). Langhans. Manufacturing meta cally skeletonised earthy structures for producin light. April 8.

,, 10,712 (1902). Hooker. Incandescent gas vapour lighting. April 8.

,, 11,042 (1902). Terrell. Incandescent mantl April 22.

,, 11,131 (1902). Bray. Acetylene burners. Apri

,, 11,328 (1902). Webber. Gas manufacture. Apri

,, 12,363 (1902). Crossley and Rigby. Gas produce April 22.

,, 23,413 (1902). Dempster. Apparatus for maki oil-gas. (Int. Appl., Nov. 5, 1901.) April 2.

,, 27,568 (1902). Widmer. Solidified fuel. Apri

,, 27,821 (1902). Oppenheim and Feuer. Proc for making incandescent mantles transportal April 22.

,, 3307 (1903). Otto-Hilgenstock Coke Oven ((Otto and Co.). Coke-ovens. April 16.

,, 3339 (1903). Franz. Furnaces. April 8.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 8130. Hawliczek. Destructive distillation of c bonaceous matter. April 8.

[C.S.] 9416 (1902). Edeleanu and Filiti. Manufactur nitro products from petroleum or mineral distillates. April 22.

IV.—COLOURING MATTERS AND DYESTUFFS

[A.] 7353. Imray (Meister, Lucius und Brüning). Gr anthraquinone dyestuff. March 30.

,, 7356. Imray (Meister, Lucius und Brüning). Ma facture of yellow monazo dyestuffs from o-am *p*-sulphobenzoic acid and phenyl-alkylpyraz March 30.

,, 7394. Johnson (Badische Anilin und Sodafa). Anthracene colouring matters and intermed products. March 30.

,, 7395. Johnson (Badische Anilin und Sodafa). Purification of indigo. March 30.

,, 7396. Johnson (Badische Anilin und Sodafa) Monazo colouring matter. March 30.

,, 8405. Abel (A.-G. f. Anilinfabr.). Manufactu of sulphur dyes derived from indophenol. Apri

,, 8406. Abel (A.-G. f. Anilinfabr.). Manufactu mordant-dyeing monazo-dyestuffs. April 11

,, 8503. Iljinskij and Wedekind and Co. Manufac of halogen derivatives of oxy-anthrachin April 14.

,, 8575. Lake (Oehler). Manufacture of April 15.

,, 8832. Johnson (Kalle). Production of d colouring matters. April 18.

[S.] 11,711 (1902). Ransford (Cassella). Sulphur derivatives of *m*-toluylene diamine and sulphur colours therefrom. April 8.

, 11,898 (1902). Ransford (Cassella). Manufacture of sulphur colours. April 8.

, 12,305 (1902). Abel (A.-G. f. Anilinfabr.). Manufacture of polyazo dyestuffs. April 16.

, 12,444 (1902). Newton (Bayer). Manufacture of new dyestuffs and intermediate products. April 16.

, 12,584 (1902). Johnson (Badische Anilin und Sodafabr.). Manufacture of azo colouring matters and intermediate products. April 8.

, 13,429 (1902). Imray (Meister, Lucius und Brüning). Manufacture of bromo-substitution products of indigo dyestuffs. April 8.

V.—PREPARING, BLEACHING, DYEING, INTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

] 7562. Wild. Apparatus for oxidising dyed textile material.* April 1.

, 7727. Bolland. Process of dyeing patterns on fabrics. April 3.

7872. Jackson and Hunt. Machine for treating fabrics in the open state.* April 6.

, 7913. Krefting. Extraction from seaweed of products for use in dressing textile materials, &c.* April 6.

S.] 7774 (1902). Lake (Lee). Reducing fibrous vegetable materials to pulp. April 8.

7870 (1902). Theis. Scouring and bleaching textile piece goods. April 8.

8509 (1902). Perkin and Whipp Bros. and Todd. Treatment of raw cotton and cotton goods to reduce the inflammability thereof. April 16.

12,717 (1902). Williams. Calendering or finishing textile fabrics. April 8.

13,471 (1902). Urquhart (Chem. Fabr. vorm. Weiler-ter-Meer). Printing with sulphur dyes. April 8.

14,525 (1902). Calico Printers' Association, and Warr. Mercerising fabrics and recovery of caustic alkali or other liquor used in the process. April 22.

V -COLOURING WOOD, PAPER, LEATHER, Etc.

.] 7954. Ransford (Cassella). Method of dyeing leather with sulphur colours. April 6.

VII.—ACIDS, ALKALIS, SALTS, Etc.

.] 7363. Roux. Manufacture of cream of tartar. March 30.

7510. Feld. *See under* I.

7802. Western. Purification of zinc liquors. April 3.

7835. Bailey. *See under* X.

8117. Tee. Manufacture of salt. April 8.

8212. Grossmann. Manufacturing alkali nitrites. April 9.

8239. Westwood. Utilising tinners' or galvanisers' waste acid. April 9.

8287. Brunck. Extraction of ammonia from distillation gases.* April 9.

8478. Swan and Kendall. Apparatus for use in the production of cyanides. April 14.

8819. Trivick. Manufacture of the sulphates of the alkali metals and the products thereof.* April 18.

8833. Johnson. *See under* XI.

[S.] 8302 (1902), Alvisi and Millosevich. Treatment of alum and alunites to obtain aluminic and potassic compounds. (Int. Appl., June 3, 1901.) April 16.

10,351 (1902). Carey, Heslop, and United Alkali Co., Ltd. Recovery of sulphur compounds from waste gases. April 8.

25,353 (1902). Corrado Arzano. *See under* XI.

VIII.—POTTERY, GLASS, AND ENAMELS.

[C.S.] 12,627 (1902). Knowles. Furnaces, especially glass furnaces. April 22.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 7407. Allen and Rees. Manufacture of articles of earthenware or china. March 31.

„ 7579. Gilmour, Morton and Co., Ltd., Morton and Milloy. Manufacture of glazed bricks, &c. April 1.

„ 7739. Holland and Pickford. Basic fire bricks. April 3.

[C.S.] 8696 (1902). Cartlidge. Construction of kilns or ovens for use in firing earthenware goods. April 22.

„ 1231 (1903). Illemann. Manufacture of artificial slates or roofing tiles. April 22.

„ 1404 (1903). Mills (Edson). Manufacture of Portland cement. April 8.

„ 3294 (1903). Purvis and Rouse. Manufacture of artificial stone. April 16.

X.—METALLURGY.

[A.] 7333. Alzugaray. Extraction of metals from complex ores. March 30.

„ 7669. Berlstein. Method of treating ores. April 2.

„ 7693. Sexton. Method of treating ores of zinc.* April 2.

„ 7785. Alzugaray. Extraction of gold, silver, and other metals from their ores. April 3.

„ 7835. Bailey. Extracting the precious metals and metalloids present in solution in the sea. April 4.

„ 7855. Polte. Manufacture of articles of wolfram and lead.* April 4.

„ 8026. Lash. Manufacture of steel. April 7.

„ 8182. Cowper-Coles. Coating metals with copper. April 8.

„ 8298. Tresidder. Manufacture of steel. April 9.

„ 8328. Swinburn and Ashcroft. Treatment of antimonial and arsenical ores. April 11.

„ 8466. Huth. Soldering compound for cast iron. April 14.

„ 8591. Elbers. Treating fine iron ores for blast furnaces. (U.S. Appl., May 9, 1902.)* April 15.

„ 8820. Wemyss-Just and J. J. Metal Syndicate. Manufacture of an alloy. April 18.

[C.S.] 7778 (1902). Hadfield. Treatment of steel. April 8

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 7357. Bloxam (Soc. Anon. d'Etudes Electro-Chimiques). Manufacture of lead peroxide. March 30.

„ 7558. Reid. Electrolytic treatment of tinned iron scrap for the removal of the tin. April 1.

„ 7783. Edelmann. Carbon electrodes for arc lamps. April 3.

„ 7831. Hopfelt. Electrodes of arc lamps.* April 4.

„ 8607. Goudrand and Celestre. Accumulator plates.* April 15.

„ 8676. Cance. Electrodes for accumulators. April 16.

„ 8679. Hubert. Apparatus for electro-plating. April 16.

„ 8833. Johnson (Chem. Fabr. Griesheim-Elektron). Electrolytic preparation of permanganates of metals and obtaining by-products in the process.* April 18.

[C.S.] 11,843 (1902). Lake (General Electric Co.). Fuses for electrical purposes. April 8.

„ 12,157 (1903). Abel (Siemens and Halske Act.-Ges.). Filaments for electric incandescence lamps. April 16.

„ 12,158 (1902). Abel (Siemens and Halske Act.-Ges.). Manufacture of filaments, &c. for electrical incandescence lamps. April 8.

12,160 (1902). Abel (Siemens and Halske Act.-Ges.). Filaments for electric incandescence lamps. April 16.

[C.S.] 25,353 (1902). Corrado Arzano. Arrangement of mercury in apparatus for the electrolytic decomposition of alkaline chlorides. April 16.
,, 25,354 (1902). Corrado Arzano. Electrolytic treatment of liquids of all kinds. April 16.

XII.—FATS, OILS, AND SOAP.

[A.] 7410. Meusel. Manufacture of oils.* March 31.
,, 7443. Zimmerli. Dry soap. March 31.
,, 7861. Adiassewich. Purifying shale oil and its by-products. April 4.
,, 8099. Jurgens. Manufacture of margarine.* April 7.
,, 8588. Breda. Separating liquid constituents from fats and waxes. April 15.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[C.S.] 1836 (1903). Armbruster and Morton. Manufacturing pigments and the resulting product. April 16
,, 1837 (1903). Armbruster and Morton. Composition to be used as pigments. April 16.

B.—Resins, Varnishes

[C.S.] 18,355 (1902). Zachow. Varnish-like substance as a vehicle for colours or as a coating substance. April 8.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 7492. Magnus. Leather, and the process of treating the same. March 31.
,, 7776. Carstairs and Allrich Guano Co. Separating proteids from non-nitrogenous bodies.* April 3.
[C.S.] 10,962. Jolles. Manufacture of albumin. April 16.

XV.—MANURES.

[A.] 7921. Baker. Treatment of brewers' and distillers' yeast for use as manure. April 6.
,, 8005. Meiklejohn. Fertiliser. April 7.

XVI.—SUGAR, STARCH, GUM, ETC.

[A.] 7998. Stein and Crosfield. Manufacture and refining of beet, cane, and other sugars.* April 7.
[C.S.] 9048 (1902). Kollrepp and Wohl. Purifying sugar juices. April 16.
,, 10,872 (1902). Blumer. Process for rendering starch soluble. April 16.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 7658. Anderson. *See under* XVIII. B.
,, 7921. Baker. *See under* XV.
,, 8165. Lambert. Treatment of brewers' grains. April 8.
[C.S.] 13,767 (1902). Thompson (Mühlenbauanstalt und Maschinenfabr. vormals Gebr. Seek und Krusemark). Manufacture of malt. April 22.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

A.—Foods.

[A.] 7595. Neumann. Manufacture of cocoa paste. April 1.
,, 7605. Boult (Herite). Method of preserving organic substances. April 1.
,, 7675. Williams and Hutchins. Manufacture of certain proteid products for use as foods, &c. April 2.
,, 7854. Cooper and Westgate. Conditioning bran, &c. April 4.
,, 8091. Cooper and Westgate. Conditioning bran, &c. April 7.
,, 8743. Just. Drying and preserving milk and milk-like products. (U.S. Appl., May 23, 1902.)* April 17.
,, 8815. Pollard. Foodstuffs. April 18.
[C.S.] 7473 (1902). Beale. Preservation of food, &c. April 8.
,, 7744 (1902). Roger and Bamber. Producing a pure, soluble extract of tea. April 8.
[C.S.] 22,101 (1902). Mulertz. Manufacture of meal powder for use as forage, &c. April 16.
,, 6073 (1903). Wiese. Manufacture of chocola April 22.

B.—Sanitation; Water Purification.

[A.] 7567. Harris. Purification of air. April 1.
,, 7658. Anderson. Treatment of distillers' wash dregs or other noxious organic effluents. April
,, 8348. Spence and Spence and Sons, Ltd. Treatment of sewage sludge and like matters. April
[C.S.] 9179 (1902). Candy. Apparatus for distributi liquids on filter beds. April 16.
,, 28,621 (1902). Zalarski. Rendering putrefact products from corpses innocuous. April 8.

C.—Disinfectants.

[C.S.] 3371 (1903). Otto. Disinfecting fabrics with ozo and steam. April 16.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 7341. Lederer. Manufacture of plastic or oth objects from cellulose compounds. March 30.
,, 7346. Newton (Bayer). Manufacture of cellu acetate. March 30.
,, 7372. Cross and Bevan. Preparing mixed est of cellulose. March 30.
,, 8278. Thomson. Manufacture of nitro-cellul April 9.
,, 8646. Hawke. Preparation of copying paper April 16.
[C.S.] 2529 (1902). Stearn and Woodley. Manufacture filaments, sheets, or films from cellulose. April
,, 13,269 (1902). Knopf Patent Paper Pulp Syndic (Knopf *née* Fuchshuber). Preparation a cleansing of waste paper, and production of pa pulp therefrom. April 22.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 8095. Ritsert. Manufacture of medical anæsthe compounds. April 7.
,, 8367. Warrick. Sampling essential oils, & April 11.
,, 8596. Bengough. Production of highly sulphuret hydrocarbons. April 15.
,, 8675. Piot. Preparation of methylal-isosulph cyanate of allyl. April 16.
[C.S.] 8076 (1902). Ritter. Preparation of plant juic April 16.
,, 8787 (1902). Moureu. Useful products fr hydrocarbons of the acetylene series, and deri tives thereof. April 8.
,, 16,298 (1902). Lake (Cyanid-Ges. m. b. H.). P paration of cyanamide salts. April 8.
,, 5901 (1903). Johnson (Boehringer). Preparat of theophylline and an intermediate prod April 22.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 7472. White and White. Photographic prin March 31.
,, 7853. Archer. Production of photographic prin April 4.
,, 7924. Gurtner. Production of coloured pho graphs. April 6.
,, 8260. Butler. Printing photographic pictures i natural colours. April 9.
,, 8719. Brookes and Robinson. Producing fla light for photographic purposes. April 17.
,, 8828. Abrahams, Cowan, and Teacher. Impro ments in photography. April 18.
[C.S.] 2697 (1903). Schönecker. Manufacture of lig sensitive paper, cardboard, &c. April 8.

XXII.—EXPLOSIVES, MATCHES, ETC.

[A.] 8163. Salas. Manufacture of fireworks.* Apri

XXIII.—GENERAL ANALYTICAL CHEMISTR

[C.S.] 20,458 (1902). Turney. Photometers. April

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JOURNAL OF THE
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L. J. de Whalley, B.Sc.	XVI.
Joseph T. Wood	XIV.

Notices.

CONGRESS OF CHAMBERS OF COMMERCE AT MONTREAL.

The fifth Congress of Chambers of Commerce of the Empire will be held at Montreal, Canada, from the 17th to the 20th August 1903, and the General Secretary will be glad to hear from any member who is disposed to attend.

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held at Bradford, Yorks, on Wednesday, July 15th, and following days. Full particulars will appear in a subsequent issue.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Sir William Ramsay has been nominated to the office of President under Rule 8; Prof. P. Phillips Bedson, Mr. E. Carey, Mr. W. H. Nichols, and Prof. H. R. Procter have been nominated Vice-Presidents under Rule 8; and Mr. Ivan Levinstein has been nominated a Vice-President under Rule 11.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Members are hereby invited to nominate fit and proper persons to fill four vacancies among the ordinary Members of the Council. Forms for this purpose can be obtained, on application, from the General Secretary, or from the Hon. Local Secretaries of the Canadian and New York Sections.

Extract from Rule 18:—"No such nomination shall be valid unless it be signed by at least ten Members of the Society who are not in arrear with their subscriptions, nor unless it be received by the General Secretary, at the Society's Office, at least one month before the date of the Annual General Meeting, to the election to take place at which it refers. Nor shall any such nomination be valid if the person nominated be ineligible for election under Rules 12 or 15. No member shall sign more than one nomination form."

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

FIFTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, 1903.

The Fifth International Congress of Applied Chemistry will meet in Berlin during Whitsuntide week, and the names of those proposing to attend should be forwarded without delay to the General Secretary, accompanied by a remittance of 1*l*.

The Congress will be opened on June 2nd, 1903. On Wednesday, June 3rd, Friday the 5th, and Monday the 8th, meetings will be held for the reading and discussion of papers.

PROGRAMME.

Tuesday, June 2.—Reception in the Palace of the Imperial Parliament.

8 p.m.—Address by the President of the Organising Committee in the Hall. Supper will be served in the galleries.

Wednesday, June 3.—10 a.m. First General Meeting.

Afternoon.—Sectional meetings.

7 p.m.—Banquet in the Restaurant of the Zoologic Gardens. Members may bring ladies.

Thursday, June 4.—Sectional meetings continued.

7.30 p.m.—Reception of the Congress in the Tov Hall by the Municipal Authorities. (For gentlem only.)

9.30 p.m. — "Commers" in the "Philharmoni building. The boxes will be reserved for ladies.

Friday, June 5.—10 a.m. Second General Meetir Address by the President of the fourth Congre Prof. H. Moissan.

7 p.m.—Performance in the Royal Opera House.

7 p.m.—Reception of the German Chemical Society the gardens of Prof. C. D. Harries at Charlottenbu Berlinerstr. 36.

Saturday, June 6.—Sectional meetings continued. Visits to various factories and museums.

Sunday, June 7.—Special trains from the Potsdar Bahnhof at 9.55 a.m. and 10.15 a.m. to Wannsee, f a trip on the lakes.

Luncheon at Wannsee at 2 p.m.

Monday, June 8.—Sectional meetings concluded.

Afternoon.—Third General Meeting, for bringing t business of the Congress to a close.

Ladies tickets, price 15*s*. each, can be obtained application to the Secretary of the Congress. A ladi committee has been formed to provide entertainment ladies during the business hours of the Congress.

TRAVELLING AND HOTEL ARRANGEMENTS.

The headquarters of the Society will be at the Sa Hotel, Friedrichstrasse, tariff of which is subjoined:—

Tariff.

Floor.	Single Bedroom.	Double Bedroo
	Marks.	Marks.
First	7.00 to 6.50	12.00 to 18.00
Second	6.00	18.00 to 17.00
Third	5.00	10.00 to 15.00
Fourth	4.50	7.00 to 10.00

The above charges include lights and attendance.

	Marks.
Breakfast	1.25
Luncheon	2.50
Dinner	5.00

Application for railway tickets and berths should he me to the Continental Traffic Manager, Great Eastern Railw, Liverpool Street Station, London, E.C.

Railway Notice.

A party of members will leave Liverpool Street Sta (G.E.R.) for Berlin, *viâ* Harwich and Hook of Holl, at 8.30 p.m. on Whit Sunday, May 31st. Any mem may join the party at Liverpool Street or Harwich, should send immediate notice of his intention to General Secretary, so that the necessary arrangem may be made.

FIRST LIST OF MEMBERS ATTENDING THE CONGRE

Dr. L. Baekeland, George T. Beilby, Dr. J. F. Botton, H. Brearley, Dr. Jno. Clark and lady, J. M. Col, L. M. Deane, Dr. E. Divers, H. Ellison, Dr. Thos. E, Jno. S. Ford and lady, Walter M. Gardner, Dr. Thos. G, Oscar Guttmann, R. A. Hadfield, George Haller and l, Dr. A. P. Hallock, Dr. E. Hart, Prof. W. N. Har, E. Grant Hooper, J. Hübner, R. S. Hutton, J. B. C. Kersl, Holman Kingdon, Dr. E. Knecht, Ivan Levinstein, D J. Lewkowitsch, J. W. Macdonald, Peter MacEwan and l,

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te.—In acknowledging the receipt of all congress fees te, Dr. G. Pulvermacher, writing on April 9th, states ll tickets will be given out in the Parliament Building beginning of the Congress.

Changes of Address.

en notifying new addresses, members are requested to them distinctly, and state whether they are temporary rmanent. Multiplication of addresses is also to be ed as tending to create confusion. When sending riptions, the use of the form attached to the application in the verification of addresses, on which the safe ry of the Journal depends.

sewich, A.; Journals to 6, Camden Gardens, Shepherd's Bush, W.

B., l/o Java; Bazarstraat 10, den Haag, Holland.

l, T. C.; Journals to c/o General Secretary until urther notice.

, Chas. B., l/o West 134th Street; Lion Brewery, olumbus Avenue and 108th Street, New York City, .S.A.

p, Robt., l/o New Zealand; Shettleston Oil and hemical Works, Shettleston, Glasgow.

r, Hy. C.; Journals to 4, Dayton Street, Worcester, ass., U.S.A., until further notice.

, Herbert; Journals to c/o Department of Agriculture, overnment Buildings, Pretoria, Transvaal.

Jno. A., l/o Syracuse; Jefferson Avenue and Delano treet, Pulaski, Oswego Co., N.Y., U.S.A.

e, Miss Mary S., l/o Fourth Avenue; 421, Wood treet, Pittsburg, Pa., U.S.A.

, E. H., l/o Charles Street; 520, West 27th Street, ew York City, U.S.A.

s, Cresswell, l/o Knock Hall Grove; 1, Elm Villas, reenhithe, Kent.

Dr. E. E., l/o Cheetham Hill; 26, Stanley Road, Moss ide, Manchester.

Dr. H., l/o Manchester; Rusterstrasse 15, Frankfurt /M., Germany.

r, Herbert; Journals to 80, Lancaster Avenue, Fennel treet, Manchester.

ll, Oliver, l/o Magnus Lodge; Shalem Lodge, Newark-n-Trent.

nmaker, H., l/o 703; 734, West 9th Street, Cincinnati, hio, U.S.A.

Bertram, V., l/o Oakfield Road; 27, Belgrave Road, lford, Essex.

MEMBERS OMITTED FROM LIST.

Edison, Thos. Alva, Edison Laboratory, Orange, N.J., U.S.A., Inventor and Manufacturer.

Ullman, Jas. A., c/o Sigmund Ullman Co., 146th Street and Park Avenue, New York City, U.S.A., Printing Ink Manufacturer.

CHANGES OF ADDRESS REQUIRED.

Vaughan G., l/o Madras, India.

tzoff, Basil N., l/o Kazan, Russia.

Canadian Section.

Meeting held at Toronto, on Wednesday, May 6th, 1903.

DR. HAROLD VAN DER LINDE (VICE-CHAIRMAN) IN THE CHAIR.

CHAIRMAN'S ADDRESS.

THE CHEMICAL INDUSTRIES OF CANADA.

BY W. R. LANG, D.Sc.

In selecting a subject for an address as the first Chairman of the Canadian Section of this Society, two main considerations have been kept in mind; firstly, that the development of the industrial resources of the Dominion during the past decade has been phenomenal, and, secondly, that the extent of these developments is only fully understood by a few, while it is almost unknown to our fellow members in Britain. While it is impossible to discuss *all* the industries in which chemical operations and reactions are made use of, an attempt has been made to select processes in some cases peculiar to the country, but notably the industries which owe their development to the natural, mineral, and vegetable resources, and to the widely scattered water power obtainable in the Dominion.

The subjects taken up may be classified as follows:—

I.—Common Salt, Alkali, and Chlorine Compounds.
II.—The Extraction and Refining of Metals.
III.—The Leather and Tanning Industries.
IV.—Sulphuric Acid, Acetic Acid, Wood Alcohol, Charcoal, and Ammonia.
V.—Soap and Glycerin.
VI.—Refined Chemicals and Drugs.
VII.—Fertilisers.
VIII.—Coal-Tar and Asphalt.
IX.—Calcium Carbide, Carborundum, and Graphite.
X.—The Cement and Plaster Industry.
XI.—Carbohydrates: Divided into—
  (*a*) The Refining of Sugar.
  (*b*) The Beet-Sugar Industry.
XII.—Natural Gas and Petroleum.
XIII.—Pulp and Paper.
XIV.—Asbestos.

I.—Common Salt, Alkali, and Chlorine Compounds.

Sodium chloride is found in the Upper Silurian beds in Ontario and in the Devonian in Manitoba and Athabasca; salt springs also occur in Cape Breton and in New Brunswick, but these are comparatively unimportant sources of supply. In Ontario the salt area stretches through the counties of Middlesex, Huron, Bruce, and Lambton, large deposits being found along the shore of Lake Huron from Kincardine to Windsor. At Coderich there is a deposit 126 ft. thick, and at Windsor a well extending to a depth of 1,672 feet passes through four beds of rock salt of an

—	Natural Salt of Coderich, Ontario.	Natural Salt of Cheshire (England).
	Per Cent.	Per Cent.
Sodium chloride	99·687	96·70
Calcium chloride	0·032	0·68
Magnesium chloride	0·095	0·00
Calcium sulphate	0·090	0·25
Moisture	0·079	0·63
Insoluble matter	0·017	1·74
	100·000	100·000
Total impurities	0·234	2·67

aggregate thickness of 392 ft.[1] The salt is obtained by evaporation, and is of an excellent quality. The foregoing comparison serves to illustrate the purity of the natural product.[2]

The total production of salt in Canada was valued in 1892 at 162,000 dols., and in 1901 at 262,328 dols.

Apart from its uses as a seasoning and as a preservative, common salt is employed in the electrolytic preparation of caustic soda and bleaching compounds. (A full description of this industry was given in a paper read before the Society in Toronto by Mr. B. E. F. Rhodin in 1902. See this Journal, 1902, 449).

The alkali and bleaching powder industries throughout the world are at the present time in an unsettled condition, mainly owing to the advent of electrolytic methods.[3] Wherever cheap water power is available, however, electrolytic processes will be rapidly developed.

II.—The Extraction and Refining of Metals.

Almost every province in the Dominion possesses valuable mineral resources; these are rapidly being exploited, and among the metals produced in quantity may be mentioned iron, copper, lead and silver, nickel, arsenic, antimony, and, lastly, aluminium. These metals are found in the form of native iron, magnetic iron ore, iron pyrites, hæmatite, native copper, chalcopyrite, galena, native silver, and ores of silver, nickeliferous pyrrhotite, gold, sulphide of antimony, and arsenical pyrites.

Iron.—The iron ores of the Dominion occur at varied intervals, from Vancouver Island, on the west, to Cape Breton Island and Newfoundland on the east. In Nova Scotia there are particularly rich deposits, and in close contiguity to them are found the necessary materials for smelting. Hæmatites, too, are found in all parts of Canada. One of the most valuable deposits of specular iron is at Hull, near Ottawa, which assays from 61 to 68 per cent. of metallic iron. In the Appendix (Appendix I.) will be found more particulars regarding the iron ores of the Dominion.

The Canadian iron industry dates back to the establishment of the St. Maurice forges by the French Government in 1737. Many other minor plants were subsequently built, as at Batiscan, Hull, and Bois St. Paul, all in Quebec; at Furnace Falls, Mormondale, Marmora, &c., in Ontario; at Woodstock, in New Brunswick; and at Moose River, Nietaux, and Bloomfield, in Nova Scotia. They all subsequently failed, however, in consequence of the competition of Great Britain and the United States. This early failure was due as much as anything else to lack of enterprise, capital, and proper shipping facilities. The modern development of the industry may be said to date from the introduction of a protective duty on iron in 1887. The granting of bounties by the Dominion and Ontario Governments has also assisted largely in bringing about the present condition of the iron and steel industries.[4] The annual aggregate capacity of the completed and unfinished furnaces in the Dominion in 1901 was close on 1,000,000 gross tons.[5] Much of the iron produced is now being made into steel[6] by the Bessemer process. At Sault Ste. Marie an extensive plant has recently been completed, with a capacity of 200,000 tons of ingots and 180,000 tons of finished products. There, steel rails are being made for the first time on Canadian soil. At Collingwood, Ontario, the Cramp Steel Co. expect to have an output from their new works of from 100 to 120 tons per day, finished into small size material suitable for blacksmith's and machinist's use. The works of this Company, which are not yet completed, consist of a 250-ton blast-furnace—to be finished this season—and two 20-ton open-hearth steel-furnaces, beside rolling mills. In these furnaces will be utilised equal amounts of pig and sc iron; the furnaces are lined with magnesite, and the christ-Thomas basic process will be employed. T machinery for the plant is actuated by electric hydraulic power, while the cranes are hydraulic entir It is claimed that the rolling mills will be the finest in country.[7] On the eastern seaboard of the Dominion situated the works of the Dominion Iron and Steel begun in 1899. This company has a capital of 20,000, dols. common stock, besides 5,000,000 dols. 7 per c preferred stock and 8,000,000 dols. in 5 per cent. bo An arrangement has also been entered into with Dominion Coal Co. for a 99 years' lease, paying for privilege 6 per cent. on 20,000,000 dols. common stoc the latter company. Coal and limestone are found c paratively near at hand, the farthest afield mine from wh the coal supply is drawn being 25 miles distant, while nearest one is 6 miles. There is no lack of this mine the output being now from 3 to 3½ million tons per ann as compared with 800,000 tons in 1898. Nearly all iron ore at present used is brought from mines owned company on Great Belle Island, in Conception Bay, N foundland, some 400 miles from Sydney. This mine estimated to contain 28 million tons of available besides areas under the sea, which are believed to be v extensive. Analyses of the ore show it to contain 50 cent. of iron, little sulphur, but rather too much sil aluminium, and phosphorus. The result is a pig iron high in phosphorus, but during the subsequent conver of the pig into steel in open-hearth furnaces, this imp is eliminated, and a fine quality of steel produced. For best kind of pig iron, it is necessary to mix other ores it, and for this purpose Cuban, Spanish, and Swedish are used, the result being a low phosphorus pig. Ind tions of large deposits of high-grade ores have been fo both in Nova Scotia and Cape Breton, which, when f developed, will in a great measure replace the foreign

Limestone is obtained from the company's quarrie the Bras d'Or Lakes, about 85 miles, by water, from works. It is a stone of good quality, and is found large deposits; it acts well with the Newfoundland ore the Cape Breton coke.[8] The works contain four bl furnaces capable of yielding 1,000 tons of pig iron day; the furnace gases are utilised also to the utm being used to heat the blast and also to raise steam. iron produced is partly cast into pigs and in part conve in a molten condition direct to the open-hearth furna where it is converted into steel. Of these there are t number, of the H. H. Campbell type of tilting basic op hearth furnaces, having a capacity of 50 tons each. very complete arrangement of testing the steel at inter is in vogue, and of stamping each ingot with special ma so that the consumer can ascertain from the compan any time every particular regarding the analysis and mal of the piece.

The gases produced in the coke ovens are used in open-hearth furnaces, the other bye-products, namely c tar and ammonia, being also collected. The ammoni converted into ammonium sulphate by neutralising it sulphuric acid—which can be obtained from the py separated from the coal in the preliminary grinding washing processes to which it is subjected—and is princ exported to the United States, the West Indies, and Glas The coal-tar at present finds a market in the State Montreal, and other points in Canada. Recently arra ments have been made with an English chemical comp to locate at Sydney. The works are now in proce construction, and all the coal-tar produced will be ut for the manufacture of the numerous products of distilla

Canadian-made steel is largely exported to the Ur States, whence it returns to Canada in the form of and other finished products; but it is intended that feature of the steel industry will shortly be transfe to Canadian territory. Sydney is extremely well situ as a seaport, being nearer to England than is New Y and, strange as it may appear, to the ports of S ica and South Africa.[9] As far as geographical position cerned, therefore, Sydney possesses many advantages, the masterly and liberal way in which the iron and ndustry has been organised and developed points to a future for it in Canada.[10]

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[1] W. Hodgson Ellis, M.B., in "A Handbook of Canada," 1897.

[2] Wilmott, A. B., "Some Minor Minerals of Canada," 1897.

[3] Chem. Tr. J., 23.8.02, 6.9.02, and 24.1.03.

[4] Dominion bounty on pig iron, 3 dols. per ton produced. Ontario bounty, 1 dol. per ton on pig produced from Ontario ores, and 50 cents on ores not obtained in the province; the rate of 1 dol. to be only paid up to 25,000 tons. Bounty is at present largely reduced, owing to increased production.

[5] Statistical Year Book of Canada, 1901, p. 160.

[6] Dominion bounty on steel, 3 dols. per ton; 2 dols. per ton on steel from foreign ores.

[7] Letter from Mr. J. A. Currie.

[8] The daily shipment is 1,500 tons.

new plant is being erected near North Sydney by the Scotia Steel Co., who have at present works at Ferrona, a limited supply of ore near at hand. Hence they t largely from Newfoundland. Their steel works are esent at New Glasgow, but a new plant is under uction at Sydney. Their output, which is sold almost sively in Canada, approximates 100 tons of pig-iron y, and the same amount of steel. The Canadian Iron ace Co., of Montreal, has recently acquired the iron its formerly belonging to the Londonderry Iron Co., s reconstructing the works on the most modern

pper.—The production of refined copper can hardly be d among the chemical industries of the Dominion, as cally only the first stage in the extraction of the is reached, namely, the making of copper matte, is exported to the United States to be refined. Copper occur in great abundance, and constitute one of the important mineral resources of the country. These istributed over large tracts in Ontario, Quebec, Nova , and New Brunswick. The deposits consist of native r and sulphides, the former confined principally to the Superior region, the latter being more widely diffused, otably in the Sudbury region, Ontario, where it occurs nickel. The production of copper, other than the copper near Lake Superior, is dependent for the most n that of this latter metal. Some idea of the advances in the production of copper matte may be had from ct that in 1891 the production amounted to 9,000,000*l*., 1901 showed an output of 41,000,000*l*.[11]

ckel.—The first discovery of nickeliferous deposits made in 1883 near Sudbury, in the district of Algoma, io. The ore, which contains on the average about per cent. of nickel, is roasted in heaps, and smelted in rreshoff water-jacket furnace, near the mine, into a r nickel matte, the average composition of which is: r, 26·91; nickel, 14·14; iron, 31·335; sulphur, ; and cobalt, 0·935. It is also said to contain some es of platinum to the ton. Previous to the discovery ckel in this country, the French colony at New onia contributed the world's supply of the metal. the International Nickel Co. controls the deposits in io and in New Caledonia, and has refining works at oden, N.J., in the United States.[12]

partial list of firms engaged in nickel production is in the Appendix. The Frasch and the Mond pro- are the principal methods of treating the matte, that the Victoria Mines of the Mond Co. being shipped to sea for treatment in England. The Frasch process e separation of copper and nickel is an electrolytic and is being largely adopted here.[13]

uminium.—The extraction and refining of aluminium n recent years, owing to the advent of electricity oped from cheap water power, become an important try. At Shawinigan Falls, Quebec, are situated the Canadian works of the Northern Aluminium Co., a sub-company of the Pittsburg Reduction Co., which also has two large factories at Niagara Falls, on the American side. The raw material, bauxite, is obtained from Alabama and Georgia, in the United States. The process employed is the Hall[14] process, and is a combined electrolytic and electric furnace one. The native aluminium hydroxide is first purified by mixing with sufficient carbon to reduce all impurities in it to the metallic state, the resulting iron, mixed with titanium and silicon, forming a slag after melting the mass in an electric furnace. An alternating current of low voltage is used, and the purified alumina separates out above the slag in an almost chemically pure condition. The alumina thus purified is then electrolysed in a bath containing cryolite at a temperature of from 850° to 900° C. The action of the current sets free aluminium and oxygen, the latter uniting with the carbon anodes to form carbonic oxide. The metal is run into rough ingots weighing 20 lb. each, and is stated to contain, on an average, 99·5 per cent. of aluminium.[15]

The production at the Quebec works is probably 9,500 lb. per day, the value in 1902 being approximately 1,043,250 dols.[16] It may safely be said that the three works of this Company, between them, produce one-half of the world's supply.

Lead and Silver.—These metals are derived principally from the mines of British Columbia, but there are also deposits of galena along the shores of Lake Superior, the ore from which is sent to Niagara Falls, N.Y., for reduction. The British Columbia ore is a high grade one, carrying from 200 to 300 oz. of silver to the ton, and is mostly smelted at Butte and St. Helena, Montana. No refinery for lead (on a large scale) has yet been started in Canada, though at Trail, in British Columbia, the Canadian Smelting Works have recently begun to produce commercial lead, stated to be of 99·9 per cent. purity,[17] by means of the Betts process, which is an electrolytic one.

The Hall Mining and Smelting Works, whose Canadian headquarters are at Nelson, British Columbia, are smelting lead ores which are obtained in the Slocan and Kootenay Lakes. They employ blast furnaces, a considerable portion of the ore being first roasted in hand or mechanical furnaces and the product of the latter briquetted. The principal markets for the pig-lead are the Orient, England, and Canada, though the home market is somewhat handicapped by the present arrangement of duties, which allows the importation of foreign corroded lead at a lower rate than that imposed on pig-lead. With a revisal of the duties, a greatly increased development, and revival of the lead and smelting industries, is anticipated.[18]

In 1894 the amount of silver exported, in ores, concentrates, or otherwise, was 629,655 oz., while in 1901 the quantity had risen to over 4,000,000 oz.[19] Despite these figures, the "Monetary Times," Toronto, of date Jan. 16, 1903, says, "The silver-lead production of British Columbia is severely handicapped by the adverse competition of the United States, the European and Mexican products. The tariff is unfavourable—a higher one would be quite beneficial to the industry."

Arsenic.—A not unimportant metal found in considerable quantities in Ontario is arsenic; the chief form in which it occurs is arsenical pyrites (mispickel), which also contains gold. Its manufacture was begun by the Canadian Goldfields, Ltd., at their Deloro Mine, Hastings County, Ontario, in 1899. Attempts had been made, extending over the previous 20 years or so, to extract the gold from the ore found there, and, after the mine had experienced some vicissitudes, the present company acquired it and obtained the rights (1896) for Ontario to the Sulman-Tweed patents (bromo-cyanide process), working it with only a modified degree of success for a couple of years, when the installation

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	Miles.
dney Harbour to Liverpool (*viâ* South of Ireland)	2,307
ew York Harbour to Liverpool	3,110
dney Harbour to Pernambuco	3,567
ew York Harbour to Pernambuco	3,696
dney Harbour to Cape Town	6,467
ew York Harbour to Cape Town	6,787

se figures were supplied to me by Mr. Watson Griffin, who ed them from Captain W. H. Smith, R.N.R., Halifax. The ces from New York were compiled by the United States ission of Navigation.

r. Watson Griffin, who kindly supplied me with material from the above description of the Sydney operations was written, oned also that a leading Scottish iron and steel magnate told at, everything considered, Sydney, in regard to raw materials, ess to the market, and the excellent equipment it possessed, be the finest steel manufactory in the world. Watson Griffin, inion Steel and Coal Co., Sydney;" Montreal, 1902. Watson . "The Front Door of Canada;" Montreal, 1899.

atistical Year Book of Canada, 1901.

he French Société le Nickel, with works in New Caledonia efineries in France, is not included in this combination.

.S. Pat. 669,899.

[14] U.S. Pat. 677,207, 677,208, 677,209, of June 25, 1891.

[15] Dr. J. W. Richards in "Electro-Chemical Industry, Oct. 1902.

[16] *Ibid.* (average value of product is 31 cents per pound).

[17] Canadian Mining Rev., March, 1903.

[18] Letter from the Business Manager, Hall Mining and Smelting Co., Nelson, B.C.

[19] Statistical Year Book of Canada, 1901.

of improved machinery and the adoption of a combination of amalgamation and leaching with bromo-cyanide resulted in the recovery of arsenic from the mispickel concentrates. To accomplish this the concentrates are heated to a high temperature in specially constructed cylindrical revolving calciners, and the resulting impure arsenious oxide evolved is condensed in hermetically sealed brick chambers.[20] The crude arsenic is refined by sublimation, and contains from 99·6 to 100 per cent. arsenious oxide, the main impurity being silica in a finely divided condition.[21] It is exported chiefly to the United States, where it is used for making "Paris Green," &c. The output has increased from 113,477 lb. in 1899 to 1,317,000 lb. in 1901.[20] In time, and with proper development, Ontario should be able to supply the entire demand for arsenic on the continent of America.

Antimony.—This metal might almost be said to occupy the position of a by-product in the extraction of gold. At Rawdon, in Nova Scotia, the ore (stibnite) is auriferous, and from 1898 to 1901 no refined antimony was produced, the stibnite being mined for the sake of its more precious contents.[22] It is also found in Quebec, and recent reports indicate deposits of ore in several localities of Ontario and British Columbia. The output in 1891 had fallen to 60 dols. In 1902 the refining of the metal was renewed.

Gold.—Gold is mined to a small extent in Ontario, in in Nova Scotia, and Quebec. Gold deposits are also found in the Kootenay district, B.C., in Cariboo, B.C., and in the Yukon. In the Rossland district the ore is a cupriferous pyrrhotite under a diorite cap, and from Trail on the Columbia River, where the ore is smelted, the gold-copper matte produced is shipped to Montana for refining purposes. There is also a smelter at Nelson for the ore of the Hall mine. The Yukon territory covers in a general way the district north of Cariboo, south of the Arctic Ocean, and lying between the Mackenzie River and the Alaska-Canada boundary. Gold has been known to exist there since 1864, and has been worked intermittently since 1873. Forty Mile River, a tributary of the Yukon, was discovered to carry coarse gold in 1886, and, 10 years later, what is known as the Klondike was found to contain gold also. It was first discovered on Bonanza and Eldorado creeks[23]: the news of this discovery spread far and wide, and active prospecting was the result. There are about 1,400 miles of Canadian Yukon streams, on all of which gold can be found. Mr. Ogilvie, former Canadian commissioner in the Yukon, estimates that an area of 125,000 square miles is gold bearing.[24] The former difficulties of reaching the Yukon have now been overcome; a telegraph line has also been laid by the Canadian Government from Skagway, on the coast to Dawson. The gold is found and worked in the gravel deposits of the valleys and on their adjacent slopes, and it has been estimated that gold to the value of 95,000,000 dols. will be produced from these deposits in the next few years.[25]

The gold fields of Nova Scotia occupy the entire Atlantic coast line, and contain gold in combination with sulphides and arsenides of iron, but mostly in the free state. The table given in the next column will best convey the output of gold from Canada and its distribution.[26]

The gold production for the Yukon in 1902 was 12,018,561 dols.; according to the United States Mints it was 14,525,275.[27]

—	1892.	1901.
	Dols.	Dols.
Ontario	7,148	243,022
Saskatchewan (N.W.T.)	98,006	15,000
Yukon	..	12,500,000
Quebec	12,987	3,000
British Columbia	399,525	5,596,70
Nova Scotia	389,965	604,50
Total	907,601	21,963,222

III.—The Leather and Tanning Industries.

The manufacture of leather occupies quite a promin position in Ontario and Quebec, the industry having gre developed during the past few years. There are from 1 20 large establishments in operation, and fully 20 small o Bark, chrome, and combination tanning methods are ployed, the spent bark being utilised as fuel in speci constructed furnaces. Though the United States may said to lead the world in the extent of the leather produ the quality of the Canadian product cannot be surpasse heavy leathers for common goods. Light leathers, have made very creditable progress; also chrome kids classes of bag, case, and trunk leathers. Much of American patterned machinery employed, and form imported, is now being manufactured in the Domin such as bark mills, fleshing machines, glazing ja measuring machines, and leather presses. As comp with a decade ago, the value of the leather produced the country may safely be said to have increased half.

IV.—Sulphuric Acid, Acetic Acid, Wood Alcohol, Charcoal, and Ammonia.

The manufacture of commercial sulphuric acid has yet been developed to the extent that the quantity sulphur found throughout the Dominion would jus There is enough sulphur in Canada to supply the e home market with acid and even to develop a consider export trade. Only a few firms, however, are engage the trade, and a large portion of their product is used in refining of Canadian petroleum, some five million po being annually consumed for this purpose. Quebec, Ont, and British Colombia are each represented in the industry. The Lake Superior Power Co. employs sulphur obtained in the smelting of nickeliferous ore the manufacture of sulphite pulp, but only utilises it required for its own industrial operations. It is prob that the construction of electrolytic lead smelters will to the sulphur dioxide obtained from the galena being into sulphuric acid, as is done at the Electric Lead Re tion Co.'s works at Niagara Falls, N.Y., where, it is sta the sulphuric acid produced yields a financial re sufficient to cover the entire cost of the process.

By the destructive distillation of wood, acetic acid, w alcohol and charcoal are obtained; hence Canada, with enormous supply of wood of all kinds, should be abl take a prominent place in the production of acetic acid wood spirit. At the present time the residual char from the retorts does not find a ready market, owing t comparatively high rates for transport as compared other fuels, weight for weight. The outlook in this d tion is, however, brightening. Among the firms eng in this manufacture might be mentioned the Stand Chemical Co.—with plants at Fenelon Falls, Desert and Longford, Ontario, and Cookshire, Quebec—and Canada Paint Co., Montreal and Toronto. Very keen petition has to be faced in this connection with the U States, as a combination of some 175 manufacturers ticaly controls the market. The crude acetate of produced in the distillation process is converted into a acid, some of which is sold for dye and colour making poses, while a considerable portion is exported to Eu and Australia.

The wood alcohol, obtained at the same time as the a acid, supplies the home market and is also exported la

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[20] C. Kirkegaard, in Eng. and Mining J., Jan. 31, 1903.

[21] Bureau of Mines Report, Ontario, 1901.

[22] Assays of two ores give, according to the Nova Scotia Mines Report, 1901:—

—	I.	II.
Antimony (per cent.)	45·75	18·21
Gold (oz. per ton)	2·48	0·23
Silver (oz. per ton)	0·10	0·13

[23] "Official Guide to the Klondike," by William Ogilvie.

[24] *Ibid.*

[25] Report of the Canadian Commission in the Yukon.

[26] Statistical Year Books, 1892—1902.

[27] Letter from Hon. Clifford Sifton, Minister of Interior Ottawa

[28] Letter from Mr. B. E. Walker, General Manager, the Can Bank of Commerce.

to reat Britain, France, Germany, Holland, Japan, and A tralia. It may be of interest to know that timber is in orted from Canada by makers of wood-alcohol in the U ed States.[29]

V.—Soap and Glycerin.

ap.—The soap industry in Canada is growing rapidly; at e present time some 15 large concerns are in operation, em loying in all about 2,000 hands. A branch of the well-kn wn firm whose headquarters are at Port Sunlight, near L rpool, was recently started in Toronto, with an annual ca city of 10,000 tons. Their products are similar to those m e at their other works, and their raw materials are pro-cu d from Africa, the United States, and locally (tallow). T y own islands in the Pacific from which they import co anut oil.

ost of the other firms mentioned in the Appendix are al manufacturers on a large scale and produce all grades, fr the cheapest textile and laundry soaps to the finer qu ities of toilet soaps. Great advances have taken place in e industry during the past 10 years, particularly in the m ing of the latter. The same system of manufacture ob ins as in England. The raw materials are mainly co anut oil, palm oil, and tallow, the first two in a large me sure superseding the last mentioned. The market for Ca adian made soap is limited, the home market is supplied a a large export trade is done with the West Indies and A tralia. The competition of the United States is felt m e than that of England or France. In 1902 the value of e soap produced was approximately 3,000,000 dols.[30]

lycerin.—This necessary by-product in the manufac-tu of soap is refined in some cases by the producers th selves; others sell it to firms engaged more particularly in e refining trade. Among these might be mentioned th St. Henri Chemical Co., of Montreal, who buy waste ly from the soap manufacturers, recover the salt from the ly refine the glycerin and sell to the makers of nitro-g erin. The capacity of these works is 10,000,000 lb. of w e lye yearly.[31]

VI.—Refined Chemicals and Drugs.

e is reminded forcibly, after writing the heading to th section, of the "Snakes in Ireland" story, and, indeed, th classical remark recorded on that occasion might almost b id to apply with equal force to the refined chemicals pr uced in the Dominion. Messrs. Lyman Bros. and Co., of oronto, however, are conspicuous in having their own la ratories, in which are made some 150 salts, acids of ph phorus, syrups, tinctures, and flavouring extracts. M t of the raw materials are imported. The scope of the bu ess is increasing yearly. The production of chemicals in 92 amounted to 37,000 dols., and last year had in ased to 50,000 dols. The small demand for pure ch icals is mainly accountable for the lack of local manu-fa rers, the market being necessarily a small one, and m buyers of pure chemicals for laboratory uses are apt to emand articles of the make of one or other of the large an old-established German or English houses. One can h ly doubt but that the Canadian maker must desire a hi er tariff on imported material. Within the last year th Liquid Carbonate Co. — and liquid carbon dioxide is ade in Canada, and used largely in the manufacture of rated waters—have been making Epsom salts and G ber's salt as a by-product, while pepsins and phosphates, m ly for medicinal purposes, are now produced by the W iam Davies Co.

VII.—Fertilisers.

ineral phosphates, in the form of apatite, are found in th Ottawa Valley, Ontario, but the deposits have not been w ked for several years. About 1891, in which year the ph phates mined were valued at 50,000 dols., a falling off be n in the output of this mineral, which has continued up the present time, the amount now mined being hardly w h recording. This state of affairs has been brought ab t mainly by the large supply of easily-worked phosphates found in Florida and Carolina, U.S.A., much of which is obtained by dredging. It may be mentioned, however, that a certain amount of apatite is made use of in the Province of Quebec by the Buckingham Electric Reduction Co., who manufacture phosphorus therefrom.[32]

Sulphate of ammonia is manufactured at the works of the Dominion Iron and Steel Co., Sydney, N.S., whose products are supplied to dealers and others engaged in the fertiliser business. The ammoniacal liquors of the Quebec, Ottawa, and Toronto Gasworks are worked up at the latter city by the Michigan Ammonia Co.[33] In Montreal, one firm, at least, makes sulphate of ammonia, and at one time the gasworks there utilised their own liquors for its production. Latterly, however, the gas liquor was exported, to be dealt with by a firm in the United States.

Quite a number of other fertilisers are produced in the Dominion from refuse matter, such as blood, tankage, bones, and offal, besides natural phosphates. Ontario, New Brunswick, Quebec, Nova Scotia, Prince Edward Island, and British Columbia, all produce fertilisers, more or less.[34]

VIII.—Coal-Tar and Asphalt.

Very little tar distillation is carried on in the Dominion, owing to the tar produced in the gasworks being too thick for treatment with any degree of success. It is mainly used for saturaturing paper, which is employed largely as a waterproofing material by builders. Some is boiled down into pitch, but fully one-half of the tar produced is exported to the United States. There is a small distilling plant at Hamilton, Ontario, which, the writer understands, is at present the only one of its kind from which coal-tar oils are produced in Canada.[35]

Asphalt.—Asphalt occurs naturally in several varieties as albertite, found in King's and Albert Counties, N.B., and as maltha, one of the stiffer petroleum compounds, which is not of much importance, however, being almost too hard for use in street paving. Up to 1898, albertite was employed in gas-making, and much of it was shipped to the United States, but the original supply is now exhausted.

IX.—Calcium Carbide, Carborundum, and Graphite.

Calcium Carbide.—The production of this substance on a manufacturing scale dates back only to the year 1891, when Mr. T. L. Willson, of the Willson Aluminium Works at Spray, N.C., accidentally obtained carbide whilst trying to reduce lime by carbon in the electric furnace. Instead of metallic calcium resulting—which was to be employed in preparing aluminium—a hard, almost black, substance was obtained which reacted violently with water, giving lime and an inflammable gas clearly recognisable as acetylene. The author was privileged, through the courtesy of Lord Kelvin, to have at one time in his possession some pieces of the first carbide made by Mr. Willson at Spray. Acetylene being a powerful illuminating agent and readily obtained from carbide, the development of the carbide industry on a commercial scale followed this discovery as a natural consequence. The industry has progressed by leaps and bounds during the past decade, in Europe even to the extent of over-production.[36] Two carbide works are in operation in Canada, using water as their source of power, namely, the Willson Carbide Co., at St. Catharine's, Ontario, and the Ottawa Carbide Co. The Union Carbide Co.[37] of Chicago, which utilises 13,000 horse-power in all and has an immense establishment at Niagara Falls, N.Y., has contracted for a large amount of power for a new plant at Sault Ste. Marie, Ontario, for the manufacture of carbide.[38] Another important prospective company is the Shawinigan Carbide Co. of Shawinigan Falls,

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[29] Mr. Webster, of the Standard Chemical Co.

[30] Mr. Knight, of the Sunlight Soap Co.

[31] Letter from the President of the Company.

[32] Minerals of Quebec; published by the Prov. Government.

[33] Letter from Mr. Macfarlane, Chief Analyst to the Inland Revenue Department.

[34] Inland Revenue Bulletin, No. 81, 1902.

[35] See Section II., Iron and Steel.

[36] Italy alone possesses enough carbide plants to supply the whole of Europe. Dr. J. W. Richards, in "Electrochemical Industry," Sept. 1902.

[37] Capitalised at 6,000,000 dols. On the American side of the river.

[38] "Electrochemical Industry," Dec. 1902.

Quebec,[39] the works being now in the course of construction. The process of manufacturing consists in fusing together burned lime and ground coke in the electric furnace; the temperature required is not so high as that needed in other operations for which the electric furnace is employed, notably the making of carborundum and graphite. The reaction taking place in the furnace results in a transference of the oxygen of the lime to a portion of the carbon with the formation of carbon monoxide and carbide of calcium.

The present market value of carbide (61 dols. per ton)[40] affords considerable profit to its manufacturers, and the increasing popularity of acetylene as an illuminant ensures a brighter future for the industry. In Ontario several towns have already had acetylene installed for house and street lighting, the gas being generated at a central station and distributed in pipes to the consumers.[41] At the generating station the gas is purified by a special process before use, which obviates all the disadvantages inseparable from the employment of small generators—automatic or otherwise—by individuals, who in most cases have neither the time nor the scientific skill necessary for the proper production of the gas, simple as it may appear at first sight.

Carborundum.—Ten years ago the very name "carborundum" was unknown; it is due entirely to the advance made in the development of electrical power, obtained from the immense waterfalls of the American Continent, that this as well as other materials are now in daily use throughout the world. Although deposits of corundum itself are found in Eastern Ontario, the artificial carbon silicide has practically supplanted the natural product as an abrasive agent. The history of carborundum may well be likened to that of carbide, its discovery being accidental. A full account of this interesting substance will be found in a paper by the Chairman of the Liverpool Section (Dr. Kohn) in 1897 (see this Journal, 1897, 863).

The Canadian works of the Carborundum Co. are comparatively small, only operating 200 horse-power. The factory, however, supplies the Canadian market, thus avoiding the payment of duty. The writer is informed by Mr. Acheson that most of the Canadian product is exported to Scotland, to be used there in finishing granite. The estimated cost of the crude crystals is 2·5 cents per pound, that of the treated powder, 4·5 cents per pound, while the selling price averages 9 cents per pound.[42]

Graphite.—Though no company for the manufacture of graphite has yet been capitalised in Canada,[43] the production of it by the Acheson process is carried on to a small extent in the Canadian branch of the Carborundum Co. at Niagara Falls. The formation of the "skeleton" crystals suggested making use of the decomposition of carborundum for making graphite itself. The inventor's patents include the production of graphite in the form of pure electric-light carbon, by subjecting impure carbon to a high temperature for a sufficient length of time to volatilise the impurities;[44] the conversion of carbon into graphite by mixing with it such metallic oxides as would be capable of forming metallic carbides, to be subsequently decomposed;[45] the conversion into graphite of such natural carbonaceous material as contains, uniformly intermixed through it, metallic oxides sufficient to produce carbide, and thence graphite.[46] These processes throw considerable light on the scientific principles underlying the formation of this substance.[47]

X.—*The Cement and Plaster Industry.*

The manufacture of Portland cement is mainly confined to Ontario, though one establishment—the Crescent Cement Works—is situated at Longue Pointe, in the province of Quebec. In Ontario there are some 14 companies, a eight factories in operation, and throughout this Provin are found the necessary raw materials (clay and marl) an excellent quality. The development of the industry h been rapid, and has all taken place within the past f years. The most improved method of procedure is follows: the marl is thoroughly mixed, mechanically, wi water into a thin paste, and the same operation is perform with the clay. The two fluids are mixed thoroughly in t required proportions, and in a pasty condition are pump into rotary steel calciners, about 70 ft. in length and 6 ft. diameter, set at a slight angle to the horizontal. The rotary calciners are the great feature of the Canadi cement plants. This form of kiln is originally of Engli origin, but has only been brought to its present effect condition since its introduction to this country. In t interior of the kiln are "channel-irons" running from e to end. At the lower end fuel is introduced in a particul manner, and the burning gases pass through the enti length of the kiln, and are allowed to escape at the upp extremity. At this latter end is introduced the "slurry" the mixed ingredients, which becomes dried and fina calcined in the slow passage from one end to the oth The revolving irons carry the "slurry" up with them they rise, and on reaching the top it falls, under the act of gravity, through the burning gases, being subjected the hottest part to a temperature of 3,000° F., when co bination takes place between the constituents of the fus mass, and the resulting "clinker" emerges into the ves destined for its reception. The drying and calcining thus performed in one operation, and no preliminary pre ing of the material into bricks is required.[48] At the wor of the National Portland Cement Co., recently erected Durham, Ont., a great saving of time is effected by cooli the clinker in vessels drawn by an endless chain through stream of water below the ground level. After cooling this manner it is ground to a fine powder, and packed bags or barrels ready for use. The whole operation this process occupies only eight hours, a period of ti which will be appreciated by all aquainted with the ol methods. At Durham the raw materials are brought fr the natural deposits, which are close at hand, calcin cooled, ground, and packed by means of a continuous ser of mechanical conveyers, from one part of the establishm to the other. This company has another plant in course erection at Hull, P.Q., on the Ottawa River, which intended to supply the Eastern Canadian market.

Several articles have appeared lately in the public pres pointing out that a possible over-production of cement m be the result of the numerous large concerns which already in operation, or are about to be started. Wheth or not this will take place in the immediate future depen naturally, on the general prosperity of the country a the consequent demand for building materials. Certai cement has gained considerable reputation as a substit for stone, as can be seen by the extent to which it is ma use of by architects. It can be readily moulded into a form and may then be dressed to represent the natu article. Whether it can ever oust stone or brick from th present position depends, not only on its comparative co but on the quality of cement put out by manufacture One case of a collapse due to an admixture of a single b of inferior material and the whole fabric of the cem industry, as supplying a substitute for the older buildi materials, will be in danger of a similar fate. The to output of Portland cement in 1902 was valued at 1,028,6 dols.[50]

Gypsum is found in considerable quantities in Nova Sco and New Brunswick. At Windsor, N.S., there are imme deposits; the beds found in the vicinity of Hillsborou N.B., are, however, very large and of great purity, and fo the basis of the most extensive operations.[51] It is a found in Ontario, and plaster works are located at Paris that province. In 1901, active operations were begun psumville, Manitoba. The industry, however, is princi- ly located in New Brunswick. Drawbacks in the way freight charges, inadequate shipping facilities, and the apetition offered by manufacturers of plaster of Paris in United States, kept the industry from developing until Intercolonial Railway was opened and the increased y on American plaster imposed, when the New Bruns- k plaster, quarried and prepared at Hillsborough, came be firmly established on the Canadian market. In manu- turing plaster of Paris, the stone is first dried in the air l ground—not burned in lumps, as is still done to a con- erable extent in England and on the Continent of Europe nd the pulverised material subjected to a process of ination in kettles, of a capacity of 60 barrels of 300 lb. the calcined plaster, furnished with lids and stirring is which keep the material in constant motion. When required temperature has been reached (285° F.), the ster is removed and packed in paper-lined barrels for ket. Analysis of the Hillsborough gypsum shows it to tain 99·88 per cent. $CaSO_4$.[52] The principal markets for ster of Paris are Canada, the United States, and South ica, while the crude gypsum is exported largely to New k and other portions of the States, being used for king plaster for walls and ceilings.[53] According to the logical Survey Reports for 1902, the gypsum produced Canada during that year amounted to over 332,000 tons, ed at 356,317 dols.

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[39] Capitalised at 1,000,000 dols.

[40] Ontario Mines Report, 1901.

[41] Worked under patents held by the Burgess Gas Process Co., Canadian Pat. 73,040, Sept. 10, 1901; Eng. Pat. 241, Jan. 3, 1901; Amer. Pat. 701,995, June 10, 1902.

[42] U.S. Pat. 542,982 of July 23, 1895.

[43] Letter from Mr. Acheson.

[44] U.S. Pat. 542,982 of July 23, 1895.

[45] U.S. Pat. 568,323 of Sept. 29, 1896, and No. 617,979 of Jan. 17, 1899.

[46] U.S. Pat. 645,285 of March 13, 1900.

[47] Electrochemical Industry, Vol. I., No. 2.

[48] The Portland Cement Industry: "Queen's Quarterly," J 1903.

[49] "The Globe," Toronto, March, 1903, and other papers.

[50] Geological Survey of Canada: Mineral Products, 1902.

[51] Geological Survey of Canada: The Mineral Resources of N Brunswick, 1899.

XI.—*Carbohydrates: (a) The Refining of Sugar; (b) The Beet-Sugar Industry.*

efining of Raw Sugar.—The recent remarkable elopments in the production of sugar from beets in ario and Southern Alberta have rather minimised the ortance of the refining of imported sugars in the ninion, and there seems little reason to doubt that the -sugar industry will continue to progress, as will be seen a the sequel. Statistics show that, during the last ade, cane sugar has increased in production about 200 cent. Judging from present appearances, and allowing some slight tariff alterations, the increase in Canada ıld soon be in proportion to that of other countries.[54]

aw sugar is imported from Cuba, the West Indies, Java, ila, the Brazils, Mauritius, and the Continent of ope. The most improved machinery and processes are loyed, refined sugars and syrups being the staple lucts.

elgium supplies to Canada the largest proportion of ır, the imports from that country amounting in 1901 27,931,553 lb.; from Germany in the same year 41,290 lb. entered the country, the total imports being ,694,833 lb., valued at close on 8,000,000 dols.[55]

eet Sugar.—The most interesting point connected with sugar industry is the remarkable way in which the uction of sugar from beets cultivated on Canadian soil become, in the past few years, an important factor in country's progress. As far back as 1872 the Dominion ernment sent a special agent to Europe to make a study he industry. A bounty of 25,000 dols., afterwards eased to 70,000 dols., was offered by the Quebec ernment in 1875 to the first successful factory to be blished in a situation approved by the Government. led to the establishment of a company, known as the n Sucrière du Canada, which, in 1881, erected the first our proposed factories at Berthierville, Que.[56] This blishment was unsuccessful and only operated for a days, mainly owing to the failure of the beet crop. r passing into other hands the plant was bought by an rican company and removed to Eddy, New Mexico.[57] ther company was, in the same year, organised at Farnham, P.Q., not far from Montreal, which, after some vicissitudes, did not deem its success sufficient to warrant a continuation of its operations, so sold its plant to a company at Rome, N.Y., in 1897. A third company, known as the Pioneer Beet Co., started operations in 1881, at Coaticook, P.Q.,[57] and was successful in part, receiving a subsidy of 35,000 dols. from the Government, but it, too, closed its doors in 1883. The causes to which these failures may be attributed were lack of capital and enterprise, and the indisposition of the farmers to cultivate beets. The Agricultural Departments of the Provincial Governments, however, continued experimenting with various kinds of beets and studied the conditions most favourable to their successful growth. For some years past the Ontario Agricultural College at Guelph has, as a consequence of the excellent results obtained at their experimental stations, been carrying on an educational campaign among the farmers of the province. As a result of this the quality and tonnage of beets now grown in different parts of Ontario surpass those of many American States. The climate of this province, with its sunshine and long autumns, is peculiarly favourable to the cultivation of the beet, which takes about four months and a half to reach maturity. It requires, however, to be demonstrated to the farmers that the cultivation of beets will pay them better than other land produce before the requisite supply of suitable material will be obtained. That profits are large can be gathered from the fact that wheat yields in Ontario 15 dols. an acre per annum, oats, 9·74 dols., and beets for sugar, 60 dols. In the last case the cost of production is necessarily large, owing to a greater amount of labour being required, but, all the same, the profits to the farmer should, with skilful treatment, be at least 30 dols. per acre per annum. The beet tops are of value as a fertilising agent owing to the salts they contain, and find a use also as a food for cattle. In 1901 beets were grown—under instructions from the Agricultural Department—in 15 districts of Ontario, and the average yield per acre was over 17 tons of a high quality of beets which gave an average of 15·6 per cent. of sugar of an average purity of 87·7 per cent. All this points to a great future for Ontario as a sugar-producing country; this important fact has been fully realised by the Provincial Government, which has offered a bounty of 275,000 dols. for three years,[58] to be distributed among factories according to the amount produced. Four companies have been organised lately, namely, the Wiarton Beet Sugar Co. (capital 445,000 dols.), whose works are situated on Lake Huron, with a capacity for treating 350 tons of beets per day; the Dresden Sugar Co., capacity 600 tons; and the Ontario Sugar Co., at Berlin, the last with a capital of 1,000,000 dols.; each of these companies has received a bonus from the town where it is situated, averaging 28,000 dols. The capitalisation of a company engaged in this industry depends entirely on the size of the plant, a general estimate of 1,000 dols. per ton of beets per day may be considered a fair calculation of what would be required.

Beet sugar factories have also been established in Alberta, in the North-West Territories of Canada. Since 1898, an area of about 300,000 acres has been made productive by means of the irrigation system of the Canadian North-West Irrigation Co., and a portion of this area has been utilised for beet cultivation, principally by the Mormon settlers. The most important factor is now in course of construction at Raymond, south of Lethbridge, on the Canadian Pacific Railway. The capital of this Company is 1,000,000 dols. The area intended to be planted with beets is 3,000 acres, and the daily capacity of the factory will be 400 tons of beets per day. The only difficulty which the industry is encountering in the north-west is the scarcity of labour.[59] This is due partly to the scanty settlement of the country, and partly to the superior attractions of the mining regions, which are situated at no great distance.

A plentiful water supply, lime, and a source of power, are necessary for the profitable prosecution of the industry;

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nalysis by A. A. Breneman, of New York, in Mineral Resources w Brunswick, Geological Survey of Canada, 1899.

etter from the Manager, Albert Manufacturing Co.

etter from Mr. D. A. Gordon, President of the Wallaceburg r Co.

ssay. Mr. Read, University of Toronto.

eport of Dominion Government on beet sugar manufacture in da.

[57] Letter from the manager of the Dresden Sugar Co., Ontario.

[58] 1 Edw. VII, cap. 11, 1901.

[59] Letter from Manager of works at Raymond.

all this has been carefully considered in locating the factories enumerated above, steam power being employed for pumping and the working of all machinery. There is room for many more factories in the Dominion; according to Dr. A. B. Shuttleworth, Chief Agriculturist to the Ontario Sugar Co., whose name is indissolubly connected with the development of beet cultivation, it would require over 30 refineries of 600-ton capacity to supply the home market alone.[60]

The working season of a factory runs for about 100 days, operating continuously. The cost of the sugar is from 3 to 3½ cents per lb. and the profits to the makers are estimated at 50 cents per ton of beets used. This would mean that in a factory of 500 tons capacity, working for 100 days, the profits would amount to 25,000 dols.

The scope of this article does not allow of any detailed consideration of the working process by which the sugar is extracted from the sliced beets and crystallised. New processes are being employed for utilising the residual molasses. This is treated for the recovery of the sugar in some part, and also for the production of alcohol by fermentation. An American company in 1901 produced 915,000 galls. of alcohol in this way, of a quality considered to be quite equal to the grain product. Another new process is that of the manufacture of syrup from the beet instead of sugar; 40 galls. of this can be obtained from a ton of beet, which, at 30 cents a gallon, means a return of 12 dols. per ton of material used, while the product in sugar yields only from 7 to 8 dols. per ton of beets. The beet-pulp refuse is also being largely used as a food for live stock, for which purpose it is extremely suitable owing to its nitrogen contents. In this connection a new process has been introduced for drying the pulp, which entails an expenditure of 5 dols. per ton, but, as the dried pulp is sold at 6·25 dols. per ton, a clear profit of 1¼ dols. is thus secured to the manufacturer.[61]

The production of sugar from Canadian grown beets is a new and rising industry which offers great scope for some co-operative arrangements between the companies and the farmers. It should give an impetus to agriculture, afford employment to thousands of unskilled workpeople, and, as an important industry, be a lasting benefit to the country. The following communication, dated March 6, 1903, from Mr. George Elsey, manager of the Dresden Sugar Co., conveys some idea of the position of the industry at the present moment and its possible future:—

"At the present time there are four factories which operated this last season, and, from what we are able to learn, the results were as satisfactory as could be expected under the existing conditions, that is, the rainfall last summer damaged the beet crop from 50 to 60 per cent., both in the United States and in Canada. The balance of the crop, on account of wet weather, cost considerably more to raise than what was necessary. It was unfortunate that this should occur in the first season that the factories were started in Canada as it was very disappointing, but most of the farmers have told us that they were surprised at the amount of rain the beet would stand, and in several instances where they could harvest the beet crop, the corn and other crops were ruined. After we have had a seasonable year, and it will be demonstrated to the farmers that there is more money in raising sugar beets than any other crop that grows, the four factories now in existence will get their supply of beets within hauling distance of the factories. . . . Our farmers know well that the Michigan farmers obtain about a dollar a ton more for their beets than they do, and they also understand that it has cost as much in money and labour to raise a ton of beets in Canada as it does in Michigan or any part of the United States. They therefore feel dissatisfied, and are clamouring for more money, which the companies would be glad to pay if they could sell their sugar for the same price as the American Beet Sugar refineries. The difference between the two markets to-day is 1·10 a 100. The presen Canadian sugar tariff is such that it would not allow an more sugar refineries to be built in Canada. The companie that are already here have the experience of what thi tariff can do. It allows sugar that has been refined in th United States to be shipped in here and undersell Canadia refined sugar, which means a loss to the refineries and t the Canadian people. It allows raw beet sugar to be imported at a price that will prevent the farmers from takin hold of the beet industry as they should. Canada i sending to Germany and other foreign countries abou 1,000,000 dols. per month for raw beet sugar, and th naturally yearly increase of consumption is about eight pe cent., so that the future of the sugar beet industry, unde a proper tariff, would be a lasting one and a great benef to the farming community."

XII.—Natural Gas and Petroleum.

Natural Gas.—The existence of natural gas in Ontari was first discovered in 1889, being found in two well-defin areas, as the Essex county field and the Welland count field. It is chiefly near Buffalo, on lake Erie, and nea Windsor, Ontario, that the largest supplies are met wit though practically it may be got in nearly any part of th Niagara peninsula in small quantities. In 1901 there wer 158 wells in operation, and 368 miles of piping were need to distribute the gas. Much of the gas produced in Esse county was formerly led across the river to Detroit b pipe lines, but on representations made by the peopl of the Essex district, to the effect that the supply of ga was not sufficient for home consumption, the Ontari Government passed an Order in Council, in October 1901 prohibiting the gas from the Essex field being exported t the States. None of the product of this natural gas fiel is therefore now being sent across the Detroit river; it i however, still exported from the Welland field to th American side of the Niagara river, chiefly to Buffalo, N. It may be mentioned that the landowners on whose farm the wells are located get their gas free in addition to bei paid for the use of their land.[62] The value of the g produced in Ontario during the last ten years shows co siderable fluctuations, being somewhat less in 1901 th in the previous year, due, no doubt, to the Governme prohibiting its export.[63]

Petroleum.—This is one of the chief mineral products the Dominion, though as yet the output is not sufficient t meet Canada's needs. The principal seat of the industry i at present in Ontario, where commercial quantities are foun in the counties of Kent and Lambton. In the former the are two oil fields, one at Oil Springs, extending over 1,2 acres, and the other in the Petrolea district, 20 miles lo by 2 wide.[64] In Lambton county the industry dates ba to the year 1862. Petroleum is also found in Quebec, No Scotia, and New Brunswick, and boring operations that ha in recent years been carried on at Athabasca, near Edmonto in the North-West Territory, point to a likelihood of th part of the country contributing largely to the future supp of mineral oil.

The industry is now one of the most highly organised i the Dominion; the system of drilling and pumping no used—the "jerker-line" system—enables a well yieldi from eight to ten gallons a day to be profitably work This system has gained for itself a world-wide reputatio it is used in Galicia, Russia, Afghanistan, Burmah, Indi Italy, France, California, and Australia. Its advantag are numerous: a central engine can operate a large numb of wells; on one property near Petrolea, 233 wells, scatter over an area of 400 acres, are worked by a single engi It is estimated that to sink a well of about 500 feet in dep costs only 125 dols.[65] In 1900, there were approximate

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[60] Berlin News Record, Nov. 8, 1902.

[61] In the above I have drawn largely from an essay on the beet-sugar industry by Mr. E. R. Read, a fourth year student in the Department of Political Science, University of Toronto, who kindly placed his papers at my disposal. Also from Dr. Shuttleworth's article in the "Berlin News Record."

[62] Report of the Bureau of Mines, Ontario, 1902.

[63] Statistical Year Book of Canada, 1901.

[64] The oil is found at depths varying from 370 to 400 feet.

[65] This, and much of what is given here on natural gas a petroleum, is from a paper by Mr. J. W. J. K. Vanston, read bef the Canadian Section of the Society of Chemical Industry in Ja 1903.

0,000 wells in operation, yielding on an average 71 barrels oil each.

The refining side of the petroleum industry is largely in e hands of the Imperial Oil Co.,[66] which some years ago osorbed several other concerns, and of the Canadian Oil efining Co. The plant of the former at Sarnia has a pacity of 60,000 barrels of crude oil per month, and the arket for their products reaches from Halifax to Vanouver. Many of the bye-products of the refining process d a market in England and in Spain. The latter comany have erected an up-to-date plant at Petrolea, on the te of one which was in operation some years ago, where l the products will be manufactured that modern science ows can be obtained from petroleum[67] Improvements in ethods of retorting have recently led to a considerable antity of the crude oil being used for gas making, million gallons being an estimate of the amount so nployed.[67]

There has been a slight falling off in the production of l during the past years: calculated as "crude" oil, the tput in 1891 was 27 million imperial gallons, and in 1901 little over 26½ million.[68] A slow process of diminution ems to be going on in the area at present productive, and falling off must be looked for from year to year unless is is counteracted by an extension of the oil-bearing rritories.[67] Probably, the field about to be exploited in e North-west will alter the position somewhat, and an crease in the output may be confidently looked for.[69]

XIII.—Pulp and Paper.

Pulp.—As timber is one of the chief natural products of e Dominion, it is only to be expected that Canada should ure largely in the wood-pulp industry; the figures that ight be given to indicate the number of cords of pulpod available throughout the country are so large that e could hardly grasp their real significance. The dustry is not so young as many others that have been nsidered: in the census of 1871, no pulp-making plants e mentioned; in 1881, there appear five mills, employing men, and having an output valued at 63,000 dols.; in 91 there were 24, with a yield valued at more than a illion dollars; while 1901 shows some 35 factories from ich the exported pulp alone amounted to nearly 2 million llars.[70] The area of pulp-making operations is not coned to any one province, New Brunswick, Nova Scotia, ebec, Ontario, and British Columbia all being represented the industry.

The principal woods employed for pulp-making are ite and black spruce, balsam, poplar, and pine; spruce[71] d balsam are those most generally used, on account of e special quality of their fibre and their colour, pine ing utilised mostly for chemical pulp. The two main rieties of the pulp are *mechanical* and *chemical*. The rmer is obtained by grinding spruce logs to powder, the s being pressed against a rapidly revolving grindstone, th water constantly supplied to prevent the friction using a rise of temperature. A liquid pulp is thus tained from which the water is squeezed by hydraulic chinery, a pressure of many tons to the square inch ing employed. The resulting pulp still contains water, wever, to the extent of from 50 to 60 per cent., though e works—notably those at Sault Ste. Marie—have introced a machine specially constructed for the purpose of moving this large excess of moisture. Where the pulp to be made at once into paper, this drying process is necessary. The specially dried pulp resembles paper very closely in outward appearance.[72] Chemical pulp is prepared by disintegrating and extracting the resinous matter from the wood—in the form of chips—by digestion with sulphur compounds, usually a weak solution of sulphurous acid, about a quarter of which is in the form of bisulphite of lime.[73] A soda chemical process is also employed by some makers. The sulphurous acid is either made from sulphur imported from Sicily, or obtained by burning pyrites. Chemical pulp possesses many advantages over mechanical pulp, though its manufacture is necessarily more expensive, and the yield per cord of wood, as compared with the latter, is much less.[74] It has a longer and tougher fibre, and, the resinous matter being no longer contained in it, finds uses for qualities of paper for which the mechanical pulp would be unsuitable. The principal markets for pulp are Great Britain, the United States, France, Australia, and Japan. Much of it is used, however, locally for the manufacture of paper.

Paper.—In many cases the producers of pulp also manufacture it into paper. The principal requisites for the paper industry are a plentiful supply of pulp-wood, good water and an abundance of it, and cheap power; all these can be found in many parts of Canada. The growth in the demand for paper of all kinds, news, wrapping, wall, and the finer grades, was one of the features of last century—especially news paper. The introduction of wood fibre into its manufacture has consequently enabled the supply to keep pace with the demand. The process of manufacture requires no description here; the secretary to a prominent Canadian firm states that originally they used rope as a raw material, then straw, which was abandoned for rags, and finally these gave place to chemical and ground wood-pulp. Previous to 1870 no wood whatever was used in the manufacture of paper in this country. Ground wood-pulp was introduced at that time, and has become the filling material of the cheaper grades of paper, being partly pasty and partly fibrous. Up to 1885 the real fibre—the framework of the paper—was supplied by rags. In 1885 sulphite pulp was introduced and has largely replaced rags, except in the higher grades of paper, in which linen is used, and in the very low grades, where straw is employed.[75]

The "Toronto Globe" of March 4th, 1903, in an article on the wood-pulp industry, gives the following statistics, which are of interest:—

	Tons.
Production of mechanical pulp in 1902	155,210
" sulphite " "	76,735
" soda " "	9,044

XIV.—Asbestos.

This mineral occurs in large deposits in the "Eastern Townships" of Quebec, where it was first worked in 1878 from 1880 up to the present date the production of asbestos has increased steadily; the output that year is given as 380 tons, while in 1901 over 38,000 tons are recorded in the return furnished by the producers. The world's supply of asbestos is, for the most part, obtained from Canada, and the Quebec deposits have in the past proved to be the most profitable mineral mined in the province. Thirteen mining companies are at work in this industry, which is principally carried on at Thetford, Lac Noir, and Danville,[76] giving employment to approximately 1,000 men. Asbestos is shipped largely to Great Britain, the United States, Belgium, Germany, and France.

Another silicate found in Canada is mica, which, though occurring in small quantities, is a not unimportant industry; in Ontario there are several mines and a number of works where splitting, trimming, and sorting the mineral into saleable sizes is carried on. Most of these, however, are on a small scale.

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[6] Capital stock, 1,000,000 dols.

[7] Bureau of Mines Report, Ontario, 1902.

[8] Statistical Year Book, 1901.

[9] Total value of products of petroleum in Ontario in 1901, 57,940 dols. Bureau of Mines Report, 1902.

[0] Statistical Year Book, 1901.

[1] In 1894 it was estimated that Canada contained between 38 1 40 per cent. of woodlands and forests, or about 1,400,000 sq. les, one-half of this being spruce. The spruce area is thus million acres. In all there are 4,500 million tons of pulpwood sight. ["Pulpwood of Canada." Pan-American Exhibition mphlet, published by the Geological Survey, 1901.]

[72] The Saulte Ste. Marie Works use some 200 tons of spruce logs, yielding 150 tons of pulp per day.

[73] Letter from Mr. Carl Riordan, Merriton, Ont.

[74] One ton of mechanical pulp requires a little over a cord of wood; 1 ton of chemical pulp requires a little over two cords of wood.

[75] Mines Report, P.Q., 1901.

[76] See note 73.

Conclusion.

The subjects that have been considered in this paper do not by any means exhaust the catalogue of chemical industries in Canada. Many important manufactures have, for the reasons mentioned in the opening paragraph, been omitted. A short summary of these will suffice. Matches, for example, constitute an important and necessary article of daily use, and are made in enormous quantities, practically all that are used in Canada being manufactured in the country. Brewing and distilling are also carried on extensively, ale, lager beer, and stout being made, while Canadian rye whiskey is known throughout the whole English-speaking world; even a "Canadian Scotch" is produced at Perth, Ont.; brandy and champagne and other wines are made at Hamilton, Brantford, and Pelee Island, on Lake Erie. Fruit canning is one of the great industries of Wentworth and Essex counties, Ont.; bacon packing and salmon canning may also be classed among those manufactures requiring the careful supervision of the skilled chemist. To the list may be added explosives of all kinds; blackings, varnishes, japans, lacquers, paints and shellac, foodstuffs and sauces; antitoxins for use in the practice of medicine are made by the Parke Davis Co. at Walkerville. Natural mineral waters are abundant at St. Catharines in British Columbia, and in Quebec, while manufactured aerated waters are made in nearly all the important towns. The almost universal wearing of india-rubber foot coverings during the winter season necessitates the production of large quantities of goods of this sort. Many large factories for this purpose are in existence, from which rubber goods of a superior quality emanate; dyeing and calico-printing might also be mentioned as being in a flourishing condition. The attitude of manufacturers towards chemists has of late years been extremely favourable and many have seen it to be to their advantage to employ men trained in our universities to investigate the processes and materials employed in their particular industries. So far their employment has been amply justified by the results, and it is to be hoped that more may be brought to see the profit to be gained by adopting scientific methods of work. The university man who has specialised in chemistry can assist the manufacturers in this by bringing to bear on the *rationale* of the technical processes the general scientific knowledge which he has gained during his college course, and his experience of methods of research and manipulation; he can thus materially benefit his employer by improving the quality of his products or enabling him to turn out his goods at a cheaper rate. Let the manufacturer, be he dyer, tanner, pulp-maker, or ironmaster, indicate only that he is willing to find employment for men educated in the higher branches of scientific work, and the universities of the Dominion will supply them. Where chemical processes are used, it is essential for the prosperity of this country that all the available scientific knowledge should be brought to bear on them, in order that they may continue to improve and to develop even more than they have done in the past decade. Canada, with its immense natural resources, and its water power should, in time and with proper management and assistance in the lines indicated, become one of the largest producers of the world's supplies.

In conclusion I wish to acknowledge the great assistance I have received from Mr. Fred. P. Clappison, B.A., Fellow in Political Science in the University of Toronto, in gathering together for me from all quarters, the information required for this short and imperfect account of the chemical industries of the Dominion. In particular his help in connection with the statistics contained in the text and in the appendices has been invaluable. To the gentlemen who so kindly answered our enquiries as to their particular industries and placed valuable material at our disposal, I desire also to convey my hearty thanks.

APPENDIX I.

The Iron Ores of Canada.

Nova Scotia.—Magnetites in enormous quantities at Nictaux, in Annapolis County, at Whyhogomah, in Inverness County. Specular and red haematite at Nictaux Stewiacke, Pictou, Antigonish, Guysboro, East Bay, and many other points. Limonite, specular, spathic clay ironstone and haematite at Londonderry. Mineral fuel and fluxes are in close proximity throughout the whole district.[77]

Cape Breton.—Extensive deposits of brown haematite, magnetite, and spathic ores lying adjacent to the great coalfields.[78]

New Brunswick.—Magnetite and bog ores. Coalfields at Grand Lake and hardwood throughout the Province.

Province of Quebec.—Very extensive deposits of bog and lake ores, extending from the Province of Ontario to Gaspé. Magnetite deposits especially good at Sherbrooke Leeds, Sutton, St. Jerome, and in Pontiac County Hardwood and limestone abundant. Deposits of chrome ironstone found in 1895 in Coleraine. The "Eastern Townships" obtain iron by dredging in the Lac-a-la-Tortue Magnetites at Hull, near Ottawa.[79]

Ontario.—Vast deposits from the Ottawa Valley to head of Lake Superior, comprising magnetite, red haematite limonite, specular, and occasionally bog ores. The Helen Mine, at Michipicoten, is said to be one of the richest in the world. There are also extensive forests of hardwood especially suited for the production of charcoal, and fluxes in abundance.[80]

Manitoba.—Magnetite, haematite, and bog ore on Lake Winnipeg. Hardwood in abundance.[81]

British Columbia.—Magnetic ores at Texada Island and Cherry Tree Bluff. Coal and wood in plenty. Collieries at Nanaimo (Naval coaling station for H.M's ships), Wellington, and Comox. A recent discovery of large deposit of magnetite has been reported in the Boundary Regi t which at present mainly finds a use as a flux.[81]

APPENDIX II.

Metallic Production of Canada, 1892—1901.

Metals.	Value, 1892.	Value, 1897.	Value, 1901.	Value, 1902.
	Dols.	Tons.	Dols.	Dols.
Pig iron	637,421	53,796	1,212,113	..
		Dols.		
Steel slabs and billets	..	347,280	..	..
Copper in mattes	818,580 (83)	1,501,660 (82)	6,600,104 (83)	..
Nickel in mattes	1,399,176 (83)	1,399,179 (82)	4,594,523 (83)	..
Arsenic	1,000	..	41,676	50,000 (84)
Gold	907,601	6,190,000	24,462,222	12,500,000 (85)
Silver	193,411	2,613,173	2,993,668	..
Aluminium	..	..	1,000,000 (85)	1,643,250
Lead	49,422	1,396,853 (83)	2,199,787 (83)	..

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[77] Nova Scotia Report of Mines, 1901.

[78] Report of Geological Survey.

[79] Mines and Minerals of Quebec: Department of Mines.

[80] Bureau of Mines Report, Ontario, 1901.

[81] Geological Survey of Canada, 11th Annual Report.

[82] Value of metal, if refined.

[83] Value of matte.

[84] Estimated.

[85] Letter from Mr. B. E. Walker, General Manager, The Canad i Bank of Commerce.

APPENDIX III.

Iron and Steel Production.

Company.	Plant at	Built.	Source of Ore.	Employees, 1902.	Output in Tons.				Capacity of Furnaces in Tons per Day.		Capitalisation.
					Pig Iron.			Steel.			
					1892.	1901.	1902.	1901.	1892.	1902.	
											Dols.
anada Iron Furnace Co.	Midland, Ont.	1899	Ontario	..	..	18,948	..	..	..	..	1,000,000
	Radnor, Que.	..	Quebec	..	5,574	31.159	..	..	40	..	..
	Londonderry, N.S.	1887	N.S.	(86)	28,052	(86)	(86)	(86)	40,000 per ann.	150	..
amilton Steel and Iron Co.	Hamilton, Ont.	1896	Ontario and U.S.A.	1,000	(88)	51,701	..	9,473	(88)	180	1,500,000
va Scotia Steel and Iron Co.	Now Glasgow, N.S.	..	N.S.	965	29,502	28,407	..	23,916	100	100 pig. 100 steel.	5,000,000
esoronto Iron Co.	Desoronto, Ont.	..	U.S.A.	..	..	13,701	..	..	..	..	..
minion Steel and Coal Co.	Sydney, N.S.	1901	Newfoundland	6,000	(88)	27,643	191,259	86,424 (1902)	(88)	1,000 pig, 800 steel.	33,000,000
n MacDougall and Co.	Drummondville, Que.	..	Quebec	..	..	793	..	..	6	..	..
ramp Ontario Steel Co.	Collingwood, Ont.	1900	Ontario and foreign.	(87)	..	..	..	..	..	200,000 per ann.	..
ake Superior Power Co.	Saulte Ste. Marie.	1901	Ontario	500	(88)	(87)	(87)	(87)	(88)	..	117,000,000

[86] Not in operation, due to repairs being made.

[87] Not in operation yet.

[88] Not in operation.

APPENDIX IV.

Portland Cement and Plaster of Paris.

Firm or Company.	Place.	Capital.	Capacity of Plant in Barrels per annum.	Output, 1902 (Barrels).	Date of Beginning Manufacturing.
		Dols.			
scent Cement Co.	Longue Pointe, Que.	200,000	..	..	..
adian Portland Cement Co.	Deseronto, Ont.	1,500,000	250,000	250,000	1893
cfield ,,	Lakefield, Ont.	590,000	75,000	75,000	1902
erial ,,	Owen Sound, Ont.	250,000	50,000	50,000	1902
y and Bruce ,,	,, ,,	100,000	30,000	20,000	1902
en Sound ,,	Shallow Lake, Ont.	199,000	100,000	100,000	..
,,	Owen Sound, Ont.	500,000	40,000	40,000	1902
ional ,,	Durham, Ont.	1,000,000	300,000	..	1903
over ,,	Hanover, Ont.	150,000	30,000	30,000	..
		4,399,000			
ert Manufacturing Co. (Plaster Paris)	Hillsboro', N.B.	350,000	..	60,000	..

APPENDIX V.

Carbohydrates.

Sugar from Beetroots.

Company.	Place.	Capital.	—	Output, 1902.	Capacity.
		Dols.			
rton Beet Sugar Co.	Wiarton, Ont.	445,000	Began, 1901	..	350 tons of beet per day.
ario Sugar Co.	Berlin, Ont.	1,000,000	,,	Over 6,000,000 lb. of granulated sugar. (89)	600 ,, ,,
sden Sugar Co.	Dresden, Ont.	500,000	,,	..	600 ,, ,,
llaceburg Sugar Co.	Wallaceburg, Ont.	500,000	,,	..	700 ,, ,,
ght Sugar Co.	Raymond, N.W.T.	1,000,000	Will begin 1903	..	400 ,, ,,

Sugar from Cane.

dia Sugar Co.	Halifax, N.S.	..	..	..	..
ada Sugar Co.	Montreal, Que.	..	..	..	..
Lawrence Sugar Co.	,, ,,	750,000	..	100,000,000 lb. of raw sugar.	..

[89] Letter from Dr. A. F. Shuttleworth, 19.3.03.

Manchester Section.

ERRATA.

THE MANUFACTURE OF SULPHURIC ACID BY THE CHAMBER PROCESS.

BY B. HART AND G. H. BAILEY.

(This Journal, 1903, 473—476.)

Page 476, col. I., line 9, for "Maclear" read "Mactear."

Page 476, col. II., line 2, for "Mactean" read "Mactear."

Page 476, col. II., line 9, for "4" read "0·4."

Page 476, col. II., lines 16 and 17, for "32 and 33" read "2 and 3."

Page 476, col. II., line 30, for "mere" read "these."

Page 476, col. II., line 40, for "sulphazolised" read "sulphazotised."

Page 476, col. II., line 42, for "Linde" read "Linder."

Page 476, col. II., line 46, read "full stop" after obtained.

Page 476, col. II., line 46, "Notwithstanding" begins a new sentence.

Page 476, col. II., line 48, after "excess" read "comma," not full-stop.

DRAUGHT AND CURRENTS IN VITRIOL CHAMBERS.

BY HERBERT PORTER, F.I.C.

(This Journal, 1903, 476—480.)

Page 479, col. I., line 29, insert Table A as follows:—

Fig. 2............	14·5 minutes.
Fig. 3............	7·5 „
Fig. 4............	13·7 „

Page 480, col. II., for "Experiment 8" read "Fig. 3."

NOTE.—The model glass chamber was 98 ft. long, 30 ft. wide, and 30 ft high.

Scottish Section.

Meeting held at Glasgow, on Tuesday, April 7th, 1903.

MR. T. L. PATTERSON IN THE CHAIR.

TEREBINE AND ITS DRYING PROPERTIES.

BY CHAS. A. FAWSITT, F.R.S.E., F.C.S.

Terebine is an article of commerce which has been in use for 35 years, and has during that time supplied a want as a quick drier for oil, usually when mixed with pigment. As its properties and behaviour under various conditions are not well understood, I thought a little experience gained in testing this article might be of interest.

The reason it has been generally adopted is on account of its drying power for oil when mixed with pigment to form paint. By its use work can be carried on more expeditiously, especially outside work.

Terebine is an article which is not used with discretion, much more being added usually than is required. The users think that by increasing the quantity quicker drying is obtained, but this is only the case up to a certain point, and after this is reached the drying of the paint does not proceed more quickly until it is added in the proportion used for staining work, in which case it depends more on the nature of the solids contained in the terebine than on its oxidising effect on the oil. In some concerns, terebine is used *ad libitum* by the workpeople, whilst in others the paint is mixed up in large quantities by an experienced colourman, who uses the proper proportion of terebine; and it is in the latter class of establishments that the best and most economical results are obtained.

In order to form some idea as to the properties of the terebines most commonly used, samples were procured, and these were examined as to colour, specific gravity, amount of solid matter, drying properties in oil and in oil mixed with pigments at various temperatures and under various conditions.

The terebines examined were all mobile liquids, and consisted of solutions of certain solid bodies in turpentine. What the solid bodies were it would have been difficult to determine with any degree of certainty; and, as the samples were procured with a view of testing their drying power, the composition of the solids was a point which was not taken up. No doubt, however, they would in most cases be a mixture of linoleates or resinates. The colour varied from dark to pale brown; but it is unfair to judge of a terebine from its colour, as they contain such a variable amount of solid matter, which imparts the colour. The palest terebine, as a rule, has the least proportion of solid matter. But this is not always so, as the colour depends to some extent on the nature of the solids. Some of the samples containing a high percentage of solids could be diluted with an equal quantity of turpentine and still contain more solid matter than others. A strong terebine, therefore, is usually darker than a pale one, on account of the higher percentage of solid matter. It may be mentioned here that terebine is not used largely for pale-coloured paints, but mostly for outside work, where quick drying is desired.

Terebines are, with few exceptions, made with turpentine as the solvent, and in such cases the specific gravity is a guide to the solid matter they contain. In Table I. are the specific gravities, percentage of solids, and colour of the samples which were tested.

TABLE I.

No.	Sp. Gr. at 60° F.	Per Cent. of Solids.	Colour.
A	1·039	46·5	Dark
A_1	0·990	37·1	Dark
A_2	0·930	21·4	Pale
B	1·040	43·8	Pale
C	1·005	40·0	Pale
D	0·991	39·5	Pale
E	0·930	19·5	Dark
F	0·970	36·4	Very pale
G	1·034	37·5	Dark

A_1 and A_2 were A thinned with turpentine. The solid matter was determined by heating a weighed quantity in an air-bath at 250° to 260° F. until the weight was constant.

From Table I. it will be noted that the specific gravity of the terebines tested varied from 0·930 to 1·040, and the percentage of solid matter from 19·5 per cent. to 46·5 per cent. Now, as the specific gravity of turpentine, which was the solvent in each case, is approximately 0·870, it follows that to increase the weight per gallon from 8·7 lb. to 10·4 lb., a considerable amount of solid matter must have been added in the case of the sample, sp. gr. 1·040, and this is the drying agent. It must, however, not be inferred that those terebines which contain the most solid matter are the best driers, as it depends very much on the nature of the solid matter; but, as a rule, the quick-drying terebines do contain a high percentage of solids. Take the case of E; it only contained 19·5 per cent. of solids, whereas A contained 46·5 per cent. Now, if the solids in each case happened to be of the same composition A would go very much further than E; in fact, 1 gall. of A would be as effective as fully 2 galls. of E. This point will be brought out more clearly in the subsequent tests.

Before proceeding to test the drying of oil when mixed with terebine, it was thought advisable to ascertain the times required for linseed oil to dry when unmixed with terebine, and included in this test were a few oils which are sometimes used for adulterating linseed oil.

The oil was brushed on squares of glass, so that an even surface could be obtained and the times of drying more accurately compared. Results as in Table II.

TABLE II.

Oil.	Sp. Gr.	Time of Drying.	Temperature.
			° F.
L eed, Baltic	0·932	168 hours	50 to 55
, ordinary..	0·930	192 „	„
C on-seed........	0·919	Not dry 150 days	50 to 60
R -seed	0·910	„ „	„
R a*.............	0·999	„ „	„

* This oil became stiff.

he above results show that good raw Baltic oil is a su rior drying oil to ordinary raw linseed. This is owing to ordinary linseed being contaminated with a large proportion of seeds, such as rape, dodder, and mustard seeds, which yield a slower drying oil.

In the next place, these oils were mixed with terebine in order to ascertain the times of drying, because when using terebine as a drier for paint, it is the oil which has to be dried, not the pigment, although the latter in some cases retards the drying of the oil and in some cases accelerates it. In these trials 2 oz. of terebine were added to 1 lb. of raw oil.

Included in these tests were several samples of different Baltic and ordinary linseed oils which had been kept for different periods of time. The mixtures of terebine and oil were brushed on when freshly prepared and also after standing 24 and 96 hours. Results are in Table III.

TABLE III.

Oil.	Sp. Gr.	Age of Oil.	Amount of Terebine to Oil.	Time of Drying.	Temp. of Air.	Time after 24 hours.	Temp. of Air.	Time after 96 hours.	Temp. of Air.
		Months.		Hours.	° F.	Hours.	° F.	Hours.	° F.
c	0·932	2	2 oz. to 1 lb. oil	6½	50 to 51	6½	50 to 51	5½	55 to 56
....	0·935	25	„ „	6½	„	7	„	5¾	„
....	..	30	„ „	6¼	„	6¼	„	5	„
....	0·931	24	„ „	6½	„	6½	„	5½	„
nary	0·930	1	„ „	7	„	7	„	6	„
.....	0·930	New	„ „	7½	„	7½	„	6¼	„
.....	0·930	3	„ „	7	„	7	„	5¾	„
.....	0·931	19	„ „	7¾	„	7¾	„	6¾	„
.....	0·93t	18	„ „	7	„	7	„	5¼	„

om the above results it will be noticed that the Baltic s les dried in very much the same times, and also the o nary linseed-oil samples, but the former in every case d l faster than the latter. The reason of the faster d ng of all the samples after standing 96 hours was on a unt of the air temperature having increased 5° F. It is i ortant, in view of subsequent trials, to note that the k ing of the mixture of terebine and oil for 24 and 96 hours d not retard the drying times.

he drying effect of terebine was next tried on oils which a sometimes used for adulteration purposes, and which, a as been shown before, do not dry of themselves in a r onable time. As in the case of Baltic and ordinary li ed oils, 2 oz. of terebine were added to 1 lb. of oil.

TABLE IV.

Oil.	Sp. Gr.	Amount Terebine to Oil.	Time of Drying.	Temp. of Air.
				° F.
on-seed*	0·919	2 oz. to 1 lb. oil	Not dry 40 days	50 to 55
R -seed† .	0·910	„ „	„ „	„
R 1.......	0·999	„ „	20 to 24 hours	„

* Skin became stiff, not dry. † Oil remained soft.

e results in the above table show that, with the e ption of rosin oil, the others were little affected, as r rds times of drying, with the addition of an ordinary p ortion of terebine.

adding the terebine to the cotton-seed oil it remained c for a time, but on standing for 24 hours it had become o muddy appearance. The rape oil became turbid at o , and jellified after standing. The rosin oil remained clear, but thickened. No doubt the turbidity in each case would be due to the precipitation of the solids in the terebine.

A series of trials were next made by mixing terebine with Baltic and ordinary linseed oil, to which different pigments had been added. The proportion of terebine to oil contained in the paint was the same as in the trials detailed in Table III. The oil was weighed out, and the pigment, the weight of which was noted, was added to the oil until it was of the usual consistence for painting. The mixture of oil and pigment was allowed to stand for 12 hours to become well incorporated, and then the terebine added in the proportion of 2 oz. of terebine to 1 lb. of oil, which would amount to about 1 oz. of terebine to 1 lb. of paint, as the mixed-up paints contained about 45 per cent. of pigment, excepting red lead, 61½ per cent., and Venetian red, 50 per cent. It was thought preferable to fix the proportion of terebine to the oil used, as it was the same in each case, and if the pigments did not retard or accelerate drying, the time required would be the same in each case, as it has been shown before that for similar kinds of oil the drying times are the same.

The Baltic and ordinary linseed oil samples used were the No. 1 samples in Table III.

The pigments selected were those which were thought would represent hard, ordinary, and easy to dry paints.

After the oil and pigment mixture had stood 12 hours the terebine was added, and the paint brushed on to plates as soon afterwards as possible. The plates were allowed to stand in an airy room until dry. The paint was called dry when the back of the fingers rubbed lightly over the surface of the paint did not become marked or experience a feeling of tackiness. This was the point at which the best comparison could be arrived at, although the paint took some time longer to become thoroughly dry. The results are in Tables V. and VI.

TABLE V.

Baltic Samples.

Paint.	Weight of Pigment.	Weight of Oil.	Weight of Terebine.	Time of Drying.	Temp. of Air.	Time after 24 hours.	Temp. of Air.	Time after 96 hours.	Temp. of Air.
	Lb.			Hours.	° F.	Hours.	° F.	Hours.	° F.
T ey umber............	1	1¼ lb.	2½ oz.	4	54 to 55	5½	59 to 60	8	55 to 56
C non umber	1	„	„	5¼	„	5	„	5¾	„
V tian red	1½	„	„	5	„	5	„	5½	„
B t sienna	1	„	„	4½	„	5½	„	7½	„
D black	1	„	„	5½	„	6¼	„	8½	„
R ead	2	„	„	5½	„	5½	„	6¼	„

TABLE VI.

Ordinary Linseed-Oil Samples.

Paint.	Weight of Pigment.	Weight of Oil.	Weight of Terebine.	Time of Drying.	Temp. of Air.	Time after 24 hours.	Temp. of Air.	Time after 96 hours.	Temp. o Air.
	Lb.			Hours.	° F.	Hours.	° F.	Hours.	° F.
Turkey umber	1	1¼ lb.	2¼ oz.	4	54 to 55	7	59 to 60	9¼	55 to 56
Common umber	1	,,	,,	5½	,,	5¾	,,	6	,,
Venetian red	1¼	,,	,,	5¼	,,	5½	,,	6¼	,,
Burnt sienna	1	,,	,,	4½	,,	7	,,	9½	,,
Drop black	1	,,	,,	6	,,	7½	,,	8¼	,,
Red lead	2	,,	,,	6	,,	6	,,	7	,,

From the above results it would appear that for all practical purposes ordinary raw linseed oil is as good as raw Baltic oil for paint mixing. The paints made up with Baltic oil, when freshly put on, dried in from 4 hours for Turkey umber to 5½ hours for black and red lead, and those with ordinary oil from 4 hours for Turkey umber to 6 hours for black and red lead. After the paints had stood 24 hours, the Baltic-oil samples dried in from 6 hours for common umber and Venetian red to 6¾ hours for black paint, while for ordinary oil from 5½ hours for Venetian red to 7½ hours for black paint. (These numbers, both in the case of Baltic and ordinary oil samples, after 24 hours' standing, would have been higher if the temperature of the air had remained the same as when freshly put on.)

After the paints had stood 96 hours the temperature of the air was practically the same as when the paints were freshly put on, so the numbers are strictly comparative. In this case the times varied for the Baltic samples from 5½ hours for Venetian red to 8½ hours for black paint, and for the ordinary oil samples from 6 hours for common umber to 9½ hours for burnt sienna. The keeping of the paint had resulted in slower drying in each instance, Venetian red taking half an hour longer and Turkey umber took four hours longer for Baltic samples, and for the ordinary oil samples half an hour longer for common umber and five hours longer for burnt sienna.

These trials show the importance of not adding terebine to paint until it is going to be used, as when freshly mixed the paints dry faster; besides, it is more economical.

The same pigments as used in the above trials, if manufactured by another firm, would, no doubt, give different times for drying.

As patent driers are much used for drying paint, a series of trials were made with them in oil alone, and also in oil mixed with pigment, to see how they would dry compared with terebine. They are solid bodies mixed with oil to the consistence of putty. The solid matter consists chiefly of some inert substance, such as whiting, Paris white, china clay, or sulphate of lime, mixed with a small proportion of one or more of the following substances: acetate and borate of lead; acetate, borate, and sulphate of manganese.

For these trials four samples of patent driers, made by firms of high repute, were procured. Trials were firstly made in oil alone. Two proportions of patent drier were added: 3 oz. and 6 oz. to 1 lb. of raw Baltic oil. After mixing the patent drier with the oil, the mixture was allowed to stand 18 hours, so as to allow of the drier becoming thoroughly incorporated with the oil. This was considered necessary, as the drier was in the solid form, and some time would necessarily elapse before the oil had appropriated or dissolved an amount of drier sufficient to effect its drying. A sample of 2 oz. of terebine to 1 lb. of oil was included in the tests. The results showed that the terebine sample dried much faster than 3 oz. or 6 oz. of patent drier. After standing 16 days the patent drier samples dried much faster than when 18 hours old. After the tests with oil a series was made with 3 oz. and 6 oz. of patent drier in ordinary paint. The results showed that terebine dried much faster in each case. On long standing, however, the times of drying in the case of the patent drier samples were much decreased.

In order to test the drying properties of different terebines under various conditions, a series of trials were made with those detailed in Table I., and for this purpose a quantity of burnt sienna in paste form was procured from a manufacturer of good repute. This was then made down to the usual consistence for painting with raw linseed oil, and tests ma with each terebine, varying the proportions from 2 oz. ¼ oz. to 1 lb. of paint; it would have been preferable apportion the terebine to the oil in the paint, but as the bur sienna which is sold in paste form contains oil, and as t amount of oil could not be well estimated, it was thoug advisable to fix it to the paint when thinned down and rea for painting.

This method of reducing the proportion of terebine to pai by instalments from 2 oz. to ¼ oz. per lb. of paint w thought likely to be the best for arriving at their compar tive strengths; 2 oz. of terebine per lb. of paint wou amount to about 4 oz. per lb. of oil in the paint.

The paints were painted on glass when freshly mixed a after 72 hours' standing.

Burnt sienna was selected, as it is accounted a pai which is hard to dry, the effect of this pigment on the being to retard its drying. Burnt siennas vary very mu in this respect, no two lots giving the same numbers, a as will afterwards be pointed out, occasionally a qua specially difficult to dry is met with. Results of the tests are in Table VII.

Taking the results for 2-oz. samples when freshly put there is a difference of 4½ hours between the fastest dry sample, D, and the slowest, C, and, after standing 72 hou a difference of 10 hours between the fastest, D, and slowest, B; it will also be noticed that in each case drying time is slower after standing 72 hours.

For the 1½-oz. samples, D was still the fastest and C slowest, the times being very similar to those for 2 o showing that 2 oz. was, for each of these terebines, excessive quantity when the paint was put on after be freshly mixed. But the 1½-oz. samples went back very mu on standing 72 hours, sample E taking 19 hours longer to d The 1-oz. samples, when freshly put on, dried very w almost as well as with 2 oz., but they showed worse res on standing 72 hours, E taking 21½ longer than wh freshly put on. For ½-oz. samples there is a mark increase in the drying times, C taking 43 hours, whereas took only seven hours for 1½ oz. A marked increase w noticed also on all the ½-oz. samples on standing 72 hou the time of the fastest sample, A, increasing from 5¼ to 17 hours.

For the ¼-oz. samples, when freshly put on, the times again much increased, the fastest, A, taking 11¼ hours, a the slowest, C, 84 hours, whilst after 72 hours' stand A, the fastest, takes 30 hours, a difference of 18¾ ho brought about by standing, and C, the slowest, 90 hours

These results show the value of this method for arri at the strength of a sample of terebine. The differen between some of the samples was not very marked, ev when the amount of terebene had been reduced from 2 to 1 oz., but the ½-oz. samples showed a very dec difference, D, for instance, which was the fastest with 2 of terebine, taking eight hours longer to dry with ½. These trials bring out very forcibly the necessity of mix terebine with paint immediately before using, and allowing it, if possible, to stand over night.

In order to ascertain whether or not a larger proport than 2 oz. of terebine to 1 lb. of paint would quic the time of drying, a test with 4 oz. to 1 lb. of p was compared with a 2-oz. sample, and the times w as follows:—2-oz. sample dried in 6 hours; 4-oz. sam dried in 5¾ hours. Temperature of the air, 41° F.

Table VII.

Sample.	2 oz. of Terebine to 1 lb. of Paint.				1½ oz. of Terebine to 1 lb. of Paint.				1 oz. of Terebine to 1 lb. of Paint.			
	Time of Drying when Fresh.	Temperature of Air.	When 72 Hours old.	Temperature of Air.	Time when Fresh.	Temperature of Air.	When 72 Hours Old.	Temperature of Air.	Time when Fresh.	Temperature of Air.	Time when 72 Hours Old.	Temperature of Air.
	Hours.	° F.	Hours.	° F.	Hours.	° F.	Hours.	° F.	Hours.	° F.	Hours.	° F.
A	3½	60 to 61	3¾	60 to 62	3½	60 to 61	5½	53 to 55	3½	60 to 61	5¼	53 to 55
A_1	3½	,,	3¾	,,	3¾	,,	5¾	,,	3¾	,,	8	,,
A_2	3¼	,,	5¼	,,	4½	,,	11½	,,	5½	,,	16	,,
B	4½	,,	13½	,,	6¼	,,	14	,,	6	,,	11¼	,,
C	7½	,,	8½	,,	7½	,,	12	,,	7	,,	28	,,
D	3	,,	3½	,,	3½	,,	5¾	,,	3¾	,,	12¼	,,
E	4	,,	12½	,,	5	,,	24	,,	7½	,,	29	,,
F	6	,,	6¼	,,	6¼	,,	11½	,,	7½	,,	24	,,
G	5	,,	5½	,,	5¼	,,	7½	,,	5¼	,,	11½	,,

Sample.	½ oz of Terebine to 1 lb. of Paint.				¼ oz. of Terebine to 1 lb. of Paint.			
	Time when Fresh.	Temperature of Air.	Time 72 Hours Old.	Temperature of Air.	Time when Fresh.	Temperature of Air.	Time 72 Hours Old.	Temperature of Air.
	Hours.	° F.	Hours.	° F.	Hours.	° F.	Hours.	° F.
A	5½	54 to 55	17	52 to 55	11¼	53 to 55	30	52 to 55
A_1	7	,,	18	,,	15	,,	36	,,
A_2	9¼	,,	23	,,	27	,,	50	,,
B	8	,,	42	,,	46	,,	57	,,
C	43	,,	55	,,	84	,,	90	,,
D	11	,,	36	,,	19	,,	48	,,
E	17	,,	48	,,	48	,,	58	,,
F	40	,,	50	,,	46	,,	57	,,
G	8	,,	26	,,	19	,,	43	,,

hese results were practically the same, and showed t the addition of the extra 2 oz. was unnecessary.

t is the universal experience that cold weather retards drying of paint when mixed with terebine or other ers, so, in order to ascertain what difference a moderate l also a low temperature would have when compared h drying at the ordinary temperature, trials were made in artificially cooled chamber.

ls the stock of burnt sienna with which the preceding ls had been made run out, another supply from the ne maker was obtained, and as from previous experience was known that this paint was very irregular as regards time for drying, a comparative trial was made with it remained of the previous stock. 1 oz of terebine to). of paint was used. The results are in Table VIII.

Table VIII.

Sample.	Time for Old Sienna.	Time for New Sienna.	Temperature of Air.
	Hours.	Hours.	° F.
A	3½	4½	57 to 60
A_1	3¼	6	,,
A_2	5½	8½	,,
B	6	9	,,
C	7	22	,,
D	3¾	6½	,,
E	7½	13	,,
G	5¼	7	,,

he above results show that the new stock was very ch harder to dry than that previously used, and shows importance of testing each lot as it comes in, so as to id unsatisfactory results. Occasionally a sienna specially d to dry is met with, and when this occurs in ordinary k it is not the sienna which is suspected, but the terebine.

After having tested the new stock of sienna paint, the ls at low temperatures were proceeded with. Three of trials were made : 1st, at the ordinary temperature ; , at 40° F., or 8° F. above freezing ; and 3rd, at 14° F., 18° F. below freezing point.

s the results in Table VII. showed that 1 oz. of terebine l lb. of burnt sienna paint was sufficient for ordinary poses, this proportion was adopted, but a 2-oz. sample of A was included at the lowest temperature to ascertain if an extra 1 oz. would quicken the drying time. The results are in Table IX.

Table IX.

Sample.	Proportion of Terebine.	Proportion of Burnt Sienna.	Time of Drying in Air at 55° to 56° F.	Time of Drying in Air at 40° F.	Time of Drying in Air at 14° F.
	Oz.	Lb.	Hours.	Hours.	Hours.
A	1	1	4½	7½	23
A	2	1	..	..	23
A_1	1	1	6	11	40
A_2	1	1	8½	15	52
B	1	1	9	18	52
C	1	1	22	34	97
D	1	1	6½	16½	40
E	1	1	13	24	80
G	1	1	7	15	43

The above results show the marked effect of a low temperature on the drying times. Comparing A, the fastest dryer, at 55° F. and 40° F. there was an increase in the drying time of 11½ minutes for every 1° F., and from 40° F. to 14° F. there was an increase of 36 minutes for each 1° F. Taking C, the slowest dryer, from 55° F. to 40° F., there is an increase of 46 minutes for each 1° F., and from 40° F. to 14° F. an increase of 115 minutes for each 1° F. The 2-oz. sample of A did not dry faster than the 1-oz. sample at 14° F. The paints in the trial at 14° F. were covered with ice crystals very shortly after being put on, owing to the moisture in the air condensing on the surface and freezing.

In very cold weather, such as is experienced in this country, good terebine never fails to dry ordinary paint, even although the time of drying may be considerably retarded.

As the foregoing trials, *i.e.*, those at low temperatures, were made in a confined space, it was thought possible that as free air circulation did not take place in the same sense as in those samples which were dried in the ordinary way for comparison, it might affect the results. In addition also to the space being confined they were in the dark. In order to settle this point three sets of trials were made, first, in ordinary daylight in an airy room; second in the dark with the free circulation of air; third, in the dark in a confined space. The proportion of terebine added was 1 oz. to 1 lb. of burnt sienna paint, and the results are in Table X.

TABLE X.

Sample.	In the Light. Free Access Air.	In the Dark. Free Access Air.	In the Dark. Confined Space.	Temperature of Air.
	Hours.	Hours.	Hours.	F.
A	5	5¾	5¼	49 to 50
A_1	7	7¼	7	"
A_2	9½	10	10	"
B	9½	10	10½	"
C	24	26	23	"
D	5¼	6	6¼	"
E	23	25	23	"
G	7¼	8¼	8½	"

It will be noticed from the above numbers that although the times for the samples exposed to the light are a little shorter than those for the other two, yet for all practical purposes they are the same, and the fact that the low-temperature trials were conducted in a closed space could only affect the results to a slight extent.

It is commonly stated that damp and foggy weather retards the drying of paint, but during all the trials made the state of the weather was carefully noted, and the results do not corroborate that view. Of course, in foggy weather the temperature is often lower, which has been shown has a very marked influence on retarding the drying, but from careful observation neither damp nor fog or both combined had any influence.

In all the above trials, the paint was brushed on a glass surface to ensure uniformity in the film of paint, and so obtain more strictly comparative results. No doubt it may be thought that if wood had been used different results would have been obtained. To settle this point burnt sienna paint mixed with the same samples of terebine which had been used in previous trials was brushed on glass, wood, and wood which had received a coat of knotting varnish. The wood selected was an ordinary flooring board. The results proved that there was no difference in the times of drying on glass, wood, or wood coated with knotting varnish.

For pure lead paints, such as white and red lead, terebine does not possess such an advantage as a drier as for other paints. It was found that two or three per cent of good borate of manganese mixed with these paints and allowed to stand for some time before using was almost equally satisfactory. For ordinary paints, however, borate of manganese is not at all serviceable.

All the trials detailed in this paper were made with genuine linseed oil and paint made up with a similar quality of oil. If, however, adulterated oil had been used, the drying would have been slower.

For the purposes of staining wood terebine is often used, but in this class of work it is added in much larger proportion—about 2 lb. of terebine to 1 lb. of paint in paste form. Such a mixture is very thin by intention, as it is merely used to give the wood the requisite colour without covering it. It does not follow because a terebine is a good drier for paint that it will be equally good for staining. It depends more on the nature of the solids contained in the terebine. If they are hard or brittle when dry, they will be most probably quick driers for staining, but if of a soft or greasy nature they will be slow.

In order to ascertain what kind of skin the terebines used in the paint trials would give, they were put on glass, and when the turpentine had completely evaporated the skin examined. The times of drying are in Table XI.

From these numbers it will be noticed that terebine, when put on a glass plate alone, in the majority of cases dried quickly and left a hard skin.

After the above trials were made the same terebines were mixed with burnt sienna (in paste form) in the proportion of 2 lb. of terebine to 1 lb. of burnt sienna, to ascertain their suitability for staining purposes, and the results are in Table XII.

TABLE XI.

Sample.	Time of Drying.	Appearance of Skin.
A	15 minutes	Hard glassy
A_1	15 "	"
A_2	10 "	"
B	15 "	"
C	15 "	"
D	Not dry some hours	Soft greasy
E	" "	"
G	15 minutes	Hard glassy

Comparing the results in Table XI. with those in Tal XII., it will be seen that the terebines which were slow in the staining tests were those which gave a soft a greasy skin when dried alone, and bears out what w previously stated, that when terebine is used in so large proportion as in these trials, that the drying depended ve much on the hardening nature of the solids contained in t terebine.

TABLE XII.

Sample.	Weight of Terebine.	Weight of Sienna.	Time of Drying.	Temp. of Air.	Time of Drying 48 Hours old.	Ter o An
			Hours.	F.	Hours.	F
A	2 lb.	1 lb.	¾	60 to 61	¾	57 t
A_1	"	"	1	"	1	"
A_2	"	"	1¼	"	1¼	"
B	"	"	1¼	"	1½	"
C	"	"	1¼	"	1½	"
D	"	"	¼	"	6	"
E	"	"	2	"	2¼	"
G	"	"	1¼	"	1½	"

It must, however, be borne in mind that the tests stain are no test for a terebine which is to be used for pai as D, which was poor in stain, was good in paint.

My thanks are due to Mr. Anderson for the care bestow on the work detailed in this paper.

THE DECOLORISATION OF PEATY WATE BY ALUM.

BY JOHN MACGREGOR, M.A.

Dunoon water, used in the following experiments, almost wholly a surface-water, containing from 2·8 to 3 grains of dissolved solid matter per gallon. The hardn is very slight. As there are no human habitations with the collecting area, contamination with sewage is avoid The natural reservoirs of the rainfall are extensive p mosses and glacial moraines. After heavy rain, the col of the water is not as intense as it is after a long droug the reason being that the highly-coloured "peat extrac is greatly diluted with a clear surface-water from localit which are free from peat.

Mechanical filters were adopted about a year ago, a attempts were made to decolorise the water by the use alumino-ferric cake. This material contained about 14 cent. of alumina, 0·5 per cent. of ferric oxide, and 0·1 cent. of arsenic acid. As the last ingredient is a m dangerous poison, alum of this quality should not used. Arsenic-free sulphuric acid should be used in manufacture of the alum-cake for clarifying water. In following experiments pure crystallised alum was used.

In order to find the amount of alum required to decolor a gallon of Dunoon water, several 8-oz. bottles are tak and 70 c.c. of the water to be tested added to each. To ea bottle is then added a certain quantity of an alum solut containing 1 mgrm. per c.c. The amount varies fr 0·4 c.c. to 2 c.c., *i.e.*, 0·4 to 2 grains per gallon. T bottle is then shaken, to mix the contents, and left at r till the following day.

The bottles which do not contain enough alum will t show no coloured precipitate; in those which cont sufficient alum, or an excess, there is a highly-colou flocculent precipitate. Bottles containing insufficient al have been left for weeks without showing any sign of a precipitate.

he correct amount of alum to decolorise Dunoon water been found to vary from 0·8 to 1·8 grain per gallon.

he following table shows the weight of precipitate pro-ed by different amounts of alum in half a gallon of er. Five Winchesters, A, B, C, D, and E, were used. f a gallon of water, and stated quantities of alum were ed to each. After 24 hours each of these was filtered ugh a weighed filter-paper. The papers were then d, weighed, and the non-volatile matter subsequently ermined by ignition.

Alum added in Grains per Gallon.	Weight of Precipitate in Mgrms.	Weight of Residue after Ignition of Precipitate.	Weight of Al_2O_3 in Alum added to Half Gallon.	Condition of Water after Treatment.
0·6	..	2·5	2·1	Approx. 16 per cent. of colour removed.
0·9	15·5	6·0	3·1	Approx. 90 per cent. of colour removed.
1·3	16·5	6·8	4·5	Completely decolorised.
1·6	17·0	6·2	5·6	„ „
1·9	16·5	6·0	6·6	„ „

efore filtration, A showed no sign of suspended matter. he case of B the particles were very small, and remained ended throughout the whole of the liquid; the filtration tedious. In bottles C, D, and E there was a coloured ipitate, and filtration was rapid.

his table shows that the weight of precipitate is tically constant after the addition of a certain weight alum. (Further experiments have shown that the n precipitate produced by alum is soluble in a strong tion of alum, and that if a very large excess of alum be d to Dunoon water, the colouring matter is not pre-ated.) It also shows that the weight of alumina in the ipitate does not increase beyond a certain amount, and any excess of alum, beyond the correct amount, remains lution, taking no part in the reaction with the colouring er. The non-volatile residue after ignition is chiefly ina with some ferric oxide; the volatile portion contains ast 25 per cent. of carbon.

e following table shows the rapidity of the reaction een the colouring matter and alum. Several half-litres of the water were treated with different quantities of alum and filtered after certain intervals.

—	Grains of Alum used per Gallon.	Time between Addition of Alum and Filtration.	Result after one Filtration.	Result after passing a Second Time through the same Filter Paper.
A	0·9	2 minutes	Very little colour removed.	Some more colour removed, but not nearly decolorised.
B	1·1	„	„	„ „
C	1·3	„	„	„ „
D	1·5	„	„	„ „
E	0·9	3 hours	As good as A, B, C, and D after two filtrations	More colour removed, but not all.
F	1·1	„		
G	1·3	„		
H	1·5	„		
I	1·1	24 hours	Decolorised	..

The solid particles formed in the reaction between alum and the colouring matter are at first so minute that no filter can retain them; if sufficient alum is present they increase in size until their removal becomes easy. If filtration is performed immediately after adding the correct quantity of alum, the colour is not removed, and a coloured precipitate forms in the filtrate after a few hours.

Use of Soda or Lime along with Alum.—While it was found that the colour was completely removed by the use of 1·2 grains of alum per gallon when alum alone was used, no precipitate of coloured matter was obtained when, in addition to the alum, quantities of carbonate of soda up to 2 grains per gallon were also added. Many experiments were made with other quantities of alum and soda, but in every case the soda hindered the precipitation of colour. Lime up to 2 grains per gallon had a similar effect. When more than 5 grains of lime per gallon were used, a coloured precipitate was obtained without the use of any alum. Barium hydrate gave no precipitate. A sample of water was saturated with ozone, but its colour was unchanged.

To decolorise a peaty water, the best method would be to add the correct quantity of alum to the water in large tanks of known size, leave for several hours until the solid product of the reaction between alum and colouring matter is in visible particles, and then run the contents of these tanks to filters. Any other method will inevitably lead to "after-precipitation" of coloured matter in the supply pipes.

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ench.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3^e^).

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Furnaces for heating Boilers, Salt Pans, and other Structures, Reverberatory and other Metallurgical Furnaces, such as Refining and Puddling Furnaces; Impts. in ——. J. Armstrong, London. Eng. Pat. 4154, Feb. 18, 1902.

The fuel is fed down on to the grate of the furnace through a vertical shoot surmounted by a hopper, which may be provided with a cup and cone apparatus for preventing the escape of smoke or gas. This hopper may be either of solid masonry or of iron plates water-jacketed. The furnace is provided at both sides with doors for removing clinker and distributing the fuel, and air is supplied by a blower to a wind box below the grate. The gases produced by the combustion of the fuel are met by a second air-blast supplied from a heated chamber above the bridge and so completely consumed, the blast also directing the flames down upon the hearth. Steam may also be blown into the furnace to yield carbon monoxide and hydrogen. (Compare Eng. Pat. 1910 of 1901.)—H. F. C. G.

Centrifugal Machines for Filtering, and the Separation of Suspended Solids from Liquids [Water, Solutions, &c.]. M. K. Bamber, Colombo, Ceylon, and J. Roger, London. Eng. Pat. 7745, April 2, 1902.

The material to be treated is first heated or cooled to any desired temperature, in a tank or other receptacle fitted with an internal or external arrangement of heating or cooling pipes, &c. The liquid is then passed, either intermittently or continuously, into a centrifugal filtering drum, constructed similarly to a centrifugal cream separator, but with the usual skim-milk outlet provided with a tap or plug, or omitted. The drum is fitted with a removable lining, for the collection and removal of solid matters, the lining being kept in position by flanges on the drum, &c., and resting on a pad of rubber or other suitable material. For the bacteriological purification of water, the lining consists of an inner part of porous material, such as unglazed earthenware, and a close-fitting perforated metal casing. The upper or lower end of the drum can be detached, to facilitate the insertion and removal of the lining. The filtered liquid is discharged from the bottom of the drum.

—R. A.

Drying Machines or Hydro-Extractors: Impts. in Centrifugal ——. H. C. Longsdon, Keighley, Yorks. Eng. Pat. 11,450, May 20, 1902.

The improvements relate to the driving mechanism of the rotary cage and the lubrication of the shafts.—R. A.

Fumes and Gases evolved from Vessels employed in Metallurgical, Chemical, and Analogous Operations; Appliances for Abstracting or Carrying off the ——. W. Lynes, Birmingham. Eng. Pat. 22,852, Oct. 21, 1902.

A detachable hood is connected to the crucible or other vessel, and is provided with a flexible pipe leading to a chimney stack; a gap is provided in the hood for the inspection of the contents of the vessel, which may be closed with a lid or flap. A pan may also be slung in front of the hood for the reception of dross or skimmings.

—J. W. H.

Low Temperatures; Method and Apparatus for Producing Constant Previously Determined ——. A. B. Seiffert, Chemnitz, Germany. Eng. Pat. 26,792, Dec. 4, 1902.

The chamber or space to be cooled is surrounded by a cryohydrate having a cryohydrical temperature suitable for the purpose required. A gas, produced, for example, by dissolving carbon dioxide "snow" by means of ether, is passed into the cryohydrate until the latter is completely congealed, the cryohydrate then serving to maintain the required uniform temperature until it again reaches the point of complete liquefaction, when the spent gases are discharged, and fresh cold gas is introduced. In the apparatus claimed, the release of the spent gas and the formation of the fresh gas are controlled by a thermo-regulator.—R. A.

United States Patents.

Incrustation Preventive, and Method of Manufactur A. Raymond, T. Lowther, and D. Perry, Bobrik, Russia U.S. Pat. 724,331, March 31, 1903.

See Eng. Pat. 21,075, 1900; this Journal, 1902, 32.

—W. P. S.

Filtering Substance, and Process of Making Same. Wendling, Assignor to C. Bomeisler and H. Fisher, all New York. U.S. Pat. 724,636, April 7, 1903.

Asbestos fibre is disintegrated by treatment with carbonate and an acid, calcium carbonate and hydrochlor acid being suitable. It is then washed, mixed with silicate (magnesium silicate) to form a paste, and applic as a coating to asbestos cloth, which is then baked, a finally washed to free from any uncombined chemicals.

—R. A.

French Patents.

Evaporating, Boiling, and Distilling Apparatus. H. Untiedt, Fr. Pat. 323,167, July 21, 1902.

See Eng. Pat. 5015, Feb. 27, 1902; this Journal, 1902, 13

—J. W. H.

Centrifugal capable of being Emptied and Recharg during Rotation. F. Hampl. Fr. Pat. 323,271, July 1902.

See Eng. Pat. 13,547 of 1902; this Journal, 1903, 220.

—J. W. H

Centrifugal Apparatus for Cleaning and Concentrat Granular Mineral Matter, such as Phosphates, Kaol &c. L. Beaussart. Fr. Pat. 324,114, Aug. 29, 1902.

The drum of the apparatus, rotating on a vertical a receives the material and also a stream of water, wh carries away, as it leaves the top of the drum, the usel or waste material into an annular chamber; the con trated or cleaned material is discharged below, by rais the body of the drum from its base (the diameter of drum being greater near the base than at any other plac

—J. W. H

Centrifugal Separators. [Steam, Oil, &c.] W. B. Sm Fr. Pat. 324,145, Sept. 1, 1902.

The steam or other fluid flowing along a pipe, after be directed by the fixed vanes, meets the moving vanes c turbine, which are connected to a fan running in an enla ment of the pipe, which enlargement is connected wit "draw-off" vessel. Oil or water, associated with the ste or other vapour, is discharged by the fan into the draw vessel, while the dried steam passes on.—J. W. H.

Filter Press: "Le Suprême." R. Bennac. Fr. Pat 323,562, Feb. 23, 1902.

The liquid to be filtered is distributed to the sev elements contained in a wooden casing. The filte medium, in the form of bags, is supported on cylind baskets inside cylindrical drums, which receive the filt liquid.—J. W. H.

Filter Press. Soc. Ch. Prevet et Cie. Fr. Pat. 323, Aug. 14, 1902.

The plates of the press are of two kinds, and are pl alternately one above the other, and secured by three bolts; the plates of one set have on opposite sides, of carbon or of gauze, while those of the other set re hollow. Alternate plates communicate to channels fo by the plates, for carrying the liquid thereto and theref

—J. W.

Thermometer; Metallic ——. Leboyer. Fr. Pat. 323 Aug. 11, 1902.

Strips of two kinds of sheet metal are placed upon other alternately, each alternate end being solder otherwise fixed; the two metals, having different coeffi of expansion, produce a considerable movement i topmost strip when their temperature alters, and movement is communicated to, and magnified by, an needle.—J. W. H.

siccation of Liquid Material; Apparatus for ——. Soc. Gebrüder Glass. Fr. Pat. 323,961, Aug. 23, 1902.

E material is carried in a thin bed on a series of izontal endless belts, between which heating vessels or es are placed. On reaching the delivery end, the iccated material is scraped off the belts.—J. W. H.

II.—FUEL, GAS, AND LIGHT.

Alcohol-Hydrocarbon Gas. D. Mohr. Zeits. f. Spiritusind., **26**, [15], 152.

the manufacture of Pampe's "alcohol-hydrocarbon ," alcohol (preferably containing 75 per cent. by ume) and petroleum are admitted, from separate ks, into a vaporising retort placed at the back of the nace, where the emulsion of spirit and hydrocarbon is orised. The vapours pass into a gasifying retort, uated in the front of the furnace, and are completely ified without the production of tar or other by-products. hot gases are then led out round the vaporising retort, which they supply heat to assist in the vaporisation.

he gas produced has a penetrating, disagreeable odour, ich facilitates the detection of leakages. Its sp. gr. apared with air is 0·675—0·700. It contains about per cent. of heavy hydrocarbons, 22—23 per cent. of bon monoxide, 26—27 per cent. of hydrogen, and about same proportion of methane, 0·5 per cent. of carbon xide, and 2·6—3·2 per cent. of nitrogen. Cyanogen apounds are absent; ammonia and sulphur occur in gnificant traces.

he lighting and heating powers of the gas are very h. Used with an Auer mantle, it gave 67 Hefner dles, with an hourly consumption of 66 litres of the containing 10 per cent. of air (= 59·4 litres of the free gas). The efficiency is still higher with a mixture taining 25—30 per cent. of air. Such a mixture can be plied from gasholders for consumption, as only those tures are explosive which contain above 6 and below per cent. of the gas. When burned with a luminous ne, the lighting power of the gas is much superior to t of coal-gas. With regard to heating power, 1 cb. m., asured at 15° C. and 760 mm., gives 7,400 calories, as inst about 5,000 from coal-gas.

The cost of the gas, inclusive of wages, repairs, depre- tion, and fuel, is 20—21 Pf. per cb. m., which is much aper than oil-gas, though dearer than coal-gas. The plicity of its manufacture renders it suitable for small allations.—H. B.

andescent Light in the Prussian State Railway Depart- ent, and Spirit Motors. Zeits. f. Spiritusind., **26**, 15], 153.

rit Motors.—Experience with these shows that with tor-spirit at the present price—about 0·15 shilling per —the cost of fuel is lower than with duty-paid benzine troleum spirit), not much higher than with petroleum, considerably greater than with the liquid hydrocarbon ained in the manufacture of oil-gas. The costs for ndance and maintenance are the same as with petro- m spirit motors, and lower than with the others. On whole, the use of spirit is cheaper than the use of roleum spirit, and no dearer than that of petroleum. y a limited quantity of the liquid hydrocarbon referred s available. For economical working, only such motors uld be chosen as effect the most complete combustion the spirit and especially permit of the requisite high apression of the air-and-spirit mixture.

Spirit Incandescent Light.—Over 7,000 of these lamps e been in use, and they have been found very suitable lighting locomotive sheds and the like; but, as they not free from smell, they are unsuitable for closed ms. To obtain the best results, good spirit, free from nous substances, is necessary, and the lamps want careful ention and maintenance. The cost for spirit per unit lighting power is the same as with ordinary petroleum ps, but much higher than with petroleum incandescent ps, mainly because the latter are made for a consider- y greater illuminating power than spirit lamps are.

—H. B.

Oxides; Heat and Light Emission of some ——. C. Féry. Ann. Chim. Phys., **27**, [7], 433—548. Chem. Centr., 1903, **1**, [3], 122.

The author examined corundum, retort charcoal, chromium sesquioxide, platinum, the oxides of calcium, magnesium, zirconium, lanthanum, thorium, and cerium, and the Auer mixture (98·7 Th and 1·3 Ce), with regard to their total radiation and light-emission at temperatures of from 500°—1,700° C. The oxides of calcium, thorium (lanthanum), and the Auer mixture show, at a definite temperature, a stronger total radiation in the oxidising flame than in the reducing flame; that of cerium, on the other hand, a weaker. The same is the case with regard to emission of light, except that the Auer mixture gives a higher value in the reducing flame. The colour is also different, in the case of the oxides mentioned, in the two flames (thorium gives a pinkish-white and cerium a greenish-blue in the oxidising flame, whilst in the reducing flame the corresponding tints are greenish-white and bluish-red to brick-red). Stefan's law of radiation is directly confirmed in the case of charcoal, corundum, and chromium sesquioxide, but only within certain limits in the case of the other substances. With regard to emission of light, Wien's law is directly applicable only in the case of charcoal and chromium oxide. The results obtained indicate that, especially at high temperatures, the earths examined, undergo physical and chemical alteration.

The author suggests the following explanation of the efficacy of the Auer mixture:—Cerium exercises a strong condensing action on gases, and thereby accelerates the combustion of the latter. The rapidly intermittent local increases of temperature on the surface (above the temperature in the interior) caused in this way, produce a strong emission. The thorium gives a more extended surface to the cerium, and, owing to its transparency, permits the passage of the rays.—A. S.

English Patents.

Agglutinant Composition [for Briquettes]. G. Charles, Paris. Eng. Pat 6738, March 19, 1902.

See Fr. Pat. 319,856 of 1902; this Journal, 1902, 1525.

—T. H. P.

Fuel; Production of Solidified ——. J. Widmer, Zürich, Switzerland. Eng. Pat. 27,568, Dec. 15, 1902.

100 parts of "petrol," or the like, are warmed and mixed with 7 parts of a molten fatty acid and 3 parts of resin, the whole being then saponified with about 5 parts of an alkali. The product is next absorbed in 40 to 60 parts of sawdust, powdered coal, &c., and submitted to heavy pressure. The claim includes the use of mineral oil.

—F. H. L.

Furnaces for the Combustion of Liquid Fuel. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and E. L. Orde, Newcastle-on-Tyne. Eng. Pat. 7925, April 4, 1902.

A primary combustion chamber is arranged as a prolongation of the furnace, and is fitted with the burners or burner-nozzles; it is also lined with refractory material at the front and bottom, and the sides and top are provided with casings forming flues through which air is drawn and heated on its way to the burner nozzle and furnace. The supply of air to the main furnace is controlled by hinged shutters, situated underneath the firebars and operated by regulating-rods.—C. S.

Furnaces; Impts. in ——. R. S. Franz, Etna, Pa., U.S.A. Eng. Pat. 3339, Feb. 12, 1903.

The furnace is fitted with a bridge wall at the rear end, perforated air pipes situated in the side walls and above the firebars, a transverse air-supply pipe situated under the bridge wall and fitted with vertical pipes communicating with the perforated pipes, and a series of perforated horizontal pipes placed under the fire-bars and communicating with the supply-pipe. In each pipe of the series is mounted a check-valve, to which is connected a rod, which in turn is connected to a lever, fulcrumed to the exterior of the furnace.—C. S.

Coal-, Oil-, and like Gases: Apparatus for use in the Purification of ——. W. S. Clapham, Keighley. Eng. Pat. 8618, April 14, 1902.

The purifying materials are spread upon grids arranged preferably one above the other in a purifying box, at the bottom of which the impure gas is admitted, the box being provided with lids below and above for the removal and insertion respectively of the grids. By means of a travelling hydraulic or other lifting jack, the lid below the box can be removed and the whole series of grids lowered, so that the lowermost grid, with its fouled material, is withdrawn, whereupon the lid is replaced. With the aid of a hoist the lid at the top of the box can then be taken off, and a grid carrying fresh material placed at the top of the series. —H. B.

Coal-Gas: Purification of ——, *and the Recovery of By-Products therefrom.* H. W. Smith, Sutton Coldfield, and G. S. Albright, Birmingham. Eng. Pat. 9070, April 18, 1902.

An improvement on Eng. Pat. 13,653 of 1901 (this Journal, 1902, 1077), consisting in scrubbing the gas with liquor containing free sulphur, heating the liquor to decompose or remove the unstable ammonium compounds formed, cooling the liquor, again scrubbing gas with it, and repeating, until the liquor contains sufficient sulphocyanide. The heating appears to decompose the ammonium thiocarbonate which is formed, and which prevents the continued absorption of the carbon bisulphide.—H. B.

Gas Manufacture; Impts. in ——. W. H. Y. Webber, Teddington. Eng. Pat. 11,328, May 16, 1902.

To render practicable the use of high temperatures in the manufacture of coal-gas, the coal is carbonised in thin-walled retorts of relatively small diameter, arranged in groups of two or more, united at one or both ends to a common mouthpiece or header, so that a single ascension pipe serves for each group of retorts. Suitable dimensions for the retorts are: internal diameter, 10 ins.; thickness, 1 in.—H. B.

Oil-Gas; Apparatus for Making ——. R. Dempster, Marietta, Ohio. Eng. Pat. 23,413, Oct. 27, 1902. Under Internat. Conv., Nov. 5, 1901.

See U.S. Pat. 703,901; this Journal, 1902, 1128.—H. B.

Gas; Apparatus for accurately Measuring and Mixing ——. A. O. Boistelle, Paris. Eng. Pat. 84, Jan. 1, 1903. Under Internat. Conv., Jan. 14, 1902.

See Fr. Pat. 317,750 of 1902; this Journal, 1902, 1445. —H. B.

Acetylene Burners. J. W. Bray, Leeds. Eng. Pat. 11,131. May 15, 1902.

The terminal portion of an injector acetylene burner is formed in the shape of a truncated cone, the base of which is the aperture where the gas is consumed, while towards the apex the side tubes leading air to the gas, converge. It is claimed that this method of construction renders the acetylene less liable to fire back from the proper place of combustion to the original (undiluted) gas-jet than if the final tube had parallel walls; and therefore the burner remains cleaner than usual.—F. H. L.

Incandescence Gas or Vapour Lighting; Methods and Apparatus for ——. W. Hooker, London. Eng. Pat. 10,712, May 9, 1902.

The burner-head is provided with two or more concentric rows of tubes or passages composed of corrugated metal, the orifices having a diameter of $\frac{1}{32}$ — $\frac{3}{32}$ in., which device, it is claimed, will enable a brilliant light to be obtained from combustible vapours too poor in hydrocarbons to be burnt in ordinary burners.—C. S.

Incandescent Structures for Producing Light: Process for Manufacturing Metallically Skeletonised Earthy ——. R. Langhans, Berlin. Eng. Pat. 9412, April 23, 1902.

See Fr. Pat. 320,620; this Journal, 1903, 88.—H. B.

United States Patents.

Kiln or Furnace. J. Roberts, Catasauqua, Pa. U.S. Pat 723,310, March 24, 1903.

The kiln is circular, and has a number of fire boxes arrange at regular intervals around the outside, and provided wit flaring mouths opening into the furnace space. The kiln is also provided with a series of air conduits, for supplying a under pressure beneath the bars of the grates, and with second series of flaring-mouthed air ports situated betwee the top and bottom of the kiln walls, the mouths of thes ports being inclined so as to project the currents of a issuing from them, in a direction which will set up a spira motion of the air currents inside the furnace. A third serie of inclined ports is provided in the upper part of th furnace for the purpose of projecting a series of air current down upon the charging space.—H. F. C. G.

Furnace. G. F. Rendall, New York. U.S. Pat. 724,941 April 7, 1903.

In this specification a furnace is described, with a clos chamber, the walls of which consist of plumbago; spirall arranged burners for heating the chamber round the lowe portion from the exterior; a valved outlet at the top of t chamber; a discharge pipe leading from the outlet to receptacle for the products from the chamber; means fo introducing liquid or gaseous hydrocarbon into the chamber and a force-pump for forcing oxygen into the chamber may be desired.—H. B.

French Patents.

Fuel; New ——. C. Lefevre and G. Blum. Additio dated Aug. 27, 1902, to Fr. Pat. 319,523, March 1 1902. (See this Journal 1902, 1525.)

The sodium carbonate recommended in the principal pate is now abandoned, having proved objectionable in practice and the black soap may be replaced by heavy oils or oth fatty substances, the fuel therefore consisting of a mixtu of coal-dust and marl, with or without the addition of emulsion of oleic acid and potash.—C. S.

Fuel; Solid ——, *from Petroleum, Sulphuric Acid, a Lime.* J. C. Berntrop and M. L. Q. van Ledden Hul bosch. Fr. Pat. 323,651, Aug. 11, 1902.

See U.S. Pat. 711,380 of 1902; this Journal, 1902, 1323. —C. S.

Briquettes; Manufacture of ——. A. G Browning a H. Musgrove. Fr. Pat. 324,213, Sept. 8, 1902.

100 parts of powdered coal or similar material are saturat with water (about 20 parts), and the product is incorporat with 10 parts or less of tar, which expels the water and for a compact briquette. The object of using water is to redu the quantity of tar needed in the formation of the briquet so that they may burn better than usual, without becomi semi-fluid when ignited. Some peat may be added to t mixture in order to mask the unpleasant odour on combu tion. The same idea is applicable to the manufacture of paving. (See also Eng. Pat. 4779 of 1902; this Jour 1903, 289.)—F. H. L.

Fuel; Manufacture of Artificial ——. F. Ptacek. Fr. Pat. 324,347, Sept. 10, 1902.

In order to prepare briquette fuel which will burn well stoves and the like, where the draught is not stro it is proposed to mix a coal rich in carbon, and difficult ignite, such as anthracite, with one rich in hydrogen oxygen, and easy to inflame. For the same purpose heavy compact coal like anthracite, may be incorpora with a porous and readily inflammable material like dust. The materials must be very finely powdered a well mixed together.—F. H. L.

Coke; Testing the Hardness of ——. L. Carton an E. Lecocq. Fr. Pat. 323,799, Aug. 18, 1902.

A weighed quantity of the coke under examination, lumps (8—10 cm. in diameter), is treated in a breaker a quarter of an hour, and then screened through a s (e, with 519 meshes per sq. cm.). Hard coke will leave uch as 80—90 per cent. behind on the sieve, whilst coke will only leave 40—50 per cent.—C. S.

Gas and Water-Gas; Method and Apparatus for the roduction of a Mixture of ——. Watergasmaatbappij Systeem Dr. Kramers en Aarts. Fr. Pat. 4,177, Sept. 3, 1902.

generators and two superheaters are arranged side by , and connected with a recuperator for the supply of air. After the first blow-up period, the air blast is off: steam is admitted to one superheater, and passes n through the fuel in the adjoining generator, forming r-gas; the latter flows up through the second generator, re it meets the oil supply; and the mixture of oil- and r-gases produced leaves the apparatus *viâ* the adjoining rheater, which acts as a mixing chamber. After a nd blast-period, the period of gas production is repeated, the gases pursue the opposite direction, steam being itted to the mixing chamber, which now acts as the rheater; the oil-gas producer acts as the generator, the rator as the oil-gas producer, and the superheater as mixing chamber. No fresh fuel is added to the water-generator, the coke, &c., from the preceding oil treat-, furnishing what is required. (See also Eng. Pat. of 1901; this Journal, 1902, 331.)—H. B.

ndescent Lighting; Material [Liquid Fuel] for ——, d Motive Purposes. J. G. Massie. Fr. Pat. 324,266, pt. 4, 1902.

Eng. Pat. 19,145 of 1902; this Journal, 1902, 1524.
—F. H. L.

ndescence Mantle made from Artificial Threads. M. Plaissetty. First addition, of Sept. 9, 1902, to . Pat. 321,803, May 2, 1902. (See this Journal, 1903, 1.)

ead of the artificial filaments mentioned, extremely ilaments, obtained by any mechanical means, may be oyed.—H. B.

ndescence Mantle with Unsewn Top. A. H. Chenier. rst addition, of July 1, 1902, to Fr. Pat. 322,258, y 23, 1902. (See this Journal, 1903, 291.)

the "fixing" or adhesive described in the original fication, there is used collodion containing in solution tes of thorium, lanthanum, &c. The process is cable to the manufacture of mantles from filaments of cial silk.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

ral Lubricating Oils; The Application of Heavy ude Petroleum and Residues to the Manufacture of —. K. W. Charitschkow. Westnik shirow. weschtsch., 351. Chem.-Zeit., 27, [31], Rep. 102.

iestan petroleum, distilled up to 360° C. with super- d steam, furnished the following fractions:—

	Per Cent.
Burning oil	34·0
Solar oil, sp. gr. 0·860–0·903	17·0
Spindle oil, sp. gr. 0·903–0·910	4·6
Engine oil, sp. gr. 0·920—0·927	6·1
Cylinder oil, sp. gr. 0·939—0·950	16·0
Resin (black pitch), sp. gr. 1·02 and over	18 to 20

e products are easily refined, and the consumption of nts is small. The residue is hard, but readily fusible, suitable for a number of purposes.

sny oil was also examined, but the higher fractions a higher specific gravity and lower viscosity than from Baku oil, and are not well adapted for ation.

empts are being made to isolate the high fractions ut distillation, by extraction with, *e.g.*, amyl alcohol hyl alcohol.—C. S.

Ceresin in Paraffin; Detection of Small Quantities of ——. Graefe. XXIII., pages 574 and 575.

Ceresin in Paraffin; Detection of Small Quantities of ——. F. Sommer. XXIII., page 574.

English Patents.

Carbonising Wood-Waste or Similar Material; Apparatus for ——. O. Haltenhoff, Hanover. Eng. Pat. 7767, April 2, 1902.

Wood or wood-waste is pressed into tubes by means of stamps. These tubes are arranged within a heating chamber, which, together with the stamps, is caused to rotate in such a manner that the material is supplied to the tubes only at certain intervals, so that the wood can be completely carbonised with small amount of power, and using short tubes.

A collecting tube is arranged in the centre of the carbonising tubes, connected with them by passages, to collect and remove the products of distillation.—T. F. B.

Hydrocarbons of the Acetylene Series; Manufacture of Useful Products from ——. C. Moureu, Paris. Eng. Pat. 8787, April 15, 1902.

New acids are manufactured from hydrocarbons of the acetylene series, "near homologues of heptine$_1$ and octine$_1$," by forming the sodium compound by means of metallic sodium, treating this compound with carbon dioxide to obtain the sodium salt of the acid, and liberating the free acid as described for the corresponding derivatives of heptine and octine (Eng. Pat. 23,727 of 1900; this Journal, 1902, 188).

The formation of the sodium compound is brought about by heating a mixture of approximately one atom of sodium with one molecule of the hydrocarbon to the boiling point of the hydrocarbon.

The acids claimed by this process are, methyl-6-heptine-2-oic-1-acid, methyl-7-octine-2-oic-1-acid, dekine-2-oic-1-acid, dodekine-2-oic-1-acid, methyl-7-octene-6-ine-2-oic-1-acid, and methyl-7-octene-4-ine-2-oic-1-acid. The esters of these acids are obtained either by esterification in the usual manner or by acting with chloroformic esters on the sodium compounds of the hydrocarbons.—T. F. B.

Deodorising Naphtha and the Products of its Distillation: Method of ——. E. Lenders, Hanover, Germany. Eng. Pat. 28,516, Dec. 24, 1902.

Naphtha or the products of its distillation are deodorised by treating with alkalis a mixture of substances having a naphtha base with essential oils containing terpene; for example, spirit of turpentine, fennel, cumin, pine needles, lavender, eucalyptus, &c. A variation of the process consists in treating the naphtha and essential oil separately with alkali and then mixing. The proportions of the mixture may vary according to the nature of the final product to be obtained.

An explanation suggested is that unsaturated hydrocarbons, of bad odour, of the nature of dicyclopentadiene are condensed by the alkali with the terpene forming odourless substances.—T. F. B.

United States Patent.

Crude Petroleum and Petroleum Distillates: Process of Purifying ——. T. F. Colin, Elizabeth, N.J., and O. P. Amend, New York. U.S. Pat 723,368, March 24, 1903

Petroleum and its distillates are desulphurised by oxidation by means of a hypochlorite in an alkaline solution, in presence of an oxygen carrier, and subsequent removal of the excess of chlorine with some metallic salt capable of existing in two or more states of oxidation readily transformable one into the other. The oxidation is carried out at ordinary or slightly elevated temperatures. Manganous nitrate is claimed as a catalytic agent, and the use of ferrous salts in general (particularly agitation with ferrous sulphate) is claimed for removing the excess of chlorine.
—T. F. B.

French Patent.

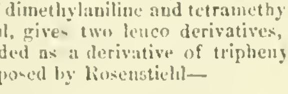
Carbonising Wood in a Closed Vessel. H. F. Rizier and E. H. Ragot. Fr. Pat 324,088, Aug. 28, 1902.

The usual process is accelerated by $1\frac{1}{2}$—2 hours by withdrawing the retort from the fire as soon as the condensable gases have been driven off, and introducing air through a perforated pipe provided for that purpose. The charcoal is thus raised to partial incandescence, and the liberated gases burn and complete the carbonisation of the charge.
—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

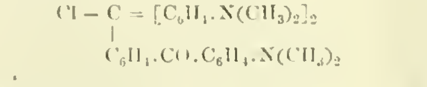
Phthalic Green. M. Prud'homme. Bull. Soc. Ind. Mulhouse, 1903, **73**, 24—25.

Phthalic Green, obtained by condensing equimolecular quantities of dimethylaniline and tetramethyldiaminophenyloxyanthranol, gives two leuco derivatives, and is therefore to be regarded as a derivative of triphenylmethane. The formula proposed by Rosenstiehl—



$$\begin{array}{l} Cl - C = [C_6H_4.N(CH_3)_2]_2 \\ \qquad\ | \\ \qquad C_6H_4.CO.C_6H_4.N(CH_3)_2 \end{array}$$

is thus confirmed. Fluorene Blue also forms two leuco derivatives, a stable and an unstable one, and the formula established for it is—



—J. McC.

Diazo Solutions; Stability of ——. J. Cain and F. Nicoll. J. Soc. Dyers and Colourists, **19**, [4], 102—105.

The authors studied the stability of the diazo compounds of aniline, meta- and paranitraniline, benzidine, tolidine, dianisidine, and α- and β-naphthylamine.

The rate of decomposition at different temperatures was measured by observing the volume of nitrogen evolved by these bodies. The experiments show that the above diazo compounds (with the exception of those of benzidine, tolidine, and dianisidine) decompose in accordance with the law of unimolecular reactions, that is to say, if A is the total nitrogen and x the volume of nitrogen evolved in the time t, then—

$$\frac{1}{t} \log \frac{A}{A - x} = C \text{ (a constant).}$$

This law is broken in the case of α- and β-naphthylamine after 35—50 per cent. of decomposition, for the naphthol formed, combines with some diazo compound to form an azo dyestuff.

The three diamines referred to, follow no simple law, and the two diazo groups decompose at varying rates, so that the values of C give only an approximate idea of their stability. Comparing the constants, and putting the value of C equal to unity for each substance successively, the relative rate of decomposition of each diazo compound for any temperature is as follows:—

Aniline.	m-Nitraniline.	p-Nitraniline.	α-Naphthylamine.	β-Naphthylamine.
1·3	..	..	..	1·0
5·4	..	..	1	1·2
160·0	..	1·00	30	37·0
378·0	1	2·36	70	88·0

The stability of the tetrazo compound from benzidine is about 17 times that from tolidine and five times that of diazobenzene chloride. Tetrazomethoxydiphenyl is about 25 times as stable as diazo-p-nitraniline. The amino compounds mentioned may be arranged, in the following order with regard to the stability of the diazo compounds derive from them, diazobenzene chloride being the most unstabl product:—Aniline, β-naphthylamine, tolidine, α-naphthy amine, benzidine, p-nitraniline, m-nitraniline, dianisidine.
—E. N.

English Patents.

Indigo Dyestuffs; Manufacture of Bromo-Substitutio Products of ——. O. Imray. From Farbwerke vorm Meister, Lucius und Brüning, Hoechst a Main. En Pat. 13,429, June 13, 1902.

See Fr. Pat. 322,198; this Journal, 1903, 293.—T. A. L.

m-Toluylenediamine [Sulphide Dyestuffs], and Sulph Colours therefrom; Manufacture of Sulphur Derivativ of ——. R. B. Ransford. From L. Cassella and C Frankfort-on-Main. Eng. Pat. 11,771, May 23, 1902.

See Fr. Pat. 321,122; this Journal, 1903, 141.—T. A. L.

Sulphur Colours [Sulphide Dyestuffs]; Manufacture ——. R. B. Ransford. From L. Cassella and C Frankfort-on-Main. Eng. Pat. 11,898, May 24, 1902.

See Fr. Pat. 321,183; this Journal, 1903, 141.—T. A. L.

Azo Colouring Matters and Intermediate Products relat thereto: Manufacture of ——. J. Y. Johnson. Fr the Badische Anilin und Soda Fabrik. Eng. Pat. 12,5 June 2, 1902.

The partial reduction of o-o-dinitro-chlorobenzene-p-s phonic acid yields 1.2.3.5-amino-chloro-nitrobenze sulphonic acid, which, after diazotisation, combines wi β-naphthol. The resulting azo compound, when boi with caustic soda lye, is converted into a bluish-vio hydroxy dyestuff, the chlorine atom being replaced hydroxyl.—T. A. L.

United States Patents.

Azo Dye, and Process of Making Same. A. Bertschma Assignor to Soc. Chem. Ind., Basle. U.S. Pat. 724,0 March 31, 1903.

A nitrobenzaminonaphthol sulphonic acid produced the action of a nitrobenzoyl chloride on 2.5.7-amino-napht sulphonic acid is converted by the action of reducing age into the corresponding aminobenzaminonaphthol sulpho acid, which combines with aromatic diazo compounds in alkaline medium. The new dyestuffs so obtained unmordanted cotton from a salt, neutral, or alkaline b yellowish-red to bluish-red shades. They can be diazoti and developed on the fibre, giving strong and brilliant shades very fast to washing. (See Eng. Pat. 13,77 1902; this Journal, 1902, 1274.)—T. A. L.

Red Azo Dye, and Process of Making Same. C. Sc-macher, Soden, Assignor to Farbwerke vorm. Mei Lucius und Brüning, Hoechst a M. U.S. Pat. 724, April 7, 1903.

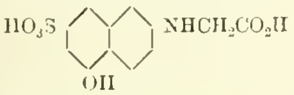
Diazotised p-nitraniline homosulphonic acid is combi with β-naphthol. The product forms a reddish pow with a bronzy lustre, is tolerably readily soluble in water with a yellowish-red colour, but sparingly solubl cold water, and dissolves in concentrated sulphuric with a bluish-red colour.—T. A. L.

Blue Dye [Anthracene Dyestuffs], and Process of Ma Same. R. Bohn, Assignor to Badische Anilin und Fabrik, Ludwigshafen. U.S. Pat. 724,789, Apri 1903.

By fusing β-amino-anthraquinone with caustic alkali high temperature, dissolving the melt in water, and blo air into the solution, a mixture of dyestuffs is obtai which can be separated by reducing the mixture i alkaline solution, when one of the components crystal out. On oxidation, both yield crystalline indigo-colo substances practically insoluble in water, caustic soda lye mineral acids. One of these is sparingly soluble in an quinoline, and nitrobenzene, the other being easily sol the former corresponding with the blue product wh parates on reduction, the more soluble product when luced being brownish-red. The formation of a dyestuff also assisted by the addition of a suitable agent, such as tassium nitrate, to the melt. (See Fr. Pat. 309,503; this urnal, 1902, 911.)—T. A. L.

olet Azo Dye, and Method of Making Same. A. L. Laska, Assignor to the Firm of K. Oehler, Anilin und Anilin-arben Fabrik, Offenbach-on-the-Main. U.S. Pat. 724,893, April 7, 1903.

nzidine is converted into its tetrazo derivative and comied with two molecular proportions of the glycin of 5.7-aminonaphthol sulphonic acid having the following mula:—



The product dissolves in cold water to a violet solution, l dyes unmordanted cotton a bright violet.—T. A. L.

d to Violet Dyestuff [Azo Dyestuffs], and Method of Making Same. A. L. Laska, Assignor to K. Oehler. Anilin und Anilinfarben Fabrik, Offenbach-on-the-Main, U.S. Pat. 724,894, April 7, 1903.

he intermediate compound obtained by combining equi-lecular proportions of tetrazotised benzidine and salicylic id is combined with one molecular proportion of the cin of 2.5.7-aminonaphthol sulphonic acid. The pro-ct forms a brown powder dissolving in water to a red lution, and dyes fast red shades on unmordanted cotton. —T. A. L.

French Patents.

digo Dyestuffs; Brominated ——. Badische Anilin und Soda Fabrik. First Suppl., dated Sept. 12, 1902, to Fr. Pat. 322,864, July 7, 1902.

hloro derivatives of indigo are obtained by treating indigo-ite with chlorine in presence of an acid medium. The loro-indigo formed is a blue powder soluble in alcohol, loroform, glacial acetic acid, &c. It is reduced by alkaline drosulphite, and gives very bright shades on the fibre. digo-white, when treated with bromine in presence of ming hydrochloric acid, yields bromo-indigo white, which converted, by the action of one or two molecular propor-ns of bromine, into mono- or dibromindigo respectively. e method is also applicable to derivatives such as di-ethyl-indigo white.—T. A. L.

ialkyl-anthrachrysone Ethers [Anthracene Dyestuffs] and their Nitro- and Amino-sulphonic Acids; Manufacture of ——. Cie. Par. de Coul. d'Aniline. Fr. Pat. 324,349, Sept. 10, 1902.

nthrachrysone, or one of its alkali salts, is converted by e action of dialkyl sulphuric ethers into dialkyl ethers of thrachrysone, which, on sulphonation and subsequent tration, yield dialkyl ethers of dinitroanthrachrysone di-lphonic acid. These products, when treated with suitable ducing agents, are converted into dialkyl ethers of iaminoanthrachrysone disulphonic acids, which dye un-ordanted wool blue from an acid bath.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

itanium Salts; Mordanting Silk with ——. G. H. Hurst. J. Soc. Dyers and Colourists, 1903, **19**, [4], 105—107.

he hitherto used titanium mordants are the oxalate and rtrate. It has been found that other compounds of tanium, such as titanium-tanno-oxalate, titanium sodium-lphate, titanium potassium-oxalate, and titanous chloride, n be used with very good results in mordanting and dye-g silk.

Silk immersed in a solution of 5 per cent. of titanium nno-oxalate absorbs, in 3—4 hours from 2·3—4·2 per cent. of its weight, and the fibre acquires a fine golden-yellow colour. Titanium potassium-oxalate is rather slowly soluble. Silk absorbs the salt within 3—4 hours, but does not acquire any colour thereby. Before dyeing the so impregnated silk, it is preferable to pass it through a bath of calcium acetate (5 per cent.), whereby calcium is fixed. The increase of the weight of the silk is about 7 per cent.

Titanous chloride is best used in a 5 per cent. solution, and the mordanted silk passed afterwards, preferably, through a solution of sodium phosphate. The silk gains 3 per cent. of its weight.

Titanium sodium sulphate is slowly soluble in water; it is also used in a 5 per cent. solution. The mordanted silk is passed through a bath of calcium acetate.

Silk absorbs tannin from sumac solution, and this can be fixed on the fibre by passing through a solution of either titanium potassium-oxalate or titanium sodium-sulphate.

The titanium mordants are also very serviceable in the use of chrome developing colours, and in the after-treatment of silk previously dyed with Anthracene Yellow or Brown or Alizarin colours. For this method titanium potassium-oxalate or titanium sodium-sulphate are the best of the salts to use.—E. N.

Indigo; Printing of Wool, Silk, or Cotton with ——. Badische Anilin und Soda Fabrik, Ludwigshafen. Ger. Pat. 139,217, Dec. 1, 1900. Zeits. angew. Chem., **16**, [15], 352.

The indigo, in presence of a hyposulphite (hydrosulphite), preferably the zinc or zinc-sodium salt, a thickening material, and a weakly alkaline substance, such as magnesia, alkali carbonate or bicarbonate, borax, or sodium silicate, is fixed by steaming on the fabric, either by printing a mixture of indigo, hyposulphite, and thickening medium on the fabric previously treated with the alkaline substance, or by printing a mixture of all four (which will not react, save on warming) directly on the fabric.—J. T. D.

Indigo Resist-Printing; Process for ——, with Simultaneous Bleaching of the Resist-Foundation. Badische Anilin und Soda Fabrik, Ludwigshafen. Ger. Pat. 140,602, July 20, 1902. Zeits. angew. Chem., **16**, [15], 351—352.

A resist-paste is made of any usual thickening material, glycerin and lead peroxide. This is printed on the fabric, which is then passed through the vat as often as necessary. Finally it is passed through a hydrochloric acid bath, when the chlorine evolved bleaches the fabric on the undyed spots.—J. T. D.

Reserve White and Colour under Indigo Blue; Process for ——. A. Feer. Bull. Soc. Ind. Mulhouse, 1903, **73**, 26—27.

A reserve, made up with a wax and borax emulsion, to which the acetate of barium, calcium, magnesium, zinc, tin, or lead is added, acts well in an indigo vat. Instead of tin acetate, any other tin salt may be used.—J. McC.

Reserve White and Colour under Indigo Blue; Report on Feer's Process for ——. R. Bruckmann. Bull. Soc. Ind. Mulhouse, 1903, **73**, 27—28.

The process devised by Feer has been tested and found to be satisfactory. It has also been found that an emulsion made with olive oil, stearine, &c. under the same conditions acts satisfactorily as a reserve agent.—J. McC.

Azo Resists under Steam Indigo Blue. J. Brandt. Bull. Soc. Ind. Mulhouse, 1902, **72**, 428—430.

Bloch and Schwartz have pointed out (this Journal, 1894, 1193) that, when printed in admixture with precipitated sulphur upon tissues prepared with sodium β-naphtholate and glucose, a number of diazo compounds give colours which resist the fixing of the dyestuff from alkaline indigo mixtures over-printed as "covers" upon them, but which do so much less perfectly when the same mixtures are machine-padded over them. Cognisant of this, Colli (this Journal, 1902, 1453) has endeavoured, by the addition of suitable compounds to the sulphur mixtures employed, to increase the resisting action of these to the padded indigo mixtures. The compounds available for this purpose may be classified as (1) organic acids, (2) ammonium salts, and (3) aluminium sulphate. Of these, it has long been recognised that the members of class (1) resist indigo too feebly to be of use for the purpose. Of class (2), ammonium nitrate as discovered by Bontemps (this Journal, 1894, 1193) efficiently neutralises alkalis in tissue printing, and may be made to serve in producing a white resist under over-printed Indigo Blues. Under padded indigo mixtures it does not, however, act well, and when it is printed, in conjunction with diazo salts, upon tissues prepared as described, it dulls the shades of the azo colours produced. Aluminium sulphate, the sole compound left, is the one which Colli recommends. Colli states that a mixture containing 200 grms. of this salt per litre gives good results, especially in the cases of Azophor Pink A and Metanitraniline Orange. To verify this, the author printed mixtures containing Azophor Pink A, Azophor Orange (prepared by diazotising *m*-nitraniline, adding aluminium sulphate, and evaporating the mixture to dryness in a vacuum), and the diazo salts of the three nitranilines and of the two naphthylamines, with additions of (1) 200 grms. of precipitated sulphur, (2) 200 grms. of precipitated sulphur and 200 grms. of aluminium sulphate, and (3) 300 grms. of precipitated sulphur per litre. The results were as follows:—The Orthonitraniline Orange was completely discharged in all three cases. The Metanitraniline Orange was changed to a brown, and the Paranitraniline Red to a puce, in all cases. The Azophor Orange colour was slightly less damaged with mixture (2) than with mixtures (1) and (3). An improvement was observed in the case of the Azophor Pink printed with mixture (2), although the intensity of the shade obtained was considerably weakened. On the whole, the addition of aluminium sulphate would appear to be of little value, since sulphur by itself resists sufficiently well over-printed dark Indigo Blues, while sulphur and aluminium sulphate together do not satisfactorily resist the padded dark Blues. Moreover, even if they did so, the reaction would not be of industrial worth, on account of the difficulty of obtaining evenness of shade in the machine-padded dark Indigo Blue prints.

—E. B.

Resists under Indanthrene Blue. A. Romann. Bull. Soc. Ind. Mulhouse, 1902, **72**, 423.

Ammonium nitrate has been recommended by Tigerstedt (this Journal, 1902, 912) as a resisting agent for Indanthrene Blue, when this is applied in the same manner as indigo, according to Wilhelm's method (this Journal, 1902, 545) of printing with that dyestuff. The author, however, finds ammonium nitrate irregular in its action, and inferior in this respect to a mixture of sodium chlorate and tartaric acid, and to ammonium persulphate, with the last of which a satisfactory white resist may be obtained.—E. B.

Indanthrene Blue Discharge for Tannic Acid Mordants. A. Romann. Bull. Soc. Ind. Mulhouse, 1902, **72**, 423.

The author reports that the process of discharging tannic acid mordants on cotton tissues, with a mixture containing Indanthrene Blue, as proposed by Tigerstedt (this Journal, 1902, 912), gives satisfactory results, provided that steam free from air is employed in the steaming operation.

—E. B.

Discharges on Aniline Black, Navy Blue, and Bordeaux on Wool. E. Jaquet. Bull. Soc. Ind. Mulhouse, 1902, **72**, 416—418.

Discharges on Aniline Black on Wool.—The woollen tissue is padded with a solution of potassium ferricyanide, 500 grms.; potassium chlorate, 500 grms.; aniline hydrochloride solution, composed of 9 parts of hydrochloric acid and 7·18 parts of aniline, 2·5 kilos.; vanadium trichloride, $\frac{1}{10}$ litre of a solution prepared by reducing with glycerin and hydrochloric acid, 40 grms. of ammonium metavanadate, and diluting the product to 4 litres; in water, 10 litres. It is then dried and printed with a mixture of egg albumin solution, 10 litres; sodium acetate, 3·2 kilos.; sodium hyposulphite (thiosulphate), 3·2 kilos.; and zinc oxide, which is added to mask the yellow colour the wool shows after steaming, 10 kilos. Colour discharges are obtained by adding suitable pigments to this mixture; *e.g.*, cadmium sulphide, for yellow, Guignet's green, for green, and a "red lake," for red. The printed tissue is steamed for 5—10 minutes at 100° C., rinsed in hot water and dried.

Discharges on Navy Blue.—For the blue ground a mixture is used, of Chromotrope 8 B, 500 grms.; water, $9\frac{1}{3}$ litres; gum tragacanth and British gum thickening, $3\frac{1}{2}$ litres; potassium chromate, 165 grms.; crystallised sodium carbonate, 150 grms; sodium chlorate, 150 grms.; glycerin, 1 litre; with the addition of 1 vol of water t 4 vols. of the mixture, and of 6 grms. of Soluble Blue pe litre. For the "discharge" there is employed a mixtur of gum solution, $\frac{1}{10}$ litre; zinc oxide, 300 grms.; stannous hydrate paste, 250 grms.; egg albumin solution (13 : 10), $\frac{5}{10}$ litre; zinc oxide, 150 grms.; glycerin, 20 c.c. Th tissues are wrapped in damped "greys" during th steaming operation and are afterwards washed in cold wate

Discharges on Bordeaux.—The padding mixture for thi colour is composed of 5 parts of a mixture of Bordeaux S 60 grms.; water, $\frac{1}{20}$—$\frac{3}{4}$ litre; thickening, $\frac{3}{10}$ litre; glycerin $\frac{1}{20}$ litre; and 1 part of a mixture similar to that employe for the dark-blue padding colour, but containing Chromotrope 2 R, instead of Chromotrope 8 B. The "discharge" colour and the treatment of the printed tissue are the sam as for the Navy Blue. (See also this Journal, 1902, 1453.

—E. B.

Discharges on Aniline Black, Navy Blue, and Bordeau on Wool. (Note on the preceding Article.) H. Schmid Bull. Soc. Ind. Mulhouse, 1902, **72**, 418—421.

Jaquet, in his communication (sealed note deposite Aug. 8, 1891), describes a method of producing on woolle tissues effects similar to those obtained in the Prud'homm Aniline Black resist style of calico printing. In this h has anticipated Kallab (Eng. Pats. 17,022 of 1891 an 7638 of 1892; this Journal, 1892, 745 and 746), who us for the same purpose soluble dyestuffs which can be fixe upon wool, applying them to tissues which have been treated first, with chlorine, and then, to whiten them, with hydrog peroxide, before being padded with the Aniline Black mixture. Kallab adds a little Acid Violet to the thickene solution of sodium acetate, which constitutes the resisti agent, to counteract the yellow colour of the wool, and thu to obtain a white resist. Jaquet obtains a better white b the use of zinc oxide, which becomes fixed upon the tiss by means of the albumin employed in conjunction with and which more effectually prevents the yellowness of th chlorinated fibre from being seen. For the production c colour resists, on the other hand, Kallab's method is to b preferred, colours being obtained which are clearer an brighter than those obtained with the pigments employed Jaquet's method, and which do not, like the latter, interfe with the softness of the fibre; thus Quinoline Yellow ma be employed for a yellow, Patent Blue for a blue, and mixture of Tartrazin and Patent Blue for a green resist.

In view of the numerous black dyestuffs available fo printing wool, Schmid is of opinion that Aniline Black is n destined to have in this industry the importance whic possesses in calico printing.

The resists on Navy Blue and Bordeaux-coloured grou are technically inferior to those under Aniline Black. T white obtained is impure, and the use of stannous hydra in the manner described is objectionable, as this compoun becoming fixed upon the fibre, is ultimately rendered yello by the hydrogen sulphide emanations to which it is expose

—F. B.

English Patents.

Filaments from Cellulose Solutions; Process for t Manufacture of ——. E. Thiele, Barmen, Germa Eng. Pat. 8083, April 7, 1902.

See U.S. Pat. 710,819 of 1902; this Journal, 1902, 1393.

—T. F. B.

ecorticating and Separating Gum and other Incrusting Matter from Ramie and other Fibrous Substances. E. Depetro, Orléansville, Algeria. Eng. Pat. 11,790, May 23, 1902.

e U.S. Pat. 707,907, and Addition to Fr. Pat. 317,501; s Journal, 1902, 1183, and 1903, 416.—E. B.

nw Cotton and Flax and Cotton and Linen Goods; Impts. in the Treatment of ——, to reduce the Inflammability thereof. W. H. Perkin, jun., and Whipp Brothers nd Tod, Ltd. Eng. Pat. 9620, April 25, 1902.

e Fr. Pat. 321,063 of 1902; this Journal, 1903, 142.
—J. McC.

umping Textile Fabrics and Materials; Apparatus for ——. The Bleachers' Association, Ltd., Manchester, nd T. Morris, Adlington. Eng. Pat. 11,438, May 20, 1902.

drum composed of perforated sheet metal, and having edges of the perforations made rough and jagged on external surface of its periphery, is mounted in a tank ich is supplied with water to a suitable level. When the m is rotated, the projecting edges throw the water up in form of a fine spray, which moistens the tissues to be mped as these pass over the top of the tank.—E. B.

eing Machines; Impts. in ——. E. de Pass, London. From The Vacuum Dyeing Machine Co., Chattanooga, U.S.A. Eng. Pat. 4142, Feb. 21, 1903.

e dyeing machine consists of a tank with one or more low rolls, and each provided with grooves on its periery to receive the warp or thread. The dye-liquor is charged through the grooves in small streams from the erior of the rolls on to the travelling warp or thread. e rolls are supported on standards, through which the e-liquor is conveyed back into the interior of the rolls. e also U.S. Pat. 721,630 of 1903; this Journal, 1903, .)—J. McC.

eing and Embossing Hat Bodies; Impts. in ——, and n Apparatus therefor. R. B. Ransford, Upper Norwood. From J. Mehler and J. M. Rey. Eng. Pat. 11,770, May 23, 1902.

perforated metal form is fitted on a plate in the bottom a vat. Over this is placed the hat body, which is then ered by another perforated metal form. The dye-liquor orced by means of a pump through a tube, which enters first perforated form. The dye-liquor is thus forced ough the hat body from within to without, and the terial is uniformly dyed. The hat body is held in ition by the metal plates, and its shape is consequently altered during the process. The washing is effected by lacing the dye-liquor by pure water.

Relief effects can be produced by placing between every bodies a form of metal or india-rubber cut out according the required design. The pressure of the liquor is ficient to cause the relief effect.—J. McC.

ed Cloth and the like; Apparatus for the Examination f ——. F. Schemel. Eng. Pat. 11,687, May 22, 1902.

e apparatus consists of a tube or light-well closed at the tom and painted black in the interior. The samples of th to be examined are placed in the bottom of the tube l so illuminated that the light falling on the samples is from rays reflected from coloured bodies. The samples observed through a lateral socket. The apparatus can fitted in a hut with rotatable roof.—J. McC.

United States Patents.

eing Apparatus. J. A. Willard, Assignor to The acuum Dyeing Machine Co., Chattanooga, Tenn. .S. Pat. 723,795, March 24, 1903.

ylinder, in which the materials to be dyed are placed, ertically mounted in a tank, and is closed above and w by plates. The lower of these is perforated, and is d above the bottom of the tank, leaving between the er and it, a space which serves as a dye-liquor chamber. A similar chamber is arranged at the top of the cylinder between the upper cover-plate and a vertically adjustable compression plate, which is carried by a screw rod extending through the tank, and which, as desired, can be raised or lowered along with the surmounting cover-plate, to release or compress the textile materials below it. By means of a pump, a suction and two feed pipes communicating with these chambers, a suction pipe communicating with the tank, and the necessary valves, dye-liquors are caused to circulate alternately in opposite directions through the materials contained in the cylinder.—E. B.

Sizing; Preparation of ——. T. Aspinall, Bolton, England. U.S. Pat. 724,238, March 31, 1903.

See Eng. Pat. 2447 of 1902; this Journal, 1903, 91.
—R. L. J.

Fabrics; Process of rendering ——, Fireproof. G. Blenio, New York. U.S. Pat. 724,788, April 7, 1903.

The fabric is soaked in a solution of alum and ammonium phosphate, dried, and then again soaked in a solution of silicate of soda.—A. S.

French Patents.

Silk; New Process of Treatment of ——. J. A. Bredoux. Fr. Pat. 323,902, Aug. 20, 1902.

The usual method of charging silk consists in treating it with tin salt, and afterwards passing it through a bath of phosphate of sodium, and, finally, of silicate of sodium.

According to the present invention, the silk is passed for $\frac{1}{2}$—1 hour through an additional bath of sodium bicarbonate solution of 10° B. This treatment is claimed to impart scroop, brilliancy, and solidity to the silk, whilst the weighting is about 50 per cent. greater than that obtained by the usual process.—E. N.

Wool and other Fabrics; Process and Apparatus for Scouring ——. L. A. Morel and G. E. C. Porchez. Fr. Pat. 324,078, Aug. 27, 1902.

The goods to be cleansed are placed in a chamber, into which a suitable volatile solvent is introduced. The temperature is raised, but during the whole process is never allowed to exceed 40° C. When the first extraction is completed, the solvent is removed, and then hot air is introduced, so as to dry the goods. The solvent, after use, is drawn off, and redistilled without coming into contact with the atmosphere, so that loss by evaporation is avoided. An apparatus comprising a chamber, a series of reservoirs and condensers, and a distilling apparatus for the spent solvent, is claimed.—T. F. B.

Cotton; Apparatus for Mercerising, &c., ——. L. Bretonnière. Fr. Pat. 324,076, Aug. 27, 1902.

A rectangular plank is provided on its two long edges with bars, the extremities of which are hollowed out to receive the rollers, which bear the hanks. The hollowed parts at one end of the plank are in the form of symmetrical curves, but those at the other end are unsymmetrical, to facilitate the placing of the rollers in position. The two rollers are inserted in the hanks, and one of them is then placed in the symmetrical hollowed parts of the bars, and the other forced into the unsymmetrical hollows at the other end. The whole is then immersed in the mercerising solution, and the hanks are thus kept under constant tension during the treatment.—A. S.

Dyeing, Bleaching, Scouring, and otherwise Treating Textile Goods; Apparatus for ——. P. Schirp. First addition, dated Aug. 26, 1902, to Fr. Pat. 314,274, Sept. 16, 1901.

A variation is claimed in the apparatus described in the original specification (this Journal, 1902, 406). The movable receptacle for holding the fabrics is mounted on friction rollers, instead of being placed on a truck, and it is connected with an elevator. In addition to this, the walls of the vat are made removable, enabling the receptacle to be wheeled into and out of it to an elevator which is fixed in the dyehouse.—T. F. B.

Wool Black; Production of Solid ——. Soc. F. Bayer et Cie. Fr. Pat. 323,809, Aug. 18, 1902.

The azo dyestuffs derived from *o*- aminophenol, as, for example, the combination from diazo-*o*-aminophenolsulphonic acid, aminohydroxybenzoic acid, aminohydroxybenzyl sulphonic acid (both having $OH : NH_2$ in ortho position) with the dihydroxynaphthalenes 1:5, 1:7, 2:6; the aminonaphthol 1:7, or their sulphonic acids, give very fast black shades on wool. The colours are particularly solid against the potting process; they are dyed in sulphuric acid bath and chromed with bichromate of sodium or other chroming agents in the usual way. The chroming process can be carried out in the dye bath. In this case the addition of sulphuric acid is not necessary.—E. N.

Khaki Shades; Production of ——. T. C. Dupont. Fr. Pat. 324,002, Aug. 26, 1902.

Khaki shades on cotton goods are produced by fixing on the fibre a mixture of oxide of chromium and manganese. The fabric is immersed in a bath of bichromate of sodium, chloride of manganese, and acetate or formate of sodium. A great variety of shades, from light olive to dark brown, can be produced by altering the proportions of the three components, by diluting the solution, or by varying the duration of immersion.

The goods are afterwards well washed and, while still wet, passed through a solution of alkali, the concentration of which should never be less than 11° B. If the shade obtained is judged to be too light, another passage through the first bath only will be sufficient to produce the shade desired.—E. N.

Sulphur Dyestuffs; Process of Printing with ——. Chem. Fab. vormals Weiler ter Meer. Second Addition, dated Aug. 19, 1902, to Fr. Pat. 322,147, June 9, 1902.

See U.S. Pat. 708,429 of 1902; this Journal, 1902, 1231. —E. N.

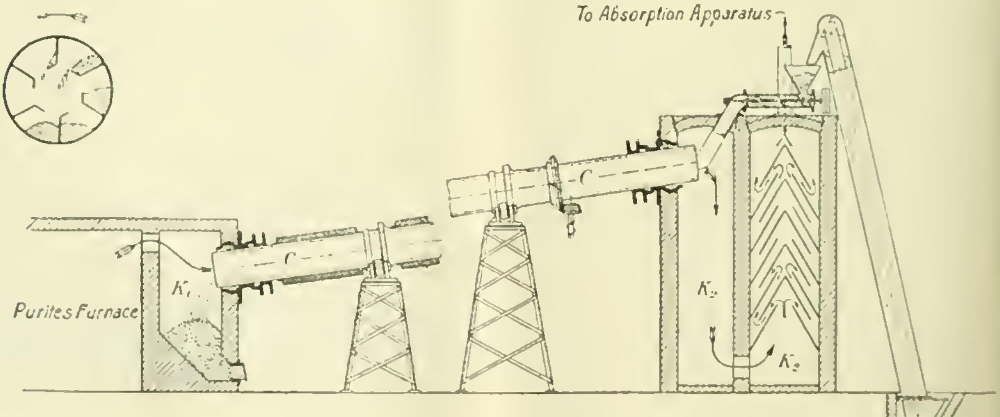
Printed Fabrics. P. Barboutau. Eng. Pat. 323,643, Aug. 11, 1902.

Fabrics of any kind are attached to paper, and then printed upon by any process. Especial claim is made for printing on such mounted fabrics by the "xylographic" process (see Eng. Pat. 7923 of 1901; this Journal, 1902, 341) for obtaining colours in graduation.

The special advantage arising from this process is, that several sheets of light fabric, fastened together, can be printed at once by this xylographic method.—T. F. B.

Fig. 2.

Fig. 1.



Thread or Fabric with Metallic or Metallically Glittering Coating, and Method of Producing same. E. and W. Leuscher, Teutschenthal, Germany. Fr. Pat. 324,137, Aug. 30, 1902.

See Eng. Pat. 18,684, Aug. 25, 1902; this Journal, 1903, 211.—E. N.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Printing [Paper] in Different Colours; Apparatus fo ——. J. Wojciechowski, Warsaw, Po'and. Eng. Pa 26,281, Nov. 28, 1902.

An apparatus for printing in several colours simultaneousl consisting of a roller upon which are mounted a fixed an one or more movable clichés. The latter, when in operatio are successively pushed outwards by means of springs, t receive from corresponding inking rollers the colours whic they are to print. These are depressed by the action side flanges on them and on the roller which supplies colo to the fixed cliché, to enable the latter to be supplied wi colour, and pushed outwards again to the level of the fix cliché, when this is in contact with the printing roller, roun which the paper to be printed is passed. Each cliché th independently receives colour from the inking rollers, wh all the clichés print together.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Anhydride and Sulphuric Acid; Manufactu of ——. Farbwerke vorm. Melster, Lucius und Brünin Höchst a Main. Ger. Pat. 139,554, Jan. 25, 190 Zeits. angew. Chem., **16**, [14], 327—328.

At the upper end of the canal C (Fig. 1) burnt pyrit impregnated with ferrous sulphate, is fed in. The canal continuously rotated, and the longitudinal partitions (Fig. ensure a thorough turning over of the mass as it proce down the canal, meeting the gases from the pyrites burne The burnt pyrites absorbs the sulphur dioxide complete at the upper, cooler end, and as the substance reaches t hotter parts of the canal, the compounds so formed a decomposed, evolving sulphur trioxide and producing fer oxide in a powerfully catalytic condition, which induces t oxidation of part of the sulphur dioxide in the gase moreover, the ferrous sulphate is completely decompos and the whole of the sulphur in the burnt pyrites is oxidis, so that the spent substance, falling into the chamber contains no sulphur. At the other end, the sulphur triox and sulphuric acid, with excess of oxygen and nitrogen, freed from dust in the chamber K_2, and pass on to e absorption apparatus. The ferrous sulphate solution p ceeding from the wet process of copper extraction is u to impregnate the burnt pyrites. The advantages of e process are that it yields sulphuric acid of any des d concentration from the ordinary pyrites burners, with t any apparatus for drying the air, or for purifying the bur r gases, and without excessive cooling of the gases; th oreover, the process frees the spent pyrites completely om sulphides, which is of great advantage for subsequent pper extraction.—J. T. D.

ulphuric Anhydride Process; Contact Substance for the ——. Badische Anilin und Soda Fabrik, Ludwigshafen. Ger. Pat. 140,353, March 21, 1901. Zeits. angew. Chem., **16**, [15], 352.

xides of iron, copper, or chromium, or mixtures conining these, are used instead of asbestos as foundations r spongy platinum. In spite of the relative compactness id lack of porosity of these substances, the platinum is irprisingly active, possibly because there is added to it e activity of the foundation itself. These substances e much cheaper than asbestos, more resistant to heat and iemical influences, are more easily filled into the appatus, and need no arrangements to protect the lower layers om the pressure due to the weight of the upper ones. As i example: 145 parts of arsenic-free burnt pyrites, oken and sifted to the size of peas, are impregnated with parts of platinum chloride solution containing 17 grms. platinum per litre; the material is dried at 70° C., and ien used, either direct or after a preliminary heating.
—J. T. D.

ulphuric Acid; Employment of Ozone in the Manufacture of ——. Terrisse. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, 209.

. sealed note, deposited June 30, 1892, describing a iethod of manufacturing sulphuric acid, in which the xidation of the sulphur dioxide is effected with ozone or zonised air.—E. B.

oric Acid; Solubility of ——, *in Acids.* W. Herz. Zeits. anorg. Chem., **34**, 205—206. Chem. Centr., 1903, **1**, [13], 755. (See this Journal, 1903, 296, 320.)

he solubility was determined by shaking excess of solid oric acid with aqueous solutions containing known quanties of different acids, and determining the total acidity of ie saturated solutions (by titration of a definite volume fter addition of mannitol). In the following table the esults obtained at 26° C. are shown, the figures reprenting the "normality" of the solutions referred to boric cid and to the hydrogen ions of the solvent acids:—

ulphuric Acid.		Nitric Acid.		Acetic Acid.		Tartaric Acid.	
H·	B(OH)$_3$.	H·	B(OH)$_3$.	H·	B(OH)$_3$.	H·	B(OH)$_3$.
0·548	0·746	0·241	0·818	0·570	0·887	0·955	0·890
2·740	0·518	1·206	0·676	2·850	0·538	1·909	0·923
5·480	0·312	2·411	0·567	5·700	0·268	2·510	0·962
8·750	0·092	5·960	0·268	..	..	3·316	1·070
..	..	7·380	0·238	..	..	..	..

In tartaric acid the solubility is somewhat increased, but wing to the less distinct final point of the titration, the gures are somewhat less accurate.—A. S.

arium Hydroxide; Preparation of a New Hydrate of ——. O. Bauer. Zeits. angew. Chem., **16**, [15], 341—350.

rystals of a new hydrate of barium hydroxide, the xistence of which was inferred by Lescœur in 1883, have een prepared by heating 3 kilos. of the ordinary 8-molecule ydrate in an iron vessel till the temperature had risen to 8°·5 C., cooling very slowly for six hours, and draining ff the mother-liquor from the crystals which had formed. he composition of the new hydrate is expressed by a(OH)$_2$, 3H$_2$O, instead of 3Ba(OH)$_2$, 10H$_2$O, the formula iven by Lescœur. The crystals are rhombic prisms, of ardness 2·5 in Moh's scale, sometimes 2 cm. long, and sually grouped together, and having a brilliant lustre hich becomes rapidly dimmed in the air by carbon ioxide. When heated, this hydrate loses water without using and becomes the monohydrate, whereas the 8-molecule hydrate melts at 78° and boils at 103° C. In saturated aryta water its crystals crumble to powder. In all other espects it resembles the 8-molecule hydrate. No similar ydrate of strontium hydroxide could be obtained.
—J. T. D.

Potassium Chlorate; Electrolytic Process of Manufacturing ——. Terrisse. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1902, 208—209.

A solution of calcium chloride, to which potassium chloride or sodium chloride is added according to the chlorate which is to be produced, is submitted to the action of a current of 5—6 volts and 10 ampères. After some time the solution is heated. More potassium or sodium chloride is then added to form the corresponding chlorate by double decomposition with the calcium chlorate produced.
—E. B.

Zinc and Cadmium Sulphides; Preparation of Crystallised ——. G. Viard. Comptes rend., **136**, [14], 892—893.

Two boats, containing respectively zinc chloride and stannous sulphide, are placed in a porcelain tube in a furnace, and a stream of carbon dioxide is led over them, passing from the first to the second. The stannous sulphide is heated to redness, and then the zinc chloride is gradually heated. Vapour of zinc chloride is carried on by the carbon dioxide, and reacts on the stannous sulphide. The stannous chloride formed is volatilised; the zinc sulphide remains with the excess of stannous sulphide in colourless faint amber or straw-yellow needles, seen under the microscope to be hexagonal prisms, sometimes terminated by pyramids. Analysis proves them to be ZnS.

Cadmium sulphide is similarly obtained in crystals of similar form, but orange-yellow to red-brown in colour.

Antimony sulphide may be substituted for stannous sulphide, but its greater volatility renders it less convenient.
—J. T. D.

Sodium Acetate; Solubility of ——, *in Water and Alcohol.* G. Schiavon. Gaz. chim. ital., **32**, [2], 532—535. Chem. Centr., 1903, **1**, [13], 763.

One part of the anhydrous salt dissolves—	One part of the crystalline hydrate dissolves—
At 9° C. in 2·5 parts of water; at 13° in 2·3; at 37° in 1·64; at 41° in 1·47; at 8° in 48 of 98·4 per cent. alcohol; at 12° in 47·17; at 19° in 42·91; at 11° in 48·42 of 90 per cent.; at 13° in 46·94; at 15° in 7·43 of 63 per cent.; at 16·5 in 7·39; at 18° in 7·20; at 21° in 6·82; at 23° in 3·5 of 40 per cent.	At 9° C. 1·11 parts of water; at 13° in 1·0; at 37° in 0·59; at 41° in 0·49; at 8° in 29 of 98·4 per cent. alcohol; at 12° in 28·49; at 19 in 25·90; at 11° in 29·24 of 90 per cent.; at 13° in 28·32; at 15° in 4·48 of 63 per cent.; at 16°·5 in 4·45; at 18° in 4·34; at 21° in 4·11; at 23° in 2·11 of 40 per cent.

—A. S.

Calcium Carbide; Reaction of Ammonium Chloride with Commercial ——. R. Salvadori. Gaz. chim. ital., **32**, [2], 496—504. Chem. Centr., 1903, **1**, [13], 754.

The calcium carbide used in the experiments contained calcium, 56·04; carbon (calculated from the amount of acetylene evolved on treatment with water), 31·60; sulphur, 0·66; insoluble residue (in 1 : 5 hydrochloric acid), 5·31; and silica, aluminium, iron, phosphorus, and magnesium, 6·30 per cent.; 1 kilo. yielded 265·7 cb. m. of acetylene. Carefully purified ammonium chloride was used, and the products of the reaction between the two compounds were calcium chloride, carbon—which, owing to its purity, fine state of division, and great decolorising power, may find technical application—ammonia, and a mixture of methane, ethane, acetylene, and nitrogen. The small quantity of pyridine bases and amino compounds formed are probably derived from the nitrogen present in the carbide.—A. S.

Alkali Cyanides in Commercial Cyanide; Determination of ——. A. Adair. XXIII., page 573.

English Patents.

Sulphur Compounds; Recovery of ——, *from Waste Gases [as Sulphuric Anhydride].* A. Carey, O. Heslop, and The United Alkali Co., Ltd., all of Liverpool. Eng. Pat. 10,351, May 5, 1902.

This is an improvement on Eng. Pat. 10,317, June 5, 1900 (this Journal, 1901, 474), in which the preliminary treatment there required, in preparing the waste gases of the Chance-Claus recovery process, for application in the production of sulphuric anhydride by the contact process, is dispensed with. According to the present invention, the waste gases are led direct into a contact oven, in which, instead of platinised asbestos, platinum deposited on an inorganic salt, such as sodium sulphate, is used. This contact mass is stated not to be chemically acted upon by the ingoing gases or their reaction products, even in the presence of water-vapour. The fore part of the heated oven is packed with broken brick or the like, the hinder part containing the contact mass.—E. S.

Tin from Tinned Iron; Improved Process for Stripping ——, Recovering the Respective Metals, and Obtaining Nitric Acid as a By-Product. H. W. Hemingway. Eng. Pat. 8759, April 15, 1902. XI. B., page 561.

Cyanamide Salts; Preparation of ——. H. H. Lake, London. From The Cyanid-Gesellschaft, Berlin. Eng. Pat. 16,298, July 22, 1902.

A MIXTURE of lime and charcoal is heated, preferably in an electric furnace, to about 2,000° C., whilst a current of nitrogen or air is passed through or over the mixture. More than the theoretical proportion of carbon may be used, of which the greater part may be in some organic form, as pitch, tar, or the like. A metal, such as iron, may be added to the reacting mixture, to increase its electrical conductivity. Reference is made to Eng. Pat. 25,475 of 1898. (Compare also Eng. Pat. 17,507, Aug. 8, 1902; this Journal, 1902, 1462.)—E. S.

UNITED STATES PATENT.

Sulphuric Acid and Metallic Oxides; Process of Producing ——. H. S. Blackmore, Mount Vernon, N.Y. U.S. Pat. 724,251, March 31, 1903.

SOLID or infusible "compositions" containing sulphur and oxygen in proportion to form sulphuric acid when combined with the elements of water, are heated, and exposed to the action of superheated steam, or of "a fluid containing oxygen and hydrogen," at a temperature higher than that of the solid substance, but below that at which sulphuric acid is liable to dissociation, means being provided for withdrawing the sulphuric acid as it forms, and for collecting the residual metallic oxide. Aluminium sulphate is specified as a substance that may be thus treated. (Compare U.S. Pat. 11,995 (Re-issued), May 27, 1902; this Journal, 1902, 914; and U.S. Pat. 717,328, Dec. 30, 1902; this Journal, 1903, 145.)—E. S.

FRENCH PATENTS.

Barium Hydroxide; Manufacture of ——. Società Industriale Elettrochimica di Pont St.-Martin. Fr. Pat. 324,609, Sept. 19, 1902.

BARIUM sulphide, produced from the sulphate by heating with carbon or the like, is treated, in presence of water, with carbon dioxide to form barium carbonate, which is mixed with reducing substances and heated in an electric furnace to obtain barium carbide, and this, on treatment with water, gives barium hydroxide and acetylene.—E. S.

Metal Sulphides; Obtaining ——, in the Electric Furnace. Société anon. de l'Industrie Verrière et ses Dérivés. Fr. Pat. 324,193, Sept. 1, 1902.

A METAL sulphate is mixed with a carbon-containing substance, and the mixture, after drying if necessary, is electrically heated in a suitable furnace to obtain the corresponding sulphide. An acid sulphate, mixed with a chloride of the same metal and with carbonaceous matter, may alternatively be used, in which case the furnace is provided with adjuncts for collecting and condensing the hydrochloric acid evolved.—E. S.

Sodium Sulphide, Crystallised; Manufacture of ——. A. Drouville. Fr. Pat. 324,481, Sept. 16, 1902.

CRUDE sodium sulphide is dissolved in water under pressure to obtain a solution which crystallises quickly and gives a product free from sulphates.—E. S.

Metal Carbides; New Method for the Preparation of —— N. Basset and P. Germain. Fr. Pat. 324,232, July 11 1902.

THE invention relates to the production of metal carbide generally, but especially of calcium carbide. Calciu cyanide, preferably formed by reacting on calcium hydroxid by ammonium cyanide, is carefully dried, and heated t about the melting point of zinc in a closed vessel, to obtai calcium carbide, nitrogen being evolved. Sodium cyanid formed from part of the ammonium cyanide used in th described process, is heated in presence of water to obta sodium formate and ammonia, and from the format mixed with barium hydroxide, an oxalate is formed, fro which oxalic acid is obtained as a by-product.—E. S.

Spent Acid from Galvanising Works, &c.; Treatme of ——. H. E. Howard and G. Hadley. Fr. Pa 324,546, July 31, 1902.

SEE U.S. Pat. 715,804, Dec. 16, 1902; and Eng. Pat. 932 of 1902; this Journal, 1903, 97 and 498.—E. S.

Oxygen; Manufacture of ——, by the Aid of Liquid A G. Claude. Fr. Pat. 324,160, Sept. 15, 1902.

IN apparatus for the production of "super-oxygenated" ai from liquid air, the latter is evaporated, with simultaneo liquefaction of gaseous air at a higher pressure, the proce consisting in causing a "methodical circulation in the inver sense" of the liquid and of the gaseous air, the circulatio being of such rapidity as to effect only a partial liqu faction of the gaseous air, the uncondensed portion, rich i nitrogen, being conducted outside, after having travers one of the exchanger-compartments, inverse to that f the gaseous air to be treated. The liquefied portion, no rich in oxygen, is separated into fractions of varyin richness in suitably arranged exchanger compartment (Compare Fr. Pat. 322,702 of July 2, 1902; this Journa 1903, 365.)—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

FRENCH PATENTS.

Glass; Opaque ——. R. Rickmann and E. Rappe. Fr. Pat. 324,227, July 3, 1902.

GLASS-metal, glaze, or enamel may be rendered opaque l the addition of antimonic acid or its compounds. Th addition may be performed in three ways: by fusing t antimonic acid or antimonates with the crude metal; fus with the latter certain substances furnishing the acid compounds in question; or by fusing the ready-made gla or enamel with the acid or compounds of the same. (also U.S. Pat. 716,106 of 1902; this Journal, 1903, 94.) —C. S.

Glass; Manufacture of ——. W. E. Heal. Fr. Pat. 324,341, Sept. 10, 1902.

SEE U.S. Pat. 710,357 of 1902; this Journal, 1902, 1330. —C. S.

Mirrors; Manufacture of ——. W. E. Evans. Fr. P 324,330, Sept. 10, 1902.

THE removal of portions of the silvering from the bac mirrors for the purpose of filling the resulting blank s with ornamentations, is effected by means of pieces unglazed paper, or other absorbent material, cut to pat and steeped in a 2—10 per cent. solution of nitric a The parts of the silvering to be removed, are then prin over, or coated in any other suitable way, with a sl drying composition that softens when heated, and the wh is covered with a thin layer of a quick-drying soluti On exposure to heat, the first-named composition softe and can be removed by friction, leaving a negative de protected by the quick-drying solution. This treatm preserves the sharp contour of the design. The pa stencils, steeped in acid, are then applied to the exp portions, whereupon the nitric acid converts the silver into silver nitrate, which can be removed by friction.—(

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ement Mortar ; Addition of Trass to ——. Koning and Bienfait. Thonind.-Zeit., **27**, 215 ; Chem.-Zeit., **27**, [27], Rep. 89.

ɪᴇ determination of the most favourable ratio between ment and trass was effected under the presumption that nols. of silica will combine with 3 mols. of lime. By using ment containing 19·4 per cent. of silica, 5 per cent. of imina, and 61·4 per cent. of lime, and a trass containing ·5 per cent. of silica, 10·8 per cent. of alumina, and 3 per cent. of lime, the ratio of 6 parts by weight of ment to 4 parts of trass was obtained.

To ascertain the behaviour of pure cement mortar and ment-trass mortar in fresh and salt water, the following xtures were taken :—I. Cement, 1 part ; sifted river sand, –4 parts. II. The aforesaid mixture (cement, 6 ; trass, 4), part, and 3—4 parts of sifted river sand. III. and IV. The me ingredients, but normal sand in place of river sand. esh water was used for mixing.

The results showed an absence of any injurious influence the part of sea water, the tensile and compression strength the cement-trass mortar increasing progressively, the ter most. The compression strength of cement-trass ortar increases to a larger extent than that of pure nent mortar, both in fresh and salt water. Up to days, the compression strength of cement mortar reases regularly in salt water, but then begins to inish. At the outset the cement mortar sets harder in the cement-trass mortar. A partial substitution of ss for cement reduces the initial compression strength in sh water, but has no influence on the tensile strength. carefully calculated partial substitution of trass for nent does not diminish the compression strength, and, fact, decidedly augments this strength when the setting es place in sea water.—C. S.

irebricks ; Properties of ——, *and their Behaviour in Zinc Furnaces.* O. Mühlhaeuser. X., page 556.

English Patents.

lns or Apparatus for Calcining Purposes. J. R. Horton, Worksop. Eng. Pat. 7691, April 1, 1902.

ᴇ bottom of the kiln is made with downwardly-inclined faces, which terminate in outlets provided with outer rs, which close the outlet completely, and with indedent inner doors of less sectional area than the outlet sages. These inner doors are intended to easily control discharge of treated material through the outlet, and operated by means of a counterweighted lever, being ferably hinged so as to move about a horizontal axis on r lower edges. The outer doors are fitted with any venient arrangement by means of which they may be le to tightly close the outlet, and are hinged so as to e about their upper edges.—A. G. L.

ne Bricks, Artificial ; Manufacture of ——. L. P. Ford, Gresford. Eng. Pat. 26,258, Dec. 23, 1901.

materials (sand, lime, &c.) are mixed in an ordinary (or mixer), either placed over a direct fire or else steameted, the heating removing any superfluous moisture, ch is condensed and removed by means of a dome-shaped having curving ridges leading into pipes near the lower r edges. If, however, the lime used be not already ed, water is supplied to the materials from a pipe running de the pug. On the top of the pug is placed a small per with an automatic valve in the bottom, the pug lf also automatically discharging into the brick-making hine by means of a pipe, which is cold-water jacketed. hopper is fed with measured quantities of the materials n elevators, which are themselves supplied from boxes ing a measured hole in the bottom and fitted with a ing arm inside, whereby a certain quantity of material, rding to the size of the hole, falls into the elevator in ven time.—A. G. L.

Blocks and Tiles for Paving and other Purposes ; Manufacture of ——. G. Livingstone and the Sanitary Block and Tile Pavement Co., Ltd., both of London. Eng. Pat. 18,583, Aug. 23, 1902.

Wood, granulated to particles of a suitable size, is heated to 180° to 200° F., and then mixed with a pulverised stone, preferably limestone, and a bituminous cement or asphalt, obtained preferably as described in Eng. Pat. 5439 of 1897. The best results have been obtained with a mixture consisting of 65 parts of granulated wood, 85 parts of limestone dust, and 147 parts of bituminous cement. The mixture is given the required form in a suitable press, *e.g.*, the one described in the above patent.—A. G. L.

Portland Cement ; Manufacture of ——. B. J. B. Mills, London. From T. A. Edison, Orange, N.J. Eng. Pat. 1404, Jan. 20, 1903.

The object of the invention is to utilise a part at least of the waste heat of the products of combustion, and to produce a uniform clinker containing no unburnt particles. Both objects are accomplished by burning in a rotatory kiln of exceedingly large dimensions, the length being 46 m. and the internal diameter 1·7 to 1·8 m. The clinkering zone, which commences 3 m. from the lower end, is 9 to 12 m. long, so that a length of 34 to 31 m. is left in the kiln in which the material to be burnt takes up heat from the burnt gases. The charge itself is five to seven times as much as that used with kilns of the ordinary size. The fuel (powdered coal) is introduced through two nozzles at the lower end. As the clinker is completely burnt, the resulting cement, even with the addition of gypsum, would set in a few minutes ; one or two per cent. of hydrated lime are consequently added with the gypsum to delay setting.—A. G. L.

French Patents.

Refractory Bricks and like Articles ; Manufacture of ——. The Carborundum Co. Fr. Pat. 324,276, Sept. 4, 1902.

See Eng. Pat. 19,493 of 1902 ; this Journal, 1903, 213.
—A. G. L.

Refractory Materials, Basic ; Impts. in ——. The Basic Brick Co., Ltd. Fr. Pat. 324,295, Sept. 8, 1902.

Portland cement is rendered anhydrous, and then mixed with 5 to 10 per cent. of coal-tar or, preferably, coal-tar residues left after distillation, also previously dehydrated. Both substances may be heated before mixing. The mixture is either formed into bricks, tiles, &c., which are then baked, or applied directly as a furnace lining.
—A. G. L.

Agglomeration of Building Materials ; Process for ——. V. Conti and G. Geofroy. Fr. Pat. 324,374, Sept. 12, 1903.

Any building materials, such as pieces of bricks, pebbles, stones, sawdust, &c., are mixed with a binding agent composed of a mixture of magnesia and kieselguhr in suitable proportions with solutions of magnesium chloride, aluminium sulphate, and magnesium or zinc sulphate, or both these bodies. Instead of using magnesium chloride, an excess of magnesia may be used together with hydrochloric acid. The resulting mixture is given the required shape and allowed to stand. After several hours a disengagement of heat takes place, and the mixture rapidly hardens, owing to the formation of oxychloride of magnesium. The substance obtained may be used for building and paving purposes, as well as for making objects of art, *e.g.* statues. (See also U.S. Pat. 705,650 of 1902 ; this Journal, 1902, 1140.)—A. G. L.

Asbestos ; Application of ——, *to the Manufacture of Fire-resisting Materials of Construction and Refractory Materials.* P. Chagot and A. Quédeville. Fr. Pat. 324,471, Sept. 11, 1902.

The asbestos is reduced to a fibrous powder, mixed with powdered clay and refractory earths, and made into a paste with water, the resulting product being then moulded into the required shape, dried, and burnt. The substance obtained may be used for bricks and paving, as well as for furnaces, retorts, crucibles, &c., and is claimed to be very refractory, of great hardness and very light; it also deadens sound and prevents the spreading of fire.—A. G. L.

Mortar; Manufacture of ——, for Use in Preventing Penetration of Water under Pressure. W. Staab. Fr. Pat. 324,171, Sept. 3, 1902.

The mortar is composed of cement and sand in the proportion of 2 to 1 or 3 to 1, and is mixed with wood charcoal, and, immediately before use, with water heated to a temperature of 30° to 40° C., and containing 17 grms. of sodium chloride and 50 grms. of potassium chloride per litre. The mixture hardens almost instantaneously, even under a water-pressure of several atmospheres.—A. G. L.

X.—METALLURGY.

White-Iron Castings; Strength of ——, as influenced by Heat-Treatment. A. E. Outerbridge, jun. J. Franklin Inst., 1903, **155**, [4], 289.

The effect of heat on white-iron castings appears to be to convert a portion of the combined carbon into the free state. The following facts have been observed:—

The separation of graphite commences at a lower temperature as the percentage of silicon in the iron is increased, and continues to separate at a lower temperature than is required to start the reaction.

At a certain constant degree of heat the separation of graphite continues more slowly according as the temperature is lower, and the proportion of silicon less.

"The proportion of combined carbon which corresponds to the equilibrium at a given temperature diminishes when the amount of silicon is increased."

In conclusion, the author is certain that this converted white iron should not be called "steel."—T. F. B.

[*Steel*] *Manganese Ore for Desulphurising in the Basic Martin Process.* A. Riemer. Stahl u. Eisen, **22**, 357. Zeits. angew. Chem., 1903, **16**, [13], 307.

By adding manganese ore to the charge, pig iron rich in sulphur may be converted into good steel in the basic Martin furnace. A considerable excess of manganous oxide prevents the burning off of the manganese and carbon, whilst at the same time the sulphur is eliminated, without being reabsorbed as it is when the slag is rich in ferrous oxide and lime. The detection of sulphur dioxide vapours at the time of tapping the slag, indicates that the sulphur does not remain in the latter.

A charge consisting of 1,000 parts (poods) of pig iron (containing 0·45 per cent. of Mn, 0·84—0·92 per cent. S, and 0·17 per cent. Si), 125 parts of limestone, 130 parts of iron ore, and 140 parts of manganese ore, furnished a steel containing 0·56 per cent. Mn, 0·12 per cent. S, and 0·08 per cent. C, the product forging, rolling, and welding admirably. The author states that no ferromanganese or spiegeleisen will be required if the proportions be selected in a suitable manner, so that the charge can be kept in ebullition for half an hour without needing any addition of ore. At the commencement of ebullition the charge will be fluid and red short, but quickly becomes thick, until a sample shows but very little grain, whereupon it is ready for tapping if mild ingot iron be desired. Since no reduction of the manganese occurs in the slag during ebullition, the manganous oxide should therefore have a favourable influence on the elimination of gas.
—C. S.

Silicon Carbide: Use of —— [Steel Manufacture]. Eng. and Mining J., 1903, **75**, [13], 481.

Carbide of silicon has to some extent been used as a substitute for ferro-silicon in steel manufacture. To insure solid castings in basic open hearth work, a higher proportion of silicon is required than can be obtained in the pig-iron fulfilling the requirements of the furnace. As a source of this additional silicon, carbide of silicon presents the advantage over ferro-silicon, that it can be added directly to the ladle during the process of tapping and without previous heating. Uniform action is secured, and complete solution generally takes place, by the time th ladle is full. Carbide of silicon is also extensively used i open hearth practice in the case of steel which is first ru into ingots and in which the amount of silicon is very mu lower than in steel castings. In the acid open-hear process, silicon carbide has been used for cleaning dir furnace bottoms. A small quantity is sprinkled over tl furnace bottom, and on heating, the incrustation is reduce to a fluid slag which is readily removed from the hearth.

In ordinary cupola practice silicon carbide has not be used to any considerable extent, and in general found practice it has not replaced high silicon iron, although as means of reducing iron oxides in burnt iron and scrap, is much the more effective.—A. S.

Firebricks: Properties of ——, and their behaviour Zinc Furnaces. O. Mühlhauser. Zeits. angew. Che **16**, [14], 321—323.

Firebricks were made from the clay of St. Louis (M souri), in wooden moulds of appropriate shape for zi furnaces. The carefully dried bricks were fired at a te perature just below that required to melt completely Seg cone No. 8. The brick had a porosity of 25·5 per cent. measured by the water it absorbed), and 51 c.c. weigl 100 grms. Its analysis is given below. These bri answered admirably for use in zinc furnaces, not o because of their infusibility and their toughness, but a because they shrink only very slightly after long-contin heating. This last quality is of importance, for shrink alters the dimensions of the furnace and its flues so seriously to affect the working efficiency. For this reas bricks for use in zinc furnaces should be burnt at hig temperatures than are ever reached in the furnace.

The author determined the temperature in a zinc furn 10 cm. from the back of the furnace and near the m wall, every two hours, by means of the Le Chate pyrometer, and found that it varied with the time betw the limits of 900° and 1300° C., being during the grea part of the day (say 14 out of the 24 hours) betw 1200° and 1300° C. These daily variations, with accompanying expansion and contraction of the bri are repeated during the whole life of the furnace. sample of the flue dust, to the action of which the por bricks heated to these high temperatures are exposed, analysed with the results given below. Probably some the metallic oxides, especially the alkalis, come into con with the bricks in the gaseous form. The analysis of of these bricks, taken from the furnace after 75 mon work, is also given below. The brick was completely gla to a depth of about 10 mm. on the side exposed to gases of the furnace, the glaze being in two layers, outer dark brown, the inner greyish white. The rest the brick was sintered throughout, had a wax-like lu and showed under the microscope a number of caviti no doubt the pores in the original brick, enlarged shrinkage of the solid substance, some of them still c municating, others completely closed. The porosity this part of the brick was 15·5 per cent.; 45·3 c.c. we 100 grms.

—	Original Brick.	Brick after 75 months' use.		Flue
		Unglazed Part.	Glazed Part.	
Al_2O_3	39·26	39·49	34·50	2
SiO_2	56·03	55·93	54·31	9·
Fe_2O_3	3·09	2·02	2·22	1
ZnO	..	1·07	0·89	12
CaO	0·78	0·97	0·79	0·
MgO	0·51	0·39	0·35	0·
K_2O	0·07	0·08	2·92	0·
Na_2O	0·19	0·05	1·76	0·
S	..	..	..	S
	99·93	100·01	99·84	

It thus appears that the brick has changed hardly at all save on the outside, where directly exposed to the gases and dust. The glaze there formed is viscous the

perature of the furnace, and does not diffuse into the k. If occasionally the temperature rises so that the k becomes fluid outside, this portion drips down; so t the bricks gradually become thinner, without being rnally altered. The brick had, however, shrunk (the ume occupied by 100 grms. decreasing from 51 c.c. to 43 c.c.), and no doubt would have been improved in this pect had it been burnt at a much higher temperature, 100° above the maximum temperature of the furnace.
—J. T. D.

Sulphur; Determination of ——, in Pig Iron. C. A. Seyler. XXIII., page 573.

nganese in Steel; Modification of the Schneider lethod of Determining ——. E. Jaboulay. XXIII., age 574.

old and Silver in Cyanide Solutions; Determination of ——. A. Arents. XXIII., page 573.

anide Solutions; Assay of ——. A. Chiddey. XXIII., page 573.

English Patents.

n or Steel, Treatment of ——. W. Joukoffsky and . de Strouvé, St. Petersburg. Eng. Pat. 6727, larch 19, 1903.

: Fr. Pat. 320,105 of 1902; this Journal, 1903, 97.
—J. H. C.

el; Treatment ["Stiffening"] of ——. R. A. Hadfield, Sheffield. Eng. Pat. 7778, April 2, 1902.

"stiffen" steel (*i.e.*, increase its resistance to comssion) it is heated, whether in the cast or forged form, ctly, or after annealing, to a temperature between about ° C. and 1100° C., the stiffening temperature being her, the lower the percentage of carbon. The steel is n allowed to cool in the air. The annealing is preferably ried out by the process described in Eng. Pat. 16,131 of 1; this Journal, 1902, 1280. Reference is also made Eng. Pat. 27,753 of 1897; this Journal, 1899, 49. The fening of steel for armour-piercing projectiles in the nner described, is specially claimed.—E. S.

st-Iron; Tempering and Hardening ——. W. Gilmour nd A. Lindsay, Montreal, C. A. Myers and H. H. Bradfield, Morrisburg, Canada. Eng. Pat. 28,396, Dec. 23, 1902.

E objects, heated to a cherry red, are dipped in a solu consisting of sulphuric acid, to which has been added lgar, arsenious acid or other compound of arsenic, and n cooled in water.—J. H. C.

st Furnaces; Impts. in ——. P. Meehan, Lowellville, U.S.A. Eng. Pat. 14,017, June 20, 1902.

E escape-pipe rises vertically to a considerable disce above the top of the furnace, and then leads downds, the bend being enlarged to form an expansion mber, within which a transverse baffle plate is arranged. ipe passes from the bottom of the expansion chamber k to the furnace. By these means the fine ore, fuel, &c. ried up by the blast are deposited and fall back into the nace. Steam or air-pipes may be provided in the ansion chamber to direct the dust-laden gases against baffle, and sprays may be arranged in the return-pipe moistening the dust. The explosion valve is fitted to upper part of the down-comer.—H. B.

rnaces; Reverberatory ——, or Ore Hearths. O. Thiel, iserslautern, Germany. Eng. Pat. 6486, Mar. 17, 1902.

E invention refers to stationary open hearth or reverberry furnaces, and its object is to enable any quantities the fluid contents of the furnace to be discharged. This is attained by providing several tapping holes at erent heights from the bottom of the hearth in blocks parts of the back wall or front of the furnace, which is ken through or pierced at a level at which certain ntities of the fluid contents of the furnace can be drawn off, and is provided with a recess or enlargement extending outwards, and containing the tapping openings. A furnace of this description possesses the advantage over a tilting furnace of not requiring the gas firing to be cut off while the charge is being tapped, enabling also a larger output to be obtained, and providing for the continuous escape of the slag.—H. F. C. G.

Furnaces; Reduction ——. H. E. Vosburgh, Auburn, N.Y. Eng. Pat. 24,366, Nov. 6, 1902.

See U.S. Pat. 712,161, 1902; this Journal, 1902, 1538.
—H. F. C. G.

Stereotype Metal; Manufacture of ——. G. A. W. Stavenow, Altona. Eng. Pat. 1019, Jan. 15, 1903.

An intimate mixture of metals, &c. in the proportions given below is melted in a crucible covered with a graphite lid. Copper, 45·45 parts; nickel, 11·36; manganese, 4·54; cast iron, 4·54; calcium phosphate, 3·77; graphite, 5·35; tin, 22·72 parts. When melted, 2·27 parts of bismuth wrapped in paper are added, and the molten mass is further heated for 20 minutes, stirred, and run into bars. Subsequently 20 parts of this "bronze" are melted with 100 parts of tin, and the mass is raised to a white heat, when 5 parts of bismuth wrapped in paper, 225 parts of antimony, and 150 parts of lead are added; the whole is cooled to a red heat and run into bars. Of this metallic basis, 40 parts are melted with 140 parts of antimony, 818 parts of lead, and 2 parts of tin.—J. H. C.

United States Patents.

Steel; Manufacture of ——. H. G. C. Thofehrn, Paris. U.S. Pat. 723,501, March 24, 1903.

A mixture of air, steam, lime, and hydrocarbon is blown on to the surface of a cast-iron bath in a hearth furnace by means of blast-pipes arranged around the furnace.—J. H. C.

Steel; Process of Rephosphorising ——. J. Stevenson, junr., Sharon, Pa. U.S. Pats. 724,140-1, March 31, 1903.

To "rephosphorise" iron or steel, an alloy is added to it containing iron, manganese, and phosphorus. Basic steel is rephosphorised and recarburised by tapping it from an open hearth furnace, and adding an alloy of iron containing high proportions of phosphorus, carbon, and manganese. Iron combined with large proportions of phosphorus and manganese is claimed as a new metallurgical product.
—E. S.

[Iron] Alloys; Method of Making ——. J. Stevenson, jun., Sharon, Pa. U.S. Pat. 724,142, March 31, 1903.

To produce an alloy of iron containing large proportions of phosphorus and manganese, two materials, one rich in manganese and the other in phosphorus (one of the two containing iron) are smelted together. Another process consists in smelting iron, or an iron ore, containing much manganese, with a phosphoretic flux. See also the preceding abstract, and U.S. Pat. 714,618, Nov. 25, 1902; this Journal, 1903, 32.—E. S.

Steel; Art of Making ——. F. E. Young, Canton, Ohio. U.S. Pat. 724,770, April 7, 1903.

A bath of molten iron, to which may be added scrap, iron-oxide, and, when necessary, fluxes, is treated with a blast which can be made oxidizing, carbonising, or neutral at will. The direction of the blast may be varied, accelerated, or retarded as desired. The metal may be simultaneously skimmed, puddled, and so converted into malleable iron or steel.—J. H. C.

Furnace; Metallurgical and Chemical ——. C. A. Doremus, New York. U.S. Pat. 723,251, March 24, 1903.

The furnace consists of a rotating hearth provided with a stationary dome, means for sealing the joint between the two, and also an inlet and outlets for discharging the finished product and gases formed. The burners are arranged in the furnace radially to the axis of rotation, and extend over the hearth so as to project the flames upon the same. The flames may be rendered oxidizing or reducing at will.—W. P. S.

Ore-Roasting Furnace. G. B. Rendall, New York. U.S. Pat. 724,912, April 7, 1903.

A ROASTING furnace is described, having a hopper which delivers ore to the uppermost of three superimposed horizontal retorts, provided with rotating conveyors and communicating with each other at alternately opposite ends, so that the ore is caused to take a zig-zag course. A pipe leads downwards from the uppermost retort near its mid-length, and a steam blast-pipe discharges directly downward into the vertical part of the pipe.—H. B.

Ores; Concentration of ——. H. F. Campbell, Melrose, Mass. U.S. Pat. 723,362, March 24, 1903.

THE ores are heated to redness, whereby certain constituents are rendered paramagnetic. They are then made to pass through a magnetic field of a strength inversely proportional to the degree of exposure to heat.—J. H. C.

Ores; Concentration of ——. H. F. Campbell, Melrose, Mass. U.S. Pat. 723,363, March 24, 1903.

THE ores are moderately heated for a brief time, whereby certain constituents are rendered magnetic and may be removed, leaving other constituents, which, after further exposure to heat, may be similarly removed.—J. H. C.

Precious Metals; Apparatus for the Extraction of ——. J. B. De Alzugaray and W. A. Mercer, Assignors to the Baxeres Gold Extraction Co., Ltd., all of London, England. U.S. Pat. 724,076, March 31, 1903.

THE apparatus consists of a lead-lined vessel, capable of being closed hermetically, to contain a "liquid chemical," the vessel being provided with a vertically adjustable air-inlet pipe with mechanism "for regulating the impregnation of the air with the chemical," and having a gauge-glass and an outlet pipe with an inspection glass. See also U.S. Pat. 701,002, May 27, 1902; and Eng. Pat. 15,541, July 31, 1901; this Journal, 1902, 863 and 1140.—E. S.

Copper and Nickel; Treatment of Ores of ——. H. G. C. Thofehrn, Paris, France, and C. de Saint Seine, Widnes, England. U. S. Pat. 723,500, March 24, 1903.

SUPERHEATED steam, air, and powdered silica, and if necessary lime, are blown on to the surface of the bath of copper ore or matte in a reverberatory furnace. (See also Eng. Pat. 10,101 of 1901; this Journal, 1902, 862, and foregoing U.S. Pat. 723,501.)—J. H. C.

Copper: Separating ——. *from Ores.* G. D. van Arsdale, New York. U.S. Pat. 723,949, March 31, 1903.

SOLUTIONS containing cupric sulphate, with or without "ferrous or other suitable sulphate," are saturated with sulphur dioxide, and heated, with or without pressure, in an atmosphere free from oxygen, whereby copper or copper compounds are precipitated, which are reserved for subsequent treatment. The acid liquor, now containing free sulphuric acid, is used in the treatment of copper ores, whereby copper is dissolved and the original liquor regenerated, the process being thus continuous.—E. S.

Copper-Leaching Process ——. G. R. Waterbury, Denver, Colo., Assignor to N. W. Blethen, A. E. van Deusen, C. P. Schumaker, C. F. Davies, and G. D. Nickel. U.S. Pat. 724,114, March 31, 1903.

THE pulverised ore is leached in a tank by the action of water, acid, common salt, and manganese dioxide, assisted by the introduction of steam, and the pulp is agitated until the copper is dissolved. See also this Journal, 1902, 351. —G. W. McD.

Zinc; Treatment of Complex Ores of ——. W. C Wetherill, Canon City, Colo., Assignor to the Empir Zinc Co., Denver. U.S. Pat. 724,637, April 7, 1903.

A PROPORTION of iron, sufficient to render any preciou metals present susceptible to magnetic separation, is adde to the complex ore; after mixing an excess of carbon, th zinc is distilled off in closed retorts, thereby leaving carbonaceous residue containing iron in intimate associa tion with the precious metals, which, after crushing, can b separated by magnetic methods.—J. H. C.

Alloys. W. C. Tilden, Washington, Assignor to J. Lovet Martinsburg, W. Va. U.S. Pat. 724,521, April 7, 1903.

To produce a metallic alloy from a group of metals, one them, other than the most refractory, is fused to form metallic bath; subsequently the remaining metals are adde one by one in the inverse order of their fusibility, the ba being cooled down before each addition and finally rapidl cooled to solidification.—J. H. C.

Silver: Composition for coating Metal with —— E. D. Kendal, New York. U.S. Pat. 724,108, March 3 1903.

THE composition consists of a salt of silver, a suitab thiosulphate and silicious powder.—G. H. R.

Metal; Process of Coating with ——. C. E. Munr Washington, D.C., Assignor to Kuhn Formaldehy Generator Co., Virginia. U.S. Pat. 724,317, March 3 1903.

THE metallic or other substance to be coated is fi immersed in a solution of a compound of the coat metal, and then in a solution "of a compound adapted react upon the compound of the metal to form a crysta line compound," the body thus coated being then heat Abestos is coated with finely-divided platinum by successi immersions in solutions of platinic chloride and of ammoni chloride, both of which solutions may be alcoholic. T asbestos is subsequently heated.—E. S.

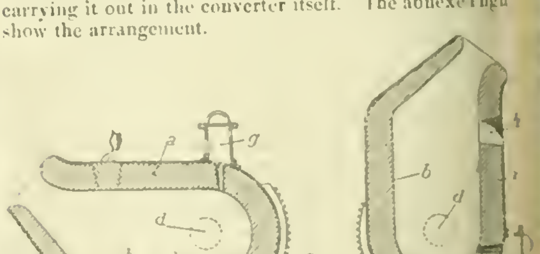
Solder (for Aluminium). E. C. Rice and H. F. Mor Cripple Creek, Col. U.S. Pat. 724,503, April 7, 1903.

MERCUROUS chloride, 19 parts; magnesium chlori 15 parts; zinc, 12 parts; and cadmium, $9\frac{1}{2}$ parts, are fu with tin.—J. H. C.

FRENCH PATENTS.

Steel; Manufacture of ——. Société des Aciers Homogènes. Fr. Pat. 324,256, Aug. 9, 1902.

THE object of the invention is to abolish the prelimi melting of pig in the cupola for the Bessemer process. carrying it out in the converter itself. The annexed figu show the arrangement.



The metal is introduced when the specially shaped verter is in the left hand position, and is melted by heating apparatus, which consists of a fireclay block duced at h, and containing three or more fireclay bur of special construction, supplied with petroleum vap steam, and air under pressure. When the metal is me the converter is rotated into the right-hand position, t blowing is carried out as usual. In certain cases, t nks to the high temperature and oxidising character of t heating flame, blowing may be unnecessary, the conv sion into steel occurring during the melting.—J. T D.

Steel and Iron : Manufacture of ——. B. Talbot and P. Gredt. Fr. Pat. 324,448, Sept. 15, 1902.

I the Bessemer process, acid or basic, the converter is not e ptied after each charge, but part of the steel, and the s (which is capable of taking up more oxide of iron) are l in the vessel. The next charge of pig is now added, w n the contained metalloids react on the slag ; the o ration is now finished by blowing, the duration of which i horter than if the whole operation were conducted by t means. In dealing with metal containing phosphorus, p of the slag is poured off, quicklime is added, and the b ving continued till the end of the operation. Before a ng each charge of melted pig, it is advantageous to add o e of iron to the slag.—J. T. D.

Iron ; Manufacture of ——, *by charging in separate olumns the Fuel and the Mixture of Ore and Flux.* . Servais. Fr. Pat. 324,591, Sept. 18, 1902.

T ore and flux are charged into a columnar furnace, w h need not be so high as an ordinary blast furnace, w e the fuel is charged into a neighbouring much shorter mn, these two columns communicating at their lower e , where they open into the crucible for the reception of t molten metal. The fuel is charged through a chamber p ided with upper and lower doors, cooled by water-ci lation, and air is supplied near the bottom of the fuel t r, either by natural draught or by blast. The tempera-t and the reducing nature of the fuel gases appropriate to t articular operation can be attained by regulating the d nsions of the fuel tower, the nature of the fuel, and t ressure of the blast. The ore, instead of descending a v cal tower by its own weight, may be fed mechanically a a horizontal tunnel. (See also Eng. Pat. 20,930 of l ; this Journal, 1903, 301.)—J. T. D.

S el ; Fusion of ——. Société Zueker and Levett and Loeb Co. Fr. Pat. 324,355, Sept. 11, 1902.

S U.S. Pat. 709,218 of 1902 ; this Journal, 1902, 1281.
—J. T. D.

M ls and Alloys ; Production of ——, *from Metallic ides.* [*Fusion with Aluminium.*] F. C. Weber. . Pat. 324,534, July 26, 1902.

S .S. Pat. 705,727 of 1902 ; this Journal, 1902, 1142.
—J. T. D.

O ; Apparatus for Roasting ——, *and for Condensation Volatile Products.* Metallic Compounds Separation ndicate, Ltd. Fr. Pat. 324,647, Sept. 22, 1902.

A NGE of furnaces all communicates with a set of ontal flues, the whole being built in one block of ry. Each furnace is charged through a hopper, cl l by an elliptical cone, and provided with a lifting ap atus arranged so that the cone can, when necessary, be ted with its major axis vertical, and be lifted com-e y out of the hopper. The fume travels in opposite ions along the successive flues vertically below one and er, then along these vertically above one another in he joining tier, and so on. The communicating chamber at each end of the flues are closed by hinged doors ro led on the inside with a packing of asbestos or similar b nce to make a tight joint ; and valves are, if necesar nserted between the furnaces and the flues, or between uc sive flues, to insure the right direction of the current.
—J. T. D.

Aluminium ; Solder for ——. F. F. Millet. Fr. Pat. 324,585, Sept. 18, 1902.

A RD solder, resisting temperatures such as that required r ercurial gilding, and a soft solder, melting at about 0 C., are given. For the hard solder, 2 alloys are re ed, A, by melting together 20 parts of aluminium, 3 silver, 6 of copper ; B, by melting together 10 parts f minium and 30 of cadmium ; then 39 parts of A are melted with 40 parts of B, and to the alloy are added 15 parts of cadmium, 3 of zinc, and 3 of tin. The fusion of B, and of A and B together, must be effected at a temperature not above a dull red heat. The proportions of the metals, especially that of zinc, may be varied according to the melting-point desired. The soft solder is made by melting zinc and adding an equal weight of cadmium ; to raise the melting-point of this there may be added a copper-aluminium (50:50) alloy in proportions up to 5 per cent. of the total solder. Both of these solders can be applied directly.—J. T. D.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Aluminium Anodes : Theory of ——. W. W. Taylor and J. K. H. Inglis. Philos. Mag., **5**, [6], 301—313. Chem. Centr., 1903, **1**, [13], 751.

The authors have investigated the two analogous phenomena that aluminium is only attacked with difficulty by sulphuric acid (as compared with hydrochloric acid, &c.) and that when used as anode in sulphuric acid or a sulphate solution, it offers great resistance to the passage of the current, owing to the formation on it of a film of aluminium hydroxide. To a molar (gram molecular-) solution of sulphuric acid in which a platinum spiral served as cathode, and an aluminium plate (renewed for each experiment) as anode, and which only showed a very weak current when connected with a 12-volt battery, small known quantities of solutions of potassium chloride, potassium bromide, potassium nitrate, potassium thiocyanate, potassium chlorate, and potassium acetate were added, whereupon a more or less strong increase in the current strength was observed. The authors conclude that the film of aluminium hydroxide formed can be penetrated by certain ions ($H^{\cdot}$, Cl', Br', &c.), but not by others (especially SO_4'', OH', $Al^{\cdot\cdot\cdot}$). Diffusion experiments with an artificially-produced film of aluminium hydroxide confirmed this view. Potassium chloride, bromide, nitrate, chlorate, and thiocyanate diffused rapidly through such a film, potassium acetate more slowly, and potassium sulphate only with difficulty.

If to a solution of sulphuric acid which, at 85° C., only acts slowly on aluminium, potassium chloride be added, the velocity of solution of the aluminium increases considerably ; potassium nitrate has a similar effect, but potassium bromide, contrary to what might be expected, has no appreciable influence.—A. S.

Electrolysis with Soluble Anodes : Formation of Precipitates [*White Lead*], *Soluble with Difficulty by* ——, *and the Cause of Unipolar Conductivity.* A. Iseuburg. Zeits. f. Elektrochem., 1903, **9**, [15], 275—283.

Continuing the work done by Le Blanc and Bindschedler (this Journal, 1902, 776) on the formation of chrome yellow, the author gives corresponding details of experiments in which lead carbonate was produced, as in Luckow's process (this Journal, 1895, 975), by subjecting a lead anode to electrolysis in an electrolyte containing various proportions of sodium chlorate and sodium carbonate, carbon dioxide being, at the same time, passed through the electrolyte. The conclusions arrived at are summarised as follows :—

1. The explanation given by Le Blanc and Bindschedler of the production of certain inorganic compounds by the Luckow process is confirmed.

2. Of the different arrangements for yielding so-called unipolar currents, the choking-cell or electrolytic valve in which an aluminium anode is employed, is the only one in which a considerable condensing action could be detected.

3. A pure white lead can be obtained only when the concentration of the carbon dioxide in the electrolyte is maintained within certain fixed limits.

4. The numbers given in German Patent 109,971, which are at variance with the law of the independence of the individual changes of potential in a cell, are proved to be erroneous.—J. S.

Lead [Lead Secondary Batteries]; The Cathodic Deposition of ——. K. Elbs and F. W. Rixon. Zeits. f. Elektrochem., 1903, 9, [11], 267—268.

When solutions of lead salts are submitted to electrolysis, the lead deposited on the cathode may either assume a bright crystalline leafy structure or it may appear in the form of spongy micro-crystalline dull needles. The authors have found that the second or spongy modification is produced only when the electrolyte contains a plumbic salt. In the case of lead secondary batteries lead disulphate is present in the electrolyte. Towards the end of the charging process, the average amount of lead disulphate in the acid was found to be 0·14 grm. per litre; while during discharge and in the stationary condition, the respective amounts were 0·07 and 0·17 grm. per litre.—J. S.

Electric Furnaces: The Efficiency of ——. J. W. Richards. Trans. Amer. Electro-Chem. Soc., 1902, 2, 51.

The proportion of the heat energy of the electric current usefully employed is the efficiency of the furnace. A portion may be employed in simply raising the temperature of the charge, and a portion also in the chemical or physical change. Since the capacity of a furnace is proportional to the cube, and its radiating surface proportional to the square, of its linear dimensions, the loss of heat due to radiation decreases as the linear dimensions increase; by increasing the size of a furnace, the efficiency may be raised very greatly on account of this fact alone. The manufacture of carborundum, an example of heating and chemical change without fusion, shows a calculated efficiency of 76·5 per cent., whilst the process of manufacturing calcium carbide, heating with fusion and chemical reaction, shows an efficiency of 63 per cent.—J. W. R.

Potassium Chlorate; Electrolytic Process of Manufacturing ——. Terrisse. VII., page 553.

United States Patents.

Storage Battery. E. A. Sperry, Assignor to National Battery Co., Cleveland and Jersey City. U.S. Pat. 723,327, March 24, 1903.

Electrodes for storage batteries are prepared by "moistening finely-divided metallic lead with a dilute solution of ammonium hydroxide and a neutral liquid, and drying the mass."

Another claim covers the use of ammonium sulphate in conjunction with finely-divided lead in this process. —T. F. B.

Storage Battery. E. A. Sperry, Assignor to National Battery Co., Cleveland and Jersey City. U.S. Pat. 723,328, March 24, 1903.

A composition for storage battery elements is prepared by mixing some active material, such as finely-divided lead, with an alkali salt, a catalytic agent, and a menstruum, and drying the mass.

Ammonium sulphate is also claimed as an "alkali-metal salt," and alizarin is claimed as a catalytic agent.—T. F. B.

Storage Batteries; Manufacture of Envelopes for ——. E. A. Sperry, Assignor to National Battery Co., Cleveland and Jersey City. U.S. Pat. 723,329, March 24, 1903.

Vegetable fibre is prepared to form a fabric for envelopes for storage batteries by first removing oleaginous and soluble starchy matter from the fibre, drying, and nitrating in such a manner as to nitrate the carbohydrates, leaving the starchy carbohydrates, unacted on.

The nitration is performed with a mixture of 113·5 parts of nitric acid (sp. gr. 1·42) and 150 parts of sulphuric acid (sp. gr. 1·84) at a maximum temperature of 78° F.

After nitration, the fabric is washed, and treated "with a weak solution of nitrobenzol."—T. F. B.

Electric Accumulator Plates; Process of Making —— J. J. H. Hunte, Charlton, Assignor to the Accumulat Industries, Ltd., Woking. U.S. Pat. 724,012, March 3 1903.

Positive-pole plates for accumulators are made follows:—

Lead-plates are subjected to the action of oxygen a chlorine by passing a current through the plates arrang as anodes in an electrolyte consisting of a solution of alkali sulphate, a metallic chloride, and a permanganate a substance or substances which will cause the format of a metallic permanganate at the anodes, so that compound of lead with oxygen and chlorine is produc The plates covered with this compound are subjected further electrolytic action, to remove all the chlori leaving a lead core covered with a porous mixture reduced lead and the lower oxides of lead. These plat are arranged as anodes in an electrolyte.—T. F. B.

Insulating Bodies; Method of Producing Electric — H. Biehn, Assignor to Pyrisolith Isolating Mater Manufacturing Co., both of Budapest. U.S. Pat. 724,0 March 31, 1903.

See Eng. Pat. 10,083 of 1902; this Journal, 1902, 1282. —G. H. R

Electric Accumulator. A. Schmidt-Predari, Wein Germany. U.S. Pat., 724,619, April 7, 1903.

The negative lead plate is coated with a mixture of l oxide, red lead, calcium hydroxide, alkali thiosulphate a suitable binder, and the positive plate is covered wit paste of lead oxide, red lead and porous spongy l suitably bound together. The electrolyte consists o mixture of sulphuric acid and alkali thiosulphate, in wh the plates are immersed after formation.—G. H. R.

Furnace; Electric ——. C. S. Bradley, New York, N U.S. Pat. 723,643, March 24, 1903.

The furnace consists of a rotating wheel or annulus receive the material under treatment, supported in a fr and revolved by gearing, and is composed of a hub por and the annulus, the sides and bottom of which are buil of section plates faced with a suitable lining mat secured thereon. The annulus is closed by lined c plates and suitable means are provided for passing electric current through the charge.—H. F. C. G.

Insulating Material [Ebonitine]; Process of Man turing ——. V. De Karavodine, Paris. U.S. 724,882, April 7, 1903.

See Fr. Pat. 319,264; this Journal, 1902, 1539.—M. J

French Patents.

Roentgen Ray Tubes; Use of Chromium and Platu Chromium as Infusible Electrodes in ——. T. Gu Fr. Pat. 323,840, Aug. 23, 1902.

Discs of chromium (about 2 cm. in diameter by 5 mm. th or chromium coated with a film of platinum or metal are used as substitutes for the platinum anod Roentgen ray tubes; these being infusible, allow protracted use of powerful currents, giving thus gr intensity to the resulting X rays.—T. F. B.

Injurious Gases Produced by Electrical Discha Absorption of ——. Société Gebr. Siemens and Fr. Pat. 324,052, July 21, 1902.

Oxides of nitrogen, formed by arc lights and ot electrical discharges, may be absorbed by placing substances as potassium hydroxide, ammonium carb and the like in the globe of the lamp.—W. P. S.

Eliminating Combustible Gaseous Impurities from [Electrolytic Oxygen]; Process and Apparatus for — M. Hazard-Flamand. Fr. Pat. 324,21, Sept. 8, 19.

In order to eliminate the hydrogen existing as an im in electrolytic oxygen, or to remove other comb g es in analogous cases, the gas is passed through a tube c aining a platinum spiral which is heated electrically ji to dull redness. In this way the impurities are burned, a they are then removed, as, for instance, by condensa- ti of the water produced.—H. B.

(*B.*)—ELECTRO-METALLURGY.

I assium: Electrolytic Preparation of ——, from Molten 'austic Potash. R. Lorenz and W. Clark. Zeits. f. lektrochem., 1903, **9**, [14], 269—271.

A hough more difficult to prepare than sodium from n ed caustic soda, potassium can be made by electrolysing fu d potash under suitable conditions. A sheet iron anode 5 u. in width was introduced to a depth of 10 cm. into a b of fused potash. The cathode consisted of an iron rod 3 m. in diameter, and was surrounded by a magnesite c ecting chamber. This was made by drilling a 3 mm. h in the bottom of a cylindrical magnesite vessel, 10 cm. h eight and 2·5 cm. internal diameter, the walls of which w e 5 mm. in thickness. The iron rod was then passed t ugh the hole and the vessel introduced mouth down- w ls into the fused bath. During the first few minutes a es of explosions occurs in the collecting chamber owing t he presence of imprisoned air, but afterwards the elec- t ysis proceeds quietly. On passing a current of 13·4 a eres with an E.M.F. of about 15 volts for 71 minutes, 1 5 grms. of pure potassium were obtained. This corre- s ds to a current efficiency of 58 per cent.

he authors disagree with the views put forward by Le nc and Brode (this Journal, 1902, 1401) to explain the c culty in obtaining potassium by electrolysis, and point that the difficulty is really due to the greater vapour ssure of potassium, which causes a metallic cloud of assium to be produced at the cathode. This cloud er dissolves in the fused bath or diffuses to the anode n it is then oxidised. The collecting chamber is used revent the diffusion of the cloud to the anode, and it is nore importance to surround the cathode in this way t to leave it bare and surround the anode. The gnesite employed answered the purpose well, and was rcely attacked by the alkali metal.—J. S.

tallic Powders and Compounds; Electrolytic Method or the Preparation of ——. Elektrol. Anz., 1903, **20**, 43; Zeits. f. Elektrochem., 1903, **9**, [14], 273.

e corresponding amalgams are first prepared by electro- s, and the mercury subsequently removed by distillation i reducing atmosphere. Powders prepared in this way very active chemically, iron powder made from iron lgam, being, *e.g.*, pyrophoric. In an oxidising osphere, several hitherto unknown oxides are said to be ined.—J. S.

tals: Advantages in the Etching of ——, by the Electric Current. A. H. Sirks. Vers. k. Akad. van Vetens, 1902—1903, 217—223; through Zeits. f. lektrochem., 1903, **9**, [15], 285.

ording to the author metals are preferably etched by sing them to act as anodes during electrolysis. In this definite alloys can be isolated which remain as anode e.—J. S.

English Patent.

; Improved Process for Stripping ——, from Tinned ron, Recovering the Respective Metals, and Obtaining Nitric Acid as a By-Product. H. W. Hemingway, Valthamstow. Eng. Pat. 8759, April 15, 1902.

nned iron scrap is immersed in slightly acidified solution ferric sulphate, and the tin solution obtained is treated trolytically, an iron anode and a copper cathode ng preferably used. To the exhausted ferrous liquor, ium or potassium nitrate and sulphuric acid are added, en the liquor can be used as before. When it is desired ecover the nitrogen oxides evolved, the solution containing alkali nitrate and sulphuric acid, is heated to about ° F., and the spent ferrous liquor (from the electrolytic h) is slowly added, the nitrous gases being collected and dised into nitric acid. In some cases, the scrap may be added direct to the sodium nitrate solution with sulphuric acid, with recovery of the nitrous gases, the dissolved tin being then electrolytically obtained. Reference is made to Eng. Pat. 8133, May 2, 1900; this Journal, 1901, 368.
—E. S.

United States Patent.

Electrolytic Deposition: Composition of Matter for ——. E. D. Kendall, New York. U.S. Pat. 724,107, March 31, 1903.

The composition for preparing an electrolyte to be used for the electro-deposition of gold consists of a suitable aurate and a ferrocyanide, for example, potassium aurate with a small excess of alkali-metal hydroxide, and a large excess of potassium ferrocyanide.—G. H. R.

XII.—FATS, FATTY OILS, & SOAP.

Fatty Oils; Colour Reactions of ——. H. Kreis. XXIII., page 575.

Glycerol; Determination of ——, in Crude Glycerins. J. Lewkowitsch. XXIII., page 576.

English Patents.

Toilet Soap Tablets; Method of Perfuming ——, by "Absorption." G. F. Pierce and F. W. Warwick, London. Eng. Pat. 8828, April 16, 1902.

A piece of highly-scented material, such as an amulet, is placed in the centre of the tablet.—C. A. M.

Soap: [Hygienic] Manufacture of ——. M. Zadig, Malmö, Sweden. Eng. Pat. 27,889, Dec. 17, 1902.

Claim is made for the addition to the soap of, say, 8 to 12 per cent. of Swedish wood-tar alone or in conjunction with carbolic acid (0·1 to 0·4 per cent.)—C. A. M.

United States Patents.

Fats; Method of Purifying ——. C. Fresenius, Offenbach o/M., Germany. U.S. Pat. 722,832, March 17, 1903.

See Eng. Pat. 19,171 of 1902; this Journal, 1903, 102.
—C. A. M.

Separating Naphtha from Oil; Apparatus for ——. E. R. Edson, Cleveland, Ohio. U.S. Pat. 723,849, March 31, 1903.

A closed tank, having a vapour outlet at the top and containing two longitudinal series of hollow plates. The plates of each series are placed one above the other and slope gently downwards, so that a section of the tank would show two opposed zig-zag systems. A heating fluid is admitted into the hollow plates. The oil to be treated is delivered on to the upper side of the two top plates, flows down on to the upper side of the next two plates below, and so on, to the outlet at the bottom of the tank.—H. B.

Oils; Process of Solidifying and Toughening ——. J. B. Scammell and E. A. Muskett, London. U.S. Pat. 724,618, April 7, 1903.

See Eng. Pat. 21,229 of Oct. 23, 1901; this Journal, 1902, 1461.—C. A. M.

French Patents

Fish Waste or other Material: Apparatus for Extracting Oil from ——. E. R. Edson. Fr. Pat. 323,995, Aug. 26, 1902.

See U.S. Pat. 707,565 of Aug. 26, 1902; this Journal, 1902, 1238.—C. A. M.

Fish Waste, Garbage, &c.: Process and Apparatus for Extracting Oil from ——. E. R. Edson. Fr. Pat. 323,996, Aug. 26, 1902.

See U.S. Pat. 707,566—7 of Aug. 26, 1902; this Journal, 1902, 1238.—C. A. M.

Fats of Animal and Vegetable Origin: Treatment of ——. H. Bouvier. Fr. Pat. 324,058, Aug. 5, 1902.

A PROCESS of purifying fats, fatty acids, stearine, or waxes, first by treatment with neutral salts, *e.g.*, sodium chloride or nitrate to remove impurities; then with an oxidising agent, *e.g.*, nitric acid, a peroxide or a bichromate, to bleach the oil and effect further purification; and lastly, with a reducing agent to eliminate all traces of the oxidising agent.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Electrolysis with Soluble Anodes: Formation of Precipitates soluble with difficulty [*White Lead*] *by* ——, *and the Cause of Unipolar Conductivity.* A. Isenburg. XI. A., *page* 559.

English Patent.

Paint; Composition for Base of ——. W. W. Brasington. Marietta, Ohio, U.S.A. Eng. Pat. 1582, Jan. 22, 1903.

SEE U.S. Pat. 713,846 of Nov. 18, 1902; this Journal, 1902, 1541.—C. A. M.

United States Patents.

Pigment, and Process of making same. W. J. Armbruster, St. Louis, Mo., U.S.A. U.S. Pat. 724,234, March 31, 1903.

A MIXTURE of barium carbonate and zinc hydroxide obtained by mixing solutions of barium hydroxide, an alkali carbonate, and a salt (chloride) of zinc.—M. J. S.

Pigments: Process of making ——. W. J. Armbruster, St. Louis, Mo., U.S.A. U.S. Pat. 724,235, March 31, 1903.

THE process consists in adding an alkali hydroxide to a soluble zinc salt (sulphate), then a soluble barium salt (sulphide), and calcining the resulting precipitate. Compare U.S. Pats. 719,073 and 719,415; this Journal, 1903, 218 and 307.—M. J. S.

French Patent.

[*Lamp-Black.*] *Black Pigments; Manufacture of* ——. D. J. Ogilvy. Fr. Pat. 323,886, July 29, 1902.

SEE U.S. Pat. 706,001, 1902; this Journal, 1902, 1084.
—R. L. J.

(*B.*)—RESINS, VARNISHES.

Drying of Linseed Oil: Influence of Atmospheric Moisture &c., upon ——. W. Lippert. Zeits. angew. Chem., 1903, **16**, [16], 365.

THIS is a continuation, dealing with oils containing lead as the only drier, of the author's previous article (this Journal, 1900, 358); the samples investigated having been prepared by Lippert himself in 1897 (this Journal 1898, 675), and having been kept out of contact with air in well closed vessels all the time.

In general it may be said that lead oils are less affected than manganese oils by the hygrometric condition of the atmosphere; but, irrespective of the amount of lead in them, they have a tendency to dry, or to become superficially dry, better in dry air than in moist. Lead oils certainly do not dry better in damp air as Weger seems to believe (this Journal 1898, 360). It is interesting to notice that both lead oils and manganese oils frequently exhibit a diminution in drying power, more particularly when the proportion of either metal present is large. When a manganese oil behaves in this fashion, its drying properties may be restored by mixing it with a lead oil. This explains why mangano-lead oils are preferred in the arts, for, apparently, oils containing both siccative metals are free from the property referred to. The true cause of this peculiarity remains to be sought. Linseed oil heavily loaded with lead only tends to yield a leathery skin wh dry; a dried manganese oil is harder and more brittle.
—F. H. L.

English Patent.

Varnish-like Substance; An improved ——, *applicable a Vehicle for Colours or as a Coating Substance.* K Zachow, Berlin. Eng. Pat. 18,355, Aug 20, 1902.

FIFTY parts of petroleum are boiled with six parts of g until the scum is of a brownish tint; the liquid is filter and, whilst it is at a suitable temperature, 25 parts of ro are dissolved in it.—M. J. S.

Oil Compound for use as a Substitute for Linseed Oil the like. E. Pfestroff and J. E. Gillon, Frankfort a Germany. Eng. Pat. 18,393, Aug. 21, 1902.

A FATTY oil, such as poppy, sesamé or nut oil, is inc porated with petroleum, colophony, mastic, turpentine, camphor, with or without the addition of a metallic dr *e.g.*, manganese borate, or litharge. The use of benz benzol, and formalin as constituents is also claimed.
—C. A. M

United States Patent.

Varnish; Composition for removing ——. J. E. Mil Monroeton, Pa., U.S.A. U.S. Pat. 725,002, Apr 1903.

A MIXTURE of three parts of alcohol, two of amyl acet one of acetone, and one of butyric ether.—M. J. S.

French Patents.

Oil to replace Linseed Oil; Manufacture of ——. W. A. Smith. Fr. Pat. 323,776, Aug. 14, 1902.

SEE U.S. Pat. 708,178, of Sept. 2, 1902; this Journal, 1 1238.—C. A. M.

Varnish; Manufacture of ——. K. Zachow. Fr. Pat. 323,820, Aug. 19, 1902.

PETROLEUM and strong glue (10 per cent.) are h together and the fluid is filtered, and colophony (abou per cent.) is then added. (See foregoing Eng. Pat. 18
—R. L.

Linoleum with a Wood or Cloth-like Structure. L. W. Seeser. Fr. Pat. 323,836, Aug. 19, 1902.

IN order to obtain linoleum which has a wood or cloth structure throughout, the materials to be used are m into a homogeneous mass whilst warm, are then cooled laid upon a basal fabric, the surface of which inste being smooth, has projections, corrugations, and irregularities formed upon it. When the whole is pressed at an elevated temperature, these irregula produce a flow-like structure in the linoleum-mass.
—R. L.

(*C.*)—INDIA-RUBBER, &c.

Rubber Analysis; Use of Chloral Hydrate in —— C. O. Weber. XXIII., page 576.

English Patents.

Vulcanisation of Rubber; Impts. in or relating C. H. Gray, Silvertown. Eng. Pat. 2939, Feb. 7,

A HEATED or vulcanising drum is rotatably mounted frame and an adjustable pressure roll is made to bear a this drum. A travelling band supported by three surrounds a portion of the drum, and is made to against it by passing between the pressure-roll and drum. The latter is heated by steam or other means can be shaped and grooved to produce different des The rubber, prepared for vulcanisation, is fed on t travelling band, and carried by it between the drum an pressure-roll, being thus moulded and vulcanised s taneously. Modified forms of the apparatus provide fi a jacket so that both sides of the material may be h and secondly, arrangements to bring the material back over the drum.—J. K. B.

ioutchouc, Gutta-Percha, Gum Elastic, and similar Materials; Devulcanising ——. A. E. J. V. J. Theilgaard, Copenhagen. Addition, dated Sept. 8, 1902, to Fr. Pat. 287,928, April 17, 1899.

E Eng. Pat. 8041, April 17, 1899; this Journal, 1899, 4.

The treatment with sulphites is conducted at temperaes higher than 100° C. by means of increased pressure —10 atmospheres).—R. L. J.

IV.—TANNING; LEATHER, GLUE, SIZE.

nnic and Tinctorial Extracts; Manufacture of ——. A. E. Peyrusson, Limoges, France. Eng. Pat. 2456, Feb. 2, 1903. Under Internat. Conv., Feb. 8, 1902.

E Fr. Pat. 318,523, Feb. 8, 1902; this Journal, 1902, 62, and 1903, 219.—R. L. J.

English Patents.

eather, Artificial ——, and the like. H. H. Lake, London. From J. Christensen and N. V. Henckel, Copenhagen. Eng. Pat. 27,041, Dec. 8, 1902.

he mould, carved or otherwise treated, is lined with a eet of fabric, such as linen; layers of paper, coated on th sides with a hardening paste are built into or on to is, a final sheet of fabric is added, and the whole is pressed o the mould until the desired shape or modelling is tained. A suitable hardening paste has the following mposition: glue ($1\frac{1}{2}$—$4\frac{1}{2}$ parts) dissolved in water, raw ound potatoes (3—6 parts), rye flour (6—10 parts), all iled together. The dried structure is coated with a mixre of starch and glue, and then varnished, gilded, or herwise finished on the face-side.—R. L. J.

latin; Manufacture of ——. W. Cormack and J. G. Flowerden, both of Midlothian. Eng. Pat. 20,800, Sept. 24, 1902.

nely-divided pelt, refuse, or other gelatin-yielding marial, is placed in a modified hydro-extractor or centrifugal achine, and dissolved by means of condensing steam or t water, the solution being continuously discharged.
—R. L. J.

rtificial Horn and Similar Substances; Manufacture of ——. L. Lederer, Oberpfalz, Germany. Eng. Pat. 7088, March 22, 1902.

E Fr. Pat. 319,724, 1902; this Journal, 1902, 1550.
—T. F. B.

United States Patent.

lastic Albuminate and Albuminate-containing Material; Durable ——. A. V. H. F. C. Clauson-Kaas, Copenhagen. U.S. Pat. 724,810, April 7, 1903.

ydroxides of those metals which do not congulate albunous compounds, such as those of iron and aluminium, th or without glue, and a saccharate are mixed with the uminous materials. As an alternative a salt of such tal may be used, and the hydroxide liberated by suitable eans.—R. L. J.

French Patents.

latin and Glue; Extraction of ——, from Bones. H. Hilbert and the Bayerische. Actien-Gesellschaft f. Chem. u. Landwirths.-Chem. Fabrik. Fr. Pat. 324,432, Aug. 20, 1902.

E Eng. Pat. 18,042 of 1902; this Journal, 1902, 1405.
—R. L. J.

lastic Horny Substances [Cellulose Acetate]; Preparation of ——. L. Lederer. Addition, dated Aug. 22, 1902, to Fr. Pat. 319,724, March 18, 1902. (See this Journal, 1902, 1550.)

orny substances are prepared by dissolving cellulose etate in phenol, chloral hydrate, or similar substances, th or without addition of turpentine, camphor, &c., or etallic salts or oxides.

For instance, 25 parts of acetone are added to a solution of one part of cellulose acetate in four parts of phenol, and the mixture spread on a glass plate and allowed to evaporate.
—T. F. B.

XV.—MANURES, Etc.

Nitroso-bacterium; Culture of the ——. H. S. Fremlin. Proc. Roy. Soc., 1903, **71**, [473], 356.

Cultures of the nitroso-bacterium were obtained by inoculating Winogradsky's ammonia solution (water containing one per 1,000 of ammonium sulphate, one per 1,000 of potassium phosphate, and one per 100 of magnesium carbonate), with small quantities (0·2 grm. or less) of various kinds of soil. The solutions were kept in the dark at ordinary temperatures. The growth took about three weeks to commence, and was complete in another week or two.

The growth was indicated by the conversion of the ammonia into nitrous acid, which was judged by a solution of diphenylamine in sulphuric acid. The nitroso-bacterium was also able to grow in a solution containing only ammonium sulphate and potassium phosphate. The bacterium produced nitrate, but could not develop sub-cultures.

Experiments with the bacterium in presence of peptone, beef broth, and urea, indicated the ability to grow in presence of organic substances, contrary to Winogradsky's statement. The bacterium was isolated from a variety of media by plate cultures, and sub-cultures therefrom were generally able to convert ammonia into nitrous acid. Hence the author infers that there is only one species of the bacterium, and not two morphologically similar, one able to oxidise ammonia, and cultivable only in special media, and the other with no oxidising power, but able to grow on ordinary media.

The following facts were indicated as a result of the author's experiments: (1) A practically pure culture of the bacterium can be obtained after sub-culturing for seven months in Winogradsky's ammonia solution. (2) The nitroso-bacterium will grow in this solution in presence of organic matter. (3) The nitroso-bacterium will grow, not only on silica jelly, but also in any ordinary organic medium.—T. F. B.

Superphosphate Manufacture: Determination of the amount of Acid required for ——. W. Strzoda, XXIII., page 574.

English Patent.

Saccharine Solutions; Process of Treatment of ——, for the Production of Nitrogenous Matters and Potassium Products rich in Fertilising Elements and Means for carrying out the Process. A. Vasseux. Eng. Pat. 15,226, July 8, 1902. XVI., page 564.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Works; Use of Aluminate of Barium in ——. E. Rembert. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [9], 747—755 and [9], 962—971.

Barium aluminate having been used with advantage to soften boiler feed-water, the author was led to try its effect on beetroot juice as a purifying agent. The aluminate of barium is obtained as a frit in powder containing about 60 per cent. of Al_2O_3BaO at 40 francs per 100 kilos. A solution is made to 4·8 Baumé, which contains 40 grms. of the reagent per litre. Stronger solutions may be made, but are not stable, and in any case the best results are obtained with fresh solutions. As an example of the purification effected, the following may suffice:—

Second carbonated juice filtered, organic non-sugar 8·85, ash 2·84; the same, after sulphiting and filtration, 8·02 and 2·82; the same treated with aluminate of barium, organic non-sugar 7·21, ash 2·64. This result was attained by adding 0·26 grm. of reagent per litre of juice. The purity was increased from 89·56 to 90·91. Only a trace of barium remained in solution.

A further development of its application consists in electrolysing juice to which aluminate of barium has been added, when more favourable results are obtained than by electrolysis alone.—L. J. de W.

Green Syrups; Treatment of ——, in Nymburg by the Czapikowski-Karlik Method. K. Andrlík and V. Staněk. Zeits. Zuckerind. Böhmen, 1903, **27**, [7], 421—436.

An investigation of the Czapikowski-Karlik method of desaccharifying syrups has led to the following results: The syrups treated had the apparent purity 78—81, and after dilution and sulphuring, the colour was less intense, but the purity was only inappreciably raised. The liquors and the sand could be completely extracted without appreciable loss and without bacterial decomposition of any kind; the suspended solid matter in the filtered syrup was extremely small in amount. After filtration, the sulphured syrup was boiled for 30—36 hours in a Karlík-Czapikowski crystallising apparatus, having a rotating heating arrangement, with a heating surface of 30 sq. m., until the density 93—94° Balling was attained; after this, and while still in the vacuum, the syrup was diluted with about 9 per cent. of molasses to make it run off more readily. Since the mass is kept well stirred, and the height of the liquid above the heating surface is small, the whole is kept at a uniform temperature, and no superheating takes place, a condition of great importance for the quality of the "Füllmasse." The colour of the second product sugar obtained was extraordinarily light, being only 18—24 units on Stammer's scale per 100 grms. of dry substance; the grain was uniform, the yield 50—52 per cent. of the second "Füllmasse," and the yield 85—86. The quotient of the residual syrup varied from about 63 at the beginning to about 65 at the end of the season. The molasses amounted to 1·4 per cent. of the weight of the beets worked.—T. H. P.

Carbonating [Sugar]; Double and Triple ——. K. Andrlík. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [2], 922—932.

After a full examination of the juices, syrups, scums, &c., both on a large scale, and from laboratory experiments, the author concludes that the difference in purification effected by double carbonating, and that by the triple carbonating of Karlik lies within experimental errors, and is much smaller than has been hitherto supposed.

As regards appearance and colour, the syrups and massecuites, and even the sugars obtained by Karlik's process are incontestably of superior quality to those obtained by double carbonating.—L. J. de W.

Massecuites [Sugar]; Mixing ——, by Compressed Air. Ehrhardt. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [9], 984—985. From Deutsch. Zuckerind., 1902, [52], 2015.

During the crystallisation without movement of massecuites of low products, the crystals accumulate at the bottom of the tanks, and the author claims that the syrup in the upper part is purer than that in contact with the sugar. Various mechanical arrangements have been proposed for mixing the crystallising massecuite. The author has tried compressed air injected into perforated pipes placed at the bottom of the tanks. He has devised an easily portable apparatus to serve for an entire plant. The massecuite is mixed in every direction in five minutes throughout a tank, even when a deposit of crystals has already formed. There is no mixing for the first day or two until crystals have formed; then there is mixing every 12, 6, and 3 hours as the crystallisation becomes more complete. Under these conditions the massecuite remains very fluid, and is easily removed from the tanks to the centrifugals by a *montejus* or a pump.

There is no diminution of alkalinity or production of invert sugar. With air at 0·3 atmosphere used for four weeks, the alkalinity was still 0·111. Every three hours, 1·5 to 2 cubic metres of air are required for a total of 1,000 quintals.

Zscheye has not found any difference of quotient in the syrups from the upper and lower parts of the tanks of low products. According to him, the author's process allows of an easier extraction of the massecuite, whilst by mixing, the crystals are brought into contact with the mother liquor, thus favouring crystallisation.—L. J. de W.

Amino-Acids; Behaviour of Ammonium Salts of ——, in Aqueous or Sugar Solutions on Heating. K. Andrlík. Zeits. Zuckerind. Böhmen, 1903, **27**, [7], 437—445.

The author's researches lead to the following results:—When boiled, solutions of the ammonium salts of asparti and glutaminic acids, tyrosine and leucine, either with o without sugar, lose ammonia, the first two only partially but the last two completely. If the solutions are alkalin to phenolphthalein, they become acid on boiling, the acidit increasing with the amount of evaporation. The acid reacting ammonium salts of aspartic and glutaminic acids on boiling, bring about inversion of sugar solutions, th amount of change increasing with the concentration. Whe evaporated under reduced pressure, solutions of the alkalin ammonium salts of aspartic and glutaminic acids los ammonia, but only slight inversion of sugar is produce owing to the low temperature. The ammonium salts o tyrosine and leucine only bring about a small amount o inversion in sugar solutions, although they completely los their ammonia. The acidity of beet juices, which in som years lose their alkalinity on evaporation, is to be explaine by the presence of ammonium salts of amino-acids; the lose ammonia, yielding an acid-reacting ammonium sa which causes decomposition of the saccharose.—T. H. P.

English Patents.

Sugars; Method of Rapidly Refining White ——. J. Robin-Langlois, Paris. Eng. Pat. 8685, April 14 1902.

See Fr. Pat. 310,368; this Journal, 1902, 59.—J. F. B.

Saccharine Solutions; Process of Treatment of ——, fo the Production of Nitrogenous Matters and Potassiu Products rich in Fertilising Elements and Means f Carrying out the Process. A. Vasseux, Belgium. Eng Pat. 15,266, July 8, 1902.

In this process the low wines of molasses or other sacchari solutions are treated with sulphuric acid to convert th potassium present into sulphate, or with ammonium su phate which yields also recoverable ammonium salts. Th potassium sulphate crystallises out when the concentratio is great enough, and is separated by filtration or centr fugalising; by using filter-presses, and washing th sulphate first with the weak solution of a preceding opera tion, and finally with a solution saturated with potassiu sulphate, a saleable product is directly obtained. In ord to obtain the nitrogenous manure, the residual liquor, aft separation of the potassium sulphate, is best dried in a clos cylindrical apparatus, which permits of the recovery of th distillable products.—T. H. P.

United States Patents.

Sugar; Electro-Endosmotic Process of Extracting ——. B. Schwerin, Berlin. U.S. Pat. 723,928, March 3 1903.

See Eng. Pat. 8,086, 1901; this Journal, 1902, 556; al Fr. Pat. 309,792; this Journal, 1902, 59.—J. F. B.

Sugar Solutions; Process of Boiling ——. H. Claase Dormagen, Germany. U.S. Pat. 723,990, March 3 1903.

The supersaturation during boiling of saccharine juic especially thick or concentrated juices, is controlled keeping up a systematically varying supersaturation, e pirically determined, according to the purity of the saccl rine solution, establishing a decrease in supersaturati after the formation of grain, followed by a systema increase in the supersaturation preparatory to boiling o according to the dropping purity of the mother syrup. —J. F. B.

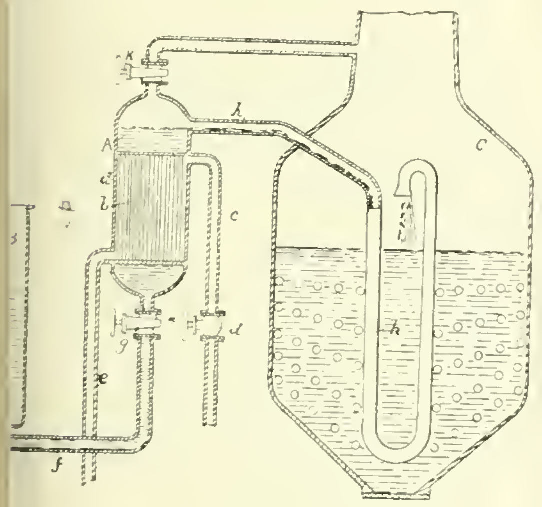
French Patents.

Sugar Solutions; Process for the Treatment of ——. F. Nowak. Fr. Pat., 321,014, Aug. 27, 1902.

Claim is made for the treatment of sugar solutions so to obtain massecuites easy to clear and yielding wh s ar, characterised by the addition, to refinery or other j :es, before filtration, of a mixture composed of an ract of peat and normal calcium sulphite.—T. H. P.

rup [*Sugar*]; *Apparatus for the Heating and Con-inuous Feeding of* ——, *in Vacuum Apparatus in the Manufacture of Sugar in Crystals.* Blake, Barclay, nd Co. Fr. Pat. 323,716, July 17, 1902.

AIM is made for: (1) A tubular receiver heated by steam other fluid and placed between the sugar liquor reser-e and the vacuum apparatus in plant for producing



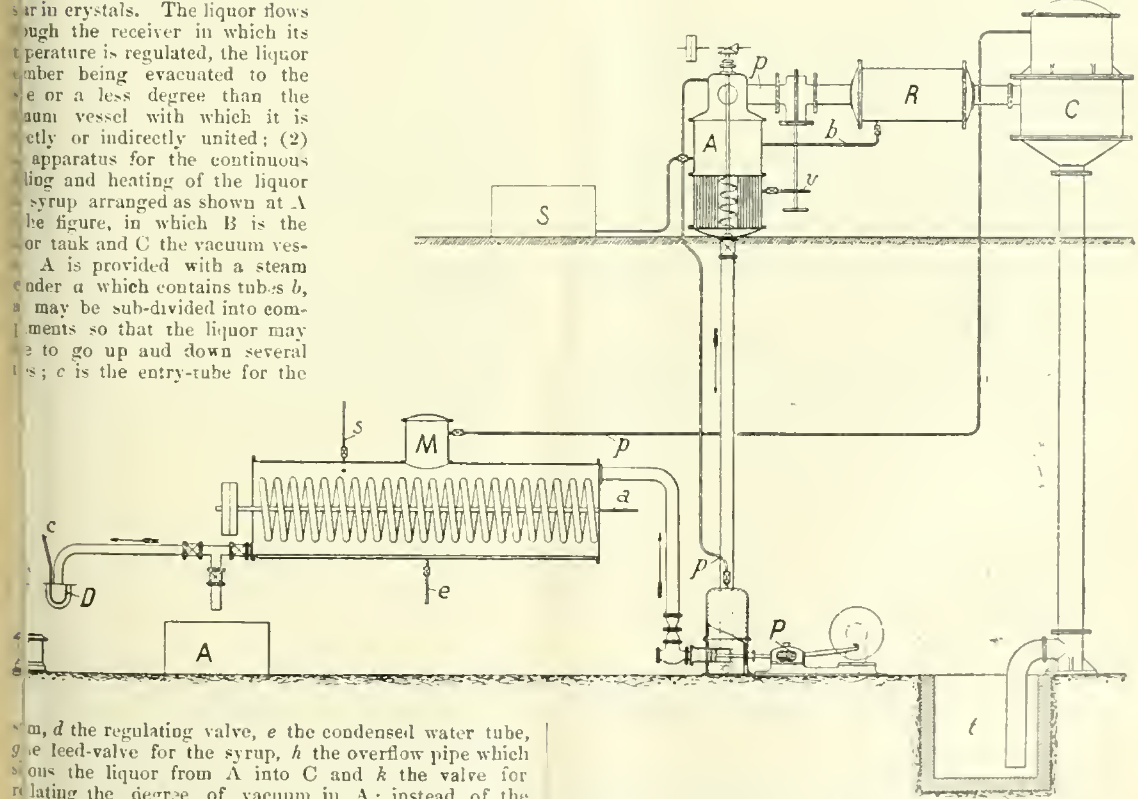
ar in crystals. The liquor flows ough the receiver in which its perature is regulated, the liquor mber being evacuated to the e or a less degree than the aum vessel with which it is ctly or indirectly united; (2) apparatus for the continuous ling and heating of the liquor syrup arranged as shown at A he figure, in which B is the or tank and C the vacuum ves-A is provided with a steam nder *a* which contains tubes *b*, may be sub-divided into com-ments so that the liquor may e to go up and down several s; *c* is the entry-tube for the m, *d* the regulating valve, *e* the condensed water tube, e feed-valve for the syrup, *h* the overflow pipe which ons the liquor from A into C and *k* the valve for lating the degree of vacuum in A; instead of the um-tube *j* and the valve *k* being connected with the pace of the vacuum vessel, they may be directly united the vacuum-pump. The feed-vessel is also provided with a vacuum meter and a thermometer. A modification of the apparatus is also described in which the tube *j* and the valve *k* are suppressed.—T. H. P.

Filtering Media [*Bone-Char*]; *Process for Regenerating* ——. T. Lewicki. Fr. Pat. 324,632, Sept. 20, 1902.

The organic impurities, which collect in filtering media, such as the bone-char of sugar refineries, are destroyed by fermentation by means of artificial cultures of bacteria suitable for the purpose. It is not necessary to remove the char from the filtering vessels; fermentation is started *in situ* by running into the filter some diffusion liquor in which the desired organisms are in active growth Where possible it is desirable to employ aerobic bacteria and to inject air into the filter during fermentation. Purification is effected in a few hours, and the filtering medium may then be washed and sterilised if necessary.—J. F. B.

First Runnings Sugar; Process for Obtaining ——. La Société Anonyme de la Raffinerie Nouvelle D'Aubervilliers. Fr. Pat. 324,144, Sept. 1, 1902.

Claims are made for: (1) A process in which the boiling of the syrup is replaced by an evaporation which bring the syrup to a density of 42—45 B., and by which, fuel and labour are economised and the yield increased; (2) A process for obtaining only one kind of crystals, consisting in remelting the grain in an apparatus in which it can be mixed and subsequently cooled. The figure represents a special apparatus for carrying out these processes; S is the filtered syrup tank, A the concentrator provided with a steam valve *v* and a vacuum valve *p*, P a pump for pumping out the finished syrup furnished, as also the tubes through which the supersaturated syrup circulates, with a double jacket containing either boiling water or steam, M is a double-jacketed crystalliser, D a mixer and distributor of massecuites, *c* a pipe for conveying the hot clairce with which the massecuites are always diluted before centrifugalising in T, and C a barometric condenser. —T. H. P.



Paper, Millboard, &c.; Manufacture of ——, from Bagasse and other Vegetable Refuse. M. Lopez de la Camara and F. Robledano Egaña. Fr. Pat. 324,599, Sept. 18, 1902. XIX., page 569.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeasts [Mycoderma a and b] obtained from Pressed Distillery Yeast; Two Mycodermic ——. W. Henneberg, Woch. f. Brau., 1903, **20**, 137—139, 178—180.

The author has studied two mycodermic yeasts which occur in pressed yeasts. They present certain morphological differences but physiologically they are almost identical. They are best detected and isolated by digesting the yeast in the pressed condition at a temperature of 34° C.; after two or three days the colonies of mycodermic yeasts attain the size of a pin's head. They grow best at 38° C., but at this temperature the pressed yeast generally liquifies too rapidly. Together with the colonies of these yeasts, colonies of a species of *Oidium* frequently appear and finally overgrow the former.

These mycodermic yeasts are killed by heating for five minutes at 60°—61 C. They ferment only glucose and fructose to any considerable extent, but have a slight action upon galactose and still less upon maltose and dextrin. They secrete glycogen in small quantities. During their activity, especially in presence of alcohol, a distinct odour of ethyl acetate is developed. In glucose solutions at 38° C., both yeasts produce alcohol to a maximum extent of about 3·7 per cent. They withstand the presence of alcohol well up to 11 per cent. and they bring about the oxidation of alcohol to carbon dioxide and water with some rapidity. As they originally occur in distillery mashes containing lactic acid, they grow well in presence of this acid in solutions containing up to about 5 per cent. The lactic acid is used up fairly rapidly during their growth, especially at 38° C. They also oxidise acetic acid, but do not grow in presence of more than about 0·45 per cent. of this acid. Experiments with mixtures of these mycodermic yeasts with cultivated distillery yeasts, in the proportion of 1 : 10,000, showed that the former developed but slightly, and their presence had no appreciable effect on the growth and attenuative power of the culture yeast. The fact of their presence in practice, however, in any considerable degree may be taken as an indication that the yeast has become infected. A third variety, *Mycoderma c* has also been met with, showing slightly different properties and growing best at a temperature of 29 C.—J. F. B.

Barley during Malting; Changes Effected in the Nitrogenous Bodies of ——. R. E. Evans. J. Fed. Inst. Brewing, 1903, **9**, [2], 175—196. (Compare this Journal, 1901, 825.)

The losses which occur in the steep, amount to about 0·277 per cent. of total organic matter, calculated on the original barley, of which 0·043 per cent. are albuminoids. Experiments are recorded on Warwickshire barley o inferior quality, daily determinations having been carrie out, from the time of steeping to that of the curing o the malt, of the moisture, diastatic capacity, extract, solubl uncoagulable albuminoids, percentage of total solids fer mented (attenuation), and percentage of soluble albumi noids removed by the yeast during fermentation, identica conditions being observed in mashing and fermenting th worts. Diagrams are given illustrating the developmer of the uncoagulable albuminoids, and the percentag of these which is removable by the yeast, the differenc being expressed as "permanent" albuminoids relativel unavailable for yeast nutrition. The *total soluble albumi noids* of the malt show a steady increase up to the 13 day on the floor, the previous highest point being reache on the day after sprinkling (fourth day on floor); a sligl decrease is shown during the kilning process. The propo tion of *albuminoids* removable by fermentation shows great variations; the albuminoids of the barley are practicall unavailable as yeast food, but even during the steep a co siderable proportion of these are rendered available, rising t a maximum on the fourth day on the floor, when the great intensity of growth occurs. From that time a gradu fall is noted with a rapid decrease as curing beg (temperature 120 F.). The total soluble albuminoi calculated on the dry extract show some variations at fir and then remain constant until the kilning process, wh the increased temperature causes a sudden rise followed l a sharp fall. The "permanent" albuminoids, calcu on the dry extract, show the same irregularity at first, wi a maximum on the second day on floor, then becomi practically constant. It would appear that the rese albumin of this sample of barley becomes split up germination into two series of products, about 50 per ce being available as yeast food and 50 per cent. not availab about 16·5 per cent. of the former, however, appear t destroyed during kilning.

By special experiments it is shown that if the g mination after the fourth day be carried out with access of air, the percentage of soluble albuminoids and t proportion of the "available" albuminoids are redu showing that oxygen is necessary for the development the proteolytic enzyme as well as of the diastase. T author's studies lead to the conclusion that the va of a malt should be deduced from the proportion of t total soluble albuminoids which is available for ye nutrition, in connection with the degree of attenuatio a large proportion of "permanent" albuminoids m indicate a tendency to gluten turbidity and other fa In the following table malts of various origins are pared:—

The large differences in the prices of these malts not accounted for by the differences in extract, the val depend rather on the quality of the extracts, favour stability, flavour, brilliancy, &c.

As a provisional basis of classification, malts which s 55 per cent. attenuation and 50 per cent. of remova albuminoids might be classed as good, those showing 60 per cent. attenuation and 45 per cent. of removable albuminoids as medium, and those showing less than 55 per cent. attenuation and 40 per cent. of removable albuminoids as inferior.—J. F. B.

—		1. English inferior.	2. English high dried.	3. English good.	4. English inferior.	5. Foreign medium.	6. Foreign best.	7. F[illegible]
Extract per cent.		69·2	71·4	72·2	72·9	70·0	71·9	72·2
On dry malt	Total albuminoids	2·85	2·47	3·31	3·37	2·62	2·85	[illegible]
	Removable	1·13	0·92	1·62	1·10	1·11	1·30	1·0
	Permanent	1·72	1·55	1·69	1·97	1·51	1·55	[illegible]
Per cent. of total albuminoids	Removable	39·7	37·5	48·9	41·5	43·6	45·5	[illegible]
	Permanent	60·3	62·5	51·1	58·5	56·4	54·5	67·0
Attenuation per cent.		56·8	56·6	61·1	62·7	67·2	60·8	[illegible]

Caramelisation of Malt and Beer Wort; Phenomena of ——. E. Prior. Zeits. angew. Chem., 1903, **16**, [13], 293—227.

In caramelising beer wort under a pressure of two and a half atmospheres, the maximum of favourable results is attained in two hours, an extension of heating m furnishing an increased proportion of furfural and b empyreumatic substances, without deepening the colour corresponding degree. A considerable amount of gluc is formed during the reaction, and the acidity incre proportionately with the depth of colour.

In an endeavour to identify the caramel-forming constituent, washed grains and also 5 per cent. solution saccharose, glucose, fructose, erythrodextrin, achroodext I., II., and III., and a 10 per cent. solution of malto ere heated separately. Furfural was detected in the roducts, but no appreciable caramelisation was obtained; nd negative results also attended the experiments repeated ith 0·18 per cent. of lactic acid and a quantity of primary otassium phosphate corresponding to 11 per cent. of ecinormal alkali; nor did the addition of albumin, peptone, nd albumose effect any change. On the other hand. accharified potato starch under the same treatment, rnished a considerable amount of acid and furfural, and ssumed a deep brown coloration, accompanied by the recipitation of a brown substance; though in presence of e above proportion of lactic acid, these changes ceased to e manifested.

From these results, the author concludes that the caramel-orming substance in wort is a degradation product of arch, probably identical with Ling and Baker's third alto-dextrin (achroodextrin IV.), the conversion into aramel being accompanied by the formation of bodies lied to or identical with humus substances or humus cids. The preventive influence of lactic acid is attributed the hydrolysis of achroodextrin IV. into glucose, though ordinary worts the amount of acid is too small to have ny appreciable effect. The same phenomena occur to a naller extent in the caramelisation of malt.—C. S.

eplacement of Alcohol by Wood as the Raw Material in Vinegar Manufacture. Behrend. Zeits. Spiritusind., 1903, **26**, [16], 165.

criticising the statement made by O. N. Witt in a lecture the development of chemical industry in the last ntury, that the distillation of wood offers a cheap means r the manufacture of ethyl alcohol, acetone and acetic id, the author points out that wood-vinegar is quite nfitted for use as food and can never replace alcohol-negar for this purpose. Further, acetic acid as sold to e public has a concentration of about 80 per cent., and is, course, highly poisonous. The fermentation-vinegar dustry is steadily increasing, although not to so great an tent as would have been the case if the distillation of ood had not been introduced as a method for manu-cturing acetic acid.—T. H. P.

ills: Relative Economy of Intermittent and Continuous ——, for Small Distillers. Goslich. Zeits. f. Spiritusind., 1903, **26**, [17], 173.

he cost of working a steam-heated pot still is compared th that for a continuous still in the case of a small stillery, distilling two tuns of wash of 1,050 litres capacity ch per day for a season of 200 working days.

The cost of working an intermittent still for the season is timated at about 910 marks, whilst that for a continuous ll is computed at 540 marks, showing a difference in vour of the continuous system of 370 marks. The causes this saving lie mainly in the lower consumption of steam, orter working hours, and less water and labour. The ime cost of a continuous still of this capacity is 523 marks, whilst that of an intermittent still is 318 marks, a difference of 1,305 marks, which, however, saved in about three and a half years.—J. F. B.

lcohol in Spirits, Liquors, and Fruit Syrups; Determination of ——. Fr. Zetzsche. XXIII., page 576.

English Patent.

irits, or the like: Apparatus for the Distillation of ——. F. Meyer, London. From J. W. Meyer and J. W. Arbuckle, both of Trinidad. Eng. Pat. 4218, Feb. 23, 1903.

the body of a distilling apparatus is situated a rotatory rinkler, consisting of a cup-shaped vessel, into which the uid to be distilled is delivered. Two or more arms iate from the bottom of the cup, and are perforated roughout their length. Through these rotating arms the uor is distributed upon a steam-drum situated below and ed with a series of vertical tubes, heated externally, rough which the liquor trickles in a thin film, being charged at the bottom.—J. F. B.

French Patents.

Brewers' Mash and Similar Mixtures: Apparatus for Separating the Solid and Liquid Constituents of ——. V. Lapp. Fr. Pat. 324,379, Sept. 12, 1902.

See Eng. Pat. 20,079, 1902; this Journal, 1903, 312.
—J. F. B.

Dextrin (Achroodextrin) and Alcohol: Treatment of Peat, Lichens, and Moss for the Commercial Manufacture of ——. G. Reynaud. Fr. Pat. 323,731, July 22, 1902.

See Eng. Pat. 17,506, 1902; this Journal, 1902, 1290.
—T. H. P.

Alcohol [from Chicory]: Manufacture of ——. M. A. Dromain. Fr. Pat. 324,199, Sept. 5, 1902.

Chicory-root is sliced up and submitted to a process of diffusion similar to that employed in the beetroot sugar industry. The diffusion juice is then fermented and distilled, whilst the spent slices are dried and roasted as a substitute for coffee. It is stated that, owing to the removal of acrid principles during the diffusion, the roasted chicory is of superior quality.—J. F. B.

Denaturing Alcohol; Process for ——. G. Hache. Second addition, dated Sept. 10, 1902, to Fr. Pat. 320,592, April 22, 1902. (See also this Journal, 1903, 108 and 434.)

Coal-tar is mixed with an equal volume of 95 per cent. alcohol; a certain quantity of water is then added to the alcoholic solution, from which a light oil of dark colour is precipitated. This light coal-tar oil has an industrial value, whilst the aqueous-alcoholic residue on distillation yields the alcoholic solution of coal-tar oils suitable for denaturing spirits.—J. F. B.

Wines and other Beverages: Preservation of ——. E. Baron and C. Baron. Fr. Pat. 324,373, Sept. 12, 1902.

Wines and other beverages are preserved in vessels by a superficial protective layer of oil, mineral wax, or paraffin. Vaseline oil, white or pale-coloured, is preferably employed.
—J. F. B.

Wine, Beer, and other Alcoholic or Saccharine Liquids: Process and Apparatus for the Concentration of ——, by Freezing and Fractional Liquefaction. E. Monti. Fr. Pat. 324,474, Sept. 12, 1902.

Wine, beer, and other alcoholic or saccharine liquors are frozen, and the blocks are placed in insulated columns or pipes of about 6 ft. in height. The liquid which runs off as the mass melts has a temperature which is lower the higher the concentration, and the melting-point is taken as an index of the concentration. The frozen mass is, therefore, systematically melted by treating it first with the original liquid previously cooled to its freezing-point and subsequently with liquors more and more dilute from a previous operation likewise cooled to their freezing-points. The residual ice is used for cooling these washing-liquors. In this manner, concentrated liquors containing up to 35 per cent. of alcohol and 60 per cent. of sugar can be obtained.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Cheddar Cheese [American]; Contribution to the Chemistry of ——. L. L. Van Slyke and E. B. Hart. Amer. Chem. Jour., 1903, **29**, 371—385.

Paranuclein was found as a common constituent of all the cheeses examined. In young cheese, four and a-half months old, the three basic products, lysatine, histidine, and lysine, were present, whilst in cheese 15 months old, tetramethylenediamine (putrescine) and lysine were found.

Arginine could not be separated in either case. There appears to be good evidence that, in the cheese-ripening process, there is a gradual conversion of primary into secondary amino compounds, and that the changing flavour of cheese as it ages is due to increasing quantities of secondary amino compounds. A high ammonia content is a characteristic of cheese ripened at ordinary temperatures. In cheese ripened in cold storage, only small amounts of ammonia are formed, and the flavour is very mild. Mere traces of putrescine, cadaverine, or ammonia do not account for abnormal sharpness or other unpleasant quality in the cheese, but it must be borne in mind that they gradually accumulate and impart their peculiar flavours to the cheese. Hydrogen forms a part of the gas in those cheeses technically known as "gassy," and may be regarded as an agent easily capable of favouring the early formation of putrescine, cadaverine, and ammonia.—W. P. S.

English Patents.

Tea Extract; Production of a Pure Soluble ——. J. Roger, London, and M. K. Bamber, Colombo, Ceylon. Eng. Pat. 7714, April 2, 1902.

Tea leaves are extracted with boiling water, and the hot extract subjected to centrifugal action. The clear solution drawn from the centre of the drum is cooled to about 33° F., and again passed through a centrifugal separator. The solution is then evaporated and mixed with the dried separated matters to form a powder.—W. P. S.

Maize or other Vegetable Substances; Nutritious Product from ——. E. Donard and H. Labbé, both of Paris. Eng. Pat. 8876, April 16, 1902.

See Fr. Pat. 320,027, 1902; this Journal, 1902, 1548.
W. P. S.

Food and other Perishable Organic Substances; Process for Sterilising ——. C. C. L. G. Budde, Copenhagen. Eng. Pat. 10,903, May 12, 1902.

See Fr. Pat. 321,039, 1902; this Journal, 1903, 159.
—W. P. S.

United States Patents.

Concentrating Solutions; Process of —— [*Milk, &c.*] A. Gürber, Würzburg, Germany. U.S. Pat. 723,152, March 17, 1903.

The temperature of the solution is lowered to the freezing point, and the solid portion separated from the liquid by centrifugal action in a suitable machine. For producing condensed milk, the cream is removed, and the milk alternately frozen and thawed to remove the watery portion; finally the cream is added to the concentrated portion.—J. W. H.

Milk-Powder; Process of Producing ——. H. V. Dunham, New York. U.S. Pat. 723,254, March 24, 1903.

Milk is heated to 200° F., then rapidly cooled, condensed at a temperature of 110° F. to a density of 23° B., mixed with an equal quantity of prepared milk-powder, and finally completely dried and powdered.—W. P. S.

French Patents.

Gluten and Analogous Products; Desiccating ——. L. A. Morel. Addition, dated Aug. 8, 1902, to Fr. Pat. 296,751, Feb. 1, 1900.

Details are given of a cylindrical vacuum oven in which the top and body of the oven form one piece, which drops on to the base (making a single annular air-tight joint), and is lifted therefrom by means of balance-weights. On the base are supported tiers of drying-trays, where the material to be dried is spread in shallow layers.—R. L. J.

Cottonseed Meal, &c.; Manufacture of ——. F. M. Pratt. Fr. Pat. 323,819, Aug. 19, 1902.

Claim is made for the introduction, in the deodorising of cottonseed meal and similar materials, for the exposure of the material to the action of heat in a chamber until it reaches a temperature sufficiently high to prevent the condensation of steam, which is subsequently admitted while the material is continually stirred. Arrangements are provided for closing the heating chamber and for removing the steam by aspiration. An apparatus for carrying out the process is described and claimed.—T. H. P.

Milk; Apparatus for Mixing ——. A. Gaulin. Fr. Pat. 323,875, July 16, 1902.

The milk is heated to 85° C., filtered, and forced by a pump between two elastic surfaces pressed one against the other, in order to break up any solid particles of fat or casein.—W. P. S.

Oleaginous Compound [*Lard Substitute*]. C. Adams. Fr. Pat. 324,484, Sept. 16, 1902.

See U.S. Pat. 709,291 of Sept. 16, 1902; this Journal, 1902 1291.—C. A. M.

Alcohol [*from Chicory*]; *Manufacture of* ——. N. A. Dromain. Fr. Pat. 324,199, Sept. 5, 1902, XVII. page 567.

(*B.*)—SANITATION; WATER PURIFICATION.

English Patents.

Furnace for the Combustion of Organic Materials and th like [*Refuse Destructor*]. E. Willshear, London. Eng Pat. 9974, April 30, 1902.

The furnace is of the vertical hopper type, the refuse bein burned in the combustion chamber proper, and the incon bustible residues discharged in a fluid state into a suitabl receptacle below it. The hopper at the top of the furnac is cut off from the combustion chamber by a water-coole door, and the upper part of the furnace is surrounded b a wind-box, which supplies heated air to another wind-bo surrounding the lower part of the furnace, and deliverin the heated air to the combustion chamber through a seri of openings in the furnace walls. Instead of surroundir each separate furnace with a lower wind-box, this may l extended round a series of furnaces. Suitable exits a provided for the waste gases.—H. F. C. G.

Foul Vapours; Apparatus for Disposing of ——. Haddan, London. From E. R. Edson, Cleveland, Ohi U.S.A. Eng. Pat. 25,960, Nov. 25, 1902.

See U.S. Pat. 714,165, 1902; this Journal, 1903, 41.
—W. P. S.

French Patents.

Sewage and Water; Precipitant for Use in the Purifi tion of ——. J. M. Lallemand and A. Goutierre. I Pat. 323,900, Aug. 14, 1902.

A precipitant for organic matter is obtained by mixi syrupy phosphoric acid, dry clay, zinc sulphide, calci sulphate, and magnesium sulphate.—W. P. S.

Sewage; Biological Process for the Purification of — H. C. Werner and F. P. Candy. Fr. Pat. 324,3 Sept. 10, 1902.

Matter, rich in aerobic bacteria, such as the resi deposited on filter beds by effluents, is added to the sewa which then passes on to the filter. Channels are provid at the bottom of the filter to prevent a stagnant filtr collecting. (See also Eng. Pat. 517, 1901; this Journ. 1902, 133.)—W. P. S.

(*C.*)—DISINFECTANTS.

Trees and Vines; Means for Destroying Insects on, Removing the Bark from Living ——. C. Bolle, M chester. From R. Flemming, Prettin, Germany. E Pat. 6439, March 17, 1902.

A composition is claimed consisting of carbolineum, 10 parts, and milk of lime, 1 to 19 parts.—W. P. S.

Soap [*Hygienic*]; *Manufacture of* ——. M. Yadig Eng. Pat. 27,889, Dec. 17, 1902, XII., page 561.

XIX.—PAPER, PASTEBOARD, Etc.

elluloid-like Masses ; Preparation of ——. Rheinische Gummi- u. Celluloidfabrik. Ger. Pat. 140,855, Jan. 14, 1902. Zeits. angew. Chem., 1903, **16**, [15], 353.

LUCOSE, levulose and lactose, when heated under strong essure with nitrocellulose, increase the solubility of the tter to such an extent that they can be substituted for rt of the camphor in the preparation of celluloid. The gars mentioned are superior to the substances previously ed as substitutes for camphor, by reason of their greater bility.—A. S.

ENGLISH PATENTS.

esin Size ; Manufacture of ——. F. Arledter, Harburg/a/E., Germany, and H. Arledter, Garston, England. Eng. Pat. 17,077, Aug. 1, 1902. (Under Internat. Conv., Jan. 25, 1902.)

x or fat is mixed with molten resin, the mixture is filtered, ammonium salt (chloride or carbonate) and sodium rbonate are added in sufficient quantity to produce partial ponification, and the mixture is agitated in contact with rbon dioxide gas so that the resulting compound contains e unsaponified resin, free alkali, and ammonium resinate.
—R. L. J.

asein Compound [for Paper Manufacture] ; Improved ——. R. W. James, London. From the Casein Company, New York, U.S.A. Eng. Pat. 28,257, Dec. 22, 1902.

READILY soluble casein compound is obtained by mixing mmercial casein (100 parts), a soluble oxalate (2 parts), d a powdered alkaline solvent such as borax (15 parts). is forms a thin and easily flowing solution in water ½ parts).

The claim is for the combination of casein with oxalates solution.—R. L. J.

asein Solution [for Paper Manufacture, &c.]. W. A. Hall, New York. Eng. Pat. 2949, Feb. 7, 1903.

ASEIN, obtained from milk by precipitation with hydroloric acid, is mixed with sodium phosphate (10—15 per nt.) and water (1—3 parts by weight), a thin solution ing thus obtained.—R. L. J.

raining Liquids from Solids [Wood Pulp, &c.] ; Apparatus for Separating or ——. C. S. Wheelwright, Bristol, R. I., and J. T. Fiske, jun., Pascoag, R.I. Eng. Pat. 2560, Feb. 3, 1903.

E U.S. Pat. 719,541 of 1903 ; this Journal, 1903, 288.
—R. A.

ork, Corkwood and the like ; Substitute for ——, and Process for Producing the same. E. P. Smith, M. L. Morrison, and G. F. Sehindler, Chattanooga, Tennessee. Eng. Pat. 25,324, Nov. 18, 1902.

OOD pulp and "cornstock"-pith are disintegrated and ixed with a warm solution of equal parts of gelatin and ycerin in four or five parts of water ; the excess of isture is then expressed, and while still warm, the mass coagulated, with a water solution of formaldehyde, and oulded into the forms desired.—J. W. H.

ellulose Filaments, Sheets, or Films; Manufacture of ——. C. H. Stearn, Westminster, and F. T. Woodley, Plumstead. Eng. Pat. 2529, Jan 31, 1902.

E U.S. Pat. 725,016 of 1903. (See next column.)
—T. F. B.

UNITED STATES PATENTS.

ellulose Films or Filaments ; Preparing ——. F. and A. Lehuer, Zurich. U.S. Pat. 724,020, March 31, 1903.

ISCOSE solutions are injected in thin streams into sulphuric id, and the resulting product is wound and desulphurised by eatment with a "sulphide hydrate," sulphide, or bisulphite an alkali or alkaline earth ; the product is then washed d dried —T. F. B.

Filaments, Sheets, or Films from Cellulose ; Manufacture of ——. C. H. Stearn, Westminster, and F. T. Woodley, Plumstead. U.S. Pat. 725,016, April 7, 1903.

XANTHATE of cellulose, isolated from crude viscose, is dissolved in an alkaline solution (caustic alkali being suitable) and allowed to stand some time at an approximately constant temperature. The resulting product is formed into sheets, &c., and treated in a precipitating acid bath.
—T. F. B.

FRENCH PATENTS.

Paper, Millboard, &c. ; Manufacture of ——, from Bagasse and other Vegetable Refuse. M. Lopez de la Camara and F. Robledano Egana. Fr. Pat. 324,599, Sept. 18, 1902.

SUGAR-CANE bagasse, or the refuse from sorghum, maize, reeds, or other vegetable matter, is submerged in a solution of caustic soda containing 10 per cent. of soda calculated on the raw material to be treated. The temperature at which the bagasse is introduced into the solution should be 60° C., at which temperature a vigorous reaction occurs. The material is thus treated for a period of from 45 to 60 minutes, according to its condition ; the mass is then removed, washed and bleached, either with sulphurous acid or bleaching powder.—J. F. B.

Celluloid Incombustible ; New Method of Manufacture for making ——. J. Sehmerber and L. Morane. Fr. Pat. 324,121, Aug. 30, 1902.

A PRODUCT, very similar to celluloid, but not possessing its high inflammability, is obtained by employing combinations of nitrocellulose and acetyl cellulose, mixed by the aid of solvents common to both substances.

The process may consist, for instance, in adding a solution of 40—60 kilos. of camphor in 50 to 60 kilos. of ethyl or methyl alcohol or acetone to 100 kilos. of nitrocellulose, and allowing the mixture to stand for 24—48 hours. A mixture of 100 kilos. of acetyl cellulose with 40—60 grms. of methyl alcohol or acetone (or a mixture of the two) which has also stood 24—48 hours, is incorporated with the first mixture and treated in the usual manner.

Nitrobenzene may be added to the second mixture, and is also said to reduce the inflammability of the resulting compound.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cinchona Succirubra ; De Vrij's Liquid Extract of ——. J. Warin. J. Pharm. Chim., **17**, [7], 314—316.

FOR the preparation of the liquid extract of red cinchona bark, official in the Dutch Pharmacopœia as "china liquida," De Vrij at first advocated extraction by percolation with an aqueous menstruum containing a little glycerin and two mols. of hydrochloric acid for each mol. of total alkaloids present in the bark, on the assumption that these dibasic alkaloids were removed in the form of hydrochlorides. It was found, however, that with an aqueous menstruum containing acid in this proportion, only half the alkaloids were removed. It was then discovered that the bases were not extracted as hydrochlorides but as cinchotannates, merely by the solvent action of the hydrochloric acid, and that to obtain complete exhaustion of the bark, it was necessary to employ four mols. of acid for each mol. of total alkaloid present. De Vrij concentrated the acid percolates by evaporation on the water-bath, but Giles advocated evaporation *in vacuo*, to avoid oxidation of the cinchotannic acid by exposure to the air, and the latter modification was adopted in the Dutch Pharmacopœia (Pharm. Bat., Supp., 1891, 49).

The author shows that this last elaboration is unnecessary, and even harmful ; since the extract evaporated *in vacuo* has a slightly lower content both of extractives and alkaloids. 200 grms. of succirubra bark, containing 4·805 per cent. of total alkaloids, were extracted with the prescribed aqueous hydrochloric acid and glycerin menstruum. The percolate obtained was divided into two equal parts. One portion was evaporated to the prescribed weight in an oven at a temperature not exceeding 70° C. This had the sp. gr. 1·091; gave 27·9 per cent. of extractive, dried on the water-bath, and contained 4·619 per cent. of total alkaloids. The other portion was evaporated in a flask, *in vacuo*: it had the sp. gr. 1·085, gave 27·03 per cent. of extractive, and contained 4·534 per cent. of total alkaloids. The product of evaporation *in vacuo* is therefore slightly inferior to that obtained by concentration, at the given temperature, in the air.—J. O. B.

Ephedrine. Archiv. **240**, 481. Pharm J., 1903, **70**, [1709], 454.

Ephedrine, $C_6H_5.CH_2.CH(NH.CH_3).CH_2OH$, was isolated from *Ephedra vulgaris* in 1878 by Nagai. Merck found that the plant contains, besides ephedrine, another isomeric base, pseudo-ephedrine,

$$C_6H_5.CH(OH).CH(NH.CH_3).CH_3.$$

Ephedrine hydrochloride gives a mono-acetyl derivative on acetylation. With benzoyl chloride the free base gives a di-benzoyl compound which melts at 115°—116° C. With methyl iodide, it gives two derivatives, methylephedrine, $C_{10}H_{14}(CH_3)NO$, and the methiodide of methyl-ephedrine, from which the quaternary base, $C_9H_{10}(OH)N(CH_3)_3OH$, is liberated on treatment with moist silver oxide. The platinum-ephedrine hydrochloride, $(C_{10}H_{15}NO.HCl)_2.PtCl_4$, has the melting point 186° C., after being dried at 100° C.—A. S.

Neroli and Petit-grain; Essential Oils of ——. H. Walbaum and O. Hüthig. J. prakt. Chem., 1903, **67**, [7], 315—325.

Neroli Oil.—The oil examined by the authors was of French origin, and had the following characteristics:—Sp. gr. at 15° C., 0·8772; α_D = + 3°·28′; and saponification value, 44·4. By fractional distillation of 2 kilos. of the oil *in vacuo* at a pressure of 10—11 mm., the following terpenes, &c., were isolated:—(1) *l-Pinene* (about 10 grms.) boiling at 160°—167° C., and having specific gravity at 15° C., 0·8592, and rotation α_D = − 18°·38′. It yielded a pinene nitrosochloride (m. pt., 103° C.) and a pinene nitrolbenzylamine (m. pt., 122°—123° C.). (2) *l-Camphene* (about 10 grms.), boiling at 168°—170° C., and having α_D = − 12°·42′. On treatment with glacial acetic acid and sulphuric acid, this fraction yielded isobornyl acetate, which on saponification gave crystals (m. pt., 195° C). having the odour of isoborneol. (3) *Dipentene* with b. pt. 175°—179° C.; sp. gr. 0·8581; and α_D = − 1° 6′. This yielded a tetrabromide melting at 135° C. (4) *Decyl aldehyde*, which was separated from the fraction of the oil boiling between 70° and 82° C. at 7—8 mm. pressure. (5) *Phenylacetic acid* from the fraction boiling between 82° and 97° C. After re-crystallisation from hot water, this melted at 76°—77° C. (6) *Benzoic acid* by saponification of the distillation residue. (7) *d-Terpineol* (m. pt., above 33° C.), which was separated from the fraction boiling at 215°—220° C., and having a specific gravity of 0·912 at 15° C. (8) *l-Linalool* (b. pt., 199°—200° C., sp. gr. 0·8714; α_D = − 7°·51′), which was present both in the free state and as an ester.

Indole, found by Hesse and Zeitschel, could not be identified with certainty. The tests for linalyl acetate and geraniol found in neroli oil by Tiemann and Semmler (Ber., 1893, **26**, 2711) were not repeated. In the authors' opinion the presence of the methyl ester of anthranilic acid is of primary importance for the odour.

Petit-grain Oil.—The specimen of Paraguay oil examined had the following characteristics:—Sp. gr., 0·8912 at 15° C.; α_D = − 0°·36′; and saponification value, 125 (= 47·25 per cent. of esters as linalyl and geranyl acetates). It began to boil at 157° C. under the ordinary pressure, and the first drops of the distillate gave a cherry-red colour with pine shavings and hydrochloric acid, pointing to the presence of a pyrrol derivative. The fraction boiling at 157°—166° C. gave the furfural reaction on the addition of aniline hydrochloride. After distillation over sodium, the fraction, which still had an odour of pinene, had the following constants:—B. pt., 160°—167° C.; sp. gr., 0·8503; and α_D = − 13°·2′. It did not yield a nitrosochloride.

Camphene was concluded to be present in the fraction boiling at 160°—167° C., whilst dipentene was identified in the terpene fractions of higher boiling point. In addition to a small amount of the methyl ester of anthranilic acid, the authors state that there is also a basic substance of characteristic odour in the oil.

The presence of linalool, geraniol, and their acetic esters in petit-grain oil has been frequently recorded, and the authors have also identified free terpineol in the fraction boiling at 88°—93° C., under a pressure of 8 mm. Geranyl acetate was isolated in approximately pure condition from the fraction boiling at 109° C., under a pressure of 8 mm., and having sp. gr. 0·9178; α_D = + 1°·6′; and saponification value, 266 (= 93·4 per cent. of geranyl acetate).

Linalool was identified by the formation of its crystalline phenylurethane (m. pt., 65° C.). The linalool fraction (2—3 grms.) was mixed with the calculated quantity of phenyl isocyanate, and left for a week in a closed vessel. It was then distilled with steam, and the residue extracted with boiling petroleum spirit to remove the crystalline compound from the nearly insoluble diphenylurea. The phenylurethane, which has the formula $C_{17}H_{23}O_2N$, is regarded by the authors as characteristic of the presence of linalool. The following table gives the characteristics of the different linalools from which they have prepared it:—

Linalool from	Boiling Point at ordinary pressure.	Specific Gravity at 15° C.	α_D.	Melting Point of the Phenyl-urethane.
	°C.			°C.
Petit-grain oil	200	0·8712	− 3° 14′	65
Neroli oil.....	199—200	0·8714	− 7° 51′	65
Linaloe oil....	196—199	0·8715	− 14° 7′	65—66
Coriander oil .	197—199	0·8687	+ 12° 51′	65
Geraniol......	197—199	0·8740	± 0	63—64

Geraniol itself does not give a solid phenylurethane. —C. A. M.

Peppermint Oil: A New Adulterant. C. T. Bennett. Chem. and Druggist, 1903, **62**, [1211], 591.

The author recently examined a sample of peppermint oil, which, in general appearance, odour, and taste, showed no abnormal features, but, on examination, was found to contain at least 15 per cent. of purified "acetine," a mixture of the three acetic esters of glycerin. The sample had only a slight yellow colour, and a fairly strong odour of peppermint. Its physical and chemical characters were different from those of pure peppermint oil; they were as follows:—Sp. gr. at 15° C., 0·964; optical rotation in 100-mm. tube, − 15°; esters (as menthyl acetate) 71·2 per cent.; esters after acetylation, 53·1 per cent.; refractive index at 20° C., 1·4581. The oil was soluble in two volumes of 70 per cent. alcohol, but on the addition of more alcohol, turbidity was produced and, ultimately, oily drops floated to the surface. When the oil was distilled under ordinary pressure, the distilled portion was soluble without opalescence in four volumes of 70 per cent. alcohol, and had the following characters: Sp. gr., 0·9[illegible]6; optical rotation, − 16°; and refractive index, 1·459. The residue was also soluble in 70 per cent. alcohol; it had the following characters: Sp. gr., 1·147; refractive index 1·4450; saponification value, 633·0, and b. pt., about 250° C. Samples of the adulterated oil and of pure oil were distilled under reduced pressure (22 mm.): 7 fractions (6 of 12½ per cent. each and one of 6 per cent. in the case of the adulterated oil, and 7 of 12½ per cent. each in the case of the pure oil were collected. In the case of the pure oil no portion had a specific gavity of more than 0·962, while in the case of the adulterated oil, the specific gravities of fractions 1, 5 and 6 were distinctly higher than the corresponding fractions of the pure oil, and the residue had a specific gravity of 1·147 and a much lower refractive index than that of any normal constituent of peppermint oil.—A. S.

ırana Elemi from Protium Carana. A. Tschirch and O. Saal. Arch. der Pharm., **241**, [2], 149—158.

: percentage composition of Carana elemi derived from *tium carana*, indigenous to Northern Brazil, is found to —Amyrin, 20—25 per cent.; essential oil, 10 per cent.; areleminic acid, $C_{40}H_{56}O_4$, 2 per cent.; careleminic acid, $I_{56}O_4$, 8 per cent.; carelemisic acid, $C_{37}H_{50}O_4$, 10 per .; resene, 30—35 per cent., with impurities 12—15 per ., and a probable trace of bryoidin.

f the resin acids isocareleminic acid is removed by ing out the ethereal solution of the resins with ammon carbonate solution. It melts at 75° C. After its oval, shaking out with 1 per cent. sodium hydroxide tion removes careleminic acid, and carelemisic acid. essential oil is obtained by steam distillation as a ow, fragrant liquid, recalling the odour of a mixture ill, fennel, and lemon oils. On fractionation, a colour- pleasant-smelling fraction distils between 170°—172° C., a denser yellowish oil between 172°—200 C.—J. O. B.

t (Pure and Commercial); Characteristics of ——. H. E. Burgess. Analyst, **28**, [325], 101—104.

the different specimens examined, Nos. 1 and 2 were osits in the cages of the animals, No. 3 was bought as civet, No. 4 was a commercial sample, and No. 5 was acted by the author. The moisture was determined by ing the substance in the water-oven until constant in ht. The ash consisted chiefly of calcium carbonate, also contained aluminium, potassium and magnesium, chlorides, sulphates, and a considerable amount of ı. The following table gives the quantitative results ined :—

Moisture and Volatile Matter.	Ash.	Acetone Extract.	Saponification Value of Acetone Extract.	Residue from Acetone Extract.	Chloroform Extract.	Saponification Value of Chloroform Extract.	Residue from Chloroform Extract.
Per Cent.	Per Cent.	Per Cent.			Per Cent.		Per Cent.
6·3	2·7	..	..	..	75·8	13·1	..
4·5	3·0	69·6	61	27·2	75·4	45·0	..
27·0	3·5	43·6	114	28·9	47·2	113·0	23
12·0	1·1	79·6	112	1·7	83·0	114·0	33
15·9	3·3	60·0	33	21·0	..	..	..

re civet was found to contain about 1·3 per cent. of gen.

e commercial product may be adulterated with soft , lard, butter and other fats, and vaseline. For the tion of the last-named substance, the author obtained factory results by Parry's method :—About 5 grms. are cted with 50 c.c. of cold acetone, and the residue ed with an additional 50 c.c. with the aid of suction. then treated with 50 c.c. of petroleum spirit, the extract filtered into a weighed flask and the residue washed the same solvent. The petroleum spirit is evaporated the residue in the flask dried and weighed. It is then itted to further examination by the usual methods. he samples in the above table, No. 1 gave by this od a residue of 4 per cent. with a saponification value , whilst No. 3 yielded 11 per cent. with a saponification of 95, and a mixture of No. 3 with 2 per cent. of ine gave 12·7 per cent. of residue with saponification 74·8. In the author's opinion the chief constituent vet is a slightly volatile fatty acid. He has been le to identify the presence of skatol as found by rt (this Journal, 1902, 1347).—C. A. M.

Chloral Hydrate; Volumetric Determination of ——. C. G. Hinrichs. XXIII., page 577.

Syrup of Balsam of Tolu; Some Reactions of ——. A. Astruc and J. Cambe. XXIII., page 576.

Cod-Liver Oil; Reaction for ——. Wolff. XXIII., page 575.

Cod-Liver Oil; Medicinal ——. C. E. Sage. XXIII., page 575.

English Patents.

Cod-Liver Oil and Preparations of Cod-Liver Oil; Treatment of ——, to render the same more easily assimilable as Food. J. Barclay, Bromsgrove. Eng. Pat. 11,410, May 17, 1902.

The introduction of carbon dioxide, which is claimed, is stated to render cod liver oil more palatable, and digestible, whilst also preventing the development of rancidity. —C. A. M.

[Formaldehyde - Nucleinic Acids] Pharmaceutical Compounds; Manufacture of New ——. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 11,882, May 24, 1902.

Nucleinic acids or salts thereof (of animal or vegetable origin) or such bodies as can be obtained from nucleinic acids by treatment with alkalis, such as nucleothyminic acid or thyminic acid or salts thereof, are combined with formaldehyde in aqueous solution; the mixture is heated on the water-bath and the combined products are precipitated by alcohol.—J. F. B.

French Patents.

Hydrocyanic Acid from Cyanides of Iron; Preparation of ——. W. Feld. Addition, dated Aug. 29, 1902, to Fr. Pat. 315,837, Nov. 12, 1901.

Double compounds of the alkaline earths and iron cyanides are treated with mercuric salts and alkaline earth salts, and the mixture is distilled with sulphuric acid.—T. F. B.

Hydrocyanic Acid; Preparation of ——, by means of Cyanides of Iron. W. Feld. Addition, dated Aug. 30, 1902, to Fr. Pat. 315,837, Nov. 12, 1901.

Cyanides of iron are treated, in alkaline or neutral solutions, with mercurous oxide or its salts, and the liquid separated from the precipitate and decomposed with acids, the residue, which contains excess of mercurous oxide, being treated with salts such as magnesium, aluminium, zinc, or manganese halides.

In the presence of ferrocyanides, an oxidising agent is used to convert mercurous compounds into mercuric oxide, which is treated as above with halide salts.

Or, the original mixture, containing ferrocyanides, is oxidised before treatment, to ferricyanide, so as to prevent the precipitation of mercury or mercurous oxide.—T. F. B.

Manganic Oxide; Use of Salts of ——, as Oxidising Agents, especially in preparing Aldehydes, Ketones, and Quinones. W. Lang. Fr. Pat. 323,916, Aug. 21, 1902.

Salts of manganic oxide, Mn_2O_3, may be used for oxidising purposes. The following is an example, in which the manganic salt is obtained by electrolytic oxidation of a manganous salt :—47·5 kilos. of ammonium manganous sulphate, $(NH_4)_2SO_4 2MnSO_4$ (obtained by heating an acid solution of manganous sulphate with excess of ammonium sulphate), dissolved in 45 kilos. of water and 79 kilos. of (98 per cent.) sulphuric acid, are submitted to electrolysis. After 6,000 ampère-hours, the water lost by evaporation is replaced, and 4 kilos. of toluene added, the temperature being kept about 50° C. and the vessel closed. After two or three hours the oil is distilled over by steam, and the benzaldehyde separated from the unchanged toluene. The yield is about 3·7 kilos. of benzaldehyde.

In a similar manner, quinones may be obtained from the corresponding hydrocarbons (*e.g.*, anthraquinone from anthracene), and formaldehyde and formic acid from methyl alcohol.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Under- and Over-exposure. J. Bartlett. J. Franklin Inst., 1903, **155**, [4], 283.

—T. F. B.

Gradation of the Negative; Control in the ——. H. W. Bennett. The Phot. J., 1903, **43**, [3], 74—95.

—T. F. B.

English Patents.

Paper for Photographic Purposes; Process for Preparing ——. Y. Schwartz, Hanover, Germany. Eng. Pat. 9992, April 30, 1902.

Paper is coated with a solution of collodion-cotton, which penetrates into the paper. It is used in solution in acetone, amyl acetate, &c., a solution recommended being composed of:—19 grms. of dry collodion-cotton; 1,000 c.c. of acetone (99 per cent.); 875 c.c. of amyl acetate; 875 c.c. benzene (b. pt. 80—82 C.). The paper is coated with this solution in such a manner that, for each square metre of paper, about 70—80 c.c. of solution are used.

The resulting paper is said to be very strong, and somewhat transparent, being thus especially suited for making silver bromide negative paper.—T. F. B.

Photographic Papers; Chemical Solution for Treating ——. M. Bauer, Montclair, N.J. Eng. Pat. 28,284, Dec. 22, 1902.

This solution is for the purpose of sensitising papers in such a manner that the resulting prints require no toning. The basis of the solution is fulminating gold, in addition to which it contains silver nitrate, collodion, glycerin, citric acid, and a chloride together with castor oil. Gelatin may be substituted for the collodion.

The preparation is as follows:—A solution of 45 grains of silver nitrate and 45 minims of glycerin in 150 minims of alcohol is added to a solution of collodion (2½ per cent. gun-cotton), 4 oz.; fulminating gold prepared from:—gold chloride, 1 gr.; ammonia solution (26 per cent.), 1 minim; lithium (or other) chloride, 3 grs. To this is added a solution of 15 grs. of citric acid in 60 minims of alcohol, and then 15 minims of castor oil in 60 minims of alcohol.

The emulsion is applied to the paper and dried. The print is finished by successive treatments with sodium chloride (1 in 30) and sodium thiosulphate (1 in 15) solutions.

If gelatin be used for collodion, water is used as solvent instead of alcohol.—T. F. B.

Paper, Cardboard, &c.; Process for the Manufacture of Light-sensitive ——. P. Schönecker, Berlin. Eng. Pat. 2697, Feb. 4, 1903.

A process for obtaining paper, &c., sensitised on a portion only of its surface. This is done either by means of a stamp or die which applies the emulsion direct to the support, or by applying the film by means of a paper carrier to the support, and then stamping, to remove the carrier, leaving only the emulsion on the support.

—T. F. B.

Colour Photographs; Methods and Apparatus for taking ——. E. R. Clarke, London. Eng. Pat. 10,690, May 9, 1902.

Records in any number of colours are produced on photographic plates by means of colour filters placed in the aperture of the lens, together with a half-tone screen placed in front of the plate. Any particular record is selected from this multicoloured record by means of masks made by photographing through one only of the colour screens, of a colour complementary to that of the record required. These selected colour records are then used for producing half-tone positives or negatives.

Transparencies in colour are produced by superposing a set of coloured dot masks (made by the use of the colour filters and half-tone screen mentioned above) on a positiv made from the multicolour record.

Positives in opaque colours on a black ground ar obtained by printing from the colour records in the metho described in Eng. Pat. 9184 of 1902 (see this Journal, 1903 511).—T. F. B.

United States Patent.

Panchromatic Dry Plate, and Process of making Sam A. Miethe, Charlottenburg, and A. Traube, Berlin. U.S Pat. 724,311, March 31, 1903.

Panchromatic or colour-sensitive plates are prepared b treating a light-sensitive matter with a dyestuff prepare from the halogen alkylates (especially the iodine ethylates of quinoline or quinaldine.—T. F. B.

French Patent.

Engravings, especially Half-tone Pictures; Process f Reproducing ——. Ivan Levinstein. Fr. Pat. 323,93 Aug. 22, 1902.

Two blocks, in relief, exactly similar to one another, a used, superposed one on the other, with correspond points in contact, *i.e.*, the shadow parts of one in conta with the shadow parts of the other.

These blocks may be prepared by reproducing the origin on a metal plate covered with a layer of substance unaffect by acids; when etching is carried out, the acid attacks t parts corresponding to the shadows, and in consequence the protecting layer, has little or no action on the parts half light and high light. The two blocks are taken fr this block, and are made of elastic material.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Cellulose; Nitrated ——. L. Vignon. Comptes re **136**, [14], 898—899.

Many analyses of oxycellulose, prepared by the action hydrochloric acid and potassium chlorate on cellulo show that it has a constant composition, expressed by t formula $(C_6H_{10}O_5)_3 + C_6H_{10}O_6 = C_{24}H_{40}O_{21}$. Nitrocel-lose, prepared according to Lunge's formula for Ligh nitration, gave on analysis (the carbon, hydrogen, a nitrogen being directly determined) results agreeing exac with

$$3\,[C_6H_7(NO_2)_3O_5] + C_6H_7(NO_2)_4O_6 = C_{24}H_{28}(NO_2)$$

The so-called nitrocellulose is thus an oxycellulose de vative. Discrepancies among the results of former expe menters are in all probability largely due to the nitrog alone having been determined, not the carbon and hydrog (See also this Journal, 1900, 1039.)—J. T. D.

English Patent.

Explosives and Cartridges containing Explosives; Wa-proof Envelopes for enclosing ——, and Process their Manufacture. F. Timmel, Vienna. Eng. 2592, Feb. 3, 1903.

The waterproofing solution consists of collodion a linseed or castor oil dissolved in acetone. Cartridges waterproofed by direct dipping in this solution or wrapp can be made by pouring the solution out in thin fi allowing the acetone to evaporate and using the sheets prepared.—G. W. McD.

United States Patents.

Nitrocellulose; Purifying ——. F. I. du Pont, Wilming Del. U.S. Pat. 724,932, April 7, 1903.

Nitrocellulose, or similar substance, is immersed water which is in contact with air, and the whole agitated under pressure, causing solution of the air. The pres is suddenly released causing the air to expand violent dislodging impurities from the substance, and actio nascent oxygen in oxidising nitrous compounds to ni compounds.

A variation of the method is to shower a mixture of w and nitrocellulose through compressed air, and to suddenly release the pressure from the mixture collected.—T. F.

rplosives ; Process of Making ——. H. Washers, York, Pa. Assiguor to Rochdale Powder Co., Delaware. U.S. Pat. 724,764, April 7, 1903.

UNPOWDER-DUST, resulting from the granulation of pressed wder-cake, is incorporated with nitronaphthalene, and roglycerin is then added to produce the finished plosive.—G. W. McD.

atches ; Igniting Material for ——. W. Muir, Edmonton, and C. R. E. Bell, Bromley, England. U.S. Pat. 724,411, March 31, 1903.

E paste consists of amorphous phosphorus, potassium lorate, hard mineral powder, and a binding agent.
—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

dometry ; Standardisation of Solutions used in ——. H. Ditz and B. M. Margosches. Zeits. angew. Chem., 1903, **16**, [14], 317—321.

E authors raise objections to the substances hitherto ed for standardising sodium thiosulphate solution for use iodometry. In most cases there is considerable difficulty obtaining the substance in a state of sufficient purity, ilst in other cases the results are not quite concordant. ey recommend the use of potassium chlorate for this pose. The commercially pure salt contains 99·82 per it. of $KClO_3$, and by simply removing adherent traces of isture, a product of 99·98 per cent. purity is obtained. e process followed is that recommended by Ditz for the ermination of chlorates in electrolytic bleaching-liquor is Journal 1901, 1026); if *k* grms. of potassium chlorate taken, and *n* c.c. of sodium thiosulphate solution be nired, then each c.c. of thiosulphate solution corremds to X grms. of iodine according to the equation :—

$$X = \frac{k}{n} . 6\cdot208.$$

e results obtained agree well with those given by the assium bromate, potassium iodate, sodium bromate, and assium bi-iodate methods.—A. S.

kali Cyanides in Commercial Cyanide ; Determination of ——. A. Adair. J. Chem. and Metall. Soc. of South Africa, 1903, **3**, [9], 140.

E following method, which is an adaptation of one ised for the determination of ferrocyanide in pot-metal very impure product), is stated to be preferable to the er method for the determination of cyanogen in commer- cyanide, since although it is not quite so quick, only the ful cyanide is estimated ; cyanates, sulphocyanides, suldes, and chlorides, even when present in considerable ntities, do not sensibly affect the results. The solutions uired are :—

A 25 per cent. solution of caustic alkali.
A 20 per cent. solution of pure sulphuric acid.
Saturated solutions of potassium permanganate and ferrous sulphate.

N/10 solution of permanganate (1 c.c. = 0·156 grm. of nogen) or preferably, a solution of which 1 c.c. = 0·1 n. of cyanogen. This solution is standardised by means potassium ferrocyanide ($K_4Fe(CN)_6 + 3H_2O$), 3 grms. ng dissolved in 300 c.c. of water and 15 c.c. of the per cent. acid added. Then

$$\frac{880 \times 3}{57\cdot9 \times \text{c.c. consumed}} = \text{cyanogen value in grms. per c.c.}$$

the determination, 10 grms. of the cyanide are dissolved about 200 c.c. of water, 2 c.c. of the alkali solution added, then a quantity of the ferrous sulphate solution equivat to 12 grms. of the crystallised salt ($FeSO_4 + 7H_2O$), being added 5 c.c. at a time with thorough agitation. reaction is as follows :—

$$6KCN + FeSO_4 + \text{alkali} =$$
$$K_4Fe(CN)_6 + K_2SO_4 + \text{alkali}.$$

phuric acid is added till Prussian blue is formed, then a her 15 c.c. of acid and saturated solution of permanate until the colour, which can be seen at the edges, remains persistent. If more than 1 grm. of permanganate be used, more acid must be added—15 c.c. for each grm. of permanganate. If much sulphocyanide be present, the solution is allowed to stand for 15 minutes, and, if necessary, a further quantity of permanganate is added. The reaction is expressed by the equation :—

$$5K_4Fe(CN)_6 + 4H_2SO_4 + KMnO_4 =$$
$$5K_3Fe(CN)_6 + 3K_2SO_4 + MnSO_4 + 4H_2O.$$

A quantity of the ferrous sulphate solution equivalent to 15 grms. of the salt is now added, then 15 c.c. of the alkali solution to make the liquid strongly alkaline, the whole well shaken, and made up to 1 litre. The reaction may be expressed by the equation :—

$$K_3Fe(CN)_6 + FeSO_4 + 3\ KOH =$$
$$K_4Fe(CN)_6 + K_2SO_4 + Fe(OH)_3.$$

The solution is filtered through a large folded filter, and 500 c.c. of the filtrate treated with 20 c.c. of sulphuric acid and titrated with the standard permanganate solution.

The influence of the precipitate on the results is small, and it may be ascertained by making a blank determination in the manner described, with a weighed amount of pure potassium ferrocyanide.—A. S.

Cyanide Solutions ; Assay of ——. A. Chiddey. Eng. and Mining J., 1903, **75**, [13], 473.

The author recommends the following method for the assay of cyanide solutions containing gold. It gives slightly higher results than the usual evaporation process, and is much more rapid. Four assay tons, or more, of the cyanide solution are treated in a porcelain dish with 10 c.c. of a 10 per cent. solution of lead acetate, 4 grms. of zinc shavings added, the solution boiled for a minute and 20 c.c. of hydrochloric acid added. When action has ceased, the mixture is heated to boiling, the spongy lead washed with distilled water, transferred by means of a stirring rod to a piece of filter paper, squeezed into a compact lump, and placed in a hot cupel. The muffle should be filled with flame at the moment of introducing the spongy lead. In the case of very dilute, nearly pure gold solutions, a known quantity of silver nitrate dissolved in cyanide solution should be added before the addition of the lead acetate.
—A. S.

Cyanide Solutions ; A Test for ——. [*Determination of Gold and Silver.*] A. Arents. Eng. and Mining J., 1903, **75**, [12], 446.

The method proposed by the author is based upon the known fact that metallic copper will precipitate gold and silver upon its surface from acid solutions. 250 c.c. of the cyanide solution are mixed with a few c.c. of sulphuric acid, and not less than 1 grm. of cement copper added. The mixture is boiled for 10 minutes and filtered through a 7-in. grey filter-paper. One-third of a crucible charge of flux is then placed on the filter, the rim of the paper folded over, and the whole transferred to a crucible, on the bottom of which another one-third of the charge of flux has been placed. The last one-third of the charge of flux is placed on the top of the filter in the crucible and the whole placed in the furnace. The author uses about 30 grms. of litharge and the usual amount of borax and soda as flux. The filter paper itself furnishes the reducing agent. About 20 grms. of lead are obtained in the form of a bright, clean button, which, upon cupelling, furnishes a bead of gold and silver free from copper.—A. S.

Sulphur ; Determination of ——, *in Pig Iron.* C. A. Seyler. Analyst, 28, [325], 97—101.

The determination of sulphur in pig iron by the evolution method gives too low results, owing to part of the sulphur being left in an insoluble form in the residue, whilst part is evolved in the form of organic compounds not precipitated by reagents for hydrogen sulphide, or oxidised to sulphates by bromine. Dougherty's method of heating the sample with a piece of filter paper in a porcelain crucible over a Bunsen flame, and then cooling it slowly before proceeding to the evolution, has been found to yield good results in the case of samples containing low proportions of sulphur. For the most accurate work the author prefers Bamber's method of oxidising the sulphur with nitric acid and potassium nitrate, but this is tedious and requires a correction for impurities in the reagents. From the results of his experiments on the evolution method he has arrived at the following conclusions:—(1) It is advisable to use strong hydrochloric acid. (2) By heating the sample for 15 minutes at 750° C. the results are nearly equal to those of the oxidation method. (3) The results of the volumetric determination of the sulphur are too low if potash be used as the absorbent, especially when the condenser is omitted. (4) If strong hydrochloric acid be used, good results are obtained by passing the gas mixed with hydrogen through a red-hot tube.—C. A. M.

Manganese in Steel; Modification of the Schneider Method of Determining ——. E. Jaboulay. Rev. gen. Chim., **6**, 119; Chem.-Zeit., **27**, [27], Rep. 84.

One grm. of steel is treated at boiling temperature with 20 c.c. of nitric acid (sp. gr. 1·20), and when solution is complete, further 25 c.c. of the same acid are added. A slight excess of bismuth tetroxide is immediately added to the lukewarm liquid, and the whole is shaken up, and filtered through calcined asbestos. After diluting the clear cold solution to 100 c.c. with cold water, an excess of hydrogen peroxide is run in from a graduated burette, the quantity needed to ensure complete decolorisation being carefully noted. A 12 per cent. (vol.) solution of hydrogen peroxide diluted with 20 vols of water, is used, a solution of permanganate containing 1·5 grms. per litre being employed for titration.—C. S.

Zinc from Nickel; Separation of ——, *by Hydrogen Sulphide in a Solution containing Gallic Acid.* E. A. Lewis. Analyst, 1903, **28**, [325], 93–97.

The solution of the two metals (preferably as sulphates), which should not contain more than 0·6 grm. of each, is treated with sodium carbonate solution until a slight permanent precipitate is formed, and this is dissolved by adding a drop of dilute sulphuric acid. The liquid is then diluted to about 300 c.c., and, after the addition of a solution containing 2 grms. of gallic acid, is treated for 30 minutes with a fairly rapid current of hydrogen sulphide. The precipitate is collected, washed with cold water, dried in the water-oven, and separated from the paper. The latter is ignited and the ash added to the precipitate, the whole being then sprinkled with a little sulphur, heated for five minutes over a Bunsen flame in a current of hydrogen, and weighed as zinc sulphide.

For the determination of the nickel, the filtrate is concentrated to 15 c.c. in a beaker on a hot plate. After cooling, 30 c.c. of strong nitric acid are added, and the beaker subsequently covered and replaced on the hot plate. The solution is boiled until it becomes dark green, after which it is mixed with 1 c.c. of sulphuric acid and evaporated nearly to dryness in a porcelain basin. It is next heated over wire gauze until the sulphuric acid is volatilised, and then more strongly to decompose organic matter, the residue boiled with water containing a litttle sulphuric acid, the solution filtered, and the filter washed once with dilute sulphuric acid and four times with water. The filtrate is treated with 10 c.c. of ammonium hydroxide, then with 3 grms. of ammonium oxalate dissolved in water, and electrolysed with three Bunsen cells (or their equivalent) at 40° C. Finally, the platinum cone is washed with water and alcohol, thoroughly dried in the water-oven, and weighed.

The results of test experiments quoted, agree closely with the theoretical amounts of the metals, and it is also shown that iron, aluminium, and manganese are also separated completely, but that a small proportion of cobalt is precipitated with the zinc.

For the analysis of alloys, such as German silver, 1 grm. of the sample is treated with nitric acid, and after evaporation of the excess of solvent, any tin oxide is filtered off. The filtrate is diluted to 300 c.c., 5 c.c. of hydrochloric acid added, and a current of hydrogen sulphide passed through.
The precipitate of copper and lead is dissolved and r
precipitated, and the filtrate evaporated to dryness wi
sulphuric acid. The residue of zinc and nickel sulphat
is then dissolved in water, and the metals separated
described above. The copper in the precipitate is dete
mined volumetrically or electrolytically, whilst sm
amounts of tin, lead, iron, aluminium, manganese, a
cobalt are best determined on a fresh portion of 5 grms.
the alloy. The method can also be used in the determin
tion of the small amounts of nickel in commercial brass
using 7 grms. of the sample.—C. A. M.

Superphosphate Manufacture; Determination of
Amount of Acid required for ——. W. Strzoda. Che
Zeit., 1903, **27**, [26], 299.

The following rapid method is stated to obviate the err
of the ordinary calculation of the requisite amount of a
from the analytical results:—20 grms. of the substan
consisting of aliquot portions in the correct ratio of
different crude materials to be employed, are mixed w
30 c.c. of crude sulphuric acid of about 53° B., and
flask is closed, well shaken, and allowed to stand for
minutes in a warm place (50°–80° C.). The contents
then transferred to a litre flask, made up to the ma
thoroughly shaken, and filtered. The amount of free a
as sulphuric acid is determined in 10 or 20 c.c. of
filtrate and calculated on a litre. The difference betw
the result thus obtained and that given by the 30 c.c
acid used, gives the amount consumed by the 20 grms
substance. To this figure the author adds 5 per cent
its own amount, and calculates the proportion of
required by the bulk on this basis, which he has fo
empirically to give good results in practice, whatever
nature or relative proportions of the materials.—C. A. M

ORGANIC—QUALITATIVE.

Paraffin; Detection of Small Quantities of Ceresin
——. E. Graefe. Chem.-Zeit., 1903, **27**, [22], 24-
249.

One grm. of the material is dissolved in 10 c.c. of car
bisulphide at a temperature of 20° C. If more than 10
cent. of ceresin be present, the solution will not be clea
that temperature but will remain cloudy, with a silky lustr
agitation. Of this solution 1 c.c. is treated in a test-tub
20° C. with a mixture of 5 c.c. of ether and 5 c.c. of 96
cent. alcohol. Under these conditions pure paraffin, of m
ing point up to about 54° C., such as is generally emplo
in candle manufacture, shows no deposit. If ceresin
present a more or less copious separation of a flocculent
cipitate occurs, closely resembling a precipitate of alum
in this way even 1 per cent. of ceresin can be dete
Harder paraffins than those melting at 54° C. norm
give a deposit on the addition of the mixture of ether
alcohol, owing to deficient solubility, but this deposit
very different appearance from that of ceresin. In
cases the test-tube containing the mixture is warmed in
hand until all is dissolved and is then set aside to
With pure paraffin the separation which then occu
crystalline, whereas the ceresin precipitate which collec
the surface is of a flocculent character. Mixtur of
paraffin with montan wax do not dissolve complete
carbon bisulphide under the above conditions, the solu
moreover, differ from those containing ceresin in
milky; the turbidity clears on the addition of the
and alcohol, and montan wax always has a distinct
value on titration.—J. F. B.

Ceresin in Paraffin; Detection of Small Quantiti
——. F. Sommer. Chem.-Zeit., 1903, **27**, [26], 2

Referring to Graefe's method (see preceding abs
the author asserts that only American and Ge
paraffin remain in solution on treatment with the mi
of alcohol and ether, whilst Scotch and Galician par
although melting below 54° C., yield large precip
as is also the case with the "Java paraffin" of l
melting point. Hence, if the method is still to be em

determination must be made at a somewhat higher operature (*e.g.*, 25° C.), or, as is preferable, the mixture alcohol and ether must be added at 20° C. and the whole ken and warmed. In the presence of ceresin, there is n a more or less pronounced flocculent deposit, whilst e paraffin usually remains completely in solution, or at st forms fine insoluble drops. In this modification, vever, the method loses much of its exactness.

As regards the series of melting points given by Graefe, author points out that their correctness is open to stion, since Shukoff's apparatus, in which they were ermined, is only designed for the determination of solidition points. Moreover, Graefe's figures have not been firmed by any other observer.—C. A. M.

esin in Paraffin; Detection of Small Quantities of ——. E. Graefe. Chem.-Zeit., 1903, **27**, [34], 408.

reply to the criticisms of Sommer (preceding abstract), author states that his method was only intended German and American paraffins, which were the kind ed in question. The limit of 54° C. (approximately) ds good for them. It is true that paraffins of other gin may yield deposits at 20° C. on treatment of the bon bisulphide solution with ether-alcohol, but in such es the method should be used as in the case of paraffins ting above 54° C. The author states that he has tried method on paraffin of Scottish origin, and has not found anting in exactness.

As regards Sommer's criticism on the melting points, the hor points out that, with the exception of the capillary e method, all the methods used in the paraffin industry really determinations of the solidification points. He repeated and confirmed his former results on the lting (solidification) points of mixtures of paraffin and esin. Thus, the following results were obtained in koff's apparatus with mixtures of paraffin (54·8° C.) and esin (62° C.): Paraffin with 10 per cent., 54·8°; with er cent., 54·8°; with 5 per cent., 54·8°; with 3 per t., 54·8°; and with 1 per cent., 54·8° C. In other ds, paraffin is not influenced in its melting, or, rather, dification point by the addition of quantities of ceresin to 10 per cent.—C. A. M.

Fatty Oils: Colour Reactions of ——. H. Kreis. Chem.-Zeit., **27**, [27], 316—317.

CORDING to the author, the Bishop reaction may be arded as a Baudouin reaction in which furfural is laced by the aldehyde present in rancid sesamé oil. the basis of this observation he has elaborated the hop-Kreis reaction, a green coloration ensuing when ain rancid fats are shaken up with hydrochloric acid fresh sesamé oil. The active constituent of sesamé oil, so-called "red oil," may be replaced by certain phenols; ats be shaken up with hydrochloric acid (1·19) and ereal solutions containing 1 per 1,000 of resorcinol, oroglucinol, or naphthoresorcinol, a violet, red, or green ration (respectively) is obtained. These reactions litate the detection of certain deteriorations in fats, for ch the organoleptic test had hitherto to be relied on, they are the more important, inasmuch as oils that give Bellier reaction lose that faculty when exposed to lation.

connection with the Bellier reaction it is found that rcinol may be replaced by aromatic hydroxy compounds aining at least two OH groups in the meta position, thoresorcinol or phloroglucinol giving the reaction, st 2.7-dihydroxynaphthalene does not. The red ration with phloroglucinol is suitable for colorimetric rminations on account of its persistence, whereas the n furnished by naphthoresorcinol is too transient to be se.

he phenol character of the "red oil" of sesamé oil is fied to by the fact that certain sesamé oils furnish azo tuffs when mixed with diazonaphthionic acid (susled in water) and treated with an alkali. Other sesamé on the contrary, will not furnish these dyestuffs, and two kinds may be distinguished by the fact that the former give a deep emerald-green coloration, the latter an orange-yellow, when treated with nitric acid of sp. gr. 1·14. This reaction should not be confounded with that of Behrens (nitro-sulphuric acid).—C. S.

Cod-Liver Oil: Reaction for ——. Wolff. Pharm. Zeit., **48**, 235; Chem.-Zeit., **27**, [27], Rep. 86.

When 15 drops of cod-liver oil are treated with three drops of pure nitric acid (sp. gr. 1·50) in a flat porcelain dish, the pure oil exhibits, at the points of contact, red stripes that quickly turn red, passing over, on shaking, to a lemon-yellow colour permeating the whole mass. Oil from *Gadus carcharius* gives blue stripes, the mixture turning brown when shaken, and finally passing into lemon-yellow after 2—3 hours. Japan fish oil or shark oil gives red stripes in addition to the blue. Seal oil gives no coloration at first, the mixture turning brown only after some time has elapsed.

The above reaction will detect additions of extraneous fish oil up to 25 per cent., further guidance being afforded by the iodine and saponification values.—C. S.

Cod-Liver Oil; Medicinal ——. C. E. Sage. Chem. and Druggist, 1903, **62**, [1210], 571.

Owing to the recent rise in price of cod-liver oil, Newfoundland oil is being freely substituted for the superior Norwegian oil. According to the author the Newfoundland oil consists largely of menhaden oil and seal oil. The characters of these oils, together with those of good cod-liver oil, are as follows:—

—	Cod-Liver Oil.	Menhaden Oil.	Seal Oil.
Sp. gr.	0·923—0·930	0·927—0·933	0·924—0·926
Saponification value	179—190	192	142—152
Free acid (as oleic)	Maximum, 1 %	..	1·8—7·3 %
Iodine value......	153—170	160	142—152

The presence of cotton-seed oil can be detected by a slight modification of Becchi's test, and other vegetable oils by saponification of the portion of the oil which is soluble in 95 per cent. alcohol, and extracting with ether. Vegetable oils yield a residue of phytosterol, m. pt. 132°—134° C.; cod-liver oil yields cholesterol, m. pt. 146° C.
—A. S.

Alcohols and Allied Bodies; New Reaction for ——. Gavard. J. Pharm. Chim., [6], **17**, [8], 374.

If a small quantity of pure ether be cautiously floated on the surface of sulphuric acid (sp. gr. 1·847) containing from 5 to 20 per cent. of potassium nitrate, an intense blue colour will be developed, permeating the whole liquid, disappearing on agitation, with evolution of nitrogen dioxide: reappearing, however, on standing. This disappearance and reappearance may be obtained many times in succession. The temperature most favourable for the reaction is from 15°—30° C. No reaction takes place at −20° C., and warm liquids fail to give it. The reaction never becomes explosive, although the mixture of 500 c.c. of the reagent and 200 c.c. of ether gives rise to a violent disengagement of nitrogen dioxide. The following bodies give a similar reaction. Trioxymethylene, formal, acetone, ethylic aldehyde; methylic, ethylic, amylic, propylic, isopropylic, normal butylic, and isobutylic alcohols; sorbite, dulcite, mannitol, erythritol; benzyl alcohol; formic, trichloracetic, and lactic acids; acetic ether, amyl acetate, ethyl oxalate, acetal; levulose, glucose, xylose, arabinose, raffinose, and saccharose. The most marked reaction is obtained with a liquid substance at about 15° C. With solids, a fragment should be first mixed with 1 or 2 c.c. of the reagent, and just before charring takes place, 1 or 2 c.c. of water should be added. A few bubbles of gas will be evolved, and the colour will develop on standing, but it is much less intense than with liquids. The reaction is obtainable with a 4 per cent. aqueous solution of formal or of ethylic alcohol.—J. O. B.

Balsam of Tolu: Some Reactions of Syrup of ——. A. Astruc and J. Cambe. J. Pharm. Chim., 1903, **17**, [8], 367—371.

Commercial syrup of balsam of Tolu is prepared either by the official method of the Codex (and the B.P.), by digesting the balsam with water before dissolving the sugar, by precipitating an alcoholic tincture; or by admixture with a distillate of the balsam.

These syrups may be distinguished by the following reactions That prepared by the official, direct maceration method alone liberates iodine from potassium iodide solution in sufficient amount to give a yellow colour and a blue starch-reaction. Both the official syrup and that made by precipitation of the tincture give a marked yellowish-green in the presence of an excess of an alkali, as soon as the acids in the syrup have been neutralised. The syrup made from a distillate remains unaffected by either of the above reagents. It is thus possible, by these two tests, to differentiate the three varieties of syrup of balsam of Tolu. —J. O. B.

ORGANIC—QUANTITATIVE.

Glycerol; Determination of ——, in Crude Glycerins. J. Lewkowitsch. Analyst, 1903, **28**, [325], 104—109.

A few years ago the results obtained by the acetin process agreed well with those given by the bichromate process (this Journal, 1889, 5) in the case of crude glycerins, but of late years there is often considerable discrepancy in certain samples, this being attributed by the author to the use of less pure raw material, owing to the great increase in prices. Thus the amount of glycerol as determined by the bichromate method is frequently as much as 5 or 6 per cent., or more, higher than that found by the acetin process, since in the case of the former everything capable of oxidation to carbon dioxide is included, whilst in the latter, only substances that contain hydroxyl groups can be determined. Since the acetin process can only be used with concentrated solutions, the bichromate method is considered by the author to be more convenient for the examination of soap leys; but here, too, the results are shown to be too high when the leys are very impure. For exact determinations he recommends concentration of the purified leys and determination of the glycerin by the acetin method. For the purification of crude glycerins the author prefers the use of copper sulphate and potassium hydroxide to that of silver oxide (or carbonate) and lead subacetate. The results obtained with the latter reagents are somewhat higher than those obtained with the former reagents, as was also pointed out by Richardson and Jaffé (this Journal, 1898, 332).

Verley and Bolsing's modification of the acetin process (this Journal, 1901, 1250) has given unsatisfactory results in the author's hands, even in the case of pure glycerins, whilst Zeisel and Fanto's method (this Journal, 1902, 992) has proved both cumbersome and unreliable. —C. A. M.

Rubber Analysis; Use of Chloral Hydrate in ——. C. O. Weber. India-Rubber J., 1903, **25**, [8], 375.

The "acetone extract" obtained in the analysis of india-rubber articles may be further split up by treatment with boiling absolute alcohol, which dissolves the free fatty acids, resins (colophony), and waxes (beeswax, carnaüba wax), but leaves undissolved the fatty oils, mineral oils, tar oils, and solid hydrocarbons. Castor oil and blown oils, however, pass into the alcoholic solution.

The soluble portion, after evaporation of the alcohol, is treated with a 60 per cent. alcoholic solution of chloral hydrate at a temperature not exceeding 50° C., which dissolves the fatty acids, castor oil, blown oils, and resins, but not the waxes. The solution is evaporated to dryness and the residue treated with a 75 per cent. aqueous solution of chloral hydrate, in which the resin dissolves, leaving behind all the fatty bodies. The latter are dissolved in ether and evaporated in a weighed flask. The free fatty acids are titrated with standard soda, and the author considers it superfluous to differentiate between the castor oil and blown oils, as the two are equivalent in rubber mixtures.

The insoluble portion of the acetone extract is treated with 70 per cent. alcoholic chloral hydrate solution to dissolve the fatty oils, separated in a separating funnel, and the solution evaporated to dryness to obtain the fatty oils. The heavy tar oils, mineral oils, and solid hydrocarbons are washed into a wide-necked flask by means of hot acetone, the latter evaporated and the residue weighed. It is then treated with sulphuric and mono-hydrate, diluted with water, and cooled. If a turbid solution ensues, the whole mass consisted of heavy tar oils, but an oily mass floating on the acid solution, indicates mineral oils, or a solid substance, paraffin wax.

The difference between the total weight treated with sulphuric acid and the non-sulphonated constituents gives the weight of the heavy tar oils. The mineral oils may be separated from the solid hydrocarbons by glacial acetic acid.—J. K. B.

Alcohol; Determination of ——, in Spirits, Liqueurs, and Fruit Syrups. Fr. Zetzsche. Pharm. Centr., **44** [12 and 13]: Chem.-Zeit., 1903, **27**, [31], Rep. 98.

According to the author, the official sodium chloride and petroleum spirit (benzine) methods, and also other method he has examined, do not always give reliable results. H therefore recommends the following methods of his own:—

Petroleum Spirit Method.—100 c.c. of the alcoholic liquid under examination are either diluted to 200 c.c. in a 200-c.c. burette, or diluted with water, 200 c.c. distilled off, and the distillate rinsed into the burette. The liqui is then shaken up with 50 c.c. of light petroleum spirit, th volume of the aqueous layer which separates is read off and the latter is run off into a dry vessel. The remaining petroleum spirit is shaken up with 50 c.c. of water, an the aqueous layer, after its volume has been noted, is unite to the first aqueous solution. Three-fourths of the tota aqueous alcoholic liquid are saturated with sodium chloride and shaken up with 25 c.c. of petroleum spirit. Th aqueous layer is measured, after separation, and two-third of it are diluted with water and 100 c.c. distilled off Since the final distillate corresponds to one-half of the tota aqueous alcoholic liquid, and consequently to 50 c.c. of th original liquid, the calculation of the percentage of alcoho remains the same as in the sodium chloride method.

Carbon Tetrachloride Method.—100 c.c. of the alcoholi liquid are diluted to 150 c.c. in the burette, or, preferabl 50 c.c. are diluted with water, 100 c.c. distilled off, and th distillate made up to 150 c.c. The liquid is then shake up first with 50 c.c. of carbon tetrachloride, and the 3—4 times in succession with 25 c.c. of the same solven The carbon tetrachloride extracts are united in a separatin funnel and washed thrice with 30—50 c.c. of water. The washings are added to the aqueous alcoholic liquid in th burette, and the whole, after saturation with sodium chlorid is shaken up with 25 c.c. of carbon tetrachloride. Whe separation is complete, half of the aqueous liquid is distille till 100 c.c. have come over. The percentage of alcohol calculated in the same manner as before.—A. S.

Nitrogen (Organic); Determination of ——, in Presen of Nitric Nitrogen. A. Quartaroli. Staz. Sper. Agra Ital., 1903, **36**, [1], 47—51.

The method of destroying the nitric nitrogen by reducti with ferrous chloride, and determining the residual organ nitrogen by Kjeldahl's method, has several practical dra backs. Thus, if much nitric nitrogen be present, t reaction is violent, whilst in any case long-continu heating is necessary to completely expel the nitro vapours, during which a small proportion of the organ nitrogen may be lost. Numerous other reducing age have been tried, but none has presented any spec advantages over ferrous chloride. The author, howev has found a suitable reagent in formic acid, which oxidised by nitric acid, firstly to oxalic acid, and finally water and carbon dioxide, the nitric acid being reduced nitric oxide. The reaction also takes place readily adding nitric acid to dilute formic acid, or with a nitr the presence of sulphuric acid. Thus 1 grm. of sodium trate treated with 10 c.c. of formic acid (26 B.) and 5 c.c. concentrated sulphuric acid, was completely decomposed, d after being heated towards the end of the reaction, left liquid free from nitrogen. The author gives the results us obtained in the case of various mixtures of organic bstances with sodium nitrate, the figures being in close reement with the theoretical amounts of organic nitrogen. —C. A. M.

ormaldehyde ; Quantitative Determination of ——, in Commercial Formaline. C. Wällnitz. Der Gerber-Zeit., **46**, [1, 2, 3, 4, 6, 8, 12]; Chem.-Zeit., **27**, [27], Rep. 85.

COMPARATIVE examination of the various proposed ethods gave the following results :—

The Blank and Finkenbein hydrogen peroxide method quires, to furnish proper results, that the boiling should prolonged to half an hour, instead of the 3—10 minutes oposed. In the Romijn method, at least 70 c.c. of 5-iodine solution must be added to 5 c.c. of the circa per cent. formaldehyde solution, and fully 10 minutes are eded to complete the oxidation. Both methods then rnish decisive and concordant results. The Legler ethod gives lower, but still practically useful values ; but solic acid is a deceptive indicator, the colour change ing insufficiently clear.

The "urotropine method" proposed by a German nufactory of formaline, consists in leaving 5 c.c. of the malin solution to stand with 50 c.c. of normal ammonia a closed vessel for 15 minutes at 50° C. or 2—3 hours the ordinary temperature, and then titrating back with rmal acid at the ordinary temperature, the volume of monia consumed being multiplied by 9 to obtain the rcentage strength (vol.) of the substance. The values about 0·4 per cent. lower than those furnished by the evious methods, and the colour change is not very tinct. The anhydro-formaldehyde-aniline method, prosed by Trillat and Klar, requires absolutely pure aniline, d the colour change with Congo Red is indistinct ; but results are concordant with those of the two first-named thods. The Vanino silver method gives values below truth. The Schiff method is also suitable, provided mixture of formaldehyde and ammonium chloride (or phate) be treated direct with 50 c.c. of half normal istic potash (*i.e.*, an excess), and the whole left to stand ner 3 hours at the ordinary temperature, or 1½ hours at C., before titrating back with decinormal sulphuric d ; though here also the colour change with litmus is istinct.

The methods considered most reliable are those of nk and Finkenbein and Romijn, with the modifications icated.—C. S.

Chloral Hydrate ; Volumetric Determination of ——. . G. Hinrichs. Pharm. J., 1903, **70**, [1711], 530—532.

CORDING to the B.P. method for the valuation of chloral drate, if 4 grms. be heated with 30 c.c. of N. caustic soda ution, no more than 6 c.c. of N. sulphuric acid should required to neutralise the free alkali which remains on completion of the reaction. The method is based on reaction—

$$.Cl_3.CHO.H_2O + KOH = CCl_3H + H_2O + H.COOK.$$

e author found that if the term "heating" be taken to an warming until all odour of chloroform has disbeared, the method gives results varying from 180 to per cent. of theoretical, whilst under various other ditions, the theoretical amount may be tripled. rfectly reliable results can, however, be obtained by ng N/2 caustic soda solution, and completing the ction within two minutes at the ordinary temperature. accurately weighed quantity of chloral hydrate is solved in 50—100 c.c. of water, excess of N/2 alkali c.c. for each grm. of the sample) run in, and when a bidity due to separated chloroform is noticed, the xture is agitated till quite clear. The excess of alkali then determined by titration with N/2 sulphuric acid. The results are a little too high owing to the slight acidity which all samples of chloral hydrate show in aqueous solution.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Calcium Lead Orthoplumbate ; A Mixed ——. G. Kassner. Archiv der Pharm., 1903, **241**, [2], 143—148.

ON heating a mixture of equivalent quantities of lead oxide and calcium oxide at 450°—480° C. in presence of air free from carbon dioxide, no calcium metaplumbate is produced, but a mixture of uncombined lime and a new compound which must be regarded as a mixed calcium lead orthoplumbate, and to which the author assigns the formula $Ca.Pb.PbO_4$. The new compound, which is of a reddish colour, decomposes at temperatures above 550° C., free oxygen being evolved and a mixture of calcium orthoplumbate and lead oxide produced—

$$2Ca.Pb.PbO_4 = Ca_2PbO_4 + 3PbO + O.$$

—A. S.

Plumbic Acid ; Derivatives of ——. A. Colson. Comptes rend., **136**, [14], 891—892.

THE author has independently, and without knowing beforehand of their work, confirmed all the conclusions of Hutchinson and Pollard (J. Chem. Soc., 1896, **69**, 212). When red lead is treated with acetic acid, one-third only of the lead is obtained as tetracetate. If now chlorine be passed into the liquor, a precipitate of lead chloride and additional tetracetate is obtained. That this is not simply the precipitation of tetracetate already existing in the liquid is shown by the fact that the same precipitate is obtained when chlorine is passed into an acetic acid solution of ordinary lead acetate. The reaction is—

$$2Pb(C_2H_3O_2)_2 + Cl_2 = PbCl_2 + Pb(C_2H_3O_2)_4.$$

The tetracetate is readily separated from the chloride by treatment of the precipitate with boiling acetic acid ; the tetracetate dissolves and crystallises from the filtered solution on cooling. This mode of preparation of tetraderivatives of lead is not only advantageous in itself, but is applicable where the normal salts and the corresponding tetra-plumbic salts are not easily separable by differences of solubility.—J. T. D.

Alcohols ; Catalytic Decomposition of ——, by finely-divided Metals ; Primary Alcohols of the Ethylic Series. P. Sabatier and J. B. Senderens. Comptes rend., **136**, [15], 921—924.

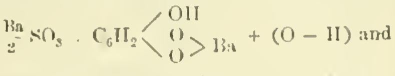
THE action of reduced copper, nickel, cobalt, and spongy platinum on ethyl alcohol was described by the authors in a former communication (Comptes rend., **136**, 738), and they have extended their work with the first three metals to other alcohols of the series (methyl, ethyl, normal propyl, normal butyl, isopropyl carbinol, and ordinary amyl alcohols). In all cases the primary reaction is the same, a decomposition of the alcohol into aldehyde and hydrogen ; but there is always some decomposition of the aldehyde into carbon monoxide and a lower paraffin :—

$$C_nH_{2n+1}.CH_2OH = C_nH_{2n+1}.CHO + H_2.$$
$$C_nH_{2n+1}.CHO = C_nH_{2n+2} + CO.$$

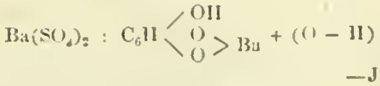
In general, the temperature required to initiate the first reaction (200° C. for methyl alcohol with copper), rises as the series is ascended ; but the second reaction occurs more readily with the higher aldehydes (save in the case of formaldehyde). With copper, the method affords a good way of preparing aldehydes, the range of temperature between that at which aldehyde begins to form and that at which it is rapidly decomposed being considerable, even in the case of amyl alcohol. The action with nickel is in all cases much more violent than with copper, but the speed of the second reaction is increased considerably relatively to the first, and the products are complicated by the direct action of the nickel on the carbon monoxide. Cobalt differs farther from copper than nickel does, and in the same direction.—J. T. D.

Pyrogallolsulphonates of Alkali-earth Metals; Action of Alkali-earth Bases on ——. M. Delage. Comptes rend., **136**, [14], 893—895.

When to a cold aqueous solution of pyrogallolmono- or disulphonate of calcium, strontium, or barium, the corresponding hydroxide is added, coloured substances are formed. The reactions involved are not yet fully investigated, but the substances exhibit a regular gradation in characters with molecular weight and degree of sulphonation. These substances are flocculent precipitates, drying to amorphous powders, varying in colour from bright blue to bright violet. Acids dissolve them, destroying the colour and forming yellow solutions; and they are readily oxidised in the moist state, especially in presence of alkali. They are, however, stable in the dry state. They are evidently oxidation products, but their constitution is not yet determined. The author formulates the two barium compounds as—



$$\frac{Ba}{2}SO_3 \cdot C_6H_2\begin{cases}OH\\ O\\ O\end{cases}\!\!>Ba + (O - H) \text{ and}$$



$$Ba(SO_4)_2 : C_6H\begin{cases}OH\\ O\\ O\end{cases}\!\!>Ba + (O - H)$$

—J. T. D.

New Books.

Lead Poisoning in Earthenware and China Works. Ordered by the House of Commons to be printed, April 1, 1903. Eyre and Spottiswoode. Printed for His Majesty's Stationery Office. East Harding Street, Fleet Street, London, E.C. 1903. Price 1*d*.

Return of the cases of Lead Poisoning reported as occurring in China and Earthenware Works during the years 1899 to 1902, showing (1) the number of cases in the several classes of works and in the various processes; the number of persons employed. (2) The number of cases occurring in each month of the year. (3) Particulars as to the character of the attacks. (4) The number of persons suspended in certain districts by the certifying surgeons (in continuation of Parliamentary Paper, No. 61, of Session 1902).

Der Stickstoff und seine wichtigsten Verbindungen. Von Dr. Leopold Spiegel, Privatdozent an der Universität Berlin. Friedrich Vieweg und Sohn, Braunschweig. 1903. M. 20. H. Grevel and Co., 33, King Street, Covent Garden, London.

8vo volume containing 901 pages of subject-matter with a few illustrations, preface, table of contents, and alphabetical index. After 28 pages devoted to nitrogen as an elementary body, the nitrogen compounds are treated of as follows:—I. Nitrogen Halogen Compounds. II. Oxygen Compounds. III. Sulphur Compounds. IV. Nitrides. V. Phosphorus Compounds of Nitrogen. VI. Arsenides. VII. Carbides of Nitrogen, &c. VIII. Silicon Nitride. IX. Titanium Compounds. X. Zirconium Compounds. XI. Boron Compounds. XII. Nitrogen in Closed-Ring Systems. XIII. Alkaloids. XIV. Proteids. XV. Analytical. XVI. Appendix.

Analytical Chemistry. By F. P. Treadwell, Ph.D., Professor of Analytical Chemistry in the Polytechnikum, Zürich. Translated from the Second German Edition by Wm. T. Hall, Massachusetts Institute of Technology. Vol. I. Qualitative Analysis. First Edition. John Wiley and Sons, New York. 1903. Price 3 dols. Chapman and Hall, Ltd., London.

8vo volume, with prefaces, translator's note, table of contents, &c., and 459 pages of subject-matter, with alphabetical index. The subject as a whole is subdivided as follows:—I. Introduction. II. Reactions of the Metals (Cathions), Groups (v) to (i). III. Reactions of the Metalloids (Anions). Division of Acids into Groups (i) to (vii). Course of Analysis. Supplement. Reactions of some of the Rarer Metals: Group (v) (Alkalis); Group (iii) (Beryllium, &c.); and Group (ii) (Thallium, &c.).

Tests and Reagents, Chemical and Microscopical, known by their Author's Names, together with an Index of Subjects. Compiled for the use of Chemists, Microscopists, Pharmacists, Students, &c. By Alfred J. Cohn, Ph.G. Author of "Indicators and Test Papers," &c. First Edition. John Wiley and Sons, New York. 1903. Price 3 dols. Chapman and Hall, Ltd., London.

8vo volume, containing preface, and subject-matter extending over 383 pages. The first part of this work (pages 1—339), is devoted to such distinctive reactions as are known by their authors' names (such, *e.g.*, as "Caro's Reagent," "Fischer's Reaction," &c.). Under these names, alphabetically arranged, the reactions in question are defined. The second part of the work (pages 341 to 383) contains, alphabetically arranged, the substances, &c. which form the subjects of the tests given in Part I. of the work. Thus under "Aldehydes," we find "Fischer's reaction" is one given for detection.

Trade Report.

I.—GENERAL.

Trade of Cape Colony in 1902.

Bd. of Trade J., April 23, 1903.

The following tables show the value of the imports an exports, including transit trade in both cases, of certai articles into and from the Colony during 1901 and 1902:—

Imports into Cape Colony.

Articles.	1901.	1902.
	£	£
Metals and metal manufactures (includes iron, lead, machinery, and hardware) ..	1,692,000	3,088,000
Provisions, oilman stores, &c. (n.o.d.)....	1,193,000	1,635,000
Leather and leather manufactures (includes boots and shoes, and saddlery and harness)	984,000	1,504,000
Alcoholic beverages (includes wine, beer, and spirits)	731,000	1,005,000
Drugs and chemicals	293,000	422,000
Coal, coke, and patent fuel................	368,000	398,000
Soap and candles	232,000	293,000
Cocoa and chocolate and confectionery...	226,000	283,000
Pipes, iron and earthen..................	121,000	184,000
Oil, mineral	118,000	181,000
Earthenware and crockery................	92,000	140,000
Paints and colours.......................	70,000	111,000
Cement..................................	68,000	111,000
Dynamite and blasting compounds.......	76,000	70,000
Total of all merchandise.......... £	19,745,000	29,575,000

Exports from Cape Colony.

Articles.	1901.	1902.
	£	£
Gold (raw)	1,226,000	5,915,000
Diamonds	4,930,000	5,127,000
Wool (washed, scoured, and in the grease)	1,489,000	1,030,000
Hides and skins	418,000	483,000
Copper ore.............................	571,000	273,000
Total of all merchandise..........£	10,173,000	15,833,000

Octroi Duties; Abolition of ——, in Rouman and Substitution of Excise Duties.

Bd. of Trade J., April 16, 1903.

The Board of Trade have received, through the Foreig Office, copy of a new Roumanian Law, in French translatio which was to come into force on the 1st/14th Apr providing for the abolition of all octroi dues in Rouman both in the urban and rural communes, and for the creatio stead of a general communal fund derived from excise ties leviable on foreign and native produce.

In place of the 134 octroi taxes which were formerly vied at the town or village barriers, 38 new duties have en imposed, and these will be levied by the Customs on ticles arriving from abroad, and by *employés* of the State local products and manufactures at the place of production.

The payment of the new dues, which are in nearly every ee inferior to the octroi hitherto levied, will always be companied by the presentation of a ticket showing that further dues can be levied at any communal boundary; e State has, moreover, in order to facilitate the effectual orking of the new *régime*, organised the establishment of system of State or authorised private bonded warehouses, *entrepôts*, by means of which system the importer or oducer will only be obliged to defray the accumulated ate dues at the time of the sale of his goods.

The following table shows the 38 classes of goods which e duitable under the new *régime*, and the rates of duty iable thereon :—

Description of Article.	Unit.	Rate of New Due.	
		Frs.	Cts.
Spirits of wine (alcohol)	Per degree and per decalitre	0	06
All other alcoholic preparations containing untaxed alcohol	kilo.	1	00
Spirituous essences	„	2	50
Essential oils	„	1	50
Oils called "iris," "ylang," "ilanzroza," "fleur d'oranger," and "neroles," and all compound oils used for the manufacture of liqueurs	„	10	00
Liqueurs containing untaxed alcohol.	„	1	60
Beer	„	1	00
Beer yeast, compressed or liquid	„	0	30
Brandy containing untaxed wine	„	0	50
Vinegar made from untaxed wine and vinegar made from alcohol and other products	decalitre	0	30
Essences of vinegar made with acetate of lime and other products	litre	0	75
"Tzuica" and other fruit alcohols up to 30°	decalitre	0	70
"Tzuica" above 30°	per degree and per decalitre	0	03½
Refined petroleum	kilo.	0	05
Mineral oils and cod liver oil	„	0	05
Sugar, refined, raw, and candy	„	0	10
Glucose	„	0	02½
Sweetmeats of all kinds prepared with untaxed sugar or with alcohol	„	0	50
Coal, coke, and briquettes manufactured of untaxed coal	ton	1	00
Olive oil and all other edible vegetable oils	kilo.	0	08
Cocoa in the bean	„	0	08
Cocoa in powder, chocolate of all kinds containing untaxed cocoa	„	0	20
Rice	„	0	04
Wheat and rye flour for bakers	100 kilos.	0	75
Gluten, semolina, tapioca, sago	kilo.	0	05
Farinaceous pastes containing untaxed flour	„	0	10
Stearic acid (stearin) and fatty acids.	„	0	12
Stearin candles containing untaxed stearin	„	0	15
Mineral waters, natural or artificial	„	0	07

II.—FUEL, GAS, AND LIGHT.

ETYLENE; GERMAN VILLAGE INSTALLATIONS OF ——.

H. Vogel. Acetylene in Wissensch. und Ind., 1903, 6, 73.

By the early part of 1900, 25 German villages had already en provided with central installations of acetylene; and ce that date several more have been brought into operan, although the use of the gas for this particular purpose s not (till quite recently again) continued to spread as pidly as at first. In conjunction with Caro, the author has spected most of these plants on the spot, and reports his servations in the present communication to the German etylen Verein.

Technically the installations have proved an unqualified success. In the erection of some of the earliest, mistakes were made in matters of detail, such as the dimensions of the distributing mains, &c.; part of these have had to be made good, but others remain, causing the enterprises referred to to suffer from over-capitalisation in comparison with the installations more lately laid down. Moreover, some of the plants remained the property of the firms building them, whose offices were at a distance; and this has given rise to a lack of economy in working, no technical supervision being available locally. Much waste of gas has occurred by excessive use of water in the generators, for 10 vols. of water dissolve 11 of acetylene; and, unless rigidly controlled, the gas-maker is tempted to wash out his apparatus too copiously, as the process simplifies the removal of sludge. Acetylene plants of this character ought to be fitted with water-meters. The more recent installations, which have been erected more economically, though quite soundly, and which belong either to the local authority of the village or to a local company, are more successful financially; but even here, some have been erected in unsuitable districts.

The author considers that, under German conditions, the price of calcium carbide delivered to a village installation should not exceed M. 25 per 100 kilos., if the gas is to compete with other artificial illuminants. Nevertheless, at the present price of M. 28, which appears to be a fairly permanent one, acetylene can be sold at M. 1.80 per cb. m.; and in this case the enterprise is self-supporting provided about 150 flames are supplied for every 1 kilom. of main. When a village is too scattered to permit this, it is better to erect a number of smaller installations each supplying a "block" or district.

Under German conditions, however, if the district be more compact than already suggested, there is no illuminant that can compete with acetylene for the complete service of towns containing up to 8,000 or 10,000 inhabitants either as regards lowness of capital expenditure or simplicity in use. The experience already gained shows that a place of 4,000 or 5,000 inhabitants can be provided with a well-built installation of acetylene for 70,000 marks, which includes 8 kiloms. of main, 80 or 100 public lamps complete with burners and mantles, 150 meters, supplies to 1,500 private burners, a holder storing 100 cb. m. of gas, and heating apparatus for the plant, but excludes the cost of the ground on which the works are built. A coal gas plant of similar size would cost at least 160,000 marks, and an electricity supply station 200,000 marks. In summer time the attendant upon such a plant would only be occupied about one hour per day; in winter even he would not be fully engaged with it. No other artificial illuminant suitable for small towns affords light with so little vitiation of the atmosphere as acetylene; and no other illuminant is so safe to the consumer. Numerous accidents and explosions have occurred with acetylene, but these have always taken place in connection with small apparatus, and they have been mostly due to carelessness with a naked light. All the explosions which have occurred, have been in or near the plant-house; when once the gas has left the generating plant, it may be considered safer than coal gas, for owing to its high illuminating power, the pipes and burners are so small that leakage to a dangerous extent is almost impossible.

In the discussion following this paper Caro took exception to Vogel's minimum remunerative number of 150 flames per kilom., suggesting 50. Caro, however, refers to flames in regular nightly use; Vogel to total burners connected with the service.—F. H. L.

IV.—COLOURING MATTERS, Etc.

α-NAPHTHYLAMINE HYDROCHLORIDE: U.S. CUSTOMS DECISION.

Eng. and Mining J., April 18, 1903.

α-Naphthylamine hydrochloride, produced by treating α-naphthylamine with hydrochloric acid, is not entitled to free entry under the provisions of paragraph 524, Act of July 24, 1897, as "naphthylamine," but is properly dutiable, at the rate of 20 per cent. *ad valorem*, under the provisions of paragraph 15 of said Act, as a "preparation of coal tar."

VIII.—GLASS, POTTERY, Etc.

LEAD-POISONING IN EARTHENWARE AND CHINA WORKS.

Return compiled by T. Cochrane, of the Home Office, for the House of Commons, April 1, 1903.

The number of lead-poisoning cases has considerably decreased during the past four years, the figures for earthenware and china works and for all other industries under the Factory and Workshops Act being, respectively, 1899, 249 and 1,009; 1900, 200 and 858; 1901, 106 and 757; 1902, 87 and 542. The proportion of cases to persons employed in earthenware and china works has also decreased, the figures being, 1899, 3·9 per cent.; 1900, 3·1; 1901, 1·7; and 1902, 1·4 per cent. The number of deaths and the severity of the symptoms among the non-fatal cases also showed a considerable diminution in 1902. The proportion of women affected was more than double that of men. (See also under "New Books.")—A. S.

X.—METALLURGY.

OPEN-HEARTH STEEL PRODUCTION IN 1902.

Eng. and Mining J., April 18, 1903.

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of open-hearth steel in the United States in 1902.

The total production of open-hearth steel ingots and castings in the United States in 1902, was 5,687,729 gross tons, against 4,656,309 tons in 1901, an increase of 1,031,420 tons, or over 22 per cent. As compared with 1898, five years ago, when the production of open-hearth steel amounted to 2,230,292 tons, there was an increase in 1902 of 3,457,437 tons, or over 155 per cent. The following able gives the production of open-hearth steel ingots and castings, by States, since 1899, in long tons:—

States.	1899.	1900.	1901.	1902.
New England	57,124	74,522	170,876	179,923
New York and New Jersey	61,461	67,361	82,985	92,763
Pennsylvania	2,393,811	2,699,502	3,594,763	4,675,364
Ohio	117,458	130,191	184,943	238,854
Illinois	246,183	285,551	398,522	435,461
Other States	71,279	141,008	224,220	325,364
Total	2,947,316	3,398,135	4,656,309	5,687,729

In the following table the production by States of both acid and basic open-hearth steel in 1902 is given, again in long tons:—

States.	Basic.	Acid.	Total.
New England	110,961	68,962	179,923
New York and New Jersey	54,296	38,467	92,763
Pennsylvania	3,459,702	915,662	4,375,364
Ohio	195,700	83,154	278,854
Illinois	384,951	50,510	435,461
Other States	290,923	34,441	325,364
Total	4,496,533	1,191,196	5,687,729

The increase in the production of acid steel in 1902, as compared with 1901, was 153,880 tons, or almost 15 per cent., while the increase in the production of basic ste was 877,540 tons, or over 24 per cent.

—	1901.	1901.	1902.	1902.
	Tons.	Per Cent.	Tons.	Per Cent.
Acid	1,037,316	22·3	1,191,196	20·9
Basic	3,618,993	77·7	1,496,533	79·1
Total	4,656,309	100·0	5,687,729	100·0

The production of acid and basic open-hearth steel f 1901 and 1902 is compared in the foregoing table.

The total production of open-hearth steel castings 1902, included above, amounted to 367,879 gross to The following table gives the production of open-hear steel castings by the acid and basic processes in 1902, States, in gross tons:—

States.	Acid.	Basic.	Total.
New England, New York, and New Jersey	33,158	3,883	37,04
Pennsylvania	141,385	11,014	152,39
Ohio, Illinois, and other States	80,932	97,507	178,43
Total	255,475	112,404	367,87

In 1901 the production of open-hearth steel castin amounted to 301,622 tons, of which 94,941 tons were ma by the basic process, and 206,681 tons by the acid proces

MINERAL PRODUCTION OF TENNESSEE.

Eng. and Mining J., April 4, 1903.

The following figures have been supplied by the Comm sioner of Labour, Statistics, and Mines:—

Barytes.—In 1902 there were 3,255 short tons (2,000 lb.) of barytes produced. Only one mine was work during the year. There are mines at Cleveland, Swe water, and Madisonville; also at Sinking Springs, in Sev County, and a larger production is expected this year.

Iron Ore.—The output of iron ore in 1902 includ 300,627 tons of brown hæmatite and 288,243 tons of hæmatite; a total of 588,870 long tons (of 2,240 lb.).

Phosphates.—The total production of phosphates in State of Tennessee in 1902 was 154,078 long tons 2,240 lb.). The total value was 1,311,161 dols., an aver of 2·95 dols. per ton at mines.

Of the phosphate mined, 347,078 tons came from Mount Pleasant region. Of this, 105,530 tons w exported. The average prices realised in this field w 2·90 dols. per ton for phosphate rock shipped to dome points, and 3·25 dols. for rock exported.

MINERAL EXPORTS OF PORTUGAL.

Foreign Office Annual Series, No. 2954, *April* 1903.

The quantity and value of the minerals exported fr Portugal in the years 1902 and 1901 are shown in following table:—

Minerals.	1902.		1901.	
	Quantity.	Value.	Quantity.	Val
	Tons.	£	Tons.	£
Antimony	54	844	126	5
Lead	1,723	3,450	328	2,0
Copper	143,647	199,170	189,869	135,8
Iron	25,673	11,520	21,359	10,1
Manganese	1,235	520	..	.
Not specified	878	5,670	960	45
Total	..	220,674	..	210,9

CHROME ORE IN THESSALY.

Foreign Office Annual Series, No. 2947.

His Majesty's Consul at Volo, in his recent report, sta s that chrome ore and "verde-antico" marble are extra d in Thessaly, the latter by a British company. The chr e ore is worked and exported, principally in British botto , by the Greek owners of the property on which it is fou l, and considerable and increasing consignments are annu y shipped to the United Kingdom, the Continent, d merica. The quality of this Thessalian ore is such as to nder it particularly useful to constructors of certain classes ovens and furnaces, who employ it for backing and lining eir productions.

BRASS ASHES: U.S. CUSTOMS DECISION.

April 1, 1903.

Brass foundry ashes, valuable only for the brass therein ntained, were decided to be free of duty as scrap brass ıder paragraph 505 of the Tariff Act of 1897, and not ıtiable at 10 per cent. *ad valorem* as waste under para-aph 463.—R. W. M.

XII.—FATS, OILS, Etc.

BEESWAX PRODUCTION IN MADAGASCAR.

Bd. of Trade J., April 16, 1903.

The following particulars relative to the production of d trade in beeswax in Madagascar are taken from a report the Governor-General of the island published in *La uinzaine Coloniale* of March 10.

The exports of wax in 1901 amounted to 262,923 kilos., ıued at 649,730 frs. (25,989*l.*), as against 217,918 kilos., lued at 507,800 frs. (20,312*l.*), during the preceding year.

The chief exporting centres are Tamatave, Mananjary, ıtomandry, Farafangana, Majunga, Analalava, Diego-arez, Vohémar, and Maroantsetra. Rafia, gum-copal, d rubber are also collected by the natives at the same ne.

The average price of the wax (per 100 kilos.) at the rts of shipment is as follows :—

Port of Shipment :—	Price in Francs.
Tamatave	250
Majunga	200
Vohémar	200
Fort Dauphin	200
Mananjary	250
Maroantsetra	145 to 160

XIII. A.—PIGMENTS, PAINTS, Etc.

MINERAL BLACK: U.S. CUSTOMS DECISION.

March 30, 1903.

A mineral black, also described as earth colours, which ı analysis was shown to be a mixture of carbon black and rruginous mineral matter, was decided not to be dutiable a "black made from bone ivory or vegetable substance" 25 per cent. *ad valorem* under paragraph 47 of the Tariff t of 1897.

The action of the Appraiser, in returning for duty as a lour under paragraph 58 at 30 per cent. *ad valorem*, was stained.—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

PRODUCTION OF LANDOLPHIA RUBBER IN UGANDA.

Bd. of Trade J., April 16, 1903.

A memorandum on Landolphia rubber and its production Uganda, by Mr. John Mahon, Assistant in the Scientific d Agricultural Department of the Uganda Administration, tes that one of the best rubbers in commerce is that tained from a species of Landolphia. As far back as 76 the export of this rubber reached the value of 90,000*l.* om a district in East Africa (Mungao). All the evidence es to show that Landolphiæ of at least four species are undant in the forests of the Uganda Protectorate. In uth Central Africa, where Landolphia rubber is worked to considerable extent, practically no preparations beyond crude native methods are employed, and the product has adily brought from 2*s.* 6*d.* to 3*s.* 6*d.* per lb. in the London rket. But it is quite clear, owing to the peculiar climatic ıditions obtaining in Uganda, and a consequently marked ect on the growth and physiological character of vegetation, that to produce a good quality rubber, some trouble must be taken in curing. The native's method of exposing a thin layer of rubber latex to atmospheric action by spreading it on his arms and chest is not a good or suitable one. It has been proved by specimens sent home for report by the Scientific and Agricultural Department that exporting such an article is a mistake, for, although one may obtain by this method what appears to be a most suitable-looking specimen, yet it is to be remembered that the journey home and differences of climate will tell against the crudely-prepared product. Besides, the means of preparing a better article are so simple that there can be no question of the advisability of adopting them.

An even more important matter than curing must receive the undivided attention of the employer of native rubber collectors. It is this :—In most of the lake shore forests, growing side by side with the Landolphias, is found a huge, rank climber, with small, dark green leaves in pairs, and frequently bearing trusses of pretty star-shaped yellowish flowers, with a dark-coloured eye. The fruits, when ripe, are like a piece of slender dead branch, and are closely packed with thin seeds, carrying each a silky plume, which, like thistle-down, conveys the seed long distances. It is a species of Alfia. In the stems, branches, and leaves, watery latex abounds. On coagulation this latex proves to have no elasticity whatever. The product is not unlike a piece of damp asbestos; even mixed with Landophia latex in the proportion of Landolphia two, Alfia one, it practically destroys the elasticity of the Landolphia. It is well known that the native frequently taps this climber, and in Mr. Mahon's opinion it is mainly responsible for the low value and bad condition of rubber which has hitherto been prepared in Uganda.

There is an extensive demand for good rubber. Landolphia rubber is good. Unfortunately it is one of those native products which do not lend themselves to systematic cultivation. Therefore, the duration of its existence as a commercial product will be determined by the degree of energy with which the native products of Central Africa are exploited in the future. There are several fine rubber-yielding trees, plantations of which will, one trusts, be returning handsome profits to settlers in Central Tropical Africa long before the last Landolphia vine is tapped. Of these Hevea, the source of para rubber, the standard by which all rubbers are judged, Castilloa (Central American rubber), and Funtumia (Lagos silk rubber), are thriving most favourably in the Botanic Gardens at Entebbe, and it is proposed to experiment with these, and other reputable tree-rubbers, on a fairly considerable scale in order that planters may be informed and advised in the future what sorts to work with and what to avoid. It is always possible, too, that in the western portion of the Protectorate a rubber-yielding tree may one day be found; it is feasible to assume the Lagos silk-rubber tree may have spread beyond the Congo towards Uganda, for science knows comparatively little of the botanical wealth of that fine region. Meantime, it is known that the Uganda Protectorate is rich in Landolphia, and its produce is capable of being a source of much commercial enterprise for many years to come. It only requires to be treated in a common-sense fashion by the men working it. To people of business instinct there is no need to dwell at length on the folly of killing by negligence an industry which, with ordinary care, can be the means of affording a substantial return on the capital invested in it for a considerable time.

XIV.—TANNING; LEATHER; GLUE, Etc.

LIQUID ALBUMIN: U.S. CUSTOMS DECISION.

March 30, 1903.

A preparation of the above-named was assessed for duty as gelatin not over 10 cents a pound in value, at $2\frac{1}{2}$ cents a pound, under paragraph 23 of the Tariff Act of 1897. The importer claimed it to be dutiable at 25 per cent. *ad valorem* as a chemical compound, under paragraph 3. In the absence of any sample or evidence to support the importer's claim, the assessment of duty was sustained.

—R. W. M.

XV.—MANURES, Etc.

NITRATE PRODUCTION IN CHILE.

U.S. Cons. Reps., *April* 15.

The annual report of the Nitrate Association contains the following statistics of the supply of nitrate from Chile.

The production in 1902 amounted to 2,982,967,900 lb., or 146,131,900 lb. more than in 1901. The exportation amounted to 3,008,944,000 lb., as compared with 2,738,522,800 lb. in the previous year. The deliveries for consumption showed a considerable decrease in the period of greatest demand—January to May—as compared with the corresponding period in 1901. The total deliveries in 1902 amounted to 2,840,084,000 lb., or 293,703,200 lb. less than in 1901. The decrease to Europe and other countries was 333,999,800 lb.; to the United States there was a gain of 40,200,000 lb.

The total deliveries in each year of the quinquennial—1898—1902—were :—

	Lb.
1898	2,768,322,200
1899	3,071,276,900
1900	3,944,304,000
1901	3,133,787,200
1902	2,840,084,000

The visible supplies on December 31, 1902, were as under :—

	Lb.
On shore	576,607,400
Afloat	1,071,617,000
Supplies for foreign markets	1,648,224,400
Stocks on the coast	548,400,000
Total	2,196,624,400

The smallest number of works in operation in the four years was 44 in February, 1899, and the largest was 78 in December, 1902. The total of the quotas already assigned amounts to 4,041,500,000 lb., and it will soon be necessary to take into consideration the quotas for several new works, now in course of erection.

XVI.—SUGAR, STARCH, Etc.

SUGAR PRODUCTION OF GERMANY.

Bd. of Trade J., *April* 23.

According to statistics published in the *Reichsanzeiger*, the quantity of raw sugar produced in Germany during the period from 1st August to 31st March last, being the first eight months of the 1902-3 sugar campaign, was 1,485,081 metric tons,* as compared with 1,995,800 tons produced during the corresponding period of the previous sugar campaign. The quantity of refined sugar produced increased from 938,272 metric tons during the period, August to March 1902, to 976,432 metric tons during the period, August to March, 1903. The total sugar output in Germany during the period from 1st August 1902 to 31st March 1903, reduced to terms of raw sugar, amounted to 1,686,551 metric tons.

XVII.—BREWING, Etc.

ALCOHOL; CONGRESS ON ——, AT THE GENERAL MEETING OF THE ASSOCIATION DES CHIMISTES DE SUCRERIE ET DE DISTILLERIE DE FRANCE ET DES COLONIES.

Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, 20, [9], 943—944.

Germany produces four million hectolitres of alcohol and devotes 1,161,000 to industrial purposes; France produces 2,656,000 hectolitres, of which only 221,000 are used industrially, so that to reach the same proportion as in Germany (where the consumption of alcohol in beverages is stationary 521,000 hectolitres more than at present would have to b denatured.

The principal object of the Congress was to indicate th means to be adopted and the reforms necessary to attai this result. The following are the chief recommendation to be submitted to the Agricultural Commission of th Chamber of Deputies :—

1. Abolition of the large amount of wood spirit now use as a denaturing agent and the adoption of a mixture 2 litres of wood spirit bases, 1 litre of excise wood spiri and ½ litre of benzene per hectolitre of alcohol. This im provement would effect a saving of 6·45 frs. per hectolit over the present method of denaturing.

2. Unification of the tariffs for the whole of the con panies, and the return, free of charge, of packages used f the carriage of denatured alcohols.

3. That all alcohols considered as raw material of t various industries be exempt from duty; that the den turing be suited to the use for which it is intended, and th for alcohols which are to undergo no denaturing there established supervised factories.

4. That a special study be made of the various pharm ceutical and perfumery preparations with an alcoholic basi in order to find out the possibility of adapting denatur alcohol to the whole or a part of these preparations.

5. That French manufacturers using denatured alcoh as a raw product in their manufacture have the right establish works placed under the supervision of the exci in which this alcohol can enter free of all inland duty.

—L. J. de W.

DENATURING ALCOHOL IN ARGENTINA; FORMUL TO BE USED.

Bd. of Trade J., *April* 23, 1903.

In the *Boletin Oficial* of Argentina of March 11, decree is published, to come into force three months fr 5th idem, requiring all alcohol intended for illuminati heating, and preparation of varnish to be denatured by use of the following formula, *viz.* :—

Pyridine, 45 per cent.

Acetone (commercial), 45 per cent.

Eucalyptus essence (commercial), 10 per cent.

The alcohol is then denatured by an addition of 1 p of the mixture so obtained to 50 parts of alcohol.

When, however, special systems of illuminating requ for the best results of their plans the use of certain formul the National Chemical Office will examine experiments the necessity for the modification of the general form just expressed and will report to the "Ministerio Hacienda," who will decide.

XX.—FINE CHEMICALS, Etc.

PLATINUM AND PALLADIUM IN THE ORES OF THE RAMBLER MINE.

Wilbur C. Knight. Eng. and Mining J., *April* 18, 19

The Company owning the Rambler Mine, 45 miles sou west of Laramie, Wyoming, experienced considera difficulty in securing payment for the rare metals contai in the matte they produced, owing to the fact that no of the copper refiners were extracting them. On t account it was arranged that a refining test should made upon five car-loads of matte, in order that t Company might secure the entire contents in preci metals. A sample of this matte on assay gave the follow returns :—

——	Original.	Duplicat
	Oz. per Ton.	Oz. per T
Gold	0·45	0·40
Silver	7·10	7·48
Platinum	1·05	0·99
Palladium	3·15	3·25

---

* Metric ton = 1,000 kilos. = 2,204 lb. avoirdupois.

An assay upon a car sample of ore is also interesting:—

——	Original.	Duplicate.
	Oz. per Ton.	Oz. per Ton.
d	0·16	0·19
er	3·80	4·72
inum	0·74	0·69
adium	1·80	1·90

he platinum values found in the ore at this time do vary materially from the first tests announced. The sence of both osmium and iridium has been noted, and the present time work is being done upon the slimes en from the refinery, so that ere long more will be wn about the occurrence of these rare elements in this deposit.

SSENTIAL OILS; PRODUCTION OF ——, IN CYPRUS.

Die Chem. Ind., 1903, **26**, [8], 195.

ccording to the annual report of the Director of Horticure of Cyprus, 1,086 lb. of oil of thyme were prepared the year 1901–02, as against 615 lb. in 1900–01, and lb. in 1899—1900. The plants at present only occur the wild condition, chiefly in woods, but it would bably pay to cultivate them in different parts of the nd. A small quantity of rose oil has been annually duced at Milikouri since 1897. New plantations of mascene roses for distillation purposes have been made r Prodomos and in the district of Marathasa, notably edoula and Milikouri. The plant from which marjoram is distilled grows abundantly in the woods in the districts Kerynia and Paphos. Besides the plants from which the e oils mentioned are prepared, the climate of Cyprus is ourable for the cultivation of other plants suitable for preparation of essential oils.—A. S.

Patent List.

.B.—In these lists, [A.] means "Application for Patent," and .], "Complete Specification Accepted."

here a Complete Specification accompanies an Application, an risk is affixed. The dates given are (i) in the case of Applica- s for Patents, the dates of application, and (ii) in the case of plete Specifications Accepted, those of the Official Journals hich acceptances of the Complete Specifications are advertised.

omplete Specifications thus advertised as accepted are open to ectiou at the Patent Office immediately, and to opposition in two months of the said dates.

.—PLANT, APPARATUS, AND MACHINERY.

.] 8897. Schneider. Extraction apparatus. April 20.

,, 9002. Maggi. Treatment of liquid or solid substances. April 21.

,, 9078. Meyer (Meyer and Arbuckle). Condensation or concentration of syrups or similar fluids.* April 22.

, 9101. Schilde. Drying apparatus.* April 22.

,, 9144. Treves and Raffegeau. Apparatus for supplying liquids at any desired temperature. April 22.

,, 9182. Round. Receivers, condensers, &c., such as are used with nitric acid plants, &c. April 23.

,, 9229. Lapp. Filter-presses.* April 23.

,, 9308. Glass and Glass. Vacuum drying apparatus. April 24.

[A.] 9570. Lake (Patterson). Centrifugal separators.* April 28.

,, 9798. Rennerfelt. Centrifugal separating apparatus.* April 30.

[C.S.] 9307 (1902). Moller. Method of heating substances in crucibles, &c. April 29.

,, 9854 (1902). Boult (Rejat). Filters. April 29.

,, 10,844 (1902). Herriot. Multiple-effect apparatus for the concentration of liquids. April 29.

,, 3034 (1903). Herlitschka (*née* Lieske). Centrifugal separators. May 6.

,, 3296 (1903). Bennett and Bennett. Apparatus for heating and cooling liquids, &c. April 29.

II.—FUEL, GAS, AND LIGHT.

[A.] 9147. Hartridge. Manufacture of artificial fuel. April 22.

,, 9155. Griffin. Making and burning fuel, &c. April 23.

,, 9156. Griffin. Coking carbonaceous material and making coke briquettes. April 23.

,, 9169. Everitt and Redman. Extraction of tar and other impurities from illuminating gas. April 23.

,, 9185. Terry. Fuel. April 23.

,, 9276. Meikle. Heating furnaces. April 24.

,, 9396. Gutknecht. Utilisation of substances obtained in the purification of coal-gas.* April 25.

,, 9504. Lindemann (Korting). Gas producers.* April 27.

,, 9505. Waddell. Manufacture of coal briquettes. (U.S. Appl., May 17, 1902.)* April 27.

,, 9605. Pallenberg. Coking ovens or furnaces.* April 28.

,, 9608. Spiers, and Morgan Crucible Co. Crucible furnaces. April 28.

,, 9689. De Alzugaray. Crucible furnaces. April 29.

,, 9901. McLean and Paterson. Treatment of peat. May 1.

,, 9918. Lyle. Smokeless-fuel briquettes. May 1.

[C.S.] 10,876 (1902). Feld. Obtaining soluble cyanides from gas containing cyanogen. May 6.

,, 11,280 (1902). Schottmann. Incandescent mantles. May 6.

,, 12,445 (1902). Graham. Regenerative furnaces. May 6.

,, 13,327 (1902). Wills. Furnaces. April 29.

,, 113 (1903). Higham. Treatment and combustion of fuel. May 6.

,, 536 (1903). Wilcox. Manufacture of coke in retort ovens. April 29.

,, 4164 (1903). Peters. Producers for semi-water gas. April 29.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[A.] 9878. Helbing and Passmore. Solidification of mineral oils. May 1.

,, 9879. Helbing and Passmore. Solidification of mineral oils. May 1.

,, 10,004. Heber. Deodorising Russian oil of turpentine, &c., and benzine or petroleum spirit. May 2.

[C.S.] 13,936 (1902). Fischer. Continuous extraction of highly inflammable oils from petroleum, &c. May 6.

,, 4355 (1903). Justice (Weed). Obtaining volatile products from wood. May 6.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 8905. Imray (Meister, Lucius und Brüning). Manufacture of dyestuffs of the anthracene series, and materials therefor. April 20.

,, 9598. Imray (Meister, Lucius und Brüoing). Manufacture of new cyanine dyestuffs. April 28.

[C.S.] 11,521 (1902). Imray (Meister, Lucius und Brüning). Manufacture of esters of dialkylrhodamines. May 6.

,, 5792 (1903). Lake (Oehler). Manufacture of diazo dyestuffs. May 6.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 8983. Justice (U.S. Fibre Stopper Co.). Process of treating pulp stock.* April 21.

,, 9017. Cochins. Apparatus for manufacturing artificial threads. April 21.

,, 9532. Muller. Indigo dyeing.* April 28.

,, 9683. Cipollina. Apparatus for treating cotton.* April 28.

,, 9724. Jardin. Process of bleaching flax, hemp, cotton, straw, ramie, &c. April 29.

,, 9948. Kershaw. Machines for dyeing and otherwise treating yarn, &c. May 2.

,, 10,007. Sharp, and Sharp and Sons. Finishing of fabrics. May 2.

[C.S.] 6645 (1902). Lilienfield. Vehicles for supplying colours to textile materials. April 29.

,, 9408 (1902). Doull. Treating peat moss to obtain fibre. May 6.

,, 9658 (1902). Calico Printers' Association and Warr. Treating textile fabrics, &c., to render them non-inflammable. April 29.

,, 25,163 (1902). Nasmith. Mercerising cotton rovings and yarns. May 6.

,, 1 (1903). Caux. Dyeing fibres, yarns, and fabrics. May 6.

,, 5146 (1903). De Pass (Vacuum Dyeing Machine Co.). Dyeing machines. April 29.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 27,864 (1902). Mills (Boyeux and Mora). Dyeing or colouring marble, calcareous stone, &c., in unbaked or baked condition. May 6.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 9024. Doremus. Production of anhydrous alumina.* April 21.

,, 9142. Leslie. Manufacture and purification of carbonic acid gas. April 22.

,, 9182. Round. *See under* I.

,, 9360. Bollé (Chem. Fabr. Grünau Landshoff and Meyer A.-G.). Production of solid zinc hydrosulphite difficultly soluble in water. April 25.

,, 9412. Oliver and Bevan. Utilisation of lime waste of alkali works. April 25.

,, 9453. Hilbert. Manufacture of sulphuric acid.* April 27.

,, 9613. Howard and Hadley. Treatment of spent acid from galvanising works. April 28.

[A.] 9831. Ashcroft. *See under* XI.

,, 9953. Ratcliffe and Hall. Production of iron oxid and magnesium chloride from waste liquor galvanising works and iron liquor in the coppe recovery process. May 2.

[C.S.] 2461 (1902). Woltereck. Production of ammoni by synthesis. May 6.

,, 9803 (1902). Wildermann. *See under* XI.

,, 10,876 (1902). Feld. *See under* II.

,, 11,969 (1902). Harmuth and Zavoda. Apparatu for manufacturing sulphuric anhydride. May

,, 13,536 (1902). Castner Kellner Alkali Co., Smi and Baker. Purifying slaked lime, and heatu and purifying water. May 6.

,, 16,862 (1902). Parker. Production of phosphor May 6.

,, 23,642 (1902). Tranton. Complete purification brine or other saline solutions. May 6.

,, 4935 (1903). Eldred. Treatment of lime. April 2

VIII.—POTTERY, GLASS, AND ENAMELS.

[C.S.] 12,796 (1902). Johnson (Boehringer). Manufa ture of ceramic or earthenware masses or articl April 29.

,, 13,643 (1902). Adams. Kilns and muffles for fir ceramic ware. May 6.

IX.—BUILDING MATERIALS, CLAYS, MORTAR AND CEMENTS.

[A.] 8996. Maclay. Continuous burning Portland cem kilns.* April 21.

,, 9116. Macarthy. Applying enamel and glaze bricks, tiles, &c. April 22.

,, 9172. Ellison. Apparatus for manufacturing macadam. April 23.

,, 9508. Lilienthal. Production of artificial mar April 27.

,, 9835. Geissler. Manufacture of cement.* April

,, 9884. Wallis. Hardening artificial stone, & May 1.

[C.S.] 28,679 (1902). Laidet. Manufacture of artifi building materials, &c. (Int. Appl., May 1902.) May 6.

,, 3308 (1903). Imray (Carborundum Co.). Ma facture of refractory articles, such as bricks a crucibles. April 29.

,, 3630 (1903). Justice (Acheson Co.). Manufact of earthenware products, &c. May 6.

X.—METALLURGY.

[A.] 8881. Warne. Precipitation of metal compou from their solutions. April 20.

,, 8889. Anderson. Steel smelting and heating f naces. April 20.

,, 9061. Lauer. Production of bronze, &c. April

,, 9086. Talbot Continuous Steel Process, Ltd., Talbot. Manufacture of steel and ingot in April 22.

,, 9302. Mullier. Decarburisation of iron and st April 24.

,, 9337. Wolf. Separation of metals from their o April 21.

A.] 9346. Otto. Production of iron and steel by the direct reduction of iron ores.* April 24.

„ 9380. Gutensohn. Treating metallic sand to fuse the metal contained therein. April 25.

, 9479. Hemingway. Extraction of metals from sulphide ores of antimony. April 27.

„ 9715. Sorensen. Soldering aluminium.* April 29.

, 9988. Just, and J. J. Metal Syndicate. Manufacture of a metallic alloy. May 2.

[S.] 9300 (1902). Dewar. Manufacture of nickel carbonyl, and its treatment for production of metallic nickel. April 29.

, 12,163 (1902). Abel (Siemens and Halske A.-G.). Obtaining homogeneous bodies from vanadium, tantalum, or niobium. April 29.

, 12,859 (1902). Hopkins. Process for obtaining zinc. April 29.

, 14,036 (1902). Bertou. Pulverisation of metals. May 6.

, 4041 (1903). Talbot and Gredt. Manufacture of steel and ingot iron. (Int. Appl., Sept. 15, 1902.) May 6.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

.] 8964. Yai. Electric batteries.* April 21.

, 9121. Conrad. Voltaic cells. April 22.

, 9420. Peto and Cadett. Electrolytes for secondary batteries. April 25.

, 9571. Feldkamp. Storage batteries.* April 28.

, 9831. Ashcroft. Production of metals of the alkali group by electrolysis. April 30.

S.] 9803 (1902). Wildermann. Electrolytic decomposition of alkaline salts. April 29.

16,204 (1902). Hargreaves, Stubbs, and Kearsley. Electrodes for use in electrolysis. May 6.

11,973 (1902). Fischer. Negative plates for accumulators. May 6.

12,159 (1902). Abel (Siemens and Halske A.-G.). Manufacture of filaments or the like for electric incandescence lamps. April 29.

3698 (1903). Lilienfeld. Electrodes for arc lamps. May 6.

XII.—FATS, OILS, AND SOAP.

.] 8954. Finlay. Preparation of soap and other commodities liable to evaporation. April 21.

[S.] 14,027 (1902). Scott. Utilisation of waste waters from the digestion of rough tallow. May 6.

1788 (1903). Loeffler. Reducing oils or other fatty substances to a dry powder. May 6.

X.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

B.—Resins, Varnishes.

.] 8893. Strange, Graham, and Burrell. Manufacture of varnishes. April 20.

, 9882. Millar. Composition and manufacture of linoleum, &c. May 1.

[S.] 12,830 (1902). Blumer. Synthetical preparation of resinous substances. May 6.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 9415. Haas, Pfeströff, and Gillon. Method of tanning. April 25.

[C.S.] 10,628 (1902). Jenks, Clowes, and Hatschek. Material to be used for decolorising and clarifying tannin extracts and other liquids. April 29.

„ 3485 (1903). Reid. Manufacture of material for use as substitute for leather, rubber, wood, &c. May 6.

XV.—MANURES.

[A.] 8931. Cross and Dunbar. Combination of organic and inorganic materials for manuring and fertilising purposes. April 21.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 9078. Meyer (Meyer and Arbuckle). *See under* I.

[C.S.] 9506 (1902). Besson. Purification and concentration of saccharine juices and products from sugar manufactories. April 29.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 9106. Aspinall. Preparation of wort for brewing or distilling purposes. April 22.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 9615. Baker. Process of treating coffee.* April 28.

„ 9751. Parsons. Preparation of concentrated goods, &c. April 30.

B.—Sanitation; Water Purification.

[A.] 9452. Scott-Moncrieff. Apparatus for testing sewage. April 27.

„ 9558. Wanklyn and Cooper. Treatment of sewage. April 28.

C.—Disinfectants.

[A.] 9242. Seiffert. Process and apparatus for sterilising organic fluids. April 23.

XIX.—PAPER, PASTEBOARD, Etc.

[C.S.] 11,164 (1902). Lederer. Process of acetylising cellulose and materials containing cellulose. April 29.

„ 17,502 (1902). Thompson (Vereinigte Kunstseide-fabr. A.-G.). Manufacture of alkaline solutions of viscose. May 6.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 9322. Mills (Barbier). Manufacture of saccharin.* April 24.

„ 9327. Johnson (Koepp). Preparation of oxalates. April 24.

„ 9340. Wideen and Carbon Hydrate Chemical Co. Processes for obtaining carbon compounds having the general formula $C_{10}H_{16}O$.* April 24.

„ 9603. Perkin, Fontana, and Blumann. Purification of turpentine and other turpenes. April 28.

[C.S.] 9936 (1902). Wenghöffer. Manufacture of ketones. April 29.

[C.S.] 14,032 (1902). Wohl. Manufacture of acetyl chloride. May 6.

,, 2568 (1903). Bordas. Medicinal compound. April 29.

,, 6817 (1903). Crespo. Extraction of salicine from the bark of the red osier. May 6.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[C.S.] 12,818 (1902). Fry. Non-explosive and non-inflammable photographic film. May 6.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 8898. Wetter (Westfälisch-Anhaltische Sprengst Akt.-Ges.). Explosives. April 20.

,, 9091. Engelmann. Explosive in blasting. April

[C.S.] 9043 (1902). Escales. Manufacture of explosi of high disruptive power. April 29.

,, 14,585 (1902). Wetter (Westfälisch-Anhaltis Sprengstoff-Akt.-Ges.). Safety explosives blasting compositions. May 6.

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F. H. Leeds	II., III., XIII., XXI.
A. E. Leighton	XXII.
Herbert Levinstein, Ph.D., B.Sc.	IV., V.
J. McCrae, Ph.D.	IV.
G.W. MacDonald, M.Sc.	XXII.
W. G. McMillan	X., XI., XIV., XXII.
N. H. J. Miller, Ph.D.	XV.
C. A. Mitchell, B.A.	XII., XXII.
R. W. Moore	Trade Report.
A. More	VII., XVIII.
J. G. Parker, Ph.D.	XIV.
H. T. Pentermann	XVI., XVII.
T. H. Pope	XVI., XX., XXI.
F. W. Renaut	Index.
G. H. Robertson	XI.
Chas. Salter	II., III., XVI., XVII.
M. J. Salter	XIII.
R. Sandon	II.
J. Shields, D.Sc., Ph.D.	XI.
A. Shonk	Gen. Chem.
W. P. Skertchley	XII., XVIII.
E. Sonstadt	III., VII., X., XV.
E. Howard Tripp, Ph.D.	III., VII., XVI.
Charles T. Tyrer	XX.
L. J. de Whalley, B.Sc.	XVI.
Joseph T. Wood	XIV.

Canadian Section.

Chairman: W. R. Lang.

Vice-Chairmen: { G. P. Girdwood.
{ *Harold Van der Linde.*

Committee:

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Hugo Carlsson.
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W. G. Ellis.
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Thos. Heys.
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J. M. Sparrow.
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Hon. Secretary and Treasurer:

Alfred Burton, 42, Front Street West, Toronto.

The following take office in July next:—*Vice-Chairman:* F. J. Smale. *Committee:* J. Watson Bain, Thos. Davies, W. Lash Miller, Jas. P. Murray, M. J. Taylor, Harold Van der Linde.

Liverpool Section.

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Julius Raschen.
Alf. Smetham.
H. B. Stocks.
J. W. Towers

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Hon. Local Secretary:

T. Lewis Bailey, University College, Liverpool.

The following take office in July next:—*Committee:* A. Foden, E. L. Peck.

London Section.

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Committee:

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W. Kellner.
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A. Gordon Salamon.
W. S. Squire.
F. Napier Sutton.
L. T. Thorne.
C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:

A. R. Ling, Laboratory, 74, Great Tower Street, E.C.

The following take office in July next:—*Committee:* J. N. Connah, Bernard Dyer, R. J. Friswell, J. T. Hewitt, Thos. Tyrer.

Manchester Section.

Chairman: Ivan Levinstein.

Vice-Chairman: G. H. Bailey.

Committee:

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R. Clayton.
J. Craven.
W. Heys.
J. Hubner.
H. Levinstein.
W. J. Pope.
H. Porter.
T. Stenhouse.
H. L. Terry.

Hon. Local Secretary:

J. Carter Bell, The Cliff, Higher Broughton, Manchester.

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Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.
Committee:

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P. P. Bedson.
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H. Louis.
J. Mather.
John Pattinson.
W. W. Proctor.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
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The following take office in July next: *Chairman:* J. T. Dunn. *Vice-Chairman:* W. L. Rennoldson. *Committee:* N. H. Martin, A. Spiller.

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Committee:

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G. Drobegg.
W. F. Fuerst.
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E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schieffelin.
R. C. Schüpphaus
G. C. Stone.
M. Toch.
D. Woodman.
F. G. Zinsser.

Hon. Treasurer: R. C. Woodcock
Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

The following take office in July next:—*Committee:* Capt. H. C Aspinwall, Prof. C. F. Chandler, Dr. Wm. McMurtrie, Wm. H Nicholls, and T. J. Parker.

Nottingham Section.

Chairman: L. Archbutt
Vice-Chairman: F. Stanley Kipping
Committee

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F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
J. O'Sullivan.
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A. L. Stern.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.
Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

The following take office in July next:—*Chairman:* J. T. W *Vice-Chairman:* S. F. Burford. *Committee:* L. Archbutt, F. Sta ley Kipping, G. D. Lander. *Hon. Secretary:* S. R. Trotman.

Scottish Section.

Chairman: T. L. Patterson.
Vice-Chairman: D. J. Playfair.
Committee:

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E. M. Bailey.
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C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgo

The following take office in July next:—*Committee:* J. Ar l Fleming, G. H. Gemmell, J. Falconer King, J. S. Macarthur, M. Parker.

Yorkshire Section.

Chairman: Jas. E. Bedford.
Vice-Chairman: T. Fairley.
Committee

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E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.
Hon. Assistant Secretary: A. Turnbull.

The following take office in July next:—*Vice-Chairman* G Slatter. *Committee:* T. Fairley, W. M. Gardner, H. R Pr F. W. Richardson, Geo. Ward, Thorp Whitaker. *Hon. Local Se tary and Treasurer:* A. Turnbull.

N B.—The names in *italics* are those of members of Committee who retire from their respective offices at the end of the current se on.

Notices.

ANNUAL MEETING, BRADFORD, 1903.

Abridged Programme.

Wednesday, July 15th.

0.30 a.m. General Meeting. President's Address. Municipal Technical College.

1.0 p.m. Luncheon, at Midland Hotel, by invitation of the Local Committee.

3.0 p.m. Garden Party at "Ashdown," Apperley Bridge, by kind invitation of W. Edward Aykroyd, Esq., J.P.

8.0 p.m. Reception at the Town Hall by his Worship the Mayor of Bradford (Ald. David Wade, J.P.) and Mrs. Wade.

Thursday July 16th.

hole Day Excursion :—

(1) The Works of Messrs. Wm. Fison and Co., Burley-in-Wharfedale (Spinning and Manufacturing). Luncheon at Burley.

Afternoon visit to Farnley Hall, Otley, by kind invitation of F. H. Fawkes, Esq., J.P., to inspect Hall and Collection of Paintings by J. M. W. Turner, R.A.

orning Excursions :—

(2) The Works of Messrs. W. and J. Whitehead, Ltd. (Combing and Spinning). The Works of Messrs. Priestley's, Ltd. (Manufacturing).

(3) The Works of Messrs. Jas. Drummond and Sons, Ltd. (Combing, Spinning, and Manufacturing).

(4) The Works of Messrs. John Smith and Sons, Ltd. (Combing, Spinning, and Dyeing). The Works of Messrs. H. B. Priestman and Co. (Spinning and Manufacturing). The Works of Messrs. A. Priestman and Co. (Manufacturing and Finishing).

5) The Works of Messrs. Sir Titus Salt, Bart., Sons, and Co., Ltd. (Combing, Spinning, Manufacturing, and Dyeing).

6) The City Conditioning House (Testing of Wool, Tops, Yarns, &c.).

Note.—Luncheon will be provided: for Excursion 1 at Burley, and for all others at the Midland Hotel, Bradford.

ernoon Excursions :—

7) The Works of Messrs. Geo. Hodgson, Ltd. (Loom Makers).

8) The Works of Messrs. W. H. North and Co., Ltd. (Cotton Warp Dyeing, Sizing, and Mercerising).

) The Works of Messrs. Ed. Ripley and Son, Ltd. (Piece Dyeing and Finishing).

0) The Warehouse of Messrs. Law Russell and Co., Ltd. (Dress Goods).

Note.—This Excursion is specially suitable for Ladies.

The following has been arranged so that all Afternoon Parties may participate, with exception of Excursion 1:—

(11) The New City Fire Brigade Station, at 5 p.m. (Special turn-out of the Brigade.)

7.30 p.m. Annual Dinner at the Midland Hotel. President's Reception, 7 to 7.30. Ladies are especially invited to attend the Dinner.

Friday, July 17th.

Pleasure Excursion to Ripon, Studley Royal, and Harrogate.

8—10 p.m. Ladies' Evening, Midland Hotel.

10 p.m. Smoking Concert, Midland Hotel.

A detailed programme, with request form for tickets, is issued with this Journal.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Sir William Ramsay has been nominated to the office of President under Rule 8; Prof. P. Phillips Bedson, Mr. E. Carey, Mr. W. H. Nichols, and Prof. H. R. Procter have been nominated Vice-Presidents under Rule 8; and Mr. Ivan Levinstein has been nominated a Vice-President under Rule 11.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Members are hereby invited to nominate fit and proper persons to fill four vacancies among the ordinary Members of the Council. Forms for this purpose can be obtained, on application, from the General Secretary, or from the Hon. Local Secretaries of the Canadian and New York Sections.

Extract from Rule 18:—"No such nomination shall be valid unless it be signed by at least ten Members of the Society who are not in arrear with their subscriptions, nor unless it be received by the General Secretary, at the Society's Office, at least one month before the date of the Annual General Meeting, to the election to take place at which it refers. Nor shall any such nomination be valid if the person nominated be ineligible for election under Rules 12 or 15. No member shall sign more than one nomination form."

NEW SECTION AT SYDNEY, NEW SOUTH WALES.

The Council has granted the application of thirty members of the Society residing in New South Wales to be allowed to form a section, to be called the Sydney Section of the Society.

CENTENARY OF JOHN DALTON.

The centenary of the announcement by John Dalton of his discovery of the atomic theory was celebrated in Manchester on May 19 and 20 by the Manchester Literary and Philosophical Society, of which Dalton was president from 1817 until his death in 1844. In connection with this event, the Victoria University has conferred the honorary degree of Doctor of Science on Prof. J. H. Van't Hoff, of Berlin, and Prof. F. W. Clarke, of Washington, U.S.A.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

FIFTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY, BERLIN, JUNE 2–8, 1903.

List of British Delegates.

Royal Society.—Dr. W. H. Perkin, F.R.S.; Dr. J. Emerson Reynolds, F.R.S.; Prof. H. E. Armstrong, F.R.S.; Dr. T. E. Thorpe, C.B., F.R.S.

British Association for the Advancement of Science.—Sir Henry E. Roscoe, F.R.S.; Prof. Jas. Dewar, F.R.S.; Prof. R. Meldola, F.R.S.

Chemical Society of London.—Prof. W. A. Tilden, F.R.S.; Prof. W. H. Perkin, jun., F.R.S.; Prof. Wyndham R. Dunstan, F.R.S.; Dr. Alexander Scott, F.R.S.

Royal Institution of Great Britain.—Sir Wm. Crookes, F.R.S.; Geo. Matthey, F.R.S.; Dr. L. Mond, F.R.S.

Institute of Chemistry of Great Britain and Ireland.—Prof. J. Millar Thomson, F.R.S.; George T. Beilby; Dr. J. Lewkowitsch.

Royal Agricultural Society of England.—Dr. J. Augustus Voelcker.

Iron and Steel Institute.—Wm. Whitwell; R. A. Hadfield; J. E. Stead; Bennett H. Brough.

Royal Society of Edinburgh.—Prof. Jno. Gibson; Dr. J. B. Readman; Jas. F. Pullar.

University of Oxford.—J. E. Marsh; P. Brereton Baker; W. W. Fisher; P. Elford.

University of Glasgow.—Prof. Jno. Ferguson; George T. Beilby.

University College, London.—Sir Wm. Ramsay, K.C.B., F.R.S.

Victoria University.—Dr. A. W. Bone; Dr. T. L. Bailey; Dr. J. B. Cohen.

Durham College of Science.—Dr. J. W. Swan, F.R.S.; Dr. J. T. Merz; J. W. Spencer; Prof. P. Phillips Bedson.

British Pharmaceutical Conference.—Dr. F. B. Power.

Municipal School of Technology, Manchester.—Prof. W. J. Pope, F.R.S.; J. Hübner.

Institute of Mining and Metallurgy.—Prof. H. Bauerman; Dr. T. Kirke Rose; J. H. Collins; H. L. Sulman.

Society of Dyers and Colourists.—Dr. E. Knecht, Dr. P. Krais; E. Hickson; Walter M. Gardner.

Royal Photographic Society.—Sir Wm. Abney, K.C.B., F.R.S.; Major-Gen. J. Waterhouse; Prof. R. Meldola, F.R.S.; C. H. Bothamley.

Society of Arts.—Prof. Jas. Dewar, F.R.S.; Dr. W. H. Perkin, F.R.S.; Prof. J. Millar Thomson, F.R.S.; Jos. G. Gordon.

Faraday Society (Electro-Chemists and Electro-Metallurgists).—Prof. A. K. Huntington; Dr. R. A. Lehfeldt; Dr. O. J. Steinhart; R. S. Hutton.

Society of Public Analysts.—Otto Hehner; Bertram Blount.

Federated Institute of Brewing.—C. O'Sullivan, F.R.S.; A. Gordon Salamon.

Association of Leather Chemists.—Dr. J. Gordon Parker.

Society of Chemical Industry.—Ivan Levinstein; Dr. L. Mond, F.R.S.; Walter F. Reid; Thos. Tyrer.

List of Members Attending the Congress.

Dr. L. Baekeland, George T. Beilby, Dr. J. F. Bottomley, H. Brearley, Dr. Jno. Clark and lady, J. M. Collett, L. M. Deane, Dr. E. Divers, H. Ellison, Dr. Thos. Ewan, Dr. A. G. Faulds, Jno. S. Ford and lady, Walter M. Gardner, Wm. Garroway, C. A. Goodwin, Dr. Thos. Gray, Oscar Guttmann, R. A. Hadfield, George Haller and lady, Dr. A. P. Hallock, Dr. E. Hart, Prof. W. N. Hartley, E. Grant Hooper, J. Hübner, R. S. Hutton, Gordon James, J. H. C. Kershaw, Holman Kingdon, Dr. E. Knecht, Ivan Levinstein, Dr. J. Lewkowitsch, J. W. Macdonald, Peter MacEwa and lady, Dr. K. E. Markel, J. E. Marsh, C. H. Martin Prof. R. Meldola, F. T. Munton, E. K. Muspratt, Max Muspratt and party, Wm. Pearce, Prof. W. J. Pope Dr. F. B. Power, Christopher Rawson, Dr. J. B. Readman Walter F. Reid, Sir H. E. Roscoe, E. R. Taylor, Dr. L T. Thorne, Prof. W. A. Tilden, Max. Toch, Dr. J. A Voelcker, Alex. Watt and lady, D. T. Williams, T. J Wrampelmeier.

List of Members Elected

22nd MAY 1903.

Allen, A. L., The Hollies, Hough Green, near Widne Chemist.

Allen, J. F., 147, Withington Road, Whalley Rang Manchester, Metallurgist and Chemist.

Bacon, R. A., 31, West 17th Street, New York City, U.S. Manufacturing Chemist.

Ballantyne, W. H., 111, Hatton Garden, London, E. Patent Agent's Assistant.

Baltzly, E. B., c/o Acker Process Co., Niagara Falls, N. U.S.A., Chemist and Superintendent.

Cranmer, Ridgeway, 170, West 88th Street, Brooklyn, N. U.S.A., Chemist.

De Blois, W. H., Capelton, P.Q., Canada, Chemist.

Faxon, W. A., 401, Main Street, Buffalo, N.Y., U.S. Chemist.

Feilmann, M. E., The Grammar School, Shaftesbury, Do Chemist.

Georgii, Max, 606, F. Street, N.W., Washington, D., U.S.A., Patent Attorney.

Ghose, Anukul, 42, Shambazar Street, Calcutta, In Analyst.

Gould, Sanford, c/o John Matthews; 333, East 26th Str New York City, U.S.A., Chemist.

Govers, F. X., 250, Main Street, Owego, Tioga Co., N U.S.A., Manager and Chemist.

Hirshfield, E., 14, Lancaster Street, Albany, N.Y., U.S Chemist.

Humphreys, A C., 31, Nassau Street, New York C U.S.A., Engineer.

Jennings, Henry, 42, Marlowes, Hemel Hempstead, He Analyst.

Johnson, Horace, Waialua, Oahu, Hawaii, U.S.A., Chemist.

Levi, Louis E., 267, Elmwood Avenue, Buffalo, N.Y., U.S.A., Chemist.

Mears, James, 11, Gladstone Street, Hartlepool, Analytical Chemist.

Mersereau, G., Columbia University, New York City, U.S.A., Chemist.

Patterson, E. V., University Club, Baltimore, Md., U.S.A., Textile Colourist.

Spielmann, P. E., 21, Cadogan Gardens, London, S.W., Chemical Student.

Stell, S. F., 25, Henry Street, Keighley, Yorks, Teacher of Chemistry.

Sturrock, Capt. G. C., R.A., 1, Kempsford Gardens, Earl's Court, S.W., and Cordite Factory, Wellington, India, Assistant Superintendent.

Thomson, G. M., 129, Moray Place, W., Dunedin, N.Z., Analyst.

Van Gilder, H. P., Bushkill House, Easton, Pa., U.S.A., Analytical Chemist.

Watson, H. W., 111, Brudenell Road, Hyde Park, Leeds, Analytical Chemist.

White, Ralph, 35, The Cedars, Middlewich Road, Northwich, Engineer.

Willard, C. T., 43, Edward Street, Worcester, Mass., U.S.A., Chemist.

Williams, S. M., 269, Springdale Avenue, East Orange, N.J., U.S.A., Chemist.

Wills, J. L., 133, Midwood Street, Brooklyn, N.Y., U.S.A., Technical Chemist.

Wolf, Jacques, c/o Jacques Wolf and Co., Passaic, N.J., U.S.A., Manufacturing Chemist.

MEMBER OMITTED FROM LIST.

897. Peter, Dr. A. H., 205, Third Avenue, New York City, U.S.A., Chemist.

Changes of Address.

When notifying new addresses, members are requested to rite them distinctly, and state whether they are temporary r permanent. Multiplication of addresses is also to be voided as tending to create confusion. When sending ubscriptions, the use of the form attached to the application elps in the verification of addresses, on which the safe elivery of the Journal depends.

nsdell, Gerard, l/o London ; Sand Hill Cottage, Dinton, near Salisbury.

reyer, Theodor, l/o Peoria ; c/o Warner Sugar Refining Co., Waukegan, Ill., U.S.A.

rown, Henry, l/o Cannon Brewery ; Benskin's Brewery, Watford, Herts.

ook, W. Martyn, l/o Highbury ; Cecilhurst, Uplands Park, Enfield, N.

raven, Chas. E. ; communications to Oak Villa, Bramley, near Leeds.

ibb, Thos., l/o Liverpool ; Mount Perry, Queensland.

uenther, F., jun., l/o Canada ; Mohawk Portland Cement Co., Warners, N.Y., U.S.A.

Hutchinson, E. George, l/o Barnsley ; 17, York Terrace, Akroydon, Halifax.

Jacqué, Maurice ; all communications to "La Cantabrica," Galdacano, c/a Bilbao, Spain.

Jonker, H., Czn., l/o Persia ; Nieuwe Binneweg 340 B, Rotterdam, Holland.

Lander, G. D. ; all communications to University College, Nottingham.

Laurence, Jas., l/o Paulsboro' ; 903, Wall Street, Joplin Mo., U.S.A.

Little, Jno. G., l/o Coquimbo ; retain Journals.

Lloyd, T. H., l/o Dinas ; c/o Quibell Bros., Ltd., Newark.

London, Arch. M., l/o New York City ; Cold Spring, N.Y., U.S.A.

Macintire, B. Gould, l/o Boston ; P.O. Box 365, Rumford Falls, Maine, U.S.A.

Muter, Dr. Jno., l/o The Chatelet ; Winchester House, Horley, Surrey.

Ramsay, Sir Wm., l/o Arundel Gardens ; 19, Chester Terrace, London, N.W.

Rollin, Chas., l/o Newcastle ; Bylton, East Jarrow-on-Tyne.

Schniewind, Dr. F., l/o Broadway ; c/o United Coke and Gas Co., 17, Battery Place, New York City, U.S.A.

Talati, K. E., l/o Bombay ; Tirvetteyoor, near Madras (Chingulput), India.

Watson, Jno. ; all communications c/o City and Suburban G.M. Co., Box 1026, Johannesburg, Transvaal.

Williams, W. J., l/o Bridge Street ; 5004, Franklin Street, Frankford, Philadelphia, Pa., U.S.A.

Yates, Robt., l/o Southwark ; 52, The Avenue, Beckenham, Kent.

Deaths.

Ostlere, Edward, Messrs Berry, Ostlere, and Co., Kirkcaldy, N.B.

Reddrop, Jos., Sound Manor, near Nantwich. May 12.

Liverpool Section.

Meeting held at University College, on Wednesday, April 29th, 1903.

MR. FRANK TATE IN THE CHAIR.

SOLID HYPOCHLORITE OF SODA.

BY MAX MUSPRATT.

In 1898 Mr. Shrapnell Smith and the author presented a paper on hypochlorite of soda solutions (this Journal, 1898, XVII., 1096), and announced the production of crystals of hypochlorite of soda containing 40 per cent. of sodium hypochlorite, and about 55 per cent. of water. The ultimate commercial possibilities were considerable, and work has been continued upon the product with a view to making it a commercial article. Amongst many purely technical difficulties, which are being gradually surmounted, a physical difficulty threatened to make further work useless from a commercial standpoint. This difficulty was that at the comparatively low temperature of 65°—70° F. the crystals dissolved in their own water of crystallisation to a slushy mass, which, in accordance with the properties of high strength solutions of hypochlorite of soda, decomposed with great speed. As this property would have once and for all made the product commercially valueless, attention was directed to the raising of this melting or dissolving point.

The first idea was to mix the crystals with a calcined soda salt, such as salt cake or soda ash. It was hoped that this would act as an absorbent of the water of crystallisation, and prevent the solution of the hypochlorite in this water, thus in effect raising the melting point. This expectation was certainly realised, but to so small an extent that a rise of only about 5° F. in the melting point resulted, and at that point a mixed mass of slush and solid resulted, the hypochlorite portion of which rapidly decomposed. Admixture with Kieselguhr was next tried; as far as the melting point was concerned, this was thoroughly successful, but the hypochlorite apparently acted in a similar way to a dried up solution of hypochlorite, and was decomposed into chlorate.

The only course left was the removal of a portion of the water of crystallisation, and this has been successful. Needless to say there are considerable difficulties in doing this on a technical scale as no heat must be used, but by the use of vacuum and a current of dry air, it has been possible to make a powdery hypochlorite of soda containing from 40—60 per cent. of available chlorine, which is not extremely hygroscopic (as the crystals are) has a melting point well over 110° F., and, as far as can be judged, does not decompose much more rapidly than bleaching powder.

It is not unreasonable to suppose that if this product can be placed on the market at a reasonable figure it will have a great future both for bleaching and disinfecting, whilst it has considerable pharmaceutical possibilities.

I am indebted to Dr. J. H. Shores, Dr. J. T. Conroy, and Mr. O. Heslop for all the recent work on this subject.

London Section.

Meeting held at Burlington House, on Monday, May 4th, 1903.

MR. WALTER F. REID IN THE CHAIR.

PROBLEMS IN THE FAT INDUSTRY.

BY DR. J. LEWKOWITSCH.

The industry which will occupy our attention to-night, dates back to the remotest times of our history, and it may truly be said that the fat industry is as old as the human race itself. The cave-dweller who first collected the fat dripping off the deer on the roasting spit may be considered the first manufacturer, just like the first woman who expressed the olive fruit packed into sacking, by heaping stones on them, may be considered the forerunner of Bramah, the inventor of the hydraulic press. There is a long interval after this early dawn of our industry, until we hear of the invention of soapmaking, ascribed by Pliny to the Teutons, and perhaps an equally long interval, if measured by the rapid strides made in the development of arts and industries, until Chevreul laid the truly scientific foundation of our industry by establishing the chemical constitution of fats. From his labours originated that brilliant series of researches, discoveries, and inventions which made the first half of the last century so memorable in the annals of the fat industry.

After so prolific a production of new ideas and new processes, there naturally followed a period of comparative rest. Both industry and science required time to digest the manifold problems placed before them, and the following years were mainly occupied with the quiet working out of details in the industrial workshop, as well as in the chemical laboratory. As in all the older industries, the practical man had run ahead of the scientist, and theory had to follow slowly, and explain what the inventor had accomplished.

This happy collaboration of practice and theory has helped to consolidate the scientific basis on which the industrial progress was established. We may well say that the fat industry has, nowadays, reached so high a state of development that it may fairly claim to rank with those chemical industries which have sprung, as it were, from the chemical laboratory during the last five or six decades.

As regards its commercial extent, the fat industry certainly ranks as a most important one. A careful estimate I have made, based on our imports and exports of the fatty materials, shows that over 50,000,000*l*. per annum, or about 1,000,000*l*. per week, are changing hands in this country alone. These figures give an idea of the enormous capital that is invested in the industry.

At the present moment, a fresh wave of inventive activity appears to be approaching us, and I therefore considered this a fitting time to take stock of our present position, and to point out, as far as I am able, what problems are awaiting solution at the present moment.

Raw Materials.—The raw materials are supplied by nature in the shape of animal and vegetable fats and oils. Hence, synthetical preparation has not yet acquired any practical importance. Should the raw materials become scarce, it will be time to seriously attack the problem of producing the glycerides artificially. Even at present there is no difficulty in preparing glycerides from glycerine and fatty acids. The total synthesis of glycerol is possible to-day. For the production of the higher fatty acids (stearic, palmitic, and oleic), we shall have to look to the immense quantities of hydrocarbons stored up in petroleum. The problem consists in the conversion of the CH_3 group of the hydrocarbons, boiling in the neighbourhood of 300° C. into the COOH group. Hitherto, this problem appeared to be a hopeless one, and the great prize stated to have been offered by the Standard Oil Company is still unclaimed. But quite recently, some promising attempts appear to have been made by the application of Grignard's reaction (conversion of hydrocarbons by means of metallic magnesium into metallo-organic compounds, and the subsequent treatment thereof with carbonic acid). This has led Zelinsky (this Journal, 1903, 149) to the synthesis of acids containing up to 10 carbon atoms, and although we must remember that a number of chemical reactions seem to point to a break in the regularity of the behaviour to reagents as we ascend in the series beyond 10 carbon atoms, nevertheless, a breach appears to have been made in a hitherto impenetrable enclosure.

However, nature's supply of fats and fatty oils has hitherto been so bountiful, that there is no reason to expec any shortage in the near future. The question of raw material is, therefore, more an economic one, than a purely technical question. The high prices ruling lately in the fa and oil market are bound to draw our attention to the many untapped sources of supply.

The chief raw material for the candle and soap industry—tallow—became very scarce during the last few year and reached extraordinarily high prices, in consequenc of the old sources having failed to respond to the demand Russia has ceased to be a tallow exporting country and i forced to satisfy its own increased demands by drawin upon the world's supply. North America is unable t spare the raw material it used to send to this country whilst Australia, in consequence of the drought during th last eight or nine years, has had to reduce her exports t a very serious extent. We shall have to look in future t South Africa, which promises to become a great cattle raising centre.

The demand for fats having high melting points can, a present, only be met by opening up still unexploited tract of tropical countries. The supply of palm oil which could b obtained from West Africa is stated to be almost ine haustible. All that seems to be required is to overcome th indolence of the natives, and to educate them to the point having wants for which work will supply the means of sati faction. It is true that increased quantities of palm have been brought into the market during the last two year but hitherto it has always happened that with the higher prices so much less has been brought down to the coast.

Other countries should also be able to send large supplies of vegetable fats, and it is only necessary to point to India and Brazil, and the Sunda and South Sea Islands, to hold out a prospect of large quantities of fats, which are bound to reach the European markets with improved conditions of communication, both by land and sea. Similarly, China and Japan should supply in a much increased ratio oleaginous fruits and seeds. Efforts in that direction are bound to be stimulated, as has been done already, by the erection of oil mills in the larger ports of the Far East.

The processes of producing the raw materials, namely, the rendering of animal tissues, and the expression or extraction of oleaginous seeds, seem to have reached a state of perfection, which hardly calls for any revolutionary discovery. At present it appears to be a matter of working out details. But the introduction of new oleaginous seeds may necessitate exercise of the inventive faculty of the maker of oil-mill plant, inasmuch as new seeds or fruits brought within the purview of the manufacturer may require new machinery for the preparation of the fruits or seeds for the subsequent processes of expression or extraction. In order to give an example, I show safflower seed, immense quantities of which can be had in India. The husks form about 60 per cent.—practically valueless matter. Even if suitable machinery were found for breaking the whole mass of seeds into pulp, which could be expressed in the usual manner, the resulting cakes would possess very ittle value. The problem here is to construct proper decorticating machinery which would lay bare the 40 per cent. of kernels and winnow off the husks. I may say that his problem has been before me for the last two years, and I now hope that I shall soon have a machine erected which will do the work satisfactorily.

It will be convenient to classify the several industries which deal with the raw materials under the following three heads:—

I. Industries having for their object the refining of fats and oils.

II. Industries in which the glycerides undergo a chemical change, but are not saponified.

III. Industries based on the saponification of fats and oils.

I. The object of refining is, of course, the removal of certain objectionable foreign matters. The nature and degree of refining must depend on the purposes for which he fats and oils are intended; hence, a great variety of methods are in vogue.

If the fats and oils are to serve as food, we must rely hiefly on physical methods. The employment of chemicals nvolving the use of acids must be altogether excluded, as hey impart an objectionable flavour which would render he products useless for edible purposes. Treatment with alkalis in one form or another can only be resorted to in a very moderate degree, as, for instance, in the refining of ottonseed oil for the table.

The physical methods consist chiefly in filtering, with a view to brightening the oils by removing adhering moisture nd suspended matter of an albuminoid character, and if olouring matter is to be eliminated at the same time, in treating with either charcoal or fuller's earth. The latter process is, of course, followed by filtration, in order to get id of the charcoal or fuller's earth, which absorb and retain the colouring matters.

Since text book information on edible fats and oils is but very scanty, I may perhaps be allowed to dwell a little longer on this subject, all the more so, as, in my opinion, the industry of edible fats and oils is only in its infancy.

The prejudice against fats and oils manufactured in works is gradually disappearing in the same manner as, e.g., home-made jam is being replaced by jam manufactured n a large scale; even the names "butter substitute," "lard ubstitute," &c., are losing the meaning which seemed to nderlie these words in the mind of the general public.

It is convenient to subdivide the edible products into wo large classes, according to their consistency:—firstly, dible fats; and secondly, edible oils.

With regard to edible fats, I suggest the following subdivision, which explains itself: (a) butter substitutes; (b) lard substitutes; (c) chocolate fats.

The foremost problem in the refining of the raw materials suitable for food purposes is the almost complete removal of free fatty acids, and of the objectionable products which seem to follow in the wake of the once formed fatty acids, namely, those substances which impart to the fats and oils what we comprise under the term rancidity. We have as yet no chemical test for determining whether a fat is rancid or not, nor are we able to determine the degree of rancidity, taste and smell being the best and most commonly applied reagents. On a small scale we are able to preserve fats and oils indefinitely by suitable treatment, but there is room for a technical process easily applicable to large quantities, such as are required in commerce. It is well known that palm oil, for instance, is largely consumed at the West Coast of Africa, and used by Europeans there for frying steaks, &c. Yet employment for edible purposes in the countries to which palm oil is exported is out of the question, as it arrives in a high state of both acidity and rancidity. A simple process for so treating palm oil in its place of origin, that it could be shipped and sold in Europe or India as an edible fat is a great desideratum.

As regards *butter substitutes*, there is little chemistry applied beyond testing the original fats and oils which enter the churn. The progress that must be looked for consists rather in the improvement of machinery. This machinery is already in a fairly satisfactory state, and modern works are so well fitted up that handling of the material, in the true sense of the word, is altogether unnecessary. The efforts of the margarine manufacturer tend to make his product as similar as possible to butter, and these laudable efforts deserve the chemist's full support, so long as the products are not diverted to fraudulent uses. On the continent the tendency to produce such similarity has led to a number of curious patents, having for their object the addition of substances which will impart to the margarine the property of frothing and browning like butter on heating. In this country, this has been reached by simpler means, namely, by increasing the amount of milk with which the fatty materials are churned. The latest outcome of inventiveness, namely, to add to margarine the volatile acids from genuine butter, seems a very doubtful improvement, for this process only too plainly suggests fraudulent application, inasmuch as it would appear that the volatile acids may not only be used to improve the taste, but also to mislead the public analyst.

A butter substitute made from cocoanut oil or palmnut oil had originally obtained a market in India, where religious prejudice forbids the native population to consume beef fat or hog fat. Latterly such "vegetable butter" has, under a variety of fancy names, found extensive use at home in confectionery, and, it must be feared, is also finding a growing outlet in the adulteration of cows' butter.

The manufacture of *lard substitutes* is in many respects related to that of butter substitutes, although it is much simpler, inasmuch as the product consists of pure glycerides. In the infancy of the industry, the manufacturer of lard substitutes sailed more closely to the wind than the margarine manufacturer. The halcyon times for the maker of artificial lard, when he could sell under names like "refined lard," &c., products which frequently contained no lard whatever, have passed. His efforts are now directed to the object of so rendering the fat contained in the various parts of the hog that almost each particle of fat may be termed lard and used as such. The "compounding" by means of admixture of suitable fats to lard has developed into a tug of war between the works chemist and the public analyst. Since the former is generally a couple of years ahead of his *confrère*, the "compounding" offers a series of problems which ever renew themselves when the practices of the former are detected by the latter.

The demand for cacao butter has so largely increased that the supply of the genuine material is insufficient. Hence, there is an urgent demand for a substitute—*chocolate fat*—which must possess, as a first consideration, a high melting-point, say about 34° C. This problem has not yet been satisfactorily solved. Animal fats, such as tallow, are unsuitable, for at present the tallow cannot be so completely refined that no unpleasant taste would be imparted to the chocolate, especially if the latter has to be stored for some time. We must, therefore, look to vegetable fats. Cocoanut oil and palm-nut oil are hitherto exclusively used. The oils are allowed to crystalise; the softer part, the oleine, is removed, and the crystals, "stearine," are pressed until the melting-point is deemed satisfactory. In consequence of the costliness of the operation, the pressing is not, as a rule, carried far enough, and hence, commercial cacao-butter substitutes do not exceed a melting-point of 29°—30° C. The drawback which the employment of this material entails, is apparent in the large amount of chocolate on the market which melts in the pocket or in the hand. Another drawback is that cocoanut or palmnut oil undergoes, after some time, hydrolysis, when its usual concomitant, rancidity, makes its appearance. There have not been wanting efforts to raise the melting-point of the cocoanut and palmnut oil "stearines," in their turn, by adulterating them. Mineral waxes, which have been proposed, should be excluded, as being indigestible. Japan wax is stated to have been used as an adulterant, but in my opinion Japan wax is not a suitable "stiffener." The solution of the problem will be found, I should fancy, in the introduction of one of the tropical hard fats which can be refined with ease.

In the preparation of *edible oils*, or salad oils, the absence of free fatty acids is, of course, of the same importance as in the case of edible fats. An additional requisite is that they should not congeal at temperatures near the freezing-point. Olive oil practically fulfils this demand. In the case of cotton-seed oil, it is not difficult to remove the "stearine" which begins to separate out at about 10° C. The large quantities of "winter" oil in the market for edible purposes show that this manufacturing process is practised largely. An unsolved problem under this head is to remove the "stearine" from arachis oil. I may say that I have spent considerable time on this matter, but I have not yet been able to attain my object. The "stearine," in consequence of the arachin it contains, separates out at a low temperature as a gelatinous mass. Crystals are formed with very great difficulty, and even when obtained once, the very slight rise of temperature caused by handling the material suffices to either melt the crystallised mass, or to convert it again into a gelatinous form, which it is impossible to filter off. As arachis oil is undoubtedly a finely flavoured table oil, simulating olive oil in that respect, I recommend this problem as one which should not be difficult to solve if sufficient time be devoted to it.

It goes without saying that the fats and oils which enter into the manufacture of *edible* fats and oils must be perfectly odourless. The deodourising of oils constitutes one of the most promising problems if viewed from the commercial side. The enormous stores of fish oils, including the blubber oils, still await the coming of the chemist who can deprive them of their objectionable fishy smell and taste, and prepare them for those edible purposes for which they otherwise seem to be so eminently suitable.

I am afraid the solution of this problem still lies in the dim future, for, hitherto, all attempts to render these oils perfectly odourless have failed. I lay stress on the word *perfectly*, as I may say that I have succeeded in depriving low-class fish oils to the greatest extent of their offensive smell, so that they can be used for technical purposes. But the origin of the oils still reveals itself unmistakably by the remaining faint fishy smell. Fitful efforts of individuals will hardly lead to success. Countries whose industries are largely affected, like Norway, Newfoundland, Canada, and Japan, should not leave the matter to individuals, but should endow properly-fitted laboratories for systematic research; for by sustained work the solution of this problem should be accomplished.

Processes involving the decolourising and bleaching of fats and oils are well understood and largely practised. Of course, it cannot be expected that a bleaching process, which is suitable for one fat or oil can be straightway applied, with equal success, to any other fat or oil, or even to one to which it stands in organic relationship. Each individual fat or oil requires special investigation as regards the employment of suitable chemicals, and the temperature at which they should be applied, besides a number of other conditions on which success depends. The object of bleaching is not only to remove colouring matter for the time being, but to remove it so efficiently that the colour, or even a darker shade, does not "revert" some time after the fat or oil has been bleached. Patents claiming to effect this object appear annually in great numbers, and disappear again when it has been shown that the colouring matter does "revert" to a larger or smaller extent, after the material has been converted into soap, in the case of soap-making stock. Thus, one of the simplest and most frequently practised processes, that of bleaching tallow, does not produce soaps as good in colour as those made from the freshly-rendered tallow. Further, the bleaching of bone fat has not even reached so satisfactory a state as that of bleaching tallow. Not only must each kind of fa or oil be considered a special problem, but frequently even different varieties of one of the same fat or oil cause the same difficulties as would a new individual. To mention an example, the bleaching of the softer kinds of palm oil, such as Lagos or Old Calabar, offers very little difficulty, and even a novice in the soap-works is able to carry out the process successfully. But the hardest kinds of palm oil, such as Congo oil, have hitherto withstood all attempts to bleach them, and I strongly recommend this problem to the attention of the ambitious technologist.

I have said enough to show that the refining of fats and oils offers very great scope for the exercise of the inventive faculty, especially so since powerful bleaching agents such as ozone, peroxides, persulphates, and even percarbonate are within easy reach of the experimenter.

II. Still greater promise of success to an inventor seem to be offered by the second class of industries, namely those in which the glycerides undergo a more or less pronounced chemical change without, however, being broke up into their constituents, *viz.*, fatty acids and glycerine For most of the processes carried out in the industries tha fall under this head are but incompletely understood, an really important progress can only be expected after gainin a better theoretical insight into the reactions which underli the changes the fats and oils undergo.

I mention in the first instance the industry of *blown oil* The question, "what is the chemical nature of blown oil?" cannot be answered to the satisfaction of the scientifi enquirer. We know, as the name implies, that the oils ar obtained by blowing air into them, but the actual chang the molecule undergoes is, as yet, unknown. The oi become specifically heavier, and oxygen has undoubtedl been absorbed, but in what form can only be surmised. I is likely that hydroxyl groups have been formed, and th rise in the acetyl value of the oil seems to favour this view Some of the acids have been converted into what I venture to term "oxidised acids," their most characteristic propert being insolubility in petroleum ether. But as these oxidise acids also possess a high acetyl value, it is difficult to decide i favour of either explanation. Possibly both views will hav to be admitted. Moreover, some of the acids may have bee broken up into acids of lower molecular weight, as instance by the rise in the saponification value. Since all the changes are taking place simultaneously, the proble would appear to be an analytical one in the first instanc Once this is solved, the problem of how to find extende application for these oils will become easier to atta Patient research is required here, for, up till now, so litt has been done in this direction that it is even a moot poi whether the blown oils are really as efficient lubricants they have been heralded, when they were ushered into t market with a great flourish of advertisement. If t chemical change can be so controlled that hydroxylate groups only are formed, we would be able to produ castor oil artificially. At present, the price of castor oil comparatively low, but the moment we are able to turn i exceptional qualities to extended use, a demand may spri up which may render the artificial production a mo pressing problem.

Equally little is known of the chemical change taki place in the preparation of boiled oil and its cogene Notwithstanding the enormous extent to which the indust f boiled oils and their offspring has attained, it has very rgely remained a truly empirical industry, much as it was anded over to us by its inventor, the celebrated Dutch ainter, van Eyck. We know that when an oil like linseed il is exposed to the atmosphere it absorbs oxygen, taking p in the course of a few days as much as 20 per cent., and rying to an elastic skin. What the ultimate product is, e are still unable to say with certainty. We further know hat the time required for drying can be considerably hortened by mixing metallic salts or oxides, such as white ad and zinc oxide, with the oil. The time required for rying can be further shortened by treating the oil with ertain oxides or peroxides whilst heating it at a higher mperature, say 220°—250° C., or as the technical term ns, by "boiling" the oil. What change the oil has ndergone by this somewhat severe treatment we are as et unable to say. It was assumed for a time that the oil ecame oxidised, the glycerine being attacked in the first stance; but analysis has shown that this is wrong, since oiled oil retains almost its entire quantity of glycerine. Ioreover, practice has proved that the glycerine is neces- ry in the boiled oil, for attempts to prepare boiled oils om the fatty acids only, have led to useless products. qually unfounded is, therefore, the suggested explanation at the oxides act as hydrogen carriers during the "boiling." he process of "boiling" does not consist in the oxidation oil, caused by the absorption of oxygen, as we are able show by analysis that oxidation cannot have taken place any great extent. In confirmation of this we find that e amount of oxidised acids is not considerable. Nor is e decrease in the iodine value, which we can also regard a measure of the oxygen absorption, very pronounced. oreover, we have well drying boiled oils possessing very gh iodine numbers. In the investigation of an ozone ocess, I have even noticed that the iodine values of the eated oils, which have acquired all the properties of boiled" oils, were very little lower than those of the iginal oils. Nor is a high temperature required for the eparation of boiled oils, as we are able to obtain an oil ving the property of boiled oil by carefully grinding seed oil in the cold with manganese borate; and since quid driers have been introduced, much lower tempera- res have been found sufficient for the preparation of these is on a large scale. In fact, all that seems necessary is to ssolve the liquid driers in linseed oil at a temperature of 0°—150° C. Opinions still differ as to whether the oils epared at these temperatures by means of liquid driers e as good as those produced by the old process; but ere is certainly no doubt that the oils prepared in the ld—or, as the Americans term it, "boiled through the ng-hole"—are inferior in quality. Now, if a mere dis- lving of the drier in the oil is all that is required, then no portant chemical change can have taken place. Yet hner and Mitchell have shown that a very distinct ference exists between linseed oil and a specimen of iled oil they examined, inasmuch as the latter gave no soluble hexabromides. In their case the "boiling" of sample must have been carried very far, as two samples "pale boiled" and "double boiled" linseed made on a ge scale yielded, in my laboratory, 20·97 per cent. and ·05 per cent. of hexabromides respectively, whereas the seed oil from which it was made gave 24·15 per cent. of xabromides. It remains to be seen whether the boiled s prepared by means of liquid driers show a similar crease, or any.*

This much appears to be certain, that a complete solution the drier is required, and it is most likely that in the er process the dissolving of the drier was effected in the y process of boiling, through the lead oxide saponifying ortion of the oil, as evidenced by the escape of a small antity of acrolein during the boiling of the oil.

The chemical change which takes place when linseed oil es to an elastic skin is, as stated before, unknown In boiled oils, the drying goes on at an accelerated pace, oured by the incipient oxidation which has been induced boiling in the old sense of the process, or by adding id driers which seem to act as oxygen carriers. In the t of modern views, this would appear to lead to the explanation that the driers act as catalysts, inasmuch as a small quantity only is required to accelerate the oxidation.

Here lies a wide field open for investigation, for it cannot be expected that full use of the curious properties of drying oils can be made before the chemistry of the change is fairly understood. Nor until then can we hope to bring into full practical use all those drying oils that seem to be destined to become substitutes of linseed oil, the drying oil *par excellence*. To name one or two such oils, I may refer again to safflower oil, and also to candle-nut oil, both of which I have investigated in this respect. An insight into the chemical change which underlies the preparation of boiled oils should go far to stop that annual crop of patents and secret processes which make use of the oxygen absorption property of certain resins in order to supplant the drying oil, by more or less worthless concoctions of oil and resin.

It is uncertain, at any rate unknown, whether the skin to which linseed oil dries is identical with the "linoxyn" of the linoleum industry. This was considered, up to a few years ago, to be the ultimate oxidation product of linseed oil, but you will remember that W. F. Reid has shown that oxidation proceeds further in the course of time—the oxidised linseed oil being converted into a viscous liquid, heavier than water, termed by him "superoxidised linseed oil." As the latter is soluble to a considerable extent in water, the gradual destruction of linoleum is readily explained. Possibly, when linseed oil is blown with air, or when boiled oil has been blown too strongly, a small quantity of Reid's superoxidised linseed oil is formed. This would appear to account for the poor drying properties of those oils.

Another chemical change in the constitution of linseed oil which is not yet understood, is brought about by heating linseed oil to a high temperature in the absence of driers as is done in the making of lithographic varnishes and printing inks. Reasoning by analogy, we may assume that polymerisation takes place, but with this convenient word our explanation ends. The analogy has been derived from the closer study of castor oil, which undoubtedly does become polymerised on heating, the ricinoleic acid forming di-, tri-, tetra-, and penta-ricinoleic acids. Such polymerisation products have not hitherto been thoroughly examined, nor have they, with the exception of linseed oil products, been employed technically. And, yet, it seems that such products as are obtained by heating castor oil until it is converted into a solid mass, and the jelly-like mass into which Chinese wood oil is changed on heating, are very likely to find technical application on account of their elasticity, and apparent durability.

If, in the treatment of drying oils, we substitute sulphur for oxygen, the action becomes a more energetic one. The vulcanised oils so obtained have already acquired commercial application, on account of their cheapness, as witness the sad state in which we find our india-rubber tubing after very short use. Vulcanised fish oils have also been brought somewhat prominently into the market, and it must be a matter for regret that the working out of the processes for the preparation of such products as volenite, maponite, &c., have not been completed on a small scale before they were placed before the public, as non-success only serves to discredit further technical efforts.

The nature of the change the fats and oils undergo in the vulcanising process is almost completely unknown, and we have to rely on mere reasoning by analogy in our attempts to explain how the sulphur or sulphur chloride is absorbed by the unsaturated glycerides.

Here, again, appears to be great scope for investigations on technical lines. For, in my opinion, we have only touched the fringe of possibilities in this domain. The inventor with new ideas should find ample reward for his ingenuity in the creation of new industries, based on the useful properties of fats and oils. As an example of what can be done in this direction, I wish to point to the work of W. F. Reid. The invention of velvril material not only shows that there are still great possibilities in the employment of castor oil, as I have mentioned already, but that there is room for the introduction of new chemical reactions into the industry of fats and oils.

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* This subject is now under investigation in my laboratory.

III. The technology of fats unquestionably reaches its highest development in those industries which are based on the saponification process. This, no doubt, is due to the chemical process being fully understood. The equation, expressing the chemical change, is the well-known one—

$$C_3H_5(OR)_3 + 3H.OH = C_3H_5(OH)_3 + 3R.OH.$$

Up till recently, this equation was understood to express fully the chemical change, but as has been shown by Geitel and by myself, it must now be looked upon as expressing the sum of three equations, each of which denotes a well-defined stage as saponification progresses. According to this view, the saponification of a triglyceride passes through the diglyceride and the monoglyceride, until finally free fatty acids and glycerin are obtained. I have mentioned this theoretical speculation, as it points to a possible preparation of diglycerides and monoglycerides, if only we are able to arrest the progress of the reaction at the desired point. The advantage of such a procedure would lie in the preparation of glycerides capable of yielding very high percentages of glycerin. To take an example, tristearin yields, theoretically, 10·34 per cent. of glycerin, whereas, distearin yields 14·71 per cent., and monostearin is capable of yielding 25·7 per cent. of glycerin. The problem appears attractive enough to demand more than a passing thought, although the difficulties may seem, at present, insurmountable.

Another problem that suggests itself, is to replace H by an alcohol radicle, say the ethyl or amyl radicle, in the above equation. Since the corresponding alcohols act as weak bases, the reaction is not so impossible as it appears at the first glance, and with anhydrous materials, and under high pressure, especially if a small quantity of sodium alcoholate is employed as a catalyst, it is not unlikely to proceed in the desired direction. The fatty acids radicles would thereby become converted into simple esters, which can be much more readily saponified, and, moreover, with a theoretically insufficient amount of alkali. If the alcohol can be recovered fully, the process may become feasible. For a number of years, I have looked fondly on this idea without having had the opportunity of investigating it. A recent patent taken out by Liebreich, for the treatment of glycerides with aromatic amides, embodies a similar reaction, but the yield stated by the author seems to place this process out of reach of practical application.

Leaving what may appear "music of the future," I revert to the fundamental equation, as it affords a simple means of classifying scientifically the candle and the soap industries.

The candle maker requiring the fatty acids only, would endeavour to proceed strictly according to the above equation, that is, saponify by means of water, or, to adopt more fashionable parlance, saponify by means of the hydrogen ion. The soapmaker, to continue the same mode of expression, would prefer to saponify with the aid of the Na- or K-ion, according as he requires his soap to be hard or soft.

In its simplest form, the equation has not yet been realised in the candle industry with commercial advantage. The process of saponifying under a pressure of 15 atmospheres with steam only, does not pay, since the object can be reached under lower pressure and in a shorter time by 1—3 per cent. of oxides of calcium, magnesium, and similar oxides. Nor has a process, which I patented some years ago, namely, distilling fats and oils with superheated steam *in vacuo* proved a commercial success. The aqueous saponification presents another problem to the inventor, although there seems no urgent need, from a commercial point of view, for the realisation of the above equation in its theoretical completeness. The reaction shown in the equation has to be assisted by imparting, as it were, to the hydrogen ion greater mobility or reactivity, which in the light of modern ideas can only be attained by employing a catalytic agent. True, concentrated sulphuric acid seems to act as such in the so-called saponification process, but as it has at the same time a detrimental effect on the yield and quality of some of the products, the technical application of this process is limited. More suitable as a catalytic agent is the sulpho aromatic compound, invented by Twitchell. It has alread been introduced on a commercial scale in several works i the United States. Its action presents, from a theoretica standpoint especially, features of interest, but the presen is not the occasion to dilate on this subject. I have recentl shown (this Journal, 1903, 67) that concentrated hydrochloric acid also acts as a catalyst, but whether a technica process can be based thereon remains to be seen.

A perfect process of the kind we are considering her would be offered by the ferment process, described in thi Journal, 1902 1541, if we were able to isolate the fermen from castor seed, and effect saponification in the ideal wa the equation indicates. How far the process, as sketche by the inventor, will approximate to this ideal, will b eagerly watched in the near future.

The recovery of glycerin in the candle industry, an the separation of the fatty acids into solid acids—cand material—and liquid acids, are simple processes, and hardl capable of much improvement. But the liquid acids forı a by-product of much lower value than the candle materia and here, undoubtedly, improvement is urgently require The oleic acid forms roughly 50 per cent. of the total fatt acids; by treating the fatty acids with concentrated sulphur acid, a portion thereof is converted into candle materia and hence, the yield of candle material is increased b about 15 per cent. There still remains a by produc amounting in round figures to 30 per cent., which is muc lower in commercial value than the main product. Th step required to convert oleic acid into stearic acid seen to consist simply in the addition of two hydrogen atoms the former, and although this reaction can easily be carri out with the lowest fatty acid of the unsaturated serie nevertheless all attempts to reach the same object with ole acid have so far been baffled. I have described, in a papa read some years ago before this Section, the attemp recorded in the literature of our subject. I then term this problem one of the most fascinating ones in the f industry; it still remains such. Although a number patents have been taken out since, purporting to accompli its solution, none has hitherto proved itself to be workab on a commercial scale. The latest proposal is to treat ole acid with metallic nickel powder, in a current of hydroge The development of this process will be also watched w interest.

The moulding and finishing of candles is, in its prese state, more or less a mechanical industry, and improv ments are looked for more on the mechanical side moulding, than on the chemical side. Whether the ligl giving power of the candle can be increased by means incandescent salts remains to be seen. Undoubtedly, gre difficulties present themselves in that direction, as not on chemical reasons stand in the way, but also the difficul of preparing a wick for the improved candle which retai all the advantages of the present candle wick. An inca descent mantle appears to be out of the question, for must not forget that one of the great advantages of t candle is its easy portability, and it is due to this proper that the candle is finding, even nowadays, extended ap cation, in spite of all the competition which is brought bear upon it by gas, petroleum, and electric light.

The soapmakers object is, of course, in the first instan to prepare soap. What is, therefore, more natural th that he should employ for saponification caustic soda a potash, as they lead him direct to the products he wis to manufacture. As fat gives 95 per cent. of fatty aci and only 5 per cent. of glycerin-yielding material, produci finally 10 per cent. of glycerin, it is natural that the ch care of the soapmaker, who wishes to obtain a pleasing a attractive-looking product, is directed to the 95 per cent. his raw material. For a long time the glycerin in soaperies was lost owing to the difficulties which recovery from the lyes presented, but the modern so maker can no longer be reproached with wasting valua material. A technologist would, of course, advocate a proper method the deglycerinising of the fats first, and th the conversion of the fatty acids into soaps, in other wo he would wish that the soapmaker should work accord he equation we have found to be the ideal one for the dle-maker. This has actually been done for more than years, both in the indirect way, by converting the by-duct oleic acid into soap, and in the direct way, by omposing the fats exactly like the candle-maker does, subsequently converting the fatty acids into soap. is process, however, did not commend itself to the pmaker, as soap must offer other attractions to the plic than the mere property of producing a lather; and soap made from the material as obtained by the candle ker's process was inferior to the soap made from the direct, as regards coloor, hardness, and smell. It is dent that the objectionable properties were due to the rimental effect of the high pressure in the autoclaves. e endeavours of "inventors," who looked at the problem rely from a technological point, have been directed to imise, as far as possible, the undesirable effect of the h pressure. The trend of their leading idea will be ily gathered by a glance at the following table which ublished some years ago. (Chemical Analysis of Oils, s, and Waxes, 2nd Edition, page 752.)

Saponification of Tallow in an Autoclave.

	Free Fatty Acids. Per Cent.
Sample taken after the 1st hour contained ……	33·85
" " 2nd " " ……	77·40
" " 3rd " " ……	83·9
" " 4th " " ……	87·5
" " 5th " " ……	88·6
" " 6th " " ……	89·3
" " 7th " " ……	93·0
" " 8th " " ……	97·5
" " 9th " " ……	98·1
" " 10th " " ……	98·6

rom this table it will be seen that three parts of the are saponified in the first two hours, and that after t the saponification proceeds very slowly indeed. After or six hours about 90 per cent. of the fats are saponi-. Now, it is clear, if we reduce the pressure and the nber of hours under which the fat is, let us say, ewed" or "cooked" in the autoclaves, the detrimental ct of steam and high pressure is lessened; hence, a ter product will be obtained. Of course, it must be well lerstood that the better colour is paid for by 15—20 per t. of neutral fat remaining unsaponified.

his means, naturally, that $1\frac{1}{2}$ to 2 per cent. of glycerin wasted, as it would not pay to recover the glycerin n the lyes obtained on making soap from the incom-ely sapooified material. If this led simply to the loss $1\frac{1}{2}$ or 2 per cent. of glycerin, it would amount in many es to a mere matter of calculating profit or loss. The process, modified as explained above, might then mend itself to the attention of the soapmaker. He ld simply compare the profits he can derive by lycerinising the fats previous to saponification, with profit obtainable as hitherto by recovering the glycerin u the soap lyes. But a much more important question to be considered, namely, the quality of the soap. king broadly at this process, it represents a compromise ween complete saponification in the soap pan, and ctically complete saponification in the autoclave. If product obtained by this compromise yielded equally d soaps as the former process, then no doubt it would worth considering. But, as the fatty material so ined yields decidedly inferior soaps, not only as regards our and hardness, but also as regards other properties soapmaker has to consider in these times of keen petition, the partially saponified stuff will not find our as a soap-making material, at any rate not in this ntry. On the continent, where the public has not yet educated to so refined a taste as regards household s, and moreover where the bulk of the smaller soap ers have hitherto wasted the glycerin in their spent , the process has a better chance of adoption. Since not a patentable process, and hence open to everyone, find the continental soapmaker in the unenviable tion of having offered to him a score of so-called processes with an autoclave thrown in, or as he may say in his bewilderment, a score of autoclaves with a process thrown in.

The conversion of boiled soap into the marketable bar or cake is, just like the moulding of the candle, a mechanical process. The present mode of running the hot soap into frames and allowing it to cool appears to be cumbersome, and many inventors have directed their attention to reducing the time required for obtaining the finished soap. I am not speaking of toilet soaps, or of soaps having a smaller proportion of water than the ordinary genuine household soap containing about 30 per cent. of water; for in these cases the problem is easy to solve, and has indeed been solved satisfactorily. We must look upon genuine soap as a crystalline product, or rather, as I prefer to put it, we must look upon the 30 per cent. of water as the water of crystallisation. The proper way would, therefore, be to allow the soap to crystallise as is done to-day, and any attempt to save time would not lead to a crystalline product, but to an amorphous mass, which is certainly soap from the chemical point of view, but not soap in the eyes of the buying public. Nevertheless, I have tried on a large scale to rapidly chill the soap by passing it through a long tube, cooled from the outside, the soap being propelled by a screw worm. But the appearance of the product was not encouraging enough to continue the experiments. The problem seems, however, well worth taking up again, and I would direct attention to the endeavours made at present on the continent to produce a commercial soap from the hot soap, without the intervention of the crystallising process. One inventor presses the soap in a what may be described as a kind of copying press cooled from the outside, the soap, of course, being prevented from oozing out at the sides. Another inventor, working apparently on the same lines as did Finlay a few years ago (Eng. Pat. 4581, 1893) in the case of toilet soaps, forces the hot soap through cooled pipes. Too little is known as yet of the merits of the last two processes to justify me in saying any more about them.

Want of time forbids me to enter on the manufacture of soft and dry soaps, and metallic soaps. The last-named subject especially offers a series of unsolved problems, greatly influencing the industries of paints, anti-fouling preparations, and similar materials.

I can only glance at the manufacture of glycerine. The making of crude glycerine from candle crude is simple enough, and the progress going on at present consists in the replacing of the old fashioned Wetzel pan and the still more antiquated heated pipes by properly constructed evaporating vacuum pans, which can deal effectively with the difficulty caused by the separation of calcium sulphate. The obstacles to successful glycerin recovery in soapworks, caused in former years by the impurities contained in the soap lyes, have also been removed, and the soap crude has reached so high a state of purity that it can well compare with, and is even superior to, some brands of distillation crude. Of course, at the early period of soap-lye recovery, the 10 per cent. of salt in the soap crude formed a difficulty in the distilling process, but even this has been so far overcome that chemically pure glycerin can be made from the soap crude, as I have shown first about 12 years ago.

Still, the removal of these 10 per cent. of salt by other processes than distillation would be desirable. Attempts to effect this by means of osmosis have proved a failure. The extraction of glycerin by means of solvents has not been accomplished yet, and it is very difficult to find a solvent which will wash out the glycerin and leave the salt behind. An especial difficulty arises in this case, since glycerin combines the properties of water and alcohol as regards solubility. Problems touching the most difficult chapters of physical chemistry are here offering themselves for solution, and may perhaps invite the attention of the physical chemist. I hope it will not discourage him if I state that the process must be a very cheap one if commercial application is intended.

It is impossible to conclude this paper without referring to the very great help analysis has afforded to the technology of our industry. In the foregoing lines, I have had occasion to point this out here and there. Greater assistance still will be obtained as the chemical analysis of fats and oils progresses and solves the manifold problems that belong to its proper domain.

The majority of fats are very superficially known as regards their chemical composition. Here, almost unlimited scope is given to the analytical chemist as well as to the technologist. The occurrence of mixed glycerides in fats, and the isolation of the possible isomerides of these mixed glycerides cannot but add to the charm the investigation of this subject must offer.

We are still in want of proper methods of separating the various classes of fatty acids from one another. A great many fatty acids are not so well known as they should be, considering the cheapness of the raw material at the disposal of the investigator. Less still is known about the products into which fatty acids are changed under certain conditions, such as lactones, "oxidised" acids, or polymerised acids.

How insignificant appear all these problems in comparison with the one great problem which analysis will have to solve, the problem how glycerides are synthesised by nature.

We are told that the analysis of a piece of soap instigated Chevreul to undertake his epoch-making researches. Let us hope that a modern Chevreul may soon arise achieving similar or even greater work, as we may well expect when we consider the far more refined methods at his command, with which to wrest from slowly yielding nature her innermost secrets.

I have only attempted to superficially pass in review the whole range of the fat industry. In placing some of the problems before you, I am well aware that it is far easier to point out which direction the march of progress should take than to effect and assist such progress by original work, much as it is far easier to vaguely speculate than to predict definitely. But the work of an individual is sadly limited, and many workers are wanted to lay their hands to the plough which shall prepare the soil for the rich harvest we wish to garner.

Discussion.

Mr. Joslin said he could remember the time when the raw product of the American hog was sophisticated to the extent of 15—20 per cent. of cotton seed oil, together with about one-third of that amount of tallow; and it passed muster because it looked agreeable and appealed to the taste. The analyst had altered all this, but the foreign fats which were likely to come into use would probably tax his knowledge considerably, especially as with the new refining processes, it was possible to produce from all animal and vegetable fats a large amount of strictly edible products which could not be easily identified by taste and smell. The last part of the paper, which more directly appealed to him, referred to the glycerin-splitting process by means of sulphonic acid (Twitchell process). By properly preparing the fat previously, and by the judicious use of these sulphonic acids in the right quantity and under the right conditions, it was possible to make fatty acids of almost as good a colour as that made from the original stock—fatty acids the constitution of which did not differ in the slightest degree from those which existed in the original material.

Dr. E. Divers expressed doubt whether the production of Japan wax could be largely extended and cheapened. Not only did the wax tree take seven or eight years to grow to maturity, but under favourable conditions lacquer is prepared from it with the sacrifice of it as a source of wax. He also referred to the remarkable isomeric changes brought about in Japanese wood oil by light and by heat, changes independent of the action of air, because he thought it likely that their fuller study might help to unfold the still obscure nature of the drying of oils.

Dr. P. Dvorkovitz said that some 16 years ago he introduced an admixture of tasteless and colourless heavy petroleum oils into various vegetable oils in order to prevent their getting rancid. He quite agreed with Dr. Lewkowitsch as to the value of blown oils as lubricants. Although oxidation increased the viscosity at ordinary temperatures, yet at a high temperature it diminished. No doubt it was a great mistake to use oxidised oil for lubricating purposes, because the presence of oxygen was not good for th machinery. The chief aim of those preparing lubricating oils was to remove as much as possible of the oxygen fro the oil, not to add to it.

Mr. C. Sevin said the so called Mowrah oil from *Bass latifolia*, which was used in India for soap-making, coul there be obtained in quantity. Cocoanut oil, perfectly swee and edible, had been produced in Germany, the free fatt acids having been removed by alkali; but this involved th washing out of the alkali with sulphuric acid. He had however, produced samples on a practical scale which ha kept for years. This problem was one which well deserve attention, as large amounts of Copra were available fro India, Africa, and the South Sea Islands.

Dr. P. Schidrowitz asked the author if he could give som information on the hydrolysis of fats by means of enzym action. They knew that fats were decomposed by enzyme and it was also stated that they were synthesised b enzymes. In that way they might be able to prepa fats which might have a perfectly new character, in th same way as Croft Hill had shown that the sugar forme by reversion from glucose differed from maltose.

The Chairman said that one of the most importa suggestions in the paper was the reconstitution of fatt acids from petroleum, the modern theory being that th petroleum was originally derived from fatty substan As regards the future synthesis of such bodies they n had the help of electricity and they could produce ra material such as acetylene in large quantities, and with su assistance they could build up products which were n dreamed of a few years ago. It had happened more th once, when he wanted to get an oil produced from a ra material grown in one of our own colonies, that he had go to Marseilles for it, which was rather humiliating f an Englishman. On the following evening at the Soci of Arts there was to be a paper read by a gentleman w was one of the chief officers in the Lagos Hinterla and the author had told him that he had sent a go representative collection of the productions of our territo home, which he had collected with great trouble a expense, but they disappeared and nobody ever hea anything more about them. In fact when he came ho he could not find a trace of the products he himself h sent. That was not what happened with the Germans the French, and he thought a little Government help giv in such cases would be very useful. If the Governme were in a case like that to appoint a joint committee several of the Technical Societies to confer with them th would well be able, without much expenditure, to find what materials were useful and which were not. I instance, that society could very well help in connect with the Society of Arts and one or two others in advis the Government what could be done with the raw produ of which we had such enormous quantities in the Coloni With regard to castor oil, he should rather differ fr what he understood Dr. Lewkowitsch to say with regard the quantities of it which might be available; practic he thought the quantity would be unlimited, if there w a greater demand. He had wandered for days thro woods of castor oil plants which were wasting their swe ness on the desert air. It was a plant which, once it into a country with a suitable climate, was very diffic to get rid of. The product which Dr. Lewkowits had shown might prove extremely useful, and produced not by the oxidation but by the polymerisa of the castor oil, because if the oil were heated to a cer temperature (it need not be a high one) in the absence air, or oxygen that solid substance resulted. Castor ought not to be classed without further research amon other oils, because it possessed very different properties f nearly every other oil. It was completely soluble in alco amongst other things, and in several other impor respects differed from the bodies usually classed as That solid product, which was shown, was produced a waste product in another industry. The grape harve France sometimes fell short, but there was still the dem for brandy, and in order to make that brandy somet must be found with a similar flavour. The alcohol easily obtained, but the flavouring known as oil of bra

.s made from castor oil. The oil was heated in a retort, l the volatile substance given off was the raw material : oil of cognac. The residue in the retort was made in nsiderable quantities and was similar to what had been own. There was a considerable quantity of it, which at esent was a waste product, and when he was last in Paris was asked if he could find a use for it. Probably if they old find a solvent for it, it might be used on a large ale. With regard to linseed oil, of which he had long ade a special study, there was, as had been said, no neral law at present known with regard to the action of iers. There were all sorts of rule of thumb experiments d statements, but no real law had been deduced. In ny cases it was laid down that driers acted simply as talytic agents and conveyers of oxygen from the air, but en one tested the statement in the laboratory and did it antitatively, this conclusion proved to be totally wrong. ying oils could be had without exposure to the atmohere, and the quantity of oxygen in the driers was quite sufficient to produce the change, if it were simple oxidan. If the oxidation were continued, as was done somees in blowing oils, two actions went on simultaneously, d it was impossible to regulate the process so that the quired action—the first action—should alone take place. is could not be carried out entirely separate, because, at e same time that it was in progress, there occurred a rther superoxidation in that portion which was already idised, and, therefore, a mixed product was obtained in ch case. Pliny ascribed the invention of soap to the ermans. Perhaps Dr. Lewkowitsch could inform them at use the ancient Germans made of soap. He had heard ey used it on their hair; it was also said that the Roman atrons used it as a hair dye, or rather perhaps it should called a restorer, giving their hair a golden tint by eans of German soap. The interesting remarks of . Divers opened up a very wide subject as to the ssible production of fatty matters in other countries well as our own. The difficulty which seemed to arise th regard to the Japan wax seemed to be inherent in e subject. He did not know of any vegetable wax proiced on a large scale from anything except trees of nsiderable size, while fatty matters or oils might be proiced from plants grown in a short time. Carnauba wax, wever, which came from a palm tree, could be produced in azil in much larger quantities than it was at present. e difficulty in the use of new articles of this kind, oduced on the small scale was that if they were used on industrial scale the price rose against the consumer thin a few months; that was where an energetic Colonial fice could help them by organising on the other side the pply, as soon as they found out there was a demand. It uld be of very great importance if they could arrange some eans of getting into touch with those only too willing to oduce these articles in the colonies, and the Colonial fice or some Government department might get advice as the technical use of the commodities which could be oduced on a very large scale in our colonies.

Dr. **Lewkowitsch**, in reply, said he was afraid he had t made himself fully understood in every detail, because veral speakers had mentioned subjects which he thought had disposed of. He did not in the least decry the gestive properties of those vegetable oils or animal fats hich were mixed with lard, but the public had a right to pect foodstuffs to be sold under their proper names. ith regard to the last remarks of Mr. Joslin, he did not tend going into existing processes; he had only pointed t that the Twitchell process afforded many features scientific interest. Although he had touched upon is in a previous paper and was well acquainted with e process, this was not the occasion to speak about it. e had hoped Dr. Divers would say something about the panese sardine oil, which should develop to a very large dustry if the Japanese went about it in the proper way. e did not mention Japan wax as one of those fats the pply of which could be increased; but he had referred to pan and China as countries from which they could get rger supplies of oils. Both countries were undoubtedly ore suited for the production of oils than of hard fats. here was a difference between Japanese and Chinese wood-oil. He had been found fault with before for describing wood-oil as Japanese wood-oil, whilst the great bulk of the oil, which came in large quantities to this country (especially from Hankow), was Chinese oil, and to get out of the difficulty he suggested the name Tung oil. He had passed round the solid polymerised product obtained on heating above 180° C. The drying properties of the tung oil were undoubtedly very great, but for all that it could not at present supplant linseed oil. It had the awkward property of drying to an opaque solid mass, which, though giving a coat, was not one useful in the arts where linseed oil was employed. The smell was also a slight objection, but in outdoor painting that might not matter. Dozens of patents had been taken for using the tung oil in admixture with linseed oil, rosin, gums, in short, anything which could produce a sort of hard coat, and the products were offered as varnishes and substitutes for wax, &c.; but hitherto tung oil has not been used to any great extent in the arts. One reason was that the nature of tung oil was still unknown. Theoretically, they thought every drying oil should contain linolic and linolenic acids, the presence of which could be demonstrated by isolating the hexabromide of the linolenic acid. Fish oils did not give these hexabromides, and although they seemed to dry and absorb oxygen they could not be placed in a line with the drying oils proper. He had frequently examined tung oil, and he had found it contained no hexabromides, and from this point of view alone a kind of explanation could be offered why it could not be as good as linseed oil.

Mr. **Hall** said he had a sample once which gave a most beautiful thin transparent film.

Dr. **Lewkowitsch** said he had many samples in his laboratory, but he never got a clear transparent film. No doubt as there were so many sources of supply, Mr. Hall and he had evidently got different kinds. Already the suspicion had gained ground that tung oil was often adulterated with cottonseed oil. Another reason, perhaps, was that too high a price was asked for the oil. A substitute for linseed oil which came within 2*l.* per ton of linseed oil, had little chance in the market.

Dr. **Divers** said he spoke of it as being the most marvellous of all drying oils as to rapidity, not of its technical value; in fact, in Japan, linseed oil was used, not the other oil, except for some common purposes, such as paper umbrellas.

Dr. **Lewkowitsch** said the moment they knew how to use it, it would certainly become a valuable oil. If it was only used for painting umbrellas, it would have to meet, especially in India, the competition of rosin oil. In reply to Dr. Dvorkovitch he said he had expected he would tell them something about the extensive use of edible linseed oil. He should differ from Dr. Dvorkovitch with regard to the advantage of adding vaseline oil to an edible oil. He did not know why it should prevent rancidity; there was no scientific explanation, and he could not say whether it did or not retard, or prevent rancidity.

Dr. **Dvorkovitch** said that oxidation was prevented by mixing a very small quantity of petroleum oil with vegetable oil.

Dr. **Lewkowitsch** said he was afraid the mixed oil would not be a good edible oil. He thought every public analyst would condemn any oil which contained 4 to 5 per cent. of mineral oil. Whether it was used in the sardine industry he did not know, but he might remind him that what was called sardines in olive oil was very often sprats in cottonseed oil.

Dr. **Dvorkovitch** said the price of this oil was so high it would not be used for ordinary purposes of mixture.

Dr. **Lewkowitsch** said he thought the so-called "bread-oil" which was sold in Germany to the manufacturers of confectionery for greasing the tins had that origin. With regard to Mr. Sevin's remarks, the mowrah oil was an old acquaintance of his. It was also called Dolia oil in India, and had found some application as a sizing material in the Indian cotton mills. Large quantities of the oil were imported into Marseilles. In his experience it was not difficult to remove fatty acids from cocoanut oil, nor did he say it was not possible to produce a butter substitute as he had made a very definite statement in that respect; but it was not so easy to keep it sweet a long time. The removal of the free fatty acids alone would not prevent rancidity. They did not know exactly what caused rancidity. It was something more than the formation of free fatty acids, although it followed in its wake. Mr. Sevin's cocoa butter might keep very well in his kitchen for two years, but he should like to know how it would behave if he sent it across the line, say to New Zealand. In reply to Dr. Schidrowitz as to the action of enzymes, he had said something about that a few months ago, and it was also mentioned in the present paper. In the former paper he had also referred to Hill's work on the reversible action of enzymes. If Dr. Schidrowitz would have patience, he would see in a few weeks a paper he was publishing in conjunction with Dr. Macleod of the London Hospital, on hydrolysing fats outside the organism, by means of steapsin. He had carefully looked out for the reversible action, but up to now he could not say he had noticed the synthesis of glycerides from fatty acids and glycerol. With regard to the Chairman's remarks, his suggestion as to the co-operation of that Society with the Society of Arts was certainly an extremely valuable one. He (the speaker) had treated this subject rather as a side question, as he considered it an economic one, being wishful in the present paper to deal with the matter from a technical point of view. Undoubtedly it was a great subject, and they could do an enormous amount of work which unfortunately was not done in this country. He might point to what was being done by Germany lately. They were importing from both the East and West Coasts of Africa quantities of foreign seeds, which they were investigating and examining very thoroughly. The discovery of mixed glycerides had actually been made in the course of examining fat from one of those foreign fats from the East Coast of Africa. Companies in Liverpool, and people who had large stakes in the West Coast of Africa, looked at the question in a very undecided way. They knew that out of palm oil a good deal of money could be made, but when the shipping trade was good they made so much profit they did not care what happened. Hence the question of how to prepare edible palm oil was not taken in hand properly. Undoubtedly the production of castor oil was unlimited. The proof of that was the present price, which was in the neighbourhood of 20*l*. a ton, when all other oils had reached an enormous price. Perhaps he had been assuming too much the rôle of a prophet and had dreamed of the time when extended technical application made castor oil scarce. It was certainly a peculiar oil, and stood alone in the whole range of fats, in that its glycerides consist almost exclusively of those of hydroxylated fatty acids. He would not dare to follow the Chairman in his remarks regarding the linseed oil industry, in which he was a well known expert. But what he wanted to lay stress on was that all our preconceived ideas about oxidising oils, blowing oils, &c., required thorough overhauling. He had before him a product made to replace the Scrim oil linoxin, but prepared by an ozone process, but whilst the one was useful the other was not. As to the employment of soap in the early times of its discovery, undoubtedly it was not used for cleansing purposes, but as a pomade. He should fancy the hair of the Roman ladies was bleached by the uncombined alkali, of which, no doubt, a good deal was left in the soap by the earliest manufacturers. He was not surprised that the Chairman derived little comfort from text-books as to fatty acids. Statements were copied from one text-book into another, and what had been written 50 years ago was still transferred from one book to another without verification. No doubt if the Chairman's suggestions were followed out as to picking out oils which might be useful, the price would be raised. He had had some experience of that only a few days ago, when enquiries from several quarters as to a hitherto little used oil appear to have so startled a City merchant that he refused to supply further samples.

A NEW MATCH TO STRIKE ON ANY SURFACE AND NOT CONTAINING PHOSPHORUS.

BY WATSON SMITH.

This match strikes upon any surface, but is entirely free from phosphorus; were such a match generally adopted and used, it goes without saying that phosphorus necrosis of th jaw would be entirely abolished. The composition is th invention of my friend the late Mr. S. A. Rosenthal, wh spent some years in perfecting it. I can vouch for the eas and safety of its preparation, as I assisted Mr. Rosenth in preparing some of it on a manufacturing scale, and i making a quantity of matches with it. The proportions the constituents of this mixture are as follows:—Copp thiosulphate, 5 parts; copper thiocyanite, 10 parts; potassiu chlorate, 40 parts; powdered glass, 9 parts; antimon sulphide, 3 parts; calcium sulphate, 3 parts; sulphu 4 parts; and 10 per cent. glue solution, 26 parts. (Th Journal, 1900, 851–852.) I have a box of wax vestas whic are headed with this composition, and I will ask our chai man to try them. You will notice the bluish flame of copp on igniting the match.

Friction is not quite as ready as with many phosphoru matches, but there is an element of safety here, for I hav on sundry occasions observed boxes of matches suddenl fire up, so slight was the friction required for ignition.

We are to have, this summer, I understand, a congre on fire prevention, and it may be a fair question to p before it, "How far the sensitiveness to friction of match ought to be carried for the convenience of smokers who wi them to strike easily anywhere, having regard to risks fire, and public safety."

DISCUSSION.

Mr. **SPILLER** said that before he left the War Departme in 1868 they were fuse-making with an experiment composition which exactly answered the requirement no described. It was a mechanical mixture containing phosphorus, and consisted of potassium chlorate, a litt nitrate, and sulphide of arsenic (Realgar). Arsenic bei used instead of phosphorus, was, perhaps, equally objectio able, but the matches and composition fired easily by frictio

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Manchester Section.

Meeting held on Friday, May 1st, 1903.

DR. GERLAND IN THE CHAIR.

PHENOLIC COLOURING MATTERS.

BY A. G. PERKIN.

It is well known that the use of many of the mo important natural dyestuffs dates back to remote antiquit and though one is inclined to suggest that it was at fir the highly coloured appearance of the material whic pointed to its suitability for dyeing purposes, no reliab information is available to enable us to trace the discove of, or the first mode of application of the natural dyestuf It is evident, however, that as, even at these remote period the art of mordanting was known, numerous experimen must have been carried out to test the best method fixing the highly-coloured natural products, and gradual those which proved the strongest and most permanent we eventually selected. Most interesting, from this point view, are the Indian dyestuffs, which comprise a conside able variety of plant products, such as leaves, flower seeds, bark, stem, root, &c. It is only recently that have been able to obtain any extensive knowledge of the Indian dyewares, which, even till a few years ago, we considered by some to possess a beauty of shade and pe manence which were unknown elsewhere. Whether t European dyer, who for many years used—and, indeed, st uses—natural dyestuffs, was content to work only wi those products recommended by the merchants of the tim or whether, by comparative experiment, he arrived at t conclusion that certain of these were the best, can only conjectured, because very few records of experiment up the dyeing properties of plants exist. The result, howev hat, after some thousands of years, we have a collection commercial natural dyestuffs, which are shown, as regards ir tinctorial properties, on the screen behind me. These resent, no doubt, a survival of the fittest, in that better tural products do not appear to exist; but, on the other nd, certain Indian varieties—notably chayroot and rinda root—possess most valuable properties, and could ve been more generally employed, with advantage, had re careful experiments been carried out in the first tance. With but little record of former work, and this readily accessible, it has been the usual impression that tural products capable of dyeing with mordants are newhat rare, and that those before you represented, ctically, all that are known. A study, however, of such rks as Bancroft's "Philosophy of Permanent Colours," eals the fact that certain other plants have been, and ll are, employed to some extent in outlying districts ere they happen to abound in quantity; and as an illus-tion of these, one may mention the utilisation of heather the Highlands of Scotland for dyeing yellow, and of *Genista tinctoria*, or dyer's broom, in Germany for the ne purpose.

Again, in the somewhat obscure work of Leuchs, entitled 'arbe und Farbekunde," an account is given of a very merous series of flowers, leaves, and other plant products ich possess tinctorial property, and latterly the late of. Hummel collected a large amount of information on this subject. As a result it is interesting to note, not y how widely distributed the natural colouring matters , but also that the greater number of these are *yellow*; orange-red, and especially the blue colours, being much s frequently met with. Perhaps the most striking of se latter are the deep blue-violet shades given by the berry, the blackberry, the skin of the grape, &c., patterns some of which are before you; and it is possible that dyeing properties in each of these cases may be due to presence of one and the same colouring matter.

Though it is natural for anyone who seeks for a natural stuff to select for this purpose some highly-coloured nt, it is, however, far from being the rule that its oured appearance is an indication of its dyeing property. r instance, the common brilliant yellow sunflower and common gorse flower possess but little tinctorial power, ereas the clover and acacia flowers, which are white, ertheless contain a yellow colouring matter. It is an custom in Yorkshire, and still obtains at the present , to send Easter eggs, which are dyed a brilliant colour, stly yellow. The process consists in some cases in ling eggs which have been previously wrapped in the ourless skins of the onion, whereby a peculiar mottled earance is produced on the shell, the explanation being t the calcium in the shell acts as a mordant towards a ouring matter contained in the skin. Experiment has wn that there is present in the onion a considerable ntity of a glucoside of quercetin, and I have seen it stated t onion skins used to be collected on the continent for sequent use in dyeing goods yellow.

The results of the investigation of the natural dyestuffs r a long period of years have yielded a considerable ight into the chemistry of many of the colouring matters y contain, but the progress in this direction has been from rapid, owing, no doubt, to the more enticing spect offered by work on the coal-tar dyestuffs. Again, rkers in this direction must necessarily find as time goes much greater difficulty in prosecuting their work, ecially as regards the labour entailed by the isolation a sufficiency of the pure dyestuff for investigation; this, doubt, is the reason why certain most interesting colours this class have received so little attention.

t is now possible to classify many of these substances.

Anthraquinone Group.

Alizarin.
Purpuroxanthin.
Hystazarin.
Purpurine.
Purpurine carboxylic acid.
Anthragallol.
Morindone.

Alkannin.
Ventilagine.

Glucosides.

Ruberythric acid (alizarin).
Morindine (morindone).

Naphthoquinone Group.

Lapachol.
Lomatiol.

Colouring matter of Drosera Whittakeri, a trihydroxy-methylnaphthoquinone.

Indene Group.

Carminic acid.

Laccainic acid?

Benzophenone Group.

Maclurin.

Kinoin?

Xanthone Group.

Euxanthone.
Gentisin.

Datiscetin.

Flavone Group.

Chrysin.
Tectochrysin.
Apigenin.
Acacetin.
Luteolin.
Luteolin methyl ether.
Lotoflavone.
Galangin.
Galangin methyl ether.
Kampherol.

Kaempheride.
Fisetin.
Quercetin.
Rhamnetin.
Rhamnazin.
Isorhamnetin.
Morin.
Myricetin.
Gossypetin.
Quercetagetin.

Glucosides (Flavone).

Apiin.
Robinin.
Fustin.
Quercitrin.
Vitexin?
Brasilin.

Rutin.
Osyritrin.
Xanthorhamnin.
Myricitrin.
Scoparin?
Hæmatoxylin.

Alkaloid or Basic Group.

Berberine.

Coumarin Group.

Daphnetin.

Daphnin (glucoside).

Colouring Matters of Unknown Constitution.

Curcumin.
Santalin.
Bixin.
Carthamin.
Butein.
Jacarandin.

Excoecarin.
Rottlerine.
Flemingin.
Catechin.
Cyanomaclurin.

The dyeing properties of many of these are] seen upon the accompanying sheets.

I now propose to lay before you two or three of the many points which have arisen during a long investigation of these natural products, or, more strictly speaking, phenolic colouring matters, in the hope that such a method of procedure may prove to be of interest. As a rule, a definite natural dyestuff is derived from one part of the plant only; thus, madder is got from the root, quercitron from the bark, old fustic from the stem, sumach from the leaves, whereas Persian berries may be cited as an example of the use of the fruit. In certain cases the plant contains mixtures of two or three colouring matters, which, though usually, are not always closely related to one another. Persian berries contain, for example, three dyestuffs, namely quercetin, its monomethyl ether rhamnetin, and its dimethyl ether rhamnazin, and the familiar case of madder may be cited in which alizarin, purpurine, and other anthraquinone derivatives exist side by side.

In the second class, where the dyestuffs are less similarly constituted, may be mentioned the case of old fustic, in which morin, a *penta*hydroxyflavone, and maclurin, a pentahydroxybenzophenone, occur, and also the case of dyer's broom (*Genista tinctoria*), which contains luteolin, a tetrahydroxyflavone, and genistein, a trihydroxy-phenylketocumaran. The difference in constitution exhibited by these and many other plant mixtures is obvious, but at the same time it is interesting to note that a certain connection does in nearly every case exist between these substances. An examination of a numerous series of plant products has shown that the colouring matters themselves, and also the tannin matters which so frequently accompany them, contain, as a rule, at least one chemical nucleus in common. This point is brought out by the accompanying diagram, in which is given the more important nuclei which have been proved to exist in some of the substances in question:—

Old fustic ...	*Morin*, phloroglucinol and resorcinol.	*Maclurin*, phloroglucinol and catechol.
Dyer's broom	*Luteolin*, phloroglucinol and catechol.	*Genistein*, phloroglucinol and phenol.
Jackwood....	*Morin*, phloroglucinol and resorcinol.	*Cyanomaclurin*, phloroglucinol and resorcinol.
Sumach......	*Myricetin*, phloroglucinol and pyrogallol.	*Gallotannin*, pyrogallol.
Catechu......	*Quercetin*, phloroglucinol and catechol.	*Catechin*, phloroglucinol and catechol.
Tea..........	*Quercetin*, phloroglucinol and catechol.	*Catechol tannin*, catechol.
Weld........	*Luteolin*, phloroglucinol and catechol.	*Apigenin*, phloroglucinol and phenol.

Other instances might be cited, but the above are sufficient to illustrate the point. In certain cases there are exceptions to the rule that the dyestuffs occurring in the same plant are closely related, but it seems probable that these exceptions are more apparent than real, and will in many cases disappear when the mixture in question has been more accurately examined. A further point in regard to this portion of the subject has to do with the colouring matters which frequently exist in distinct portions of the plant.

Certain trees which contain a yellow dyestuff in the stem or bark, also contain a second colouring matter in the leaves; this latter is not as a rule identical with the former, though belonging to the same group, but is frequently a derivative of the stem product, containing in addition one or more hydroxyls. Such, for instance, is the case with young fustic (*Rhus cotinus*), the wood of which contains fisetin, which is a *tetra*hydroxyflavone, and the leaves myricetin, which is a *hexa*hydroxyflavone; again, the wood of the yellow cedar (*R. rhodanthema*) contains fisetin, and the leaves quercetin or *pentahydro*xyflavone. Interesting relationships occur in regard to the logwood tree, as the stem contains hæmatoxylin, and the leaves myricetin and gallotannic acid, all these three substances being derived from pyrogallol; again, the madder root contains alizarin, and the stem and leaves a yellow dye, which appears to be a catechol derivative.

As is well known, the natural colouring matters as a rule exist in the plant in the form of glucosides, which, by means of dilute acid or alkali, are hydrolysed, with formation of free colouring matter and a sugar. Though comparatively few of these have as yet been isolated in a pure state, four distinct types are known, the characters of which are illustrated by the diagram.

$$? \underset{\text{Fustin.}}{C_{36}H_{26}O_{14}} + 4H_2O = \underset{\text{Fisetin.}}{2C_{15}H_{10}O_6} + \underset{\text{Rhamnose.}}{C_6H_{14}O_6}.$$

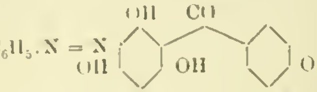
$$\underset{\text{Quercitrin.}}{C_{21}H_{22}O_{12}} + H_2O = \underset{\text{Quercetin.}}{C_{15}H_{10}O_7} + \underset{\text{Rhamnose.}}{C_6H_{14}O_6}.$$

$$\underset{\text{Rutin.}}{C_{27}H_{32}O_{16}} + 3H_2O = \underset{\text{Quercetin.}}{C_{15}H_{10}O_7} + \underset{\text{Rhamnose.}}{2C_6H_{14}O_6}.$$

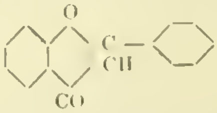
$$\underset{\text{Robinin.}}{C_{33}H_{41}O_{20}} + 4H_2C = \underset{\text{Kampherol.}}{C_{15}H_{10}O_6} + \underset{\text{Rhamnose.}}{3C_6H_{14}O_6}.$$

It has been usual to assume that these glucosides are not the actual colouring matters, but that during the dyeing operation they suffer hydrolysis, as just stated, into a sugar and the real dyeing principle. A study of the flavone glucosides has, however, shown that this cannot be considered the rule, and it is evident, on comparing the tinctorial properties of the colouring matters and of their glucosides which are before you, that the latter often act directly as dyes, and yield very distinct shades. A simple experiment with Persian berries clearly illustrates this point. The berries, as is well known, contain the glucosides of quercetin, rhamnetin, and rhamnazin, along with a ferment, which, at 40° C. in the presence of water, decomposes the glucosides, with separation of the free colouring matters. If the dye-bath therefore be gradually raised to the boil, the resulting shades are produced by the free colouring matters, but if the material be plunged at once into boiling water the ferment is killed, and the tinctorial properties of this solution are due to the glucosides only. Dyeings prepared in this manner are before you, and the distinction in the shade thus obtained is obvious.

Before the triumphal progress of the coal-tar colours many of the natural dyestuffs have already practically disappeared from the market, and the time is not far distant when it seems probable that all will have passed out of use. The question, however, arises whether, in view of the remarkable cheapness of some of these natural products, it may not be possible in some instances to utilise them as a starting point in the synthesis and the manufacture of new colouring matters. As pure quercetin can now be prepared for less than 1*s*. 6*d*. a lb., and morin for probably a little more, there is ample scope for research in this direction. The only natural colouring matter which is at present utilised in this manner is maclurin, a constituent of old fustic, from which, by combination with diazobenzene, C. S. Bedford has obtained a new dyestuff known in the trade as "patent fustin." It has the constitution—

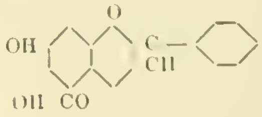


I should like now to turn for a few moments to a class of colouring matter which has recently attracted considerable attention, and the members of which appear to be more widely distributed throughout nature than those of any other series. I refer to the flavone group, of which a fairly

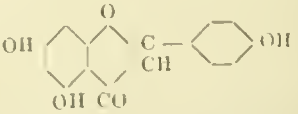


complete natural series is known to exist, represented i respect of their dyeing properties on the diagram. short survey of these will, I think, be interesting, as it i thus possible to trace the effect of the introduction o various hydroxyls in the molecule upon the dyeing property.

Commencing with chrysin—

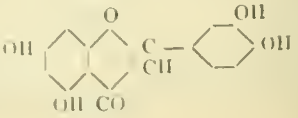


and apigenin—



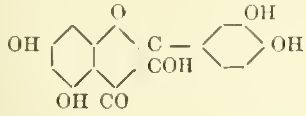
there is evidence of feeble yet distinct tinctorial propert towards certain mordants. This has, of course, no con mercial value, but the fact is nevertheless of interest fro a theoretical point of view.

If a hydroxyl be now added to apigenin in the positi 3′, it is at once transformed into a dye of strong characte namely luteolin, the colouring matter of Weld, whic possesses valuable properties—



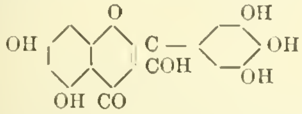
The reason of this is obvious, for this compound contains ro hydroxyls in the ortho-position to one another, a ouping which Liebermann and Kostanecki pointed out to an essential if a derivative in the anthraquinone series to be a dyestuff, and this rule obviously holds good to me extent in the flavone group.

Proceeding with the multiplication of hydroxyls, if a th be inserted into the α position, a further intensification shade is produced—



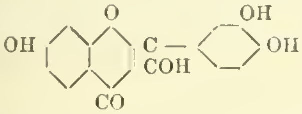
formula of this compound representing quercetin, one the strongest colouring matters of this series.

Again, the addition of a final hydroxyl in the position 5′ lds myricetin—



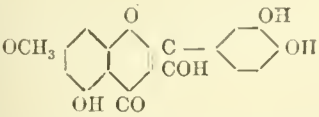
this addition has hardly any further effect on the ing property, as the substânce is almost identical in this pect with quercetin.

t is interesting now to remove from this latter the two lroxyls 1 and 5′, for this gives a representation of etin—



dyeing properties of which, it will be observed, are rly identical with those of quercetin and myricetin. m this it appears that the hydroxyls 1 and 5′ have ctically no effect upon the tinctorial property of these ivatives of the flavone group.

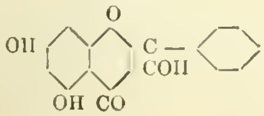
further fact as regards this question can be arrived at a study of rhamnetin, which is a quercetin monohyl ether containing the methoxy group in the ition 3—



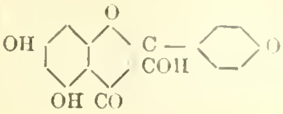
is well known that a methoxy group in these phenolic stuffs has no auxochromic effect, so that if the roxyl 3 in quercetin has any marked tinctorial influence will disappear when it is methylated. As a matter of , it will be observed that no such change takes place, rhamnetin and quercetin possess an almost identical ng property. It therefore follows that the hydroxyl 3 uercetin has no tinctorial value, and the behaviour of in, quercetin, and myricetin as dyes is practically due ie 3′, 4′ and α hydroxyls.

gain, it is evident that the dyeing property of luteolin uc to the hydroxyls 3′ and 4′, and that the groups ipying the position 1 and 3 do not add to this effect.

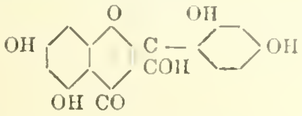
arting afresh with chrysin it will be observed that if be transformed into galangin—



there is at once a well-marked increase in dyeing power, and this is again intensified to a slight extent by its conversion into kampherol—



and to a slightly further extent by conversion into morin, the colouring matter of Old Fustic—



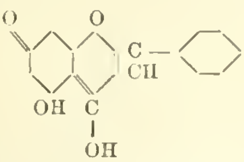
In studying this latter group of three colouring matters, *viz.*, galangin, kampherol, and morin, it is at once evident that Liebermann and Kostanecki's rule does not apply to these compounds, for they do not contain ortho hydroxyls; though therefore the presence of ortho hydroxyl groups in the anthraquinone and flavone series always confers dyeing property, this grouping is not absolutely essential in the flavone or flavanol class.

There is for instance no special distinction of importance as to strength of shade produced by luteolin, which contains ortho hydroxyls, and morin, which does not; and though, of course, the presence of these ortho hydroxyls in quercetin does have a powerful influence, they are evidently not essential to tinctorial property. That this is not a peculiarity of the flavone group alone gains support from the behaviour in this respect of curcumin from turmeric, for no evidence has as yet been forthcoming that this compound contains ortho hydroxyls.

The result of this investigation of these dyestuffs of the flavone group indicates, therefore, that three hydroxyl groupings have to be taken into account, namely, (*a*) the hydroxyls 3′ and 4′, (*b*) the hydroxyl *a*, and (*c*) these three hydroxyls together.

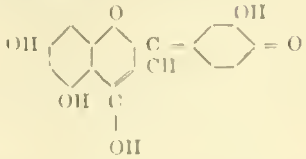
An important theory as regards coloured compounds of this type, and which has been largely applied to the artificial colouring matters, is the so-called "quinonoid theory," and, as is to be expected, it is possible to explain the dyeing property of these foregoing substances from the point of view of this theory.

(*a*) Chrysin and apigenin, being in themselves *colourless* substances, and contain no quinonoid structure, to these coloured metallic compounds such a configuration must be probably assumed, and this may be expressed in the following manner:—

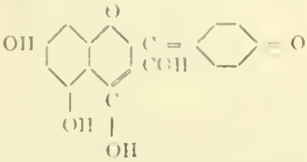


Now, the tendency of these colouring matters to form salts is probably feeble, or, putting it in another way, these salts, as for instance the lead salts, are very sensitive to dilute acids, moreover the colouring matters themselves do not decompose the alkali acetates in presence of alcohol, a reaction which will be referred to later. In other words, these compounds have little tendency to assume the quinonoid form, and consequently their dyeing properties are feeble.

(*b*) As the next example, luteolin may be cited, in the case of which there is obviously a distinct tendency to assume the quinonoid form, and there can be little doubt that in this change it is the hydroxyl in the position 4′ which takes part, being influenced in this direction by the presence of the adjacent hydroxyl 3′. The quinonoid form of luteolin will therefore be—

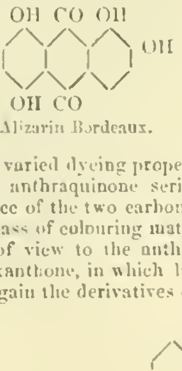


A precisely similar effect is produced by the hydroxyl situated in the pyrone ring, in kampherol for instance, which, as has been previously shown, has a dyeing property almost as intense as luteolin itself—

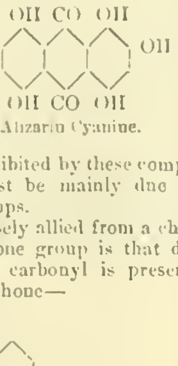


As regards the effect of the various hydroxyls upon the shade of the colouring matter in various distinct groups, it is interesting to note that the similarity of shade possessed by flavone compounds is not a characteristic of the anthraquinone group. This is evident from an examination of the result of comparative dyeing trials with alizarin (dihydroxyanthraquinone), anthragallol (trihydroxyanthraquinone), alizarin bordeaux (tetrahydroxy), and alizarin cyanine (pentahydroxyanthraquinone).

Now in the conversion of alizarin into anthragallol a change is produced in the formula which is exactly analogous to the production of myricetin from quercetin; but whereas in the latter case the dyeing property is scarcely altered, in the former it will be observed that a very marked change occurs. The presence of four hydroxyls as in alizarin bordeaux exercises a further change in shade, which is further accentuated in the pentahydroxy compound alizarin cyanine—



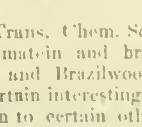
Alizarin Bordeaux.



Alizarin Cyanine.

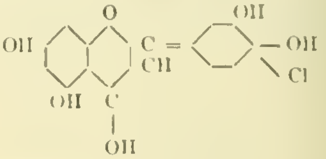
The varied dyeing property exhibited by these compounds of the anthraquinone series must be mainly due to the presence of the two carbonyl groups.

A class of colouring matter closely allied from a chemical point of view to the anthraquinone group is that derived from xanthone, in which but one carbonyl is present, and here again the derivatives of xanthone—

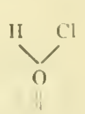


so far known which have dyeing properties are of the yellow type and exhibit but little variation among themselves. It therefore appears reasonable to conclude that the property of the alizarin dyes, in respect of variation of shade, is due to the presence of the second carbonyl group, but before a reason for this peculiarity is brought forward, I should like to allude to a subject which is connected with this point.

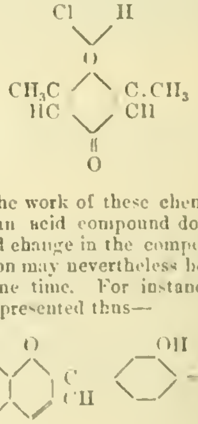
Some years ago (Trans. Chem. Soc., 1882, 2343) it was pointed out that hæmatein and brazilein, the colouring matters of logwood and Brazilwood, when treated with mineral acids gave certain interesting acid compounds. On extending the reaction to certain other colouring matters, notably those of the flavone group, it was found in numerous instances that they also frequently formed compounds with sulphuric acid and the haloid acids. These products possessed the formula of the original substance plus one equivalent o the acid, and were almost immediately decomposed in pre sence of moisture or alcohol with elimination of the aci and regeneration of the colouring matter. An examinatio of a varied series of phenolic dyestuffs showed that th reaction employed in the way described at the time wa almost limited to the flavone class, and the behaviour i this respect of the individual members was therefore closel studied. As a result it was found that only those substance which possessed a well-marked dyeing property reacted wit the acid, and that the feeble dyestuffs such as chrysin an apigenin remained apparently unaffected by the treatmen So far therefore as this group was concerned, the reactio serves as a valuable indication of the dyeing property, an in order to account for these results an explanation base upon the quinonoid theory was suggested, Luteolin hydr chloride for instance being represented thus—



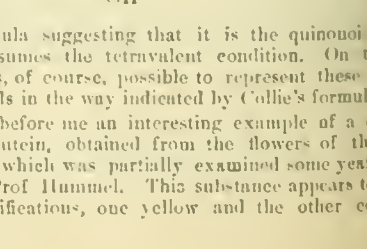
It was, however, pointed out, that certain other pheno dyestuffs did react with the acid, but that the instability the compounds thus produced hindered their isolatio For instance, *red* alizarin and *red* morindone give resp tively with sulphuric acid maroon and deep blue-colour solutions respectively and these latter probably conta highly unstable compounds of the dyestuffs with the ac These curious salts, the formation of which could for ma years only be explained with the aid of the quinono theory, have been shown by Collie and Tickle and Baeyer to be *oxonium* derivatives, that is to say, compou of tetravalent oxygen. Thus, for instance, in the case hydrochlorides the group—



or an allied grouping is assumed to be present, as illustra by Collie's formula for dimethylpyrone hydrochloride—



Now, although the work of these chemists indicates t the formation of an acid compound does not necessar involve a quinonoid change in the compounds under d sion, such a reaction may nevertheless be readily presu to occur at the same time. For instance, luteolin hy chloride may be represented thus—



this formula suggesting that it is the quinonoid ox which assumes the tetravalent condition. On the hand, it is, of course, possible to represent these oxon compounds in the way indicated by Collie's formula ab

I have before me an interesting example of a colour matter, butein, obtained from the flowers of the *frudosa*, which was partially examined some years ag the late Prof. Hummel. This substance appears to ex two modifications, one yellow and the other colou hese compounds not only possess the same percentage osition, and the same nuclei, but have also identical g properties. The examination of this dyestuff is r enough advanced to allow one to predict its consti-, but it seems very probable that the difference en the two modifications may be expressed by repreg the colourless modification by a nonquinonoid e coloured by a quinonoid formula.

I will now allude to a second reaction similar in its cter to the formation of the acid compounds just ed to, and with which it appears to be closely cted.

en a solution of a phenolic colouring matter such as tin or alizarin in boiling absolute alcohol is treated a corresponding solution of potassium acetate, a ed crystalline precipitate is almost immediately l, which is the monopotassium salt of the dyestuff. place of potassium acetate, salts of other mono basic may be employed, and alcoholic potash behaves rly as long as water is practically absent. This able reaction has, so far as potassium acetate is ned, been shown to be a general one in that all lic substances possessed of well-defined dyeing ty give salts of this character.

hose cases, however, where the tinctorial property is oderate, a mono-substituted potassium salt is not formed, the product being sometimes obtained as lition compound of the colouring matter with the .

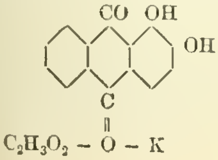
the other hand, substances are frequently formed may be termed semi-substituted salts, that is to say, hich contain only half the metal which should be , as in the case of daphnetin, which forms the salt, O_3K; but the most interesting compound of this class obtained from gallacetophenene, $C_8H_8O_4$ (Alizarine C), which contains but one-third of the normal y of potassium. It has consequently been named um trigallacetophenene, and has the formula $O_{12}K$.

ted in this way with potassium acetate, the chief rs of the flavone group yield a well-defined series stalline salts, which possess the property that, on with water, they are decomposed with separation free colouring matter. On the other hand, dyes of arin type give mono-substituted salts which can be l with water without undergoing decomposition.

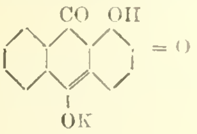
n referring to the flavone group, it is interesting to at it is only those compounds which react with acids which will yield these mono-substituted salts. r words, the acid and basic natures of the flavone ves, as expressed by these two reactions, are so ly similar in each case as to suggest an intimate ion, and a likelihood that both, at least in the first , are due to the same cause.

a, both salts and acid compounds of this group are decomposed by water; and not only this, both are ighly coloured than the dyestuff from which they ved.

remarkable that in phenolic compounds of this hich may contain two, three, four, or more hydroxyls, hydroxyl in each case reacts; in other words, merely salt is formed. Attempts to locate this hydroxyl ing the potassium salt with methylic iodide were ssful as regards the flavone group, but successful rds the anthraquinone series. In this way, the tassium alizarine gives the meta methyl ether, g that the reactive hydroxyl occupies this position. plain these results it has been suggested that the duct of the reaction is an oxonium derivative, the tion of which is represented as an addition comf the colouring matter with the acetate. For , the alizarin derivative would be thus represented—



This compound is, however, too unstable for isolation and almost immediately passes into the mono-potassium salt—

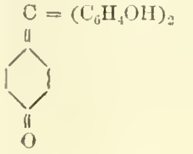


to which a quinonoid form is given.

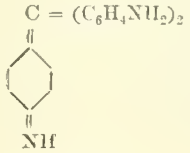
The reasons for this latter suggestion are, briefly, that the hydroxyl which takes part in this reaction is that one which is in the para position to one carbonyl group, and further that a most marked change in colour is to be observed between the *red* alizarine and its deep violet salt. A similar method of representation can be used to explain the formation of the mono salts of all phenolic colouring matters of known constitution.

In all those colouring matters which have been investigated and which contain but one carbonyl group, it is interesting to notice that their monopotassium salts closely resemble in colour the shades yielded with the aluminium mordant. Again, if the dye containing two or more hydroxyl groups be dissolved in potassium hydrate solution and a saturated salt thus formed, and which is usually assumed to contain two or more atoms of potassium, this does not differ in colour in any marked respect from the monopotassium salt itself. It therefore appears probable that the salt formation which is represented by the dyeing process is primarily due to one hydroxyl as regards the colour produced, the position of the remaining hydroxyl groups determining the readiness or otherwise with which the reaction occurs.

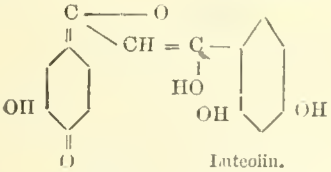
In this respect one is able to trace an analogy between, for instance, luteolin and the triphenylmethane dyestuffs. *p*-rosaniline, as is well known, owes its strong colour to but one amido group, represented according to the quinonoid theory as an imido group, and to this the colour and the combination with the fibre is usually considered to be effected.



p-Rosolic acid.



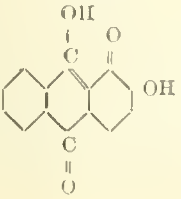
p-Rosaniline.



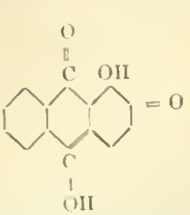
Luteolin.

On the other hand, it is suggested that these colouring matters, for instance luteolin, dye by reason of the marked acidity of one hydroxyl, the remainder possessing but an auxochromic effect.

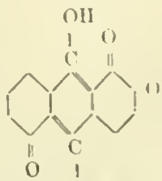
Returning now to the question of the variety of shade exhibited by the anthraquinone dyestuffs, it will be readily noted that whereas in the flavone series but one quinonoid change can be represented as occurring at one time, in the anthraquinone group this is not the case; alizarin itself is usually represented as an *o*-quinone.

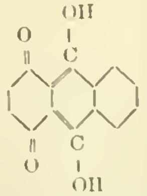


that is in the red condition, whereas in the form of its monopotassium salt the *p*-quinonoid form has been suggested—



and it is evident at a glance that both forms may be represented as occurring at the same time. On the other hand, the introduction of suitable hydroxyls would permit of the simultaneous existence of two orthoquinonoid structures. As a further possibility, two ortho and one para form can similarly be represented—





It is accordingly suggested that the variety of shade met with among the alizarin group is due either to alteration in quinonoid form or to the possibility of two such arrangements existing in the compound at the same time. As an instance it might be considered that alizarin red is the ortho arrangement, whereas alizarin cyanine gives a *p*-quinonoid grouping, and it is interesting to observe that monopotassium alizarin and the aluminium compound of alizarin cyanine (as exhibited on the dyed fabric) closely resemble one another in colour.

In throwing out these suggested adaptations of the quinonoid theory, I have purposely avoided any reference to the possibility of the occurrence of an ortho quinonoid grouping in the flavone and allied series. In certain instances this can be very probably assumed to occur, but as these instances did not appear to me to have an intimate connection with the points discussed, a reference to them has been avoided.

Nottingham Section.

Meeting held at Nottingham, on Monday, March 30th, 1903.

MR. L. ARCHBUTT IN THE CHAIR.

THE ACTION OF DISTILLED WATER UPON LEAD.

BY FRANK CLOWES, D.Sc.

An abstract of this paper has already appeared (this Journal, March 31, 1902, 421).

DISCUSSION.

Prof. KIPPING said that in University College they were in the habit of showing bottles of water in which lead had been immersed for several years. One bottle contained ordinary distilled water and the other boiled distilled water. It was the custom to show that boiled distilled water had no solvent action on lead, but that ordinary distilled water, which had not been subsequently boiled, had a very considerable solvent action. He did not know whether the experiment was at fault—whether there was some impurity in the wa which prevented the action, but as far as his knowle went, and as far as the experiments went, he thought t boiled distilled water had no action on lead which could detected by discoloration with SH_2. The action of water lead had been investigated by many chemists, but th seemed to be a very great difficulty in arriving at a defi conclusion on the subject. This appeared to be due par to the difference in the lead employed (though the lead u by Dr. Clowes was doubtless of a high degree of puri , the impurities in which might possibly give rise to a brown coloration with hydrogen sulphide.

Would Dr. Clowes explain the fact mentioned, tha white lead were suspended in water, and carbon dio passed through the solution, nothing, or a very small quan only, dissolved, whereas if precipitated white lead, wh had substantially the same composition, were used, a l quantity of some lead compound passed into soluti This seemed a very remarkable state of affairs. speaking of the inhibitive effect of substances, Dr. Clo referred to sulphates and carbonates. There again th was very great uncertainty. To what was the inhib effect of sulphate due? It could hardly be due to formation of lead sulphate, because this salt is sufficie soluble in water. It was hard to explain, therefore, the solubility of the metal was diminished. It had been stated that chlorides had an inhibitive effect.

Dr. CLOWES: We tried chlorides and did not find inhibitive effects at all.

Prof. KIPPING said that chlorides were stated as havi very pronounced inhibitive effect. It seemed to him th could not be so, unless insoluble basic lead salts w formed. He also asked Dr. Clowes whether he had fou impossible to get any water which would not act upon Would it be possible, he asked, to saturate the water hydrogen, boil it out, and then saturate it again? It stated in text-books that pure water had no action on le

Mr. S. F. BURFORD asked whether it was correc stated in Davie's "Hygiene," that lead pipes contai 3 per cent. of tin were not attacked by water. He often wondered what it was in old wells that attacke lead pipes. He had been told of cases in which so pipes had been eaten through in eight months.

In testing water for action of lead, it was necessa remember that natural waters were tinted. In an expen on the action of water on lead piping, he had fou sample to require 0·7 c.c. of a standard lead solution distilled water was employed for comparison, but 0·2 c.c. was required to produce the same depth of c when the natural water was used for the check-test.

Dr. CAVEN observed that problems of this kind turned upon the question of impurity. The lead, as Dr. Clowes was concerned, was practically pure. It difficult to understand that the addition of another made less lead dissolve. He would rather have thou would have caused an increase in the amount of dissolved. Hydrogen sulphide was more sensitive alkaline solution.

The CHAIRMAN asked, in reference to the inhibitive of sulphates, whether traces of free sulphuric acid d increase the action of soft water on lead. He belie was in connection with an epidemic of lead-poisoning occurred at Huddersfield some years ago there was difference of opinion as to the cause, which was attr by some analysts to the presence in the water sulphuric acid. It had been suggested that waters had a tendency to act upon lead should be caused over flints. He should like Dr. Clowes's opinion suggestion, in view of his observation that the con cold water with glass did not prevent its action upon

Dr. CLOWES, in reply to Prof. Kipping's last q said he had endeavoured to procure water which wo act on lead. Distilled water had been boiled *in vac* a considerable time, and the steam above the displaced by hydrogen; he had also tried other mean believed that a trace of oxygen remained in solution could not be removed by any of the processes The amount of oxygen remaining in solution wa minute (0·5 part per million). The most notewort ver, was that, after all the various methods tried, the quantity of oxygen had remained in the water: this ared to indicate that a certain quantity remained per- ntly in solution. He said he had not tried water ated with hydrogen, boiled, and again saturated.

garding the question whether the appreciable ation caused by H_2S in the boiled water was due to race of impurities in the lead, it appeared probable that ery minute traces of iron, tin, nickel, or copper would ass into solution, since their hydroxides were insoluble, t the lead hydroxide was soluble in water.

ith regard to lead carbonate, the normal carbonate be obtained, according to Watts' Dictionary, by g cold solution of sodium carbonate to cold lead salt ions. The marked difference in behaviour of the lead nates towards solutions of carbonic acid appeared to be o the absence of hydroxide in different degrees.

e lead carbonates containing much hydroxide were not ved, while others were. He had no personal ience of the effect of alloying lead with tin to nt the action of water upon the lead. It appeared ble that tin, if added in due proportion, might produce loy which would behave quite differently from lead when subjected to contact with water. Several ists had written to him mentioning that lead in contact some of the Scotch waters underwent remarkable g. Holes quickly appeared and perforated the plates. experiments he had worked with the purest commercial lead and distilled water obtainable, and had obtained ch effect. In regard to the action of cold water on t Sheffield, the practice, he believed, was to allow the water supply to flow through large beds of flint, but mixed the flints with chalk. They found that this derably reduced the action of the water on the lead es. It appeared that flint produced silicate, in nce of calcium carbonate in solution in the water.

rainy weather following a dry season, the peat acids l appear in the water in some quantity. These acids apparently the cause of the mischief at Sheffield. Houston had shown that the presence of certain i in the peat led to the production of organic acids dissolved the lead oxide. In conclusion, Dr. Clowes wledged the valuable assistance furnished by an old gham student, Mr. E. T. Shelbourne.

Meeting held at Leicester, on Wednesday,
April 29th, 1903.

MR. L. ARCHBUTT IN THE CHAIR.

DDEN SOURCE OF DANGER IN SULPHATE OF AMMONIA SATURATORS.

BY F. J. R. CARULLA.

ore proceeding with the subject of this paper it may use to describe a common form of sulphate of nia saturator.

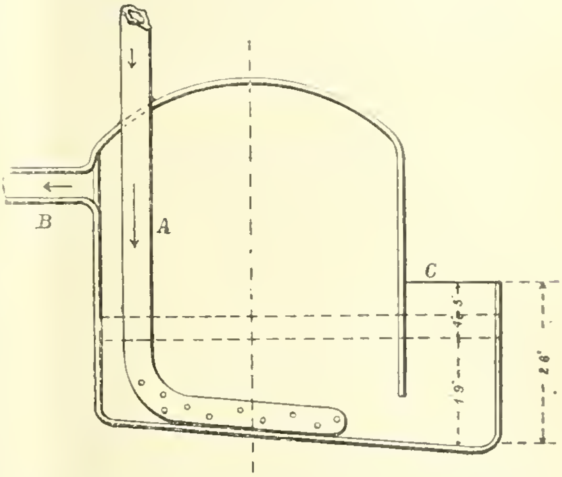
. 1 represents a saturator, which consists of a leaden covered in to form a chamber to serve as a reservoir e gases produced in the process, and which are led as fast as they are made by a pipe, B, usually placed ally, but shown horizontal in the figure for the sake of ess.

ammonia-laden steam from the still rushes through pe A into the saturator, and issuing through the small in the foot of the pipe meets with sulphuric acid e bath, when the ammonia should be completely bed, the gases evolved—mainly sulphuretted hydrogen carbon dioxide—passing forward through B, to be usly dealt with, according to the circumstances of each . The sulphate of ammonia collects in the bath and ed out at intervals through the opening at C.

riations in the level of the acid liquor in the bath are gular occurrence, and can be observed in the fishing C. Assuming the level to be 1 ft. 9 ins. from the m of the fishing well in the case now considered, the liquid rises as the "salting" proceeds, and is at its highest level some 4 ins. higher when ready for a "fishing" to be taken out.

Under every conceivable occasional difficulty and disarrangement of a Davis's column-still during a period of nearly 13 years the liquor in the saturator had always behaved in the manner described, until a few weeks ago, when it suddenly came out of the fishing well with such violent suddenness as to almost amount to explosion.

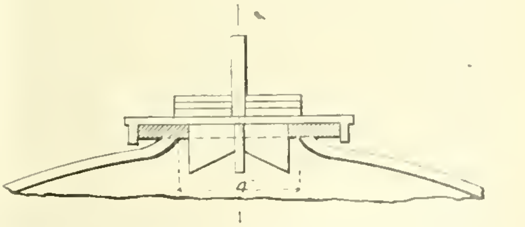
FIG. 1.



Such an occurrence was not to be ignored, and its recurrence must be prevented. A very serious accident might have resulted had any man been close to the apparatus.

The first investigations led to nothing that could give a clue to the cause of this overflow. All the gas-outlet pipes leading from B were found clear and open, but probably excessive pressure of the gases within the saturator chamber was the immediate cause of the phenomenon, however the pressure might have originated. It was only necessary for this to rise to 0·3 of a lb. per square inch for the liquor to reach the brim, and anything above that would make it overflow. The employment of a safety valve was the obvious remedy, and one (Fig. 2) was placed on the saturator. This temporary valve was made from a circular piece of thin lead having a rim burnt all round it to keep in a rubber washer which formed a tight joint with the edge of a 4-in. diameter opening made in the crown of the saturator chamber. Three wings were easily burnt on to the under side of the leaden disc to keep the valve in place, and a spindle in the centre was a convenient means for holding a number of thin discs of small diameter to obtain the necessary weight. It will be seen that as a 4-in. diameter area is 12·56 square inches, the weight of the valve had to be 3·77 lb. in order to counterbalance a pressure of 0·3 of a lb. in the saturator chamber.

FIG. 2.



Further investigation revealed the fact that the feed of gas liquor to the still previous to the accident had been increased to an unusual extent, and the liquor at the same time happened to be stronger than usual. There could now be no doubt that excessive pressure in the saturator chamber caused by too large a feed was the true explanation, but there seemed to be some difficulty in wholly reconciling the observations of the attendant with this cause. Mr. E. M. Fletcher, the alkali works inspector, considered that when the gas pressure within the saturator chamber had so depressed the level of the liquor in the bath as to lay bare any of the holes in the foot of pipe A, the pressure of the unabsorbed ammonia and steam would be so great as to violently force out the liquor from the bath through the fishing well in the manner that had been observed.

A safety valve is a real protection to a saturator, without which none should be allowed to work, if immunity from this unlikely, but possible accident, is desired.

Scottish Section.

Meeting held at Glasgow, on Tuesday, April 28th, 1903.

MR. D. J. PLAYFAIR IN THE CHAIR.

THE CARBONACEOUS MATTER OF ANIMAL CHARCOAL.

BY T. L. PATTERSON, F.I.C., F.C.S.

Introductory.—Animal charcoal is the final product of the destructive distillation of bones. Care is taken in its manufacture not to raise the temperature above a moderate red heat, otherwise the earthy constituents would be partially fused or fritted, with more or less destruction of its porosity and reduction of its valuable decolorising property. On the other hand the temperature must be high enough and long enough maintained, to sufficiently carbonise the bones and drive off the volatile products, which consist of hydrocarbon gases, water containing ammonia, cyanides, &c., and a tarry oil containing volatile organic bases and hydrocarbons.

The so-called carbon is the chief constituent of animal charcoal on which its decolorising power depends; but the mineral or earthy constituents are almost equally important, for they not only assist in absorbing earthy salts, they form a porous framework on which the active constituent is deposited and give the whole a hardness which makes it easily handled and reburned with little loss of carbonaceous matter. The carbon in animal charcoal is not pure carbon, but consists of a series of complex organic bodies containing a large percentage of nitrogen. The charcoal from wood is much purer carbon than that from bones, but it has little or no decolorising power and contains little or no nitrogen. Hence it has long been considered essential that charcoal for decolorising purposes should be nitrogenous. The combination in which nitrogen exists in animal charcoal has not hitherto been investigated. One of the objects of this inquiry was an examination of this subject.

In a note to the Chemical News (1873, 27, 111), I made the statement that "Animal charcoal when new and of good quality contains about 1·5 per cent. of organic matter. A small portion is soluble in water, the greater part is soluble in acid, and the remainder is insoluble in either menstruum. When charcoal is ignited the loss of weight is equal to the carbon + organic matter + water." This statement requires some modification, it was controverted at the time by some chemists who would not believe that bones which had been submitted to a red heat for a lengthened period could contain any organic matter. But its presence, which was known before is now generally admitted. It was my intention to return to this subject and study more closely the loss which charcoal undergoes on ignition, but circumstances prevented me doing so until now. When it is remembered that bones are never completely carbonised and are still giving off volatile vapours when raked from the retorts into air-tight receivers, the existence of more less organic matter in the finished charcoal is not to wondered at.

Its presence is easily demonstrated by dropping a s portion of charcoal into concentrated sulphuric acid in a tube. The acid assumes a more or less brown colou proportion to the organic matter present, good new char giving a dark brown colour, whilst spent charcoal gives li or none. The colour is not due to the destructive actio the acid on the organic matter, as is the case when m organic substances are digested with sulphuric acid. I of the opinion that the brown organic matter exists i charcoal as such, and gives the charcoal itself a mor less brownish black colour in proportion to the quan present. It is partially soluble in cold sulphuric without decomposition and the portion dissolved may completely recovered by precipitation with water. I h taken advantage of this reaction to separate a porti the organic matter insoluble in hydrochloric acid.

When animal charcoal is heated it loses weight, an continues to lose weight when heated up to 300° C. over, without visibly suffering oxidation or decompos Chemists differ in opinion regarding this loss. Some h that it is due to moisture not expelled at the tempera of the water oven and have recorded experiments support of this contention. The late Dr. Wallace, was an authority on charcoal, from experiments recor in the sugar cane (1869, 1, 115) arrived at the conclu that it is necessary to dry new charcoal at a tempera of 350° F.—about 160° C.—for 10 minutes to drive all the water. Wilson (Chem. News, 1873, 27, heated animal charcoal to 500° F.—about 260° C.— recorded the loss as water. On the other hand m chemists consider these temperatures too high and esti water at lower temperatures. The opinion, however general that a greater heat than 100° C. is necessar expel the water from new charcoal, but no temperature been fixed for this purpose and consequently we hav water estimations recorded at various temperatures 100° C. I agree with the opinion that moisture uncombined water is not completely eliminated at 100 but I have always adhered to this temperature, or rath the temperature of the water oven, which is only 95 96° C. One reason for this is because of the diffic of fixing a temperature over 100° C. when hygrosc water ceases to be given off and organic bodies begin t broken up. Another is because the carbonaceous res from hydrochloric acid is always dried and weighed 100° C., although, like charcoal itself, all the water is completely expelled at that temperature. By dr charcoal at temperatures over 100° C. and carbonac matter at 100° C. only, the organic matter solu hydrochloric acid, which is a difference quant returned too low. Decomposition of the organic bo takes place at comparatively low temperatures, and w is one of the products, as I shall have occasion to p out later, hence water determinations made at temperat considerably over 100° C. will record such water as as mere moisture.

Loss of Carbonic Acid in Igniting Charcoal.— problem which I set myself to investigate is this— from water lost in the water-oven, of what does portion burned off consist? I have said, in the state above referred to, that it consisted of a little or matter soluble in water, a much larger portion solub hydrochloric acid and carbon plus the remaining or matter insoluble in either menstruum. This stat requires to be considerably modified, so far as the po soluble in hydrochloric acid is concerned. I now that the greater portion is insoluble in hydrochloric and closely united with the carbon, and that the los ignition, apart from carbonaceous matter, which has hit been set down as soluble organic matter, is chiefly bonic acid liberated from the ash in the proce ignition, with perhaps a little water not recovere 100° C. It was only in the course of this investig that I suspected the loss of carbonic acid on ign The reason why it has been overlooked hither because the carbonate of lime in charcoal is al ca lated from the weight or volume of carbonic acid lib ated from the unburned charcoal. When carbonic ac is at the same time determined in the ash the loss is re aled.

he loss of carbonic acid is due to the decomposition of ca onate of lime by the phosphate of lime in the presence of arbon; no lime is set free. In the analyses I have m e, to be considered shortly, the ashes, in every case af weighing, were treated with carbonate of ammonia to ca onate any free lime, slightly ignited and again weighed. Th weight remained constant except in two or three ca s, where it was only increased by 0·2 mgrm. The pl phate of lime in charcoal combines easily with the lime in e carbonate of lime at a low red heat to form a more ba phosphate than tri-basic phosphate, which is only de mposed by the stronger acids. As charcoal becomes ol with use the carbonate of lime disappears. This loss ha been explained by assuming that the organic acids in th sugar liquor passed over it were neutralised by the ca onate of lime. As a matter of fact, very little car-bo te of lime is removed in this way, the organic acids no cing powerful enough to decompose it, except in the we liquors when washing off. The repeated burnings to wh h the charcoal is exposed in the process of revivification is sponsible for this gradual decomposition of carbonate of ne with formation of basic phosphate. So that charcoal wh h contained when new 6 to 8 per cent. of carbonate of li may not contain more than $\frac{1}{4}$ per cent. when spent. B he phosphoric acid is in combination with nearly as much li as the carbonate of lime and phosphate of lime together, co ined when it was new. This is a subject which I in stigated many years ago. It was very fully discussed b razer Smith in a paper communicated to the Chemical N s (Vol. 33, p. 100, 1876), to which those interested in th ubject may be referred. My present experiments show th the mere ignition of charcoal to burn off carbonaceous m er, determines the same decomposition of carbonate of li as is only brought about in the refinery in the course of o or three years' reburning. In the analyses recorded nc it will be observed that as much as 3 per cent. of ca onic acid is liberated in the process of igniting new ch coal over a Bunsen lamp. Doubtless the carbonaceous m er assists by reducing the carbonic acid to carbonic ox e. Hence the organic matter soluble in hydrochloric ac which I have hitherto supposed to exist in new ch coal, will be reduced by this amount.

paration and Estimation of Organic Matter.—I have sa that a portion of the organic matter insoluble in hydro-ch ic acid is soluble in sulphuric acid, from which it may be covered. The separation is carried out in the follow-m manner: The carbonaceous matter + organic matter a sand, from about 1 grm. of charcoal, which remains on a ed filter after treatment with hydrochloric acid and wa ing, is dried and weighed. As much as can be easily re ved from the filter is transferred to a small dry beaker. Th filter and adhering carbonaceous matter are dried and ag weighed. The carbonaceous matter in the beaker is co ed with about 10 c.c. of concentrated sulphuric acid, sti d and set aside with occasional stirring. When the ca naceous matter is dry, no heat is developed and no de mposition takes place. After a couple of hours, when th cid has taken up all that it will dissolve, the contents of e beaker are poured on a dry asbestos filter, and the ac sucked through with the pump. The beaker is rinsed wi a few cubic centimetres of sulphuric acid, and added to carbonaceous matter on the filter; when that is sucked th ugh the separation is completed by washing, first with a cubic centimetres of sulphuric acid, and finally with a we er acid of 1·750 sp. gr., until the acid comes through co rless. The carbonaceous matter on the filter is re ved for further treatment.

e sulphuric acid filtrate, which has a deep brown co r in proportion to the organic matter dissolved, is now po ed into a large volume of water, about 10—12 times th volume of the filtrate, and the acid residue in the re ver washed in with water. On stirring and setting as for some hours or over-night, nearly the whole of the or ic matter settles to the bottom as a deep brown floc-cu t precipitate, which can be collected on a tared filter washed with boiling water, dried, and weighed. A very small quantity remained dissolved in the acid filtrate, which is not separated by neutralising the acid, but it can be completely recovered by passing the dilute filtrate through the carbonaceous matter from which it was separated, or through a separate weighed portion of carbonaceous matter and its weight ascertained directly, after the carbonaceous matter has been washed and dried on a tared filter. The organic matter is very gelatinous, and filters with difficulty, even with the pump. But it need not be directly estimated, since its weight can be ascertained from the difference in weight of the carbonaceous matter before and after separation. Only one or two direct estimations were made, to make sure that the organic matter thus recovered accounted for the loss in weight of the carbonaceous matter treated with sulphuric acid. It will be seen that this was the case from the analysis of the carbonaceous matter insoluble in hydrochloric acid which is given below.

Returning to the residue on the filter, the acid-washed carbonaceous matter, asbestos and grid are transferred to a large beaker, and the funnel washed into it with water. The grid is lifted out and the asbestos and adhering carbonaceous matter washed off with water. The beaker is half-filled with hot water, which is then boiled and allowed to settle, the liquid decanted through a tared filter, and the residue similarly treated five or six times, with boiling in each case before decantation, since very careful washing is necessary to completely free the asbestos from sulphuric acid. When thoroughly washed it is dried in the water oven and weighed. The filter and its contents are then ignited and weighed again. The loss on ignition after making corrections for the asbestos, sand, and the portion adhering to the first filter is carbonaceous matter. The difference between the carbonaceous matter thus found and the carbonaceous matter + organic matter weighed on the first filter corrected for the sand, which has been estimated in another portion of the charcoal, gives the organic matter soluble in sulphuric acid.

The filter for the acid separation is best made by forming a mat of asbestos on the surface of a small porcelain grid supported in a small funnel. Asbestos suspended in water, which has been previously washed and cut into short lengths, is poured on to the grid until it is evenly covered, and the water filters through clear, when it is dried in the water oven. Some little experience is required in making these filters, for if the mat be too thick filtration is very slow; if not thick enough the filter is easily burst. Since asbestos contains water of crystallisation, and even ignited asbestos when moistened does not give up all its water at 100° C., a factor has to be found by which the weight of the ignited asbestos is increased to give its weight at 100° C. A portion of the asbestos used to make the filters is dried at 100 C. and weighed. It is then ignited and weighed again. The former weight divided by the latter gives the factor. As two portions of asbestos are not by any means uniform in the loss they sustain on ignition, slight inaccuracies may occur in the corrections for this substance, but the results may be taken as quite sufficiently accurate for all practical purposes.

The organic matter separated by sulphuric acid is only a portion of that contained in the carbonaceous residue from hydrochloric acid. I am inclined to believe that a much larger portion remains undissolved. As evidence of the non-elementary nature of this residue, I may say that a further quantity of organic matter may be separated by digesting the portion insoluble in cold sulphuric acid, with sulphuric acid heated to 100° C. in the water-bath for an hour or two. Nordhausen acid also dissolves organic matter from the same residue without apparent decomposition, from which it can afterwards be separated by filtration through asbestos, diluting the filtrate with sulphuric acid and pouring the mixture into water.

When this same residue, from which all the organic matter soluble in cold sulphuric acid has been separated, is heated to boiling with sulphuric acid for a few minutes, cooled and filtered, another portion of organic matter is separated. When the acid filtrate is thrown into water a brown precipitate falls out as before. This experiment was repeated a third time with the carbonaceous residue filtered from the boiling sulphuric acid with the same result. The only difference between these two portions of organic matter and the first is that the precipitate is somewhat darker, denser, and settles more easily, and that in the order in which the experiments were made. I did not pursue the inquiry farther in this direction, but have no doubt that other boilings would have dissolved more of the organic matter, and as sulphurous acid was liberated from the boiling acid on each occasion, and other signs of decomposition were evident, I did not consider it worth determining the amount of organic matter separated in relation to the carbonaceous matter.

Colour-absorbing Property of the Organic Matter.—The observation that the supernatant acid liquid in the two last experiments was colourless when the precipitate settled gave rise to the suspicion that the brown organic matter might be able to absorb colouring matters from solution, and that it might really be part of the active constituent of the carbonaceous matter. To put this supposition to the test, the supernatant liquid was poured off, and the residue from each, together with the brown organic matter, transferred to a 100 c.c. flask. 1 c.c. of a standard caramel solution was added, and each flask made up to the mark with water and transferred to a bottle for observation. At the same time 1 c.c. of standard caramel solution was made up to 100 c.c. with water and transferred to another bottle. After a few days, when the organic matter had completely settled, the solutions were filtered, and the colours compared with that of the standard solution. The mean of two closely-agreeing experiments gave 33·3 per cent. of colour absorbed by the organic matter separated by the first boiling with sulphuric acid, and 42·4 per cent. for the organic matter separated by the second boiling; and the amount of the organic matter filtered and weighed on a tared filter was 0·0198 grm. for the first and 0·010 grm. for the second. Thus the organic matters are shown to be decolorisers, and the second portion, which was the most difficultly soluble in sulphuric acid, a better decoloriser than the first in the proportion of 2·52 to 1. Compared with good charcoal, 1 grm. of which will absorb the colour from 1·048 c.c. of the standard caramel solution employed, the first portion of organic matter was 16·03 times better, and the second portion 10·46 times better, as a decoloriser.

Having found that the organic bodies separated by boiling sulphuric acid are capable of decolorising a caramel solution, it became necessary to ascertain whether the body separated by cold sulphuric acid possessed the same property. Without detailing the experiment, which was carried out like the others, I may say that 1 grm of this organic body was found to be capable of absorbing the colour from 17·43 c.c. of caramel solution, which makes it 16·63 times better as a decoloriser than good charcoal. The result is practically the same as that for the first portion separated by boiling sulphuric acid. A similar experiment was at the same time made with the dried organic body separated by cold sulphuric acid, which I assume to be in the same condition as it exists in animal charcoal. 0·0592 grm. of a ground portion was shaken up with the caramel solution employed in the other experiments; after filtering and comparing the filtrate with the standard, it was found to have absorbed colour in the proportion of 0·903 to 1 of standard charcoal. That is to say, it is not quite equal to standard charcoal in decolorising power. I did not try dried portions of the bodies separated with boiling sulphuric acid, but I have no reason to believe that they will show a materially different result. That this should be the case is not surprising, since we know that the bodies soluble in sulphuric acid are not so highly carbonised as those which are insoluble; but when dry these bodies may not be in the same condition as they existed in the original charcoal, although I have assumed that they are, because when a dried portion is redissolved in sulphuric acid, and again precipitated with water, the small portion which remains in solution has a reddish colour, whereas it is yellow on the first solution and precipitation. The property which the precipitated bodies possess of absorbing so easily the colour from a caramel solution, as compared with the same body in the dry condition, must be largely a physico-chemical one. They are extremely finely divided, very gelatinous, and in loose combination with many times their weight of water, so that when brought into intimate contact with coloring matter they absorb it very much as gelatinous alumina absorbs colour from solution to form a lake. The experiments just detailed were carried out on very small portions of the bodies, but they are sufficient to indicate that we are dealing with constituent parts of the carbonaceous matter.

Preparation of the Organic Body, its Properties and Analysis.—In order to study more completely this brown organic body, a large portion of charcoal dust was treated with hydrochloric acid, washed by decantation, and thoroughly dried. The following figures were obtained on analysis :—

Carbonaceous matter ...	87·82	Containing nitrogen..	7·80
Organic body soluble in H_2SO_4.	6·00	" " ..	0·71
Sand	6·00	.. ..	..
	99·82		8·51
Total nitrogen directly estimated			8·65

By calculating off the sand we get the composition of the carbonaceous matter insoluble in hydrochloric acid, as follows :—

Carbonaceous matter ...	93·44	Containing nitrogen..	8·30
Organic body	6·38	" " .	0·79
	99·82		9·09
Nitrogen direct......................			9·21

The dried carbonaceous residue from the hydrochlori acid treatment was further digested with cold sulphuri acid to separate the organic matter. The acid filtrate wa poured into water, and the precipitated organic matte washed by decantation, and finally collected on a filte scraped into a porcelain basin and dried. The operation tedious, but I finally obtained 2 to 3 grms. of the organ body. In the process of washing to obtain the pure bod it was noticed that after five washings by decantation tl precipitate would not settle, but remained in suspension in colloidal solution in the next washing water an sulphuric acid had to be added to throw it down agai Washing with water on the filter does not dissolve tl precipitate when the acid is removed, although it carries through mechanically if stirred up in doing so; but tl organic matter separated by sulphuric acid at 100° C. go freely into colloidal solution on the filter as the acid washed out and separates again after long standing.

In the dry condition the organic body presents a hor appearance with conchoidal fracture. Heated in a t tube it chars very easily, giving off whitish yellow vapo with a strong smell of burnt bones. Thrown into wat it does not again assume the hydrated condition. It insoluble in water, cold or hot; and insoluble in alcoh ether, benzine, and chloroform. It dissolves freely sulphuric acid, from which it is thrown down by water the gelatinous condition, but the acid solution has reddish colour, not yellow like the dilute acid filtrate fr the first sulphuric acid separation, which indicates so slight change due to the treatment. Concentrated hyd chloric acid dissolves the hydrated body in the cold t brown solution. Boiling makes little difference. Diluti with water throws it down again, from which a filtrate obtained with a very slight yellow colour. Boiled w concentrated nitric acid, free from nitrous acid, the bo dissolves with liberation of a little nitrous acid, to a bro solution. On dilution with water a portion of t substance precipitates, leaving the solution yellow. T addition of ammonia does not increase the colour of filtrate, as it would if proteids were present. Neither d Millon's test gives any reaction for these bodies. Gla acetic and citric acids have very little action. Tan does not produce any precipitate in the colloidal solut referred to above, but aluminium, iron, copper, merc and magnesium salts do. They do not precipitate ilute sulphuric acid solution, perhaps because so little ibstance is present. Strong ammonia dissolves the hydrate eely and dilution does not precipitate it, but it falls out artially on heating, leaving a yellow solution which deosits a few yellow needle-like crystals when evaporated dryness. This reaction points to the body having the roperties of an acid in very dilute solution, whilst it has iose of a base in the original charcoal.

The dried organic body is only very slightly soluble in rong ammonia, but ammonia does not separate any of it om the carbonaceous residue of charcoal. It is insoluble soda solution. It neither contains sulphur nor ash. A) per cent. solution of sugar shaken with the dried ganic body dissolves a very little to a brownish colour hich remains brownish when diluted.

The following results were obtained on analysis of the ganic body :—I. 0·2262 grm. gave 0·5217 grm. CO_2 and 0861 grm. H_2O. II. 0·2024 grm. gave 0·4738 grm. CO_2 id 0·0797 grm. H_2O; and by the Kjeldahl process :— 0·5262 grm. gave NH_3 = 4·485 c.c. normal H_2SO_4 lution. II. 0·4866 grm. gave NH_3 = 4·160 c.c. normal $_2SO_4$ solution. Worked out, these figures give the llowing percentages :—

—	Experiment.		Ox Bone Cartilage.
	I.	II.	
rbon	62·90	63·26	49·81
ydrogen	4·23	4·37	7·14
trogen	11·98	11·97	17·32
ygen	20·89	20·40	25·67
	100·00	100·00	99·94

These results correspond with the empiral formula $H_{20}N_4O_6$. The decomposition and oxidation products ve not yet been studied. But since we know the body elf to be a decomposition product of bone cartilage, I ve put alongside an analysis of the latter by Frémy Vatts's Dictionary, Vol. 1, p. 620), for comparison. It apparent from this analysis that decomposition has not oceeded far, or at any rate so far as we might expect, when recollect that the bones must have been submitted to a l heat for at least 12 hours in reducing them to charcoal. e large percentage of oxygen, which with its equivalent hydrogen form the elements of 23 per cent. of water, ght lead us to infer that this substance is a product of action of the sulphuric acid on the carbonaceous matter, that it is due to the organic body holding added water tenaciously that a temperature of 100° C. is incapable of ving it. Had the action been the result of oxidation or drolysis the weight of the organic body would have been isiderably increased, and the analysis of the carbonaceous idue from hydrochloric acid, given above, would have wn this. But the three constituents of that residue were imated directly, and they total rather under 100. We e seen that no heat is developed and no gas liberated en this residue is treated with sulphuric acid, as would e been the case had the acid acted chemically on it, and l it contained uncombined water. Much heat is liberated en the residue is not dry from the combination of the l with the water present. The action seems to be a ple case of dissolution on the part of the acid. We st, therefore, conclude that the oxygen is a constituent nent of the organic body, and that it exists in the rcoal itself, as it does in the bone cartilage. I am not re that oxygen has previously been observed as a conuent of charcoal, but its presence accounts for the fact t at all temperatures up to 300° C. water can be driven off.

Discussion of the Loss which Charcoal and Carbonaceous tter sustain on Heating.—The following experiment y be cited as evidence of this, and of the decomposition ich goes on when charcoal is heated at high temperatures. quantity of No. 1 charcoal—about 22 grms.—was introed into a small flask with side tube, the bulb of which just filled. The contents were then submitted to dry illation, by suspending the flask in a water-bath and ting to 100° C. for 10 hours. The water which distilled over was collected in a receiver for examination. It was alkaline to litmus, and a bubble or two of carbonic acid was liberated on the addition of a drop of hydrochloric acid. Evaporated to dryness it left a faintly yellow-coloured residue of chloride of ammonium. A thermometer was now inserted, and the flask and its contents heated with a bunsen flame successively to, and maintained for 15 minutes at, temperatures of 150° C., 200° C., 250° C., and 300° C. In each case there was a watery distillate which had an ammoniacal smell, turned litmus paper blue, and with the exception of the portion recovered at 150° C., effervesced strongly on the addition of hydrochloric acid. The distillate at 150° C. effervesced very slightly. All the acidified distillates left a yellowish residue of chloride of ammonium on evaporation.

The actual loss at these temperatures was the object of the next experiment. Weighed portions of two new charcoals, II. and III., stock charcoal which had been in use eight weeks, VI., spent charcoal, VIII., and portions of the carbonaceous residue from hydrochloric acid and from sulphuric acid, were heated for an hour in an air-bath fitted with a regulator to the temperatures of 150° C., 200° C., 250° C., and 300° C., and the loss of weight occurring between these temperatures recorded. All were dried at 100° C.

——	II.	III.	VI.	VIII.	HCl Residue.	H_2SO_4 Residue.
			Losses per Cent.			
100°—150° C.	1·05	0·97	0·72	0·10	1·23	1·66
150°—200° C.	0·54	0·51	0·41	0·00	0·38	0·57
200°—250° C.	1·17	0·91	0·82	0·10	1·92	1·58
250°—300° C.	1·44	1·15	1·10	0·08	3·17	3·01
Total 100°—300° C.	4·20	3·54	3·05	0·28	6·70	6·82
Total separated organic matter.	4·11	3·35	1·35	0·02	6·00	..

The experiment shows that carbonaceous matter as well as charcoal suffers loss at all temperatures over 100° C. up to 300° C., and that the total loss bears some proportion to the amount of organic matter which the sample contains. No. VIII., with 0·02 per cent. of soluble organic matter, only loses 0·28 per cent. of its weight at 300° C., whilst No. II., with 4·11 per cent. soluble organic matter, loses 4·20 per cent. The carbonaceous matter insoluble in sulphuric acid, which contains no soluble organic matter, loses rather more than does the portion insoluble in hydrochloric acid, which points to the large quantity of organic bodies which it must still contain in the insoluble condition. The portion insoluble in hydrochloric acid, containing 6·00 per cent. of the organic body soluble in sulphuric acid, lost 6·70 per cent. at the high temperature. As it seemed instructive to ascertain which constituent suffered the loss, the residue from this portion was submitted to analysis. The following is the result with the analysis of the same carbonaceous matter before heating to 100° C., placed alongside, for comparison :—

——	Before Heating.	After Heating.
Loss between 100° C. and 300° C.	..	6·69
Carbonaceous matter	87·82	89·56
Organic matter soluble in H_2SO_4	6·00	0·24
Sand	6·00	6·00
	99·82	102·49

It will be noticed that the sum of the constituents of the heated portion total about $2\frac{1}{2}$ per cent. over 100. This is due to the retention of water by the carbonaceous matter, a peculiarity which we will return to presently. Meantime observe the change which has taken place in the composition of the carbonaceous matter on heating to 300° C. Nearly the whole of the organic matter soluble in sulphuric acid has disappeared. The dry distillation experiment proves that water, carbonate of ammonia, and a little organic matter are given off at all temperatures over 150° C., and water, ammonia, and organic matter at lower temperatures. The results of both experiments are evidences of decomposition and probably of oxidation. But oxidation of the more highly carbonised portions of the carbonaceous matter does not take place at these temperatures, since No. VIII. which contains so little soluble organic matter loses practically no weight. The action seems to be confined to that portion of the carbonaceous matter which is soluble, or partially soluble, in sulphuric acid—that is to say, to the portions which are less highly carbonised.

These experiments demonstrate what I said in the early part of this paper, that charcoal goes on losing water the higher and longer it is heated. But although it is very probable the water lost is a constituent part of the carbonaceous matter, I am not quite satisfied that it really is so, since experiments can be cited which point in the opposite direction. When charcoal dried at 150 C. or 200° C. is moistened and again dried at 100° C., it retains a portion of the added water equal to that lost at the high temperature. Thus the four portions of charcoal used in the last experiment were treated in this way after each heating. The weights are recorded in the following table, in percentages.

	I.		II.		VI.		VIII.	
—	Lost.	Regained.	Lost.	Regained.	Lost.	Regained.	Lost.	Regained.
° C.								
At 150	1·05	1·16	0·97	1·00	0·72	0·68	0·10	0·13
At 200	1·59	1·59	1·48	1·49	1·13	1·08	0·10	0·14
At 250	2·76	2·06	2·39	1·89	1·95	1·43	0·20	0·23
At 300	4·20	2·22	3·54	1·97	3·05	1·60	0·28	0·23

At 150° C. the new charcoals lose about 1 per cent. of their weight, but on moistening with water and drying at 100 C. they regain that 1 per cent. The stock and spent charcoals lose less, but they too recover in weight all that was lost on moistening and drying at 100 C. The same remark applies to the charcoals heated at 200° C., only in this case they lose and recover more weight under the same conditions. When the temperature is raised to 250° C. the loss is much greater and the charcoals, except in the case of VIII. which is spent, are unable to regain all the weight lost at the high temperature. The difference is one-half per cent. to three-quarters per cent. on all the charcoals except VIII. This inability to regain lost weight is still more apparent in charcoals heated to 300 C., in which case only about one-half of the loss is recovered at 100° C. The carbonaceous matter in VIII. has been so thoroughly carbonised by the repeated reburnings of several years that heating, even to 300° C., makes very little difference on it. At all temperatures except 300° C. it regains rather more weight at 100 C. than the fraction which it lost at the high temperature. These heating experiments explain the cause of the carbonaceous matter insoluble in hydrochloric acid, which had been heated to 300 C., coming out on analysis 2½ per cent. over 100. The 2½ per cent. is the measure of the water which it would retain after moistening with water and drying at 100 C.

It would seem from these experiments then, that animal charcoal may be assumed to be capable of withstanding a temperature of 150 C. to 200° C. without decomposition, since it can reabsorb and retain at 100 C. water equivalent to the weight it lost. But against this assumption I am inclined to place the evidence of the dry distillation experiment, in which ammonia, carbonate of ammonia, and organic matter, which are the result of decomposition, accompanied the water expelled at these temperatures. It may be that the water is so loosely combined that it is easily driven off at the high temperature, and enters as easily into combination at the low temperature; and that the quantities of ammonia, carbonate of ammonia, and organic matter expelled are so little, that decomposition is trifling and does not materially influence the results at temperatures up to 200° C. I am inclined to believe that this is the case, but I feel that further experiments are needed to clear up this and one or two other points. Water, for instance, is added to charcoal in the process of manufacture to keep down dust, &c. It would be interesting to know whether or not this added water passes partly into chemical combination and at what temperature it can all be liberated. We want also to know just how much of the water in the charcoal is due to this cause, and how much to the breaking up of the nitrogenous carbonaceous matter containing oxygen, present in the charcoal itself.

The proper temperature for the estimation of water in charcoal is a very important one, not only because of its refraction value, but because of the influence it has on the analysis. When for instance charcoal is dried at 150° C. the above experiments show that it loses 1 per cent. more weight than it does at 100° C. But the carbonaceous matter itself loses 1¼ per cent. more at 150° C., yet it is always dried at 100 C.—never at a higher temperature. If charcoal is dried at 150 C.—and I think this temperature would be a safe one—the carbonaceous and organic matters should be dried at the same temperature, otherwise the organic matter soluble in hydrochloric acid, which is a difference quantity, will be returned too low, if not wiped out altogether. Thus in II.,* the organic matter soluble in hydrochloric acid and in water are together 2·02 per cent. and contain 0·33 of nitrogen. By drying the charcoal at 150° C. and the other constituents of the loss on ignition at 100° C., this soluble organic matter would only amount to 2·02 − 1·35 = 0·97 per cent. Were the charcoal dried at 200 C. the soluble organic matter would be reduced to 2·02 − 1·59 = 0·43 per cent. which is too small a quantity to contain 0·33 of nitrogen. In the sample III.,* which contains 1·45 per cent. of soluble organic matter and 0·10 nitrogen, the organic matter would disappear under the same conditions. Until therefore this water question in relation to the other losses on ignition is satisfactorily settled, and we can determine at what temperature water, which is mere moisture, ceases, and water of decomposition begins to be given off, the safest course to pursue in the analysis of charcoal, is to dry the charcoal at 100° C. and determine the constituents of the portion lost on ignition at the same temperature.

Analyses of Typical Charcoals.—Having separated and determined the composition of the carbonaceous residue from hydrochloric acid and the organic body separated from that residue by cold sulphuric acid, I analysed a number of typical samples of animal charcoal—that is to say, the portion which is lost on ignition—to ascertain any difference amongst them with regard to the organic body and the changes which take place with use. The charcoals were all calculated to dryness at the temperature of the water oven, and the weights of the carbonaceous and organic matters were determined at the same temperature. The organic matter soluble in water was obtained by washing the charcoal with water, evaporating the filtrate to dryness on the water-bath, and igniting gently. In all cases the residue blackened on ignition. The difference in weight before and after ignition is the soluble organic matter. The organic matter soluble in sulphuric acid was obtained as described above; it is the difference in weight before and after treatment with concentrated sulphuric acid. A portion was ignited, and the weight of the ash recorded. Carbonic acid was estimated in the original charcoal and also in the ash; the difference gives the carbonic acid burned off. Organic matter soluble in hydrochloric acid is the difference between the sum of these constituents calculated to per cent. and 100. Nitrogen was determined by the Kjeldahl process in the whole charcoal and in the carbonaceous residue from hydrochloric acid; that is to say, carbonaceous matter + organic matter. The difference between these two estimations gives the nitrogen soluble in hydrochloric acid. In order to ascertain whether the soluble nitrogen was not due to ammonia or some of its derivatives, a portion of I. was washed with water and the filtrate distilled with soda. Only 0·017 per cent. of nitrogen, existing probably as carbonate of ammonia, was recovered. The residue was then treated with hydrochloric acid and filtered. The filtrate distilled with soda yielded 0·087 per cent. of nitrogen, existing probably as amines. These two estimations only accou for 0·104 of the 0·51 per cent. of nitrogen soluble in hydrochloric acid; therefore most of the nitrogen soluble in hydrochloric acid exists in combinations which are not volatile. The presence of fixed nitrogenous bodies was demonstrated by evaporating other portions of the aqueous and hydrochloric acid solutions of the same charcoal to dryness with excess of soda solution. Portions of each residue were heated in a test tube with soda-lime. In each case the vapour given off had the smell of burnt bones, and turned moistened red litmus paper blue. The charcoal contains besides, a trace of nitrogen existing as insoluble cyanides, for, on condensing the gases given off on treatment with hydrochloric acid, hydrocyanic acid was detected, both by smell and by the ferrocyanide test.

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* See table of analyses of charcoals on next page.

Analyses of Charcoals.

——	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Carbonaceous matter	18·22	14·47	8·84	9·72	10·13	11·36	16·25	5·05	17·05
Organic matter soluble in H_2SO_4	1·97	2·09	1·90	1·70	0·27	0·29	0·40	0·02	0·04
„ „ „ HCl	1·37	1·59	1·33	1·46	0·55	1·06	0·97	..	..
„ „ „ water	0·44	0·43	0·12	0·28	0·56	..	..	..	..
CO_2 lost on ignition	2·00	2·96	3·02	2·98	2·12	1·77	1·11	..	0·07
Ash	76·00	78·46	84·79	83·86	86·37	85·52	81·27	95·03	82·82
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·10	99·98
Total CO_2	2·48	3·50	3·53	3·16	2·45	2·07	1·61	0·09	0·25
N in carbonaceous, and H_2SO_4 organic matter	1·85	1·75	0·99	0·84	0·55	0·67	0·71	..	..
N in HCl and H_2O organic matter	0·51	0·33	0·10	0·26	..	0·18	0·07	..	..
Total nitrogen	2·36	2·08	1·09	1·10	..	0·85	0·78	0·15	0·66

No. I. is the dust from new charcoal. Nos. II., III., IV., and V. are new charcoals. No. VI. is refinery stock charcoal which has been 3 weeks in use. No. VII. is refinery stock charcoal which has been in use for 35 weeks. Nos. VIII. and IX. are spent charcoals turned out of refineries as useless.

A great difference is noticeable in the percentage of carbonaceous matter in these charcoals. I. and II. have been made from bones from which little, if any, of the gelatin was boiled out before charring, like III., IV., and V. VI. and VII. are stock charcoals from one refinery where the carbonaceous matter increases with use, by the charring of vegetable matter absorbed from the sugar solutions in the process of revivification. In VIII. the carbonaceous matter has been reduced to about half that in new charcoal by air leakages in the same process; and No. IX., like No. VII., has accumulated carbon, to the extent of about 7½ per cent., in the course of long use.

The organic matter soluble in water is a trifling quantity, but it is present in all new charcoals. Of course the first washing removes it.

The organic matter soluble in sulphuric acid is a significant constituent of animal charcoal. Together with the carbonaceous matter it forms the residue obtained on treatment with hydrochloric acid, usually called carbon. No. V., which only contains 0·27 per cent., has been charred at a higher temperature, and probably for a longer period than he other four new charcoals. The refinery stock charcoals, VI. and VII., have lost a large portion of this organic matter, and the spent charcoals, VIII. and IX., contain little more than a trace. I am inclined to believe that this organic matter plays an important part in the life of the charcoal, as I hope to show after we consider the nitrogen estimations.

The organic matter soluble in hydrochloric acid, although a difference quantity and probably containing a little water, is, too, a significant constituent, as will also appear after iscussing nitrogen.

The only other constituent lost on ignition is carbonic cid, and the analyses show the loss to be great in the case f new charcoals. In all the charcoals, except IX., the loss mounts to between 69 per cent. and 94 per cent. of the otal carbonic acid present. The stock charcoals lose less ecause they contain less, and that in proportion to the me they have been in use. The carbonic acid in the spent harcoal has nearly all been burnt off in the process of evivification. The observation of this loss on ignition eveals a considerable error in the analysis of charcoal, hich, together with the organic matter soluble in water and n hydrochloric acid, has hitherto been recorded as organic matter.

Discussion of Nitrogen Determinations.—Nitrogen has ng been known to be an essential constituent of animal harcoal. Wallace (Proceedings, Glasgow Phil. Soc., ol. **6**, p. 377, 1865–68) gave it as his opinion that the trogen is in combination with carbon. With reference the carbonaceous matter he says, "although it is always lled carbon, it is not strictly pure carbon, but consists partly of that element and partly of nitrogen." And believing that the nitrogen removed by hydrochloric acid was due to decomposition of carbon nitride, recommends that in reporting analyses any such nitrogen should be added to the carbon insoluble in that acid (Sugar Cane, Vol. **2**, p. 505, 1870). He made several estimations of nitrogen, and found 1·08 per cent. and 1·55 per cent. in new charcoal containing 9·00 per cent. and 8·50 per cent. of carbon. He observed that the nitrogen diminished with use, for two samples of moderately old charcoal contained only 0·30 per cent. and 0·55 per cent. of nitrogen. He also observed that the carbonaceous matter separated from a particular sample contained about two-thirds of the nitrogen existing in the original charcoal; in other samples he found much less. And in a paper to the Chemical Society (Chem. Soc. Jour., Vol. **23**, p. 100, 1869) he mentions having found 0·031 per cent. of hydrogen in a specimen of charcoal, but he did not carry the investigation further. My experiments generally confirm those of Wallace with regard to the total nitrogen in charcoal, its loss on solution and diminution with use, but I have arrived at other conclusions regarding its combinations.

It has been shown above that the carbonaceous matter separated with hydrochloric acid contained 6·38 per cent. of an organic body soluble in cold concentrated sulphuric acid, which yielded to ultimate analysis 11·97 per cent. of nitrogen. On calculating the proportion of this body present in the carbonaceous matter insoluble in hydrochloric acid, that is, carbonaceous matter + organic matter, for the analyses given above, we find that I. contains 9·76 per cent., II. 12·62 per cent., III. 17·69 per cent., IV. 14·89 per cent., V. 2·60 per cent., VI. 2·49 per cent., VII. 2·40 per cent., VIII. 0·39 per cent., and IX. 0·23 per cent. The percentage is very high in II., III., and IV., and when we recollect that more of these bodies can be dissolved out by digestion with sulphuric acid at 100° C., and still more on boiling, we are justified in assuming that a large portion of what, in new charcoal, has hitherto been called carbon is composed of highly carbonised nitrogenous bodies. Indeed, it is very probable that elementary carbon does not exist in new charcoal at all, for if we calculate the nitrogen insoluble in hydrochloric acid to its equivalent of the organic body, and deduct the figure so found from the residue insoluble in hydrochloric acid, that is, the carbonaceous matter + organic matter, very little carbon is left to exist in the free state. This has been done in the table on page 614.

The last column shows how much carbon should be present in the free state, if all the nitrogen in the carbonaceous matter were combined as it is in the organic body. Inasmuch, however, as there are several organic bodies present in the carbonaceous matter, and as they are likely to decrease

—	N insoluble in HCl.	Corresponding Quantity of Organic Body = N.	HCl Residue Found. (Carbonaceous Matter + Organic Matter.)	Free? Carbon.
I.	1·85	15·45	20·19	4·74
II.	1·75	14·62	16·56	1·94
III.	0·99	8·27	10·74	2·47
IV.	0·84	7·02	11·42	4·40
V.	0·55	4·59	10·40	5·81
VI.	0·67	5·60	11·65	6·05
VII.	0·71	5·93	16·65	10·72
VIII.	0·15	1·25	5·07	3·82
IX.	0·66	5·51	17·09	11·58

in nitrogen as they become more carbonised and insoluble in sulphuric acid, we are driven to the conclusion that elementary carbon does not exist in new charcoal, but that it is all in combination with nitrogen, hydrogen, and probably oxygen. Of course, this statement does not hold good with old or used charcoals like VI., VII., and IX., in which the carbonaceous matter has increased from the accumulation of vegetable carbon in the process of revivification.

Theoretical Conclusions.—The organic bodies, soluble in acids, doubtless play an important part in the economy of the charcoal. We have seen that they are colour absorbers, and that they decrease with use and revivification, until in the two spent charcoals only traces remain. There are two theories with regard to them which may be put forward to account for the decrease. The first is, that these bodies which are less highly carbonised than the insoluble carbonaceous matter, form in the charcoal a kind of reserve, from which a new surface of very active carbonaceous matter is deposited every time the charcoal is revivified; the very low red heat to which it is subjected just being sufficient to produce the carbonisation necessary for the purpose. As long as a portion of these organic bodies are retained the charcoal remains active and capable of exerting its full, or nearly its full, decolorising power. When they are burned out as in VIII. and IX., the charcoal becomes useless.

The other theory is that these bodies are gradually dissolved out by the large quantities of sugar liquid passed through the charcoal. New charcoal has the property of giving the lower products of the refinery a rich yellow "bloom," much appreciated by sugar consumers. As the charcoal becomes old this effect wears away. The acid solution of the organic matter separated by sulphuric acid possesses this yellow colour, and the aqueous solution, although colourless at first, undergoes decomposition and becomes yellow with heating and concentration. The hydrochloric acid solution is also colourless, if we except the slight yellow colour due to iron, a little of which is present in all charcoal, and doubtless, like the aqueous solution, assumes a yellow colour with heating and concentration. This property of instability and becoming coloured on heating, is possessed in a very high degree by all the volatile products of the destructive distillation of bones. In view of these considerations it may be assumed, with little hesitation, that the bloom is produced by solution in minute quantity, in the sugar liquor, of the more soluble portions of the nitrogenous organic bodies in the charcoal. We have seen that the hydrated body is soluble in a solution of sugar, but perhaps both portions—that soluble in hydrochloric acid as well as the portion soluble in sulphuric acid—contribute to the effect. Whatever the quantities dissolved, it will be colourless at first, but the heating it undergoes in the process of boiling the sugar solutions to grain, is sufficient to bring about the slight decomposition necessary to produce the yellow colour which, like the syrup, is concentrated in the after products of the refinery. A very little would be quite sufficient to communicate the bloom to the yellow sugars. Instead, therefore, of being further carbonised by revivification, they are, according to this theory, slowly consumed by dissolution in the sugar liquors. If it be the case that these bodies are the colour producers, then charcoal No. V. could not be expected to give much bloom, since it contains less of them than No. VII., which has been 38 weeks in continuous use, and probably revivified 45 times. These, however, are questions which will require careful study in the refinery to arrive at a definite conclusion. One or other of the two theories which I have mentioned may serve to explain what takes place, but both may be required to account for the gradual fall of organic matter in stock charcoals in the course of long use.

I have to acknowledge the assistance of Dr. Patterson, of the Yorkshire College, who kindly made the combustions for me.

Yorkshire Section.

Meeting held at the Midland Hotel, Bradford, on Monday, March 30, 1903.

MR. JAMES E. BEDFORD IN THE CHAIR.

TINTOMETRIC ESTIMATION OF CHROME IN CLOTHS, &c.

BY F. W. RICHARDSON, W. MANN, AND N. HANSON.

In the laboratory of the general analyst, particularly in this part of Yorkshire, it is frequently necessary to estimate the percentage of chrome in dyed goods. This estimation is often of considerable service in enabling chemists to form some opinion as to the cause of the looseness of certain blue and blue-black dyes.

The pattern sent is often very small, and then one must be prepared to work upon 1 grm. or less for the estimation of the mordant; it was this consideration which led us to devise a process by which as little as 1 or even 1/100th mgrm. of chromium, in its equivalent as bichromate of potash, might be estimated in the sample submitted.

In a platinum crucible we place the weighed piece of cloth and incinerate thoroughly. After cooling we introduce into the crucible ⅓ grm. of a mixture of equal parts of chlorate and carbonate of potassium, and covering the crucible with its lid we fuse the mass for three or four minutes; after cooling and lixiviation of the fused mass with boiling water and filtration we obtain solutions varying from 5 c.c. to 100 c.c., diluted in rough proportion to the amount of yellow colour obtained.

In the usual course of laboratory work, and in the absence of a tintometer with standard glasses, the amount of chrome can be determined by colorimetric comparison with standard solutions of potassium chromate, as in the ordinary Nessler process.

As we find that the standard solutions of potassium chromate, when tested in comparison with Mr. Lovibond's standard sets of glasses, contain a small proportion of red, we find it necessary to add a little carbonate or hydrate of soda or potash, which at once produces a pure yellow.

Having obtained our solutions, all that is necessary is to charge the standard cells and match the colour in a good light—daylight preferable,—but the light given by a magnesium ribbon lamp will also answer very well.

With ⅕ mgrm. of potassium chromate we obtained a reading of 2·4 units in the ¼-inch cell, and even less than this could be colorimetrically determined.

In using Lovibond's tintometer one is early made awar of the fact that the colour readings in the graduated series of cells are not arithmetically proportional; thus, wit potassium chromate solution the reading in a 2-inch cell is rather less than double that of the reading in a 1-inch cell and other apparent irregularities are noticed when comparisons are made with the same solution before and afte dilution with the use of the same or different cells; this fac has often been stated by Mr. Lovibond himself.

We have, therefore, obtained the values of our sets of yellow glasses for different strengths of potassium chromate solutions, and have tabulated these in such a manner that, once we know the reading, which should not be over 4—5 units in any one cell, we can at once calculate the percentage of chrome in the solution by means of a simple rule of three sum.

The following is our standard table :—

—	1·0.	0·75.	0·5.	0·25.	0·1.	0·075.	0·05.	0·025.	0·01.	0·001.
⅛ in.	12·2	10·3	8·55	5·3	2·55	2·0	1·05	0·8	..	..
¼ „	..	..	..	8·6	4·5	3·3	2·4	1·25	..	..
½ „	..	..	..	..	7·1	6·2	4·2	2·35	1·2	..
1 „	..	..	..	..	..	..	7·3	4·2	2·3	..
2 ins.	..	..	..	..	..	..	..	..	4·2	..
3 „	..	..	..	..	..	..	..	..	6·3	..
6 „	..	..	..	..	..	..	..	..	..	1·15
12 „	..	..	..	..	..	..	..	..	..	2·5
24 „	..	..	..	..	..	..	..	..	..	5·3

In illustration we may give the following :—

	c.c.
Total volume of solution to be tested	5·0
Reading in 1-in. cell	4·0
Nearest reading in 1-in. cell from table........	4·2

$$\therefore 5 \text{ c.c.} = 4 \times \frac{\frac{0{\cdot}025\ \%}{20}}{4{\cdot}2} = 0{\cdot}00119 \text{ grm. } K_2CrO_4$$

As 1 grm. of cloth was taken 0·00119 × 100 = 0·119 % chrome = K_2CrO_4.

In illustration of the accuracy of which this method is capable we give the following results :—

—	Potassium Chromate.	In Solution.	Found.
	Mgrms.	c.c.	c.c.
1	0·36	5·0	0·37
2	2·36	10·0	2·40
3	2·88	10·0	2·50
4	1·00	100·0	1·04

With the exception of No. 3 the results are remarkably near the truth.

We have treated filter paper with measured quantities of standard chromate solutions and have recovered the chrome as chromate from the ash and have always succeeded in getting the same readings as with the same quantities of the original solutions themselves made to the same volumes, but we may note that a further fusion of the insoluble matter was necessary to recover the last traces of chrome in the ash.

Weights of ordinary blotting paper containing a large amount of mineral matter, and therefore representative of cloths containing impurities, which might interfere with the chrome estimation, were treated with measured amounts of standard chrome solutions, and these were put through the above process by some of us who were not aware of the percentage of chrome present :—

—	Chrome calculated as Potassium Chromate.	
	Present.	Found.
A........................	0·020	0·023
B........................	0·200	0·163
C........................	0·200	0·165
D........................	0·020	0·0196

No doubt a second fusion in the case of B and C would have given a result nearer the truth.

Iodimetric Estimation of Small Amounts of Chrome.—If an acidified solution of a chromate is treated with iodide of potassium an amount of iodine exactly equivalent to the oxidising power of the chrome is liberated—

$$2K_2CrO_4 + 8H_2SO_4 + 6KI = 5K_2SO_4 + Cr_23SO_4 + 8H_2O + 3I_2.$$

Therefore, 64·31 parts of K_2CrO_4 will furnish oxygen equivalent to 125·9 parts of iodine; or, in other words, 1 c.c. of N/100 thiosulphate of soda will equal the iodine set free from 0·6431 mgrm. of potassium chromate. As one-fifth of a c.c. of N/100 thiosulphate shows a good difference in the titration, this method allows of the estimation of as little as 0·2 mgrm. of chromate.

We find that the chlorate and carbonate of potassium present in the fusion mixture do not interfere with the accuracy of this process. Five c.c. of a 1 per cent. K_2CrO_4 solution with sufficient excess of sulphuric acid, potassium iodide, and pure soluble starch solution required 7·9 c.c. of N/100 thiosulphate :—7·9 × 0·6431 mgrm. = 5·08 mgrms. of K_2CrO_4 compared with 5·00 mgrms. actually present.

Five grms. of flannel were treated with 0·25 c.c. of a 1 per cent. K_2CrO_4 solution. After incineration and fusion of the ash as above described we obtained a solution which by the foregoing process required 3·6 c.c. N/100 thiosulphate :—

	Per Cent. K_2CrO_4.
Found, 3·6 × 20 × 0·0006431 =	0·0463
Present	0·0500
Error....	0·0037

Having found that very dilute solutions of iodine give pure blue colours with freshly prepared solutions of pure soluble starch, it occurred to us that by the aid of the colour depths as viewed in Lovibond's tintometer, we might be able to estimate even very minute amounts of chrome.

We content ourselves with giving one or two simple examples of the comparative accuracy of the process.

Five grms. of flannel + 5 c.c. of a 0·01 per cent. solution of K_2CrO_4 gave an ash which on treatment yielded 1,000 c.c. of a solution capable of giving a reading of 3·1 blue units in the 2-in. cell.

3·8 was the proper reading for a solution containing the same amount of chrome not put through the incineration process :—

	Per Cent. K_2CrO_4.
Present	0·001000
Found	0·000815

showing a loss which, however, might have been recovered by a second fusion of the ash.

The most interesting feature of this process is the possibility which it offers for the approximate estimation of very small amounts of chrome in metallurgical and mineralogical work. For example, in the above case a good reading could be obtained with as little as 5 c.c. of the blue solution, and this represented the 1/400th part of a mgrm. of potassium chromate, equal to about the 1/1500th part of a mgrm. of chromium.

We find it necessary to test these blue solutions at once, as the colour is prone to darken.

Discussion.

Mr. Gardner referred to the difficulty of comparing the colours of the solutions in artificial light. He asked if the presence of iron in the solutions had been found to interfere in any way. In the titration method in which iodide of starch was used, had Mr. Richardson taken account of the fact that this colour varied at different temperatures?

Mr. **Fairley** observed that though chrome iron ore was the common source of chromium, iron did not occur in most chromates, and, therefore, did not interfere. In using magnesium as an illuminant, it was necessary to screen the eyes from the direct glare of the light.

Mr. **Bedford** asked if Mr. Gardner had used his "Dalite" lamp in connection with tintometer readings.

Mr. **Gardner** replied that he had used it with success.

Mr. **Slatter** agreed that the "Dalite" lamp was most useful for matching, and results obtained by it were confirmed in daylight. It protected the eye from glare. It would be useful to have a quick method for determining chromium. He instanced a case where brown stains on a cloth were traced to the workmen having put undissolved chromium salt into the bath.

Dr. **Turnbull** stated that experiments had been carried out in the Leather Industries Department of the Yorkshire College in order to obtain a quick and yet reliable method of estimating chromium. The method, described by Prof. Procter, of igniting the dry chromium salt with a mixture of magnesia and carbonate of soda, and thus getting a chromate in which the chromic acid could be determined after the addition of potassium iodide, by titration with sodium thiosulphate, had been found to give the best results. The oxidation of chromium salts in solution to chromate, and the subsequent estimation of the chromic acid colorimetrically in Nessler glasses, had also been tried, and with fair success where the amount of chromium is small. These experiments would form the subject of a paper to the section at a later date.

Mr. **Fairley** said that the method of fusion mentioned by Dr. Turnbull was used in the manufacture of chrome salts from the ore, only lime was used instead of magnesia.

Mr. **Bedford** remarked that the difficulty of getting constant daylight for colorimetric work was in part due to the smoky atmosphere in towns. The "Dalite" lamp would give a constant light.

Mr. **Carter** stated that there was more blue in the daylight in Leeds than in Ravensthorpe.

Mr. **Gardner** said that the character of the light in any particular place was greatly affected by the colour of surrounding objects, as, for instance, the proximity of a red brick building.

Mr. **Richardson** in reply said that a standard light was necessary, but that he had not used the "Dalite" lamp. One ought to avoid the presence of coloured objects, and the lights should be of constant intensity as well as colour. Personal equation came in where colorimetric methods were used. Iron did not interfere with chrome estimation by the process described; indeed the fusion method was regularly employed to convert chromium into chromate when iron was to be separated. For very weak solutions of potassium chromate he had not found any light useful for comparative purposes other than good daylight from a white surface, magnesium light and the arc light. He would experiment with the "Dalite" lamp.

TINTOMETRIC ESTIMATION OF NITRITES AND NITRATES IN WATER.

BY F. W. RICHARDSON AND PERCY HOLLINGS.

It is commonly supposed to be a very easy matter to determine both nitrites and nitrates with reasonable accuracy in water by means of one or the other of the many colorimetric processes extant; but after carrying out a large number of experiments we must admit that it is by no means easy to make even a reasonably accurate estimation of these constituents.

We have long ago discarded the brucine and oxalic acid method for nitrates, as the colours obtainable with different waters were so very varied in tint that it was mostly quite impossible to compare them with a standard made by the use of pure potassium nitrate.

It was also with some regret that we had to cease using the ordinary phenol-monosulphonic acid method as described in Sutton's Volumetric Analysis, 7th Edition, page 262.

We have found that the temperature at which the residues were heated with the reagents and the duration of the heating produced not only different intensities of yellow colour, but also at times, with certain waters in particular, some light brown products which rendered colour comparison very difficult.

The phenol-disulphonic acid method, described in Sutton's Volumetric Analysis (*ibid.*, page 263), is very much more satisfactory, as it reacts at once in the cold and the yellow colours obtained are pure and proportional; but here we are beset with a difficulty which is not commonly suspected; the water must be evaporated to dryness before the test can be applied, and we find that in the evaporation process, particularly when the residue approaches dryness, any nitrites that may be present are very largely oxidised. To obviate the error which would arise in the application of this method to a water containing both nitrites and nitrates we boil a measured quantity of the sample with a little pure peroxide of hydrogen and then evaporate to dryness; of course in this way the whole of the nitrites are converted into nitrates, and the nitrate thus formed must be deducted from the total amount after the nitrite has been separately estimated.

We are of opinion that Lovibond's tintometer, with its excellent series of yellow glasses, can be used with considerable accuracy and economy of time in the estimation of nitrites and nitrates in waters.

At the outset we make for ourselves a colour scale based upon the readings given in different cells for standard yellow solutions obtained from pure potassium nitrate and phenol-disulphonic acid.

The following table serves our purpose :—

Mgrms. of Nitrogen as Nitrate made to 100 c.c. after adding Phenol-disulphonic Acid, &c.	Yellow Units required to match in Lovibond's Cells.				
	⅛ in.	¼ in.	½ in.	1 in.	2 ins.
0·01387	0·85	1·60	3·00	6·2	12·2
0·01110	0·70	1·30	2·45	5·0	9·8
0·008322	0·50	0·85	1·80	3·7	7·3
0·005550	0·35	0·70	1·25	2·4	4·85
0·002775	..	0·35	0·65	1·3	2·50
0·001387	..	..	..	0·70	1·45

As examples of the method of using this table and of the degree of accuracy obtainable, we give the following :—

Ten c.c. of each of two samples of Bradford City water, each made to contain a definite amount of potassium nitrate, were evaporated to dryness on the water-bath. The solids were well mixed with 1 c.c. of the phenol-disulphonic acid and after dilution ammonia was added in slight excess; the solutions were then made up to 100 c.c. and 50 c.c. respectively :—

	Yellow Units required in Lovibond's Cells.			
	⅛ in.	¼ in.	½ in.	1 in.
10 c.c. A water made to 100 c.c.	1·3	2·5	5·0	..
10 c.c. B water made to 50 c.c.	..	0·6	1·2	2·4

According to the table, A solution will contain nitrogen as nitrate equal to $\frac{5 \times 0·1387}{3}$ = 0·231 mgrm.

0·231 × 7 = 1·617 gr. of N. per gallon (found).
1·687 „ „ „ (present).

B will contain exactly—

0·05552 mgrm. N. in 100 c.c. or 0·02776 mgrm. in 50 c.c.
0·02776 × 7 = 0·19432 gr. N per gallon (found).
0·17000 „ „ (present).

Nitrites.—By means of the diazo reaction it is possible to produce a considerable amount of colour by the action of nitrous acid solutions, or what is the same, an acid nitrite solution upon sulphanilic acid, and such substances as ırbszole, α-naphthol, salicylic acid, resorcin, and α-naphthyl-nine.

We have tried various substances in reaction with lphanilic acid and acid nitrite solutions for the intensity colour produced under such conditions as would obtain a water analysis, and the following are proportional sults :—

pplication of the diazo test to 25 c.c. of a mixture containing 22½ c.c. of water with 0·02 gr. of nitrogen as nitrite per gallon and 2½ c.c. of an acidified 0·5 per cent. solution of sulphanilic acid :—allowing to stand half an hour, after which slight excess of ammonia was added.

—	Total Colour Units required for 1 in. depth of Liquid.	Ratios.
Naphthylamine	10·2	6·4
rbazole	9·0	5·6
Naphthol	7·3	4·6
ıymol	6·6	4·1
licylic acid	5·9	3·7
Naphthol-sodium-disulphonate	5·0	3·1
trophenyl-lactic acid	2·6	1·6
nzidine sulphate	1·9	1·2
Naphthol-sulphonic acid	1·6	1·0

The amounts of colour obtained being represented by the tal colour units needed to match the shade in a 1-in. glass ll.

Inasmuch as the α-naphthylamine gives the deepest lour, and what is equally important for the tintometric ethod using standard colour glasses, as it gives quite a re red ; we have adopted this process for the estimation nitrites.

After performing a very large number of experiments d obtaining some very perplexing results, we find the lowing method to be most free from objections :—

The sulphanilic acid and the α-naphthylamine are both ıde to ½ per cent. strength ; 2 c.c. of the former are ded to 35 c.c. of the water in a small stoppered bottle th ½ c.c. of 10 per cent. sulphuric acid. After standing r half an hour at the ordinary temperature 2 c.c. of the phthylamine solution are added, and the mixture is owed to remain another half-hour.

The liquid is made up to 100 c.c. with methylated spirit d 2 c.c. of acetic acid. Our reason for adding methylated irit is that when more than a certain proportion of nitrite present there is a heavy precipitation of the red colour.

The solutions are now submitted to tintometric examition, and if the colours chance to be too deep 10 c.c. are uted to 100 c.c. with spirit containing a little acetic acid.

The following is the table we have worked out for the standard colours for this estimation :—

Volume of Solution.	Containing mgrm. of Nitrogen as Nitrites.	Red Units to match Colour-depths in Lovibond's Cells.			
		$\frac{1}{8}$ in.	$\frac{1}{4}$ in.	$\frac{1}{2}$ in.	1 in.
c.c.					
50·0	0·005075	1·1	2·25	4·5	..
100·0	0·010500	1·1	2·2	4·5	..
100·0	0·020300	2·2	4·4	9·0	..
1,000·0	0·040600	..	..	1·8	3·6
1,000·0	0·081200	0·9	1·8	3·6	..
1,000·0	0·121800	1·4	2·65	5·2	..
1,000·0	0·162400	1·75	3·50	7·0	..
1,000·0	0·20300	2·2	4·40	8·9	..

With as little as 1 c.c. of the first solution in this list we can obtain a good reading in the ¼ in. cell, *i.e.*, we can see and approximately estimate the colour produced by the 1/10,000th part of a milligramme or the 1/650,000th part of a grain of nitrogen as nitrites.

Four solutions containing amounts of nitrogen unknown to one of us when applying the above process were examined :—

—	Grains of Nitrogen as Nitrites, per gallon.		
	Found.	Present.	Error.
1	0·02030	0·02030	..
2	0·00083	0·00110	0·00027
3	0·08300	0·08250	0·0005
4	0·04670	0·04670	..

Discussion.

Mr. Bedford considered that the methods indicated by the authors of this paper might be useful in testing domestic water supply.

Mr. Robinson said that the difficulty in using the sulphanilic acid method was that it gave a colour difficult to compare. Metaphenylene diamine was not so delicate but gave more reliable results. Nessler glasses were used. Had Mr. Richardson tried the estimation of nitrates by reduction ?

Mr. Richardson, in reply, said that his experiments had taken much work and time, and that he had found great difficulty in getting accurate results.

The tintometer might be of use to the West Riding Rivers Board, as the results were quickly obtained and fairly accurate.

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I.—PLANT, APPARATUS AND MACHINERY.

English Patent.

Drying Machines [*for Fabrics, Paper, Veneer, &c.*]. M. Rossow, Dessau, Germany. Eng. Pat. 8856, April 16, 1902.

The apparatus is of the type in which the material to be dried is conveyed by endless felts around heated drums, so as to bring both sides of the material into contact with the drums. In order to prevent stretching and distortion of the felts, the drums and guide rolls are arranged so that the material leaving the felts of one pair of drums is conducted with certainty between the felts of the next pair.—R. A.

United States Patents.

Centrifugal Lixiviating [*Filtering*] *Machine.* H. R. Ellis, Salt Lake City, Utah. U.S. Pat. 725,549, April 14, 1903.

The rotary drum of the machine is provided internally with a concentric perforated partition, which carries the filtering medium on its inner face. The liquid is supplied through the hollow shaft of the drum, from which it passes through radial tubes into the upper part of the annular space between the drum and partition. The discharge opening is formed in the bottom of the drum, and is provided with a cover which is opened by centrifugal force when the drum is rapidly rotated, but is held in the position for closing the opening when the drum is slowly rotated or at rest. A valve in the side of the drum, near the bottom of the annular chamber, is open when the drum is at rest, but is closed by the centrifugal action when the drum is rotated.
—R. A.

Centrifugal Separator. C. J. Pihl, Cambridgeport, Mass., Assignor to United States Dairy Manufacturing and Machine Co., Maine. U.S. Pat. 725,868. April 21, 1903.

The separator is constructed with a wall in proximity to that of the bowl, this wall being double at intervals, and including vertically-disposed transversely-curved plates or partitions, which partially overlap, and form with the wall, horizontally curved raceways for the separated constituents. The separate outlets, in communication with the raceways, are provided in a plate mounted above the partition, an expansible plug having an eccentrically formed opening being employed for regulating the discharge.—R. A.

French Patents.

Bottles or Carboys for Conveying and Storing Acid, Inflammable or Valuable Liquids, and the like; Means for Packing ——. A. Mauser. First Supplement, dated Sept. 30, 1902, to Fr. Pat. 321,328. May 21, 1902.

See Eng. Pat. 11,695, 1902; this Journal, 1903, 484.
—L. F. G.

Extraction Apparatus; Continuous ——. E. Heimann. Fr. Pat. 321,202, Sept. 6, 1902.

Two or more vessels containing the substance to be extracted, separated one from another and working independently, are enclosed in a common receptacle, through which the vapours from the still pass to a condenser. The liquid from the condenser flows into the extraction vessels, and is decanted off by siphons, from which it is redischarged into the still.—L. A.

Gas Containers; Apparatus for Preventing the Expl sion of Compressed- or Liquefied- ——. Soc. D'Esca et Meuse. Fr. Pat. 324,350, Sept. 10, 1902.

A plate of metal or other material is fixed over an orifi communicating with the interior of the cylinder, in suc manner that an excess of pressure will rupture the pla and cause the gas to escape.—L. A.

Absorption of Gases; Apparatus for ——, *by Liquids.* A. Brand. Fr. Pat. 324,911, Oct. 2, 1902.

This apparatus for the absorption of gases by liquids, specially suitable for liquids tending to froth. A perforat dome is placed over the perforated gas-inlet pipe at t bottom of a cylindrical vessel, and is rotated by a sha The vessel is half filled with the absorbing liquid. Thr such vessels form a battery, bent pipes connecting the top one vessel with the inlet-pipe of the next one. The gas entering is broken up into fine bubbles by the perforatio of the inlet-pipe and those of the rotating dome, and in mately mixed with the liquid by the rotation of the dom The gas and liquid froth over into the next vessel, whe the bubbles are again broken up, and intimately mixed wi the liquid. The saturated liquid is drawn off from the l vessel.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

Carbon Monoxide in Air; Determination of Small Quantities of ——. Spitta. XXIII., page 652.

English Patents.

Fuel in Furnaces; Apparatus for Burning Liquid — O. Lindemann, London. From E. Korting, Hanov Germany. Eng. Pat. 4249, Feb. 23, 1903.

The fuel is injected into the furnace through a scatteri nozzle against a surface fixed at right angles to the axis the cone of "pulverised" oil.—F. H. L.

Coke Ovens; Impts. in ——. The Otto-Hilgenstock Col Oven Co., Ltd., London. From C. Otto and Co., Da hausen a/Ruhr, Germany. Eng. Pat. 3307, Feb. 1903.

The channels conveying the combustible gas or air to side flues of a horizontal bottom fired coke-oven, arranged between the sole flues of the oven, so that heat of the gases flowing through them, serves to preh the combustible gas or air. In a modification of the inv tion, the sole flues are divided by horizontal baffles, ca the gases to take a zigzag course.

The sole flues are arranged below the place of ignition the gases in the side flues, thus ensuring preheating bef the point of ignition is reached. (See also this Journ. 1903, 355.)—L. F. G.

Furnaces; Impts. in ——. G. Grobet and C. Bernasc Vallorbe, Switzerland. Eng. Pat. 8199, April 8, 1902

Means are devised for automatically closing the damp of steam boilers and operating a signal to indicate time when re-stoking is required. The invention is ba on the principle that the steam-pressure in a boiler rema nearly constant if the damper be re-opened immediately fire is stoked and then slowly closed till the fuel supplied the grate, is completely burnt.—L. F. G.

Furnaces; [Rocking Device for Bars of ——]. W. B. Hilton, R. Campbell, and J. F. Crawford, Liverpool. Eng. Pat. 8654, April 14, 1902.

At their rear ends the furnace bars are carried upon a support which serves as a hinge for them to rock upon, whilst at the front end they rest upon a cross-plate of the usual pattern. The bars themselves are cast with a dowaward projection immediately behind their forward ends, in the face of which is a depression or socket. Beneath the forward bearer is a transverse rod serving as the fulcrum for a lever, which is thus free to move from side to side of the whole grate. The longer end of the lever is worked by hand; the shorter one enters the socket on the furnace-bar hanger, so that when the handle is depressed, that particular bar which is opposite the lever is lifted from its seat, whilst if it refuses to drop again, an upward pull on the lever forces it downwards. Thus, any bar, or bars, can be released from clinker. The projecting portion of the lever folds vertically out of the way when not in use.—F. H. L.

Gas Producers; Impts. in ——. W. J. Crossley and Rigby, Manchester. Eng. Pat. 12,363, May 31, 1902.

A perforated conical grate is supported by a table which rotates on ball-bearings upon a vertical water-sealed cylinder, into which the air and steam supplies are delivered. The conical grate is built up of horizontally arranged flat rings of gradually decreasing diameters placed one above the other at suitable distances apart, a conical cap being provided at the top. For small producers, the grate is cast in the form of a perforated cone.—H. B.

Carbide Cartridges for Acetylene Generators. W. L. Wise, London. From E. von Szalay, Pressburg, Hungary. Eng. Pat. 9902, April 29, 1902.

Calcium carbide is reduced to powder, and whilst still in the dry state is moulded into the desired shapes by a pressure of some 20 atmospheres. The cartridges are then saturated with any suitable liquid hydrocarbon. It has previously been proposed to compress a mixture of carbide and oil into cartridges, but (so it is said) this older process causes the carbide to absorb too much oil, and fails to give a durable solid product. The cartridges are all made of the same size, so as to represent a known volume of acetylene, and they are wrapped for storage in waxed paper.
—F. H. L.

Incandescent Gas Lighting; Impts. relating to ——. W. T. Sugg, London. Eng. Pat. 11,069, May 14, 1902.

The mantle support is formed with a point at the top, and the lower end has a threaded socket adapted to screw down upon a threaded boss on the top of the burner. A supporting piece, having a recess on its under side to receive the point of the supporting rod, is formed of dome shape with a skirt or flange directed downwards, on which the mantle will rest, openings being provided in the dome for the passage of the hot gases. The mantle has a wider top than usual. The supporting devices are made by grinding together a mixture of 9 parts of steatite dust and [illegible] part of fireclay, with a small quantity of silicate of soda, and then moulding the mass.—H. B.

Mantles; Manufacture of Incandescent ——. T. Terrell, London. Eng. Pat. 11,042, May 14, 1902.

The threads of cotton, linen, or other natural cellulose are soaked in a concentrated solution of salts of thorium and cerium until they contain from 30 to 48 per cent. of the oxides. For example, a solution of 2,000 grms. of thorium nitrate and 20 grms. of cerium nitrate in 1,500 c.c. of water may be used, and to insure complete impregnation, the fibres may remain in this for 48 hours, or the soaking may be done in a vacuum. The fibres are then dried thoroughly at a temperature below 70° C., and should then contain about their own weight of salts. They are next immersed in concentrated ammonia, washed in distilled water, dried, and made into mantles, as usual. The threads may be mercerised before impregnation with the salts.—H. B.

Mantles; Process for making Incandescent ——, Transportable. A. Oppenheim and R. Feuer, Berlin. Eng Pat. 27,821, Dec. 16, 1902.

Concentrated acetic acid, or other suitable organic acid, is substituted for the usual inflammable solvents of the nitrocellulose, &c., used for stiffening mantles.—H. B.

Filaments or the like for Electrical Incandescence Lamps; Manufacture of ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 12,157, May 28, 1902.

See Fr. Pat. 321,412; this Journal, 1903, 206.—H. B.

Filaments or the like for Electrical Incandescence Lamps; Manufacture of ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 12,158, May 28, 1902.

The filaments for the incandescence lamps described in Eng. Pat. 12,156 of 1902, are formed from vanadium, tantalum, niobium, or their alloys, by subjecting the metal or metals, in the form of an amorphous powder without a binding material, to a pressure sufficient to press it or them to the desired shape.—G. H. R.

Filaments or the like for Electrical Incandescence Lamps; Manufacture of ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat., 12,160, May 28, 1902.

See Fr. Pat. 321,412; this Journal, 1903, 206.—H. B.

Photometers. E. T. Turney, San Francisco. Eng. Pat. 20,458, Sept. 19, 1902.

The apparatus consists of a circular translucent disc with an opaque bar arranged diametrically, supported on a casing within which is an electric glow lamp. This lamp is brought into operation by depressing a push, and it is supplied with current from batteries through a variable resistance, which is manipulated by rotating the frame carrying the disc. It is proposed to employ this glow lamp as the standard light, the candle-power at any moment being "inferred" by the position of a pointer which indicates how much of the resistance is in circuit. The photometer is used by presenting the opposite (outer) surface of the disc to the light under examination, when, if the standard light be the stronger of the two, the disc "glows," but ceases to "glow" when equality is attained.
—F. H. L.

United States Patents.

Coke; Manufacturing ——. J. F. Wilcox, Assignor to Retort Coke Oven Co., Cleveland, Ohio. U.S. Pat. 725,904, April 21, 1903.

The charges are formed into briquettes outside the ovens, and are then placed in the ovens in such a manner that spaces are left between certain of the briquettes, in order to facilitate the escape of the evolved gases. The spaced portions of the charge extend from the top of the latter to a short distance from the bottom.—C. S.

Furnace. E. H. Schwartz, Assignor to the Hawley Down-Draft Furnace Co., Chicago, Ill. U.S. Pat. 725,490 April 14, 1903. (See also this Journal, 1902, 1239.)

A furnace which can be tilted is provided with pipes, entering the furnace at a point above the axis, for the supply of fuel and air, and with means (swivel joints exterior to the furnace trunnions) for enabling these feed pipes to share the movement of the furnace when tilted, without affecting their communication with the stationary pipes supplying the air and fuel.—C. S.

Regenerator Furnace. G. Campion and M. Wyant, Anderson, Ind. U.S. Pat. 725,539, April 14, 1903.

The regenerator chamber is combined with the hearth of a lateral flue-chamber, a slag-pocket in the bottom of such chamber, flues connecting the hearth and the flue-chamber, a slag-storage chamber below the slag-pocket, and a passage or tap-hole connecting the two last-named.—C. S.

Glower; Electric Lamp ——, and Method of attaching Terminal Wires thereto. M. W. Hanks, Assignor to G. Westinghouse, both of Pittsburg, Pa. U.S. Pat. 725,703, April 21, 1903.

The "glower" comprises a body composed of one or more dry electrolytes, round the ends of which, platinum terminals are wound and fastened to them by copper or other alloying material applied to the turns of the wire and fused to them. The wire-turns are finally coated with a suitable paste.—G. H. R.

French Patents.

Alcohol; Carburetting ——. Société de Lille et Bonnières. Fr. Pat. 324,778, Sept. 29, 1902.

The solubility of petroleum spirit, for carburetting purposes, in alcohol, is increased by the addition of higher alcohols or ethers, in the proportion of about 2 per cent. for 96 per cent alcohol to 10—15 per cent. for 94 per cent. alcohol.—C. S.

Briquettes: Treatment of Powdered Wood, Peat, and similar Substances for the Manufacture of ——. A. Classen. Fr. Pat. 324,722, Sept. 24, 1902.

Sawdust or other material containing cellulose is moistened with a dilute acid (hydrochloric, nitric, sulphurous or sulphuric acid), and then heated to about 105°—145° C. for 30—60 minutes in a closed vessel, after which it is dried, and will then be ready for pressing to briquettes.—C. S.

Briquettes; Impts. in Fuel ——. O. G. Blunden, W. J. Malden and A. Malden. Fr. Pat. 325,077, Oct. 9, 1902.

See Eng. Pat. 23,904, Nov. 25, 1901; this Journal, 1903, 17.—C. S.

Fuel; Manufacture of ——. F. Huppenbauer. Fr. Pat. 325,069, Oct. 9, 1902.

The gases from the distillation of coal or oil shale are conducted into a condenser, whence the tar is delivered into a chamber, where it is re-vaporised by a portion of the hot gases discharged from the retort, and passed through a grating into a mixing cylinder containing cinders, coal, bituminous shale, peat, wood, &c. The charge in this cylinder is kept in motion by paddles, and becomes impregnated with the tar, the uncondensed gases being conveyed either to the condenser or directly into the retort furnace. The other gases from the condenser are also consumed in the furnace, together with a portion of the tar if necessary, this operation and also the relative proportion of tar and hot gas admitted to the vaporising chamber being controlled by valves.—C. S.

Gas; Apparatus for Washing and Purifying ——. W. C. Holmes and Co. Fr. Pat. 324,695, Sept. 23, 1902.

See Eng. Pat. 7364 of 1902; this Journal, 1902, 1524. —H. B.

Oil-Gas; Process for Recovery of By-Products from the Purification Liquors of ——. H. Gutknecht. Fr. Pat. 324,767, Sept. 27, 1902.

To the liquors, freed from tar, is added a solution of a metallic sulphate, to precipitate unoxidised sulphur compounds and cyanides; and the liquid, separated from the precipitate, is stirred up with sufficient sulphate of lime to convert into sulphate the carbonate of ammonium present. If free ammonia be present, the liquid may be stirred by passing chimney-gases through it. If bicarbonate be present, the necessary quantity of quicklime or slaked lime is added along with the sulphate of lime. The liquid, freed from suspended matters, may now be used repeatedly for the purification of gas, treating it as above, until it has reached a considerable concentration, when it is evaporated to crystallisation, either in an open pan or by means of currents of air. The mother-liquors contain the sulphocyanide, thiosulphate, and other salts of ammonium, which are more soluble than the sulphat The various precipitates, &c., are treated for recovery o the sulphur, ferrocyanides, sulphocyanides, ammonia, &c. —H. B.

Gas; Purifying and Enriching Blast-Furnace ——. G. J. Snelus. Fr. Pat. 324,861, Sept. 30, 1902.

The apparatus employed for purifying and enriching th gas is constructed in the form of a small blast furnac and is charged with coke, anthracite, or other suitable fue The dust accompanying the gas is removed by the aid a suitable flux, which is added to the fuel in the purifi and forms a slag with the dust. The combustion of th fuel in the purifier is maintained by the aid of an a blast, admitted through tuyères, whereby carbon monoxid and nitrogen are formed. The gas to be treated, is intr duced into the purifier at a somewhat higher level th the air blast, and is converted into carbon monoxide contact with the glowing fuel. At the same time, stea is introduced into the purifier, the resulting water-g mingling with and enriching the gas already prese therein.—C. S.

Gases; Purifying Material for Acetylene and other ——. E. A. Javal. Fr. Pat. 324,873, Sept. 30, 1902.

One part of potassium permanganate, 5 parts of sulphu acid, and 1 part of water are mixed together and absorb in infusorial earth. When crude acetylene is led throu this composition, the sulphuretted hydrogen is, it is claim oxidised to sulphuric acid, thus replacing that amou which is consumed in neutralising the ammonia; and t free sulphuric acid, acting upon the permanganate, is to produce manganese peroxide, which is the essent purifying reagent as regards the sulphur and phosphor the crude gas.—F. H. L.

Mantles; Process of Preparing a Toughening Fluid Incandescence ——. J. Hirsch. Fr. Pat. 324,7 Sept. 24, 1903.

The basis of the toughening fluid is an alcoholic solut of "acetylated derivatives of cellulose or hydrocellulo For example, 25 parts of an acetylated cellulose, 3 part camphor, and 3 parts of castor oil are dissolved in 100 pa of dilute alcohol to obtain a suitable fluid.—H. B.

Mantles; Process of Regenerating [Carbonised] Inc descence ——. S. Haas and E. Bloch. Fr. Pat. 325,0 Oct. 9, 1902.

Mantles which have become blackened by the deposit of carbon are restored to their original whiteness sprinkling powdered chloride of sodium upon them, e while incandescent or not.—H. B.

Electrodes for Arc Lamps: Process of Manufacture ——. A. Blondel. Fr. Pat. 324,179, Sept. 3, 1902.

The presses for carbon intended for the making of carb of mineralised paste, with cores and envelopes as descr in Fr. Pat. 323,924, 1902 (this Journal, 1903, 187), hav double concentric screw-plate comprising two concen and adjacent adjuncts, connected respectively to two more parts of the press, and both traversed by one or m shafts serving to form the cores. The adjuncts are relative sizes suitable to the effect of the pressure t produced between the carbon body and the envelope, so arranged as to form a progressive lamination of envelope without causing inequalities of thickness or re Various modifications and applications of this system screw-plates are described and claimed.—G. H. R.

Wicks: Manufacture of Slow-burning ——. R. E Fr. Pat. 324,739, Sept. 26, 1902.

The material is impregnated successively with the fol solutions (being dried after each operation):—100 g of sodium silicate in 1 litre of distilled water; 50 gra sodium thiosulphate in 1 litre of distilled water; 80 gr of ammonium bichromate in 1 litre of distilled water is finally coated with a thin layer of vegetable wax (wax).—T. F. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Sour Lake Field; The ——. Thiele. Petroleum Review and Mining News, 1903, 8, [216], 362.

IE oil from the Sour Lake Field, in Texas, taken from a 2-ft. stratum, is heavy, viscous, and rich in asphaltum.

A distillation test gave, as the principal fractions, 1·59 r cent. (by vol.) at 320°—392° F., 19·49 per cent. at 2°—572°, and 5·15 per cent. at 572°—641° F., leaving ·11 per cent. of residue of sp. gr. 0·978. The specific avities of the principal fractions were—

Temperature in ° F.	Specific Gravity.
320°—392°	0·684
392°—572°	0·840
572°—641°	0·782

The oil was found to contain 20 per cent. of asphaltum. e specific gravity of the crude oil was 0·963 at 63° F.

It could thus be divided into the following commercial oducts :—

	Per Cent.
Benzine	0·07
Heavy illuminating oil	16·24
Middle oil	27·79
Fraction to be worked for lubricating oil and asphaltum	52·34

In 1899, oil was found at a depth of 450 ft., having a ecific gravity of 0·915.

So far, five different strata of oil have been found; the ecific gravities are as follow :—

Depth.	Specific Gravity.
Feet.	
250	0·963
450	0·915
640	0·909
Lower depths	0·909

The oil from the lower strata is not so rich in asphaltum that found nearer the surface, but is richer in the lighter drocarbons. All the oil is brownish in colour. It also ntains sulphuretted hydrogen and compounds rich in rogen.—T. F. B.

English Patent.

troleum or Mineral Oil Distillates; Manufacture of Nitro-Products from ——. L. Edeleanu and G. A. Filiti, Bucharest. Eng. Pat. 9416, April 23, 1902.

E distillates, of sp. gr. 0·87 and over, are treated with mixture of concentrated or fuming sulphuric acid and ric acid, the nitro-products being then precipitated with ter. In one modification the distillates are freed from inous products by treatment with small quantities of phuric acid, previous to nitration. The products, it laimed, may be utilised as a substitute for camphor for xing with nitrocellulose in the manufacture of celluloid; o in the preparation of explosives, "lacs, varnishes," and wn to black substantive dyestuffs.—C. S.

United States Patent.

rbon Black; Apparatus for the Manufacture of ——. . W. Porsch. U.S. Pat. 726,341, April 28, 1903. XIII. A., page 640.

French Patents.

r and Mineral Oils; Process for Deodorising ——. ütgerswerke Act.-Ges. Fr. Pat. 324,938, Oct. 3, 1902.

R, or mineral oil, is made inodorous by heating with des or hydroxides of the heavy metals, or with solutions salts of these, preferably in presence of alkalis.

For instance, 1,000 kilos. of the oil to be deodorised are mixed with 10 kilos. of an ammoniacal solution of copper oxide, and the mixture heated to 90° C. Steam is then passed into the mixture for one hour.—T. F. B.

Tar and Mineral Oils; Process for Deodorising ——. Rütgerswerke Act.-Ges. Fr. Pat. 324,958, Oct. 4, 1902.

A mixture of the oil with an aldehyde or ketone, preferably in presence of an acid or alkali, is heated, and steam is blown through the mixture.

For example, 1,000 kilos. of the oil are mixed with 20 kilos. of an acid or alkaline solution of formaldehyde (about 40 per cent.), the mixture heated to 90 C., and steam passed through for an hour.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Tetraphenylmethane. M. Gomberg and H. W. Berger. Ber., 1903, 36, [6], 1088—1092.

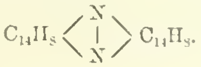
The authors obtain triphenylmethane-hydrazobenzene from phenylhydrazine and triphenylchlorobenzene in ethereal solution; yield, 90 per cent. After purification by alcohol, this is oxidised in ethereal solution with nitrous fumes to the corresponding azo compound, the yield being quantitative. The *triphenylmethane-azo-benzene* so obtained is decomposed by heating in a current of carbon dioxide, after mixing with sand, and tetraphenylmethane is extracted from the product with benzene.

The yield fluctuates between 2 and 20 per cent. of the theoretical, and a light grey product is obtained, which is white after repeated crystallisation from benzene.

A *trinitro-derivative*, $(C_6H_4.NO_2)_3 : C.C_6H_5$, was obtained by dissolving in cold fuming nitric acid. Pale yellow crystals, m. pt. about 330° C. On reduction with zinc dust this yielded a magenta-coloured solution, which appeared to have the same absorption spectrum as the similar dyestuff from triphenylmethane.—E. F.

Indanthrene. R. Bohn. Ber., 1903, 36, [6], 1258—1260.

This article is mainly polemical, in answer to a paper by F. Kaufler (this Journal, 1903, 488). It is stated that R. Scholl has obtained, by reduction of indanthrene, which is the azine of anthraquinone, the hitherto unknown anthracene-azine—



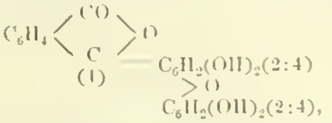
—E. F.

Dihydroxyfluoresceins from Halogenised Phthalic Acids. N. Osorovitz. Ber., 1903, 36, [6], 1076—1084.

The substances were prepared in a similar manner to the dihydroxyfluoresceins of Liebermann and Wölbling (this Journal, 1902, 854). Tetrachloro-, 3.6-dichloro-, and dibromo-phthalic anhydrides were condensed with 2 molecules of hydroxyhydroquinone. The halogenised dihydroxyfluoresceins so obtained are green crystalline substances with cantharides-like lustre, soluble in aqueous solutions of alkalis and alkali carbonates to cherry-red solutions, the spectra of which are all very similar, showing two absorption bands, the stronger of which lies between the lines D and E. These solutions are bluer than those of the non-halogenised compound. The substances dye brilliantly on ordinary basic mordants, pink to brown on alumina, and violet-blue on iron, but these dyeings are fugitive to light. They yield white crystalline tetra-acetyl derivatives, insoluble in cold aqueous alkalis, as also monohydrochlorides which are decomposed by water. Their di-, tri-, and tetra-methyl ethers do not dye on alumina and iron mordants. On the other hand, they dye on some of Scheurer's mordants (this Journal, 1902, 768) with varying intensity. With bromine in glacial acetic acid solution the halogenised dihydroxyfluoresceins yield dibromo derivatives (dihydroxy-eosines). Excess of bromine has no further action. These halogenised dihydroxy-eosines are dark red to brown crystalline substances similar in properties to the mother-substances, and dye cochineal-red on alumina, and dark blue on iron mordants.

A trihydroxyfluorescein from 4 hydroxyphthalic acid and hydroxyquinone is also described. It dyes brown on alumina mordant, black on iron.—E. F.

Phloroglucinolphthaleïn. C. Liebermann and T. Zeruer. Ber., 1903, **36**, [6], 1070—1076.



PHLOROGLUCINOLPHTHALEÏN— is prepared by heating a mixture of 10 grms. of phloroglucinol and 7—8 grms. of phthalic anhydride for three hours at 170—180° C. The product is extracted with benzene, and then recrystallised from hot water. The dry substance is orange-yellow in colour. It is easily soluble in alcohol, acetic acid, acetone, or sulphuric acid, but the solutions show no fluorescence. In solutions of alkalis or carbonates it dissolves with a deep orange-red colour. It hardly colours ordinary mordants, and dyes silk only a slightly yellow shade.

It readily yields tetrabenzoyl and tetra-acetyl derivatives, and with bromine in acetic acid solution it gives a tetrabromo derivative of the formula $C_{20}H_8Br_4O_7$. The bromo-compound is amorphous, and its solutions show no fluorescence; the bromine atoms enter the 3 : 5 positions in the two hydroxybenzene nuclei. On methylation with dimethyl sulphate, phloroglucinolphthaleïn gives di-, tri-, and tetramethyl ethers.

Phloroglucinolphthaleïn shows no resemblance to fluoresceïn, but is very similar to phenolphthaleïn, hydroquinone- and α- and β-orcinolphthaleïns.—J. McC.

α-Naphthol in β-Naphthol; Detection of ——. Arzberger. XXIII., page 653.

Sodium Nitrite; Analysis of ——. M. Wegner. XXIII., page 651.

English Patents.

Polyazo Dyestuffs; Manufacture of New ——. C. D. Abel. From Act. Gesell. für Anilin-Fabrik., Berlin. Eng. Pat. 12,305, May 29, 1902.

See U.S. Pat. 717,550; this Journal, 1903, 140.—T. A. L.

Dyestuffs [Azo Dyestuffs], and Intermediate Products therefor; Production of New ——. H. E. Newton. From the Farbenfabriken vormals F. Bayer and Co., Elberfeld. Eng. Pat. 12,444, May 31, 1902.

See Fr. Pat. 321,521; this Journal, 1903, 209.—T. A. L.

Petroleum or Mineral Oil Distillates; Manufacture of Nitro-products from ——. L. Edeleanu and G. A. Filiti. Eng. Pat. 9416, 1902. III., page 621.

United States Patents.

Indigo Mixture, and Process of Making same. B. Homolka, Frankfort on-Main, Assignor to Farbwerke vormals Meister, Lucius und Brüning, Höchst-on-Main. U.S. Pat. 726,688, April 28, 1903.

See Eng. Pat. 11,522 of 1902; this Journal, 1903, 490. —T. F. B.

Azo Dye; Black ——. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 725,848, April 21, 1903.

Diazotised *o*-aminophenol-*o*-nitro-*p*-sulphonic acid is combined with 1.5-dihydroxynaphthalene, giving a bluish-violet dyestuff for wool, which becomes deep black on treatment with chromium compounds. (See Eng. Pat. 18,569 of 1902; this Journal, 1903, 359.)—T. A. L.

Azo Dye; Black ——. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 726,695, April 28, 1903.

See Eng. Pat. 18,569 of 1902; this Journal, 1903, 359. —T. F. B.

Blue Basic Dye [Azine Dyestuffs], and Process of Making same. E. A. Fourneaux, Assignor to H. A. Metz, Brooklyn, N.Y. U.S. Pat. 726,667, April 28, 1903.

One molecular proportion of an alkali nitrite is allowed to act on two molecular proportions of asymmetrical dimethylphenosafranine in acid solution in the cold. After standing some time, or on boiling, the intermediate compound is transformed into the new dyestuff. This product is a dark purplish powder, readily soluble in water and alcohol, dissolving in concentrated sulphuric acid with a yellowish-green colour, turning blue on dilution. A solution of the dyestuff treated with zinc-dust and acetic acid turns yellow with a greenish fluorescence, becoming, on exposure to air, first carmine with a yellow fluorescence, and subsequently purplish-blue.—T. A. L.

French Patent.

o-Nitro-β-Phenyllactic Methylketone [Indigo Dyestuffs]; Separation of ——. Kalle and Co. Fr. Pat. 325,109, Aug. 11, 1902.

The patentees find that pure *o*-nitrophenyl-β-lactyl methyl ketone can be separated from the crude melt obtained by the action of a small quantity of caustic soda on a mixture of *o*-nitrobenzaldehyde and acetone, by extraction with aqueous solutions of the sulphonates of alcohols, phenols, or of aliphatic or aromatic hydrocarbons. The solution thus obtained, is carefully evaporated and the ketone salted out, or it is extracted by means of an organic solvent. For printing purposes the pure ketone is dissolved in a warm solution of an alkali salt of one of the above-mentioned sulphonic acids, and finally thickened with dextrin or British gum. (See also Eng. Pat. 11,522 of 1902; this Journal, 1903, 490.)—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk; Formation of Stains on ——. P. Sisley. Zeits. fü Farben- u. Textil-Chem., 1903, **2**, [9], 179—182.

See this Journal, 1902, 1328; Gnehm, 1903, 415; Marna 1903, 491. The author maintains that the active agent i causing red stains on silk is sodium chloride. The reaso why Gnehm (*loc. cit.*) did not find that the stains made thei appearance is to be sought in the atmospheric conditions for the author has proved that moisture is an importan factor in the development of these stains. Silk, touche with dry sodium chloride, and then preserved in sealed tubes shows no stains. The temperature is also of extrem importance in the formation of the stains, and possibly als the amount of ozone in the air. Furthermore, the sil seems to be the more easily affected as the amount o weighting material increases, but the presence of weightin material is not by any means essential for the developmen of the stains. In treating the silk, care ought to be take that it is not brought into contact with sodium chloride a any part of the process. The author quotes from letter received from manufacturers in Lyons who have substantiated the results previously recorded by him.—J. McC.

Weighting Agents from Loaded Silk; Simple Method o Removing ——. A. Müller. Zeits. für Farben- u. Textil Chem., 1903, **2**, [8], 160—161.

A boiling soap-bath is sometimes employed to reduce th weight of loaded silk fabrics. Although by its mean fabrics loaded to the extent of 50—60 per cent. may b rendered 10—12 per cent. lighter, the method is unsatisfactory, inasmuch as it is the fibroïn of the silk which i chiefly acted upon.

Oxalic and hydrofluoric acids have the power of freein silks from the whole of the inorganic weighting agent ommonly used, without attacking the fibre, which, when lieved of such matters, recovers its original elasticity and rength. Silks which have been excessively weighted and ms rendered harsh and brittle, become, it is stated, supple nd soft when so treated.

To apply the hydrofluoric acid, the silk is moistened with ater and immersed at the ordinary temperature in a 0·4—1 r cent. solution of the acid for a length of time depending on the concentration of the acid and the degree to which e removal of the inorganic matters is to be effected. The k is afterwards washed and "brightened." The oxalic id is applied as a saturated solution.—E. B.

ordanting. P. Heermann. Färber-Zeit., 1903, **14**, [8], 117—119. (See this Journal, 1903, 361.)

fluence of Temperature on the Absorption of Metallic ride Mordants by Silk.—Experiments were made at the nperatures at which the mordanting of silk is ordinarily complished, namely, from 0° to 30° C., the mordanting lts used, namely, salts of iron, chromium, aluminium, and , being those which are commonly employed in practice. e principal results obtained in the experiments made with tin salt (a solution of stannic chloride at 30° B.) are bodied in the following table :—

Condition of Silk.	Duration of Immersion.	Temperature.	Increase in Weight.	Ash contained in Mordanted Fibre.
	Hours.	° C.	Per Cent.	Per Cent.
w	6	0	14·11	10·47
led-off	6	0	15·91	11·12
w	6	15	16·92	12·24
led-off	6	15	15·84	11·17
w	6	30	18·93	13·39
led-off	6	30	16·00	11·09

(The raw silk employed in the experiments contained 6 per cent. of ash.)

From these results it is concluded that the influence of perature in the mordanting of silk with metallic oxides n general, of secondary importance. Nevertheless, it is nd that at low temperatures, *i.e.*, at 0°—5° C., the penetion of the fibre (previously moistened with water) by the rdanting salts and the absorption by it of metallic oxides e place slowly and with difficulty, owing to the reducin the power of diffusion of the salts in solution at h temperatures. Hence the silk tends to become venly mordanted. At 15°—20° C. the fibre is penetrated 1 ease by the salts, and mordanting takes place more ularly.—E. B.

alic Acid in the Chromic Acid Indigo-Discharge Process; Function of ——. W. P. Jorissen and L. T. eicher. Zeits. für Farben- u. Textil-Chem., 1903, **2**, 8], 157—160.

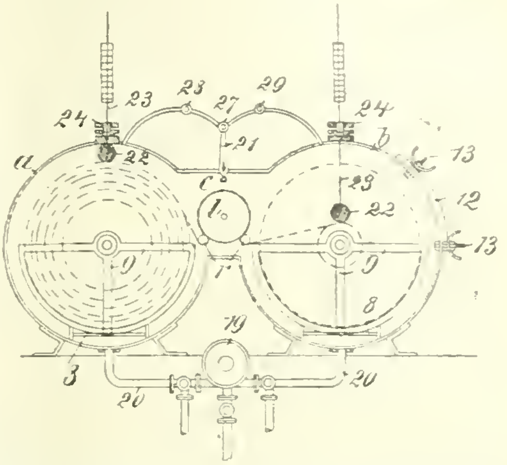
rn a view to ascertain whether the chromic acid which berated in the ordinary process of discharging Indigod tissues, as practised in tissue printing, distributes its on in a definite ratio between the indigotin on the fibre the oxalic acid in the discharging bath, the reaction in te solutions between indigotin-disulphonic acid (prepared sulphonating 2·5 grms. of indigotin and diluting the tion to 250 c.c.), chromic acid, and oxalic acid was stigated. From the results obtained it would appear that roximately ½ mol. of oxalic acid is oxidised per mol. of gotin. (See also this Journal, 1893, 758; 1902, 1276; 3, 359 and 491.)—E. B.

lax Wax; Characteristics of ——. C. Hoffmeister. XII., page 639.

English Patents.

uring and Bleaching Textile Piece Goods; Apparatus r ——. F. C. Theis, Ohligs, Germany. Eng. Pat. 70, April 4, 1902.

chambers, *a* and *b* (see figure), are arranged close to in communication with each other. One end of one of the chambers, *a*, is provided with a removable end. The same chamber is provided with rails, 8, which extend to its removable end, and upon which a carriage, 9, runs.



The latter carries a roller, upon which the tissue to be treated, is wound before it is brought into the chamber. The other chamber, *b*, is formed with a longitudinal opening, 12, closed by means of a plate held in position by suitable mechanism. If desired, this chamber may also have a removable end and have a carriage for the tissue-carrying roller running upon rails in it, as in the case of the chamber, *a*. In order to maintain the tissue at a uniform width and to prevent shrinkage, a roller, *l*, and guide rollers, *r*, may be placed in the passage, *c*, through which the chambers communicate. The amount of tissue wound upon the rollers in the chambers is indicated by means of a jockey-roller, 22, movable vertically and carried in the forked end of a rod, 23, which passes through a stuffing-box, 24, the length of rod visible outside the chamber being a measure of the quantity of tissue upon the roller underneath.

The (cotton or linen) tissue to be scoured is passed from one chamber to the other, and is treated with an alkali solution which is sprinkled upon it from the device 21 as it passes at full width below this. Steam under pressure is introduced into the chambers, and the lye is kept circulating by means of a pump, 19, or other mechanism When the treatment with the lye is completed, water may be similarly introduced into the chambers to wash the tissue. After treating in this manner, the plate, 12, is raised and the tissue is led to the "chemicking" apparatus. —E. B.

Cotton Goods; Treatment of Raw Cotton and ——, to Reduce the Inflammability thereof. W. H. Perkin, jun., and Whipp Bros. and Todd, Ltd., Manchester. Eng Pat. 8509, April 11, 1902.

An extension of Eng. Pats. 9695 and 23,557 of 1901 (see this Journal, 1902, 857, 1531). An insoluble compound is formed in the cotton by treatment with a solution of a soluble salt of zinc, copper, aluminium, or nickel (*e.g.*, aluminium acetate or copper sulphate), and a solution of one or more of certain salts (other than a soluble tungstate) derived from metals the oxides or hydroxides of which are capable of acting as acids. Under this heading are included aluminates, stannates, arseniates, biarseniates, and antimoniates. An agent, such as an organic acid or ammonia, may be used, if desired, to prevent precipitation of the bath. A soluble tungstate may be used together with the second solution (*i.e.*, the aluminate, &c.). The following are examples of the treatment :—

(1) The goods are treated with a solution of aluminate of soda (13° B.), dried, and treated with a solution made up of tungstate of soda, 4 parts; zinc acetate solution (17° B.), 4 parts; acetic acid (2° B.), 5 parts.

(2) Or the goods may be immersed in a solution of sodium stannate of 11° B., dried, and treated with a solution containing 8 parts of zinc acetate solution (17° B.), 8 parts

of tartar emetic solution (6° B.), and 1 part of acetic acid solution (7° B.).

(3) The goods are treated with a bath containing sodium arseniate (or biarseniate) solution (18° B.), 1 part; sodium tungstate solution (33° B.), 2 parts. After drying, they are treated with a 17° B. solution of nickel sulphate.

(4) If the goods contain "sizing," they may be treated with a bath containing stannate of soda solution (17° B.), 50 parts; solution of oleine or glycerin (25 per cent.), 1 part. The goods are dried and passed through a second bath containing zinc acetate solution (17° B.), 4 parts; sodium tungstate solution (33° B.), 4 parts; acetic acid (2° B.), 5 parts. The goods are now dried, or both dried and steamed.—T. F. B.

Mercerisation of Fabrics; Impts. in Means Employed in ——, and in Recovering the Caustic Alkali or other Liquor used in the Process. The Calico Printers' Association, Ltd., Manchester, and Wm. Warr, Stalybridge. Eng. Pat. 14,525, June 30, 1902.

The fabric, after mercerising, is washed while being stretched in a stentering machine, and it then passes between sets of doctors or scrapers, so that the liquor is forced to pass through the fabric, the washings being collected and recovered. More concentrated washings are thus obtained. Arrangements are also claimed for collecting the washings separately from each set of doctors, lifting and discharging them on to the fabric by bucket wheels, and finally conducting the first or strongest washing to a tank for recovery.—E. F.

Printing with Sulphur Dyes; Process for ——. R. J. Urquhart, Manchester. From the Chemische Fabriken vorm. Weiler-ter Meer, Uerdingen, Germany. Eng. Pat. 13,471, June 14, 1902.

Sulphur dyestuffs, free from alkali sulphides, are mixed with solutions of alkali carbonates, salts of basic character, or caustic alkalis, and a thickening agent, with or without an addition of sulphur (see U.S. Pat. 708,129; this Journal, 1902, 1231) or of a hygroscopic substance (see Add. to Fr. Pat. 322,147; this Journal, 1903, 417 and 552). The mixtures are printed in the usual manner, the printed tissues being steamed for 5—30 minutes, without pressure, rinsed, and soaped.—E. B.

Check or other Patterns on Stuffs by Printing; Impts. in the Production of ——. R. H. D. Mills, Darnétal, France. Eng. Pat. 2401, Jan. 31, 1903.

Each side of a fabric which is to be teazled is printed with a pattern. These patterns only overlap where a deep shade is desired. Where only one side is printed, half-shades result.—E. F.

Steaming Fabrics: Impts. in Apparatus for ——. R. Schittke, St. Petersburg. Eng. Pat. 18,066, Aug 16, 1902.

The fabric is suspended in loose hanging folds in the steamer by means of rollers circulating in a "railed track," and is fed in and led out obliquely from the side. The rate of exit is automatically regulated by an arrangement of oscillating guide levers.—E. F.

Drying Machines [for Fabrics]. M. Rossow. Eng. Pat. 8856, April 16, 1902. I., page 618.

Calendering or Finishing Textile Fabrics. R. Williams, Manchester. Eng. Pat. 12,717, June 4, 1902.

In calendering textile tissues, the latter are usually passed between an internally heated metallic roller or rollers, on the one side, and, on the other side, rollers composed of compressed paper, cotton, or other fibrous materials, which are not heated, except by surface contact with the metallic rollers, the use of fibrous rollers being desirable in order to prevent the tissues from being damaged during the operation. The object of the present invention is to provide means for internally heating the latter kind of roller. To this end the rollers are mounted upon hollow shafts, to which steam, or other hot gas, or heated rods, &c., are admitted. The rollers, thus heated, have an increased effect on the tissues, imparting to the sides of those upon which they operate the same degree or kind of finish as is given by the heated metallic rollers to the other side. They may be employed, as hitherto, in conjunction with metallic rollers, or in operation upon both sides of the tissues, the metallic rollers in the latter case being dispensed with.—E. B.

United States Patents.

Dyeing; Process of ——. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld, New York. U.S. Pat 725,847, April 21, 1903.

Fast black shades on wool are produced by dyeing th material from an acid bath with dyestuffs obtained b combining diazo-compounds of *o*-amino-phenol derivative with 1.5-dihydroxynaphthalene, and treating the dyed good with chromium compounds, which act as oxidising agent (See Eng. Pat. 18,139 of 1902; this Journal, 1903, 416.) —T. A. L.

Oxidising Textile Materials; Apparatus for ——. C. Wild, Philadelphia. U.S. Pat. 726,207, April 21, 1903.

This apparatus, which is for oxidising dyed textile materia consists of a fixed, closed casing, containing a rotatabl hollow perforated drum. An arrangement is provided fo supplying a continuous current of the oxidising flui through the apparatus. This consists of a heater an pump, which drives the liquid through a pipe, one end which is connected with the interior of the drum and th other end with the casing. The heater is arranged so th more liquid can be introduced into the apparatus, if desire while it is at work.—T. F. B.

French Patents.

Treating (Scouring, &c. Textiles); Apparatus for —— M. C. Haas. Fr. Pat. 324,168, Sept. 2, 1902.

An apparatus for boiling, bleaching, and dyeing text fibres in the loose state or in the form of fabrics, consist of a closed vessel containing a central, vertical liquor-sup pipe, into which liquor distributors may be fitted in such manner as to be readily fixed in and removed from it, the purpose of enabling the liquor to be brought i immediate contact with the fibres. The latter are plac in the vessel to a convenient height, then a set of d tributors is fixed in position above and in contact w them. More fibres are then added, followed by anot set of distributors, and so on until the vessel is full. cap is then placed on the top of the central pipe and a co on the vessel, after which the liquor is introduced, wh is heated, when required, by means of a steam coil prov for the purpose.—E. B.

Wool; Machine for Washing or Scouring ——. F. Whitney. Fr. Pat. 325,163, Sept. 4, 1902.

See Eng. Pat. 19,174 of 1902; this Journal, 1902, 1531 —T. F. B

Decatising Tissues; Apparatus for ——. M. H. S. Fr. Pat. 324,568, Aug. 27, 1902.

A combination of the following apparatus:—(1) A sl of metal, heated from below by gas or other suita means, and covered with calico; (2) a roller upon wh the tissue to be treated is wound and which is place at one end of (1); and (3) a metal framework supporting the whole. The tissue is drawn from the roller over the s of metal, the calico covering being kept moist with wa and the tissue being left in contact with the calico f a few seconds, to enable the steam which is generated to penetrate it.—E. B.

Glossing and Soupling ("Assouplissement") of Tex either Raw or Dyed; Apparatus called "Etoile" the ——. H. Menet. Fr. Pat. 324,792, July 25, 19

The goods are passed between cylindrical wooden ro which revolve in opposite directions; each roller h a number of longitudinal ribs at equal distances round surface, the ribs of one roller fitting into the sp between the ribs of the second.—T. F. B.

ercerising Machine [*for Cotton Skeins*]. R. Chevolleau. Fr. Pat. 324,848, Sept. 20, 1902.

order to prevent shrinking, the skeins are kept at nstant tension on a pair of parallel rollers, one above e other, the upper one being fixed and the lower one ovable, so as to allow variation in the tension of the ods. These rollers are mounted on a frame which can moved vertically, by powerful screwjacks and rack and nion arrangement, so that the skeins can be moved about the bath during treatment.—T. F. B.

yeing, with or without Weighting; Process of ——. R. S., J. H., and F. R. Carmichael. Fr. Pat. 325,036, Oct. 7, 1902.

IE dyeing and weighting of textiles, &c., is effected in one eration by the use of neutral or acid solutions of casein. r instance, the bath may be made up with 10 kilos. of seïn and 2 kilos. of neutral soap in 150 litres of water. is mixture is heated to 50°, and the weighting material ded, the weight of caseïn being at least 6 per cent. of at of the weighting material; after thorough mixing, the estuff is added, and the bath made up to 300 litres.

For dyestuffs used in acid baths, the caseïn is dissolved a 2 per cent. solution of glycerin, and about 2 to 5 per nt. of lactic acid is added.

In using neutral baths, without soap or acid, fresh caseïn ust be used in dilute glycerin solution; the caseïn content ould be from 30—40 per cent. of the solid constituents the bath, which contains about one part of solid to four water. (See also Eng. Pat. 5998 of 1902; this Journal, 03, 211.)—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

itriol in Chambers; Simple Instrument for Mechanically Calculating the Weight of ——. C. Davidson. Chem. News, 1903, **87**, [2266], 205—207.

IE weight, in tons, of actual "oil of vitriol" in a chamber given by the formula—

$$W = \frac{l\,b\,d}{12} \cdot \frac{62{\cdot}5}{2240} \cdot \frac{S\,P}{100}$$

b, being length and breadth of chamber in feet; *d*, depth acid, in inches; S, specific gravity of the acid; P, its rcentage content of actual H_2SO_4. The factors may be itten in the form—

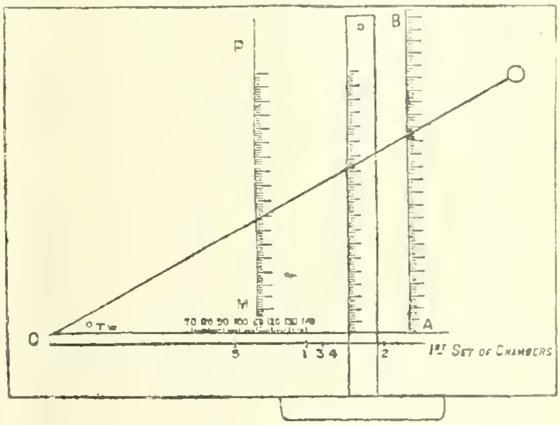
$$d\left(\frac{62{\cdot}5\,l\,b}{12 \times 2240}\right) \cdot \frac{S\,P}{100},$$

ere the second factor is a constant for each individual amber, and the third can be calculated and tabulated for rying strengths of acid. The following table gives the lues of $\frac{SP}{100}$ for each degree Tw. from 70° to 145°:—

° T.	Sp. Gr.	° T.	Sp. Gr.	° T.	Sp. Gr.	° T.	Sp. Gr.
70	0·606	89	0·790	108	0·976	127	1·173
71	0·615	90	0·799	109	0·987	128	1·183
72	0·624	91	0·809	110	0·997	129	1·194
73	0·634	92	0·819	111	1·007	130	1·205
74	0·644	93	0·829	112	1·017	131	1·215
75	0·653	94	0·839	113	1·027	132	1·225
76	0·663	95	0·849	114	1·038	133	1·235
77	0·672	96	0·858	115	1·048	134	1·246
78	0·682	97	0·868	116	1·058	135	1·256
79	0·692	98	0·878	117	1·069	136	1·267
80	0·701	99	0·887	118	1·079	137	1·278
81	0·711	100	0·897	119	1·089	138	1·289
82	0·722	101	0·907	120	1·100	139	1·300
83	0·731	102	0·917	121	1·110	140	1·312
84	3·741	103	0·926	122	1·120	141	1·323
85	0·751	104	0·936	123	1·131	142	1·334
86	0·760	105	0·946	124	1·142	143	1·345
87	0·770	106	0·956	125	1·152	144	1·357
88	0·780	107	0·966	126	1·163	145	1·368

Further, it is to be noted that the product of the first vo factors in the formula would give the weight of the quid in the chamber if it were water, and that the value of $\frac{P}{0}$ for acid of 110°·3 Tw. is 1·000, that is, the actual SO_4 in any volume of acid of that strength weighs as much as the whole volume of liquid would if it were water. Thus the product of the first two factors in the formula gives the weight of actual H_2SO_4 in an acid of 110°·3 Tw.

The author's plan is to multiply the first two factors, and then multiply the product by the third factor; and this is carried out by two applications of the proportionality of corresponding sides in similar right-angled triangles. The actual instrument consists of a sheet of paper stretched on a drawing board, with appropriate scales drawn on it and on the accompanying T-square. The whole apparatus is shown in the figure, and the construction will be best followed by taking the particular case given by the author, of a set of five chambers, for which the values of the second factor were respectively 5·85, 7·25, 6·04, 6·04, 4·07. The sheet is, say, 34 by 24 ins., the line OA is, say, 20 ins. long, and the perpendicular line AB is about the same length, and is divided into as many parts as the maximum depth, in inches, of acid in the chamber (in this case 25), each part being subdivided into tenths. OA is now divided into a convenient number of parts (in this case 7½, or 15, the unit being two divisions), and the values of $\frac{SP}{100}$ from the table, or some convenient multiple of them, are laid off along OA and numbered with the degrees Tw. with which they correspond. The second-factor values for the different chambers are also laid off along OA (or, for clearness, along a line parallel to OA and starting from the perpendicular through O, as shown in the figure) and marked with the numbers of the chambers to which they belong. The depth of water (or of acid of 110°·3 Tw.) in any chamber which would weigh (or the H_2SO_4 in which would weigh) 100 tons, is now calculated, say, for No. 2 chamber $\frac{100}{7{\cdot}25} = 13{\cdot}8$ ins. A line is drawn from 0 to 13·8 in the scale along AB; the T-square is brought up to the mark for chamber No. 2, and a line drawn from OA to the sloping line. A scale is made, on which this length represents 100, and this scale is extended and copied on the T square and along the line MP through the 110°·3 Tw. mark, as shown in the figure. A thread is now looped on a drawing-pin at O, long enough to reach beyond B, and is tied at the other end to a piece of lead massive enough to keep it taut wherever placed. Suppose in chamber No. 1 the acid be 16·3 ins. deep and 126° Tw. Set the thread to 16·3 on the scale AB, set the square at the mark for No. 1 chamber, and read the scale on the square where the thread crosses its edge—it will be 95·4. There would then be 95·4 tons of acid in the chamber if it were 110°·3 Tw.; but it is 126° Tw. Set the thread to 95·4 on the scale MP, bring the square to the 126° mark, and read the scale on the square where the thread cuts it. This figure (110·9 tons) is the weight required.



The instrument contains all its own data, and by its aid the stock of acid in the chambers can be rapidly ascertained to a degree of accuracy quite as high as that with which the depth of acid can be measured or its specific gravity determined.—J. T. D.

Sodium Carbonate, Sodium Bicarbonate, Carbon Dioxide, and Water; Equilibrium in the System Composed of ——. H. N. McCoy. Amer. Chem. J., 1903, **29**, [5], 437—462.

It is shown experimentally, that the equilibrium in a system composed of sodium carbonate, sodium bicarbonate, carbon dioxide, and water, is governed, at constant temperature, by a combination of influences represented by the equation—

$$\frac{2x^2C}{kP(1-x)} = K,$$

x being the fraction of sodium as carbonate, $1-x$ the fraction as bicarbonate, C the concentration of the sodium in grm.-atoms per litre, k the solubility coefficient of carbon dioxide in water at the equilibrium temperature, and P the partial pressure of the carbon dioxide. For dilute solutions, K is found to be 5300.

The fact that sodium bicarbonate is a weak acid, invalidates the calculation of the degree of hydrolytic dissociation from the ionisation constant of carbonic acid. The author finds that, for this reason, the amount of free hydroxide calculated by Walker for a decinormal solution (J. Chem. Soc., 1900, **77**, 5) is about 20 times too great.

In a solution containing 0·5 grm.-molecule of sodium carbonate in 10 litres, 6·2 per cent. of the carbonate was found to exist as hydroxide and bicarbonate.

The state of equilibrium reached when a solution of bicarbonate loses carbon dioxide (in air), can be calculated by means of the equilibrium formula, the amount of carbon dioxide in the air being known. This state of equilibrium depends on the concentration of the solution.—T. F. B.

Calcium Sulphate; Solubility of ——, *in Solutions of Sodium Chloride.* A. d'Anselme. Bull. Soc. Chim., 1903, **29**, [9], 372—374.

The solubility of calcium sulphate was determined in solutions of pure sodium chloride, of strengths varying from N/20 to 5N. Excess of calcium sulphate was introduced into the solutions, which were placed in a thermostat and mechanically agitated. After 9 or 10 hours, the amounts of calcium sulphate dissolved were determined.

—	Strength of NaCl.	Anhydrous $CaSO_4$ dissolved	
		At 14° C.	At 25° C.
	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.
N/∞	0	1·70	2·10
N/20	2·925	2·32	2·70
N/10	5·850	2·79	3·15
N/5	11·70	3·41	3·75
N/2	29·25	4·40	4·70
N	58·50	5·72	6·00
N½	87·75	6·58	6·85
N¾	102·30	6·90	7·15
2N	117·0	7·10	7·30
2N¼	131·6	Max. 7·20	Max. 7·30
2N½	146·2	7·10	7·13
3 N	175·6	6·80	6·80
3N½	204·7	6·30	6·30
4N	234·0	5·90	5·90
5N	292·6	5·30	5·30

—W. H. S.

Copper; Secondary Reaction in the Precipitation of ——, *from a Solution of Copper Sulphate.* A. J. J. Vandevelde. Chem.-Zeit., 1903, **27**, [36], 431.

When small zinc rods are placed in a solution of copper sulphate, the precipitate formed, contains, besides copper, basic zinc sulphate, ZnO, $ZnSO_4$. Solution of the zinc continues even after all the copper has been precipitated, a compound of zinc hydroxide with zinc sulphate being then produced.—A. G. L.

Cyanide; Impurities in Commercial ——. H. A. Mather. Eng. and Mining J., 1903, **75**, [15], 553.

The author points out that when commercial potassium cyanide contains sulphides it has been made from ammonium sulphocyanide (thiocyanate) obtained from coal-gas.—A. S.

Colloidal Arsenious Sulphide Solutions; Precipitation o ——. F. W. Kuester and G. Dahmer. Zeits. anorg Chem., 1903, **34**, 410—412; Chem. Centr., 1903, 1 [17], 994.

The authors have previously shown that arsenic trioxid in aqueous solution is converted by sulphuretted hydrogen into arsenic trisulphide, which, however, remains in colloida solution. Vanino (this Journal, 1902, 426) has recom mended heavy spar (barium sulphate) as a reagent whic rapidly effects the separation of substances in colloida solution. The authors find that the precipitating actio depends upon the method of slaking and on the natur of the reagent. A satisfactory separation was effecte by heavy spar, precipitated barium sulphate, wood charcoa copper oxide, powdered glass, and especially by Icelan double spar. 0·2 grm. of marble effected the separatio of 0·067 grm. of arsenic trisulphide from colloidal solutio in the course of half a minute.—A. S.

Nickel Carbonyl; Some Physical Properties of —— J. Dewar and H. O. Jones. Proc. Roy. Soc., 1903, 71 [474], 427—439.

When nickel carbonyl is heated suddenly, in an inert ga (such as hydrogen or nitrogen), it decomposes quietl and without the production of noticeable amounts carbon dioxide, even up to 130° C.: the authors infer th the explosion, which is produced when the compound heated, in air, to 60° C., is due to the presence of oxygen.

Vapour density determinations, made by Victor Meye and Hofmann's methods, showed that, in an atmosphe of carbon monoxide, the vapour density is higher tha in hydrogen, nitrogen, or ethylene, the value, at 66° C being 85·2. In carbon monoxide, the vapour was almo completely (99·7 per cent.) dissociated at 216° C. Ho mann's method showed a vapour density of 85·6 at 17° C and 21·5 at 182° C., 98·4 per cent. of the substance bein dissociated at the latter temperature.

The boiling point, as calculated from vapour pressu determinations, was 43°·2 C., while it was observed to l between 43°·2 and 43°·33, at 769 mm. pressure. Tl critical temperature and pressure were calculated to l about 200° C. and 30 atmospheres, respectively.—T. F. B.

Solid Carbon Dioxide; Preparation of ——. N. Teclu J. prakt. Chem., 1903, **67**, [8—9], 423—125.

A simple apparatus for preparing small quantities of sol carbon dioxide from the liquid gas, consists of a glass tul

Fig. 1.

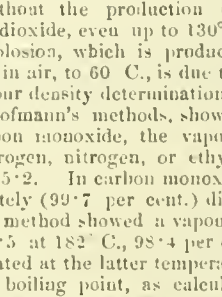


Fig. 2.

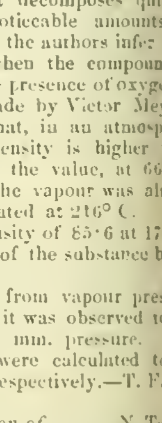
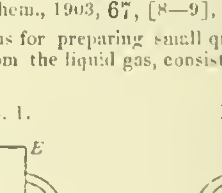


Fig. 3.



4 cm. in length and 12 mm. wide, on which are blown x bulbs at intervals of 6 cm., the first of these having a ameter of 14 cm., and the others of 6 cm. The ends of e tube beyond the bulbs are 20 cm. in length. On nnecting this tube with the carbon dioxide holder, the lbs are rapidly filled with the solid dioxide, whilst the oisture in the apparatus is condensed and frozen. Any rt of the tube may be rendered transparent by sponging e exterior of the glass with a mixture of equal parts 30 per cent. glycerin and 95 per cent. alcohol.

The apparatus shown in the accompanying figure has en designed for the preparation of larger quantities. consists of a tube, C, 12 mm. in width, with two arms, and D_1, which open exactly opposite one another at B at distance of 6 mm., and have equal-sized circular plates out their openings. The tube is fixed in a horizontal sition, and the liquid carbon dioxide entering at A erges in two impinging currents at B, with the result it solid carbon dioxide is produced; and the yield is reased by surrounding the openings by the band E. e solid product is collected in a glass cylinder, which is ced round the two arms of the tube, and has its mouth sed by a gauze covering, F.—C. A. M.

Phosphorus; Action of Liquid Ammonia on ——. A. Stock. Ber., 1903, **36**, [6], 1120—1123.

hite phosphorus, when treated with liquid ammonia at a nperature above its melting-point, is changed into a fine, ep black powder, which readily settles in the supernatant ourless ammonia. On opening the tube, the ammonia porates, and phosphoretted hydrogen escapes. Besides osphorus, the black substance contains nitrogen and lrogen; it turns bright orange red in moist air, under er, or on treatment with acids. Ammonia or other ali brings back the black colour.

he black substance is supposed to be P_2NH_2, and the P_4O. The author discusses the nature of the similar stances obtained by R. Schenck (this Journal, 1903,).—L. F. G.

trogen; Oxidation of Atmospheric ——, by Electrical Discharges. F. von Lepel. XI. A., page 636.

droferrocyanic and Hydroferricyanic Acids; Some Properties of ——, and Determination of Potassium Ferrocyanide. M. Prud'homme. XXIII., page 650.

Sodium Hydroxide; Electrolysis of Fused ——. R. Lorenz. XI. A., page 635.

Sodium Nitrite; Analysis of ——. M. Wegner. XXIII., page 651.

otassium Chlorate; Electrolytic Reduction of ——. D. Tommasi. XI. A., page 635.

ssium and Sodium Hydroxide Solutions; Dependence the Reacting Power of ——, on the Content of Water. . Vaubel. XXIII., page 656.

English Patents.

n and Alunites; Treatment of ——, for the Purpose Obtaining Aluminic and Potassic Compounds. U. visi, Rome, and F. Millosevich, Benevento. Eng. Pat. 02, April 9, 1902. Under Internat. Conv., June 3, 01.

A ot solution of potassium alum (which may be prepared fr "alunite" by known processes) is treated with a mole- ct proportion of milk of lime, and, after settling, the pr pitate of calcium aluminate and calcium sulphate is til pressed, and digested with sufficient sulphuric acid to fo aluminium sulphate, the solution of which, separated fr the undissolved calcium sulphate, is concentrated and cr allised. The potassium sulphate is recovered from the so ion separated in the first part of the process.—E. S.

ids of all kinds [Sodium Chloride Solution]; Electroic Treatment of ——. C. Arzano. Eng. Pat. 25,354, v. 18, 1902. XI. A., page 636.

United States Patents.

Sulphuric Acid; Apparatus for the Manufacture of ——. O. H. Eliel, Lasalle, Ill. U.S. Pat. 725,127, April 14, 1903.

A denitrating and concentrating tower is provided with a number of independent filled sections, above which a valved flue connected to the sulphur burner enters, connection to the acid chamber being made below the sections. The tower is closed at the top, and a spray nozzle is arranged in the entering flue for the sulphurous acid gases. A down draught is produced in the tower by suitable means.—E. S.

Sulphuric Anhydride; Process of Making ——. M. Le Blanc, Carlsruhe, and C. Krauss. Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Main, Germany. U.S. Pat. 726,076, April 21, 1903.

Gases containing approximately 7 per cent. of sulphur dioxide and 9 per cent. of oxygen, are conducted through a first portion of contact material, kept at about 500° C., in the proportion of about 120 litres of pyrites burner gases per kilo. of platinised asbestos, the resulting gas mixture passing thence at the same speed to a second portion of contact material, at a temperature of about 400° C. Compare U.S. Pat. 700,512, May 20, 1902; this Journal, 1902, 859.—E. S.

Substances; Treating ——, with Nascent Carbon Dioxide [to obtain Boric Acid]. W. Smethurst, Dolgelly, England. U.S. Pat. 725,786, April 21, 1903.

See Eng. Pat. 16,506, Aug. 16, 1901; this Journal, 1902, 970; also Fr. Pat. 320,249, April 7, 1902; this Journal, 1903, 94.—E. S.

Soda; Process of Cleaning ——. D. W. Gill, Cheyenne, Wyo. U.S. Pat. 725,553, April 14, 1902.

Natural soda is dissolved in water at 160° F., and the solution is cooled to 140° F., and retained at that temperature till all foreign matter has separated, when the clear liquid is drawn off and recrystallised at a temperature of 50° F.—T. F. B.

Sodium Bichromate; Method of Making ——. F. M. Spence. D. D. Spence, and T. J. I. Craig, Manchester, and J. J. Hood, London, Assignors to Peter Spence and Sons, Ltd., Manchester. U.S. Pat. 725,501, April 14, 1903.

See Eng. Pat. 5015 of 1901; this Journal, 1902, 253. —T. F. B.

Alumina; Process of Obtaining ——. C. A. Doremus, New York. U.S. Pat. 725,683, April 21, 1903.

Aluminium fluoride is obtained by first acting upon aluminous material with "an acid containing fluorine," and then subjecting the aluminium fluoride produced to the action of superheated steam.—E. S.

Brine; Process of Purifying ——. G. N. Vis, Schweizerhalle, Switzerland. U.S. Pat. 725,896, April 21, 1903.

See Eng. Pat. 14,812, July 20, 1901; this Journal, 1902, 913.—E. S.

Sulphite Lyes; Process of Utilising ——. V. Drewsen, New York, and L. J. Dórenfeldt, Trondhjem, Norway. U.S. Pat. 726,036, April 21, 1903.

The waste liquor of sulphite mills, containing sulphonates, is neutralised with liquor from the soda pulp, containing sodium sulphide, and the mixture is concentrated and calcined. The product is lixiviated, and the solution is treated with lime, the soluble sodium salts being drained off for further use.—E. S.

Bromine; Process of Extracting ——. A. W. Smith, Cleveland, Ohio. U.S. Pat. 725,161, April 14, 1903.

Gases containing bromine are treated first with an alkali carbonate (potassium carbonate is specified), and subsequently with an absorbent for carbon dioxide (*e.g.*, an alkaline earth hydroxide).—T. F. B.

Nitrogen Compounds; Method of Making ——. F. E. Polzeniusz, Frankfort a Main. U.S. Pat. 725,361, April 14, 1903.

SEE Fr. Pat. 323,032 of 1902; this Journal, 1903, 420.
—T. F. B.

FRENCH PATENTS.

Catalytic Masses containing Platinum; Regenerating the Activity of Spent —— [*Sulphuric Acid Manufacture*]. Badische Anilin und Soda Fabrik. Fr. Pat. 321,751, Sept. 26, 1902.

SPENT catalytic masses containing platinum are renewed by either of the two following processes:—

1. Furnace gases, air, or other inert gas, mixed with small amounts of some volatile substance containing halogens, are allowed to act on the spent mass, until the volatilisation of impurities has ceased. The following halogenised substances may be used: hydrochloric acid, ammonium chloride, sulphur chloride, sulphuryl chloride, phosgene, acid chlorides, halogen derivatives of the hydrocarbons (*e.g.*, ethyl bromide, bromobenzene, the trichloro toluenes, or chloronaphthalenes).

2. A current of sulphurous gas, either alone or with another gas, poor in, or free from oxygen, containing an excess of sulphur dioxide over the amount required for normal transformation, is allowed to act on the spent mass, at the temperature of the catalytic process, until all impurity is removed.—T. F. B.

Hydrochloric Acid and Sulphuric Acid or Sulphuric Anhydride; Process for the Simultaneous Manufacture of ——. W. Masson. Fr. Pat. 324,859, Sept. 30, 1902.

A MIXTURE of chlorine (71 parts), sulphur dioxide (64 parts), and superheated steam (36 parts by weight) is heated in a confined space, with or without the presence of a catalytic agent (such as platinised asbestos). The mixture of sulphuric and hydrochloric acids produced is passed through a tower, down which sulphuric acid flows. The resulting acid is heated to 250° C., and the hydrochloric acid escaping is freed from sulphuric anhydride vapours by cooling, and collected in water in a second tower.

To obtain sulphuric anhydride and hydrochloric acid, the amount of water vapour is reduced to 18 parts (instead of 36), and the gases are collected in sulphuric acid as before: the resulting acid is heated to 250° C., and the gases cooled, sulphuric anhydride being condensed, while the hydrochloric acid is collected in water as before.—T. F. B.

Alkaline Solutions; Electrolysis of ——. L. Gourwitch. Fr. Pat. 324,970, Oct. 4, 1902. XI. A., page 637.

Calcium Chloride; Process for Utilisation of ——. N. Basset. Fr. Pat. 324,698, Sept. 24, 1902.

A DILUTE solution of 3 mols. of calcium chloride is mixed with a dilute solution of 1 mol. of aluminium sulphate. The filtrate is evaporated, and the hydrochloric acid collected. The residue of aluminium hydroxide is dissolved in sulphuric acid, and used for a second operation.—T. F. B.

Titanic Compound; A New ——, *and Process for Making the same.* H. Spence. Fr. Pat. 324,205, Sept. 6, 1902.

A NEW compound of sodium titano-sulphate is formed by the electrolytic reduction of titanium sulphate in the presence of sulphuric acid, with the addition of sodium sulphate, after which the solution thus formed is evaporated. The new compound is lilac in colour, easily soluble in water, and forms a strong reducing agent. (See Eng. Pat. 4183 of 1899; this Journal, 1900, 246.)—G. H. R.

Titanous Chloride; [*Electrolytic*] *Production of a New* ——. H. Spence. Fr. Pat. 324,835, Sept. 4, 1902.

A SOLUTION of titanic chloride, $TiCl_4$ (conveniently prepared by dissolving titanium hydroxide in hydrochloric acid) is subjected to electrolysis, occupying the cathode compartment of the cell (lead forming the cathode), while a carbon plate, in dilute hydrochloric acid, forms the anod portion; titanous chloride, of a lilac colour, is produced.
—T. F. B.

Phosphates and Phosphatic Limestone; Apparatus fo Enriching ——. L'Union des Produits Chimiqu d'Hemixem. Fr. Pat. 325,012, Oct. 7, 1902.

THE phosphatic material is agitated with water in cylindrical vessel, and then allowed to settle. The super natant liquid having been removed, the settled materia washed with water under pressure, and the excess of wate pumped off.—T. F. B.

Alkaline Salts; Electrolytic Decomposition of ——. M Wilderman. Fr. Pat. 325,154, Sept. 1, 1902. XI. A page 637.

Soluble Glass [*Alkali Silicates*]; [*Electrical*] *Manufactu of* ——. Soc. Anon. L'Industrie Verrière et ses Deriv Fr. Pat. 325,164, Sept. 4, 1902.

THE raw mixture of sand or quartz and alkali sulphat or carbonates, is heated in an electrical resistance furna with the addition of a small proportion of some body co taining carbon, such as crushed coal briquettes; the additi of about 3 per cent. of which is said to reduce the ener required by about 25 per cent. When working with a k sulphate, the addition of an alkali chloride is said to fav the reaction, and to lower the cost of production.—W. C.

Liquid Air; Apparatus for the Production of —
R. P. Pictet. Fr. Pat. 324,715, July 12, 1902.

THE liquefaction is effected in two phases, in order avoid the inconveniences arising from the deposition solid carbon dioxide on the interiors of the work cylinders. The first phase consists in liquefying compression, cooling, and expansion in described appara a certain determined quantity of air; and the second, utilising the evaporation of this liquid air to liquef second portion of air, which is continually renewed, passes, under feeble pressure, through a coil cooled by liquid air of the first phase. The carbon dioxide cryst lises in the coil, and the liquid carrying the crystals exit through a filter which detains the carbon dioxide

The working cylinders are inclined, and the metal which they are constructed is less expansible by heat th that of which the pistons are made. The claims include other features. Reference is made to Fr. 310,330 of April 27, 1901. (Compare also Eng. Pat. 27, Feb. 8, 1901; this Journal, 1902, 407; and Fr. 322,600, June 28, 1902; this Journal, 1903, 261.)—E.

Nitrous Products; Electric Installation for the Synth Production of ——, *by Means of Electric Discharg Gaseous Mixtures.* Comité d'Initiative pour la Fab Prod. Nitriques. Fr. Pat. 324,964, Oct. 4, 1902. XI. page 637.

VIII.—GLASS, POTTERY, ENAMELS.

Mirror Glass; Composition of ——, *in Various Count* Kichs. La Céramique, 1903, **33**, [157], 111—112

THE charges of metal for mirror glass are compound follows in the various countries specified:—

—	France.	England.	Germany.	Belgium.	Russia.
			Parts by Weight.		
Sand......	1,000	1,000	1,000	1,000	1,000
Sulphate..	420	425	420	430	425
Soda......	..	..	..	..	..
Lime	300	300	300	320	300
Wood charcoal.	22	23	22	23	23
Arsenic ...	..	..	..	..	..

Then, assuming that the sand contains 98 per silica, the sodium carbonate 57·3 per cent. of Na dium sulphate 42 per cent. of Na_2O, and the lime 54·3 r cent. of CaO, the foregoing charges correspond to the bjoined formulæ:—

France.—74·30 per cent., or 1·238 SiO_2; 12·29 per nt., or 0·219 CaO; and 13·41 per cent., or 0·216 a_3O.

England.—74·30 per cent., or 1·238 SiO_2; 12·33 per nt., or 0·220 CaO; and 13·51 per cent., or 0·217 a_2O.

Germany.—74·30 per cent., or 1·238 SiO_2; 12·29 per nt., or 0·219 CaO; and 13·41 per cent., or 0·216 a_2O.

Belgium.—73·44 per cent., or 1·238 SiO_2; 13·02 per nt., or 0·232 CaO; and 13·54 per cent., or 0·218 a_2O.

Russia.—74·16 per cent., or 1·236 SiO_2; 12·33 per nt., or 0·220 CaO; and 13·51 per cent., or 0·216 a_2O.

United States.—71·41 per cent., or 1·190 SiO_2; 12·26 r cent., or 0·218 CaO; and 2·14 per cent. of Na_2O as lphate and 14·19 per cent. as carbonate, together 0·263 a_2O.

In the last-named, the proportion of Na_2O is unduly gh with regard to the silica, and the amount of CaO greater than corresponds to the normal formula for good irror glass, 6 SiO_2, CaO, Na_2O. This excess of lime vours devitrification. In the author's opinion the use of tural gas for fuel in certain glass works gives rise to fficulties, owing to the variable pressure of the supply, d consequent irregularity in the duration of the smelting d refining processes.—C. S.

French Patents.

Porcelain and Similar Substances; Furnace for ——. M. L. Goebel. Fr. Pat. 324,707, Sept. 24, 1902.

ver the central opening of the furnace, and along a ameter of it, is arranged a kind of bridge or canal, hich is covered over, and terminates at each end in the all of the furnace; the canal is provided with a rolling ay, on which muffles containing the articles to be burned, de, the muffles being connected together, so that they can adually be pushed from the point where they enter the nal, towards the middle, where they encounter the greatest at of the furnace, just over the central opening, and as ey leave this part, are gradually cooled in the passage to e other end, where they are withdrawn from the furnace. —W. C. H.

Porcelain and Similar Substances; Furnace for ——. M. L. Goebel. Fr. Pat. 324,708, Sept. 24, 1902.

the heating channels of a porcelain or similar furnace, in spaces at the side of these channels, and between two enings leading into the furnace, are placed closed muffles ntaining the bodies to be fired, &c., and afterwards by erating two dampers, the muffles can be cut off from the annel, and thus become cooled by the external air. —W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ood Treated to Resist Fire; Method of Testing ——. C. F. McKenna. J. Amer. Chem. Soc., 1903, **25**, [4], 406—414.

small cylindrical piece of the wood is cut so as to easure about 0·5 in. long and 0·25 in. wide, and weighing out 0·5 grm. This is placed in a platinum wire basket ntained at the bottom of a small retort, the dome of the ter is clamped in position, and a tube leading from the me is connected to a gas-measuring burette. The wood then subjected to the effects of a current of 7·5 ampères r exactly two minutes, and the gas evolved collected in e burette. Observations of the glow, if any, and of the ount of smoke, can be made and recorded. The gas in e burette is cooled and measured. The following examples e given: Spruce, treated with fireproofing material, 9·3 c.c., untreated, 133·8 c.c.; birch, treated, 103·3 c.c., treated, 126·6 c.c.; yellow pine, treated, 86·6 c.c., treated, 130·2 c.c.—W. P. S.

Plaster of Paris; Hydraulic or So-called Flooring ("Estrich") ——. J. H. van't Hoff and G. Just. Sitzungsber. Kgl. pr. Akad. Wiss. Berlin, 1903 249—258; Chem. Centr., 1903, **1**, [15], 900.

Flooring plaster of Paris is obtained by dehydration of natural gypsum at a higher temperature than 120—130 C. It takes up water considerably more slowly than block plaster of Paris. With regard to the composition and structure of commercial flooring plaster of Paris, the authors found that it consists essentially of anhydrous calcium sulphate, with a small excess of lime, and that for the most part it occurs in needle-shaped pseudomorphous crystals resembling the half-hydrate. The influence of the baking temperature on the setting was examined both by means of the alteration of volume, and by weighing the amount of water taken up. Whilst block plaster of Paris on setting shows, after strong contraction, a certain amount of expansion; with flooring plaster of Paris, the volume decreases uniformly and continuously. By means of tests in the dilatometer, and by weighing the amount of water taken up, it was found that flooring plaster of Paris is not a product of a higher temperature than that of over-burning, but that over-burning is only effected at a temperature above that of the formation of flooring plaster of Paris.—A. S.

English Patents.

Artificial Stone; Manufacture of ——. J. Purvis and T. Rouse, both of London. Eng. Pat. 3294, Feb. 11, 1903.

Lime concrete is made by mixing unslaked lime with sand, gravel, or fragments of stone, and, during the mixing, moistening the mixture with steam. Cement concrete is made by mixing Portland cement with sand, powdered granite, &c., and a weak solution of sodium silicate, and exposing the mixture to the action of steam gradually raised to 212° F., and maintaining that temperature for not less than 50 hours. Artificial stone blocks, slabs, &c., may be made by lining a suitable mould with the cement concrete, and filling the remaining space with lime concrete, the faced blocks being afterwards removed from the moulds, and exposed to the action of steam, as described above, for several days. See also Eng. Pats. 11,805, 1899; this Journal, 1900, 413; and Eng. Pat. 15,352, 1900; this Journal, 1901, 810.—W. C. H.

Roasting or Calcining Raw Materials from which Portland Cement, and Cements of a Similar Character, are Manufactured; Ores and Minerals; Process of ——, *and Kilns or Furnaces, used in the Process.* M. Williams, London. Eng. Pat. 10,853, May 12, 1902.

The kiln described consists of four chambers, one above another, the floors of which are composed of fire-resisting slabs attached to the side walls. Between these chamber walls and the outer shell of the kiln is a space in which air, steam, or gas introduced into the kiln is heated. Specially shaped fire-resisting blocks are laid on the floors of the chambers, and extend from side to side, and are arranged with passages between, the passages being partially covered by a projecting piece of the blocks, which are shaped to prevent material from accumulating on them, except immediately in front of the passages. Gas or finely-divided solid or liquid fuel is supplied to the passages from a main. The ceilings of the chambers consist of slabs laid horizontally, and rest on a series of slabs or "gills," with spaces between them, which communicate with the outside of the chamber. Suitable arrangements are made for introducing and removing the material treated, and valves for regulating the air, steam, or gas. It is claimed that the gas, being forced through the passages between the blocks on the floors, blows the material to be calcined up into the chamber, and is economically burned by combining with heated air supplied through the "gills." Owing to the direction of the gas jets, the material is carried forward in the chamber, from which it can be removed when calcined sufficiently, or may pass into the next chamber for further treatment. By this means, owing to the lighter particles being carried further, the material treated can be graded into sizes. The constant movement of the material in the kiln ensures uniform burning and prevents it from attacking the lining of the kiln when in a semi-fused condition, the lining being to some extent cooled by imparting heat to the air-supply. Gas of low calorific value may be enriched for use in these kilns by the admixture of powdered fuel to the raw material or by blowing in "atomised" oil. By means of the valves to the gas and air inlets, not only can the temperature of any part of the kiln be controlled, but also a succession of oxidising and reducing flames can be produced. —W. C. H.

United States Patents.

Bituminous-Macadam or other Pavements for Use; Apparatus for Preparing Mineral Ingredients of ——. H. W. Ash, Cambridge, Mass., Assignor to Warren Brothers Company, Boston, Mass., U.S.A. U.S. Pat. 725,641, April 14, 1903.

The mineral ingredients are automatically fed into a revolving heating or drying drum, from which they pass by way of an elevator, through a revolving grading-screen, into a series of bins for holding the ingredients of various sizes; the outlets of the bins are arranged close together, and each is provided with an independent discharge-gate. From the outlets the ingredients pass, by gravity, into a weighing or measuring receptacle below them. The floor of the receptacle is slanted, and by opening a discharge-gate in the side of the receptacle, the ingredients slide, by gravity, from the slanting floor into a chute, which is a continuation of the floor, into a mixer, the contents of which are withdrawn through the bottom. A bituminous composition is heated in a separate boiler, and the requisite quantity delivered to the heated mineral ingredients in the mixer, from a bucket attached to a trolley, by which the bucket can be conveyed from the boiler to a point vertically above the mixer.—W. C. H.

Cement Kiln. W. M. Maclay, Glens Falls, N.Y. U.S. Pat. 725,975, April 21, 1903.

This specification describes a continuous burning Portland cement kiln, consisting of a combustion chamber, above which is a throat, leading into a pre-heating chamber above the throat. Connected with the pre-heating chamber is a suction device, which can be regulated, and between the pre-heating chamber and the top of the kiln is a valve or damper, by the adjustment of which the draught caused by the suction device through the combustion chamber can be regulated.—W. C. H.

French Patents.

Kiln; Metallic ——, for Burning Cement, Dolomite, Magnesite, &c. H. Loescher. Fr. Pat. 324,653, Sept. 22, 1903.

The kiln is furnished throughout with an outer metallic lining, and also, at the hottest zone, with another interior lining consisting of metal plates, which are readily removable and interchangeable. Any suitable metal may be used for the lining.—A. G. L.

Concrete; Method of Making Silico-Calcareous ——. J. P. R. Blottefière. Fr. Pat. 324,680, Sept. 23, 1902.

Any suitable aggregate is mixed with a mortar consisting essentially of silica and slaked lime in such proportions that in the finished product the lime (CaO) shall be 4½ per cent. of the total quantity of silica present. Suitable colouring materials may also be added. The aggregate used may be chemically reactive or inert.—A. G. L.

Cement; Manufacture of ——. H. Passow. Fr. Pat. 324,687, Sept. 23, 1902.

The cement is composed of, on one hand, fused slag which has been strongly heated and then rapidly cooled and is of such a nature as to evolve little or no heat when subjected to the action of a current of carbon dioxide, and, on the other, of porous or granulated slag which has been similarly treated and which evolves much heat when treated with carbon dioxide. A small quantity of Portland cement may also be added.—A. G. L.

Cements, Slag; Method of Treating Raw Materials f ——. E. Morsaint. Fr. Pat. 325,107, Aug. 11, 1902.

The moist slag from blast furnaces is mixed with quicklin or incompletely slaked lime and the mixture piled into heap and allowed to remain for some time, when the he evolved owing to the slaking of the lime drives off t excess of water in the slag, thus obviating the necessity drying the slag and slaking the lime separately.—A. G. L

Cement Surfaces; Process for the Application of Pai to ——. S. Levy. Fr. Pat. 325,209, Oct. 10, 190 XIII.A., page 640.

X.—METALLURGY.

Carbon Monoxide; Transformation of ——, in Relation Equilibrium in the Blast Furnace. R. Schenck a F. Zimmermann. Ber., 1903, **36**, [6], 1231—1251.

The reversible reaction $2Co \rightleftarrows C + CO_2$ is known to ta place at a comparatively low temperature in presence finely-divided metals, such as iron, nickel, and coba Recently Boudouard (see this Journal, 1889, 767, a 1890, 808; also 1889, 278, 279, 498, 742, and 1901, 119 described the conditions under which it takes place mo rapidly, and has stated that the oxides of the metals abo mentioned accelerate the reaction. Carbon monoxide contact with these oxides at 445° C. is certainly tran formed for the most part into carbon dioxide without a change of volume (the slight alteration in the case iron oxide can be explained in another manner), where the above reversible reaction requires halving the volume the gas. No free carbon is produced, and the carbonic ac is formed by the reduction of the oxides above mention In the presence of the finely-divided metals, howev carbon is set free and the volume of the gas diminishes half its original volume, or nearly so. This progress decrease affords a means of studying whether the order the reaction is bimolecular, as is indicated by the abo equation, or unimolecular, and the authors' results lead th to believe that at 445° C. the reaction is bimolecular, t is to say, that the reaction is represented by the equat $2 CO = C + CO_2$, while at lower temperatures the reacti is unimolecular. In order to explain the unimolecul nature of the reaction at lower temperatures they assu that it takes place in two stages represented by the equ tions :—$CO = C + O$ and $CO + O = CO_2$. This applies the action in the presence of nickel and cobalt. In t case of iron, the reaction is unimolecular at 445° C., b becomes bimolecular at 568° C., the chief peculiarity bei that the initial pressure of the enclosed gas sinks to less th half, and may even approach a perfect vacuum. In oth words, the whole of the carbon monoxide gas may ultimat be transformed into solid carbon (see this Journal, 18 690 and 909). The equation $2 Fe + 3 CO = Fe_2O_3 + 3$ which is commonly used to represent the action, is held the authors to be incorrect, owing to the simultane presence of carbon monoxide and dioxide.—J. S.

Carbon Monoxide; Action of finely-divided Metals on — P. Sabatier and J. B. Senderens. Bull. Soc. Chim., 19 **29**, [8], 294—300.

The finely-divided metals were heated in glass tu (usually a layer of the metal about 35 cm. long and 8 m thick was used) in hydrogen to the requisite temperatu and the carbon monoxide was then substituted for t hydrogen, care being taken that no air entered. T progress of the reaction was measured by comparing rates at which gas entered and left the tube, and by analy of the collected gases.

Nickel.—At and above 230° C. there is deposition carbon; the reaction proceeds more rapidly as the te perature rises above this point, but for any temperat between 230° and 400° C., by using a sufficiently lo nickel layer or a sufficiently slow current of gas, it possible to make the reaction $2 CO = C + CO_2$ comple Over the same range of temperatures, neither nickel nor mixture of nickel and finely divided carbon produced above has any reducing action on carbon dioxide.

'obalt.—The reaction is precisely similar to that with el, only the initial temperature is higher—above 300° C.

'on.—Below 100° C. iron carbonyl is formed. From temperature to above 200° C. there is no reaction. ards 330° C. the reaction $Fe + CO = FeO + C$ begins, above 400° C. carbon dioxide appears from the reaction $+ CO = Fe + CO_2$. Up to 450° C. both of these tions increase in rapidity, but the first is always the f. As, however, at this temperature, iron has no action arbon dioxide, iron heated in a closed vessel with a ed amount of carbon monoxide ultimately converts the lo into carbon and carbon dioxide.

ther Metals.—Spongy platinum, platinum black, copper, r, are all without action on carbon monoxide at or w 450° C.

ıese reactions (the ultimate result of which is expressed $CO = C + CO_2$) are not physical, or they would ably be produced in a high degree by platinum. In ase of nickel, they possibly arise from the production (at high temperatures) simultaneous decomposition of el carbonyl, $Ni(CO)_4 = Ni + 2\,C + 2\,CO_2$, a decom- ion which we know to take place when that substance ated; and from analogy, we may infer the same to be ase with iron and cobalt. As, however, in the case of we know that the two reactions given above do occur, afford a more probable explanation of the phenomenon iron; and it is possible that similar reactions may r with nickel and cobalt, the oxides, however, being nposed in the moment of their formation.—J. T. D.

I ; Cementation of ——. G. Charpy. Comptes rend., 1903, **136**, [17], 1000—1002.

, as filings, thin shavings, or wire, was heated with us agents of cementation (graphite, wood and animal oal, coal gas, carbon monoxide, cyanogen, potassium de) at definite temperatures, and the progress of the ge with the time determined. At a low temperature C.) a gradual formation of cementite occurs, the being at last completely converted into cementite filings, after 86 hours). At higher temperatures ıtite is not stable and decomposes, with separation aphite. In this way a limited quantity of iron may rt an indefinite amount of carbon into graphite.
—J. T. D.

in Diorite ; Occurrence of ——. L. B. Brown. Eng. and Mining J., 1903, **75**, [16], 598.

author has examined an occurrence of diorite near astern Altai Mountains, Siberia, at the head of the ovsky Creek, a tributary of the Byely Oos, in which gold was discovered by Zaitzeff in 1900. There is n of quartz within 500 ft. of this deposit, and the gold arently embedded in original particles in the diorite There is, however, in the immediate vicinity, an se mass of an exceedingly basic rock, consisting of a tite having a somewhat porphyritic structure. At a ce of less than 1000 ft., reefs of gold-bearing quartz een discovered. The author draws attention to the s being one in which an unusually well-defined ation of metallic gold-bearing veins with igneous from which the veins appear to have drawn their ic contents, is shown.—A. S.

Conglomerate [*South Africa*] ; *Observations on the I al* ——. L. de Launay. Eng. and Mining J., 1903, 7 [14], 519—521.

regard to the nature of the gold-bearing conglomerates Main Reef Series, the ore containing the gold is nally a quartzitic sandstone, made up of pebbles and of sand, composed almost entirely of quartz, or, as essory of quartzite. Mostly, however, the ore is a merate of the sandstone, the cement consisting of containing pyrite and gold, together with the minerals metamorphism, such as chlorite, muscovite, &c. The containing gold in varying degree extend over a ess of several thousand metres of sandstone and merate, with rare intercalations of schist at their but devoid of any limestone formation. The gold ntly occurs in the free condition, but in a very fine state of division, and not visible to the naked eye. It is associated with pyrite, but the amount present is not proportional to that of the pyrite; the gold often occurs in crystals enclosed within the pyrite. The latter, which forms about 5 per cent. of the weight of the rock, is, in general, remarkably pure, containing only traces of copper, lead, and zinc. The gold and pyrite occur almost exclusively in the cement uniting the quartz pebbles, which latter only very rarely (in fissures or in beds of a special character) contain gold. The gold-bearing pyrite is present in the form of isolated grains irregularly distributed through the silicious cement; it often forms a trail of grains, but rarely continuous "veinlets." There appears to be some relation between the size of the pebbles and richness of the ore in gold, the fine sandstones being very rarely gold-bearing, or only along certain belts of disseminated pebbles which are easily overlooked. In any one layer the gold values generally appear to be highest where the thickness is least. A certain number of gold-bearing reefs, often very rich, occur in contact with beds of schist, intercalated between the latter and the quartzite.—A. S.

Gold Quartz Milling on the Rand. Notes on the Common Practice of ——. F. Alexander. J. Chem. Metall. and Mining Soc. of S. Africa, 1903, **3**, [11], 165—168.

The quantity of water required to wash the gold-bearing quartz over the amalgamating table is about six times the weight of ore crushed when the ore is first washed and sorted, but if the mill pulp be classified by means of hydraulic classifiers, the amount required would be fully eight times the weight of ore crushed.

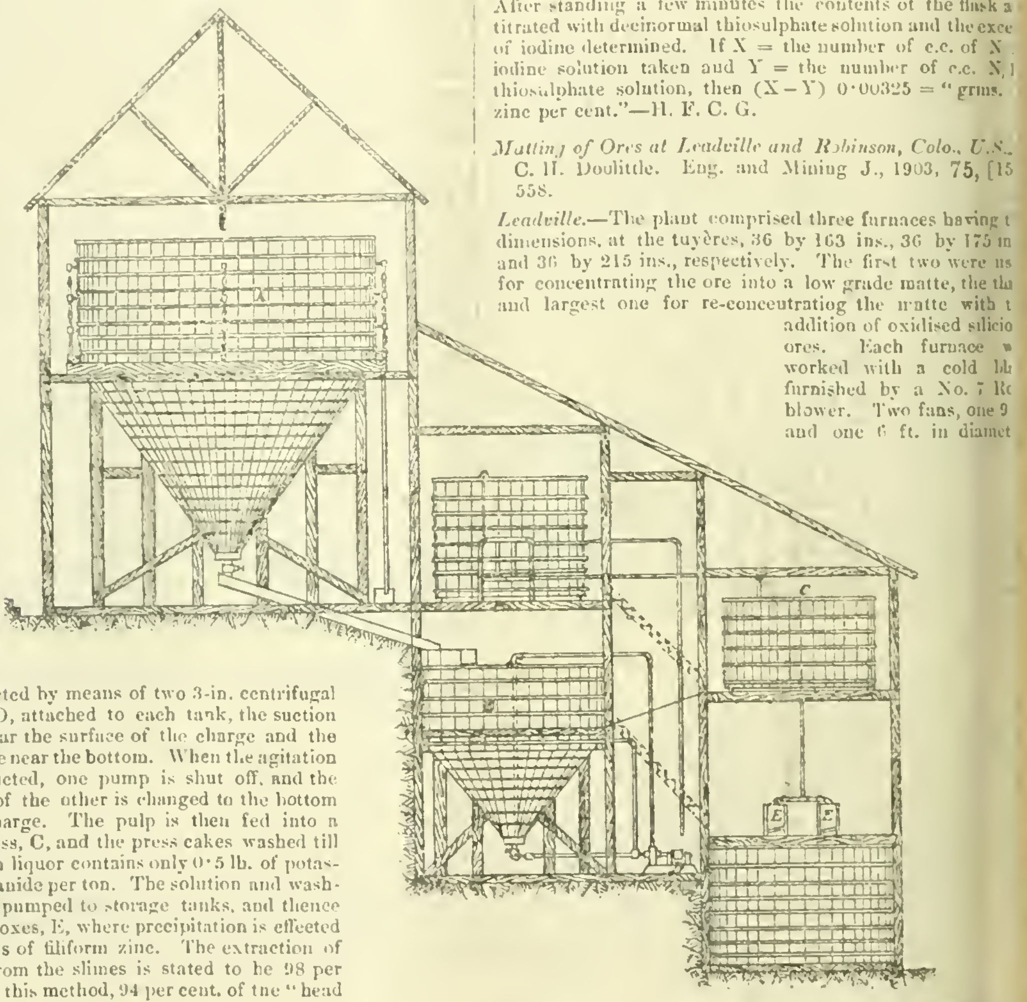
The work may be classed under two heads:—1st, Crushing, and 2nd, Amalgamating. Crushing the maximum quantity of ore to a determined degree of fineness is an exceedingly important item, and the determination of the screens to be used on each mine should be very carefully settled by experiments on the ore over a period covering, say, three months. The weight of stamp, speed, length of drop, height of discharge, and quantity of water, appear to be the chief factors governing the crushing powers of a stamp mill through a given sized outlet. The feed also, which is invariably automatic, is of the greatest importance, and should always be kept even, special care being taken that the stamp is crushing through the pulp in the mortar box on to the die.

In the amalgamation of the ores by the copper plate method, large sheets of the purest copper obtainable should be used, and care should be taken to ensure a perfectly level smooth surface which will admit of an even distribution of the pulp and an uniform flow. Inside amalgamation on copper plates fastened to the mortar has for some time past been superseded by feeding mercury into the mortar box. But here precautions are needed to prevent loss of mercury. The plates when first set must be carefully cleaned before the mercury is used, and should be allowed to accumulate a thin layer or skin of hard amalgam. By thoroughly scouring or loosening the amalgam by rubbing the whole surface of the plate with a little clean sand or grit, the amalgam becomes pasty and can be easily removed without unduly affecting the copper itself.

The author lays great stress on the importance of accurate sampling.—H. F. C. G.

Slimes [*Gold*] ; *Treatment of* ——, *in Tanks with Conical Bottoms.* A. S. Additon. Eng. and Mining J., 1903, **75**, [13], 482.

The plant described was designed for the treatment of the tailings at the Confidence Mine, California, which contain from 50 to 60 per cent. of slimes. The tailings are separated in hydraulic classifiers into sands and slimes, and, as it has been found by experiment, that about 30 per cent. of the slimes can be treated satisfactorily with the sands, the process of classification is adjusted accordingly. The remaining portion of the slimes is introduced into three settling tanks, A (see figure), each of which is 20 ft. in diameter, 9 ft. in height of staves, and 14 ft. in depth of bottom, the bottom sloping at an angle of 50°. When the settling tanks are filled, a quantity of lime, sufficient to neutralise the acid present, is scattered over the surface of the charge. This proves sufficient to cause the charge to settle in seven hours. The clear liquid is run off by means of valves arranged spirally round the tanks. The residual slimes, containing about 40 per cent. of water, are discharged through a gate valve at the lowest point of the settling tank, and are passed to the agitation tanks, B, which are 12 ft. in diameter, 8 ft. in height of staves, and 6 ft. in depth of bottom, the bottom sloping at an angle of 45°. Before the slimes are run into the tanks, a certain amount of cyanide solution is run in, and agitation commenced, the slimes being then gradually filled in, and finally, if required, more cyanide solution. Agitation continues for 12 hours; it is effected by means of two 3-in. centrifugal pumps. D, attached to each tank, the suction being near the surface of the charge and the discharge near the bottom. When the agitation is completed, one pump is shut off, and the suction of the other is changed to the bottom of the charge. The pulp is then fed into a filter-press, C, and the press cakes washed till the wash liquor contains only 0·5 lb. of potassium cyanide per ton. The solution and washings are pumped to storage tanks, and thence to zinc boxes, E, where precipitation is effected by means of filiform zinc. The extraction of values from the slimes is stated to be 98 per cent. by this method, 94 per cent. of the "head value" being recovered. The actual cost per ton for treatment is said not to exceed 95 to 90 cents.—A. S.



Cyanide Solutions; The Regeneration of Working —— where Zinc Precipitation is used. A. F. Crosse. J. Chem. Metall. and Mining Soc. of S. Africa, 1903, **3**, [11], 163—165.

Potassium cyanide is recovered from the double cyanide of zinc and potassium by precipitating the zinc as sulphide and recovering the cyanogen combined with the zinc as an alkali cyanide, the cyanide solution being heated to a temperature of about 65° C. to ensure complete precipitation of the zinc. The quantity of alkali sulphide required is determined by estimating the zinc with a sulphide solution of known strength. As the continuous use of an alkali sulphide would be objectionable owing to the continual accumulation of caustic alkali due to the decomposition of the potassium zincate formed, the zinc sulphide obtained is filtered off and used to generate sulphuretted hydrogen, which is then employed to decompose the double zinc an potassium cyanide solution.

The precise course adopted in determining the zinc in th working cyanide solution is as follows: 100 c.c. of th solution are heated to about 70° C. and an excess of a 5 pe cent. sodium sulphide solution added. The resulting pr cipitate is allowed to settle, filtered off, washed with h water till free from all traces of sulphide, and the filte paper transferred to a 150-c.c. flask. Sufficient decinorm iodine solution is run into the flask to leave an excess not more than 5 c.c., 30 to 35 c.c. being usually sufficient 100 c.c. of very dilute hydrochloric acid are now added an the flask thoroughly shaken to break up the filter pape After standing a few minutes the contents of the flask a titrated with decinormal thiosulphate solution and the exce of iodine determined. If X = the number of c.c. of N iodine solution taken and Y = the number of c.c. N thiosulphate solution, then (X − Y) 0·00325 = "grms. zinc per cent."—H. F. C. G.

Matting of Ores at Leadville and Robinson, Colo., U.S. C. H. Doolittle. Eng. and Mining J., 1903, **75**, [15 558.

Leadville.—The plant comprised three furnaces having t dimensions, at the tuyères, 36 by 163 ins., 36 by 175 in and 36 by 215 ins., respectively. The first two were us for concentrating the ore into a low grade matte, the th and largest one for re-concentrating the matte with t addition of oxidised silicio ores. Each furnace w worked with a cold bl furnished by a No. 7 R blower. Two fans, one 9 and one 6 ft. in diamet were connected with the dust chamber; the gases, a having travelled 300 ft., were forced through towers, wh they were sprayed, and thus a large proportion of the fu rich in lead and silver, was saved. The furnaces were wo in such a manner that the amount of matte produced by ore furnaces was just sufficient for the re-concentra furnace, and that the slag from the re-concentration furn which had to be re-smelted, was just sufficient in qua to maintain an open charge in the ore furnaces. composition of the characteristic ores, which were of a character, is shown in the table.

About 105·8 tons of ore were treated daily per furn During the month of March 1900, 9,838 tons of ore, taining 2,256 oz. of gold, 159,811 oz. of silver, and 314,69 of copper were treated, and the recovery was 98·5 per of the gold, 95 per cent. of the silver, and 90 per ce the copper. A charge for the ore furnace consisted o Ore (all sulphides), 2,600 lb.; lime-rock, 250; briq flue dust, 300; slag, 1,500; and coke (containing 2

Name of Mine.	SiO₂.	Fe.	Cao.	Zn.	Cu.
a Silver	3·0	41·0	0·0	6·0	0·1
x M. Co.	20·0	28·0	0·0	5·0	2·7
y Monarch	28·0	18·0	9·0	11·0	3·5
rian	8·0	78·0	0·0	1·0	0·5
nie	23·0	23·0	0·0	9·0	3·0
mmodore	85·0	3·0	2·0	0·0	0·0
tennial-Eureka	77·0	5·0	2·0	2·0	6·9

t. of moisture), 325 lb. The flue-dust, of which there s a large amount, was briquetted and again fed into the nace. A charge for the re-concentrating furnace coned of:—Matte, 1,000 lb.; silicious ore, 600; lime-rock, ; and wet coke, 125 lb. The slag contained 36 per t. of silica, 36 per cent. of iron, 7 per cent. of lime, and er cent. of zinc. The average cost of treatment was 45 dols. per ton of ore, including all expenses except t of new construction.

obinson.—The plant here consisted of a 36 by 142 ins. ler hot-blast furnace, the blast being warmed by the aping gases; the highest temperature obtained was F., but this fell to about 90° F. when the furnace was ng used for re-concentrating purposes. Owing to the rcity of copper ore, the values were collected in what practically an iron matte. The ores treated had the owing composition:—

Name of Mine.	SiO₂.	Fe.	CaO.	Cu.
shington	5·0	42·0	0·0	Trace.
binson	25·0	15·0	1·0	Trace.
le	64·0	12·0	3·0	4·0
tergreen	4·0	48·0	0·0	1·0

he iron in the Wintergreen ore was in the form of rhotite, but contrary to statements which have been le, no difficulties were experienced on this account. The owing results are given:—In a 24-hour run, the furnace rges consisted of: Washington ore, 7·60 tons; Robinson , 81·00; Wintergreen ore, 36·98; lime-rock, 25·65; , 55·50; and coke, 16·50 tons. The slag contained: ca, 41 per cent.; iron protoxide, 30·8; manganese proide, 5·5; lime, 17·0; and zinc oxide, 4 per cent.; and er, 1·1 oz. per ton. The crude matte contained 0·2 per t. of copper and 42·07 oz. of silver per ton.

n a 24-hour run for re-concentrating purposes, the rges consisted of:—Robinson ore, 116·50 tons, Pride , 28·42; matte, 121·52; lime-rock, 21·90; and coke, 60 tons. The re-concentrated matte contained 5 per cent. opper and 200 oz. of silver and 0·5 oz. of gold per ton. he flue dust amounted to 2½ per cent. of the ore treated. cost of fuel and of labour (exclusive of management, erintendence, &c.) was 2 dols. per ton of ore. All of ores contained some lead and zinc, and notwithstanding volatilisation of the greater proportion of lead, the te contained about 3 per cent. of this metal.—A. S.

tinum Metals; Disintegration of Electrically-heated —, in different Gases. L. Holborn and L. Austin. tzungsber. Kgl. pr. Akad. Wiss., Berlin, 1903, 245—48. Chem. Centr. 1903, **1**, [16], 916. (See this ournal, 1902, 1332.)

x strips of foil were introduced into flasks containing different gases (air, oxygen, nitrogen, hydrogen) at ying pressures. The temperature (1150°—1500° C.) measured by aid of an optical pyrometer. The loss in ght after heating electrically for 30 minutes was deterned by weighing. With platinum and rhodium, the ntegration at atmospheric pressure is five times greater oxygen than in air; at 25 mm. pressure, the disintegra is about half that at atmospheric pressure. The trace lisintegration in commercial nitrogen is to be attributed he small proportion of oxygen contained in the same.

ridium in air at atmospheric pressure shows a disinteion 10 times greater than that of platinum or rhodium; arefied air the disintegration is eight times less than in air at atmospheric pressure, whilst in oxygen it is 11 times greater than in air (both gases at atmospheric pressure). Platiniridium closely resembles platinum in its behaviour.

With palladium, the disintegration increases strongly as the pressure is reduced, whilst the nature of the gas is without appreciable influence. In presence of oxygen, black precipitates are obtained, but in hydrogen, the copper conducting wires become covered with a white glistening coating. In this case, however, the action is one of sublimation, whilst with platinum, rhodium, and iridium, the disintegration is due to chemical action.—A. S.

Copper and Zinc; Boiling Points of ——. Féry. Ann. Chim. Phys., **28**, [7], 428—432. Chem. Centr., 1903, **1**, [14], 813.

The determinations were made in an electric furnace of the Moissan type, in which a charcoal crucible containing 6—7 kilos. of the metal was heated by means of a current of 550—600 ampères and 80 volts; the temperature was measured by means of an optical pyrometer. The boiling points observed were: for zinc, 1,040° C. (about 100° C. too high, owing to experimental errors), and for copper, 2,100° C. From brass containing 37 per cent. of zinc, the two metals can be completely separated by fractional distillation. The whole of the zinc is volatilised in two minutes, the temperature then rapidly rises until it becomes steady again at about the boiling point of copper; pure copper is left behind in the crucible.—A. S.

Metals; Velocity of Efflux of some ——. N. Werigin, J. Lewkojeff, and G. Tammann. Ann. d. Physik, **10**, [4], 647—654. Chem. Centr., 1903, **1**, [15], 863.

Many metals become plastic considerably below their melting points, and may be welded by strong pressure. The authors measured the velocity with which the solid metals could be forced through an orifice by strong pressure. The velocity of efflux decreases with constant pressure and temperature in the following order:—Potassium, sodium, lead, thallium, tin, bismuth, cadmium, zinc, antimony. At constant pressure, and through the same orifice, an increase of temperature of 10° C. causes a doubling of the velocity of efflux of a metal.—A. S.

Gold Plating of Metals; Progress in ——. C. Göttig. Zeits. angew. Chem., 1903, **16**, [18], 417.

The usual methods of gold plating offer technical difficulties when only certain parts of a large object are to be plated. To obviate these drawbacks, the author has devised new gold solutions (Ger. Pat., 134,428), which, when simply painted on silver, steel, nickel, &c., undergo reduction, and yield a durable layer of gold. For this purpose, sulphur compounds of gold free from oxygen are dissolved in water, which may also contain miscible organic compounds such as alcohols, to increase the stability of the solution. Under certain conditions the colour of the gold layer may be improved by the presence of polishing substances, such as alkalis, ammonia, alkali carbonates, ammonium salts, acids, &c. As a rule, the solutions are prepared by treating an aqueous solution of gold chloride with solutions of suitable sulphur compounds, *e.g.*, sodium sulphide, sodium arsenic persulphide, potassium sulphocyanide, &c. By the addition of oxalic acid and alcohol, and also of other organic solvents in the case of certain gold salts, deposits of different shades of colour are yielded by these solutions. Thus, *e.g.*, solutions prepared from gold chloride, sodium sulphide, alcohol, and polishing agents mostly give deposits of brownish shade, whilst those containing gold chloride, alcohol, and sodium arsenic persulphide form gold arsenic persulphide ($2Au_2S_3,As_2S_5$) and give a reddish deposit, and those prepared from gold chloride solution with excess of ammonium sulphocyanide solution, alcohol, and oxalic or tartaric acid usually give yellow deposits, the exact shade largely depending on the nature of the metal being plated.

The concentration of the gilding solution varies with the speed of deposition required, and must be considerably higher when the metal is to be painted than when it is to be immersed in a bath.—C. A. M.

Cyanide Poisoning; Interim Report of the Committee of the Chem., Metall. and Mining Soc. of South Africa upon ——. XVIII. B., page 645.

English Patent.

Roasting or Calcining Ores and Minerals, &c., and Kilns or Furnaces used in the Process; Process of ——. M. Williams, London. Eng. Pat. 10,853, May 12, 1902. IX., page 629.

United States Patents.

Gold or other Ores; Apparatus for the Treatment of ——. W. B. McPherson, Los Angeles, Cal., U.S. Pat. 725,861, April 21, 1903.

In a precipitating apparatus for depositing gold and silver from potassium cyanide and other chemical solutions, the precipitating box for holding the solution has an inclined bottom furnished with openings fitted with valves, and is provided with a series of electric conducting plates connected to a source of electric supply. The valves are connected by a rod and yoke with a float mounted within a receptacle in communication with the precipitating box, and are opened and closed by the rise and fall of the float, the solution passing to and fro between the box and the receptacle.—R. A.

Gold; Process of Extracting ——. M. V. Uslar and G. Erlwein, Assignors to Siemens and Halske Aktiengesellschaft, all of Berlin, Germany. U.S. Pat. 725,895, April 21, 1903.

The auriferous ores are lixiviated with a solution of potassium cyanide, thiosulphates, and sodium chloride, with or without "rhodanids (thiocyanates)." Compare U.S. Pat. 708,333, Sept. 2, 1902; this Journal, 1902, 1232.—E. S.

Furnace for Roasting Ores. T. Edwards, Ballarat, Victoria. U.S. Pat. 725,056, April 14, 1903.

A reverberatory furnace having an elongated hearth, with air-supply openings, provided with regulating slides, extending up through the hearth to feed air to the furnace. A series of stirring rabbles, the hollow stems of which are supplied with a cooling medium, are arranged within the furnace, and are driven from a shaft mounted in a tunnel beneath the hearth, air inlets being provided adjacent to the rabble stems. Apertures are formed in the arch of the furnace for the insertion and removal of the rabbles.—R. A.

Smelting Furnace. E. F. Blessing, Assignor to H. M. Shiner and F. Blessing, Philadelphia, Pa. U.S. Pat. 725,661, April 21, 1903.

The furnace consists of a heating chamber containing a muffle and a fire box in contact therewith, a continuous flue leading from the fire-box and surrounding the muffle; a supplementary muffle below the main muffle, enclosed in a flue and communicating with the main muffle by means of an opening in the bottom of the latter. The floor of the main muffle slopes towards this opening, whilst the floor of the supplementary muffle slopes in the opposite direction towards a tap hole. An extension in the top of the supplementary muffle forms a partition between the flue surrounding the main muffle and the exit of the flue enclosing the supplementary muffle.—C. S.

Melting Furnace. J. F. Cottrell, Albany (N.Y.), U.S. Pat. 725,936, April 21, 1903.

The furnace comprises a fire-box, a metal chamber to the rear, and a crucible chamber situated in the rear of the latter and provided with a chimney or escape flue. The three chambers are in communication, the metal chamber (which has a concave bed), being depressed below the bottom of the crucible chamber and below the top of the fire-box. This last named is fitted with pipes for supplying air under pressure above and below the grate, those above being arranged so as to drive the flame into the metal chamber and over the charge therein. Both the metal and crucible chambers are provided with openings in the top and with removable covers for same.—C. S.

Impurities from Metallurgical Furnace Gases: Apparatus for Separating and Collecting ——. E. J. McAleer, Sharpsville, Pa. U.S. Pat. 725,352, April 14, 1903.

The furnace gases pass into the top of one side of a separating chamber, provided with a central dividing wall, on the other side of which they pass upwardly and outward. The chamber terminates below in a funnel-shaped bottom, having a controlled discharge nozzle, extending into a water tank into which the fluid and impurities from the gases fall. Other details are shown and claimed.—E. S.

Copper; Process of Extracting ——, *from Carbonate and Oxide Ores.* H. R. Ellis, Salt Lake City, Utah. U.S. Pat. 725,548, April 14, 1903.

The crushed ores are treated with an aqueous solution of sodium carbonate or bicarbonate, or a mixture of these, with or without one of the corresponding potassium salts. The cleared liquors obtained are subjected to electrolytic action.—E. S.

Mattes and Raw Materials; Treatment of ——. H. G. C. Thofehrn, Paris. U.S. Pat. 725,297, April 14, 1903.

By means of blast pipes distributed around a hearth furnace, steam, air, hydrocarbons, a granulated metallurgical flux, and a powdered solid oxidising agent, consisting of oxides of the metals to be treated, are blown on to the surface of the molten mattes or metals. These may be copper, nickel, tin, or lead mattes, or raw copper or cast-iron, the object being to obtain the respective metals in a refined state. Compare Eng. Pat. 10,701, May 15, 1901; this Journal, 1902, 862; also Fr. Pat. 321,392, May 24 1902; and Addition to the same, this Journal, 1903, 215 and 499.—E. S.

Ores; Apparatus for Treating ——. S. C. C. Currie Assignor to W. Courtenay, both of New York. U.S Pat. 725,321, April 14, 1903.

The ore is fed by a horizontal conveyor from the botto of the hopper into a closed chamber down an incline fro which the ore passes into an inclined cylinder set in furnace. From a water-tank at the delivery end of th cylinder, heated by a flue from the furnace, steam is forced in a direction contrary to the travel of the ore, into th closed chamber below the conveyor, whence it passes by an escape pipe into a condensing vessel above. Compar U.S. Pats. 719,756—7, of Feb. 3, 1903; this Journal, 1903 302.—E. S.

Sulphide Ores; Desulphurising ——. A. D. Carmichae Broken Hill, Australia. U.S. Pat. 12,105, Reissue April 21, 1903.

See Eng. Pat. 17,580, Sept. 2, 1901; this Journal, 190 349; and Fr. Pat. 320,492, April 18, 1902; this Journa 1903, 97.—E. S.

French Patents.

Steel and Iron: Manufacture of ——. B. Talbot a P. Gredt. Addition to Fr. Pat. 324,418, both of Sept. 1 1902.

Silicon, and part of the carbon, are eliminated from ca iron rich in silicon, by a treatment with slag containi much iron, preparatory to the blowing in a separate furnac Or a mixture of iron oxide and chalk may be added to t metal in the converter, and coke dust or petroleum vapo may be introduced with the air into the charge through t tuyères, to raise the temperature. In the acid process, t operation is then finished by blowing; but in the bas process, after removal of the siliceous slag, chalk is add before finishing.—E. S.

Steel; Manufacture of ——. H. Knoth. Fr. Pat. 325,052, Oct. 8, 1902.

See U.S. Pat. 712,389, Oct. 28, 1902; this Journal, 19 1537; and Eng. Pat. 21,750, Oct. 6, 1902; this Journ 1903, 99.—E. S.

erro-chrome; Application of ——, in the Construction of Tuyères, Crucibles, and Linings, intended for the Metallurgical Treatment of Minerals, and principally of Sulphide Ores. A. Germot. Fr. Pat. 324,679, Sept. 23, 1902.

ERRO-CHROME, besides the applications named in the title, ay be used for lining cupolas, and in the construction of essels in which lead is melted or desilverised; or in which nc is distilled, and generally, in metallurgical processes equiring a high temperature.—E. S.

Iron, &c.; Coating ——, with Silver. Mdlle. J. Schiele. Fr. Pat. 324,832, Aug. 30, 1902.

HE iron or steel articles to be coated are heated to redness a furnace communicating by a door with a closed cooling amber, into which they pass on to an endless, slowly oving system of chains, from which they are delivered to e exit opening, having by this time been cooled to about ° C. The articles are then submitted to a bath of luted hydrochloric and nitric acids, after which they are bbed by a scratch brush with an acid solution of zinc loride, and silver is deposited on the prepared surfaces by y suitable method, followed by reheating and finishing ith appropriate tools. Compare Eng. Pat. 9438, April 23, 02; this Journal, 1902, 917; and also Fr. Pats. 320,154, pril 3, and 320,696, April 26, 1902; this Journal, 1903, and 148.—E. S.

olten Metals; Process and Apparatus for Refining ——. G. C. Carson, A. Miller and F. Hurst. Fr. Pat. 324,763, Sept. 27, 1902.

E U.S. Pats. 714,449, 714,450, and 714,451 of Nov. 25, 02; this Journal, 1903, 32. Compare also U.S. Pat. 4,348, March 4, 1902; this Journal, 1902, 619.—E. S.

timony Ores; Melting [Reducing] ——. N. C. Cookson. Fr. Pat. 324,864, Sept. 30, 1902.

a suitable furnace a bath of iron sulphide (which may mixed with other reducing matters) is formed, the mperature being raised above the point of fusion; iron added, and then the previously heated antimony ore troduced in successive portions, access of air being oided as far as possible during the reduction. The arge is agitated by suitable means, and portions of iron e added from time to time, to cause separation of spended antimony, which latter is tapped off on nclusion of the process.—E. S.

uminium Alloy; Manufacture of ——. P. G. V. Coppée. Fr. Pat. 325,191, Sept. 25, 1902.

BALT and ferro-silicon, 10 parts each; aluminium, parts; and "silica of Silesia" 5 parts, all by weight, fused together, a temperature of about 2,000° C. being cessary, to form a "rich metal," for addition in any sired proportion, to aluminium fused in a metal crucible about 400° C. Alloys of aluminium thus obtained are ted to be easily soldered or brazed, and to be malleable l forgeable.—E. S.

etallic Surfaces; Removing the Colour [Paint] from ——. J. N. Firth. Fr. Pat. 325,161, Sept. 3, 1902, XIII. A., page 640.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

odes; Disintegration of ——. E. Wohlwill. Zeits. f. Elektrochem., 1903, **9**, [17], 311—332.

E author has shown that in the electrolysis of gold ations (see this Journal, 1898, 586), the gold may, under erent circumstances, dissolve either as a monovalent or a trivalent metal, in different proportions, and that the novalent gold may afterwards tend to become trivalent l will deposit metallic gold in so doing. It appears that copper has a similar tendency, and that with low current-densities an appreciable proportion of cuprous ions may be formed, with the result that there is a metallic anode-deposit of very finely-divided copper. Under favourable conditions, such as low current-density and non-disturbance of solution, much of this deposit may remain on the surface of the anode, but with higher current-densities the relatively rapid flow of solution downward over the surface of the anode may remove much of this deposit and carry it to the bottom. This cupreous deposit is not found in the electrolysis of cyanide solutions, which are capable of dissolving cuprous salts and so preventing their decomposition. The effect is most clearly seen when the current is very weak, such as may be produced from a concentration cell, as for example, when a copper wire is suspended vertically with its lower end immersed in strong cupric nitrate solution, on the surface of which water is afterwards poured gently. The deposit of copper on the cathode end of the wire is clearly visible, whilst, after a time, the copper portion will at one point gradually dissolve away, but will also receive a honeycombed deposit of copper mud. The effect of this deposit of copper on anodes is to cause disintegration even when both the copper and the solution are chemically pure; for the loosely-attached copper mud is less readily attacked than is the actual anode during electrolysis, so that it forms a partial protective covering, and the anode is attacked only, or chiefly, in the exposed portions, until, in course of time, the surface is undermined and minute particles become detached. Hence under conditions, such as low current-density and uneven surface, which favour the formation and adhesion of copper mud at the anode, even pure copper anodes may become pitted, and will in time crumble.—W. G. M.

Sodium Hydroxide; Electrolysis of Fused ——. R. Lorenz. Zeits. f. Elektrochem., 1903, **9**, [17], 333—335.

LE BLANC and Brode have, in a recent paper (Zeits. f. Elektrochem., 1903, **9**, 230), upheld their original view that Sacher's experiments were not reliable because he used iron electrodes. The author now adheres to his previous statement (this Journal, 1903, 424), and shows that an iron point in the electrolyte used becomes passive in two minutes, showing an E.M.F. of 0·38 volt at first, and then, after passing through zero, an E.M.F. of 0·63 volt in the opposite direction, in each case as opposed to carbon. This result is sufficiently near to Liebenow's and Strasser's determination of the E.M.F. of active as opposed to passive iron, the author's approximate result being 0·38 + 0·63 = 1·01, the others' result being 1 volt. Nickel similarly treated showed an E.M.F. at first of 0·19, and, after 1—1½ minutes, of 0·51 in the opposite direction, when opposed to carbon. If the carbon be eliminated, and a passive iron point is opposed to a passive iron crucible there is a small E.M.F. of about 0·046 (from point to crucible) which probably represents residual activity. A passive nickel point-crucible system shows a corresponding E.M.F. of 0·027 volt. Preliminary results are given for copper, silver, and platinum, examined in the same way.
—W. G. M.

Potassium Chlorate; Electrolytic Reduction of ——. D. Tommasi. Comptes rend., 1903, **136**, [17], 1005—1006.

WHEN potassium chlorate solution, acidulated with sulphuric acid, is electrolysed between platinum electrodes, perchlorate is formed at the anode, and chloride at the cathode. If the cathode only be of platinum, and the anode of zinc, chloride is formed at the anode, but no reduction occurs at the cathode. The anodic reduction is due to the zinc which becomes converted into sulphate, or, in a solution not acidified, into hydroxide. Perchlorate, under these circumstances, is not reduced at all. If granulated zinc be introduced into a solution of copper sulphate containing potassium chlorate, heat is evolved so rapidly that the solution may boil, and the chlorate is reduced to chloride, some of the copper being at the same time reduced to the cuprous condition. A similar reduction is effected by zinc with mercuric nitrate or lead acetate, or by tin or iron with copper sulphate; but sodium amalgam does not reduce chlorate in alkaline, neutral, or acid solution. Zinc does not reduce chlorate in presence of dilute acetic acid, though the copper-zinc couple does so partially.—J. T. D.

Nitrogen; Oxidation of Atmospheric ——, by Electrical Discharges. F. von Lepel. Ber., 1903, **36**, [6], 1251—1258.

The author refers to the work of Muthmann and Hofer on the same subject (this Journal, 1903, 303) and amplifies his former paper of 1897 (Ber., **30**, 1027). Oscillating discharges were found to give a lower yield. The influence of water and of various alkaline and salt solutions used in conjunction with the discharge are enumerated and discussed. The addition of ozone to effect the oxidation of the oxides of nitrogen was found to offer little advantage. —J. S.

Iodoform from Acetone; Electrolytic Preparation of ——. H. Abbott. J. of Phys. Chem., 1903, **7**, [2], 83—91. Zeits. f. Elektrochem., 1903, **9**, [17], 342—343.

Elbs and Herz (see this Journal, 1897, 932) did not obtain a sufficiently economical yield of iodoform from acetone by electrolysis, but the authors find that by employing a solution containing 6 grms. of sodium carbonate, 10 grms. of potassium iodide, and 5·5 c.c. of acetone per 100 c.c. of water, adding the acetone in portions of 0·5 c.c. at 10-minute intervals, and working at a temperature of 75° C. with a current density of 1·35 ampères per sq. decim., it was possible to convert 46·88 per cent. of the acetone into iodoform. The authors, by using a lower voltage under their conditions than Elbs did under his, obtained 0·57 grm. of iodoform per watt-hour, as against 0·3585 grm. obtained by Elbs.—W. G. M.

English Patents.

Mercury; Improved Arrangement of ——, in Apparatus for the Electrolytic Decomposition of Alkaline Chlorides. C. Arzano, Saint Gilles-les-Bruxelles. Eng. Pat. 25,353, Nov. 18, 1902.

A thin sheet or filaments of mercury of any form, width or length, circulates between the electrodes in any direction without the aid of diaphragms or other similar supports. —G. H. R.

Liquids of all Kinds: Electrolytic Treatment of ——. [Sodium Chloride Solution]. C. Arzano, Saint Gilles-les-Bruxelles. Eng. Pat. 25,354, Nov. 18, 1902.

A porous diaphragm is arranged between the active surfaces of two electrodes so as to form, at each side of the diaphragm, a space limited by the electrodes, communicating in the upper part with a liquid-supply contrivance, and in the lower with an outlet for the liquid. The electrodes are composed of elements superposed at short distances apart, and inclined from the horizontal towards the porous diaphragm, their lower ends approaching the diaphragm and forming the active parts of the electrodes. The liquid or liquids, moving under the influence of gravity in separate and uninterrupted courses, are continuously circulated in the form of thin sheets in the spaces left between the sides of the porous diaphragm and the active parts of the corresponding electrodes, and, collecting in the bottom of each compartment outside of the sphere of electrolytic action, are raised separately by a pump into the receivers which re-convey them to their respective compartments where the electrolytic treatment is effected. In the electrolytic decomposition of chloride of sodium, a saturated solution of it flows on one side of the porous diaphragm, through the compartment formed with the anode, whilst a concentrated caustic soda lye flows simultaneously on the other side of the diaphragm through the compartment formed with the cathode.—G. H. R.

United States Patents.

Storage Battery Plates; Method of Producing ——. W. Gardiner, Chicago, Assignor to H. T. Clarke, jun. U.S. Pat. 724,387, March 31, 1903.

Storage battery plates are produced by passing an electric current through lead plates, arranged as anodes in a cell. The electrolyte contains sulphuric acid or a sulphate (especially aluminium sulphate), a nitrate and oxalic acid or an oxalate. The plates are then oxidised electrolytically in a solution of sulphuric acid, magnesium sulphate and tartaric acid or a tartrate. The spongy surface thus produced on the plates is "caused to adhere more strongly" by further electrolytic treatment in "a solution containing soluble sulphur compounds, having lower degrees of oxidation than sulphuric and sulphurous acids." For this purpose "a soluble sulphide and a soluble sulphite" are used.—T. F. B.

Plastic Compound [for Insulators]. T. Hungerford, Brooklyn, N.Y. U.S. Pat. 725,968, April 21, 1903.

The insulating plastic compound is formed of a silicious base, a binder, a non-drier, such as rosin oil, and a fire-proofing element. (See Eng. Pat. 9211, 1901; this Journal, 1901, 729.)—G. H. R.

French Patents.

Generator; Thermo-Electric ——. C. A. Andrieu. Fr. Pat. 324,239, July 7, 1902.

The generator is formed of a number of piles, each of which consists of 12 couples or elements, which are formed of plates of German silver, and of "agglomerated" sulphide of copper, "the friction between the small and large molecules of the latter" being claimed to produce electricity, whilst the difference of heat of the solders which was the base of the old thermo-electric piles is said to be of secondary importance. The plates of "agglomerated" copper sulphide are prepared by heating ordinary copper sulphide just to redness, cooling, and breaking the fused sulphide into pieces of about 0·25 c.c. These pieces are placed, without ramming, into a small square mould, of an internal capacity of 2 c.c., and a quantity of molten copper sulphide is poured in till the mould is filled.—G. H. R.

Thermo-Electric Couples and Generators. L. S. Langville. Fr. Pat. 324,237, July 15, 1902.

See U.S. Pats. 704,595, and 704,596, 1902; this Journal, 1902, 1335.—G. H. R.

Magnesium Accumulator. C. Chuber. Fr. Pat. 324,830, Aug. 27, 1902.

The positive plate is a sheet of perforated celluloid on which threads of magnesium are woven and interlaced so a to form a network which acts as conductor and support fo a layer of oxide of lead. The negative plate is of porou carbon with numerous perforations, and the electrolyte is a solution of sulphate or of hydroxide of magnesium. —G. H. R.

Generator of Electrical Energy; Chemical ——. J. Portalier. Fr. Pat. 324,851, Sept. 27, 1902.

In the generator claimed under the name of the "Pil Portalier" the carbon electrodes are in a single homo genous piece, and so constructed that the electric curren is collected on the projecting head of the carbon by a singl platinised contact. The porous partitions in the bichromat piles are of asbestos porcelain. The depolarising an exciting liquids are respectively dilute solutions of sulphuri and hydrochloric acids, with the addition of a certai amount of ammoniacal bichromate to the depolariser. —G. H. R.

Carbon Bisulphide and other Chemical Products; Electr Furnace and Process for the Manufacture of —— E. R. Taylor. Fr. Pat. 324,409, July 31, 1902.

See U.S. Pat. 706,128, 1902; this Journal, 1902, 1143. —G. H. R.

Metals, Metalloids, or their Compounds; Electrolyt Preparation of ——, as free from Carbon as possibl Soc. Elektrizitätsaktiengesellschaft vorm. Schukert & C Fr. Pat. 324,621, Sept. 19, 1902.

The furnace is provided, on the side towards which th highly heated metals or metalloids are driven, with a be uniformly heated, of an oxide or oxides of the metal o metalloids which are to be the final product, or of a suitabl idised body. The carbon in the metals is oxidised by the ygen of the oxides, and the preparation and purification the metals is thus effected in one operation. The side of e furnace opposite to the beds of oxido is closed her- etically. The beds of oxide or corresponding body may provided with spaces to receive the refined product hich may be allowed to cool in them, or withdrawn.

—G. H. R.

itanous Chloride; [Electrolytic] Production of a New ——. H. Spence. Fr. Pat. 324,825, Sept. 4, 1902. VII., page 628.

itrous Products; Electric Installation for the Synthetic Production of ——, by Means of Electric Discharges in Gaseous Mixtures. Comité d'Initiative pour la Fabrication de Produits Nitriques. Fr. Pat. 324,964, Oct. 4, 1902.

E discharge sections, each comprising discharge elec- odes in series, a battery of condensers and a self-induction bbin are interposed in an induced circuit on the one hand, d on the other there is placed a self-induction bobbin signed to minimise the amount of electric energy "de- tted" (déwattée) in the induced circuit, the condensing tteries in the latter tending by their mutual reaction to gender electric oscillations of very high frequency in the rious discharge sections, whilst the self-induction bobbins e designed to maintain their frequency within such limits t, although always considerably superior to the initial quency in the induced circuit, it does not exceed the ount suitable for obtaining a maximum yield in nitrous ducts.—G. H. R.

lkaline Solutions; Electrolysis of ——. L. Gourwitch. Fr. Pat. 324,970, Oct. 4, 1902.

E electrodes are placed vertically in a vessel, the cathode ng formed on a thin layer of mercury flowing along a tical sheet of iron, and the rotation of a fluted cylinder ries the mercury from the reservoir to the distributing es. The amalgamated mercury passes into a second sel where the amalgam is decomposed by water, and the re mercury is returned into the distributing apparatus by pressure of the disengaged hydrogen.—G. H. R.

Alkaline Salts; Electrolytic Decomposition of ——. M. Wilderman. Fr. Pat. 325.154, Sept. 1, 1902.

E Eng. Pat. 22,902, 1901; this Journal, 1902, 125, and S. Pat. 709,971, 1902; this Journal, 1902, 1336.

—G. H. R.

luble Glass [Alkali Silicates]; [Electrical] Manufac- ure of ——. Soc. Anon. l'Ind. Verrière et ses Dérivés. r. Pat. 325,164, Sept. 4, 1902. VII., page 628.

(*B.*)—ELECTRO-METALLURGY.

n; Passivity of ——, and the Phenomena observed at ron Electrodes. C. Fredenhagen. Zeits. physik. Chem., **3**, 1—40. Chem. Centr., 1903, **1**, [16], 915.

E author measured the anodic charges which must be parted to iron in different liquids in order to render it sive. From his results and from those of other investi- ors, he concludes that the passive condition of iron is not to the formation of a film of oxide on its surface, or to existence of two modifications of metallic iron, but that caused by the production of a film of gas on the surface he iron. The film of gas may consist of oxygen, or of ic oxide in the case of iron which has become passive, er spontaneously or by means of an anodic charge, in ic acid. If haloid acids be added to the solution, the version of the iron to the passive condition is promoted, lst simultaneously a slime deposits from the iron anode sisting (in the case of hydrochloric acid) of iron chloride hypochlorite; that the latter is formed the author con- des from the fact that bubbles of gas rise from the esit. The reaction which leads to the formation of ochlorite is one between the discharged chlorine and the gen adhering to the passive electrode, and in this way, film of gas is destroyed and the iron again becomes ve.

The change of the iron from the active to the passive condition and back again is in many cases a periodic one. If iron be rendered passive in sulphuric acid solution by an anodic charge and then hydrochloric acid be added, periodic variations in the current strength are observed. First the iron dissolves, whereby the current becomes stronger, then it reverts to the passive condition and the current becomes weaker, and so on. According to the author, the purely chemical action of the iron on the electrolyte plays a part here, and in all other cases. So long as the iron dissolves in a purely chemical sense, or so long as it reacts with the halogen discharged by the current, the amount of iron ions in the solution increases, and the tendency to dissolve diminishes. From the fact that iron chloride is deposited in the form of slime, the author concludes that the electrolyte in the neighbourhood of the electrode becomes impoverished in chlorine ions, so that oxygen-polarisation can be developed, and the iron consequently rendered passive. Subsequently the quantity of chlorine ions at the anode increases by diffusion from the main portion of the electrolyte; this leads to a discharge of chlorine, by which the film of oxygen is destroyed. with formation of hypochlorite, whilst the iron again becomes active, and so on. (See also this Journal, 1902, 175.)—A. S.

Metallic Powders from Inert Matter; Electric Separation of ——, and of the Metallic Portion of a Mineral from the Gangue. D. Negreano. Comptes rend., 1903, **136**, [16], 964–965.

It is found that if a mixture of a metallic powder and sand be placed on an insulated metal plate attached to the negative pole of a Wimshurst electric machine, and a metal disc is brought near the mixture, a large proportion of the metallic powder will separate from the mixture and attach itself to the disc. In the case of a mixture of brass and copper, the brass was transferred to the disc. The same process serves to separate the metallic portion of a mineral from its gangue.—T. F. B.

United States Patent.

Furnace [Smelting]; Electric ——. E. A. Sjöstedt, Assignor to the Lake Superior Power Co., both of Sault Ste. Marie, Canada. U.S. Pat. 726,364, April 28, 1903.

The water-jacketed body-case, which is supported on legs at a suitable elevation, is formed of side and end plates, lined with refractory material, and water-jacketed at the lower parts, one of them being provided with a slag-notch. One set of plates has lugs with stay-bolts passing through them, and bracing the other set of plates between them. The water-jacketed bottom frame, which is removable, carries a refractory lining on a plate secured to it, and has a tapping-hole in one of the ends. The cover, which is formed of a refractory material, has feed and vent holes, and an opening within which an upper electrode is adjustably suspended. The lower electrode is embedded in the bottom lining, and has its ends in contact with the metallic frame of the bottom, the latter and the upper electrode being connected by wires to an electric generator.—G. H. R.

Copper and Nickel from Mattes and Ores; Electrolytic Separation of ——. E. A. Sjostedt and J. H. James, Assignors to F. H. Clerque, all of Sault Ste. Marie, Canada. U.S. Pat. 725,998, April 21, 1903.

The matte or ore is crushed and desulphurised and subjected to a 40 per cent. sulphuric acid solution heated to boiling point to dissolve out the iron, copper, and nickel. The liquor is cooled, diluted sufficiently to redissolve the salts which have crystallised out and the copper deposited by electrolysis, the solution being agitated with a current of air. Copper cathodes, and platinum or graphitised carbon or other insoluble anodes are used, with a gradually reduced current commencing with a normal density of about 0·3 ampère per 100 sq. cm. of cathode surface. The remaining solution is nearly neutralised with caustic soda, and then made ammoniacal. The iron is oxidised by a blast of air, the precipitated ferric hydroxide filtered off, and the liquor, heated to 80° or 90° C. and agitated by a current of air, electrolysed to deposit the nickel (using nickel cathodes, and graphitised carbon or other insoluble anodes) with a current of normal density of from 0·6 to 0·9 ampère per sq. cm. of cathode surface.—G. H. R.

Electrolytic Coating Apparatus. H. W. Botz, Ludwigshafen-on-the-Rhine, Assignor to the Firm of Columbus Elektrizitäts-Gesellschaft. U.S. Pat. 725,208. April 14, 1903.

The apparatus for coating sheet metal consists of two frames, one fixed and the other movable, each provided with distance pieces, and carrying anodes with shielding pieces at their sides. The fixed anode has a horizontal support at its foot, and the other anode is guided in vertical position, and is supported on a carriage which removes and carries it back.—G. H. R.

French Patents.

Diaphragm for Electrolytic and Galvanoplastic Applications. Soc. l'Autométallurgie. Fr. Pat. 325,074. Oct. 9, 1902.

The diaphragm is formed of a permeable tissue of any kind, impregnated with any organic or albuminoid substances, such as albumin, gelatin, &c., rendered insoluble by the addition of formic aldehyde, or in any other way. It is claimed that diaphragms thus formed prevent any intermingling of the liquids placed in different parts, whilst permitting the passage of the electric current, and giving to the deposited products all the essential qualities of a wrought and finished metal.—G. H. R.

Electric Furnace for the Electrometallurgy of Iron or of its Compounds. H. Harmet. Second addition, dated Aug. 30, 1902, to Fr. Pat. 318,283, Feb. 1, 1902. (See this Journal, 1902, 1459.)

This addition defines the position of the electrodes. The horizontal length of the slag between the two lower extremities of the electrodes is less than the sum of the two vertical thicknesses of it between the electrodes and the melted metal. This disposition allows of the production of the electric calories in the slag only where they are useful for the fusion of the solid matters which are steeped in the slag.—G. H. R.

Electric Furnace for the Electrometallurgy of Iron or of its Compounds. H. Harmet. Third addition, dated Sept. 5, 1902, to Fr. Pat. 318,283, Feb. 1, 1902. (See this Journal, 1902, 1459.)

A modification in the shape of the reducer is described, the lower part of it being divided into sections by a joint. The upper portion constitutes the reducing vessel, and the lower one the crucible proper where the fusion takes place. Besides the usual holes for the flow of the metal or the slag, this lower crucible has lateral openings for the insufflation of gases and for the passage of the numerous electrodes which transmit the several currents for the purpose of producing heat in the slag which transmits it to the materials to be melted.—G. H. R.

Copper and other Metals; Electrometallurgical Treatment of the Ores of ——, with Depolarised Insoluble Anodes. C. J. Tossizza. First addition, dated Sept. 26, 1902, to Fr. Pat. 308,382, Feb. 22, 1901.

See Eng. Pat. 14,751, 1901; this Journal, 1902, 775, and U.S. Pat. 710,346, 1902; this Journal, 1902, 1336. —G. H. R.

Calcium; Process for the Extraction of Metallic ——. Soc. Elektrochemische Werke G. m. b. H. Fr. Pat. 324,303, Sept. 9, 1902.

The fused haloid salts of calcium, especially the fused chloride are electrolysed with the employment of small cathodes and large anodes, the temperature being maintained so as not to exceed the melting point of the metallic calcium. The metal which is separated out in a spongy condition at the cathode, is compressed within the bath and is afterwards withdrawn from it.—G. H. R.

Aluminium, Pure or Alloyed; Covering ——, with different Metals, and Soldering. J. L. Baille. Fr. Pat. 324,981, Oct. 4, 1902.

Successive layers of copper and of zinc (preferably, though other metals are also claimed) are electrically deposited on cleansed aluminium, which is then heated, so as to cause these metals to make a superficial alloy with the same. The aluminium thus prepared may be coated with any desired metal, such as gold, silver, or nickel, or may be soldered to another piece of aluminium, whether or not that other be similarly prepared.—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fatty Acids [Unsaturated]; Oxidation of ——, by Mean of Caro's Reagent. A. Albitzky. J. prakt. Chem. 1903, **67**, [8—9], 357—376. (This Journal, 1900, 357 1903, 306.)

In previous experiments the author has shown that th dihydroxy acids formed by the oxidation of stereoisomeri unsaturated fatty acids in acid solution belong to a differen series to those formed by oxidation with alkaline permanganate solution. It is necessary to use an oxidisin agent with a not too energetic action, and since iodic acid di not yield satisfactory results, experiments were made wit Caro's reagent ($H_2SO_4 + (NH_4)_2S_2O_8$). The reaction were the converse of those obtained by treatment wit alkaline permanganate solution. Thus oxidation of oleic aci with alkaline permanganate solution yielded about 64 pe cent. of the theoretical amount of the dihydroxystear acid of higher melting point, whilst about 40 per cent. the theoretical quantity of the same acid was obtained b oxidising elaidic acid with Caro's reagent. Oxidation oleic acid with Caro's reagent gave only 7·5 per cent. the theoretical amount of the dihydroxystearic acid of low melting point. On the other hand, the yields of dihydrox behenic acids from erucic and brassidic acids were co siderably greater on oxidising with Caro's reagent than oxidation with alkaline permanganate solution.

On oxidising with alkaline permanganate solution, solub dibasic acids (*e.g.*, azelaic acid) are formed in addition dihydroxy acids, but these were not found in the case oxidation with Caro's reagent, the product of the reacti being insoluble in water.

The author concludes that by the action of Caro's reage on unsaturated acids, sulphonated esters of dihydroxy ac are first formed, analogous to the addition compou formed by the action of sulphuric acid on oleic acid, that on the addition of water, these esters are decompos being converted partly into sulphuric acid and dihydro acid, and partly into substances of an anhydride charact The residue left after the formation of dihydroxystea acid was found to contain not more than 2·29 per cent. sulphur.—C. A. M.

Fatty Acids; Action of Zinc-dust at High Temperatu on ——. Hébert. Bull. Soc. Chim., 1903, **29**, [322—327.

In extending his investigations (this Journal, 1903, 42 the author has repeated Jahn's experiments with form acetic, and butyric acids, and has also examined behaviour of an acid intermediate in the series, lauric a $C_{12}H_{24}O_2$. In the case of the low-carbon acids, the hyd carbon products are simple and always directly related the original acid; but with the C_{12} (and still more the member there is always a more or less complex polymer tion, and the hydrocarbons produced bear no obvi relation to the acid used. In all cases the correspond ketone appears to be produced in the first place, and to then decomposed, with production of carbon diox hydrogen, and alkylenes (olefines) both higher and lo in carbon than the original acid.—J. T. D.

Palmito-distearin; Naturally occurring and Synthet ——. H. Kreis and A. Hafner. Ber., 1903, **36**, [1123—1128.

In a previous communication (this Journal, 1902, 1542) authors showed that repeated crystallisation of beef-fa

rd from ether yielded compounds which they concluded
› be mixed glycerides, and they now state that these mixed lycerides consist of palmito-distearin.

For the purpose of identification they first prepared nthetically palmito-distearin and stearo-dipalmitin. On eating equivalent weights of stearic acid and glycerin under duced pressure for eight hours at 200° C. the resulting roduct was not monostearin, as anticipated, but mainly stearin (m. pt., 74·2° C.), apparently identical with the distearin prepared by Guth (this Journal, 1903, 427), hilst monostearin had only been formed in small proporon. On heating the distearin with palmitic acid under duced pressure at 200° C. and recrystallising the product the reaction from ether, palmito-distearin was obtained. his melted at 52° C. and 63·2° C., but in the crystalline ate had only one melting point:—63·2° C. (Guth, 63° C). ansen (this Journal, 1902, 553) stated that it was aracteristic of this glyceride that its melting point did ot alter on recrystallisation from ether, benzene, or loroform, but that when crystallised from boiling amyl cohol the melting point was raised to 66·8° C., and he tributed this to conversion of the glyceride into tri-almitin and tristearin. The authors are unable to confirm is, and doubt the identity of Hansen's palmito-distearin. oreover, they point out that the melting point of Hansen's earo-dipalmitin (55° C.) does not agree with that of Guth's mpound (60° C).

They confirm Guth's observation (*loc. cit.*) as to the uble melting points of triglycerides, and agree with his planation.

In order to obtain glycerides from lard, &c., quite free om olein, the authors treated the crystals with Hübl's lution, and then recrystallised them from benzene and cohol, and finally from ether until quite free from halogen.

The palmito-distearin thus separated from beef or mutton t crystallised from ether or petroleum spirit in brilliant anches of needles, which melted at 63·5° C. in the crystalne state and at 52° C. and 63° C. after having been melted. hey had the saponification value of 191·8 (Theory = 195·2). he compounds obtained from beef- and mutton-fat were entical in appearance and melting points, and corresponded th Guth's synthetical α-palmito-distearin.

The glyceride from lard crystallised in long flat plates th sharply cut ends, and melted at 51·8° and 66° C. (in e crystalline state at 66·2° C. only). It had the saponifition value 195·2, and agreed in elementary composition th palmito-distearin. In the author's opinion it is obably identical with the isomeric β-palmito-distearin, ich has not yet been synthetically prepared.—C. A. M.

its; *Enzymic Decomposition of* ——. K. Braun and E. C. Behrendt. Ber., 1903, 36, [6], 1142—1145.

he authors confirm the experiments of Connstein and his llaborators on castor-oil seeds. It was found that the composition of the oil was much greater in an acid than a neutral solution. Similar experiments were then made th jequirity seed (*abrus precatorius*) containing the enzyme rin. On mixing 15 c.c. of castor oil with 25 c.c. of water d 25 grms. of crushed jequirity seeds, the alkali required r neutralisation after 20 hours was 3·6 c.c., and had not creased after 40 and 92 hours. By neutralising, however, e acid first liberated it was found that jequirity promoted e decomposition of the fat. Thus, in an analogous periment the following amounts of alkali were required:—fter 24 hours, 3·0 c.c.; after 48 hours, 3·7 c.c.; after hours, 5·7 c.c.; and after 96 hours, 6·8 c.c.

Experiments were made with crushed almonds (emulsin) d with the leaves of *Arctostaphylos Uva Ursi*, containing e glucoside arbutin, but in neither case was there any crease in the decomposition of the oil.—C. A. M.

rachis Oil; Presence of Sesamé Oil in Commercial ——. G. Fendler. Zeits. Unters. Nahr.- u. Genussm., 1903, 6, [9], 411—412.

ltsien (this Journal, 1901, 1121) found that it was actically impossible to obtain commercial arachis oil free om sesamé oil, and that in some cases as much as 15 per cent. was present. The author's examination has confirmed this, and he considers that the admixture is not due to accidental impurities during the expression. He advocates the adoption of Schnell's suggestion, that arachis oil that gives the Baudouin reaction, but does not give Soltsien's stannous chloride reaction, shall be regarded as free from sesamé oil, since the former will detect mere traces (less than 1 per cent.).—C. A. M.

Candle-Nut Oil. F. Kassler. Seifensieder-Zeit.; Farben-Zeit., 1903, 8, [26], 359.

A sample of candle-nut oil from Fiji, examined by the author, gave the following constants: sp. gr., 0·9248 at 15·5 C.; Hehner value, 95·2; saponification value, 189·5; iodine value, 152·8 (Lewkowitsch found this value 163·7); acetyl value, 9·52; acid value, 0·5; solidification point of the fatty acids, 12·5 C.; m. pt. of same, 19·5 C., and iodine value, 157·5. The percentage of oil furnished by the kernels was upwards of 64½, and the proportion of unsaponifiable constituents in the oil, 0·53 per cent. The kernel itself forms only about 32 per cent. by weight of the nut. Owing to the resemblance between these data and those furnished by linseed oil, an analogous sphere of usefulness is indicated; the cost of freight, however, militates against the shipment of the nuts to Europe, and it is therefore considered that the oil will have to be recovered in the centres of production.—C. S.

Flax Wax; Characteristics of ——. C. Hoffmeister. Ber. 1903, 36, [6], 1047—1054.

The suppleness and odour of flax are due to a characteristic fat-like substance on the surface of the fibres. If this be removed by means of a suitable solvent, the residual fibres are rough, lustreless, and brittle. On evaporating the yellow solution thus obtained, a wax-like residue is left, which varies in colour from white to yellowish green or brown, and has a strong odour of flax. It is insoluble in water, partially soluble in alcohol, dissolves with difficulty in chloroform, but is readily soluble in ether, benzene, &c. A hot saturated alcoholic solution deposits crystalline granules on cooling. This flax wax floats on water, and has the sp. gr. of 0·9083 at 15° C. It melts at 61·5° C. (average of 10 determinations) and burns with a smoky flame without leaving any weighable residue.

The amount obtained varies according to the kind of flax, and appears to stand in a certain relationship to the fineness and purity of the fibres. Thus, an imperfectly cleansed flax gives a large yield of the wax, which appears to be derived from the cuticle of the plant. A sample of the so-called flax dust from a factory, which has hitherto only found a use as an inferior fuel, yielded 10 per cent. of the wax.

On analysis the substance gave the following results:—Unsaponifiable residue, 81·32 per cent.; acid value, 54·49; saponification value, 101·51; Reichert-Meissl value, 9·27; Hehner value, 98·31; and iodine value, 9·6.

The unsaponifiable residue was a hard, brittle, yellowish-brown substance. On acetylation it yielded an insoluble residue melting at 68° C., and having the sp. gr. of 0·9941 at 10° C. Its elementary composition (C = 83·91 and H = 15·40 per cent.) showed it to be a paraffin closely allied to ceresin. It constituted 70—80 per cent. of the original wax. The fatty acids were separated into solid and liquid constituents by treatment of the lead salts with ether. The solid acids fractionated by Heintz's method were found to contain palmitic and stearic acids, whilst the liquid acids examined by Hazura's oxidation method were judged to consist of oleic, linolic, linolenic, and isolinolenic acids. In addition to these substances, the wax also contained phytosterol and ceryl alcohol, and a small amount of a volatile substance of an aldehydic character which was not identified.—C. A. M.

Cod-liver Oil. Wijs. XX., page 648.

Glycerin in Soap Leys; Determination of ——. R. Fanto. XXIII., page 654.

United States Patents.

Oil-Bearing Materials; Process of Treating ——. N. B. Powter, Brooklyn (N.Y.), Assignor to the Powter Co., New York. U.S. Pat. 725,363, April 14, 1903.

The oil-bearing material is heated, and simultaneously exposed to the influence of suction so as to produce a partial vacuum, after which, it is raised to a higher temperature in presence of a dry compressed gas (air). The oil separated out during the second stage is collected, the residue is treated with water to extract glue and other soluble products, and after the separation of these latter, the residue is dried.—C. S.

Hydrated Silicates; Reviving —— [*Purification of Oils, &c.*]. C. A. McKerrow, Manchester. U.S. Pat. 726,091, April 21, 1903.

See Eng. Pat. 10,825, 1901; this Journal, 1902, 555.
—W. C. H.

French Patents.

Oils, Fats, and other Saponifiable Materials: Treatment of ——. C. Weygang. Fr. Pat. 325,038, Oct. 7, 1902.

See Eng. Pat. 17,988 of Sept. 9, 1901; this Journal, 1902, 1403.—C. A. M.

Soap; Antiseptic and Antiparasitic ——. H. Schowalter. Fr. Pat. 324,870, Sept. 30, 1902.

Ninety-five parts of ordinary green soap are incorporated in the melted state with $2\frac{1}{2}$ parts of purified "pine black," and after cooling to 25°—26° C., $2\frac{1}{2}$ parts of cresol are added, and the mass intimately mixed, and cooled as rapidly as possible.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

English Patents.

Pigments; Process of Manufacturing ——, *and the Product resulting therefrom.* W. J. Armbruster and J. Morton, St. Louis, Mo., U.S.A. Eng. Pat. 1836, Jan. 26, 1903.

See U.S. Pat. 719,415, 1903; this Journal, 1903, 307.
—M. J. S.

Pigments; Compositions of Matter to be used for ——, *and Process of Making the same.* W. J. Armbruster and J. Morton, St. Louis, Mo., U.S.A. Eng. Pat. 1837, Jan. 26, 1903.

See U.S. Pat. 719,073, 1903; this Journal, 1903, 218.
—M. J. S.

United States Patents.

Pigments; Process of Making ——. W. J. Armbruster, St. Louis, Mo., U.S.A. U.S. Pat. 726,239, April 28, 1903.

Barium hydroxide is added to zinc chloride or any soluble zinc salt except the sulphate; zinc sulphate is then added, and the resulting mixed precipitate is heated to dehydrate the zinc hydroxide. Compare U.S. Pats. 719,073, 719,115; this Journal, 1903, 218, 307.—M. J. S.

Carbon Black; Apparatus for the Manufacture of ——. F. W. Porsch, Summitville, Ind., U.S.A. U.S. Pat. 726,341, April 28, 1903.

Immediately above the burners there is situated a depositing plate, consisting of two horizontal concentric bevelled rings, the larger ring being at a higher level than the smaller. The rings are rotated by friction gearing, and are provided with scrapers for both their upper and lower surfaces. Through the annular space between the rings the smoke rises into a conical flue, the axis of which is inclined obliquely, and which is caused to rotate by the frictional contact of its lower edge with the face of the upper ring. Fixed scrapers inside the flue detach the black deposit, which falls into a collecting hopper.
—M. J. S.

Pigment: and Process of Making same. W. N. Blakeman, jun., New York, U.S.A. U.S. Pat. 726,623, April 28, 1903.

Gelatinous zinc hydroxide, with or without an additional hydroxide, is incorporated with zinc oxide by means of a volatile vehicle, which is then evaporated.—M. J. S.

French Patents.

Aniline Lakes; Manufacture of ——. Soc. Hanappier and Maillard. Fr. Pat. 324,974, Oct. 4, 1902.

Equal parts of gum tragacanth and gelatin, in powder paste, or solution, are mixed with 3 parts of whiting o any other suitable inert substance. The dyestuff is the added, and then some substance, such as tannin or formalin which will produce with the gelatin a compound not liabl to putrefaction. The paste is then dried and is mixe with either linseed oil or an oxidising siccative.—M. J. S.

Lead Carbonate [*White Lead*]: *Process and Apparatu for Producing* ——. Union Lead and Oil Co. Fr. Pat 325,182, Sept. 20, 1902.

See U.S. Pats. 709,954 and 709,955 of 1902; this Journa 1902, 1337.—T. F. B.

Lead Carbonate [*White Lead*]; *Process and Apparat for Producing* ——. Union Lead and Oil Co. Fr. Pa 325,183, Sept. 20, 1902.

See U.S. Pat. 709,956 of 1902; this Journal, 1902, 1337.
—T. F. B.

Colours for Painting; Process of Manufacturing ——. E. Sass. Fr. Pat. 324,819, Sept. 25, 1902.

Ten parts of paraffin, 10 parts of ceresin, 10 parts carbolineum, and 70 parts of turpentine are boiled togeth and cooled. This mixture applied to wood, cardboard, & is completely absorbed, gives a gloss to the surface, a protects from the attack of insects.—M. J. S.

Casein Compositions for Painting, Over-laying, &c Impts. in ——. J. R. Hatmaker. Fr. Pat. 325,0 Oct. 6, 1902.

The following composition suitable for various kinds overlay-work becomes almost impervious to moisture wh dried. Dry casein, 90 parts, by weight; resin, oil, or f 90 parts; lime to which has been added 5—10 per cent. aluminium sulphate or zinc sulphate in solution, 90 part together with mineral or other pigments according to desired purpose, and sufficient water to make into a pa If resin is employed it should be powdered and mixed w the other constituents; the oil or fatty matter should emulsified in skim milk and separated together with casein by means of acid.—R. L. J.

Paint; Process for the Application of ——, *to Cem Surfaces.* S. Levy. Fr. Pat. 325,209, Oct. 10, 1902.

The rough, but well-cleaned, cement surface is first trea with a solution of an ammonium salt, and before this quite dry an oil paint, thinned with oil of turpentine applied. The surface is then ready to receive a coat of oil paint.—M. J. S.

Metallic Surfaces; Removing the Colour [*Paint*] *fro* ——. J. N. Firth. Fr. Pat. 325,161, Sept. 3, 1902.

Painted metal surfaces are dipped for some seconds i hot aqueous solution, containing about $2\frac{1}{2}$ per cent. each potassium and sodium hydroxide, and are then rinsed in water and cleaned. The process is particularly applic in treating painted sheet tin to fit it for re-use.—E. S.

(*B.*)—RESINS, VARNISHES.

English Patents.

rying Machines [*for Veneer*]. M. Rossow. Eng. Pat. 8856, April 16, 1902. I., page 618.

etroleum or Mineral Oil Distillates; Manufacture of Nitro-products from ——. L. Edeleanu and G. A. Filiti. Eng. Pat. 9416, 1902. III., page 621.

French Patents.

noleum, Floor-cloth, Tarpaulins, and similar Preparations; Composition for the Manufacture of ——. M. G. Peters and J. A. Shepherd. Fr. Pat. 324,885, Oct. 1, 1902.

e Eng. Pat. 268, 1902: this Journal, 1903, 36. The troleum and lime water are omitted in the French ecification.—M. J. S.

noleum, consisting of two Layers; Process of Manufacturing ——. L. W. Seeser. Fr. Pat. 325,129, Aug. 23, 1902.

produce a linoleum consisting of a hard upper layer d a soft lower layer, the hard layer must first be formed d the soft layer be applied to its under surface. This y be performed in a single, continuous operation, by st compressing the composition which is to form the per layer between rollers and conducting the sheet so oduced round one of these rollers until it reaches a third ler, which is adjusted to give a weaker compression. At s point the composition for the soft layer is fed in, but is pt from contact with the upper sheet, by means of a rtition plate, until it reaches the place where the pressure the rollers is exerted, at which point there is also roduced a small quantity of an adhesive paste to ensure union of the two sheets.—M. J. S.

(*C.*)—INDIA-RUBBER.

Caoutchouc; Coagulation of ——. C. O. Weber. Gummi-Zeit., 1903, **17**, [30], 652.

lius has recently shown (this Journal, 1903, 434) that y acids with complex molecules have the power of idly and energetically effecting the coagulation of umin. In view of the fact that the coagulation caoutchouc latex is due to the coagulation of the uminoids contained therein, Mylius' results should ow light on the problem as to which is the most suitable d for effecting the coagulation of caoutchouc latex. droferrocyanic, tungstic, and gallic acids appear to be most likely ones, and only very small amounts should aeded. Hydroferrocyanic and tungstic acids could be d in the form of a solution of the sodium or potassium t, treated with an equivalent amount of acetic acid.

—A. S.

United States Patent.

nenting Substances; Process of ——. W. M. imberlin, Assignor to the Goodyear Tyre and Rubber o. U.S. Pat. 725,094, April 14, 1903.

is process consists in coating the substances to be ted with a rubber or gutta-percha solution, treating the ting on each with a curing solution, and pressing the faces together.—J. K. B.

V.—TANNING; LEATHER, GLUE, SIZE.

ther; Action of Extracts containing Sulphites on ——. J. Paessler. Collegium, 1903, **2**, [51], 66—70. eport of the Annual Conference of the International ssociation of Leather Trades Chemists, Leeds, Sept. 902.

racts which have been decolorised and rendered ble by treatment with sulphites, produce free sulphuric d in the resulting leather when used in conjunction with liquors, owing to liberation of sulphur dioxide and subsequent oxidation. Lactic acid (0·4 per cent.) was added to samples of such extracts to imitate tan-yard conditions, and tanning experiments made with these liquors. The total amount of sulphur dioxide varied from 0·2 per cent. to 4·55 per cent., and the amount of free sulphuric acid (calculated as SO_3) found in the leather ranged from 0·19 per cent. to 1·44 per cent. As evidence that sulphur dioxide is oxidised, a quebracho liquor of 2° B. strength was prepared from the wood, treated with sulphur dioxide, and allowed to stand in flasks under such conditions that oxidation was limited as far as possible. The odour of sulphur dioxide, however, slowly disappeared, and in the course of 5½ months the percentage of sulphuric acid present (calculated as SO_3) rose from 0·006 to 0·265.

Parker and Gansser claim that the evidence brought forward by them in a previous paper (Collegium, 1902, 49) as to the harmless nature of sulphites in extracts is supported by practical experience.—R. L. J.

Barium Chloride; Stains produced in Leather by ——, *in Contact with Salts of Alkaline Earths.* J. G. Parker and H. R. Procter. Collegium, 1903, 2, [55], 93—99. Report of the Annual Conference of the International Association of Leather Trades Chemists, Leeds, Sept. 1902.

Leather which has been weighted by means of barium chloride, is liable to show stains if it comes in contact with salts of lime or other alkaline earths.

The reaction may be demonstrated in a test-glass by adding barium chloride solution to a clear tan-liquor. No precipitation is observed, but when an alkaline salt is added, a precipitate of barium tannate forms on standing, which is at first grey, but turns brown and finally black.

—R. L. J.

Tannins; Composition, Molecular Weight, Identification and Separation of ——. C. Korner. XXIII., page 654.

Chromic Acid in Tan Liquors; Rapid Technical Method for the Determination of Free ——. C. Dreher. XXIII., page 652.

Glue; Valuation of ——. R. Kissling. XXIII., page 655.

United States Patent.

Hides, Skins, and other Animal Tissue; Process of Tanning ——. O. P. Amend, New York, U.S.A. U.S. Pat. 725,648, April 21, 1903.

The use of a nitrite of a tanning metal (iron, chromium, or aluminium) in conjunction with (*a*) vegetable tannages, (*b*) mineral tannages, is claimed. (See this Journal, 1902, 1544, and 1903, 37.)—R. L. J.

French Patent.

Calcium Carbide as a Soaking, Unhairing, and Plumping Agent in the Tan-yard, and for Preserving Offal for Gelatin Manufacture. L. V. Dubray. Fr. Pat. 324,912, Oct. 2, 1902.

A solution of calcium carbide in water or the waste liquor from acetylene generators is employed for soaking down hides, loosening the hair, and plumping them before tanning, and also for treating the offal preparatory to the manufacture of gelatin.—R. L. J.

XV.—MANURES, Etc.

Phosphoric Acid; Determination of ——, *by the Citrate Method.* A. Verweij. XXIII., page 652.

Fertilisers; Determination of Potash in —— C. L. Hare. XXIII., page 652.

French Patents.

Fertilisers; Process [*Electrical*] *of Making* ——. J. J. and R. Crooke. Fr. Pat. 324,211, Sept. 8, 1902.

See Eng. Pat. 19,583 of 1902; this Journal, 1902. 1515.

—G. H. R.

Manures Rich in Nitrogen; Process for Preparing Potassic ——. G. Jacquemin. Fr. Pat. 324,515, Sept. 17, 1902.

The mother liquors of sugar works are concentrated to about 30° B. and distilled with quicklime in quantity sufficient to decompose the betaine, asparagine, &c., forming other simpler amines, which are led into slightly diluted hydrochloric acid.

The solution of hydrochlorides of amines thus obtained is evaporated, and the methyl and ethyl chlorides collected; the residue consists of ammonium chloride.

The residue from the first operation is treated with sulphuric acid and mixed with the ammonium chloride resulting from the above treatment. This forms a "complete" manure, containing ammonium sulphate, potassium chloride, and calcium sulphate.—T. F. B.

XVI.—SUGAR, STARCH, GUM, Etc.

Cane Sugar; Deterioration of ——, *on Keeping and during Transport.* H. C. Prinsen Geerligs. Mededeelingen van het proefstation voor suikerriet in West Java "Kagok" te Pekalongan, **61**, 1—45; Chem. Centr., 1903, **1**, [16], 939.

The author has made experiments as to the deterioration, by inversion, of sugar on keeping, and during transport, resulting in a decrease of the polarisation and an increase of the proportion of water and glucose. He finds that the inversion is caused by microbes, and is promoted by moisture. To prevent this deterioration, the sugar should be well dried at a temperature not exceeding 95° C., and, after cooling, packed in Java baskets lined with leaves. The leaves should previously be disinfected with a 1 per cent. solution of carbolic acid at 70° C., and dried in a current of air.—A. S.

Yeast, Brewers' Grains, Hops, and Starch: Determination of Moisture in ——. J. F. Hoffmann and J. H. Schulze. XXIII., page 655.

English Patents.

Sugar Juices; Improved Process of Purifying —— A. Kollrepp and A. Wohl, Germany. Eng. Pat. 9048, April 18, 1902.

See Fr. Pat. 319,635, March 15, 1902; this Journal, 1902, 1545.—T. H. P.

Starch; Process for Rendering —— *Soluble.* L. Blumer (H. Zwieger's successor), Saxony. Eng. Pat. 10,872 May 12, 1902.

See Fr. Pat. 322,206, June 18, 1902; this Journal, 1903 310.—T. H. P.

United States Patents.

Lead Sucrate; Process of Making ——. [*Sugar Purification.*] A. Wohl, Germany. U.S. Pat. 726,130, April 21 1903.

The improvement here described in the art of sugar manufacture consists in adding lead oxide to an impure alkalin saccharine solution at a rate below the rate of crystallisatio of the lead bi-sucrate thus formed. The addition of lea oxide may be preceded by one of a certain quantity of lea bi-sucrate. The total quantity of the latter crystallising ou is ultimately removed.—T. H. P.

Starch: Apparatus for Making ——. W. H. Uhlan Leipzig-Gohlis, Germany. U.S. Pat. 725,180, April 1 1903.

The starch is separated in a "square and rectangular tank, having a lateral inlet channel, which slopes downward and is provided with a rounded shoulder for deflecting th starch emulsion to the horizontal direction. A conveye is arranged on the bottom of the tank, which is also fu nished with a lower outlet, and a vertical pipe with regulat for running off the starch emulsion.—T. H. P.

French Patents.

Sugar: Diffusion Apparatus for the Extraction of —— Société d'Hennezel et Cardon. Fr. Pat. 324,623, Sept. 2 1902.

In a diffuser for the extraction of sugar, the central ci culation is assured by a partitioning of the door and water-tight hydraulic joint round the whole periphery, t liquid being thus obliged to traverse the perforated pla supporting the beet slices. A system of bolts for t doors of diffusers, provided with an index, showing, at distance, by means of optical or acoustical signals, t positions of the bolts, is also claimed. The arrangemen are shown in plan in Fig. 1, and in section in Fig. 2. is the door of the diffuser provided with a hydraulic joint at its periphery, and having above it a plate B with a centr

Fig. 1.

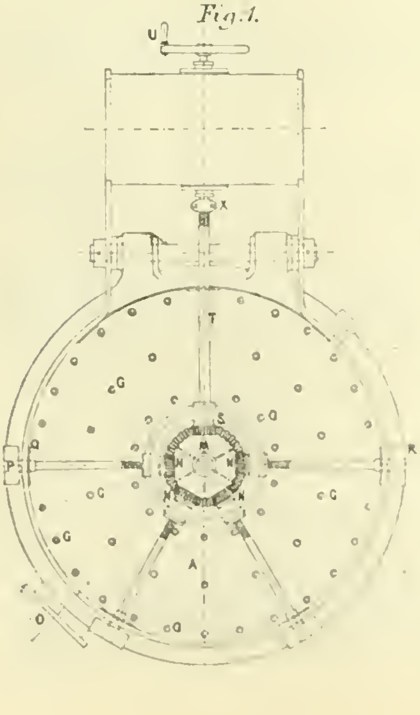
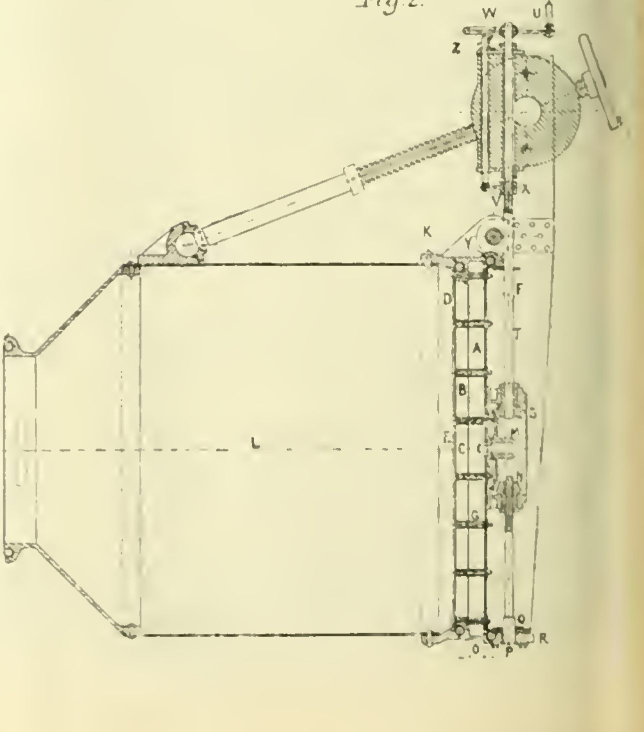


Fig. 2.



erture C. Still higher is another plate D perforated over e whole of its surface except a small part E at the centre ; and B, joined by a ring F, form a cylinder connected with e discharge door by the stays G. The beet slices are suprted on the perforated plate D, and the hydraulic joint K mpletely separates the cylinder L, containing the slices, om the spaces above the door. The liquid passes through then through the hole C on to A, whence it passes out erally through the tube O. In order to render the large ors capable of resisting high pressures, it is necessary to pport them at a large number of equidistant points, and, ther, the fixing of the door to the wall of the diffuser ist be rapid and simple; these conditions are satisfied by ystem of bolts arranged as follows :—A conical gear M, ed to the bottom of the door, actuates a variable number pinions with threaded naves N, which cause the bolts P advance or recede; these bolts are square or oblong and a in blocks Q. M is worked by means of the toothed eel S, carried by the spindle T, which is rotated by the ndle U. An index Z shows the position of the bolts at y time.—T. H. P.

gar Juices ; Process for Regulation of the Supersaturation during the Boiling of Pure ——, especially Thick Syrups. H. Claassen. Fr. Pat. 324,271, Sept. 4, 1902.

is process consists in maintaining in the vacuum pan a ersaturation varying with the purity of the solution. e supersaturation becoming less after the formation of grain, it is systematically increased to the end of the ling in a way corresponding with the diminution in the rity of the mother syrup. The variations in the degree supersaturation are made in accordance with the results experimental determinations—T. H. P.

gar ; Process of Extraction and Instantaneous Crysallisation of ——. P. Lagrange. Fr. Pat. 324,777, Sept. 29, 1902.

rup is boiled to "thread" in the vacuum pan, avoiding production of grain; the degree of vacuum is then dually lowered, and the temperature is allowed to rise. hen 100° C. is reached, the pan is opened to the air, ling still being continued until a temperature of 110°— ° C., or higher according to the purity of the syrup, is ined. The mass is then let down into a special stallising trough, open to the air and provided with tators and a jacket for heating or cooling. A certain ntity of sugar is then dissolved in the syrup to set up letermined degree of supersaturation, taking care that temperature at which solution is effected does not fall ow 108° C. When supersaturation is complete, cold er is admitted to the jacket, and an immediate precipion of sugar takes place. The temperature is gradually ered to a suitable point (*e.g.*, 60° C.), and no more ar is precipitated, but, on the other hand, the grains tinue to increase in size until the mass is judged to be dy for the centrifugals.—J. F. B.

VII.—BREWING, WINES, SPIRITS, Etc.

ast ; Development of ——, in Sugar Solutions without Fermentation. Iwanowski. Centr. Bl. f. Bakter. u. Parasitenk., **10,** [2], 151—154. Chem. Centr., 1903, , [15], 890.

e author has previously found that (1) the higher the centration of nitrogenous substances (peptones) the ker is the fermentation; (2) the higher the concentra of sugar in the nutrient solution, the stronger is the holic fermentation; (3) in solutions which contain ut 0·5 per cent. of sugar and about double that quantity peptone, hardly any alcoholic fermentation is to be rved. In view of Richter's statements (this Journal, 2, 1239), the author has repeated the experiments which him to the above conclusions, and he reiterates his ement that in solutions rich in nitrogenous substances, st loses in a high degree the character of a fermenting nism, whilst, on the other hand, its reproductive power mes greater, notwithstanding access of air, and other rimental conditions remain the same. The influence of the concentration of sugar was also examined, and it was found that yeast can assimilate sugar without causing alcoholic fermentation. The free access of air is, however, not alone sufficient to bring about this state of affairs; it is also necessary to have a nutrient solution of suitable composition. The author considers that Pasteur's theory of the relations between alcoholic fermentation and oxygen must be extended in accordance with the above facts.

—A. S.

Alcoholic Fermentation ; Production of Formic Acid during ——. P. Thomas. Comptes rend., 1903, **136,** [17], 1015—1016.

Rayman and Kruis in 1891 found formic acid in yeast-cultures some years old, and Khoudabachiau in 1892 discovered it in unfermented grape-musts, and found that it increased during fermentation, but attributed this to defective nourishment of the yeast. The author finds that formic acid is produced during the fermentation of sugar solutions by vigorous and well-fed yeasts, provided there be included in the yeast-food nitrogen in one or other of certain forms. Urea, alone or with ammonium bicarbonate, is the most active substance in this way, but acetamide and its two next homologues are also effective. Some acetic acid always accompanies the formic acid, but the proportion of this is not greater with acetamide than with the more stimulating urea. The acetic acid is relatively increased, however, if to the acetamide be added salts of ammonium (bicarbonate, sulphate, acetate, succinate, aspartate). With different organic ammonium salts the proportion of acetic acid varies. In all cases the amount of formic acid produced is increased if calcium carbonate be added to the liquid. As amides and ammoniacal salts exist in grape-juice and other natural culture media, the existence of formic acid in newly-fermented wines is not surprising. Later it lessens in amount, for it is consumed by the yeast. The author finds that infusion of malt contains formic acid, so that it may be expected in cultures grown in this medium, independently of its formation by the yeast.—J. T. D.

Barley ; Use of Bleaching Powder in the Steep Waters for ——. Stuchly. Oesterr. Brauer. u. Hopfenzeit., 1903, [7], 85; through Woch. f. Brau., 1903, **20,** [17], 207.

The author has carried out experiments on the employment of bleaching powder in the steep-water for barley, and has found that the germinating power of badly germinating barley was improved by the use of bleaching powder; a barley which showed 12—13 per cent. of non-germinating corns in the ordinary way showing only 7—9 per cent. after treatment with bleach. The growth of the barley was also more uniform, and a rootlet development was better. The odour of the grain when couched, however, was unpleasant, and a penetrating odour was noticed in the mash and wort, which latter ran off opalescent, and remained so in the fermenting tun. The finished beer also retained an unpleasant odour of bleach, and a harsh flavour which would entirely spoil it for sale. The use of bleaching powder for steeping is therefore not recommended.—J. F. B.

Hops ; Relations existing between the Aroma and the Chemical Composition of ——, and the Importance of Testing the Aroma. C. Beckenhaupt. Woch. f. Brau., 1903, **20,** [18], 220—222, and [19], 234—235.

It is pointed out that the aroma of hops is just as liable to local and climatic variations as the chemical composition, on which the aroma must depend. It is necessary that the characteristic properties of specific varieties should be determined, and that these properties should be developed in a sufficiently high degree in order that the sample should be admitted as a high-class product of the particular district.

In studying the variations in aroma, as dependent on variations in the chemical composition, the author sprinkled hops with solutions of various salts, and determined the changes in aroma and colour after drying. Samples of fresh hops were employed, one being a Saaz hop of fine aroma and the other an Alost hop of inferior aroma.

After experiments with potassium chloride, sulphate and carbonate, ferrous sulphate, ferrous hydroxide, sulphuric acid, and phosphoric acid, it was found that similar experiments with old hops gave analogous results, but in the case of phosphoric acid the intermediate changes of aroma did not take place, and the hops acquired the vinous aroma immediately. The same was the case when malic acid was employed.

It would appear that the evolution and alterations of the aroma of hops in the natural state are connected with the chemical composition of the plant, and more especially with the relative proportions of the potash and phosphoric acid. It is suggested that by a study of the aroma and of the reactions by which changes may be effected, some classification might be arrived at, and the question of the valuation of hops might be placed on a more scientific basis.
—J. F. B.

Wort; Influence of Length of Acrospire and Nature of Grist on the Composition of the ——. E. Jalowetz and G. Ewald. Allgem. Zeits. f. Bierbrau., 1903, 73—77; Zeits. ges. Brauw., 1903, **26**, [13], 208—209.

Influence of Steeliness.—The fluctuations in moisture content are accidental, and influenced by the classification with the diaphanoscope. Mealy corns yield the largest extract and steely ones the least, whether the grist be coarse or fine, the limits of difference between coarse and fine grist being 1·1 per cent. in the case of friable malt and 4 per cent. in steely malt. Other points of superiority in friable malt are higher cupric reducing power, increased rapidity of saccharification, clearer and lighter coloured wort. The dextrin content increases with the steeliness.

Influence of Length of Acrospire.—The effect on the yield of extract is not great, but the percentage of dextrin increases with the length of the blade until the latter exceeds that of the corn, whereafter an increase in maltose recurs; hence forcing the blade may result in beer with very high attenuation.

Influence of Size of Corns.—The yield of extract increases with the size, the difference between that furnished by the largest and smallest corns being 1·6 per cent., or even 3·2 per cent. when coarse grist is used. In special cases the percentage of dextrin also increases with the size of the corns.

Influence of the Nature of the Grist.—The kernel of the malt gives 90·5 per cent. of extract, but only a small quantity is yielded by the grains. The percentage of dextrin in the two extracts is approximately the same, and therefore the authors are of opinion that, so far at least as the carbohydrates are concerned, the objections urged against the utilisation of extract from the grains are without foundation.—C. S.

Wines; Employment of Carbon Dioxide for the Treatment and Drawing-off of ——. A. dal. Piaz. Allgem. Wein-Zeit., 1903 [3]; through Woch. f. Brau., 1903, **20**, [17], 215.

Commenting on the increasing popularity of highly gassed beers, the author expresses the opinion that the value of carbon dioxide has not been sufficiently appreciated in the wine industry. An excess of carbon dioxide in wine not only makes it fresher, sweeter, and more aromatic, but imparts to it a strength beyond that due to the alcohol present. For this reason wine drawn straight from the lager cask in a cold cellar always has a superior value to wine which has lost its natural gas by transport and other treatments. The author further deals with the favourable influence of carbon dioxide on the keeping qualities of wine. It is recommended that wine should be drawn off from cask under a pressure of carbon dioxide in a similar manner to draught beer. The Moselle wines, in the treatment of which carbon dioxide is employed, are increasing in popularity. An extension of the use of carbon dioxide in racking, bottling, and serving of wine on draught is advocated. The presence of carbon dioxide protects the wine in a half-empty cask from the attacks of moulds and acetifying organisms in the air, and the objectionable practice of sulphuring can be dispensed with.
—J. F. B.

Yeast, Brewers' Grains, Hops, and Starch; Determinatio of Moisture in ——. J. F. Hoffman and J. H. Schulz XXIII., page 655.

Yeast Extracts. H. Zellner. XVIII. A., page 645.

Saccharin; Detection of ——, *in Beer, Wine, &c.* C. Boucher and F. de Boungue. XXIII., page 653.

Methyl Alcohol in Absinthe; Detection of ——. Sangl Ferrière and Cuniasse. XXIII., page 653.

Aldehydes; General Reaction for —— [*Detection of Ald hyde in Spirit*]. E. Riegler. XXIII., page 653.

English Patents.

Malt; Manufacture of ——. W. P. Thompson, Londo From Maschinenfabr. vorm. Gebrüder Seck, Dresden, a H. Krusemark, Plauen, Germany. Eng. Pat. 13,76 June 17, 1902.

Malt is first shredded by passing through a pair of flut rollers; the husks are then separated and freed from flo and grist by passing over a screening device; the husks a grist are subsequently milled separately in any suita manner, and finally mixed together in the original pr portions. In this way it is possible to obtain a perfect reduced malt grist without excessively crushing the hus and thereby lowering their filtering value.—J. F. B.

Brewing: Impts. in ——. G. G. M. Hardingham, Londo From H. Johnson, Brussels. Eng. Pat. 11,100, May 1902.

Pulverised raw grain is heated in a converter, and t resulting mash is removed by means of steam- or a pressure into a separate vessel. A previously prepar malt mash is then introduced into the converter, and original grain mash, now partially cooled, is returned to t converter and mixed with the malt mash. The mixture heated to 80° C. for a short time, cooled to 68° or 69 and saccharified at that temperature by a portion of m extract previously withdrawn during the preparation of malt mash. When the conversion is complete, the ma is run off to a filter-press, in which it is filtered and wash
—J. F. B.

Tanks for Cooling Liquid [*Wort, Beer, &c.*]. H. Hur London. Eng. Pat. 4248, Feb. 23, 1903.

The sides and bottoms of the tanks are formed w bulges or pockets, which permit the expansion and c traction due to the variations in temperature to which tanks are subjected, and thus obviate to a great extent risk of the plates buckling and cracking. The pock serve also to assist in the collection of any sludge deposit from the liquid.—R. A.

French Patent.

Beer Wort possessing any desired Degree of Fermentabili Preparation of ——. A. Eckardt. Fr. Pat. 324,7 Sept. 24, 1902.

Malt is mashed and the clear main wort is run off; residual grains are then treated with water in presence o basic substance, such as an alkali or alkaline earth, or th carbonates; the mixture is heated for a longer or shor time in order to complete the extraction, after which acid is added to precipitate albuminoids, the quantity of acid being regulated so as to leave a portion of the alk still in combination as lactate. The extract so obtaine mixed with the main wort, and maintained at a suita temperature for saccharification. It is stated that greater the proportion of base in combination with min acids, the greater is the fermentability, whilst the revers the case when the proportion of base in organic combinat is increased. If desired, lactates may be added as such.
J. F.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Ioney; Analysis of Congo ——. E. Carpiaux. Bull. Assoc. Belge des Chim., 1903, **17**, [1], 32—35.

A AMPLE of Congo honey—blackish in colour, of disagreea flavour, and contaminated with numerous impurities—w examined by the author in accordance with the method rommended by Grégoire (Kjeldahl method; this Journal, 12, 875), and gave the following composition:—Moisture, 204 per cent.; fructose, 33·86 per cent.; glucose, 34·47 p cent.; saccharose, 1·58 per cent.; wax, 2·27 per cent.; ir luble matter, 1·46 per cent.; ash, 0·58 per cent.; sc ble nitrogenous constituents (expressed as albumin), 0 per cent.; and lactic acid, 0·44 per cent.—C. S.

B ter; Composition of Process-, or Renovated ——. . A. Crampton. J. Amer. Chem. Soc., 1903, **25**, [4], 8—366.

T process of renovating rancid or mouldy butter generally c ists in melting and settling it, drawing off the curd and sa water from beneath the layer of oil, or sometimes by p ing the whole through a separator. The fat is then a ted by means of an air blast, sometimes in a bath of w n water. The fat is finally emulsified with fresh milk w h has been inoculated with a bacterial culture after in oved creamery methods, and the whole is chilled, gr ulated, and churned. Analyses of samples (75) of b r thus prepared, showed that the process had little in ence on the usual analytical constants of the fat, pr ably because low temperatures are maintained during th ıeration.—W. P. S.

Y st Extracts. H. Zellner. Zeits. Hyg., **42**, 461—466. Chem. Centr., 1903, **1**, [17], 984.

Y ST extracts under the names of "Siris," "Ovus," and "uk" have appeared on the market as substitutes for m extracts. The three preparations named are obtained fr beer yeast. In the preparation of "Ovus," the yeast is amed and the fluid mass obtained, concentrated *in vacuo*, til is of the required consistence. "Ovus" has a faint od r, dissolves in cold water to a turbid liquid, reacts fa ly acid, and has a strong saline taste. "Wuk" is ol ned from beer yeast suspended in an equal volume of w r at 60°—70° C.; it occurs as a light brown extract, ba ng a faint odour. "Siris" is obtained by the action of et on yeast, and concentration of the extract obtained. F enius obtained the following results by an analysis of " is":—Water, 29·54 per cent.; ash, 17·29; nitrogenous or ic substances, 49·5 (ammonia, 0·3; albumoses, 0·84; su ances precipitated by cupric hydroxide, 5·74; and ai genous extract substances, 42·6); gum, 3·65; subst es extracted by ether, 0·07 per cent.

ccording to the author, yeast extracts can satisfactorily re ce meat extracts so far as flavour and odour are co erned, but they do not contain the valuable extractive m ers and stimulants—"the meat bases and meat salts" — genuine meat extracts.

r the determination of nucleïn in the extracts, 10 grms. ar issolved in 100 grms. of water, dilute hydrochloric acid is led gradually, and, after standing for several hours, the pr pitate is filtered off. The latter is washed in succession wi water acidulated with hydrochloric acid, pure water, ho lcohol, and boiling ether. It is then fused with sodium ca nate and potassium nitrate, and the amount of phosph c acid in the melt determined.—A. S.

V ogen in Proteid Bodies. T. B. Osborne and F. Harris. XXIII., page 655.

English Patent.

lbumin; Manufacture of ——. A. Jolles, Vienna. Eng. Pat. 10,962, May 13, 1902.

Se U.S. Pat. 707,423, Aug. 19, 1902; this Journal, 1902, 11 —R. L. J.

United States Patent.

Butter; Process of Refining and Preserving ——. Société Française pour la Conservation des Beurres, Boulogne. U.S. Pat. 726,065, April 21, 1903.

The two processes described in this specification consist in (1) melting the butter nearly instantaneously at a temperature of about 35° C., and in a vacuum of about 70 cm. of mercury, and then treating the molten butter with sterilised water under the same vacuum, for the removal therefrom of the solid and liquid impurities, the time occupied in melting the butter not exceeding one minute, whereby loss of natural aroma of the butter is avoided; (2) first forming an emulsion of the purified molten butter with sterilised water *in vacuo*, and then submitting the mixture, while in a liquid state, to the action of a refrigerating agent. —T. H. P.

French Patents.

Butter; Process and Apparatus for the Determination of Water in ——. M. Vogtherr. Fr. Pat. 324,745, Sept. 26, 1902. XXIII., page 656.

Milk; Process for the Desiccation and Preservation of ——. J. R. Hatmaker. Fr. Pat. 324,913, Oct. 2, 1902.

Milk, either whole or skimmed, is rapidly dried at a temperature of about 115° C., on heated rollers or otherwise, and then powdered.

A small quantity of calcium sodium citrate and alkali hypochlorite may be added to the milk before evaporating. —W. P. S.

Food-cake and other Foodstuffs containing Casein; Manufacture of ——. J. R. Hatmaker. Fr. Pat. 324,942, Oct. 3, 1902.

A strong solution of casein in a weak solution of sodium bicarbonate or other convenient alkali, is incorporated with the foodstuff, which is then pressed into cakes.—R. L. J.

(*B.*)—SANITATION; WATER PURIFICATION.

Cyanide Poisoning; Interim Report of the Committee of the Chem., Metall. and Mining Soc. of South Africa upon ——. J. Chem., Metall. and Mining Soc. of South Africa, 1903, **3**, [11], 178—179.

The cyanide process is, *per se*, healthy, the number of fatal cases in the Transvaal being very small, and, with one exception, all due to personal carelessness or pure accident The most important complaints are cyanide eczema and "gassing" due to the hydrocyanic acid gas and arseniuretted hydrogen given off at the zinc-dissolving tanks.

As those deaths from cyanide poisoning have been all due to careless drinking of cyanide solutions in mistake for water, all testing rooms and assay offices must be provided with a proper supply of good drinking water distinctly labelled as such. Cyanide eczema being entirely due to the handling of zinc shavings wetted with cyanide solution, this latter should be replaced by water before the shavings are handled. "Gassing" being due to the inhalation of the hydrocyanic acid gas and arseniuretted hydrogen evolved at the dissolving vats, the Committee recommends that in addition to proper ventilation the vats should be hooded so as to carry the gases into the open air, and that some mechanical form of agitation be adopted to supersede stirring by hand.—H. F. C. G.

Carbon Monoxide in Air; Determination of Small Quantities of ——. Spitta. XXIII., page 652.

Carbonic Oxide and Carbon Dioxide in Vitiated Atmospheres; Determination of ——. F. Jean. XXIII., page 652.

English Patents.

Garbage [for Oil]; Apparatus for Treating ——. C. S. Wheelwright, Bristol, R.I., and J. T. Fiske, Pascoag, R.I., U.S.A. Eng. Pat. 2561, Feb. 3, 1903.

See U.S. Pat. 709,836, 1902; this Journal, 1902, 1285. —W. P. S.

Liquids upon Filter Beds; Apparatus for the Distribution of ——. F. P. Candy, Redhill, Surrey. Eng. Pat. 9179, April 21, 1902.

Moving sprinklers or distributors for sprinkling sewage upon bacteria beds, are supported wholly or partially upon floats, instead of upon bearings, and the device is propelled by the motion of the sewage itself, either through the agency of a water-wheel or by utilising the recoil of the jets of sewage issuing from the distributor under pressure. —L. A.

(*C.*)—DISINFECTANTS.

French Patents.

Noxious Animals and Plants; Process for the Destruction of ——. G. de Istvánffi and L. Vásony. Fr. Pat. 324,305, Sept. 9, 1902.

Claim is made for a process of destroying noxious plants and animals (phylloxera, fungi, moulds, &c.), which consists in treating (by spraying, steeping, &c.) the plants or other objects with solutions of acid sulphates (acid sulphate of calcium or magnesium) of suitable dilution.—A. S.

Soap; Antiseptic and Antiparasitic ——. H. Schowalter. Fr. Pat. 324,870, Sept. 30, 1902. XII., page 640.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose; Soluble ——. L. Vignon. Comptes rend., 1903, **136**, [16], 969—970.

On dissolving oxycellulose (prepared by the action of potassium chlorate and hydrochloric acid on cellulose) in caustic potash solution (30° B.), the temperature rises, and a yellowish viscous solution is obtained, a few lumps separating out on standing, which proved to be cellulose (60 per cent. of the oxycellulose used). The solution, after filtration under pressure, was added, drop by drop, to a strongly cooled solution of hydrochloric acid. An almost white precipitate separated. The quantity was about 10 per cent. of the oxycellulose used. Analysis showed its percentage composition to be identical with that of cellulose, but its heat of formation and its ability to form furfural distinguished it from cellulose. The product is soluble in boiling water to the extent of about 0·4 grm. per litre, and is insoluble in alcohol, ether, and other organic solvents. Caustic potash or soda dissolves it, forming a yellow liquid, which is reprecipitated by the chlorides of the alkali and alkaline earth metals. It is partially soluble in hydrochloric acid, and completely so in nitric acid, nitrous fumes being evolved on boiling. Sulphuric acid carbonises it when hot, sulphur dioxide being evolved. It will reduce Fehling's solution and tint Schiff's reagent a rose colour. —T. F. B.

English Patents.

Pulp; Reducing Fibrous Vegetable Materials to ——. H. H. Lake, London. From C. T. Lee, Boston, Mass., U.S.A. Eng. Pat. 7774, April 2, 1902.

Absorbent, fibrous, vegetable materials, such as bagasse, *i.e.*, the crushed stalks or waste of sugar cane or sorghum, waste flax and jute, corn-stalks, &c., after being thoroughly moistened with water, are treated with chlorine gas for $\frac{1}{2}$—1 hour. They are then washed with water to remove the soluble "chlorine compound of the intercellular matter of the material" and the hydrochloric acid, which are formed, along with the excess of chlorine. The whole of the fibrous material thus treated, it is stated, is resolved into its ultimate fibres and a pulp of excellent quality is produced, while the pith of the material, if present, forms a gelatinous matter, which does not interfere with the laying of the fibre, in making paper, for example, and improves the quality of the resulting pulp.—E. B.

Waste Paper; Process for Preparation and Cleansing of ——, *and Production of Paper Pulp therefrom.* Knopf Patent Paper Pulp Syndicate, London. From A. B. Knopf, Hamburg, Germany. Eng. Pat. 13,269, June 11, 1902.

Waste paper, such as old newspapers, is sorted and then subjected to a tearing or beating operation either in a moist or dry state; it is then treated in a kneading machine t further reduce it, but not to divide the fibres entirely. Th paper is then subjected to the action of a soap solution in washing machine, drained by the aid of suction sudden applied, whilst the pulp is on a wire gauze, to remove th printer's ink and most of the soap, again kneaded an washed, and rinsed in a solution containing less soap, an finally rinsed in clear water. The soap employed may l of a soft nature and manufactured from "olein" or Japa fish oil; the used soap may be recovered by the proce described in Eng. Pat. 13,255 of 1900; this Journal, 190 926.—J. F. B.

Drying Machines [*for Paper*]. M. Rossow. Eng. Pa 8856, April 16, 1902. I., page 618.

Cellulose and Materials Containing Cellulose; Proce for Acetylising ——. L. Lederer, Sulzbach, Bavari Eng. Pat. 11,164, May 15, 1902.

See Fr. Pat. 320,885 of 1902; this Journal, 1903, 160. —T. F. B.

Petroleum or Mineral Oil Distillates; Manufacture Nitro Products from ——. L. Edeleanu and G. Filiti. Eng. Pat. 9116, 1902. III., page 621.

United States Patents.

Cellulose Fibre; Method of Cooking ——. F. E. Go Assignor to S. D. Warren and Co., Boston, Mass. U Pat. 725,071, April 14, 1903.

In the process of preparing cellulose by boiling the n materials containing it with caustic alkali liquor, the boili liquor is constantly withdrawn from the boiler into accessory apparatus, in which it is agitated with slak lime, filtered, and returned to the boiler, thus maintaini its strength.—J. F. B.

Fibre; Apparatus for Manufacturing ——. F. E. Go Assignor to S. D. Warren and Co., Boston, Mass. U Pat. 725,072, April 14, 1903.

The apparatus for conducting the process of boili cellulosic raw materials described in the previous abstr consists of a digester, an accessory decarbonating vessel communication with the digester, an agitator in causticising vessel, filters supported on brackets ther communications between the filters and the digester, means for circulating the liquor through the digester decarbonating vessel.—J. F. B.

Sulphite Lyes; Process of Utilising ——. V. Drew and L. J. Dorenfeldt. U.S. Pat. 726,036, April 1903. VII., page 627.

Composition of Matter [*Cork Substitute*]. E. P. Sm Assignor to M. L. Morrison and G. Schindler, all Chattanooga. U.S. Pats. 726,582 and 726,776, A 28, 1903.

See Eng. Pat. 25,324 of 1902; this Journal, 1903, 569. —T. F. I

French Patents.

Cellulose Esters; Manufacture of ——. A. D. Li W. H. Walker, and H. S. Mork. Fr. Pat. 324,862, Sept. 1902.

See U.S. Pat. 709,922; this Journal, 1902, 1345. —J. F. 1

Celluloid [*Imitation Pearl*]; *Manufacture of* —. Cie. Française du Celluloid. Fr. Pat. 324,891, Oc 1902.

The transparent, iridescent celluloid, as at pre prepared, is made to have a greater resemblance to pearl by inserting between two sheets of the transpa iridescent material a sheet of opaque white celluloid, welding the sheets together by heat and pressure. —J. F.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

l- *mphene ; A High-Rotating* ——. J. Schindelmeiser. russ. phys.-chem. Ges., **35**, 75—76. Chem. Centr., 03, **1**, [14], 835.

F m the essential oil of the Siberian silver fir (*Abies si ica*) the author has obtained a fraction, distilling at 1 —165° C., which has an optical rotation, $[\alpha]_D$ = – ·45°. On refrigeration, a crystalline *l*-camphene is ol ined of m. pt. 40° C.; b. pt. 159°—160° C.; and [= – 94·61°. The hydrocarbon is very volatile, as al is its hydrochloride, which melts at 150° C.; it does n give a crystalline compound with nitrosyl chloride. T portion which remains liquid on refrigeration is *l-* ene, which, owing to the presence of *l*-camphene, has a optical rotation, $[\alpha]_D = -56·10°$; it gives with n syl chloride, a solid compound melting at 106° C. The *l-* nphene described, is evidently identical with the high-r ting "*l*-pinene" obtained by Zelinski and Alexandroff (. russ. phys.-chem Ges., **34**, 848) from the *l*-pinene of R sian turpentine oil by oxidation in stages, by means o ermanganate. Goluboff (J. russ. phys.-chem. Ges., 2 477) has previously isolated a *l*-camphene melting at 3 C., and boiling at 159° C. from the oil of *Abies sibirica*. —A. S.

H notics ; New ——. Fischer and Mering. Pharm. eit., 1903, 225. Chem. and Druggist, 1903, **62**, [1212], 20.

T authors find that the alkyl substituted acetyl and m nyl ureas possess very powerful hypnotic properties. T di-ethyl and di-propyl derivatives are the most effi-ca ous, the ethyl-methyl compound having but a slight a n, and the di-methyl derivative practically no effect. D thyl-acetyl-urea has the constitution $(C_2H_5)_2 : CH.CO.$ N CO.NH_2. A typical compound of this class is *e nal*, a crystalline substance soluble in water, with a s tly bitter taste, and melting at 191° C.—A. S.

M phine ; Decomposition of Iodic Acid by ——, *in Acid olution.* N. A. Orlow. Farmaz. J., 1902, **41**, 79. eits. Unters. Nahr.- u. Genussm., 1903, **6**, [9], 413.

T well-known qualitative test for morphine by means of ic acid cannot be used for the quantitative determination o he alkaloid, since the reaction is irregular, and is in enced by the amount of acid present, the temperature, a duration of action. Concentrated solutions of mor-p e cause immediate reduction, with the separation of ic ne, whilst in the case of weak solutions reduction takes p e after long standing, but is accelerated by the addition of ulphuric acid, and still more by heating the liquid. T separated iodine appears to combine partially with the al loid.—C. A. M.

Apomorphine. R. Pschorr. Ber., 1902, **35**, 4377.

C trary to the views held up to the present, to the effect th of the two oxygen atoms of apomorphine one has a h oxyl function and the other an ethereal, the author sl s that both oxygen atoms are present in phenol-hydroxyl g ps, and that apomorphine is derived from a phenan-th ne nucleus.—A. S.

Lavender Oil. Schimmel's Report, April 1903.

F m French lavender oil a ketone possessing a pleasant o r has been isolated. It boils at 159°—166° C., has a sp. gr. 0·8445, and the composition $C_8H_{16}O$. Its semicar-b ne melts at 116°—117° C.—A. S.

C onella Oil. C. P. Hayley and Co. Chem. and Druggist, 1903, **62**, [1212], 630.

I s stated that citronella oil containing as much as 1 er cent. of petroleum will pass Schimmel's test. The w ers disagree with the statement of Parry and Bennett (Journal, 1903, 163, 439) that resin spirit is used as an a terant, and express the opinion that the adulterant used is Russian kerosene, which can be easily and cheaply o ined by the natives who prepare the oil.—A. S.

Cade Oil (Empyreumatic Oil of Juniperus Oxycedrus) ; Characters of ——. P. Kauffeisen. Répertoire de Pharm., 1903, **15**, [4], 151.

True cade oil, obtained by the destructive distillation of juniper wood, is largely adulterated with, or substituted by, the so-called "veterinary cade oil," which is, in fact, nothing but tar oils from either wood- or coal-tar.

True cade oil has the following characters :—Sp. gr., 0·976; acidity, in terms of acetic acid, 0·99 per cent. It is not completely soluble in 90 per cent. alcohol. It contains neither furfural nor catechol (pyrocatechin). Tar oil or false cade oil has the sp. gr. 1·048; acidity, as acetic acid, 6·61 per cent. It is completely soluble in 90 per cent. alcohol, and contains both furfural and catechol.

Furfural is readily detected in the aqueous washing from the suspected oil by adding a few drops of aniline. The mixture, in the case of pure cade oil, is at first colourless, and on agitation and addition of acid assumes a bright mahogany colour. In the presence of furfural from tar oil, however, an immediate bright red colour is given. Catechol may also be detected in the aqueous washing by the brown colour reaction given with potassium chromate or bichromate. The aqueous washings of true cade oil give no such colour.—J. O. B.

Amber Oil. Schimmel's Report, April 1903, 12.

There are marked differences between genuine amber oil and the commercial article. Both the oils are soluble in 4—4·5 volumes of 90 per cent. alcohol, but the specific gravity and ester value of the commercial oil are lower than those of the pure oil. The saponification value varies between 2·1 and 12·7 in the case of commercial oils, and from 5·1 to 6·5 with pure oils. The greatest difference, however, is shown in the optical rotation, which, with the genuine oil, varies from + 22° 30′ to + 26°, whereas with commercial oils it ranges from 3° 4′ to 12° 55′, whilst in one case it was – 1° 53′.—A. S.

Oils of the Monardæ. J. W. Brandel and J. J. Beck. Pharm. Rev., 1903, 109. Chem. and Druggist, 1903, **62**, [1212], 620.

Oil of *Monarda didyma* (yield, 14 c.c. from 100 lb.) has a sp. gr. 0·902 and an optical rotation of – 10°. It does not contain carvacrol or thymol. The oil distilled from the corolla of *Monarda fistulosa* has a sp. gr. 0·958, and contains carvacrol, thymoquinone, and thymohydroquinone. The oil from the leaves of the same plant has a sp. gr. 0·924 and an optical rotation of – 0° 9′. The oxidation products of carvacrol which occur in the corolla oil do not appear to be present in the oil from the leaves.—A. S.

Angelic and Tiglic Acids ; Preparation of ——, *from Roman Camomile Oil.* E. E. Blaise. Bull. Soc. Chim., 1903, **29**, [8], 327—331.

Oil of Roman camomile was saponified by potash and methyl alcohol. After distilling off the methyl alcohol *in vacuo*, the mass was extracted with water, the aqueous solution exhausted with ether, and the ethereal solution treated with sulphuric acid. The fatty acids so obtained, on extraction with ether, yielded angelic acid. From 500 grms. of the Roman Camomile oil were obtained 180 grms. of crude acids, which yielded 90 grms. of angelic acid and 25 grms. of isobutyric acid. In the neutral portions were found 30 grms. of normal butyl alcohol, 25 grms. of isoamyl alcohol, 80 grms. of active hexyl alcohol, and 33 grms. of methol. Besides these, there was observed a small quantity of a white insoluble powder, containing approximately 77·4 per cent. of carbon and 8·8 per cent. of hydrogen.

Tiglic acid was prepared from α-methyl-β-hydroxy-butyric ester by the action of phosphorus pentachloride. The product is a mixture of the esters of tiglic and α-methyl-β-chlorobutyric acid; but on saponifying, the latter acid is converted into tiglic acid. The yield was about 75 per cent. of the theoretical. Angelic acid was also formed, but only in very small quantity. Both angelic and tiglic acids were esterified with ease by heating for six hours on the water-bath with 1·5 times the theoretical amount of alcohol, to which was added 15 per cent. of sulphuric acid.—J. T. D.

Cod-Liver Oil Wijs. Pharm. Centr., 1903, 152. Chem. and Druggist, 1903, 62, [1212], 620.

The author finds, from the examination of a number of samples, that the iodine-absorption value rises as the specific gravity of the oil increases. The following results were obtained :—

Specific Gravity.	Iodine Value (Mean).
0·9200—0·9204	154·5
0·9215—0·9219	165·2
0·9220—0·9224	167·9
0·9225 0·9229	171·8
0·9230—0·9234	172·6
0·9235 0·9239	174·4
0·9240—0·9244	176·4
0·9245—0·9249	177·6

—A. S.

Aloin-Content of Various Kinds of Aloes. E. Léger. J. Pharm. Chim., 1903, [6], 15, 519 ; through Pharm. Centr., 1903, 44, [17], 243.

Cape Aloes contains 6 per cent. of barbaloin, without any iso-barbaloin.

Barbados Aloes of English commerce, gives 5 per cent. of aloin, with a very little iso-barbaloin. Barbados aloes of French commerce, however, contains much more of the latter, and is apparently derived from a different botanical source.

Curaçao Aloes contains 10 per cent. of aloins composed of equal parts of barbaloin and iso-barbaloin.

Socotrine Aloes yields 4 per cent. of aloin, which consists of barbaloïn with very little iso-barbaloin.

Natal Aloes contains neither barbaloin nor iso-barbaloïn, but nataloïn and homo-nataloïn.—J. O. B.

Vanillin ; Formation of ——. Lecomte. J. de Pharm., 1903, 341. Chem. and Druggist, 1903, 62, [1213], 665.

The author states that vanilla beans contain both a hydrolysing ferment and an oxidising one. The formation of vanillin is probably effected in two stages. The coniferin is first decomposed by the hydrolysing ferment into coniferyl alcohol and glucose, and the coniferyl alcohol is subsequently converted into vanillin by the action of the oxydase.—A. S.

Salicin in Willow Bark ; Note on the Location of ——. D. Browo. Pharm. J., 1903, 70, [1713], 588.

A specimen of willow bark, collected about the end of 1901, was air-dried, and was found to consist of three well-defined layers : a very thin inner one, A, of a deep yellow colour ; a middle one, B, considerably thicker than A, and almost white ; and an outer one, C, very much thicker than the two others, and of a dirty grey colour. The whole bark contained 5·8 per cent. of salicin. The inner bark, A, contained 11·3 per cent. of salicin ; the middle bark, B, 8·0 per cent. ; and the outer bark, C, 2·5 per cent. Samples of bark taken from the same tree in the spring of 1893, and in the autumn of 1894, were found to contain the following quantities of salicin :—Spring, 1893, 7·38 per cent. ; autumn, 1894, 6·66 per cent.—A. S.

Peroxides in Ether ; Detection of ——. A. Jorrissen. XXIII., page 653.

Iodoform ; Electrolytic Preparation of ——. *from Acetone.* H. Abbott. XI. A., page 636.

a-Naphthol in β-Naphthol ; Detection of ——. Arzberger. XXIII., page 653.

Pilocarpine Hydrochloride ; Characteristic Reactions of ——. H. Helch. XXIII., page 654.

Pilocarpine and Apomorphine ; Notes on the Reactions of ——. A. Wangerin. XXIII., page 651.

Pilocarpine ; Helch's Test for ——. *Reactions of Apomorphine.* A. Wangerin. XXIII., page 654.

Apomorphine ; Characteristic Reaction of ——. A. Wangerin. XXIII., page 654.

Narcotine and Codeine ; Determination of —— *in Opium* P. van der Wielen. XXIII., page 656.

Hydrastinine ; A Reaction of ——. A. Jorissen. XXIII., page 654.

Eugenol ; Determination of ——. Schimmel's Report. XXIII., page 656.

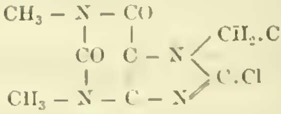
English Patents.

Ketones ; Manufacture of ——. L. Wenghöffer, Berlin. Eng. Pat. 9936, April 30, 1902.

See Fr. Pat. 320,519 of 1902 ; this Journal, 1903, 11.
—T. F. B.

Theophylline ; Manufacture of ——, *and of an Inte mediate Product.* G. W. Johnson, London. Fro C. F. Boehringer und Soehne, Waldhof. Eng. Pa 5901, March 13, 1903.

7′-8-Dichlorocaffeine, having the structural formula—



is prepared by heating dry chlorocaffeine (23 grms.) wi phosphorus oxychloride (100 c.c.) containing chlori (9 grms.) in solution, to 100° C. in a closed vessel f about nine hours. On distilling off the phosphorus ox chloride *in vacuo*, 7′-8-dichlorocaffeine is obtained. It purified by recrystallisation from methyl alcohol, an forms long needles of m. pt. 145° C.

On boiling this product with water, formaldehyde separated together with hydrochloric acid, 8-chlorothe phylline being produced.

This latter body can be prepared direct from 8-chlor caffeine by passing excess of chlorine into 45 grms 8-chlorocaffeine, suspended in 400 c.c. of nitrobenzene, a temperature of 50° C.

The greater part of the nitrobenzene is distilled off *vacuo*, and the remainder is removed by means of stean the residue is further treated with steam till only a slig odour of formaldehyde remains. The solution is n filtered, and the filtrate evaporated to dryness. Th 8-chlorotheophylline is extracted from the residue b means of aqueous ammonia, and is precipitated from t ammoniacal solution by an acid. It can be reduced theophylline in any suitable way.—T. F. B.

United States Patents.

Camphene ; Process of Making ——. K. Steph Assignor to Chemische Fabrik auf Aktien vorm. Schering, Berlin. U.S. Pat. 725,890, April 21, 1903

See Eng. Pat. 26,618 of 1901 ; this Journal, 1902, 1553.
—T. F. B

Pinene ; Derivative of ——. *and Process of Prod same.* N. Thurlow. Niagara Falls, Assignor to the P chester Chemical Co., New York. U.S. Pat. 726,7 April 28, 1903.

When anhydrous turpentine is heated with anhydro oxalic acid, and the excess of acid removed by wash with water, the product contains dipentene, pinyl oxal pinyl formate, borneol oxalate, borneol formate, and ca phor. The mixture has a sp. gr. of about 0·902, and boiling point of about 185° C.

The product is treated with alkali to saponify the est and distilled ; the first portions of the distillate cont dipentene, and the later parts borneol and camphor.
—T. F. F

lenediamine Bases; Mercury Salts of ——, and ocess of Making same. G. Wichmann and H. Kipnberg, Assignors to the Chemische Fabrik auf Actien rm. E. Schering, Berlin. U.S. Pat. 726,126, April 21, 03.

Eng. Pat. 5981 of 1900; this Journal, 1901, 382. —T. F. B.

French Patent.

cetic Acid; Manufacture of Concentrated ——. A. Behrens, jun. Fr. Pat. 325,013, Oct. 7, 1902.

Eng. Pat. 22,096 of 1902; this Journal, 1903, 110. —J. F. B.

XI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

English Patent.

lopment of Photographic Plates in Daylight or Bright tificial Light; Process for the ——. J. W. F. Scheffer, neva, and H. J. Bocage, Haarlem, Holland. Eng. . 3877, Feb. 18, 1903.

olphthalein is added to the developing solution h must be alkaline) "for keeping back the chemiactive rays of the light." A solution is used which ius, "besides sulphides, bisulphides, carbonates, and tes of the alkalis; an alkali bromide, yellow prussof potash, citric acid, sulphurous acid, and one or developers."—T. F. B.

United States Patent.

ing Clichés and High Reliefs; Process of Producing —. J. Schmidting, Vienna. U.S. Pat. 725,879, ril 21, 1903.

sitive film, on which an actinic impression has been d, is treated with a solution of an electrically noncting silver salt which will not swell the film. An lic solution of silver nitrate is suitable for this se. The silver salt in the film is converted into a ctive salt; in the case of silver nitrate, sulphuretted gen is used, forming silver sulphide. The film is now d by means of water, and electro-plated. A cast is aken from the resulting electro-plated film, and from metallic cast is obtained, which is used for producing ting surface of celluloid.—T. F. B.

French Patents.

ions; Process of Making Sensitive ——. Elektro- u. tochemische Industrie Ges., Bingen a/Rhein, and I. Mies, jun. Fr. Pat. 324,442, Sept. 13, 1902.

iol, or any other reagent which will precipitate the fier (gelatin, &c.), is employed in such amount that xture remains in solution at the temperature necessary ening the emulsion.

process may be carried out as follows:—150 grms. tin are caused to swell up in $2\frac{1}{2}$ litres of water; to re added successively 600 c.c. of a solution of 290 of cadmium bromide in 1,500 c.c. of alcohol, 600 c.c. olution of 220 grms. of silver nitrate in 300 c.c. of and 600 c.c. of alcohol, the mixture being stirred well the process. The emulsion is allowed to ripen, and rapidly to a temperature of 12°—14° C., with constant en; this causes the silver-bromide-gelatin to separate ne, heavy, sandy powder, which is obtained quite y filtering and washing. This ensures an absolutely mulsion of extremely fine grain.—T. F. B.

ve Tissues, &c.; Process for Producing ——. tro- u. Photochemische Industrie Ges., Bingen ein, and A. H. Mies, jun. Fr. Pat. 324,161, Sept. 15, 2.

.S. Pat. 713,474 of 1902; this Journal, 1902, 1554. —T. F. B.

Photographic Films; Process and Apparatus for Producing Bands of Matter of any kind, including ——. Neue Photographische Gesellschaft, Act.-Ges. Fr. Pat. 324,208, Sept. 6, 1902.

A process for producing strips of film by applying liquid or semi-liquid substances to a support, the whole being dried or solidified.

The coating liquid is applied to the film, one end of which is wound on a bobbin; the film then passes over rollers leaving a strip exposed for treatment, and then on to another bobbin, on which it is wound. This second bobbin is furnished with rollers to prevent any two portions of the treated film from coming into contact with one another; these rollers are arranged so that they separate from the bobbin when the band of film has passed over them.

The band of film is drawn with uniform velocity over the space between the bobbins, and, when the whole strip has been treated, the direction can be reversed for a second coating.

The support is arranged so as to be easily separated from the film at the end of the process.—T. F. B.

Films; Apparatus for Obtaining Layers of Uniform Thickness for the Preparation of Bands of Matter or ——. Neue Photographische Gesellschaft, Act.-Ges. Fr. Pat. 324,285, Sept. 6, 1902.

The device which applies the emulsion to the support is arranged so that it automatically assumes the correct position in relation to the support, which is secured from lateral displacement. The feeding device is so mounted as to respond to and compensate for all irregularities in the surface of the support.

The emulsion distributor is connected with lateral guides regulating the support, which is mounted on a movable frame. The support passes between fixed rollers, thus being rendered uniform. Friction rollers are also provided at its sides, fixed at a distance apart slightly greater than the mean width of the support, to allow for any irregularities therein. The bands which fix the support, and carry it to the emulsion distributor, are kept in position by bands joining them together, so as to prevent an irregular movement of the bands with respect to each other.—T. F. B.

Plates of any Thickness; Distributing Apparatus for Producing Layers of Preparation, or ——. Neue Photographische Gesellschaft, Act.-Ges. Fr. Pat. 324,286, Sept. 6, 1902.

The apparatus which contains the emulsion to be applied is fixed at one extremity of a long lever, the other end of which is fixed. This lever, with the distributor, can move laterally.

The apparatus is also supplied with an arrangement of non-cylindrical pulleys, or eccentrics, so as to enable the distributor to be applied with variable pressures on the support, which rests on rollers. The support passes through lateral guides fixed to the distributor, to compensate for any irregularity in the width of the support.—T. F. B.

Negatives for Processes involving the Use of Bichromated Gelatin; Production of ——. A. Leuchter. Fr. Pat. 324,222, May 12, 1902.

See Eng. Pat. 10,948 of 1902; this Journal, 1902, 1195. —T. F. B.

Colour Photographs, and Process of Making the same. Miley Colour Photograph Co. Fr. Pat. 324,813, Aug. 9, 1902.

See Eng. Pat. 17,185 of 1902; this Journal, 1902, 1411. —T. F. B.

Trioxymethylene in Photography; Use of ——. Soc. Anon. des Plaques et Papiers Photographiques, A. Lumière et ses Fils. Fr. Pat. 324,921, Sept. 29, 1902.

The right is claimed of using trioxymethylene, either in solutions of alkali sulphites or in solid form mixed with these sulphites—

(1) as substitute for alkali in photographic developers;

(2) as substitute for alum in preparing combined toning and fixing solutions, or fixing solutions for photographic prints on paper.

The following formula is suggested for a developer:—

	Parts.
Water	100
Hydroquinone (quinol)	2
Mixture containing 3 parts of trioxmethylene to 100 parts of anhydrous salphite	10

For a toning and fixing bath (combined) the following composition is suggested:—

	Parts.
Water	1,000
Sodium thiosulphate	250
Mixture of 1 part of trioxymethylene and 1 part of anhydrous sodium sulphite	2
Lead acetate	2
Gold chloride	0·6

See also this Journal, 1903, 318.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitroglycerin; Circumstances attending an Explosion of ——, which occurred in one of the Final Washing Houses of the Factory of Nobel's Explosives Co., Ltd., at Ardeer, near Stevenston, Ayrshire, on 7th Oct. 1902. By Capt. M. B. Lloyd, H.M. Inspector of Explosives.

The explosion which forms the subject of this report was of a most violent description, somewhat under 4,000 lb. of nitroglycerin and 132 lb. of nitrocotton being in the house at the time. By the accident one man lost his life. The close similarity between this explosion and that which occurred in another washing house at the same factory on 9th January 1902 is pointed out. Capt. Thomson (Special Report No. CL.) had given the metal handle of the skimmer as the most probable cause of the latter accident. At the time of the accident under notice, this metal handle had been replaced by a light wooden pole shod with rubber, and with so light an implement it would be difficult to give a blow sufficiently heavy to explode nitroglycerin on the lead lining of the tank. Capt. Lloyd is unable to suggest any probable cause other than the friction of the air pipes on the bottom of the tank. To obviate this in future, they have at Ardeer arranged rubber rings on the air pipe so that it cannot come in contact with the lining. Another method of dealing with this difficulty is that introduced at the Royal Gunpowder Factory, and described in an appendix supplied by Major Nathan. "The air pipe is carried down outside the tank from above the level of the liquid, and passes through the wood shell at the top of the sloping bottom. It then divides into three branches with the usual perforations." "From the point at which the pipe passes through the lead lining it is burned into and forms part of the bottom of the tank." The same arrangements are made in the pre-washing tank. The report has three appendices and three plates.—A. E. L.

French Patents.

Safety Explosive; Manufacture of ——. Poetler and Co. Fr. Pat. 324,880, Oct. 1, 1902.

See Eng. Pat. 21,189, 1902; this Journal, 1902, 1471.
—G. W. McD.

Smokeless Powder. J. M. Brown. Fr. Pat. 324,998, Oct. 6, 1902.

The explosive consists of potassium chlorate (32 parts), wheat flour (16 parts), boiled linseed oil (4 parts), and chrome yellow (1 part). The chlorate is first incorporated with the linseed oil, the colouring matter added, and then the wheat flour with sufficient water to give the mass the consistency of dough, which is broken up into grains after drying.—G. W. McD.

Nitro-Explosives; Manufacture of ——. A. Hough. Fr. Pat. 325,196, Oct. 2, 1902.

See Eng. Pat. 21,171, 1902; this Journal, 1902, 1471.
—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Indicators; Applicability of ——, in the Determination Alkali in presence of Nitrite and Formate. M. Wegn Zeits. anal. Chem., 1903, **42**, [3], 153—157.

The author's experiments show that, for alkalimetry presence of formate and oxalate, litmus (or azolitmin) a sodium alizarinsulphonate are the best indicators. presence of nitrite, sodium alizarinsulphonate and galle are the most suitable, whilst litmus, salicylate indicator a rosolic acid also give good results.—T. H. P.

Alkalimetry; Use of Anhydrides and Acidyl Chlori in ——. B. Oddo. Atti. R. Accad. dei Lincei Ron **12**, [1], 58—61. Chem. Centr., 1903, **1**, [16], 935.

The author recommends the use of inorganic and orga anhydrides and acidyl chlorides for standardising volumet solutions of alkalis and acids. 25 c.c. of the alcoho solution of alkali are weighed, a small excess of anhydr or chloride is added by means of a well-dried pipette, t mixture well shaken, again weighed, and the excess of acid titrated back with the alkali solution, using phenolphthal as indicator. In the case of acetic anhydride and cau soda, the reaction is expressed by the equation—

$$(CH_3CO)_2O + 2NaOH = 2CH_3CO_2Na + H_2O.$$

The results agree well with those obtained by means oxalic acid. The author has also made satisfactory te with acetyl chloride (CH_3COCl), phosphorus oxychlori ($POCl_3$), sulphuryl dichloride (SO_2Cl_2), and phosphor trichloride (PCl_3).—A. S.

Precipitation and Separation [of Metallic Hydroxides] Weak Organic Bases. E. T. Allen. J. Amer. Che Soc., 1903, **25**, [4], 421—444.

Aniline quantitatively precipitates the quadrivalent a weakly basic elements, titanium, zirconium, cerium, a thorium, as well as the trivalent elements, Fe‴, Al, a Cr‴, under certain conditions, from dilute and slightly a solutions of their chlorides, nitrates, or sulphates. T same applies to phenylhydrazine, except that ceric ferric salts are reduced by this reagent to the cerous ferrous condition, *i.e.*, to salts of comparatively str bases, which are precipitated incompletely or not at Zinc, cadmium, mercury, cobalt, and nickel solutions, wh sufficiently concentrated, yield with phenylhydrazine ac- tion compounds which are only slightly soluble. Zi cadmium, and mercury also give similar compounds wi aniline. Magnesium, barium, calcium, strontium, mangan and ferrous iron are not precipitated. Beryllium is precipitated by aniline, nor by phenylhydrazine, exc from solutions of the sulphate. Titanium and zircon may be separated from iron, and titanium, zirconium, thorium from beryllium. A double precipitation is alw advisable. Aniline cannot be substituted for phenylhy- azine in the separations from ferrous iron, as its reduc power is not sufficient, but all the separations from beryll may be carried out equally well with aniline. Minute q tities of alumina may be accurately separated from l amounts of iron by means of phenylhydrazine.

The concentration of free acid in the solutions must quite small, a few mgrms. per 100 c.c.—W. P. S.

Hydroferrocyanic and Hydroferricyanic Acids; S Properties of ——, and Determination of Potass Ferrocyanide. M. Prud'homme. Rev. Gén. des Col., 1903, **7**, [77], 130.

In connection with the method of oxidising hy ferrocyanic acid by means of chromic acid, using p impregnated with guaiacum tincture as indicator, the au finds that the reaction is not complete when a drop of solution colours the test-paper blue. Hydroferrocy acid alone gives no coloration, and hydroferricy acid alone gives a blue colour, but the presence of s antities of hydroferrocyanic acid in hydroferricyanic d prevents the coloration.

The author considers the coloration to be due to drolysis of hydroferricyanic acid, giving hydroferrocyanic d and oxygen; in addition to this, the inverse change ces place, equilibrium being established at the point when e coloration of the test-paper is produced.

The completion of the oxidation of the hydroferrocyanic d can be judged by means of ordinary filter paper, which author finds, gives a blue coloration with hydro-rocyanic acid, a yellow coloration, turning to a faintly en shade after a long time, with hydroferricyanic acid; ilst with a mixture of the two, a yellow coloration is duced, rapidly turning green.

By using these two papers (guaiacum and filter paper) cessively, the author finds that the amount of chromic d necessary to complete the oxidation after the uilibrium point, is about 10 per cent. of that required to duce equilibrium, *i.e.*, the speeds of the inverse reactions resented by $H_6Fe_2(CN)_{12} + H_2O \rightleftarrows 2H_4Fe(CN)_6 + O$ are the ratio of approximately 1 : 10.

This furnishes a method of estimating potassium rocyanide by means of chromic acid (a solution of manganate works equally well by this method).

The author considers it probable that the decolorisation indigo by potassium ferricyanide in presence of potas-m hydroxide, with formation of potassium ferrocyanide, lue to a similar example of hydrolysis, with formation hydrogen peroxide. It is found that the addition of assium ferrocyanide retards the decolorisation of indigo ution to a marked degree.—T. F. B.

rbon Dioxide in Alkali and Alkaline Earth Carbonates; Determination of ——, by means of an Alkalimeter. S. Fokin. J. russ. phys.-chem. Ges., **35**, 76—78; Chem. Centr., 1903, **1**, [14], 852.

e author finds that better results are obtained in the ermination of carbon dioxide by the difference in weight a carbon dioxide apparatus before and after a test, if sphoric acid is used instead of hydrochloric or nitric l. He prefers Rohrbeck's apparatus, 1 grm. of the stance being taken and about 12 c.c. of phosphoric acid ution (1 : 1) added. The reaction is completed by boiling; before, during, and after the heating, a current of dry is passed through the apparatus.—A. S.

dium Nitrite; Analysis of ——. M. Wegner. Zeits. anal. Chem., 1903, **42**, [3], 157—159.

e author's experience of the volumetric determination of ium nitrite by both the permanganate and the sulphanilic l methods is as follows:—

The permanganate method is the quicker and gives good ults when properly carried out. The permanganate ution, of which 100 c.c. should correspond with exactly rm of sodium nitrite, should be standardised by means ferrous ammonium sulphate and also by pure sodium ite. As regards the determination of the end point of titration, the solution should retain its colour for five utes after the addition of the last drop of permanganate. tandard sulphanilic acid solution is prepared by olving 33·478 grms. of sodium sulphanilate up to a litre water; control tests with pure sodium nitrite show that h a solution gives exact results. Only freshly prepared ch solution should, however, be employed, no matter ther it be mixed with cadmium iodide or not.

The permanganate method cannot be employed when the ium nitrite contains formate as is sometimes the case n it is prepared by Goldschmidt's method, namely, uction of sodium nitrate by means of sodium formate in sence of free alkali.—T. H. P.

n in presence of Zirconium; Quantitative Determination of ——, by Rivot's Method. K. Daniel and I. Leberle. Zeits. anorg. Chem. **34**, 393—402. Chem. Centr., 1903, **1**, [17], 996.

CORDING to Rivot (Ann. Chim. Phys. **30**, [3], 188, palen, **78**, 211), the amount of iron in a mixture of ic oxide with the oxides of zirconium, (ZrO_2); beryl-, (BeO); chromium, (Cr_2O_3); tin, (SnO_2), and silicon, (SiO_2), can be ascertained by determining the loss of weight which occurs by ignition in a current of hydrogen. Gutbier and Hüller (this Journal, 1902, 1350), state that this method gives excellent results. The authors, however, find that the accuracy of the results is dependent upon the proportions of iron oxide and other oxide or oxides present, and that even with the most favourable proportions, *viz.*, 50 equivalents of Fe : 1 equivalent of Zr, the results have only a moderate claim to accuracy. The reduced iron is strongly pyrophorous and this leads to erroneous results, unless the residue, after ignition, is weighed in a sealed glass tube filled with hydrogen.—A. S.

Manganese; Separation and Determination of ——, E. Pozzi-Escot. Ann. Chim. anal. appl., **8**, 83. Chem. Centr., 1903, **1**, [15], 896.

In many products, *e.g.*, in presence of aromatic acids, manganese cannot be separated by ammonia alone, and the use of chlorine or bromine is precluded, because they act on the compounds to be isolated. In such cases, the separation of manganese can be satisfactorily effected by hydrogen peroxide, probably also by ammonium persulphate.—A. S.

Cobalt; A Higher Oxide of ——. Method for the Volumetric Determination of Cobalt. R. L. Taylor. Paper read before the Manchester Lit. and Phil. Soc., March 31, 1903. Chem. News, 1903, **87**, [2265], 201.

According to the author, cobalt sesquioxide is very seldom obtained by precipitation from cobalt solutions, but there appears to be a considerable number of oxides higher than the sesquioxide. The black oxide of cobalt which is precipitated from an exactly neutral solution by calcium or barium carbonate in presence of bromine water is fairly constant in composition, and may be represented as either Co_9O_{14} or Co_7O_{11}, it is probably a mixture or compound of the sesquioxide and the dioxide. As the precipitation of cobalt in the form of this black oxide is complete in 5—10 minutes, the author bases a method for the determination of cobalt upon it. The precipitated oxide, after washing, is dissolved in a mixture of hydrochloric acid and potassium iodide (Bunsen's method): then, the amount of iodine liberated is a measure of the quantity of cobalt present. For the purpose of calculation, the composition of the precipitated cobalt oxide is taken as intermediate between those represented by the two formulæ given above. The solution must be free from iron, lead, and manganese, but the presence of nickel has no influence. The method has given satisfactory results in the analysis of cobalt ores.—A. S.

Cobalt; Qualitative and Quantitative Analysis of Compounds of ——. H. Copaux. Bull. Soc. Chim., 1903, **29**, [8], 301—306.

The author has especially investigated the detection of nickel in presence of cobalt, and the separation of these two metals. He finds that the formation of nickel-carbonyl, though a very delicate test for nickel alone, 1 mgrm. showing a bright metallic ring 6—7 cm. long in the capillary tube, fails when cobalt is present in excess, 1 mgrm. of nickel in 1 grm. of cobalt giving practically no indication of its presence. The best method is Pinerua's—treatment of the chlorides with ether saturated with hydrochloric acid gas; the yellow insoluble nickel chloride left is readily and certainly detected when 1 grm. of cobalt contains 1 mgrm. of nickel. For quantitative separation, the potassium nitrite method is by far the best, though the method with nitroso-β-naphthol gives fairly good results. The author carries out the nitrite process as follows:—Place the solution of the chlorides or nitrates (from which metals of the second group, iron, and alkali-earth metals have been removed) in a conical flask, and bring to a concentration of 1—5 per cent. of cobalt. Add 1 c.c. of strong nitric acid, and 15 c.c. of potassium nitrite solution of 40 per cent. strength. Allow to settle, filter, wash with 15 c.c. of the nitrite solution, add the washings to the filtrate, add also 0·5 c.c. of nitric acid, and allow to stand 12 hours. Filter through the filter already containing the first precipitate, and wash with a more dilute (10 per cent.) potassium nitrite solution. (A third precipitation may sometimes, but rarely, be needed.) Replace the filter and precipitate in the conical flask, dissolve in hot dilute sulphuric acid, filter, neutralise with solid ammonium carbonate, add 4—5 grms. of ammonium oxalate, and electrolyse with a current of 1 ampère per sq. dcm. under an EMF of 3—4 volts.—J. T. D.

Kjeldahl Method; Slight Modification of the ——. A. Grégoire and E. Carpiaux. Bull. Assoc. Belge des Chim., 1903, **17**, [1], 36.

In distilling off the ammonia in the Kjeldahl method, considerable inconvenience is caused by the frothing of the alkaline liquid, especially when the substance under analysis is of a fatty nature. The phenomenon is due to the liberation of volatile fatty acids in the sulphuric acid treatment, which acids condense and return to the flask, where they are saponified by the alkali, and the resulting soap furnishes the objectionable lather. This may be prevented, or at least minimised, by adding a little calcium chloride (to precipitate a lime soap) to the liquid previous to distillation.—C. S.

Chromic Acid in Tan-liquors; Rapid Technical Method for Determining Free ——. C. Dreher. Collegium, 1903, **2**, [56], 111—112.

The deep cornflower-blue coloured perchromic acid, formed when chromic acid is treated with hydrogen peroxide, is soluble in sulphuric ether, and can be estimated colorimetrically.

One c.c. of the chrome-liquor, 5 c.c. of dilute sulphuric acid (10 per cent.), 10 c c. of ether, and 5 c.c. of hydrogen peroxide solution are mixed in a reagent glass and allowed to stand. The colour of the ethereal layer is matched against that of similarly prepared mixtures each containing 1 c.c. of a standard solution of potassium chromate (*e.g.*, 10, 20, and 40 grms. per litre). Pure reagents must be used the ether must be free from alcohol, and the mixtures kept cold to avoid evaporation of the ether. The hydrogen peroxide is prepared by shaking 10 grms. of sodium peroxide in 50 c.c. of cold water, and adding dilute sulphuric acid in slight excess. This will keep for a week in a cool, dark, place.

If the liquor contains chromic oxide, a few c.c. are evaporated to dryness in a porcelain dish, with bromine water or hydrochloric acid and potassium chlorate, and the resulting chromic acid is then estimated as above.

Old partially reduced liquors may be analysed by applying the test to similar portions one of which is first oxidised, and finding the relative proportions by difference, or the chromic oxide is precipitated by alkali, the chromic acid filtered off, each portion being then tested, as described above.—R. L. J.

Phosphoric Acid; Determination of ——, *by the Citrate Method.* A. Verweij. Zeits. anal. Chem., 1903, **42**, [3], 167—168.

The author has noticed that when ammoniacal citrate solution, which has been prepared for some time, is employed in the determination of phosphoric acid in superphosphate, guano, &c., high results are obtained. He finds that this is due to the presence, in the magnesium pyrophosphate weighed, of silicic acid which is dissolved from glass vessels by the citrate solution. Glass which has been once attacked loses silica very readily under the action of the citrate.
—T. H. P.

Fertilisers; Determination of Potash in ——. C. L. Hare. J. Amer. Chem. Soc., 1903, **25**, [4], 416—420.

The following method, first proposed by Ross, is stated to have several advantages over the Lindo-Gladding process. 10 grms. of the sample are boiled with 350 c.c. of water for 30 minutes, milk of lime being then added while the solution is still hot, until the reaction is slightly alkaline. After cooling and diluting to 500 c.c. with water, 50 c.c. are acidified with hydrochloric acid, platinum chloride solution is added and the whole evaporated to a stiff paste on the water-bath. The residue is then washed with 80 per cent. alcohol and ammonium chloride solution as in the Lindo-Gladding process. Should the fertiliser contain organic matter, 10 grms. are treated with dilute sulphuric acid (1 : 1) and incinerated. The residue is moistened wit dilute sulphuric acid, warmed, boiled with 350 c.c. of wate and proceeded with as above. The advantages of thi method are: (1) the precipitation is immediate; (2) evaporation to expel ammonium salts is avoided; (3) loss o potash during the evaporation is obviated; (4) washin the potassium-platinum chloride is simplified. The metho is not applicable to fertilisers containing ammonium salts.
—W. P. S.

Carbonic Oxide and Carbon Dioxide in Vitiated Atmospheres; Determination of ——. F. Jean. J. Pharm Chim., 1903, **27**, [9], 418—422.

The apparatus, devised by the author for the detection an approximate determination of the presence of dangerou quantities of carbonic oxide and carbon dioxide in suspecte atmospheres, can be employed by unskilled observers, an consists essentially of a graduated reversible aspirator o 10 litres capacity in connection with a series of thre washing bottles which contain the reagents. The firs bottle contains the reagent for carbonic oxide, which ma consist of 50 c.c. of a neutral solution of palladium chlorid which is reduced by carbonic oxide to metallic palladium which forms a black deposit on the upper walls of th bottle. The palladium reagent may be replaced if desire by an ammoniacal solution of silver nitrate of the sam degree of sensitiveness, prepared by adding silver nitrate t a solution of ammonia until a precipitate begins to appea These reagents, as prepared, show an indication after th passage of air containing from 8 to 10 c.c. of carbonic oxid The second bottle contains 5 c.c. of semi-normal causti alkali mixed with 45 c.c. of water and coloured with B.u C4B. The passage of 88 c.c. of carbon dioxide throug this bottle changes the violet-red tint to pure blue. Th third bottle, through which the air first passes, contai concentrated sulphuric acid, and is connected with a tub plugged with cotton wool. This bottle absorbs hydrocarbons and volatile organic matters, which impart yellow colour to the acid.

In operation, the suspected air is slowly aspirated throug the apparatus at the rate of about 10 litres per hour, and assuming that the delicacy of the reagents has been previously standardised, an approximate idea of the quantitie of the impurities present can be obtained by noting th volume of air which has to be aspirated before each of th reagents shows an indication.—J. F. B.

Carbon Monoxide in Air; Determination of Smal Quantities of ——. Spitta. Arch. Hyg., **46**, 284—310 Chem. Centr., 1903, **1**, [17], 995.

The method is based upon the oxidation, by means of a electrically-heated surface of palladium, of the carbo monoxide to carbon dioxide, and determination of th latter. A wide-necked glass bottle of 10—11 litres capacit is closed by a special form of stopper, which bears tw sealed-in glass tubes provided with taps. One tube exten to just below the stopper and the other to the bottom the bottle; the latter tube is bent so that its end lies the outermost angle of the bottom of the bottle. Tw copper wires also pass through the stopper, one of whic carries a funnel of platinised copper plate which suppor the lower part of a tube containing the palladium, whil the other shorter wire ends in a hook on which the upp part of the tube is fastened. A second, control bo similar to the first, is fitted in the same manner, exce that in place of the copper wires and the palladium, it provided with an air-thermometer. The tube consists of cylinder of well annealed glass, 14 mm. in diameter a 19 cm. long, in which is sealed a thermometer graduat from 100° to 360 C. The sealed-in portion of the cylind is surrounded by a spiral of strong "nickelin" wir 0·5—0·75 mm. in diameter, the upper and lower ends which are connected to strong platinum loops sealed the glass. The lower end of the cylinder is enlarged, a the enlarged portion supports a cylinder of silver electrolytically coated with palladium. On connecting t platinum loops to the copper wires and passing an electr current, the "nickelin" spiral is more or less strong heated (according to the current strength), and combustib mpounds present in the air are oxidised. The difference the acidity of the air before and after oxidation is a easure of the amount of combustible substances present. ıe author found that carbon monoxide is oxidised to rbon dioxide at 125° C., benzene vapour at 210°—220° C., cohol at 220°—230° C., ether at 180°—200° C., light troleum spirit at 190°—210° C., and acetylene at 250°— 0° C.; ethylene was not oxidised at a temperature of 0° C. Ammonia is oxidised at 170°—180° C.; sulurretted hydrogen is oxidised to sulphur and water. r the determination of carbon monoxide, the temperature ould be maintained between 150° and 160° C., and as nperature indicators the author recommends citric acid . pt. 154° C.) and cane sugar (m. pt. 160° C.).

The two bottles are accurately graduated and are filled th the air to be examined in exactly the same manner. certain proportion of hydrogen is introduced with the air facilitate the combustion of the carbon monoxide. hen the oxidation is complete, the bottle is cooled, and ndardised barium hydroxide solution, for the absorption the carbon dioxide formed, is introduced through the ss tube which reaches to the bottom. Barium hydroxide ution is also introduced into the control bottle. After orption of the carbon dioxide, the barium solution is ked over by means of a water pump either into a mer's pipette, or directly into a small flask, where it is ated with a standardised oxalic acid solution.

3y means of this method it is stated that carbon monoxide a dilution of about 1 : 37000 can be detected. In the ducts of combustion of the Auer burner, the author found ratio of carbon dioxide to carbon monoxide to be 263 : 1. impregnated with the smoke from two cigars contained the average 0·1295 per 1,000 of carbon monoxide.

—A. S.

ORGANIC—QUALITATIVE.

er; Detection of Peroxides in ——. A. Jorissen. . de Pharm. de Liège; through Répertoire de Pharm., 903, **15**, [4], 167.

EAGENT is prepared by heating together for 10 or 15 utes 0·10 grm. of vanadic acid, and 2 c.c. of strong phuric acid in a porcelain capsule; after cooling, a little er is added, the undissolved acid is detached from the s of the vessel, and the whole made up to 50 c.c. and ated until all the vanadic acid is dissolved. The reagent t obtained is bluish-green and will keep well.

o test ether for hydrogen peroxide, or other peroxides, 10 c.c. are added to 2 c.c. of the reagent and shaken In the presence of peroxides, the ether assumes a rose blood-red tint, according to the amount of impurity p ent.—J. O. B.

charin; Detection of ——, in Beer, Wine, &c. C. oucher and F. de Boungue. Bull. Soc. Chim., 1903, **29**,], 411—412.

T authors recommend treating the liquid with a 1 per c . solution of potassium permanganate, after adding a f drops of sulphuric acid, then removing excess of p anganate by sulphurous acid, and extracting with e r alone, in preference to directly extracting the a lated beer or wine with a mixture of ether and light p oleum spirit. When only traces of saccharin are ected, the treatment with permanganate should be c ed out in the cold, but for the best wines it is necessary to eat on the water-bath. It is claimed that tannin, sa ylic acid, and colouring matters, which being more or le soluble in a mixture of ether and petroleum spirit vi e determinations by the ordinary process, are destroyed in e above process; that no emulsion with the solvent is fo ed, and that the extraction is more rapid and complete.

omine water may be used instead of permanganate, but do not appear to work so satisfactorily in the case of wi s.—W. H. S.

M yl Alcohol in Absinthe; Detection of ——. Sanglérrière and Cuniasse. Ann. Chim. anal. appl., 8, —83; Chem. Centr. 1903, **1**, [15], 898.

T 0 c.c. of the alcoholic distillate from absinthe, 1 c.c. of su uric acid, and 5 c.c. of a saturated solution of potassium permanganate are added, the mixture allowed to stand for a few minutes, and if the red colour of the permanganate does not entirely disappear, 1—2 drops of a concentrated solution of tannin added. The solution is made just alkaline with sodium carbonate, filtered, and the filtrate tested for formal by the addition of 2 c.c. of a 0·1 per cent. solution of phloroglucinol and 1 c.c. of concentrated caustic potash solution; in its presence, a decided red coloration is produced. The gallic acid reaction can be used as a confirmatory test. Wine distillates contain traces of methyl alcohol, but give so faint a reaction by the above test, that they can be unmistakably distinguished from alcohol to which methyl alcohol has been added.—A. S.

Aldehydes; General Reaction for ——. E. Riegler. Zeits. anal. Chem., 1903, **42**, [3], 168—170.

The following reaction is given by all aldehydes and derivatives such as chloral and bromal hydrates, as well as by the aldoses.

Into a fairly large test-tube, 5 c.c. of the aldehyde solution (of concentration not greater than 1 per cent.) is placed together with 5 c.c. of water and as much well crystallised phenylhydrazine oxalate as will lie on the point of a knife blade; the liquid is then heated over a spirit flame, with frequent agitation, until complete solution takes place, after which 10 c.c. of 10 per cent. potassium hydroxide solution are added. The tube is then closed with a well-fitting rubber stopper and vigorously shaken for a few seconds. If a rose-red coloration makes its appearance during the shaking, an aldehyde is present.

This reaction may be employed for the detection of aldehyde in spirit.—T. H. P.

Phenols; Microchemical Detection and Distinction of ——. H. Behrens. Zeits. anal. Chem., 1903, **42**, [3], 141—152.

The author has brought together a number of reactions by means of which the phenols, both mono- and poly-hydric, may be identified microchemically. The reactions are grouped under the following headings: (1) General characteristics; (2) Group characteristics; (3) Methods of separation, group separations; (4) Recognition of the separate phenols. For the methods employed reference must be made to the original.—T. H. P.

α-Naphthol; Detection of ——, in β-Naphthol. Arzberger. Pharm. Post., **35**, 753; through Répertoire de Pharm., 1903, **15**, [4], 168.

Thirty cgrms. of the naphthol to be tested are dissolved in 3 c.c. of alcohol; 10 to 15 c.c. of water are added to the solution, which, after standing for 15 minutes and being frequently agitated, is filtered. To the filtrate are then added 10 or 12 drops of 10 per cent. potassium hydroxide solution and 2 or 3 drops of a solution of iodine in potassium iodide (potassium iodide 2, iodine 1, and water 60). A violet colour is formed if the naphthol contains traces of α-naphthol. Since α-naphthol is much more toxic than β-naphthol, the presence of the former in naphthol intended for medicinal use is to be avoided.

—J. O. B.

Organic Acids; Identification of ——, by their Toluides. H. Scudder. Amer. Chem. J., 1903, **29**, [5], 511—513.

A modification is suggested in the preparation of the toluides of organic acids, for the purpose of identification. 1 to 1·2 grms. of *p*-toluidine, and 0·3 to 0·4 c.c. of concentrated hydrochloric acid, are heated in a test tube, with about 0·4 grm. of the sodium salt of the acid under examination. The heating is carried out by resting the bottom of a tube on a hole, about 1 cm. diameter, in a piece of asbestos; this prevents overheating the sides of the tube. The tube is heated gently for about one hour. The toluide is best purified by recrystallisation from benzene or ligroin (petroleum spirit): the yield is said to be very good.

This method does not apply to formic acid, in which case oxaltoluide is the chief product.—T. F. B.

Pilocarpine Hydrochloride; Characteristic Reactions of ——. H. Helch. Pharm. Post, 1902, **35**, 289—290; Zeits. Unters. Nahr.- u. Genussm., 1903, **6**, [9], 414.

From 0·01 to 0·02 grm. of pilocarpine hydrochloride is dissolved in a little water, and after the addition of 1 to 2 c.c. of an acid solution of hydrogen peroxide is treated with 2 c.c. of benzene and a few drops of a 0·3 per cent. solution of potassium bichromate. On shaking the liquid and then allowing the layers to separate, the benzene shows a clear violet colour, which is blue when larger quantities of pilocarpine are used. No other alkaloid gives the same coloration, although the benzene is coloured violet by pyridine and dirty violet by quinoline, both colorations fading completely after 20 minutes. Antipyrine, migranine, and salipyrine give a deep-blue coloration. If neutralised hydrogen peroxide be used, the benzene is coloured violet or blue by pilocarpine, pyridine, and salipyrine, and the colour appears in the case of antipyrine and migranine after the addition of acid. If the coloured benzene layer be withdrawn and shaken with water faintly acidified with hydrochloric or sulphuric acid, the aqueous extract will give the coloration again on the addition of hydrogen peroxide, potassium bichromate, and benzene in the case of pyridine, antipyrine, migranine, and salipyrine, but not when pilocarpine was present. In the case of antipyrine this aqueous extract can be used for the potassium nitrite (green coloration) reaction.—C. A. M.

Pilocarpine and Apomorphine; Notes on the Reactions of ——. A. Wangerin. Pharm. Zeit., 1902, **47**, 599; Zeits. Unters. Nahr.- u. Genussm., 1903, **6**, [9], 414.

Helch's reaction for the detection of pilocarpine (see preceding abstract) is also given by apomorphine, a violet coloration of the bezene layer being obtained under the same conditions. In the case of apomorphine, however, the violet has a more reddish shade, and on standing, the colour becomes more intense. The aqueous layer from the pilocarpine test is nearly colourless, whereas in the case of apomorphine, it is at first purple-red, changing to brownish red and finally to brownish green. The following reaction is stated to be characteristic of apomorphine. If a solution of 0·01 grm. of the hydrochloride in 1 c.c. of water be treated with 4 drops of a 0·3 per cent. solution of potassium bichromate, and the deep-green liquid be shaken with benzene, the latter becomes a deep and permanent violet. One to 2 c.c. of a 15 to 20 per cent. solution of potassium hydroxide can be used instead of water as the solvent without influencing the reaction, which, however, is prevented by the addition of 1 or more c.c. of hydrochloric acid. If the benzene be replaced by amyl alcohol, the colour obtained is indigo blue instead of violet.—C. A. M.

Pilocarpine; Helch's Test for ——; *Reactions of Apomorphine.* A. Wangerin. Pharm. Zeit., 1902, **47**, 739—740; Zeits. Unters. Nahr.- u. Genussm., 1903, **6**, [9], 415.

If 1 c.c. of a 1 per cent. solution of apomorphine hydrochloride be shaken with 4 drops of a 0·3 per cent. solution of potassium bichromate for a minute, and subsequently with 10 c.c. of acetic ether, the latter assumes a permanent violet colour, which changes to green on the addition of 5 drops of a 1 per cent. solution of stannous chloride, and back again to violet on adding potassium bichromate. If the acetic ether be replaced by chloroform, the violet colour assumed by the latter changes to indigo blue on the addition of stannous chloride. If 5 c.c. of amyl alcohol be used in place of acetic ether the colour is first indigo blue, and then green on the addition of stannous chloride, whilst on adding bichromate the green colour becomes yellow or brown. A mixture of 5 c.c. of chloroform and 5 c.c. of xylene becomes reddish violet, changing to bluish violet with stannous chloride; whilst a mixture of 5 c.c. of chloroform and 5 c.c. of amyl alcohol becomes blue or bluish violet and green on the addition of stannous chloride. —C. A. M.

Apomorphine; Characteristic Reaction of ——. A. Wangerin. Pharm. Zeit., 1902, **47**, 588; Zeits. Unters. Nahr.- u. Genussm., 1903, **6**, [9], 414.

A solution containing 0·3 grm. of uranium acetate and 0·3 grm. of sodium acetate in 100 c.c. gives a red to orange-yellow coloration with solutions of morphine, but yields with apomorphine a brown precipitate which becomes darker on standing. On the addition of dilute mineral acids, acetic acid, or tartaric acid, this precipitate is dissolved to a colourless solution, from which it can be reprecipitated by the addition of a fixed alkali or ammonia. Since toxines and most of the other alkaloids do not react with uranium solution, this reaction can be used for the identification of apomorphine.—C. A. M.

Hydrastinine; A Reaction for ——. A. Jorissen. Annales de Chim. Analyt., 1903, **8**, [4], 127.

Hydrastinine may be distinguished from most other alkaloids by its behaviour towards Nessler's reagent. A few drops of the reagent added to a solution of the hydrochloride of the base, gives a precipitate which blacken instantly. Of the other alkaloids experimented with, only morphine and apomorphine occasion a more or less rapic precipitation of mercury from the reagent. Picrotoxin also among the nonbasic bitter principles, has the property o reducing Nessler's reagent.—J. O. B.

ORGANIC—QUANTITATIVE.

Glycerin in Soap Leys; Determination of ——. R. Fanto Zeits. angew. Chem., 1903, **16**, [18], 413—414.

The method described by Zeisel and the author (thi Journal, 1902, 992), can be used for the determination r glycerin in soap leys. In the previous communication was shown that the presence of even considerable quantitie of certain salts, such as potassium iodide, sodium acetat and barium acetate, had no influence upon the results, so the author has since made experiments to determine th influence of the substances that occur in soap leys. Fro these it appears that only the sulphur and chlorine com pounds need be taken into account, and both can be readil removed.

When an error of a few tenths of a per cent. of glyceri is of no importance, the following method is recommended —20 c.c. of the ley are diluted with two to three times th volume of water, and the sulphuric acid precipitated fro the hot solution with barium acetate. After cooling, th liquid is diluted to a definite volume, *e.g.*, 100 c.c., a filtered or decanted, and 5 c.c. of the filtrate used f the determination of the glycerin.

When very accurate results are required, 20 c.c. of t ley, diluted as above, are treated with a quantity of so silver sulphate corresponding to the amount of chlori present, and after being warmed for some minutes on t water bath with constant shaking, the sulphuric acid precipitated with a hot solution of barium acetate. T liquid is then filtered (turbidity of the first portion bei of no consequence), and the precipitate washed with l water until free from barium. The filtrate and washi are boiled in a flask fixed obliquely until concentrated about 80 c.c., during which process the traces of precipit in the liquid darken. After cooling, the liquid is made to 100 c.c., and the glycerin determined in 5 c.c., cor sponding to 1 c.c. of the original ley.—C. A. M.

Tannins; Composition, Molecular Weight, Identificat and Separation of ——. C. Körner. Collegium, 19 2, [55], 100—102. Report of the Annual Conference f the International Association of Leather Trades' Chemi , Leeds, Sept. 1902.

With the object of establishing chemical constants for e various tannins analogous to those employed in the anal s of oils, fats, and waxes, the author has determined e elementary composition of several tannic acids, a r purifying them by treating the aqueous extract with alcol to precipitate "non-tans" and then fractionally precipita g the alcoholic solution with ether.

The hydrogen percentage is not specially characteri c, but the carbon percentage affords a means of differentia o.

he following carbon percentages were determined :—uebracho, 63·7 ; oakwood, 53·1 ; chestnut-wood, 51·4 ; imosa, 57·6 ; valonia, 48·1 ; myrabolans, 45·3 ; oak-ırk, 51·3 ; pine-bark, 54·3 ; mangrove-bark, 56·5.

Mimosa tannin appears to be a mixture, as the first action contained only 50 per cent. of carbon, but the st 57·6 per cent.

The author has shown that quebracho tannin is soluble ethyl acetate, and this solvent may be employed to isolate from a mixture. Mixtures of quebracho with from 1 to parts of oak, pine, and chestnut-tannin, when shaken out ith ethyl acetate gave a fraction with a carbon percentage 62—63.

The molecular weight of the tannins is very high, in veral cases above 1,000 instead of between 300 and 400 stated in text-books. The following molecular weights ere determined :—Quebracho-tannin, 1,272 ; mimosa-nnin, 1,063 ; chestnut-wood-tannin, 1,139 ; oakwood-nnin, 1,148.—R. L. J.

Glue ; Valuation of ——. R. Kissling. Zeits. angew. Chem., 1903, **16**, [17], 398—400.

HE author refers to a paper by Müller on the analysis of ne gelatin and glue (this Journal, 1902, 874), in which e method recommended is that of precipitation with cess of tannin solution, and subsequent determination of e uncombined tannin. After calling attention to some rors in the paper, the author gives as his opinion that the -called chemical methods, precipitation with tannin and timation of nitrogen, are insufficient in forming an opinion a glue, and describes his apparatus for determining the elting point of glue. This consists of a copper water-th, maintained at a temperature of 50° C. On this is aced a shallow vessel, the bottom of which is lined with n asbestos sheet, in which are placed small glass cylinders ntaining the samples of glue, and one containing a ermometer ; the vessel is covered with a glass plate. grms. of the sample with 30 grms. of distilled water are ft over-night, and then heated with boiling water to ssolve the glue, which is poured into the cylinders up to a ed mark. The cylinders are closed with stoppers and aced upright in a vessel with a sieve-bottom, together ith the thermometer cylinder, which is filled with a l solution of the best leather-glue, the whole being kept r 1 hour in water at 15° C. The cylinders are then laid rizontally on the above-described thermostat, and the mperature noted at which the perpendicular surface of e jelly begins to bend. The higher the melting point, e larger the content of glutin.

The value of a glue of course depends on the use to hich it is to be put. As far as adhesive power is con-rned, the author has found many common bone-glues as od as expensive size. With regard to the strength of e jelly, in the author's experience size is better than bone-ue, though the latter often reaches a very high value in is respect. The smell of a glue is also important, being a way an indication of the tendency of a glue to compose. In this respect size is generally better than ne-glue, though there are now in commerce many of the tter which closely resemble the former in smell. The me holds good for the last important property, namely, e content of acid. The amounts of water, ash, and fat e regarded as of less importance. On the whole the best ne-glues are almost as good as medium hide-glues. sides the question of smell, a glue should be almost e from acid, and the strength of the jelly should be high ; r adhesive purposes cheap bone-glues are sufficiently good.

—W. C. H.

east, Brewers' Grains, Hops, and Starch ; Determination of Moisture in ——. J. F. Hoffmann and J. H. Schulze. Woch. f. Brau., 1903, **20**, [18], 217—218.

a previous paper (this Journal, 1902, 1088) a method as described for the determination of moisture in grain, alt, &c., by distilling it off at a high temperature from a ixture of oils and measuring the volume of the aqueous rtion of the distillate. In the pesent paper details are ven for the application of the process to certain materials hich for various reasons fail to give correct results by the iginal procedure.

Yeast and Brewers' Grains.—250 c.c. of oil of turpentine mixed with 5 c.c. of toluene are vigorously agitated in the distillation flask with 50 grms. of yeast or brewers' grains. The contents of the flask are then heated up to 140° C. in 8 minutes and maintained at this temperature for 5 minutes. The temperature is then increased to 155° C. in 3 or 4 minutes and the burner is withdrawn. When the temperature has fallen to 140° C., the measuring tube is taken between both hands and rotated to and fro for a few times, the level of the aqueous layer is then immediately read off and 0·2 c.c. is added to the volume so noted as a correction for the water suspended in the oily layer.

Hops.—The accurate determination of the moisture in hops in the ordinary manner is a matter of the greatest difficulty. An exposure of several weeks in the vacuum desiccator is necessary before a constant weight is obtained.

Results corresponding with those found by this tedious procedure are obtained in less than half-an-hour by the following method :—50 grms. of hops are vigorously shaken in the distilling flask with 500 c.c. of oil of turpentine and the contents are heated to 135° C. in 8 minutes. This temperature is maintained for 5 minutes and then increased to 150° C. in 3 minutes ; the burner is removed and when the temperature has again fallen to 135° C., the reading is taken in the manner described above.

Starch.—The estimation of moisture in starch by this method is complicated by the tendency of the starch to scorch and gelatinise, in which condition it does not part with its moisture at all readily. Perfectly satisfactory results may, however, be obtained as follows :—50 grms. of starch are treated in the distilling vessel with 400 c.c. of oil of turpentine and 10 c.c. of toluene, and heated for 5 minutes at 50° C. The temperature is then raised to 140° C. in 5 minutes, maintained at that for 5 minutes, then raised in 4 or 5 minutes to 155° C. The burner is removed and the reading is taken when the temperature has fallen to 140° C.

All these determinations require considerable practice and rigid observance of the temperatures directed and the general precautions previously noted.—J. F. B.

Nitrogen in Proteid Bodies ; Determining ——. T. B. Osborne and F. Harris. J. Amer. Chem. Soc., 1903, **25**, [4], 323—353.

THE following method was adopted for determining the various forms of nitrogen as present in proteids obtained

Proteid.	Source.	As Ammonia.	Basic Nitrogen.	Non-basic Nitrogen.	In Magnesia Precipitate.	Total.
Globulin.....	Wheat......	1·42	6·83	9·82	0·28	18·39
"	Cocoanut ...	1·33	6·06	10·92	0·14	18·48
"	Squash seed.	1·28	5·97	11·04	0·22	18·51
Edestin......	Hemp seed..	1·88	5·91	10·78	0·12	18·64
Excelsin.....	Brazil nut ..	1·48	5·76	10·97	0·17	18·30
Corylin......	Hazel nut...	2·20	5·75	16·70	0·16	19·00
Globulin.....	Cotton seed.	1·92	5·71	11·01	..	18·64
"	Castor bean.	1·96	5·64	11·00	0·12	18·75
Corylin......	Walnut.....	1·78	5·41	11·51	0·15	18·84
Conglutin....	Lupine.....	2·65	5·13	10·30	0·14	18·21
Legumin.....	Pea, lentil, bean, vetch	1·69	5·18	10·92	0·17	17·97
Globulin.....	Flax seed ...	2·00	4·77	11·47	0·22	18·48
Vicilin.......	Pea, lentil, horse bean.	1·78	4·73	10·37	0·21	17·11
Nucleovitellin	Egg yolk....	1·25	4·65	10·16	0·22	16·28
Vignin.......	Cow pea	1·91	4·28	10·81	0·25	17·25
Globulin.....	Sunflower...	2·57	4·27	11·52	0·24	18·58
Conalbumin .	Egg-white ..	1·21	4·16	10·49	0·26	16·11
Amandin	Almond.....	3·05	4·15	11·55	0·17	19·00
Phaseolin	Kidney bean, adzuki bean.	1·74	3·97	10·18	0·29	16·20
Glycinin	Soy bean....	2·11	3·95	11·27	0·12	17·45
Legumelin ...	Pea, lentil, horse bean, adzuki bean.	1·04	3·71	10·96	0·38	[illegible]
Leucosin.....	Wheat......	1·16	3·50	11·83	[illegible]	16·95
Casein.......	Cow's milk..	1·61	3·19	10·31	0·21	15·62
Ovalbumin...	Egg-white ..	1·34	3·30	10·58	0·29	15·51
Glutenin.....	Wheat gluten	3·34	2·05	11·95	0·19	17·49
Gliadin	Wheat, rye..	4·20	0·98	12·41	0·14	17·66
Hordein	Barley......	4·01	0·77	12·04	0·23	17·21
Zein	Maize.......	2·97	0·49	12·51	0·16	16·13

from different sources. 1 grm. of the proteid was boiled with 20 per cent. hydrochloric acid until the solution no longer gave the biuret reaction, usually from 7—10 hours. It was then evaporated to a bulk of 2—3 c.c., transferred to a flask, magnesia cream was added, and the ammonia distilled off and determined. The solution remaining in the flask was filtered, the residue washed and the nitrogen determined in it by Kjeldahl's method. The filtrate was next concentrated to a volume of 100 c.c., cooled to 20° C., 5 grms. of sulphuric acid were added, and then 30 c.c. of a solution containing 20 grms. of phosphotungstic acid and 5 grms. of sulphuric acid per 100 c.c. After 24 hours the precipitate was filtered off, washed with the latter solution and the nitrogen determined in the precipitate. The remaining nitrogen, principally in the form of monamino acids, was found by difference. The accompanying table shows the average percentages of nitrogen that were yielded by the different groups in various proteid bodies. In the table the wide range in the amounts of basic nitrogen obtained from the different proteids will be noticed, and also the fact that supposedly the same proteid gives different results according to the source from which it is obtained.

—W. P. S.

Narcotine and Codeine; Determination of —— in Opium. P. van der Wielin. Pharm. Weekblad., 1902, [10], through Pharm.-Zeit., 1903, **48**, [26], 267.

Determination of Narcotine.—3 grms. of powdered opium are shaken up for a few minutes with 90 c.c. of ether; 5 c.c. of 10 per cent. sodium hydroxide solution are added, and the mixture is allowed to stand for three hours, with frequent agitation. 3 grms. of calcium chloride are then added, and the whole again allowed to stand for 24 hours. 75 c.c. of the clear ethereal layer (= 2·5 grms. of opium) are then removed, 60 c.c. of the solvent distilled off, and the residue transferred to a separator, the distilling flask being washed out with 4 c.c. of water and 1 c.c. of dilute hydrochloric acid, to dissolve any crystals which may have separated from the ethereal solution. This acid washing is used to shake out the ether. The acid aqueous layer is separated, the flask again rinsed out with 5 c.c. of 2·5 per cent. hydrochloric acid and the ether shaken out with the same, and the shaking out repeated with a fresh portion of dilute acid, until the acid extract gives no precipitate with Mayer's reagent. The bulked acid solutions are now filtered, made alkaline with sodium hydroxide solution, and shaken out with 25 c.c. of ether. The ethereal layer is separated, run into a flask containing 5 grms. of calcium chloride, with which it is shaken up for 10 minutes, and then filtered off. The filter, the calcium chloride, and the alkaline liquid are again washed with successive 10 c.c.'s of ether until 1 c.c. of the ethereal washing leaves no residue, on evaporation of the ether, which gives a precipitate with Mayer's reagent. The bulked ethereal extracts are distilled and the residue dissolved by warming with 4 grms. of 90 per cent. alcohol. The alcoholic solution is allowed to stand for 24 hours, the crystals which have formed by this time are collected on a tared filter, washed with 5 c.c. of alcohol, dried at 100° C., and weighed as narcotine.

Determination of Codeine.—Codeine is determined in the alcoholic mother liquor and washings of the narcotine crystals in the above process. 10 c.c. of water are added thereto, the mixture evaporated to 10 c.c., and the turbid solution thus obtained allowed to stand for 24 hours, when a resinoid mass is deposited. The liquid is filtered, the insoluble residue and the filter are washed with water. To the bulked aqueous filtrate and washings, 5 c.c. of N/100 acid solution are added, and 3 drops of hæmatoxylin indicator. The excess of acid is then titrated back with N/100 alkali, and the amount of codeine combined with the acid calculated from the molecular weight 317 ($= C_{18}H_{21}NO_3 + H_2O$).

The following results were obtained. Two specimens of Asia Minor opium gave 11·1 and 10·1 per cent. of morphine; 5·84 and 2·82 per cent. of narcotine; 1·08 and 1·29 per cent. of codeine. A sample of Persian opium contained 12·4 per cent. of morphine; 8·37 per cent. of narcotine, and 1·51 per cent. of codeine.—J. O. B.

Eugenol; Determination of ——. Schimmel's Report, April 1903.

Verley and Bölsing's method (this Journal, 1901, 1250) is stated to be unreliable; Umney's method (with 5 per cent. of caustic potash) gives accurate results with eugenol, but in the case of natural clove oils it is thought probable that other bodies are absorbed. In the following table, results obtained by the two methods are compared:—

—	Umney's Method.	Verley and Bolsing's Method.
	Per Cent.	Per Cent.
10 per cent. eugenol........	9·5	13·2
50 " "	49·5	51·3
75 " "	75·0	78·6
100 " "	100·0	102·3
Clove oil, No. 1..............	90·5	79·9
Clove oil, No. 2..............	73·0	74·1
Clove oil, No. 3..............	80·0	69·5

—A. S.

French Patent.

Butter; Process and Apparatus for the Determination o Water in ——. M. Vogtherr. Fr. Pat. 324,745, Sept 2 1902.

Ten grms. of the butter are mixed in a graduated tube with 27 c.c. of sulphuric acid (sp. gr. 1·835), containing 4 per cent. of amyl alcohol. The tube has a bulb at its lower end and also one at the top, provided with a neck. The neck is closed by a hollow stopper, the latter being of such capacity that it will exactly hold the 10 grms. of butter taken. After warming the tube and its contents to 90 C., the fatty and acid layers are read off when cold.

—W. P. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Potassium and Sodium Hydroxide Solutions; Dependence of the Reacting Power of ——, on the Content o Water. W. Vaubel. Zeits. angew. Chem., 1903, 16, [17], 389—391.

The author has studied the behaviour of potassium manganate and permanganate towards alkalis. Potassium manganate, prepared by heating the permanganate, i not stable in aqueous solution, unless some sodium o potassium hydroxide solution has been added to the water before any change of manganate to permanganate ha occurred. The permanence of the potassium manganate molecule depends on a definite minimum concentration o the alkali, which in the case of sodium hydroxide is 0·1 pe cent., and of potassium hydroxide, 0·04 per cent. I presence of sodium carbonate, even up to 17 per cent., the formation of permanganate takes place, and sodium chloride solution up to 25 per cent. does not retard the change, whi a saturated solution of calcium hydroxide does, and barium hydroxide precipitates a green barium salt.

Potassium permanganate is permanent in aqueous solution, even in the presence of 27·8 per cent. of sodium hydroxide; in presence of larger amounts, however, green colour appears, owing to the formation of potassium manganate. These changes consequently depend on the concentration of the alkali solutions.

The absorption of oxygen by pyrogallol and simila bodies in alkaline solution, furnishes another example of the influence of concentration. The power is shown by the phenols, in which the hydroxyl groups are in the ortho and para-positions, but not in the meta-position, with the exception of phloroglucinol. According to Weyl an Zeitler, 0·25 grm. of pyrogallol in 10 c.c. of potassium hydroxide solution of sp. gr. 1·050 retains almost all oxygen drawn through it, but when the sp. gr. of the potassium hydroxide solution is lower or higher, less oxygen is absorbed and similarly with sodium hydroxide.

Experiments were made with catechol (pyrocatechol quinol (hydroquinone), pyrogallol, and gallic acid. Th influence of the concentration of the sodium hydroxide ast with pyrocatechol. The greatest absorption by hydro-uinone is with a 4·5 per cent. solution of sodium ydroxide, and by pyrogallol with a concentration of 0·5 2·25 per cent. With gallic acid the greatest absorption with a 4·5 per cent. solution of sodium hydroxide, and alls with 2 per cent., but again increases with 1 per cent. odium hydroxide solution. Quinol acts as the best absorb-ig reagent. The author concludes that the reacting power f sodium hydroxide solution is very dependent on the oncentration, and that the formation of hydrates or omplexes plays an important part in the reactions.

—W. C. H.

adio-active Lead as a Primary Active Substance. K. A. Hofmann and V. Wölfl. Ber., 1903, **36**, [6], 1040—1047.

N continuation of a previous paper (this Journal, 1902, 26), the authors describe a process by which the prepara-ons of radio-active lead chloride, previously enriched in ne active principle, may be purified and freed from ordinary nactive lead by repeated treatments with a mixture of dilute ydrochloric and sulphuric acids, with the addition of lcohol up to about 30 per cent. The residues are nearly nactive, whilst, from the filtrates, ammonium sulphide recipitates a most powerfully active sulphide, which is ecomposed into the chloride by dilute hydrochloric acid. he properties of various salts of the radio-active lead are escribed. These salts contain a substance, the activity of hich is certainly of a primary nature and not induced. he α-activity is temporarily weakened by certain treat-ents, whilst the β-activity is unchanged. Solutions of hese salts induce powerful α- and β-activity in other metals ith which they are brought into contact, notably in palla-ium; the activity induced in bismuth is comparatively light. This induced activity may be imparted either by ixing solutions of radio-active lead chloride with those of alts of the metals or by immersing bright pieces of metal n the active solutions, in which case no deposit occurs on ne surface of the metal.—*J. F. B.*

Stilbene from Phenylnitromethane. W. Wislicenus and A. Endres. Ber., 1903, **36**, [6], 1194—1195.

THYL nitrate condenses with benzyl cyanide in an lcoholic solution of sodium ethylate, with the production f the sodium compound of phenylnitroacetonitrile, ${}_6H_5.C(CN):NO.ONa$. This compound, when boiled ith caustic soda, yields phenylnitromethane. When henylnitromethane is heated with the calculated quantity f a 10 per cent. solution of caustic soda at 160° C., stilbene is roduced with a yield of 85—95 per cent. of the theoretical uantity.

This synthesis of stilbene can also be effected by heating he sodium compound of phenylnitroacetonitrile with a 0 per cent. solution of caustic soda at 180°—200° C. for —10 hours according to the equation—

$$2C_6H_5.C(CN):NO.ONa + 4NaOH + 2H_2O =$$
$$C_6H_5.CH:CH.C_6H_5 + 2Na_2CO_3 + 2NH_3 + 2NaNO_2.$$

—J. F. B.

olloidal Solutions of Gold, Platinum, and Silver; Use of Polyhydric Phenols, Phenolic Acids, Aldehydes, and Phenolic Aldehydes in the Preparation of ——. L. Garbowski. Ber., 1903, **36**, [6], 1215—1220.

OLUTIONS of salts of gold, platinum, and silver exhibit ifferences in their behaviour towards the above organic ompounds. Gold chloride and platinic chloride readily orm coloured colloidal solutions in concentrations of /10000 N., silver nitrate reacts slowly, and only in nore concentrated solutions. The reaction is accelerated y heating. The reducing powers of the phenols are roportional to the number of hydroxyl groups present, nd depend on their relative positions. A carboxyl group eakens the reducing power.

The experiments were carried out as follows:—N/100 and N/1000 solutions of the reagents were added in the cold to 0 cc. of N/1000 and N/10000 solutions of gold chloride, latinic chloride, and silver nitrate, in quantities of a few rops at a time. The quantities required to produce the ame depth of colour were taken to represent the relative reducing powers. Resorcinol, catechol (pyrocatechin), hydroquinone (quinol), pyrogallol, and phloroglucinol produced equal effects on solutions of gold chloride; towards platinic chloride slight differences were noted, and these became very marked in the case of silver nitrate; resorcinol having no action, and pyrogallol and phloroglucinol producing the greatest effects on silver nitrate solutions.

The reducing powers of gallic acid, tannic acid, protocatechuic acid, salicylic acid, and quinic acid follow the order given; acetaldehyde, propylaldehyde, valeraldehyde, and vanillin only act on gold chloride. Benzaldehyde has no action; whilst salicylaldehyde produces colloidal solutions with gold, platinum, and silver.—L. F. G.

Alcohols; Catalytic Decomposition of ——, by finely divided Metals. B. Sabatier and J. B. Senderens. Comptes rend., 1903, **136**, [17], 983—986.

AN extension of the authors' former work. (See this Journal, 1903, 577.)

Allyl Alcohol.—Copper (180°—300° C.) forms propionic aldehyde (yield up to 50 per cent.) along with a little hydrogen and acrylic aldehyde, probably by the two successive reactions—

$$CH_2:CH.CH_2OH = H_2 + CH_2:CH.CHO \text{ and}$$
$$CH_2:CH.CHO + H_2 = CH_3.CH_2.CHO.$$

Benzyl Alcohol.—Copper at 300° C. induces dissociation, almost quantitative, into benzaldehyde and hydrogen. At 380° C., besides this reaction, there occur

$$(1)\ C_6H_5.CH_2OH = C_6H_6 + CO + H_2, \text{ and}$$
$$(2)\ 2(C_6H_5.CH_2OH) = C_6H_5.CH_3 + C_6H_6 + CO_2 + H_2.$$

Out of 18 molecules, 13 yield benzaldehyde and hydrogen, two are decomposed according to (1), three according to (2). Nickel favours these subsidiary decompositions more than copper.

Secondary Alcohols.—These yield hydrogen and the corresponding ketones; the ketones being more stable than the aldehydes, subsidiary reactions occur less readily than with the primary alcohols. With copper, the 3-, 4-, and 8-carbon members give almost quantitative decompositions between 150° and 300° C. With nickel, subsidiary reactions, yielding carbon monoxide, methane, and its higher homologues, occur more readily. Cobalt is intermediate in effect between nickel and copper, while platinum black behaves almost like copper.

Tertiary Alcohols.—Copper readily dissociates these into water and alkylenes; nickel reacts similarly, but the action easily goes farther, the alkylenes dissociating into carbon and paraffins.—J. T. D.

Ethyl Alcohol; Decomposition of ——, in presence of various Catalysers. W. Ipatiew. J. prakt. Chem., 1903, **67**, [8—9], 420—422.

EHRENFELD (this Journal, 1903, 322) makes no reference to the author's experiments (this Journal, 1901, 1200; 1902, 567). The latter states that he has found that the decomposition of alcohols may take place in two ways, either with the formation of aldehyde or with the formation of ethylene, $C_2H_5.OH = C_2H_4 + H_2O$. When the aldehydic decomposition (catalyser, zinc and iron) proceeds at a high temperature, the aldehyde undergoes further decomposition into carbon monoxide and dioxide. The ethylene decomposition (catalyser, graphite), for which in recent experiments ignited clay has been used, shows the possibility of preparing large quantities of ethylene hydrocarbons from alcohols. The most recent experiments with powdered aluminium have shown that on passing the ethyl alcohol through a red-hot glass tube containing the powder, a reaction of a special kind occurs, a diethylene hydrocarbon (divinyl), $CH_2:CH.CH:CH_2$, being formed in addition to the aldehyde and ethylene. The temperature has considerable influence on the composition of the products of the reaction. Further experiments have shown that steam is not decomposed by aluminium powder at 620°—700° C., but that at that temperature ethylene is decomposed, with the formation of a hydrocarbon, carbon, and methane.—C. A. M.

Periodides; Notes on ——. D. Stroemholm. J. prakt. Chem., 1903, **67**, [8—9], 345—356.

In the author's experiments on the formation of periodides of substituted ammonium compounds, the only ones met with were those which for each iodine atom of the simple iodide contained an even number of periodide iodine atoms. Of the eight bases examined, one had a penta-iodide as its highest periodide, one (? two) a hepta-iodide, and six (? five) an ennea-iodide. Of the ennea-iodides, three yielded on decomposition the complete series of iodides down to tri-iodides, whilst three broke down immediately into penta-iodides, which then passed into tri-iodides. The highest types of compounds, such as those obtained in the case of double salts of mercuric chloride (this Journal, 1902, 1561), were not met with, and in the author's opinion ennea-iodides represent the highest possible type of iodides. In the case of divalent bases the ennea-iodides were of the type $R^{II}I_{18}$, and the author concluded that in all the salts the iodide was in the negative radicle. In the case of ennea-iodides, unlike the highest type of mercuric chloride double salts, the tension rises when methyl is replaced by ethyl, but this does not appear to be the case with hepta-iodides. Substitution of phenyl for methyl also raises the tension. As regards colour, periodides can be classified into those of brownish-violet and those of greenish tones. Tri-iodides are invariably brown or brownish-violet, but, whereas Geuther found penta-iodides to be invariably green, the author has obtained a brownish-violet one of a divalent base. Of the hepta-iodides $(C_2H_5)_4NI_7$ is violet, but others have a blackish tone. Ennea-iodides appear to be green, as was also asserted by Geuther. Speaking generally, when a base forms periodides of different classes, the green periodides belong to a higher class than the brownish-violet compounds. The green periodides are transformed into the violet-brown iodides merely by the loss of iodine, and *vice versa*. When a base forms a violet periodide of a high type it appears to form no ennea-iodide.
—C. A. M.

Terpene Series; Reduction in the ——. F. W. Semmler. Ber., 1903, **36**, [6], 1032—1040.

Metallic sodium in presence of ethyl or amyl alcohol is an excellent agent for the reduction of terpene compounds without inducing isomerisation. The unsaturated hydrocarbons of the terpene series which contain only one double bond, are not reduced by this reagent, reduction apparently only occurs when two double bonds are present, attached to two neighbouring carbon atoms. Propenyl or allyl benzenoid derivatives are reduced, with the production of propyl side chains, iso-safrol yielding *normal propyl safrol*. Limonene and terpinolene do not fulfil the necessary conditions and are not reduced. Phellandrene does not react with sodium and ethyl alcohol, but is reduced in presence of amyl alcohol, yielding a hydrocarbon, $C_{10}H_{18}$, *dihydro-phellandrene*, which is oxidised by permanganate to acetic acid and β-isopropyl-glutaric acid. Although limonene is not reduced directly, its hydrochloride reacts with sodium and alcohol, and, if the temperature of the reaction be not allowed to exceed 10° C., the chlorine is replaced by hydrogen, with the production of *dihydro-limonene*, $C_{10}H_{18}$, which yields on oxidation the same products as dihydro-phellandrene. This substitution of halogen by hydrogen, by the action of sodium and alcohol at a low temperature, is a general reaction, both with the hydrochlorides of unsaturated hydrocarbons and with the halogen substitution products of terpene alcohols, aldehydes, and ketones, whereby the corresponding hydrocarbons may be obtained. In this way, tanacetyl chloride obtained by the action of phosphorus pentachloride on tanacetyl [thujyl] alcohol, yields *dihydro-tanacetene*, $C_{10}H_{18}$.

Sesquiterpenes.—Caryophyllene does not react with sodium and alcohol, but caryophyllene hydrate (more correctly isocaryophyllene hydrate), the alcohol obtained from it with isomerisation, when heated in a closed vessel with zinc dust, is reduced, with the production of a saturated hydrocarbon, $C_{15}H_{26}$, *dihydro-isocaryophyllene*. The same hydrocarbon is obtained from the chloride of isocaryophyllene hydrate by the action of sodium and alcohol in the cold.—J. F. B.

Anaerobic Assimilation [*"Stoffwechsel"*] *of the Higher Plants, and its Relation to Alcoholic Fermentation.* J. Stoklasa, J. Jélinek, and E. Vitek. Beitr. z. chem. Physiol. u. Pathol., **3**, 460—509. Chem. Centr., 1903, **1**, [14], 847.

The authors find that the anaerobic respiration of the sugar beet under aseptic conditions is a process which bears a great similarity to the respiration of yeast cells. In both cases, the same products are formed, *viz.*, carbon dioxide and alcohol, and by the action of the enzyme on sugar solutions, the two substances are formed in the typical proportions; the fermenting power of the beet enzyme is, however, considerably smaller. After the completion of the period of anaerobic respiration, an expressed juice can be obtained from sugar beets, by the application of a pressure of 100—400 atmospheres, which possesses all the properties of Buchner's zymase. It ferments *d*-glucose better than it does *d*-fructose, yet invert sugar which has been subjected for a time to its action, does not consist wholly or mainly of fructose.

An invertase which hydrolyses sugar in 16—48 hours, is present in the expressed juice obtained from beets at a pressure of from 50 to 350 atmospheres: it is precipitated by alcohol The authors have found similar enzymes in parts of various plants and in fruits.—A. S.

THE TECHNOLEXICON.

Circular from Verein Deutscher Ingenieure, May 1903.

In the beginning of 1901 the Society of German Engineers (Verein Deutscher Ingenieure) began the compilation of an universal technical dictionary in the three languages English, German, and French.

Up to now (May 1903) there are 341 societies (42 in English, 272 in German, and 27 in French speaking countries) co-operating in the work.

Assistance has so far been promised—and partly already rendered—by 2,185 industrial establishments and individual collaborators.

Notebooks (each with three indexes, A—Z) have been provided, and will be called in by the editor-in-chief in the course of 1904.

As the contributions will not be called in before 1904, all who wish to help in the compilation of the Technolexicon have still time and opportunity to assist in the preparation of their specialities. Contributions from all technical branches (including handicrafts) are welcome, and it is obvious that small contributions from a host of various collaborators will be more useful than large ones compiled by a few men, who naturally cannot cover so many specialities. Attention is to be drawn to the fact that contributions in only one language are also most acceptable, though of course those in two or three languages are the most valuable, as also polyglot business catalogues and other technical publications. Delayed contributions, if they arrive before the end of 1906, when printing begins, can still be utilised.

The Editor-in-chief will be pleased to give any information required. Address: Technolexicon, Dr. Hubert Jansen, Berlin (N.W. 7), Dorotheenstr. 49.

PRIZE FOR A DUST-ARRESTING RESPIRATOR.

The Council of the Society of Arts are prepared to award, under the terms of the Benjamin Shaw Trust, a prize of a gold medal, or 20*l.*, for the best dust-arresting respirator for use in dusty processes and in dangerous trades.

The apparatus will be required to fulfil the following conditions:—

(1) It must be light and simple in construction:

(2) It should be inexpensive, so as to admit of frequent renewal of the filtering medium or of the respirator as a whole; or, alternatively, it should be of such construction that it can be readily cleaned:

(3) It should allow no air to enter by the nostrils or mouth except through the filtering medium:

(4) It should not permit expired air to be rebreathed:

(5) The filtering medium, though it should be effective in arresting dust particles, should not offer such resistance as to impede respiration when worn for some hours under the actual conditions of work :

(6) It is desirable that it should be as little unsightly as possible.

It should be noted that the prize is offered for a respirator ntended merely to arrest dust, and not for a chemical espirator designed to arrest poisonous fumes. The appliations of such chemical respirators are more limited, and here are special requirements connected with them. The Council have, therefore, preferred to limit the range of their resent offer to the simpler and more important cases of lust, either dust of all kinds or of some special character, *.g.*, iron or steel.

Inventors intending to compete should send in specimens f their inventions not later than 31st December 1903, to he Secretary of the Society of Arts, John Street, Adelphi, ondon, W.C. Such specimens must be accompanied by ull descriptions, and, in cases in which the apparatus has een put into actual use, the experience of such use should e given.

Competitors intending to patent their inventions should e careful to obtain protection, as the Council of the ociety cannot undertake any responsibility as regards the ecrecy of the whole, or of any part of an invention ubmitted to them.

The prize will be awarded on the report of judges pppointed by the Council.

The competition is not limited to British subjects.

The Council reserve to themselves the right of witholding the prize, of extending the time for sending in, or f awarding a smaller prize or smaller prizes.

HENRY TRUEMAN WOOD,
April 1903. Secretary.

New Books.

A COMPRESSIBILITÉ DES GAZ RÉELS. Par L. DÉCOMBE, D. ès Sc. C. Naud, 3, rue Racine, Paris. 1903. Price 2 frs.

IIS little work forms one of the "Scientia" series. It is 8vo volume, containing 99 pages of subject-matter, and illustrated with 15 engravings. The subject is treated in ght chapters, devoted to the following themes:—I. Ma-otte's Law. II. Compressibility of Gas under High ressures. III. Under Low Pressures. IV. Influence of emperature on the Compressibility of Gases. V. The ritical Point. VI. Characteristic Function. VII. The orresponding States. VIII. Compressibility of Gaseous ixtures.

IE ELEMENTS OF ELECTRO-CHEMISTRY TREATED EXPERIMENTALLY. By Dr. ROBERT LÜPKE. Second English Edition, revised and augmented from the Fourth German Edition by M. M. PATTISON MUIR, M.A. H. Grevel and Co., 33, King Street, Covent Garden, London, W.C. 1903. Price 7*s*. 6*d*.

o volume, containing prefaces, table of contents, and 250 ges of subject-matter, illustrated by 66 wood engravings, d alphabetical index. The work is divided into three rts:—I. RECENT THEORIES OF ELECTROLYSIS. (i) Phenona of Electrolysis. (ii) Faraday's Law. (iii) Hittorf's ansport Numbers. (iv) Kohlrausch's Law. (v) Disciation Theory of Arrhenius. II. THEORY OF SOLUTIONS VAN'T HOFF. (i) Osmotic Pressure. (ii) Vapour essures of Solutions. (iii) Boiling Points and Freezing ints of Solutions. (iv) Summary. (v) Aqueous Soluns of Electrolytes. III. OSMOTIC THEORY OF THE RRENT OF GALVANIC CELLS. (i) Liquid Cells. (ii) Contration Cells. (iii) Daniell Cells. (iv) Reduction Cells d Oxidation Cells. (v) The Solution Pressures of the tals. (vi) Intensity of Fixation and Polarisation. i) Irreversible Cells. (viii) Accumulators. (ix) The ergetics of Galvanic Elements.

A TEXT-BOOK OF ORGANIC CHEMISTRY. By Dr. A. F. HOLLEMAN, Prof. ord. in the University of Groningen, Netherlands. Translated from the Second Dutch Edition by A. JAMIESON WALKER, Ph.D., assisted by OWEN E. MOTT, Ph.D., with the co-operation of the author. John Wiley and Sons, New York, U.S.A. Chapman and Hall, Ltd., London. 1903. Price 2.50 dols. or 10*s*. 6*d*.

8vo volume, containing 528 pages of subject matter, 73 illustrations, and an alphabetical index. The subject-matter is subdivided into three portions :—

The INTRODUCTION (pages 1—28), with Development of Organic Chemistry. Qualitative and Quantitative Analysis. Determination of Molecular Weight. Valency, and Laboratory Methods.

PART I. THE FATTY COMPOUNDS (pages 29—258), and PART II. THE AROMATIC COMPOUNDS AND SUBSTANCES RELATED TO THEM (pages 259—419).

BENZOLTABELLEN. Darstellungsmethoden und Eigenschaften der einfacheren, technisch wichtigen Benzolderivate, aus der Literatur zusammengestellt. Von Dr. CARL SCHWALBE, Privatdocent an der tech. Hochschule zu Darmstadt. Verlag von Gebrüder Borntrāger, 11, Dessauerstrasse 29, Berlin, S.W. 1903. Price M. 15.

QUARTO volume, containing preface, table of contents, list of abbreviations, and 266 pages of subject-matter, followed by an alphabetical index. The following subjects are treated of in the tabulated scheme, wherein the names of discoverers, with references, are given in the margin:—I. Sulphonic Acids. II. Halogen Derivatives. III. Nitro Derivatives. IV. Monamines. V. Sulphonic Acids of Monamines. VI. Chloro- and Nitro-substitution Products of the Monamines. VII. Diamines. VIII. Phenols. IX. Phenol Sulphonic Acids. X. Homologous Phenols. XI. Alcohols. XII. Aldehydes. XIII. Aldehyde Sulphonic Acids. XIV. Monocarboxylic Acids. XV. Homologous Monocarboxylic Acids. XVI. Dicarboxylic Acids.

DIE CONSTITUTION DES KAMPHERS UND SEINER WICHTIGSTEN DERIVATE. Die theoretischen Ergebnisse der Kampherforschung, Monographisch dargestellt. Von OSSIAN ASCHAN. Friedrich Vieweg und Sohn, Braunschweig, Germany. 1903. Price M. 3.50.

8vo volume, containing preface, table of contents, 114 pages of subject-matter, and the alphabetical index. The subject-matter is classified as follows: — I. Introduction. II. Review of the Camphor Formulæ. III. Available Results of Research in Determining the Constitution of Camphor. IV. Critique on the Camphor Formulæ. V. Further Products derived by the Rupture of the Camphor Molecule. VI. Constitution of Camphene and Bornylene.

IMPERIAL INSTITUTE BULLETIN No. 1. Price 1*d*. Eyre and Spottiswoode, East Harding Street, E.C.

THE first of the periodical "Bulletins" be be issued as Supplements to the *Board of Trade Journal*, containing information as to the work carried on in the Imperial Institute, at South Kensington, and reports prepared by the Scientific and Technical Department of the Institute, is published with the issue of the *Board of Trade Journal* for May 21, 1903.

ANNUAL STATEMENT OF THE TRADE OF THE UNITED KINGDOM WITH FOREIGN COUNTRIES AND BRITISH POSSESSIONS, 1902. Vol. I. [Cd. 1,583.] Price 6*s*. 11*d*.

THIS is the first volume of the Annual Statement of the Trade of the United Kingdom for the year 1902, and contains detailed statistics of the imports and exports of the principal articles of trade, distinguishing the countries whence imported, and to which sent, during each of the five years 1898 to 1902. Certain alterations have been made this year in the classification of imports and exports; the classes of dyes and cotton piece-goods especially have been subdivided in a more detailed manner than previously. The imposition of the corn duties in April 1902 has also necessitated the introduction of several new headings in the statement. The second volume, to be issued later, will contain tables of imports and exports, arranged under the headings of the countries from which they are received or to which they are sent, the amount of Customs duties received at each port, details of the imports and exports at each port, particulars of the imports and exports of corn and bullion, transhipment, &c., &c.

Trade Report.

I.—GENERAL.

GERMANY; TRADE OF ——, IN 1902.

Foreign Office Annual Series, No. 2959.

Spirit.—The over-production in the spirit industry, with the resulting lowering of prices, led 90 per cent. of the agricultural distilleries to combine to limit their production, which will probably result in the production of the current year being lessened by one-fifth. The production of spirit during the last three years amounted to:—

	Galls.
1900	80,776,000
1901	89,360,000
1902	93,388,000

The export of spirit was:—

——	Quantity in Tons of 1,000 Kilos.		
	1900.	1901.	1902.
Total	14,268	15,567	31,350
To the German colonies	3,769	5,780	9,200

Sugar.—The principal consumers of German sugar in 1902 were the United Kingdom, the United States, British North America, the Netherlands, Norway, Switzerland, and Japan. The trade with the United States showed a great decrease, owing to the increased import of Cuban cane sugar, and the decreased demand of Japan is attributed to the rise in the Japanese import duties.

The German export amounted to:—

——	Quantity in 1,000 Tons.					
	Raw Sugar.			In Loaves.		
	1900.	1901.	1902.	1900.	1901.	1902.
Total	563	473	495	425	594	552
United Kingdom	161	239	273	346	443	406

The amount of beet-sugar produced in Germany, reckoned as raw sugar, for the period from August 1 to July 31, was:—

	Tons.	
1900-01	1,979,030	
1901-02	2,300,000	Estimated.
1902-03	1,730,000	

Potato-starch and Dextrin.

The export of these products from Germany to the United Kingdom was:—

——	1900.	1901.	1902.
	1,000 Tons.	1,000 Tons.	1,000 Tons.
Potato starch	11·3	14·1	23·8
Dextrin	4·0	4·6	6·9

Chemicals.—There was a good demand in all branches of chemical industry, particularly in the last month of the year. The tar colour industry was especially satisfactory. The export of drugs, apothecaries' wares, and of colours amounted to:—

	£
1900	17,633,000
1901	18,089,000
1902	20,081,000

The following show an increase in values:—

Articles.	Value in 1,000*l*.		
	1900.	1901.	1902.
Potassium cyanide	130·4	182·7	285
Aniline oil and salts	567·6	598·1	788·5
„ dyes and tar colours	3,864·4	3,981·5	4,809
Indigo	408·2	631·7	1,255

The increase in the export was chiefly for potassium cyanide to British South Africa, Portugese East Africa, the Transvaal, and Japan.

Aniline oil and salts were sent to France, Russia, Switzerland, the German colonies, and the United States.

Aniline dyes and tar colours to the German colonies, Italy, Austria-Hungary, Russia, Sweden, Switzerland, China, Japan, and the United States.

Indigo.—The total exports of indigo (almost entirely artificial) were 1,873 tons in 1900, 2,672 in 1901, and 5,284 in 1902. These figures include:—

Country.	Quantity.		
	1900.	1901.	1902.
	Tons.	Tons.	Tons.
United Kingdom	169	348	842
Austria-Hungary	377	573	873
United States	492	710	1,392

Artificial Manures.—The demand for artificial manures has increased. Chile saltpetre showed a slight decrease owing to the diminished beetroot culture, consequent upon the lower sugar prices. Several German agricultural firms have obtained possession of saltpetre works in Chile, in order to supply their clients directly. Thomas slag finds a constantly increasing demand; the home consumption amounts to about 1,000,000 tons, and the supply can scarcely keep pace with the demand. The sale is entirely in the hands of the United Thomas Phosphate Factories; the Thomas slag offered from foreign countries is not valued owing to its inferior quality.

Petroleum. — The consumption of Russian, Austro-Hungarian, and Roumanian petroleum has increased during the past year; American petroleum, on the contrary, shows a decreased demand.

The import of petroleum was as follows:—

Country.	Quantity in 1,000 Tons.		
	1900.	1901.	1902.
United States	790	781	752
Russia	119	117	137
Austria-Hungary	10·0	4·4	17
Roumania	2·1	4·2	8

Paper.—All branches of the paper trade were depressed. The machinery in fine paper and journal paper factorie stood still, either entirely, or for some days in the week. The export was a little better than last year, but it was onl towards the end of the year that the demand was at al satisfactory.

Leather.—The year 1902 was only satisfactory in certai branches of the leather trade. Only small profits wer made, and great drawbacks were experienced from ove production. A considerable expert of raw hides raised th rice for these goods, which caused a want of proportion etween the cost of production and the selling value of nanufactured goods. The driving gear leather industry ad a very unfavourable year, the home demand being small nd the raw material dear; the export trade was good.

GERMAN INDUSTRIES IN 1902; PROFITS OF ——.

U.S. Cons. Reps., April 27, 1903.

The department has received a statement of the dividends aid by some of the principal industrial undertakings in ermany for the year 1902, as compared with the preceding ear. Most of the industries, it is noted, show a falling ff in profits. The textile line and the porcelain and glass dustry show some improvement, while the chemical dustry about holds its own, and, upon the whole, makes a vourable showing.

The average dividend paid by stock companies in the ore important branches of manufacturing in 1901 was ·98 per cent. In 1902 the same industries paid an erage dividend of 6·69 per cent., or a falling off of 29 per cent.

The following table shows the figures given for some of e principal industries as carried on by stock companies:—

Description.	Average Dividend paid in 1901.	Average Dividend paid in 1902.
	Per Cent.	Per Cent.
rcelain and glass	12·93	12·98
emical manufacture	10·43	10·39
uing and blast furnace	9·66	7·73
gar manufacture	10·88	7·64
ewing business	9·4	8·86
xtile industry	2·91	4·69
ment industry	5·24	4·51
per industry	8·76	8·76

IMPORT OF CHEMICALS INTO EGYPT.

Chamber of Com. J., May, 1903.

A statistical statement issued by the Customs authorities es the import of chemical products into Egypt from 96 to 1901, the figures for the two years mentioned ng—

Imported from	1896.	1901.
	£E.	£E.
gland	14,969	31,377
many	1,793	5,544
tria-Hungary	2,735	3,371
gium	2,271	5,983
nce	5,653	11,385
y	711	4,410

The figures for the year 1901 show considerable progress compared with previous years. The yearly average, ch was £E36,500, has rapidly increased to £E66,000. sides numerous productions employed for the requireats of pharmacy, the principal chemicals imported into ypt are: Sulphuric acid, nitric acid, borax, salts of nonia, alum, the sulphates of iron and magnesia, oride of lime, corrosive sublimate, soda crystals, caustic a, and aniline colours. England occupies the first place the import of chemicals, and the business done by her early equal to the total of the importation of the other ntries.

NEW RUSSIAN GENERAL CUSTOMS TARIFF.

Bd. of Trade J., May 14, 1903.

he Board of Trade have just published a translation the new General Customs Tariff for the European tiers of Russia, with comparison, as far as possible, he rates of Custom duty contained in the Tariff with the rates at present in force on imports into European Russia from the United Kingdom.

In publishing this translation the Board direct attention to the following points:—

1. The tariff is not in operation at the date of publication of the translation, and no date has yet been fixed on which any portion of it is to come into force.

2. So far as regards goods on which the rates of Russian import duties are "Conventional," *i.e.*, are fixed by existing commercial treaties between Russia and other Powers, no alteration of the present rates can be made until those treaties expire, unless special arrangements are made with the powers concerned. As regards other goods, the Russian Government can put the new rates in operation at any time.

3. The tariff has been prepared by the Russian Government in view of the approaching termination of commercial treaties at present existing between Russia and other Powers, and the duties contained therein are liable to modification, as the result of negotiations for fresh commercial treaties. Any reductions of rates of duty on different articles that may be arranged in the course of such negotiations will apply to similar British goods imported into Russia by virtue of the "most-favoured nation" stipulation of the Anglo-Russian Treaty of 1859.

The return in question (Reference Number, Cd. 1,525) may be procured through any bookseller, or direct from Messrs. Eyre and Spottiswoode's Office for the sale of Parliamentary Papers in East Harding Street, Fetter Lane, London, E.C., at a price of 7¼*d.* per copy.

II.—FUEL, GAS, AND LIGHT.

WELSBACH MANTLES: U.S. CUSTOMS DECISION.

April 3, 1903.

Unfinished Welsbach mantles, consisting of cotton sleeves saturated with solutions of mineral salts (chiefly thorium nitrate, which latter constitutes 28·32 per cent. of the mantle), were decided by the Board of General Appraisers to be dutiable at 20 per cent. *ad valorem* as "manufactured article, unenumerated," under section 6 of the tariff.—R. W. M.

III.—TAR PRODUCTS, PETROLEUM, Etc.

DISCOVERY OF NAPHTHA DEPOSITS IN ASIATIC RUSSIA.

Bd. of Trade J., May 14, 1903.

Boring works in the Ferghaña Territory have led to the discovery of a bed of rich naphtha bearing land, situated near the Central Asian Railway.

IV.—COLOURING MATTERS AND DYESTUFFS.

INDIGO IN THE NETHERLANDS.

Foreign Office Annual Series, No. 2965.

The increasing consumption of artificial indigo, though it has greatly diminished the importation of Bengal and Java indigo, has not banished these descriptions from the market, and it appears probable that there will be always a demand for them sufficient to absorb the reduced culture. The total imported into the Netherlands in 1902 was:—

	Chests.
Into Amsterdam	1,407
„ Rotterdam	1,625

Prices for natural indigo were firm and steady throughout the year, and for the superior descriptions, "warm process," 4*s.* 6*d.* to 4*s.* 10*d.* per lb. was readily paid. It is not anticipated that prices are likely to decline further for the present.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

"SHIBORI": A JAPANESE DYED STUFF.

U.S. Cons. Rep., May 4, 1903.

A new variety of Shibori, or Japanese dress material, is shown in the Osaka Exhibition. Designs in dyed stuffs are brought out by dexterously making knots in the material so that the dye does not penetrate when the stuff is plunged into the coloring solution. It sold very readily at the Paris Exhibition, and it is believed that a good European market will ultimately be obtained for it as a dress material.

"OCTOPUS GLOY": U.S. CUSTOMS DECISION.

"Octopus Gloy," a solution of starch in a magnesium salt, designed for use in sizing cotton and woollen fabrics, was assessed for duty at $1\frac{1}{2}$ cents per lb. as a "preparation of starch" under paragraph 285 of the tariff and was claimed by the importers to be dutiable at 25 per cent. *ad valorem* as a "chemical compound," under paragraph 3. This question having been decided by the courts, adversely to the claim of the Government, in which decision the Treasury Department acquiesced, "gloy" is therefore dutiable at the rate claimed by the importers.—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

CARBOSIL (SODA CRYSTALS): AUSTRALIAN TARIFF DECISION.

Commonwealth of Australia Gazette, March 13, 1903.

By a decision made under section 139 of the Customs Act of 1901, the rate of import duty payable on "carbosil" has been fixed at 1*s.* per cwt., as soda crystals.

CITRATE OF LIME; ABOLITION OF IMPORT DUTY ON ——.

Bd. of Trade J., May 7, 1903.

The French *Journal Officiel* for the 4th May contains a Presidential Decree, dated the 30th April, providing that citrate of lime shall be exempted from the payment of import duty.

AMMONIUM SULPHATE IN GERMANY.

Chem. Trade J., May 2, 1903.

The Gelsenkirchen Coal and Coke Company produced last year 5,963 tons, against 4,726 tons in 1901; the Consolidation, 2,431 tons, against 2,155; the Nordstern, 2,197 tons, against 1,950; the Friedrich der Grosse Works, 1,303 tons, against 1,155; and the Bochum Coal and Coke Co., 934 tons, against 886. These five concerns alone account for an increase of 2,000 tons, and there are scores of others, every modern blast-furnace and coke-oven in the country being fitted with appliances for the recovery of the valuable by-product.

ALUMINIUM ACETATE: NETHERLANDS CUSTOMS DECISION.

Bd. of Trade J., May 14, 1903.

By a Resolution of the Ministry of Finance, dated 21st April, 1903, aluminium acetate is exempted from the payment of Customs duty on importation into the Netherlands.

CHALK, PRECIPITATED: U.S. CUSTOMS DECISION.

Precipitated chalk, dried and bolted, and intended for toilet purposes, was assessed for duty at 1 cent per lb., under paragraph 13 of the Tariff Act, as "chalk (not medicinal nor prepared for toilet purposes), when ground, precipitated, &c."

This assessment was affirmed by the Board of General Appraisers, but reversed, on appeal, by the U.S. Circuit Court, who decided it to be a "manufacture of chalk not otherwise provided for," and dutiable at 25 per cent. *ad valorem*, under the same paragraph. The Treasury Department has concurred in this decision.—R. W. M.

IX.—BUILDING MATERIALS, Etc.

LOSS OF CEMENT TRADE OF TEXAS (U.S.A.).

Foreign Office Annual Series, No. 2958.

There used formerly to be a large and paying business in cement from the United Kingdom, but this has gradually passed into the hands of German and Belgian traders. In 1893, out of a total of 15,816*l.* worth of cement imported, 8,614*l.* came from the United Kingdom. Last year practically none came from the United Kingdom, whilst Germany sent 22,199*l.*, and Belgium 12,211*l.* worth. This year contracts were first offered by a British firm here, importing cement, to London dealers for some 400,000 barrels of cement, for use on public works here, but on account of the price asked they went to Germany and Belgium.

X.—METALLURGY.

ZINC INDUSTRY IN EUROPE.

U.S. Cons. Reps., April 20, 1903.

Austria.—Zinc ore is mined in almost all the provinces of Austria, and, according to the official returns, the chief participants in the total output during the year 1901 were, Bohemia, with 3,090 tons; Styria, with 2,725 tons; Carinthia, with 22,845 tons; Tyrol, with 29,160 tons; and Galicia, with 4,760 tons.

Austria is not numerously provided with zinc smelteries. There is one in Bohemia, in connection with the Erste Böhmische Zinkhütten und Bergbau Gesellschaft, which mines and smelts its own ore. There is also a zinc smeltery at Cilli, in Styria, the property of the State, which obtains its ore supplies from Raibl (Carinthia) and Schneeberg and Klausen (Tyrol), and turns out about 3,050 tons annually. But it is in Galicia that the largest quantity of ore is treated. The Galician zinc smelteries are located at Neidzieliska, near Szczakowa, at Kiesz, and at Trzebinia. They draw their supplies from local sources, and produced about 3,625 tons of metal in 1901.

The greater part of the zinc ore exported from Austria finds a market in Germany. It is estimated that, while the total quantity of Austrian zinc ore exported abroad was about 22,640 tons, no less than 22,510 tons were supplied to German buyers. The total quantity of the metallic zinc leaving the country was, approximately, 1,870 tons, of which Germany took 1,525 tons.

Similarly, Germany occupies the first place as regards importation, for out of a total of 18,700 tons of zinc ore entering Austria last year, 18,600 tons were supplied by Germany. The returns dealing with the entry of zinc from abroad also show that, while the total amount was 3,250 tons Germany contributed 1,970 tons, Great Britain about 24 tons, and British India about 935 tons.

Belgium.—There are in Belgium 12 zinc smelting an manufacturing establishments producing (according to th last statistics published—in 1898) 119,671 tons (of 2,205 lb. of metallic zinc of a total value of 11,881,860 dols. pe annum. In that year, 291,977 tons of ore, 11,770 tons o by-products, consisting of various oxides, and 624,511 ton of coal were consumed by this industry in Belgium.

Three out of the 12 zinc smelteries belong to the Soc. d la Vieille Montagne; these produced from 141 furnaces, total of nearly 50,000 tons of metal. The following is brief description of one of the works of this company, sai to be the largest in the world.

There are 69 smelting furnaces of the type known as "Belgo-Silesian." These furnaces are two-sided, comprising each 108 crucibles—*i.e.*, 54 on each side, disposed in hree rows of 18. The crucibles are oval in shape, measurng 1·4 meters (4 ft.) in length, 0·168 meter (6·6 ins.) in breadth, and 0·254 meter (9·9 inches) in height. The urnaces are heated by means of longitudinal grates in the centre, the flames rising vertically to the roof of the urnace and returning on either side, thus heating the rucibles on both sides from top to bottom. In each side of the furnace there are nine receptacles, each containing room or six crucibles in two vertical rows. These receptacles are divided horizontally into three compartments by cast-iron plates having an opening for the ashes from the crucibles, when cleaning. During this operation the receptacles are partially closed by rotary sheet-iron doors or shutters, which serve to shield the men from the heat radiating from the crucibles. These doors also serve to diminish the quantity of dust blowing into the sheds during he process of cleaning.

The furnaces are all of practically the same dimensions, *viz.*, height of roof from the ground, 2·3 meters (3·05 yards); width at the centre, 5·5 meters (six yards); ength of two furnaces adjacent, 15 meters (16·3 yards).

Nine sheet-iron chimneys have been adapted to each furnace (one for each series of 12 crucibles), carrying the moke above the roof.

In these chimneys there is a slide valve allowing the closing of the draft during the smelting process.

The principal sources of ore supply are Sardinia, France, Sweden, Spain, and Algeria, in the order named.

France.—The largest producers of zinc in this country seem to be the Société Anonyme des Mines et Fonderies de Zinc de la Vieille Montagne. This company mines ores and manufactures its own product.

The native zinc ores of Germany come from Eastern Silesia, the Rheinlands, and Saxony, and the output of 1901 was divided as follows with respect to origin:—

Description.	Quantity.	Value.
	Tons.	Dols.
From the mining district of Breslau	520,099	3,002,746
From the mining district of Bonn..	105,406	1,694,560
All other mining districts..........	21,991	419,070
Total..................	647,496	5,116,376

Besides this native product, there were imported from various countries, 75,503 tons of zinc ores; the largest item, 24,046 tons, being contributed by Austria-Hungary.

The official statistics show, somewhat curiously, that during the same year Germany exported 41,002 tons of zinc ores, of which 21,860 tons went to Belgium and 18,225 tons to Austria-Hungary.

From this supply of native and imported ores, in 1901 here were produced 166,283 metric tons of block zinc, valued at 13,039,206 dols. From Belgium, France, Great Britain, the Netherlands, and Austria, Germany imported during the same period 20,180 tons of raw zinc and exported 53,312 tons.

Italy.—The zinc industry in Italy is practically confined o two centres, *viz.*, the district of Iglesias, which comprises he mining districts of Cagliari, Iglesias, and Sassari, and he district of Milan, which comprises the mining districts of Bergamo, Brescia, and Lecco.

There are few, if any, mines in Sardinia which produce zinc alone, lead and zinc being usually found together. The production of blende is on the increase. Some of the mines which had been considered exhausted, have, as a result of renewed explorations, been found to contain beds, which will ensure a good supply for the future. Other mines are giving a greater yield than heretofore, since the ntroduction of electric plant in place of the former inadequate steam plant.

In the district of Cagliari, the amount of zinc and lead blende excavated in the year 1901 was as follows:—

From 89 mines and explorations—

Lead produced	tons.	41,439
Zinc produced	„	109,710
		Dols.
Value of zinc........................	per ton.	18·27
Total value of zinc....................		2,004,401·70

In the district of Sassari the figures are:—

Number of mines of zinc and lead		4
Lead produced........................	tons.	1,432
Zinc produced	„	6,976
		Dols.
Value of zinc........................	per ton.	14·47
Total value of zinc		100,942·72

The augmented production in the season 1900–01, in comparison with 1899—1900, was 5,176 tons. This result was obtained by the increased yield of blende, being 19,562 tons against 13,170 tons of the previous season. The calamine yield, however, showed a decrease of 1,216 tons, the figures of the season 1900–01 being 97,124 tons, as against 98,340 tons of 1899—1900.

Owing to the decrease in price of zinc ore, the diminution in value of the season's production was 564,279 dols.

The mines in the district of Milan are in the provinces of Bergamo and Brescia. In the province of Bergamo, there are at present 16 registered mines and four concessions for research. The number of people engaged is 1,827. The quantity of zinc ore mined in the year 1901 was 17,253 tons, the estimated value of which was 265,006·08 dols., being 15·36 per ton. The number of electric and hydraulic motors was six, with a total horse-power of 198, with one steam or gas engine of 12 horse-power.

Exports of zinc ore amounted, in 1901, to 103,020 tons, against 111,870 tons in 1900. Imports decreased from 85 to 23 tons. The exports were principally sent to Belgium and France.

The export of metallic zinc in blocks or pigs was 349 tons in 1901, against 359 in 1900, import of zinc blocks was 3,991 tons, and sheets 3,859 tons, an increase in each case over 1900.

Russia.—All the Russian zinc works in actual operation are located in Poland. Deposits of zinc ores are scattered in various parts of the Empire, *viz.*, in the South of Russia, the Caucasus, and Finland, but no work is done in those districts. Zinc blende occurs in large quantities in the Caucasus in association with silver-lead ore. The blende is not yet reduced on the spot, but is exported to Great Britain, Belgium, and Germany.

Year.	Metallic Zinc.		Sheet Zinc.		White Zinc.	
Bendinsk Works.	Poods.	Tons.	Poods.	Tons.	Poods.	Tons.
1898	194,274	3,158·7	..	..	..	..
1899	251,635	4,091·6	..	..	..	..
1900	223,410	3,632·6	..	..	..	..
Paulina Works.						
1898	151,520	2,463·7	..	..	..	..
1899	134,598	2,188·5	..	..	..	..
1900	140,608	2,286·5	..	..	..	..
1901	155,362	2,526·2	..	..	..	..
Constantin Works.						
1901	51,467	836·8	..	..	..	..
Emma Works.						
1898	..	..	193,362	3,144·0	73,6 2	1,196·9
1899	..	..	206,280	3,354·0	47,826	777·6
1900	..	..	177,936	2,893·2	76,869	1,249·9
1901	..	..	203,763	3,312·2	35,968	584·8

The quantity of zinc yielded by the Polish mines—from information obtained from the Imperial Department of Mines—was 4,068,063 poods (66,147·3 tons) of zinc ore in 1899, 3,864,354 poods (62,834·9 tons) in 1900, and 3,496,233 poods (56,849·3 tons) in 1901. The production of zinc from these ores is shown in the accompanying table. The figures show that the production of metallic zinc in Russia is not very important; this is partly due to the poor quality of the ores and partly to the keen competition of the Silesian (German) zinc. The Silesian ore is considered superior to the Polish; the Silesian manufacturers control large capital, and, being favoured by more advantageous economic conditions, are able to lower the prices of their product.

Russia imports zinc principally from Germany, Belgium, and Holland, and the quantity entered during 1898 was 10,840 tons. Zinc blende is imported from Silesia. Zinc ore is not exported, all the ore mined being smelted in this country. A portion of the zinc produced in Poland goes to the interior of Russia in the raw state, and is chiefly used for manufacture of brass. The remainder is rolled into sheets at the works in Poland.

MINERAL PRODUCTION OF QUEENSLAND DURING 1902.

Eng. and Mining J., April 25, 1903.

The amount of fine gold produced in 1902 was 640,463 oz., against 598,382 oz. in 1901; showing an increase of 42,081 oz., or 7 per cent., last year.

The total coal produced in 1902 was 501,531 tons, against 539,472 tons in 1901; showing a decrease of 37,941 tons, or 7·0 per cent.

The output of other metals and minerals reported is as follows:—

—		1901.	1902.
Silver	oz.	571,561	701,312
Tin	tons	1,661	2,085
Lead	"	561	267
Copper	"	3,061	3,784
Iron ore	"	430	..
Tungsten ore	"	72	55
Manganese ore	"	218	4,600
Bismuth ore	"	20	1
Bismuth and molybdenite	"	26	41
Lime, made	"	6,514	4,743
		£	£
Opals	value	7,400	7,000
Other gems	"	6,000	5,000

The total value of these minor products in 1902 was 417,675*l*., against 382,933*l*. in 1901; showing an increase of 34,742*l*., or 9·1 per cent., last year.

NICKEL, COBALT, AND CHROME EXPORTS OF NEW CALEDONIA.

Bd. of Trade J., April 30, 1903.

In 1902 the quantity of nickel ore exported was slightly inferior to that of the preceding year, the figures being 129,653,090 kilos., as compared with 132,814,356 kilos. The exports of cobalt, which were only 3,123,150 kilos. in 1901, reached 7,512,220 kilos. in 1902, while those of chrome fell from 17,451,192 kilos., in 1901, to 10,281,000 in 1902.

SILICATE COTTON OR SLAG WOOL: U.S. TARIFF DECISION.

Bd. of Trade J., April 30, 1903.

The article known in Great Britain as "silicate cotton" or "slag wool," and in the United States as "mineral wool" or "rock wool," is liable, on importation into the United States, to a duty of 20 per cent. *ad valorem*, as a non-enumerated manufactured article under section 6 of the Tariff Act.

TIN PRODUCTION OF 1902; SOME DETAILS OF THE ——.

Eng. and Mining J., April 25, 1903.

Tasmania produced 1,958 tons of metallic tin during 1902, worth 1,189,140 dols., and 131 tons of tin ore, value 25,810 dols. The output of the metal in New South Wales was valued at 268,530 dols., compared with 386,575 dols. in 1901. The diminution was due to drought, since the alluvial deposits from which tin is obtained can only be profitably worked when plenty of water is available. Western Australia produced 620 (long) tons, valued at 198,915 dols., compared with 734 tons, valued at 200,000 dols., in 1901.

The Malay Peninsula, for the year ending June 30, 1902, produced 22,763 tons of ore, yielding 622 tons of black tin, value 242,505 dols. The net profit for the year was 111,200 dols.

The three representative Cornish mines show cost and yield (for 1902) as follows:—

Mine.	Cost per Ton.	Yield of Black Tin per Ton.
	Dols.	Lb.
Basset	5·13	36·00
Dolcoath	4·74	40·78
Carn Brea and Tincroft	4·64	26·49

Of these, only Dolcoath made a profit, at the rate of 1·30 dols. per ton net (*i.e.*, after paying landlord's dues, which amounted to 43 cents per ton).—T. F. B.

PLATINUM SPATULAS: U.S. CUSTOMS DECISION.

April 8, 1903.

Spatulas with a platinum point and a nickel-plated handle were held by the Board of General Appraisers to be dutiable at 45 per cent. *ad valorem* under paragraph 193 as "manufactures of metal."—R. W. M.

GERMAN SILVER STRIPS: U.S. CUSTOMS DECISION.

April 20, 1903.

Strips of German silver rolled and cut to definite form and shape were held by the Board of General Appraisers to be dutiable at 45 per cent. *ad valorem* under paragraph 193 of the Tariff Act, as "manufactures of metal," and not at 25 per cent. *ad valorem* under paragraph 174 as "German silver, unmanufactured."—R. W. M.

XII.—FATS, OILS, Etc.

COTTON-SEED OIL AND CAKE IN TEXAS (U.S.A.).

Foreign Office Annual Series, No. 2968.

Exports of Cotton-Seed Meal and Cake from Galveston for 1898—1902.

Year.	Quantity.					
	United Kingdom.	Germany.	Holland.	Belgium.	Denmark.	France.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1898	9,046	156,027	29,289	8,603	26,653	4,441
1899	20,567	156,507	34,399	5,651	31,948	4,985
1900	12,553	164,969	28,379	8,445	12,137	[illegible]
1901	21,546	152,876	34,079	7,745	17,813	3,183
1902	8,003	102,117	26,332	6,196	21,175	2,460
Average, five years	14,343	146,499	30,496	6,328	21,945	3,594

Exports of Cotton-Seed Oil from Galveston for 1898—1902.

Year.	Quantity.							
	United Kingdom.	Germany.	France.	Holland.	Belgium.	Italy.	Denmark.	Mexico.
	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.
1898	97,500	312,455	927,305	1,850,289	108,846	1,085,349	74,510	915,870
1899	34,860	191,132	1,674,769	3,190,897	146,072	12,750	205,020	1,036,551
1900	31,000	369,986	1,921,527	2,403,160	..	..	108,120	1,036,477
1901	47,300	169,204	857,948	2,422,260	54,080	..	49,950	1,410,825
1902	77,009	92,600	..	2,681,860	86,211	..	..	506,559
verage, five years ...	57,532	227,075	1,076,310	2,511,493	79,042	219,620	87,520	981,256

Oil-Seeds in Uganda in 1902.

Bd. of Trade J., April 30, 1903.

Earth-nuts are largely grown in the districts around Lake ictoria Nyanza, and it is believed that a rapidly increasing iantity will soon be passing over the railway.

Sim-sim or Oil-seed.—A trade in this only started during e half-year under report, and the seed is grown in the stricts on the lake. The Italian Trading Company seem have a monopoly of it, and they were almost the only m who despatched the 16½ tons from Port Florence to e coast, and it no doubt found its way to Europe by the ıstrian-Lloyd boats. The agents of the above-named m state that they expect to provide a steadily increasing affic in this seed.

Hints for Exporters of Soap and Candles.

Chamber of Com. J., May 1903.

The German Consul at Varna reports that soaps are ıncipally native productions. Soaps from Turkey are ty-free, and are consequently much in favour at present. ilet soaps come from Germany and Austria-Hungary; tter sorts from France and Great Britain. Candles are ncipally imported into Adrianople by Belgium and olland at the price of 100 frs. per 100 kilos. French ıdles, on account of their high prices, do not now meet h buyers. The French Consul at Damascus states that natives remain faithful to the native soaps; they princi- ly use soap from Nablus, to the north of Jerusalem, or m Beyrout or Antioch. A French attempt to import rseilles soap has failed. England supplies the market of ipoli, the price of candles being 92 to 95 frs. per 100 os. It is true that Tripoli possesses some soap works, Tunis covers the principal requirements. Marseilles l Italian merchandise is also imported into the market. e German Consul at Hayti reports that the consumption ordinary soaps is proportionally very considerable, and y are mostly imported from the United States. It is ted that a soap factory, which has been in existence at t-au-Prince for six years, and which produces from 1,000 1,250 gourds of soap per month, sells the same readily 1·80 to 1·90, packed in gourds, per case weighing ilos. At St. Marc also a soap factory has been existent some months, which is, however, inferior to the before- ned one, and the development of which is being ited.

Grease, Soluble: U.S. Customs Decision.

April 8, 1903.

uty was assessed at 30 per cent. *ad valorem* on a paration known as "soluble grease" produced by sulfo- ing tallow; it is used as alizarine assistant. The orter claimed that the merchandise was more properly oftening than an alizarine assistant, and was dutiable 20 per cent. *ad valorem* as a "manufactured article numerated." The Board of General Appraisers, owing a ruling of the United States Court, sustained the m of the importer.—R. W. M.

XIII. A.—PIGMENTS, PAINTS, Etc.

Colours, Earth: U.S. Customs Decision.

An article described as an "earth colour" which was neither an ochre, umber, nor sienna, but an extract from a Vandyke or Cassel brown, was decided by the Board of General Appraisers to be dutiable at 30 per cent *ad valorem* under paragraph 58 of the Tariff Act.—R. W. M.

XV.—MANURES, Etc.

Crown Licenses for Removing Guano in the South Atlantic Islands.

Bd. of Trade J., May 14, 1903.

The Crown Agents for the Colonies are prepared to receive applications for crown licenses for the exclusive occupation of any or all of the uninhabited islands in the South Atlantic Ocean, known as Nightingale, Inaccessible, and Gough Islands, for the purpose of removing guano, &c.

Applications for permission to conduct experimental operations for a short period, with a view to taking out a license, will also be entertained subject to the deposit of a sum to be arranged, as a proof of *bona fides*.

Information as to the conditions usually attached to licenses can be obtained from the Crown Agents, and a specimen form of license can be seen at their offices in Downing Street, S.W.

XVI.—SUGAR, STARCH, Etc.

New Sugar-Legislation of France, Germany, and Austria-Hungary.

The Board of Trade have received copies of the new Sugar Laws recently promulgated by the Governments of France, Germany, and Austria-Hungary. These laws are to come into operation in each case simultaneously with the convention, *i.e.*, on the 1st September next.

The principal provisions of the Laws are as follows:—

I.—France.

From the 1st September 1903 the internal consumption duty on sugar is fixed at the following rates:—

		Frs.	Cts.
Raw and refined sugars	100 kilos. of refined	25	00
Candies	100 kilos. net weight	26	75

The manufacturing tax of 1 fr. per 100 kilos. is to be abolished from the same date, and the tax on refining reduced from 4 to 2 frs. per 100 kilos. Authorisation is also given for the exemption (under conditions to be determined by the Administration) of molasses destined for agricultural purposes and containing a saccharine richness of not more than 50 per cent.

The Customs surtaxes on foreign sugars of any origin are from the same date to be modified as follows:—

		Frs.	Cts.
Refined sugars and raw sugars, testing not less than 98 per cent............	100 kilos. net weight	6	00
Other sugars	" "	5	50

The surtax on candies will be calculated in the proportion of 107 kilos. of refined to 100 kilos. of candy, net weight. With regard to molasses and chocolate, the existing provisions in respect of import duties are to remain in force.

The "détaxes de distance," or allowances for cost of transport granted to French Colonial sugars imported directly into France and to French sugars despatched under certain conditions to refineries at Atlantic or Mediterranean ports or in the interior, are for the future to be allowed according to the actual cost of transport instead of at the former fixed rates, which rates, however, are not to be exceeded.

Sugars for use in the manufacture of alimentary products for exportation may be introduced into factories specially engaged in such manufacture and utilised free of duty under control.

The direct bounties on exported sugars are to be abolished, together with the system of assessing the amount of the consumption duty on the weight of the beetroot employed in the manufacture of the dutiable sugar, which was found to operate as an indirect bounty by reason of excess yields and allowances for waste in manufacture.

The dispositions in force prior to the Law of 1884, relative to the assessment of the "prise en charge" based on the volume and density of the juice before defecation, are to be again put into operation. The rate of the "prise en charge" is fixed at 1,500 grms. per hectolitre and per degree of density above 100° (100° = density of water).

The dispositions actually in operation as to the taxation of raw sugars according to saccharimetric test, as well as those relating to the working of refineries, are maintained in force.

II.—Germany.

From the date when the Brussels Sugar Convention comes into force, the internal tax on sugar in Germany is to be fixed at 14 marks per 100 kilos. The import duties on foreign sugars on which no premium has been paid in the country of production, are to be levied, from the same date, at the highest rate possible under the Brussels Sugar Convention (*i.e.*, at the rate of the internal duty *plus* a surtax equivalent to 6 frs. per 100 kilos. for refined, and 5 frs. 50 cents per 100 kilos. for raw). The country of origin of the sugar is to be proved on entry.

The provisions of the existing sugar laws relative to the "additional tax" on sugar produced, and to export bounties are to be suspended. It is also provided that sugar which shall have been received into a bonded warehouse before the coming into force of this law, shall, on coming into the open market or into a sugar factory after that date, repay the export bounty accorded thereon.

III.—Austria-Hungary.

From the date when the Brussels Convention comes into force, the import duty on sugar is to be levied at the highest rate permitted under the terms of the Convention (see above, under Germany). The origin of foreign sugar is to be certified on importation.

After August 31, 1903, no further export bounty will be granted on Austro-Hungarian sugar, either in its natural form or when contained in sacchariferous articles.

No alteration is made by the present law in the existing consumption duty on sugar which stands at 38 kr. per 100 kilos.

The remaining sections of the law provide for regulating the supply of sugar in the home market in the various districts within the Austro-Hungarian Customs Union, and fixes the sugar "contingent" for the ensuing season (1903-4) for Austria, Hungary, and Bosnia Herzegovina, respectively. In this connection, a further law has been promulgated containing regulations for the individual distribution of the sugar "contingent" in Austria,* the provisions of which have been summarised in a memorandum by Mr. Bennett, His Majesty's Commercial Attaché at Vienna, received at the Board of Trade through the Foreign Office.

The system, known as "double contingentirung," consists in granting to each branch of the sugar industry certain definite claims to the prescribed contingent. To refiners is granted the right of placing the sugar contingent directly on the home market, while raw sugar producers alone possess a claim to the raw sugar value of the contingent, which is calculated on the basis of 100 kilos. of raw being equal to 90 kilos. of refined.

With regard to raw sugar factories, the maximum net production of each factory during one of the seasons of 1898-99, 1899-1900, 1900-01, is to be taken as the basi for the scale of participation in the raw sugar value of th contingent. At the same time, modifications of this genera rule are to be made in favour of the smaller factories Similarly, the share in the contingent assigned to eacl refinery is to be fixed by ascertaining the maximum amoun of refined sugar placed on the home market by suc refinery during one of the seasons of 1898-99, 1899-1900 1900-01.

The certificates issued every month by the Government showing what portion of the contingent prescribed for an particular season may be set free for home consumptio will be distributed among the various raw sugar producer and must eventually be acquired by refiners before the can exercise their right of placing the refined article on th home market. Mr. Bennett accordingly points out that th system of "double contingentirung" consists in an arrange ment under which, on the one hand, refiners receive th right of admitting the sugar contingent to excise, wherea on the other, raw sugar producers can alone obtain th certificates enabling the refiners to exercise that right; an he adds that, though the law contains no stipulations as t how refiners are to acquire the necessary certificates, private arrangement has been come to between the refine and raw sugar producers, by which the former can acqui the certificates in question on payment to the latter 3 kr. 30 h. per 100 kilos. of refined sugar placed on th home market.

XVIII. C.—DISINFECTANTS.

Sheep Dip: U.S. Customs Decision.

April 24, 1903,

Sheep dip, consisting of soap, carbolic or creosote oils, a arsenic compounds, not adapted for household use, a suitable only for disinfecting sheep or other animals, w held by the Board of General Appraisers, to be free of du under paragraph 657 of the free list Tariff Act, and not 20 per cent. *ad valorem* as assessed by the Collector.

—R. W. M.

XIX.—PAPER, PASTEBOARD, Etc.

Wood Pulp in Spain.

Bd. of Trade J., May 14, 1903.

H.M. Consul remarks that 10,239 tons of wood-pu imported into Bilbao in 1902, point to an article which m become worth the attention of Canadian producers. present Norway supplies nearly the whole of this, which said, in Bilbao, to be superior to the Canadian, but price probably the decisive factor. Norwegian pulp costs 11 f per 100 kilos. (say 4*s.* 5*d.* per cwt.) franco Bilbao, agai Canadian, 5*s.* per cwt.

XX.—FINE CHEMICALS, Etc.

Saccharin Regulations in Germany.

Bd. of Trade J., April 30, 1903.

The regulations for carrying out the law prohibit the production, importation, or sale of saccharin, &c., Germany, came into force on April 1, 1903.

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* A Bill containing corresponding provisions for Hungary is under the consideration of the Hungarian Legislature.

The principal provisions are as follows:—

Of the existing factories of saccharin, only one is allowed t go on manufacturing, a permission that may, however, be r alled at any time. The price of 30 marks per kilo cannot b exceeded when selling refined saccharin to German c sumers ; exportation is allowed without any restriction o price. The price before the passing of the law was c v 15 marks.

With regard to business done within Germany, the regulat s treat saccharin in the same way as if it were poison. I can only be furnished to apothecaries or to persons who h e special authority to use it, and to the heads of certain e blishments for cures, which at present is limited to that a Neuenahr on the Rhine.

For the production of specified articles, manufacturers c procure saccharin in cases where sugar cannot be used.

QUININE IN THE NETHERLANDS.

Foreign Office Annual Series, No. 2965.

he import of quinine bark in 1902 was large, and prices w e in consequence depressed, dropping from 1½*d*. per unit anuary to 0·90*d*. per unit in August, recovering in the l er part of the year, and closing in December at 1*d*. per u .

he production of sulphate of quinine was 714,400 lb. in 1 and 705,000 lb. in 1902, and was sold at prices a raging 1·39*d*. per unit.

CAMPHOR; ARTIFICIAL —— .

Schimmel's Report, April 14, 1903.

he Port Chester Chemical Co., with a capital of one n ion dols., has been formed in New York, for the manufact of camphor from oil of turpentine. The immediate p luction will be, it is said, about 600,000 lb. per annum; a this will ultimately be increased to 2,000,000 lb. per a um. It is estimated that one barrel of turpentine will y l 98 lb. of camphor of 99 per cent. purity.

he production of natural camphor amounts to 300,000 lb. i apan, 220,000 lb. in China, and 7,000,000 lb. in Formosa, t production in the last named island affording an annual r nue of 800,000 dols. to the Japanese Government.

—A. S.

Patent List.

B.—In these lists, [A.] means "Application for Patent," and [C.], "Complete Specification Accepted."

here a Complete Specification accompanies an Application, an a isk is affixed. The dates given are (i) in the case of Applicat for Patents, the dates of application, and (ii) in the case of C plete Specifications Accepted, those of the Official Journals in hich acceptances of the Complete Specifications are advertised.

mplete Specifications thus advertised as accepted are open to in ection at the Patent Office immediately, and to opposition w in two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 10,053. Smithson. Packing for acid towers or condensers. May 4.

„ 10,124. Ekenberg. Concentrating and evaporating liquids.* May 4.

„ 10,682. Farrell. Settling or filtering tanks. May 11.

„ 10,831. Knight. Manufacture of filtering mediums.* May 12.

[A.] 10,834. Ekenberg. Method of and apparatus for heating substances containing liquid or moisture.* May 12.

„ 10,936. Köhler. Means for facilitating the reading of thermometers, burettes, and other graduated tubes.* May 13.

[C.S.] 10,724 (1902). Eltz. Apparatus for heating air or liquids to a constant temperature. May 13.

„ 11,305 (1902). Hiorth. Drying apparatus. May 13.

„ 14,073 (1902). Bridge. Crushing machine. May 13.

„ 18,830 (1902). Reese. Separation of solid matter from liquids, or of liquids from each other. May 20.

„ 24,447 (1902). Heimann. Extracting apparatus. May 20.

II.—FUEL, GAS, AND LIGHT.

[A.] 10,295. Dressler. Heating furnace. (U.S. Appl., May 6, 1902.)* May 6.

„ 10,364. Fletcher, Russell, and Co. Bunsen or atmospheric gas burner.* May 7.

„ 10,416. Faucheur. Manufacture of fuel briquettes. May 7.

„ 10,493. Thwaite. Prevention of oxidation in carbon electrodes of electric stack furnaces. May 8.

„ 10,527. Blau. Oil gas of high combustible value. May 8.

„ 10,624. Pearson. *See under* VII.

„ 10,687. Grayson. Manufacture of artificial fuel. May 11.

„ 10,852. Grundy. Manufacture of incandescent mantles. May 13.

„ 10,866. Henderson. Regenerative furnaces. May 13.

„ 11,000. Reynolds. Electric crucible furnaces. May 14.

„ 11,001. Reynolds. Electric crucible furnace. May 14.

„ 11,119. Hansen. Rotary furnaces. May 15.

[C.S.] 12,156 (1902). Abel (Siemens and Halske A.-G.) *See under* XI.

„ 12,162 (1902). Abel (Siemens and Halske A.-G.). *See under* XI.

„ 12,362 (1902). Crossley and Rigby. Apparatus for treating gas and air in connection with gas-producers. May 13.

„ 12,429 (1902). Von Heidenstam. Producing fuel briquettes. May 13.

„ 13,447 (1902). Berntrop and Hulsebosch. Manufacture of fuel or fuel briquettes or blocks. May 20.

„ 15,154 (1902). Johnson (Deuts. Cont. Gas-Ges. and Bueb). Apparatus for manufacture of gas. May 20.

„ 15,770 (1902). Lake (Julius Hardt). Bunsen burners. May 20.

„ 5566 (1903). Brown. Artificial fuel. May 13.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[C.S.] 27,070 (1902). Ballantyne. Discharger for sulphate of ammonia saturators. May 20.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 10,074. Newton (Bayer). New derivatives of the anthraquinone series. May 4.

„ 10,536. Johnson (Badische Anilin und Sodafabr.). Production of disazo colouring matters. May 8.

„ 11,003. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of green sulphurised dyestuffs. May 14.

„ 11,004. Abel (Act.-Ges. f. Anilinfabr.). Manufacture of red monazo dyestuffs. May 14.

[C.S.] 13,130 (1902). Imray (Meister, Lucius und Brüning). Manufacture of bromioated products of indigo. May 13.

„ 16,917 (1902) Ellis (Soc. Chim. Usines du Rhône). Manufacture of indigo or intermediate products. May 13.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 10,035. Rawson and Lodge. Machine for treating textiles with liquids. May 4.

„ 10,224. Bloxam (Knapstein). Manufacture of mordants and of mixtures thereof with dyestuffs. May 5.

„ 10,234. Rousselle. Apparatus for treating wool. May 5.

„ 10,255. Crompton and Horrocks. Machines for treating yarn in hank form. May 6.

„ 10,538. Perkin, and Whipp Bros. and Todd. Treatment of raw cotton and flax, and cotton and linen goods, to reduce their inflammability. May 8.

„ 10,802. Schoening and The Carl Schoening Eisengiesserei u. Werkzeug Maschinenfabr. A.-G. Printing patterns on piece goods, paper, &c. May 12.

„ 10,839. Kohn. Manufacture of fibre material. May 12.

„ 10,925. Rott and Müllen. Textile printing machines. May 13.

„ 11,061. Kenworthy. Machines for finishing textile fabrics. May 15.

[C.S.] 10,530 (1902). Leinveber. Preparing and spinning threads from cellulose, paper, pulp, &c. May 20.

„ 5249 (1903). Spenle. Tentering and mercerising machines. May 20.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 10,122. Trivick. Production of nascent chlorine. May 4.

„ 10,123. Trivick. Generation of nascent chlorine. May 4.

„ 10,315. Elworthy. Processes for solidifying carbon dioxide. May 6.

„ 10,624. Pearson. Manufacture of lime and fuel gas. May 9.

„ 11,126. Dumars. Apparatus for separating air into its constituent gases.* May 15.

„ 11,221. Lightfoot (Ges. f. Linde's Eismaschinen A.-G.). Process and apparatus for obtaining nitrogen from liquid air.* May 16.

[C.S.] 12,201 (1902). Johnson (Badische Anilin und Soda Fabrik). Production of alkali metal oxides. May 13.

[C.S.] 12,691 (1902). Cuénod and Fournier. *See unde* XI.

„ 27,070 (1902). Ballantyne. *See under* III.

„ 6824 (1903). Clark (Ferguson). Manufacture o sulphuric anhydride. May 13.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 10,285. Swearer and Toynbee. Making wire-glass. May 6.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 10,557 Graham. Manufacture of a substanc resembling stone. May 9.

[C.S.] 13,664 (1902). Christen. Manufacture of aspha composition. May 20.

„ 2458 (1903). Krause. Production of artifici stone. May 13.

„ 3629 (1903). Justice (Acheson Co.). Productio of compounds containing carbon, silicon, a oxygen in chemical combination. May 20.

X.—METALLURGY.

[A.] 10,211. Pearce and Pearce. Obtaining metallic ti from its oxide. May 5.

„ 10,330. Kohlmeyer and Edwardes. Centrifug machines for treating tailings or slimes from or stamping operations, &c. May 6.

„ 10,412. Atkinson. Treatment of ores. May 7.

„ 10,648. Heffelmann. Preparing fine, granulate or sand ores for use in the blast furnace. May 1

„ 10,659. Loewenthal and Lippert. Smelting san like or dusty ores.* May 11.

„ 10,754. Williamson. Cyanide process of gol extraction. May 12.

„ 10,771. Leifert and England. Method of solderi aluminium. May 12.

„ 11,002. Reynolds. Method of melting steel, &c. electric resistance furnaces. May 14.

[C.S.] 12,563 (1902). Wright. Amalgamating plates f gold ore treatment. May 13.

„ 13,025 (1902). Jensen (Rübel). Manufacture aluminium. May 13.

„ 13,744 (1902). Knigge and van Holt. Process hardening iron. May 13.

„ 14,936 (1902). Warrington. Manufacture aluminium alloys. May 20.

„ 15,222 (1902). Stone. Process for freeing cop regulus from arsenic and antimony. May 20.

„ 1519 (1903). Dobbelstein. Working off or red ing pulverulent or dust iron ores. May 20.

„ 7693 (1903). Sexton. Method of treating ores zinc. May 20.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 10,194. Carrère. Electric furnaces.* May 5.

„ 10,193. Thwaite. *See under* II.

„ 10,541. Bijur. Making battery plates.* May 8

A.] 10,743. Wakelin and Turquand. Method of applying electrolytes to batteries. May 12.

,, 11,145. Calandri. Accumulator electrodes. May 15.

.S.] 12,156 (1902). Abel (Siemens and Halske A.-G.). Electric incandescence lamps. May 20.

,, 12,162 (1902). Abel (Siemens and Halske A. G.). Manufacture of filaments for electric incandescence lamps. May 20.

,, 12,691 (1902). Cuénod and Fournier. Electrolytic decomposition of alkaline chlorides. May 13.

,, 14,133 (1902). Baker, and Castner-Kellner Alkali Co. Connecting carbon electrodes with electric leads. May 20.

, 14,583 (1902). Gaiffe and Gallot. Electrolytic interruptors. May 20.

,, 15,128 (1902). Bloxam ("Columbus" Elect. Ges.). Apparatus for electrolytically coating sheet metal with zinc. May 20.

,, 28,013 (1902). Chloride Electrical Storage Co., Ltd. (Soc. Anon. Travail Elec. Métaux). Formation of negative electrodes for accumulators. May 13.

,, 1670 (1903). Reid. Method of generating electricity. May 20.

II.—FATS, FATTY OILS, WAXES, AND SOAP.

.] 10,197. Darrington. Candles. May 5.

,, 10,324. Delahaye. Manufacture of artificial wax. May 6.

S.] 12,957 (1902). Liebreich. Manufacturing fatty substances from fats, &c., of animal and vegetable origin, and of fat-like substances of mineral origin. May 13.

,, 15,897 (1902). Johnson (Elek.-Act.-Ges. vorm. W. Lahmeyer and Co.). Apparatus for testing lubricating oils. May 20.

XI.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

.] 10,279. Tytherleigh. Copying ink. May 6.

, 11,112. Armbruster and Morton. Making pigments.* May 15.

, 11,113. Armbruster and Morton. Composition to be used for making pigments.* May 15.

.S.] 3769 (1903). Armbruster and Morton. Composition of matter to be used for pigments. May 13.

C.—India-rubber, &c.

S.] 25,004 (1902). Thielgaard. Treatment of waste caoutchouc, gutta-percha, &c. May 20.

IV.—TANNING, LEATHER, GLUE, AND SIZE.

.] 10,845. Howarth (Bauer and Co.). Manufacture of albuminous compounds soluble in water. May 12.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 10,062. Process for refining sugar. May 4.

,, 10,340. Treatment or preparation of sugar. May 6.

[C.S.] 885 (1903). Haake and Haake. Preparation of an adhesive or cement from starch. May 20.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 10,093. Johnson and Hare. Fermentation of liquids.* May 4.

,, 10,581. Wardle. Preserving brewers' or distillers' yeast. May 9.

,, 10,929. Guillaume. Distillation and rectification of alcohols and the like. (Fr. Appl., June 7, 1902.)* May 13.

,, 11,072. Maynard. Method of extracting the soluble constituents of hops added to beer when stored in vats, tanks, &c. May 15.

,, 11,223. Lapp. Manufacture of beer free from alcohol.* May 16.

[C.S.] 11,645 (1902). Grant and Duff. Evaporating and drying liquid distillery refuse or by-products. May 13.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

B.—Sanitation; Water Purification.

[A.] 11,073. Travis and Ault. Purification of sewage and other liquids. May 15.

C.—Disinfectants.

[A.] 10,668. Musgrove. Means for disinfecting. May 11.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 10,243. Balston and Briggs. Production of soluble acetylised cellulose derivatives. May 5.

[C.S.] 1479 (1903). Koenig. Manufacture of compoboard. May 13.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 10,095. Zimmermann (Schering). Manufacture of methylene hippuric acid. May 4.

,, 10,242. Iljinskij and Wedekind and Co. Manufacture of organic sulpho-compounds. May 5.

,, 11,136. Imray (Fabr. Prod. Chim. Thann et Mulhouse). Manufacture of saccharine. May 15.

,, 11,137. Imray (Meister, Lucius und Brüning). Manufacture of derivatives of cyclo-hexane and cyclo-hexene. May 15.

,, 11,138. Imray (Meister, Lucius und Brüning). Manufacture of esters of trimethyl cyclo-hexenone carboxylic acid. May 15.

[C.S.] 1945 (1903). Boehm (Fischer). Preparation of C. C-dialkyl barbituric acids from monoalkyl malonic esters. May 20.

[C.S.] 3430 (1903). Boehm (Winternitz). Manufacture of solid iodized and bromized oils in powder form. May 13.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 11,219. Fulton and Gillard. Production of photographs on linen or other fabric. May 16.

[C.S.] 5595 (1903). Fritzsche. Photographic film bands. May 15.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 10,789. Fischer. Explosive mixture. May 12.

,, 10,836. Brock. Explosive for blasting, signalling and other purposes. May 12.

[C.S.] 11,503 (1902). Muir and Bell. Igniting materia for matches, cartridge fuses, &c. May 20.

,, 13,111 (1902). Az. Explosives. May 20.

,, 2977 (1903). Brock. Explosive compounds fo signal, blasting, and other purposes. May 20.

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Notices.

ANNUAL MEETING, BRADFORD, 1903.

Abridged Programme.

Wednesday, July 15th.

10.30 a.m. General Meeting. President's Address. Municipal Technical College.

1.0 p.m. Luncheon, at Midland Hotel, by invitation of the Local Committee.

3.0 p.m. Garden Party at "Ashdown," Apperley Bridge, by kind invitation of W. Edward Aykroyd, Esq., J.P.

8.0 p.m. Reception at the Town Hall by his Worship the Mayor of Bradford (Ald. David Wade, J.P.) and Mrs. Wade.

Thursday July 16th.

Whole Day Excursion :—

(1) The Works of Messrs. Wm. Fison and Co., Burley-in-Wharfedale (Spinning and Manufacturing). Luncheon at Burley.

Afternoon visit to Farnley Hall, Otley, by kind invitation of F. H. Fawkes, Esq., J.P., to inspect Hall and Collection of Paintings by J. M. W. Turner, R.A.

Morning Excursions :—

(2) The Works of Messrs. W. and J. Whitehead, Ltd. (Combing and Spinning). The Works of Messrs. Priestley's, Ltd. (Manufacturing).

(3) The Works of Messrs. Jas. Drummond and Sons, Ltd. (Combing, Spinning, and Manufacturing).

(4) The Works of Messrs. John Smith and Sons, Ltd. (Combing, Spinning, and Dyeing). The Works of Messrs. H. B. Priestman and Co. (Spinning and Manufacturing). The Works of Messrs. A. Priestman and Co. (Manufacturing and Finishing).

(5) The Works of Messrs. Sir Titus Salt, Bart., Sons, and Co., Ltd. (Combing, Spinning, Manufacturing, and Dyeing).

(6) The City Conditioning House (Testing of Wool, Tops, Yarns, &c.).

Note.—Luncheon will be provided: for Excursion 1 at Burley, and for all others at the Midland Hotel, Bradford.

Afternoon Excursions :—

(7) The Works of Messrs. Geo. Hodgson, Ltd. (Loom Makers).

(8) The Works of Messrs. W. H. North and Co., Ltd. (Cotton Warp Dyeing, Sizing, and Mercerising).

(9) The Works of Messrs. Ed. Ripley and Son, Ltd. (Piece Dyeing and Finishing).

(10) The Warehouse of Messrs. Law Russell and Co., Ltd. (Dress Goods).

Note.—This Excursion is specially suitable for Ladies.

The following has been arranged so that all Afternoon Parties may participate, with exception of Excursion 1:—

(11) The New City Fire Brigade Station, at 5 p.m. (Special turn-out of the Brigade.)

7.30 p.m. Annual Dinner at the Midland Hotel. President's Reception, 7 to 7.30. Ladies are especially invited to attend the Dinner.

Friday, July 17th.

Pleasure Excursion to Ripon, Studley Royal, and Harrogate.

8—10 p.m. Ladies' Evening, Midland Hotel.

10 p.m. Smoking Concert, Midland Hotel.

A detailed programme, with request form for tickets, was issued with the Journal for May 30.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Sir William Ramsay has been nominated to the office of President under Rule 8; Prof. P. Phillips Bedson, Mr. E. Carey, Mr. W. H. Nichols, and Prof. H. R. Procter have been nominated Vice-Presidents under Rule 8; and Mr Ivan Levinstein has been nominated a Vice-President under Rule 11.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

NEW SECTION AT SYDNEY, NEW SOUTH WALES.

The Council has granted the application of thirty membe of the Society residing in New South Wales to be allowe to form a section, to be called the Sydney Section of th Society.

ST. LOUIS EXHIBITION, 1904.

The invitation to British manufacturers to participate the St. Louis Exhibition next year, which has been issu by the Royal Commission, with the endorsement of t Prince of Wales as President, may perhaps be regarded l some as an appeal to the patriotism rather than to t business instincts of British manufacturers, but it is to hoped that on the higher ground indicated it will not ignored.

It would be most regrettable if other nations made better display than this country, for, as has been pointed by His Royal Highness, conclusions respecting the relat industrial importance of various nations will certainly drawn from the respective exhibits, and thus, indirectly not directly, the manufacturing interests of this coun will suffer unless they are adequately represented St. Louis.

The Commission is seeking to encourage the adoptio the principle of collective exhibits, and is offering import advantages to those who co-operate on this basis. T chemical industries lend themselves readily to such method of representative illustration, and it is satisfactory learn that already many important firms have signified th willingness to become exhibitors under those conditions.

In order that adequate space may be secured, it necessary that the Commission should at once receive information as to the extent to which chemical manu- turers are prepared to support the action now being tal and those who have not responded to the appeal shoul so without loss of time. Full particulars can be obtai from the Secretary of the Liberal Arts Committee at office of the Royal Commission for the St. Louis Exhibit 1904, 47, Victoria Street, S.W.

COMMUNICATIONS.

Authors of communications read before the Societ or any of its Local Sections, are requested to take notice at under Rule 43 of the Bye-laws the Society has the rig of priority of publication for three months of all such pa rs. Infringement of this Bye-law renders papers liable t be rejected by the Publication Committee, or ordered t be abstracted for the Journal, in which case no reprints an be furnished to the author.

Changes of Address.

When notifying new addresses, members are requested to ite them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be oided as tending to create confusion. When sending bscriptions, the use of the form attached to the application lps in the verification of addresses, on which the safe livery of the Journal depends.

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CHANGE OF ADDRESS REQUIRED.

Bu ell, A. W.; l/o Euclid Street, Cleveland, Ohio, J.S.A.

Deaths.

La on, Dr. T. A., 90, Boundary Road, N.W. June 2.
Ma ar, Jas., 72, Ashley Gardens, S.W. June 3.

Canadian Section.

ACTION OF POTASSIUM PERMANGANATE ON INDIGO, WITH REFERENCE TO THE DETERMINATION OF NITRATES BY THE INDIGO-CARMINE METHOD.

BY W. R. LANG, D.Sc., AND W. M. WILKIE.

A series of experiments with dilute potassium nitrate, sulphuric acid, and indigo, titrated with N/10 permanganate of potash, gave such anomalous results for the same amounts of potassium nitrate and indigo when the quantities of sulphuric acid and of water varied, that the authors, in this paper, have endeavoured to determine the causes to which the previous failures to obtain any comparable results in the above titrations might be attributed.

The solutions employed were made as follows:—

Indigo.—1 grm. of pure indigotin was treated with 40 c.c. of concentrated sulphuric acid for an hour at a temperature of 70° C. The solution, on cooling, was made up to 1 litre, and of this, 10 c.c. diluted with 100 c.c. of distilled water was employed for each experiment.

Decinormal Potassium Permanganate. — The permanganate was standardised against pure iron wire, the iron solution being reduced in a Jones reductor. For use the solution was made centinormal.

I. *Titration of Indigo Solution by Permanganate in the presence of Sulphuric Acid.*—10 c.c. of indigo, 100 c.c. of water, and varying amounts of sulphuric acid were titrated with N/100 permanganate; in the first column are the quantities of permanganate required when no attention was paid to any increase in temperature consequent on the addition of the sulphuric acid, and in the second column are the amounts required when the temperature was kept constant at 100° C. during titration:—

Indigo.	Water.	Sulphuric Acid.	Permanganate required.	
			I.	II.
c.c.	c.c.	c.c.	c.c.	c.c.
10	100	1	24·75	25·7
10	100	2	24·77	27·5
10	100	3	25·00	27·9
10	100	10	25·73	28·0
10	100	25	25·80	28·6
10	100	50	26·18	30·2
10	100	100	31·43	48·8

From these results, each one obtained from at least four titrations, it is apparent that the amount of sulphuric acid present exerts a considerable influence on the action of the permanganate on the indigo, and also that the temperature at which the reaction takes place is an important factor, the sulphuric acid evidently attacking the permanganate readily, as in the last example, where, it will be noticed, almost double the amount of permanganate is used as in the first. Experiments of a similar nature, but running the permanganate into the solution at different rates, showed that the reaction between it and indigo was a slow one, as much more was required than when the oxidising solution was added slowly. In all the experiments, therefore, the permanganate was added at a definite rate.

II. Adhering to this definite rate of adding the permanganate, further determinations of the permanganate required to decolorise 100 c.c. of dilute indigo (0·1 grm. per litre) in the presence of an equal volume of concentrated sulphuric acid were made, as in the method recommended by Trotman and Peters (this Journal, 1902, 694) and other writers. After mixing the acid and the indigo and bringing the temperature to 100° C., and titrating—occupying 15 minutes in this operation—with the temperature kept as nearly constant as possible, the amounts of permanganate required were 45·15, 46·5, 42·2, and 43·05 c.c.

II.(*a*).—Repeating the above with only 50 c.c. sulphuric acid under precisely similar conditions of temperature, time, and the rate of adding the permanganate, from 30·18 c.c. to 30·2 c.c. were required, the end point being quite accurate and practically constant,

III.—Experiments made with water and sulphuric acid in varying amounts, and permanganate added, gave the following results:—

Water.	Sulphuric Acid.	N/100 Permanganate required to produce any colouration.
c.c.	c.c.	c.c.
100	1	0·25
100	2	0·25
100	5	0·35
100	10	0·45
100	50	1·25
100	100	(from 6 c.c. to 8 c.c., depending on the rate of adding the permanganate.)

IV.—Lastly, the effect of a dilute solution of a nitrate (1 grm. KNO_3 per litre) on indigo in the presence of sulphuric acid was tried; the end point was difficult to determine, but the following figures will show how much depends on keeping the temperature constant, and for the same length of time:—

KNO_3 Solution.	Water.	Sulphuric Acid.	Time of heating at 100° C.	Indigo required.
c.c.	c.c.	c.c.	Mins.	c.c.
10	20	10	5	15·8
10	20	10	10	17·9
10	20	10	15	17·3
10	20	10	15	7·5
10	20	10	15	2·0

In the last three experiments (15 minutes' heating) the temperature was allowed to rise in each case further above 100° C., the results thus obtained being due to loss of nitric acid.

If, then, this method of estimating nitrates is to be of any accuracy, an *absolute similarity of conditions, both as regards time and temperature, must be observed.* It would appear from the results quoted in II.(*a*) that half the volume of concentrated acid would act better than a solution containing equal volumes alike of water and indigo and of acid. The figures given here may, it is hoped, help to explain certain anomalous results obtained and difficulties met with by users of the indigo-carmine method.

Liverpool Section.

Meeting held at University College, Liverpool, on Wednesday, April 29th, 1903.

MR. FRANK TATE IN THE CHAIR.

THE MAKING AND SETTLING OF BLEACHING POWDER SOLUTIONS.

BY ARTHUR CAREY AND MAX MUSPRATT.

Most makers of bleaching powder have from time to time been troubled and perplexed by complaints of their customers as to the bad settling of bleaching powder solutions. Investigation has on many occasions given little satisfaction to either party as no clear reason was forthcoming for what were, no doubt, annoying and possibly expensive delays to the bleacher.

We therefore made for our own information, two or three years ago, a series of experiments on the settling of bleaching powder solutions and on the most economical way of making them.

As the properties of bleaching powder solutions are of interest to a large and important branch of the Chemical Industry we propose to put our results before you.

We will first deal with our results on the rate of settling of a bleaching powder solution.

The apparatus we used, and still use, consists of a glass cylinder about 12 inches deep × 2⅜ inches diameter in which is suspended a vertical spindle supported by a glass bearing and carrying a small pulley above the bearing. The spindle dips down to the bottom of the cylinder and carries at its lower end a paddle shaped like a screw propeller.

Our standard method of testing a "settling" is to drop 39 grms. of the ground sample of bleaching powder into the cylinder, add 500 c.c. of water at 70° F., and then thoroughly stir and break up the bleaching powder by hand with a glass rod. The volume is then made up to 560 c.c with water at 70° F., and the solution mechanically stirred at a speed of about 250 revolutions per minute for 15 minute and then allowed to settle for 10 minutes, when the depth of clear liquor is measured.

Under these conditions the total depth of the column of liquor in the cylinder is about 8 inches and the Tw about 8°.

There were three chief points to be investigated—

1. The variations in the bleaching powder itself.

2. The possibility that with the same bleaching powde material variations might be obtained through differen methods of treatment.

3. The question, since the compacting of the body of th sludge is bound to exert a retarding influence on the late stages of the settling, as to how far it is possible to carr the settling in a reasonable time, and further, whethe alterations in the treatment of the solution affect th ultimate volume of the sludge.

To take these points in order—

1. *The Variations in the Bleaching Powder itself.*—A makers of bleaching powder we are bound to admit th such variations exist, and, though we understand the co ditions which cause them and are able to keep them withi reasonable limits, it is practically impossible to avoid so fluctuations.

2. *The effect of varying the Method of making th Solution.*—There are practically only two directions i which material variations in the method of making th solution are possible, *viz.*, in the temperature of the wat used, and in the amount of grinding or agitation the bleachin powder undergoes.

The Temperature of Solution.—We found a very marke difference in the speed of settling of solutions of the sam sample of bleaching powder with variations in the temper ture at which they were made. The rate of settling increas with the temperature of solution, and we find that there no danger of decomposition at temperatures up to 90° F.

Table III. gives some of the results obtained by solution at different temperatures.

The effect of prolonged Agitation of the Solution on t Rate of Settling.—We have often observed in the course our visits to the works of consumers of bleaching powd that it is the practice to agitate the solution for any length time up to six hours; two to three hours perhaps being t period most favoured. This system is followed both making the solution of the original bleaching powder a in the subsequent washings the object, of course, being ensure recovery of the whole of the chlorine.

As we believed that, with so soluble a substance hypochlorite of lime, such prolonged agitation was n necessary, we took the opportunity of testing the point the working scale at the works of one of our custome We found that with efficient stirring the hypochlorite solution does not increase after the early stages of t operation, say after the first 15 minutes. By "efficien stirring we mean a sufficiently high rotation of a prope constructed mechanical agitator to produce a disti swirling effect on the surface of the liquid. This c clusively proved that prolonged agitation is an absol waste of time.

In order to see if the lengthened agitation had any eff on the speed of settling of the bleaching powder solut

/hen made, we tested three different samples of bleaching owder by our standard method, agitating them in the arious experiments for different lengths of time.

TABLE I.

The results were as follows :—

Duration of Agitation.	Degree Tw. of Solution.			Relative Settlings.		
	A.	B.	C.	A.	B.	C.
Hrs. Mins.						
0 15	8½	8	8	48	49	44
1 15	..	..	..	44	46	41
2 15	..	..	..	33	36	31
3 15	..	..	..	32	36	28
4 15	..	..	..	30	34	26
5 15	..	..	..	30	34	26

There is no increase in the specific gravity after 15 inutes' agitation, whilst after 4¼ hours' agitation there an average reduction of 36 per cent. in the rate of ttling.

To express the results given in this table in the form a practical example, we may consider a batch requiring ly 15 minutes' agitation and, say, six hours' settling; or, y, 6½ hours in all.

If this batch be stirred for 2¼ hours there would be a ss of time of four hours, if it be stirred 4¼ hours a loss time of 7½ hours would result.

We now come to the third of the points we investigated, ., the retardation during the final stages of the settling d the conditions which govern the ultimate volume of e sludge.

From a practical point of view this is a very important int, and one which, when not appreciated, is very likely lead to serious loss of time.

Our investigations showed us that the rate of settling gins to be retarded when the sludge occupies about three nes its final volume. The following table shows the rapid rease of this retardation :—

TABLE II.

X represents the ultimate volume of the sludge.

Interval of Settling.		Ratio of Time taken to Time required for the same Distance at the beginning of the Operation.
From	To	
X × 3·0	X × 2·0	1·5
X × 2·0	X × 1·5	6·0
X × 1·5	X × 1·17	55·0

The increase in the retardation after the second of these os is very marked.

To obtain a fairly accurate idea of the ultimate volume the sludge from a given weight of bleaching powder, made a number of trials in the laboratory by the method cribed above, and checked them on the large scale. We nd that, with the same bleaching powder, the condition ch tended to decrease the speed of settling tended also increase the ultimate volume of the sludge; that is to , the lower the temperature at which the solution is le, and the more prolonged the agitation it undergoes, larger is the ultimate volume of the sludge.

he following table gives some of our results :—

TABLE III.

ample.	Inches settled per Hour.	Temperature of Water used.	Degrees Tw.	Cb. ft. Sludge per 1 cwt. Bleaching Powder.
A	6	50	13	5·4
A	22	85	13	2·2
B	13	60	9	3·5
B	24	90	9	2·0
C	19	60	9½	2·1
C	36	90	9½	1·5

The value of the data given above is exemplified by the following instance :—

We received a complaint from a customer that our bleaching powder would not settle even after 16 hours. On investigation we found that our customer used 12 cwt. charges in his mixer, which had a fixed outlet for the clear settled liquor. This fixed outlet only allowed a sludge space of 47 cb. ft., or 3·9 cb. ft. per 1 cwt. bleaching powder. The depth of the liquor was 5 ft., the diameter of the tank 7 ft., and the height of the discharge pipe 15 ins.

We tested the bleaching powder in the laboratory. It yielded a perfectly clear solution, and the rates of settling during the different intervals indicated that it should behave as under for the conditions named, with water at 70° F.

TABLE IV.

Distance settled clear.	Time occupied.
Ft. Ins.	Hrs. Mins.
2 0	1 36
1 0	1 12
0 6	2 16
0 3	11 0
3 9	16 4

This is the stage at which their outlet was fixed, and the table shows that no less than 11 hours were wasted in waiting for the last 3 ins. of settling. In addition they used water at 55° F., which made their results worse than they would otherwise have been.

We recommended that the outlet should be raised 3 ins., and this proved entirely efficacious. The position we advised corresponded with an allowance of 4¾ cb. ft. of sludge space per 1 cwt. bleaching powder used per batch, which was approximately (the ultimate volume) × 1·5.

We now come to the conditions necessary for the economical use of the bleaching powder. After running off the clear liquor from a batch of bleaching powder solution the sludge left behind requires, of course, to be washed to save the very considerable amount of chlorine left with it. We have on visiting some of our customers' works been much struck by the amount of agitation they appear to consider these washings require. If as we expected the residual chlorine in the sludge is due to the solution in which solid particles of lime are suspended, this prolonged agitation would not be necessary. We found that after the first solution of the bleaching powder is made there is a solid residue of about 20 per cent. (dry) on the original bleaching powder, having a sp. gr. of 2·3, in which the undissolved available chlorine varies with the specific gravity of the solution from which it is filtered, in the ratios given in the following table :—

Specific Gravity of Solution.	Undissolved available Chlorine on 100 original Bleaching Powder.
° Tw.	
20	2·0
18	1·4
16	0·8
12	0·
8	0·7
6	0·4
4	0·4
2	0·3

The sludge when compacted to its ultimate volume contains about 95 per cent. of liquor by volume.

From this it is evident that the residual chlorine is in solution and not in the dregs, and therefore it is only necessary, in order to obtain a full yield, to dilute the sludge from any strong washing, agitate for, say, a couple of minutes, and allow to settle forthwith.

To summarise our results we consider that in order to made and settle a bleaching powder solution in the shortest time, and with an almost complete utilisation of the chlorine contents, the following precautions should be observed :—

Water used in the Solutions.—The water should not be cold. The best practical temperature is 75° to 80° F.

Bleaching Powder.—This should be emptied into the agitating tank through a 1 in. mesh sieve, any lumps being knocked through with the flat of a spade.

Agitation.—The agitation should be performed so as to show a strong swirl on the surface, say, with a periphery speed on the agitator of 500 ft. per minute for tanks of 5 ft. to 9 ft. diameter, and the lower limbs of the agitator should be not more than 1 in. from the bottom of the tank.

After completing the volume of the batch thorough, agitation for 20 minutes is ample for all strengths of solution up to 16° Tw. Further time spent on agitation is wasted, and, by beating up the bleaching powder, renders subsequent settling appreciably slower.

Clearing Space for Sludge.—The run-off pipe should be at such a height as to allow 5 cb. ft. of sludge per cwt. of bleaching powder used per batch, for all strengths of solution up to 16° Tw. Unless a sufficient space is allowed, enormous waste of time will arise in waiting for the last few inches to settle clear.

Washing Sludge.—The sludge consists not of bleaching powder but of insoluble lime suspended in bleach solution. When the clear liquor has been run off, the agitating tank should be filled again with water, and the contents agitated for five minutes only prior to settling.

Efficiency of Plant.—When the above advice is followed the loss of bleaching powder in the washed sludge will not exceed 2 lb. per cwt. of bleaching powder used, provided the last clear liquor is not more than 2° Tw.

In conclusion we wish to acknowledge the important share taken in these investigations by our friend and late colleague, Mr. Shrapnell Smith, who did practically the whole of the experimental work.

London Section.

Meeting held at Burlington House, on Monday, March 16th, 1903.

MR. WALTER F. REID IN THE CHAIR.

THE STANDARDISATION OF ANALYTICAL METHODS.

BY H. DROOP RICHMOND, F.I.C.

Standardisation of methods has been proposed as a means of approximating to the truth of analytical determinations ; two opposing schools of thought, however, approach the question from different directions.

On the one hand, bodies of men chiefly in America, who have had the opportunity of simultaneously examining identical samples have been so struck with the magnitude of the errors revealed that they have attempted to find a remedy in laying down exact conditions under which every one shall work.

On the other hand, numerous chemists with less experience in combined work, think that the differences which other people find are due to avoidable errors, and express the opinion that a competent man, having chosen a good method, will obtain exact results. They argue that it is not necessary to lay down exact conditions for all to conform to, because the competent man will know the necessary conditions, and the incompetent will still deviate from them.

Both standpoints give a distorted vision, and neither party's view is unmasked by fallacies.

The sum of human knowledge is not large, but even this is greater than the knowledge of any individual, even the best ; the most learned and competent man is, after all, but the least ignorant, and measured from an absolute standpoint, *i.e.*, by the smallness of the amount he does not know, dare we assume that he is so greatly superior to the common herd as the opponents of standardisation are compelled to hold ? It is probable that the sum of several intellects is better than the mean intellect, but they are never equal to the sum of all intellects, and may be inferior to the sum of all other intellects, and possibly even to some individual intellect. As methods have been standardised by quite a few men, it by no means follows that they have laid down all conditions necessary to ensure approach to accuracy, nor that they have laid them down as well as other bodies, or even individuals, would have laid them down. A standardised method may give rise to larger chances of error than other methods which bear the official approval of no committee o council.

We have either failed to learn or have omitted to bea constantly in mind that chemical reactions are neve complete, are reversible, and finally only attain a equilibrium, often, it is true, at a point approaching limit so nearly that we do not distinguish the difference and we have consistently ignored the influence of conditions in determining the position of the point o equilibrium. By studying closely any reaction we fin that in our daily work we usually ignore one or mor conditions, which are not quite without measurable influence on the point of equilibrium. We forget the la of mass action, which should tell us of the influence o time, we assume that the temperature of the laborator does not alter, we ignore (in both senses) the laws o diffusion, we assume that we work in a vacuum, and tha at the same time vapour tension is nil, we consider al reagents as pure—in short we take many variables a constant.

It is certainly true that our errors proceed from th untrue simplifying assumptions that we make ; many o these assumptions we deliberately make to save time an labour ; but we do not always properly appreciate, or eve know the effect of our simplification. It is very desirabl that we should know the influence of conditions, it is fa less desirable that we should have certain conditions mor or less strictly laid down, and it is not desirable that w should ignore the conditions which are appreciable.

Standardisation of methods by the present process is no ideal ; a committee lays down a method after a more less extended investigation, during which they have do little to make exact studies of the influence of condition and the laws underlying the methods ; they have aimed concordance, and not approximation to the truth, and the method is often shown not to be the best, but as it "official" it remains. A perhaps worse state of things the ostrich-like ignoring of any except avoidable error, an the fallacy of the assumption that the competent man usi a good method must be correct.

The really standardised method would be the meth about which the maximum knowledge is possessed ; obtain this we must first find out the errors, study the causes, and eliminate or evaluate these. Practically, t easiest and surest method of finding error is by combin work of many chemists on identical samples ; the caus will be found by a discussion of results, by visits of o man to another's laboratory to observe how conditions diff and by a subsequent study of the effects of the differen of conditions ; the influence of each cause of error will th require careful study. It is not to be expected that the fi piece of combined work, nor the first discussion, will lead the elimination of errors, but gradually a knowledge of t method will grow, and when the observers are satisfi with their work, they may publish the results for criticis others will suggest points overlooked and correct erroneo deductions, which will be again investigated, discussed, a published ; gradually a good method will grow.

There will be no dictation, as no method will be l down ; there will be simply an invaluable record of investig tion of sources and causes of error, and a means to l and their elimination. The method will not be the committe method, but the method studied by the committee ; it w gradually approximate more and more to the truth.

To sum up, my contentions are :—

(*a*) Individually we are not advanced enough in knowlge to solve all the problems put before us.

(*b*) Collectively we can do so to a much greater extent.

(*c*) Combined work and discussion are the best methods finding out the errors of and laws underlying a method.

(*d*) Having found the laws of the method, which we can ost simply express in the form of a differential equation, must by combined work find the most probable values its constants.

(*e*) This being done, conditions need not be prescribed, l especially partial conditions only must not be prescribed ; can be left to the individual to integrate the equation, d find the constant for his conditions.

(*f*) It will be also a simple matter to integrate between limits required by the manufacturer.

Meeting held at Burlington House, on Monday, March 16th, 1903.

MR. WALTER F. REID IN THE CHAIR.

THE STANDARDISATION OF COMMERCIAL METHODS OF ANALYSIS, ESPECIALLY THOSE APPLIED TO BREWING MATERIALS.

BY ARTHUR R. LING, F.I.C.

Since there seems to be some misunderstanding as to at is implied by the term "standardisation," I would like the outset to state what I myself take it to mean. It is determination and fixation of the conditions necessary attaining accuracy.

In very few cases is it possible to separate each of the conuents from a given mass of material, and indirect means quantitatively determining the constituents have to be orted to, such as the formation of a definite substance ot necessarily a derivative in a chemical sense of the one are estimating), by the occurrence of a chemical reaction. reaction is under any conditions absolutely complete ; t in the majority of cases a state of equilibrium is reached en the change in one direction may practically attain npletion, which, however, is generally only possible if of the compounds formed be continuously removed m the sphere of action by change of physical state. e determination of the effect of various conditions on attainment of this state of equilibrium is a matter of portance, if the reaction is to be made use of as the basis an analytical process.

As a rule, in methods of analysis based on chemical nciples. a high degree of accuracy is possible, within a rly wide range of conditions; still, as this range of ditions differs in different cases, standardisation can ver be ignored, but in many cases we have to be ntent with having established the effect of conditions pirically without discovering the precise nature of the turbing influence. Whilst, therefore, I agree with . Bertram Blount (Chem. News, 1902, 86, 177), that methods of estimating the same substance which are emically sound must give the same result, the methods which we can apply the qualification "chemically sound," I understand it, are but few. I agree also with Messrs. nger and Blount (this Journal, 1902, 1216) in their ictures on the adoption of stereotyped and uniform thods in such determinations as that of silica, lime, gnesia, &c., for one of the surest means of confirmation have is the determination of the better known inorganic es and acid radicles in several ways, and agreement of ults obtained by different methods, each having the same bability, furnishes the best guarantee of their truth. t the fact that an analytical process is based on chemical nciples does not obviate the necessity of standardisation the sense I have used the word ; and that Messrs. Stanger l Blount recognise the truth of this, no better illustration be given than the elaborate way in which they describe various details which must be attended to in order to ure accuracy in the determinations referred to. That the majority of the analytical methods commonly employed yield accurate results is accounted for by the fact that they are the result of the combined experience of numerous workers, so that errors, due to a variety of conditions met with in practice, have been eliminated; in other words, they have been standardised.

There are numerous industries in which the main materials and products are organic compounds, and although processes of chemical analysis can often be applied to these, there are instances in which it is necessary to adopt methods depending on the measurement of some physical property. These latter methods are for the most part of an arbitrary and empirical nature; but as a rule, when all the conditions capable of being controlled are kept constant, concordance of results follows; but not necessarily accuracy, that is to say, the results may deviate widely from the absolute truth. Take, for example, the determination of cane sugar (saccharose) by the polarimeter. Commercial sugars contain a number of foreign substances known and unknown, some of which are optically active, and others, whilst they may not affect the polarised ray *per se*, yet modify the rotatory power of the cane sugar by their presence. The direct translation of rotatory power into percentage of sugar does not, therefore, invariably give accurate results, although the values obtained by two or more operators may be in strict agreement. Errors of this kind are minimised by the adoption of the method of double observation before and after inversion under the conditions first drawn up by Clerget. Still, the analysis of sugars has received such a large amount of attention that, despite the empirical character of many of the methods, if the results do not approximate to the truth as closely as do those obtained by chemical processes, their relation to the truth is so well known that they are not only available for commercial purposes of buying and selling, but also for factory control.

At the present time there are complaints in the brewing and malting industries that the results obtained by different chemists, working on what are assumed to be the same samples, exhibit great differences. This applies more especially, though not exclusively, to malts. The consequence is that both brewers and maltsters very naturally complain of this state of things, which frequently leads them into disputes, besides leaving them in doubt as to the quality of malt as judged by its analysis. I am open to admit that the evil may be largely due to improper methods of sampling, this being, in the case of malt, a matter attended with great difficulty. But even when identical samples of malt are given to two analysts, there can be no hope of concordance of results unless uniformity of procedure be adopted in carrying out the various determinations, because these are one and all of arbitrary and empirical character.

In a paper read before the North of England Institute of Brewing last year (J. Fed. Inst. Brew., 1902, 8, 441) I discussed some of the principal determinations which are carried out in the analysis of malt. I pointed out that the yield of extract as determined in the laboratory is recorded in the same terms as it is in the brewery, yet it must not be expected that identical values will be obtained in the two cases. The brewer modifies his procedure according to the material he is dealing with and the product he desires to obtain. The analyst, on the other hand, will generally adopt some more or less stereotyped method, his object being, not to obtain the maximum extract, but to furnish evidence of the nature of the sample to his client. Hence, steeliness or some other defect will, if it occur, be indicated by the result of the extract determination taken in conjunction with certain others.

The fact that different analysts, working on the same sample of malt, return discordant values for one and the same item is one that tends to bring discredit on the value of scientific advice. Bearing in mind the arbitrary nature of the determinations in question, the obvious remedy is the adoption of uniformity of procedure; this, however, involves a difficulty. The various chemists who have made a special study of brewing and malting have, very naturally, a preference for the methods devised by themselves, the indications of which they understand; and there can be no hope that any uniform procedure will be agreed to until a conference has been held of all interested in the question. This course has been suggested by Dr. W. Frew, and at a somewhat later date by myself; but up to the present I have not heard that the suggestion has received any attention.

In a recent paper by Mr. A. C. Chapman on the standardisation of analytical methods with especial reference to the analysis of brewing materials, the author, after pointing out that in the case of all the well-known and commonly-used analytical processes, the conditions necessary for accuracy have been determined by numerous workers, deprecates the prescription of standard (uniform) methods except in certain cases in which the results vary with the precise experimental conditions adopted. Dealing with the analysis of sugars, Mr. Chapman says: "The best form of 'standardisation' is . . . that which every careful chemist ought to adopt for himself, and which consists in testing the accuracy of the methods he employs with the pure sugars themselves. If this were done all results would agree, as they would all be very approximately accurate." Following this he states that, whilst he feels that little good could possibly result from any attempts to reduce our analytical processes to one standard pattern, he believes the discussion by competent persons of the proper interpretation of some of the numbers obtained might be useful; in this connection he cites the different views held at the present time with regard to the unfermentable substances (other than dextrin) present in commercial glucoses, inverts, &c.

With many of Mr. Chapman's remarks I cordially agree, but I must dissent from some of them. In the present state of our knowledge it is not possible, in dealing with commercial sugars, to insure accuracy by employing a method which has been standardised with pure sugars, for some of the constituents of commercial sugars are not even known. Chemists are in the habit, after standardising their methods with certain well-known sugars, of interpreting the results of the analysis of commercial sugars in terms of these. This is a conventional procedure to which the term accuracy in the absolute sense cannot be applied. Take the determination of maltose in a malt wort by the cupric reducing method in combination with the polarimeter. We may apply a method of cupric reduction which yields accurate results with pure maltose, and we may use the optical constants of certain carbohydrates so far as they are known; we may further correct the results for the small amount of cane sugar, dextrose, and lævulose, determined by a separate experiment, but even then the result will not indicate the true amount of maltose present, and, recognising this, many brewing analysts report this value as "apparent maltose." The relation between this apparent maltose and the actual amount will vary, not only according to the mashing temperature, but also according to almost all the conditions obtaining during the flooring and kilning of the malt. This is, in the first place, due to the occurrence in malt wort of carbohydrates, the constants of which are unknown; but apart from this, malt wort contains so many foreign substances that, although the analyst may employ a method which, with a solution of pure maltose, will give accurate results, this is not the case when it is applied to malt wort. When a gravimetric cupric reduction method is used, some of the cuprous oxide is dissolved by the nitrogenous compounds of the wort, besides which the precipitate is invariably contaminated with inorganic compounds. Absolute accuracy is quite out of the question. Relative accuracy, combined with uniformity, in terms of maltose or of any other sugar is only possible under standard conditions. Much less certain than the maltose value is that of dextrin, for here we are dealing with a whole series of bodies of unknown constants. It has now been definitely established that among the products of the diastatic conversion of starch there is no such substance as a dextrin which does not reduce Fehling's solution.

Mr. Chapman and I are in complete accord with regard to the significance to be attached to the terms "brewery extract" and "laboratory extract" respectively. "Laboratory extract" means, he says, "the extract obtained by any particular chemist working under the experimental conditions he is accustomed to observe in his own laboratory." A little further on he states: "An analyst who has devised a process for determining the extract yield of malt (arbitrary or indefensible on strict scientific grounds though it may be), and who has for a number of years had the opportunity of comparing his laboratory results with those obtained by his clients in actual brewery practice, is, in fact, in possession of a process of great value to himself, and it is absurd to ask him to exchange such a method for one at least as arbitrary and unscientific, and to expect him to voluntarily relinquish the value of years of experience." This has nothing to do with the point at issue. No one has a right to dictate to the consultant the means he shall adopt in investigating the samples submitted to him. The point is that the term extract, unless its precise significance be defined, is of no more use for technical or commercia purposes than is the specific gravity of a substanc without reference to the temperature at which it has bee determined. At a juncture like the present it behoves u to offer any methods we have been in the habit of using with our experience of the results obtained with them, fo discussion. If this were done, there would be little fea that an experienced technologist like Mr. Chapman would as the result of the deliberations of a committee, be aske to give up the use of any method which he had foun valuable. The recommendations of a committee would no necessarily be the prescription of one uniform method fo any given determination, but it would be for them t determine as accurately as possible exactly what an specific method measures, so that the differences betwee the results of several analysts working on one and th same sample would no longer be inexplicable. Apart however, from commercial reasons, for the progress o analytical research it is desirable that any analyst who ha a valuable method shall divulge it in the orthodox manne by publishing a detailed description of it. Such a procedure, which has worked so well in the evolution o methods of chemical analysis, would have an equall good effect in the case of methods of a more arbitrar character.

In discussing the diastatic activity of malt, Mr. Chapman' views approach much more closely to my own. He says "Here, I think, is a case in which some degree o uniformity among brewers' chemists might with advantag be observed." . . . . . . "I do feel, however, that bot brewers and maltsters have a legitimate grievance whe they have presented to them two reports on one sampl giving quite different numbers under the same headin without any explanation of their meaning." In my pape on malt analysis (*loc. cit.*) I used words to the same effec Proceeding, Mr. Chapman states: "I would venture t suggest that analysts might insert the word 'Lintner' i cases where the activity has been determined by Lintner' original method, and has been expressed on his scal When some modification of this method of working ha been followed, or some other scale employed, a fe explanatory words in the body of the report would tend t prevent misunderstanding." He expresses substantiall the same views with regard to the determination of colou Do not the same remarks, however, apply to the determination of extract, for which methods equally arbitrary ar employed as those used for diastatic power and colour?

Personally I disagree strongly with stereotyped method wherever their use can be avoided, and the brewin industry is I think at the present time suffering rath by their use than by their absence. Take, for example, th method we have just been discussing, that of determinin diastatic power, as prescribed by Lintner. I have state on several occasions that I consider the indications afforde by this method of little practical value, and Profess Windisch, commenting upon my remarks, has expresse himself in complete accord with them. The determinatio is essentially of a stereotyped nature; conditions must b obeyed exactly, otherwise uniformity of results is n possible. I could cite numerous data indicating that t values expressing the diastatic power of malt on Lintner scale are not only often valueless, but are frequent misleading; but they would be out of place on the prese occasion. I may, however, draw your attention to th season's malts. Speaking quite generally these give ve w values for diastatic power on Lintner's scale, but the eld of extract is for the most part unusually high. Now do not wish to infer that diastatic power and yield of tract have of necessity any direct connection, but the lue for the diastatic power ought to have a relation to e saccharifying power of the malt, and therefore this ason one might expect to find that worts had a tendency be incompletely saccharified, or to give low values for parent maltose; such, however, is not the case.

I am aware that there are numerous other methods used the analysis of brewing materials and products which might have mentioned, but since the same remarks ply in a greater or less degree to them all, this unnecessary, and those I have dealt with are typical amples.

In conclusion, the main point which I have endeavoured support by my arguments and which appears to me to beyond the region of contention is the necessity of estigating certain empirical methods of analysis whith iew of ascertaining what they actually measure when ried out under certain defined conditions. This contutes the standardisation of the method in question, and my opinion ought only be attempted after the conjoint liberations of those in the habit of carrying out the erminations and of applying the results. It is the first p towards the elaboration of standard methods which at present time cannot be adopted because they do not ist. It by no means follows that the ultimate result of h work will be to reduce all methods to one pattern.

I am glad to note that Dr. J. Augustus Voelcker, in his esidential address to the Society of Public Analysts, kes the following remarks, which speak for themves:—

"It has been abundantly brought home to the Editorial mmittee that there is a useful field open to them in re closely examining some of the methods or processes before them from time to time, and in ascertaining v far various suggestions may be practically useful. It ntended that such inquiries be prosecuted by different mbers of the Committee and the results be communicated he form of papers to the Society. Many a process put ward tentatively by its author may be found, on fuller estigation, to be impracticable, while others that have ound basis cannot fail to be strengthened, and to become ter known by the fact that men of eminence in their pective domains have examined the same and submitted m to close criticism and wider application. It is much ed that this branch of the Council's work will be well en up and form an important part of the Society's rations."

DISCUSSION.

he following note from Dr. W. Frew, was read by the retary:—I am specially interested in the standardisation he methods employed in the valuation of the raw erials and finished products of the brewing industry, some of my statements in this connection have been ected to Mr. Chapman's most courteous criticism. In aper read to the Midlands Institute of Brewing in ember of 1901 (J. Fed. Inst. Brew., **8**, 341), I ted out that most of the determinations made in this ich of analysis are simply *values* varying with every it alteration in the details of the methods employed, that, therefore, to have comparable results, standard litions of experiment and of translation of results, t be laid down and rigidly adhered to. For, although now exactly how two different methods (say) for the rmination of the "available extract" of a malt have carried out, we cannot (owing to the nature of malt to many other considerations) compare the two values ined. As it is always better to give a concrete example, ll quote a few figures recently obtained by myself.

high dried malt from a French barley was mashed rding to the Vienna Congress method, (1) ground to (2) crushed in Seck's Standard Laboratory Mill, t No. 25, (3) and in Seck's Mill, Grist No. 40. The sets were made up, after mashing as usual to grms. with water in each case; whilst, in the case of 3, a parallel mash was made up to 500 c.c. total volume. The extracts of those made up to weight were calculated as usual, whilst in the case of 3*a*. Mr. Heron's assumption as to the volume of insoluble matter left from 50 grms. original malt was adopted, and the extract calculated on the basis of 585 c.c. of resultant wort.

The following figures represent percentages of extract (Windisch, 15°/15°) on the dry matter of the malt as obtained from each of those grists:—1 (Flour), 77·96; 2 (Seck, 25°), 77·08; 3 (Seck, 40°), 73·66; 3*a* (Seck, 40°, 485° c.c. wort?), 71·40. These figures speak for themselves and show how serious are the differences produced by variations in the fineness of the grist and the method of making up to the final volume. Thanks to the energy of the Berlin Station for Brewing, with the aid of the Gebrüder Seck of Dresden, a mill has now been provided which gets over the hitherto unsurmountable difficulty of equality of grist-fineness so that the chief obstacle in the way of standardisation all over the world has been removed. It only now remains to decide on the mashing method and the way of making up to volume and, if I might be allowed to make a suggestion to the brewing chemists of this country, their opportunity might well be found at the coming congress of applied chemistry in Berlin. We want a world wide standard; in these days of international competition we cannot afford to neglect the weapons that are being used against us. Methods which are useful for ourselves and our particular class of clients are all very well so long as our clients are not competing outside their own circle or island; when we have a large scientifically conducted and controlled industry like the brewing trade of Germany competing most successfully with us in all our foreign markets, it is time to be less insular and to adopt methods by which we can learn something of our opponents' mode of working, methods which will keep us in our struggle to retain our old supremacy. Men like Ledlmayr and Duker learned how Science might help an industry by their visit to England more than 70 years ago, and we see now how well that lesson has been applied; do not let us be too proud to acknowledge that it is our turn to profit by the fruits of that historic "Bierreise."

Mr. A. C. CHAPMAN said that what Mr. Ling called "standardisation" he should call "chemical analytical research." If Mr. Ling only understood that by the term "standardisation" he did not think anyone would venture to disagree with a single word he had said, as what they all wanted was that chemists should investigate analytical processes, and learn the conditions necessary for obtaining the best results. What he understood by "standardisation" would be clear from the following extract from his paper:—"We mean, I take it, the prescription of detailed and rigidly-defined conditions which every analyst is to carry out to the best of his ability and with mechanical precision, departing neither to the right hand nor to the left, under the pain of incurring the serious displeasure of the prescribing committee, or of being branded as an analytical heretic. The desire to standardise any analytical method necessarily implies that the method in question is an imperfect one, and that certain discrepancies will be observable in the results of different operators when applying it to one and the same material, unless all those operators can be induced to obtain results *incorrect to the same extent*, by implicity following the same recipe." That was what he understood by "standardisation," and he was under the impression that there was a desire on the part of some to bring about in this country the state of affairs which was unfortunately so common in America, and to which Mr. Blount had recently drawn attention. If, for example, a chemist wished to determine phosphoric acid, iron, silica, and so forth, all the conditions were prescribed, and he was not allowed by the committee, unless he wished to pose as a heretic, to depart by a hair's breadth from those conditions. He must employ a beaker of definite and constant size, stir it so many times, allow it to stand at a certain temperature just so long, and in this manner he obtained results which were "standardised," that is to say, everybody who did exactly the same thing would, of course, get the same result. He would like to define his own position in this matter; he personally held no brief either for standardisation or against it. There were certain cases in which standardisation was absolutely necessary, and there were others in which it might not be altogether necessary, but very desirable, and others again in which any attempt at "standardisation" ought to meet with their most strenuous opposition. In the first category he would place those methods, which were of an entirely arbitrary character and which might have to serve as the basis of a criminal prosecution. There it was essential that all operators should, in the first place, agree as to the best methods, and, secondly, should follow them. In the second category he would place those methods of an arbitrary character, which yielded numerical results which were, or ought to be, understood by their clients. In the last category he would place all those exact processes which every man, who was worthy of the name of a chemist, should know how to carry out for himself, and all those extremely arbitrary processes which a chemist carried out, not so much for the information of his clients as for his own information. If, for example, anyone there had had submitted to him, say a sample of malt, and were asked to give his opinion on it, that is, to say whether it was good or whether it was well adapted for certain purposes, then he should be absolutely free to do what he liked, and should be entitled to use any method he pleased to enable him to arrive at a judgment. Therefore all practising chemists ought most resolutely to set their faces against any attempt on the part of any one to influence them in the carrying out of their work. On general principles there were certain cases where they were all agreed that standardisation was good and desirable, but his own feeling was most strongly that when any attempt was made to carry standardisation, in his sense of the term, beyond those cases in which its advantage was most obvious and most clearly defined, any such extension would be fraught with the very gravest danger and disaster to the profession. They were professional men carrying out certain processes of great complexity and intricacy, and any wide-spread attempt in the direction of standardisation would tend to reduce their profession to the level of a mere mechanical art. He would rather have confined himself that evening to the question of general principles, but Mr. Ling had dealt with one or two points to which he might refer, as they resolved themselves into criticisms of his own paper. In the first place Mr. Ling said that if one took pure maltose, dextrose, or cane sugar, and determined its properties, one would not be entitled to reason from these to the conditions which obtained when it was mixed with other things. He knew that perfectly well. His statement was merely made in reference to Dr. Frew's suggestions, that a certain set of tables should be used in sugar analysis. Whatever the influence of other substances, known or unknown, on the reducing powers of the sugars might be, the employment of the tables would increase the error by 5 per cent. His criticism was, not on Mr. Ling, but on Dr. Frew. Dr. Frew suggested the use of certain tables, the errors of which Mr. Ling was, as a matter of fact, instrumental in pointing out. He agreed with Mr. Ling that no one should have any right to dictate to a consultant how he should work. Mr. Ling had referred to the general low activities of this year's malts and their high yield of extract. That might be due, however, to the much more perfect modification which was known to be usually the case this year. He did not think it necessarily had any bearing on the question of a relation between the two numbers.

Mr. Blount said when the first report of the American Committee for standardising cement analysis was issued he recognised in it certain important errors which, if the method laid down had been generaly adopted, would have led to unsatisfactory and harmful results. Having studied the subject of cement analysis closely he felt it necessary to go to America and discuss the report, and he was glad to say the method recommended had been much modified and improved. But if these questions concerning analysis had been raised and urged in a more debatable field than in that of cement analysis, it would have been impossible to grasp the principle as closely as it was grasped, and what he held most definitely was, a false position might have been maintained. The attitude of the American Committee was that it was possible to educate and train a competent chemist how he should determine those things which were capable of very definite and accurate determination, and that they were in a position—Committee as they were—to lay down laws, not merely for his guidance, but for his tutelage. He was entirely in sympathy with the opinion put forward by Mr. Richmond as to the necessity in all analytical observations of chemical research. He thought they were all agreed on that point. Analysis would sink to a very low ebb if they were to put aside this method of research and to do everything as suggested by their misguided American friends and make empirical rules. He would also endorse the statement of Mr. Chapman that they must be extremely careful not to confuse what was meant by standardisation with what was stated as its meaning by some controversialists. Standardisation of analysis was standardisation of those methods which really belonged not to empirical assaying but to analysis. Nearly two-thirds of what had been read or spoken that evening had related not to analysis at all, but to certain empirical assays, and he thought all sensible men were agreed that some definite procedure, laid down as rigorously as might be, would be very useful for many empirical assays. Nobody would deny that; but that had nothing to do with analysis. It was a misnomer. In short, the two things should be kept entirely distinct. As the practical issue of all this he would suggest, after some study—and nothing said even by eminent opponents had caused him to alter his belief—that in analysis proper the chemist should be left to himself. Of course he meant chemists in council. Let them exchange ideas. Let them make researches and let them arrive at the nearest approach to truth they could; then let them have a free hand. As regards the conduct of things which were not analyses but mere assays let that be regarded as a matter of expediency and, if requisite, let standard methods be erected, but let i be recognised throughout that all these matters were arbitrary matters, and had nothing whatever to do wit the chemist as analyst.

Mr. Otto Hehner said there seemed to arise from time to time, in science and in communities generally, period of panic under which legislation was demanded. At th present time analytical chemists appeared to be disturbe on account of numerous reasons, none of which were quit plain. A large section of the chemical public, operative o manufacturing, were crying out for some kind of legislatio —for that was what standardisation amounted to. It wa extremely difficult to find out what had led to this outcry In America a large number of their colleagues met togethe once a year, and added to or altered their conferenc methods. They had heard the note from Dr. Frew, whom he understood to argue that they should adopt standar methods, and not fall behind other countries in the makin of beer. At the present time physical chemistry had shake even the atomic theory. Professor Ostwald had remarke that every substance must bear traces of its mother liqu within it. A great deal was heard about chemical equil brium—that no reaction was carried to its end—a new mo of expressing what had been known for three or fo generations. By an imperfect understanding of these ide the security which older men (unwisely, perhaps) felt th possessed, vanished. Further, at the present time so mu chemical literature was published that it was impossible read it, as formerly, with profit. Every one who had be six months in a laboratory thought he must add some ne fact or devise a new method. The papers are abstract and re-abstracted, and no doubt much of the matter w good, but who was there to select the good and new fr the bad or old? Largely from this plethora of inform tion came the cry for some one to pick out of the immen haystack the needle of truth; the cry goes up, "give out of the hundred methods which are described for a cert determination the one on which we can rely." Was t practicable? And if so, was it desirable? What th wanted was to stimulate everybody to keep step with t advance of science by study. Chemists for years had be looking for standard methods, and in the case of mine analysis many such methods existed, and anybody w chose could pick out for himself those which had be roughly investigated and gave good results. Some of the thods employed in certain commercial work could hardly described as analytical, although the analytical chemist l to carry them out. The determination of the soluble tter obtainable from malt under certain conditions, was lly a commercial or manufacturing operation on a small le. If everyone worked according to the same process results would be the same. By all means let them agree perform such an arbitrary process in a uniform manner, that would not exercise the scientific man to any great ent. The methods adopted for malt analysis in England ld not possibly be applied in Germany, where the malt s extracted by a totally different process. Hence they st have a standard for every country or every village. set his face against general standardisation in the chemical sc, as this would be the death blow to analytical science. ey did not want to make their laboratories into factories l to become machinists.

Mr. A. **Gordon Salamon** said perhaps not more than years ago malt analysis was practically unknown in this utry so far as the general run of brewers were concerned. ey used to analyse malt by biting it, and it appeared to that in the present state of their knowledge of that ject it was somewhat premature to fix a standard method analysis. Personally he had ventured, in the analyses nalts he had made, to deviate from certain standards laid vn abroad. The converting power of English brewing lt lay somewhere normally between 28° and 38° on tner's scale. That gave a very small limit within which express their views on the behaviour of the malt in the sh tub, which was what the brewer wanted to know. , therefore, ventured to divide the degrees lying between and 38 with 100 so as to give him larger limits for the ression of the results. His clients had accepted that lification. He called his standard 100, and worked it ording to Lintner's method. Although he might be ng in having extended, for the reasons he had explained, t small range of degrees into 100, why should he be vented by any standardised methods? If he worked curately, or if his reasoning was wrong, there were nty ready to pull him up; but he did not see why he uld be fettered as to originality and compelled to do in t analyses what others were compelled to-day to do in hol analysis, for instance, and express the results in ns of proof spirit based on the action of an explosive ch in a few years would probably be practically obsolete his country. One could cite many other similar examples, after all, when one came to malt analysis, it was not ely the converting power which had to be considered. had to deal with the extract, with the colour, with the verting power, with the nature of the starch modifica- , with the time of starch conversion, and with a variety ther subjects, and then to correlate those results, and whole practical value of the figures of a malt analysis given in the terms of the few words which were put at bottom of the report as the result of considering those res. You could not have standardisation for that. That where judgment and experience must have play. But st one felt that in certain questions, such as these, dom should be given and grooves should be avoided, did recognise that, in substances which were sold by and upon which large commercial transactions were endent, it would be advisable, as it had been adopted by ention, to have certain methods whereby a man knew t he was buying or selling. That did not interfere with inal research, nor did it interfere with the progress of ytical chemistry. They should be careful not to tie nselves up too tightly, because if they yielded them- s over to the influence of a committee, such a committee generally dominated by one man, and chemists who ted the methods of the committee lost their individuality merged it into that of the chairman of the committee. e was just one other aspect of standardisation he should to point out, always excepting that which he had spoken applying to the determination of units. He thought if a standard method of analyses were universally ted and acted upon it would open the door to a very iderable amount of fraud. The chemist who had a r to examine, say a modern American brewing sugar, for his own safety's sake, would to-day look out for other substances being added, and would report accordingly; but the man who added it, if there were a standard method, would take perfectly good care to try and bring it within the limits of that standard method, and if possible would use his adulterant accordingly. In this way the chemist might well be put off his guard. That would apply to a great many substances, and he did think it would open the door to an adulteration of that kind if they were to have such a method of standardisation universally adopted. For this, and many other reasons he might mention if time permitted, he did think they ought to safeguard themselves as a profession most carefully before consenting to adopt these suggested methods of standardisation.

Mr. **Grant Hooper** said the subject had already been very well discussed, and he had little to add beyond expressing his accord with the later speakers. It seemed to him that the great body of the meeting were of opinion that whilst there were cases where it was useful that a particular method should be agreed upon and be practised by buyers and sellers, yet, as a general practice it was extremely inadvisable that the chemist should be bound down to a particular process. As a matter of experience he was quite in agreement with Mr. Salamon that anything like a fixed process rendered it more easy to develop a mode of sophistication that would escape ready detection and he further thought that in inexperienced hands a too closely defined process was apt to blind the eyes to other points in connection with the analysis and so lead to variations—sometimes of great importance—being entirely overlooked. That seemed to him a real danger in connection with all methods of standardisation, though, in an empirical determination it was undoubtedly advisable that the exact conditions under which the operation was to be performed should be laid down, and therefore in such cases the adoption of what were called standard methods was desirable.

Mr. G. C. **Jones** said, as a maltster's chemist, he was grateful to Mr. Ling for bringing this matter forward. That was neither the time nor the place to discuss the relative value of different methods of malt analysis, and if standardisation were determined on, that would be dealt with by those whom it specially affected; but it seemed that the majority of brewer's chemists were opposed to standardisation. Mr. Chapman had painted a very terrible picture of what would come about if analytical methods were to be standardised, but he wanted to show what would happen if they went on in the old way. Mr. Chapman said, if any one knew a method better than that generally used, he should bring it forward and publish it. But this would increase the bulk of that literature which Mr. Hehner deplored. He would be listened to and thanked, and everybody would go on performing his analysis in his own old way, with the result that they would get figures like those shown on the board. Some little time ago a maltster of his acquaintance had determined to send similar samples of malt for analysis to five chemists. He regretted this determination, anticipating the outcome; but, as he was to be one of the chemists, he obtained permission to see to the sampling, and those five samples were as nearly similar as was possible. The opinions of the chemists did not materially differ; one gentleman, perhaps, worded his report as a buyer's chemist might be expected to do, and another, rather as a seller's chemist, but the malt was fairly described as not being quite satisfactory. The figures given were as follows:—

—	1.	2.	3.	4.	5.
Extract............	95·0	97·1	95·8	97·2	..
Colour............	8·0	7·6	4·0	5·5	..
Diastatic power ...	48·0	32·0	34·3	44·0	18
Cold extract	23·3	18·98	20·93	18·4	..

The malt was, in fact, neither better nor worse than such barley treated on the floor, and kilned in the manner that it had been directed to be by the buyer, might have been expected to yield. But what he wished to call attention to were the analytical numbers, as they professed to be, on which these similar opinions were based, and from a consideration of those numbers, they could only conclude that in forming their opinion, these chemists were either not guided at all, or very little, by the numbers, or that when using a term like diastatic power each meant something different. Mr. Chapman, with whom he was cordially in agreement on many points, urged that they should define their terms, and that when using a term they should all mean the same thing by it. In that paper to which reference had been made, Mr. Chapman said he objected to standardisation, because "such a course must in fact tend to perpetuate error, and would oppose a serious obstacle to that progress which can only result from laborious investigation and research," but Mr. Chapman advocated unanimity in the interpretation of results, which he suggested might be "arrived at by discussion, and *perhaps* by experiment" by competent persons. He asserted, with little fear of contradiction, that their knowledge of the significance of the components and constants of a malt was, relatively, nothing to what it must be before any committee could hope to force on others the acceptance of its views on such debatable points; that would indeed be the standardisation of falsehood, and the stifling of research. Before they could come to anything like unanimity of interpretation, there must be brought forward, not assertions or laboratory experimental results, but properly authenticated accounts of results obtained from the use of various kinds of material in the brewery. But to come back to the analytical numbers; these numbers should either agree or should be dropped altogether. Then Mr. Blount and Mr. Hehner had stated that malt analyses were altogether different from inorganic analyses; they were not analyses at all; they were a determination of certain constants which had no meaning unless determined under rigidly defined conditions. If chemists differed in their opinions, that merely showed that their knowledge was not what it should be, and that more research was required. But if they seriously differed in their analytical numbers they were utterly discredited. He, personally, was not concerned so much with the interpretation of results as to see that malt was produced which would give certain analytical numbers, which met with the approval of a brewer or his chemist, and when six brewers (each at the suggestion of his consulting chemist) asked for malt of colour 8, and diastatic power 35, and each meant something absolutely and entirely different, the position of the maltster became almost intolerable. Mr. Chapman had admitted that the extract obtained in the laboratory would never be the same as that obtained in the brewery; and, therefore, the chemist's statement of the probable brewery extract was an opinion and not a fact, and might be as much less than the laboratory extract as he pleased; but the maltster must be judged by the laboratory extract, and he had a right to know how this was conducted, and to know that it was conducted in a manner which would give concordant results. As to the stifling of research, he inclined to an exactly opposite view. The report of the Committee of the American Chemical Society on coal analysis had been immediately followed by a paper pointing out that one of its recommendations was inapplicable to anthracite and coke. But for that paper, called forth by the committee's action, those chemists who had seldom handled anthracite or coke, might have continued to use the less accurate method recommended by the committee, which was, in fact, the method most in use previously. But for the report of another American committee, how long might they not have had to wait for Mr. Blount's valuable paper on cement analysis? At present he considered it was waste of time to attempt to show the uselessness of an analytical process of an individual chemist. But if a competent committee were to give the weight of their authority to that which he thought was wrong, he should not rest until he had convinced them of their error, or had proved that he was wrong himself, and that would mean research, and not assertions unsupported by evidence which, in his opinion, had played far too great a part in brewing chemistry.

Mr. Julian L. Baker said he considered Mr. Jones had sounded the keynote in the discussion, namely, the upholding of professional dignity. It was unfortunate that five chemists analysing similar samples should place such a different series of figures before their clients, although the opinion supposed to be based on those numbers agreed. If a client asked for an opinion about a malt, whether i would be suited for his beers, &c., the consultant would answer the question to the best of his knowledge and ability, and in such a case, taking into account that no recognised methods for analysing malt existed, and that every chemist used the methods which suited him best, i seemed unfortunate that figures should be quoted in the report at all.

But in the competition now so apparent in the brewing trade, certain analytical results, such as extract, colour matter soluble in water, &c., were asked for, as buyers of malt, rightly or wrongly, attached value to such figures What is the result in the everyday practice of a brewery! The maltster submits an analytical report with the sampl he proposes to sell; the brewer has that sample analysed and is greeted with an entirely different set of figures. Did such circumstances redound to the credit of our profession Surely it would be more business-like for those chemist who are connected with certain industries to agree among themselves as to what methods should be adopted. The alternative would be that buyers and sellers would demand that figures in reports should be based on certain methods of analysis. Such a state of affairs existed in the sugar trade, and the speaker was of opinion that it would not be long before it obtained in the malting and allied industries.

Mr. W. T. Burgess rather thought chemists had brought the condition of affairs by which they got in disrepute with their clients to some extent on themselves and in this way:—It was a very common practice to expres the results to places of decimals which the methods employed did not warrant. It rather gave the client a idea, when you expressed the result to two places o decimals, that you had a process which was absolutel accurate, when you really had not. He was not directl interested in some of the things which had been discussed but he thought it highly desirable, wherever empirica processes were used, to briefly indicate by names or otherwise the actual processes; this might be of service t clients, and certainly would be to other analysts to whom the statements of results might be submitted.

Dr. Thorne thought with Mr. Jones that the presen state of things was at least as bad as any possible stat of things that even a rigid standardisation would brin about. But those who were striving for some sort o standardisation, or unification, as he should prefer to call i did not want to go so far as their opponents made ou You could carry standardisation to an extreme which wa harmful, but the present state of things was certainly scandal, and amongst a great many people the name o chemist was held more or less in disrepute because of th very great discrepancies to be found in different analyst reports. Mr. Gordon Salamon said with justice that " very important, possibly the most important, part of a analytical report was the opinion of the chemist at th bottom." If the chemist were really an expert that wa absolutely the case. But if that were so there was a goo deal to be said for leaving out the figures altogether. O the other hand if the analytical figures were given t reports (and he considered they should be given) the ought to be figures which were fairly comparable wit those of other analysts and were reasonably intelligibl There should be no possibility that, when identical sampl were sent to different analysts, the results returned shou differ by as much as 6 or 7 per cent., which was no sometimes the case. He maintained that the analys of such things as malt and sugar, which had been lo referred to as "only empirical assays," were merely le accurate analyses; they were in an earlier stage than t more accurate mineral analyses; there had been less wo done on them. It seemed to him that just as they h had subsequent methods in mineral analysis, going beyo those given in Fresenius, which book was for yea practically accepted as a standard. So it would be other things. That was sufficient an answer to the stat ment that a certain amount of standardisation in the k ac urate methods of the present day in organic analysis w ld not be an advantage. He thought they ought to st e, not for laying down hard and fast rules which could n be altered, but for the unification from time to time of th results of the research which was going on. He should pr er to call it defining and synchronising of methods, ra er than standardisation, and the methods should be re sed from time to time. They wanted standing com- m ees of experts in particular branches and in this way im rovement might easily be obtained without in any way st ng, but rather stimulating research, and progress. If th went on as they were going now, the result would un oubtedly be bad. Some sort of standardisation or ag ement amongst chemists was most desirable, and they m t not run away with the notion that standardisation m nt the laying down of hard and fast lines which, like th laws of the Medes and Persians, were not to be altered. T y wanted to agree amongst themselves and arrive at ce ain general methods and terms which for the time be g should be accepted, subject to modification as fu her research went on. If numbers were to be given at al as they undoubtedly should be given, those numbers sh ld be fairly comparable amongst themselves, or else ch nists were made to look absurd, one reporting that a ce in sample contained, say, 75 per cent. of invert sugar, w st another reported 70 per cent., the article being pr tically bought for the invert and valued accordingly. T opinion at the bottom of the paper did not mean the sa e thing to the purchaser who wanted to know what w the number of units of available material *as well* as th general character of the product. By conference am ngst chemists engaged in any particular branch, there sh ld be a possibility of getting unification of results and wh e an empirical standard of comparison was used that st dard ought to be clearly indicated in the report. In th way they might avoid coming so unpleasantly into co ict with one another.

r. F. J. Lloyd said the American system had been ra er severely criticised, and it had been altogether over- lo ed that the Americans had simply copied the G mans. The Germans were considered good analysts, an many of those present had learned a good deal from th . If in Germany it was considered that methods sh ld be standardised to some extent, and the Americans ha copied this system, it might be concluded there was so argument for such a system. The word "standardi- sa n" had been used in a wrong sense, so far as he co l judge, with regard to both the American and G man systems. In both countries they tested proposed m ods of determination, and if a particular method was fo l accurate it was designated "official"; it was hall- ma ed, and every chemist knew that by properly carrying ou that method, accurate results could be obtained. Th e might be two or three official methods for de- te ining the same substance; and in no sense could it be sa that you were tied down to one particular manner of ca ing out the work. His own experience was that he ha wasted an enormous amount of time in endeavouring to btain accurate results with different systems put fo ard in chemical literature for the estimation of this or at particular substance. Surely it was desirable, with the enormous increase in the number of methods of an sis, that there should be bodies of men competent to ju and determine whether a method was accurate? Th was desirable, not so much for the specialist, because a m who was a specialist in a particular line, studied that in minutely, and could for himself judge of the accuracy of dif ent methods; but they were all called upon at times to ndertake work which was a little outside of their spe al line, and then it was most difficult to select a me od which could be relied upon to give accurate res s. In fact he had to go to foreign literature and find, if l could, what had been adopted as the official method for btaining those results, either in Germany or in the Ur d States, simply because in England there was no offi l method. He thought they failed to realise a funda- me l principle which should guide them in this discussion. An ubstance which could be isolated could be determined; he red not by what methods, because you had something capable of being isolated. But hundreds of analyses had to be made where the substance could not be isolated. Then the method was empirical, and the moment you had to employ an empirical method it was necessary to have certain conditions of procedure laid down. Another rule he had adopted was this: Whenever an ultimate result can be obtained no approximate result should be tolerated. He always found it easier to get accurate ultimate results than accurate proximate results. In analytical operations they must consider the question: Would the result depend on physical condition? and if any result was dependent on physical conditions you would never get accuracy or uniformity, unless you had uniformity of procedure. Hence he considered that such methods should be standardised.

The Chairman said there was one point which ought not to be lost sight of—that most of the tests that were empirical now might become scientific in future. There was a transition stage in almost every analytical method, and probably in many of these methods they were only in the transition stage. It might possibly be an advantage that those who carried out such transitional methods should agree among themselves how to tabulate the numerical results, so as to be somewhat in accord. Especially if several analysts were making analyses in practically the same way. It did seem a pity they should not agree on the numerical methods of stating the results. Another point which had not been emphasised as perhaps it might have been, was this: an official method, from its very nature, gradually got stereotyped and was kept in use long after the original object of the method, or the original reasoning had ceased to exist. They got personal methods, and he need only mention the Abel methods in connection with the testing of the flash point of petroleum, and the heat test for explosives. At the time they were originated they were the most advanced scientific methods known, the result of most careful research in those matters, and at the time were generally accepted. But science went on developing, and yet these methods were retained, and were called by the original name, although the methods themselves were developed and improved. Very often what was supposed to be the Abel test was not anything like the original Abel test at all. There must be a continual revision of such standards, preferably, annually; this was an absolute necessity unless they were to stagnate. From a scientific point of view there was no such thing as finality, everything was changing, even the atoms were now being superseded, probably the electrons themselves might ultimately follow them. With regard to the practical or empirical tests which were carried out now, one never knew at any moment, but that a new method, or means of isolating some characteristic component part of a substance, might be found out, which would throw a flood of light on the remainder of the ingredients. Some 30 years ago nearly every cement factory in this country controlled the process of manufacture by simply taking a portion of the mixed materials known as slurry and burning it in a sample oven. The resulting clinker was ground, and the finished cement tested. After the lapse of considerable time the manufacturer could thus detect errors in the composition of the raw mixture. At that time Dr. Scheibler brought out his calcimeter for testing the percentage of calcium carbonate in sugar char. He went over to Berlin, brought back one of the instruments, and tried to introduce it into cement works. At that time it was generally met with ridicule, but now there is hardly a cement factory where such an instrument, or an improved one, is not in use; the old empirical method being quite superseded. The modern method did not determine the whole of the substances present in the cement, but gave a pretty accurate test of one of the ingredients which would be sufficient to control the manufacture of the whole. With malt, also, it might at any time be found possible to isolate one of its component parts which would give at once an indication as to the others. There was little fear of dictation by clients to analysts, when analysts themselves could not agree. It seemed to him that it was for the analysts themselves to agree as to their methods. How could a client dictate when he was not familiar with the methods of analysis. He wanted a result which would be of some use to him, and figures which he might compare with other results, and on which he could base his manufacture or mercantile transactions. It must always be left to the competent analyst to decide how to carry out his work if he was to give his client the best results of his own experience. A man might be engaged for 20 or 30 years on some kind of work, and naturally what his client wanted was the net result of his experience. If he was tied, hand and foot, he could not give the full result of that experience; he could only act as a machine to carry out certain operations. In the case of lawyers, physicians, or other professional men, no one dreamed of dictating to them how they should arrive at their opinions; you give them a fee and expected them to give the results of their accumulated experience. He would conclude by moving a hearty vote of thanks to the readers of the papers.

Mr. Ling said there was practically nothing for him to reply to. The discussion had wandered from the points he had raised to the question of whether or not it was desirable to adopt uniformity in carrying out processes of analysis. A certain amount of latitude as regards conditions was generally permissible in the case of chemical methods, but that could only be determined by what he had called standardisation, which might equally well be termed analytical chemical research, as Mr. Chapman preferred. His point was that all methods of analysis, whether chemical or not, required to be standardised in this sense of the term, and he would venture to point out that as a result of this it was sometimes found that even a chemical method was of an empirical nature, for many instances could be given in which, under the only possible conditions, a given reaction was incomplete. In the case of the brewing methods he had referred to it was absolutely essential to adhere strictly to fixed conditions, as Mr. Hehner had pointed out, but his contention was that, as several different methods were in use among various analysts, ostensibly for the same determinations, which, however, gave different values, these methods should be investigated by a committee of experts with a view to ascertaining as far as possible what was actually measured when a definite procedure was adopted. If after this had been done the committee prescribed certain of them for commercial purposes, it by no means followed that they could not be replaced by more efficient ones as knowledge advanced.

The following contribution to the discussion was sent in by Mr. M. J. Cannon:—As a chemist engaged in the examination of brewing materials, I think that brewers and maltsters have reasonable grounds for complaint that the analytical data supplied by different chemists show considerable differences which are apparently irreconcilable. Not infrequently, however, the explanation of such differences is to be found, not in a discussion of abstruse problems of mass action, velocity, and equilibrium of reaction, or even an investigation of the precise physical conditions under which the determinations were made, but in the prosaic details of the method of calculation adopted by the individual chemist. This is particularly the case in the determination of extract, to which a previous speaker has alluded with such force. Recently I conducted some experiments with four methods. In all five mashes were made, these being conducted at the same time and under precisely similar conditions as regards grinding, mashing, quantity of liquor, time, and dilution. The result of the determinations all agreed very closely with each other when calculated in the same manner, but when calculated according to the formula of the respective authors wide differences are apparent, *viz.*, Heron. 94·3 lb.; Stern, 96·0 lb.; Briant, 94·9 lb.; Ling, 95·5 lb. These differences, arising wholly from the method of calculation adopted, are certainly not less than the discrepancies to which a previous speaker has drawn attention. In other determinations discrepancies undoubtedly occur in a similar manner, and I am convinced that it would be a wise policy for chemists to come to some agreement as to uniformity in expressing the results of those methods which are already sufficiently universal as to be almost standard methods. This could undoubtedly be done without th sacrifice of abstract principles or interfering with th interpretation of the analytical data upon which the analys bases his opinion.

ERRATA.

This Journal, 1903, page 600, col. 2, line 9 from top, *fo* "thiocyanite" *read* "thiocyanate."

This Journal, 1903, page 600, col. 2, line 17 from top, *fo* "Friction" *read* "Ignition."

Manchester Section.

Meeting held on Friday, May 1st, 1903.

DR. GERLAND IN THE CHAIR.

PHENOLIC COLOURING MATTERS.

BY A. G. PERKIN.

(This Journal, 1903, 600—606.)

DISCUSSION.

Professor Knecht congratulated the lecturer upon th lucid manner in which he had placed the subject before th meeting. He had arranged the natural colouring matte (which had hitherto been grouped in somewhat stragglin fashion) according to their constitution, towards the solutio of which he (the lecturer) was well known to have con tributed largely by his valuable researches.

Mr. L. G. Radcliff also complimented Mr. Perkin o the completeness of his paper and referred to the tediou nature of such investigations, which he fully appreciate inasmuch as he (Mr. Radcliff) had done some work in thi direction. Mr. Perkin had shown a complete classificat o of several of these complex groups of colouring matters.

Mr. Perkin, in reply to Prof. Knecht, said that he co sidered the colour of the alizarin red lake to be the effe of the one hydroxyl which takes part in the quinonoi change, but did not suggest that in this case the secon hydroxyl was not involved in the later formation. N attempts to his knowledge had been carried out with th natural colouring matters in the direction suggested b Dr. Levinstein, and his remarks had been made with th object of pointing out such future possibilities for thes substances.

Nottingham Section.

Meeting held at Leicester, on Wednesday, April 29th, 19

MR. L. ARCHBUTT IN THE CHAIR.

A HIDDEN SOURCE OF DANGER IN SULPHAT OF AMMONIA SATURATORS.

BY F. J. R. CARULLA.

(This Journal, 1903, 607—608.)

DISCUSSION.

Mr. J. F. Kempson said that although he had had a accident with his sulphate plant, he had no experience one similar to that mentioned. It struck him, howeve that the proposed safety valve would probably stick fa through dirt, and fail of its object at the critical moment.

Mr. Carulla replied that the attendant could occasional lift the valve to see that it was in working order. I position was so accessible that there should be no difficul about this.

Scottish Section.

eeting held at Glasgow, on Tuesday, April 7th, 1903.

MR. T. L. PATTERSON IN THE CHAIR.

WOOD SPIRIT, AND ITS TESTING.

BY CHARLES A. FAWSITT, F.R.S.E., F.C.S.

Vood spirit, or, as it is called in America, wood alcohol, ised in large quantities for the preparation of methylated it, and formerly was employed in considerable quantity the manufacture of aniline colours, and to a smaller ent as a solvent of gums, but at present the consumption the two last-mentioned purposes is small.

uring the period covered by these notes large numbers samples of Scotch, Continental, American, and Canadian od spirit were received, and it is worthy of note that, ough produced from different woods, grown on erent soils, and distilled by different methods, these e fairly similar in composition. Some firms, especially se abroad, take out a portion of the distillate rich in thyl alcohol, which they sell for purposes other than for thylation, and accordingly discrepancies were noticed n the mean of genuine samples.

Vood spirit consists principally of methyl alcohol, ked with smaller amounts of acetone, methyl acetate, ethyl acetal, aldehyde, allyl alcohol, methylamine, oil, l water. Some of these constituents, such as allyl hol and the oily matter, give to wood spirit a pungent ur, and it is on this account the Government selected it the denaturating principle of methylated spirit, which sists of nine parts of spirits of wine, and one part of od spirit. The Government tests are so framed that se bodies which impart a pungent odour to the methy- ed spirit are always present in a certain proportion; at st, a minimum is fixed. . If, however, these bodies are sent in too large a quantity, the methylated spirit is not table for use in some industries; for instance, in the hat nufacture; also for French polishing, as the workpeople's s are affected. This irritating effect is more noticeable in od spirit which has been prepared from wood distilled high temperature, especially birch wood.

Iethyl alcohol, which forms about 75 per cent. of wood it, has very little smell; that of acetone and the esters not unpleasant; and these three constituents, together the water, make up about 95 per cent. of the wood it, leaving about 5 per cent. for the allyl alcohol, alde- c, methylamine, and oily constituents.

he last runnings of a refined wood spirit still have a uliar physiological action on the skin. If some gets the hands, no peculiar sensation is experienced unless rwards the hands are washed in cold water, when nse pain is felt between the fingers, where the skin is ler. I have repeatedly experienced this myself, and the ement is corroborated by others.

rude wood spirit is sold from sp. gr. 0·980 to 0·850 at F. (15·5° C.).

u testing a sample of crude it is usually distilled over or other alkali, in order to bring up the strength to ewhat above the minimum allowed by the Government methylating purposes, *viz.*, 60° over proof, sp. gr. 289 at 60° F. The wood spirit should now be what is ned "miscible" wood spirit or naphtha, *i.e.*, that when ed with water in any proportion it does not produce a kiness, due to an excess of oily matters. If the crude it is very oily, it follows that it is more difficult to pare refined spirit which is "miscible."

he first test usually applied to the refined wood spirit boiling-point determination, conducted in an ordinary tionating flask, attached to a condenser, the distillate ng collected in a graduated measure. The apparatus as wn in Fig. 1 will explain itself. It is only after using apparatus for some years that a description of that used in the Somerset House laboratory appeared in this Journal, 1900, 1034. This differs from the other form in that the separation of the constituents is more complete. A descriptive sketch is given in Fig. 2.

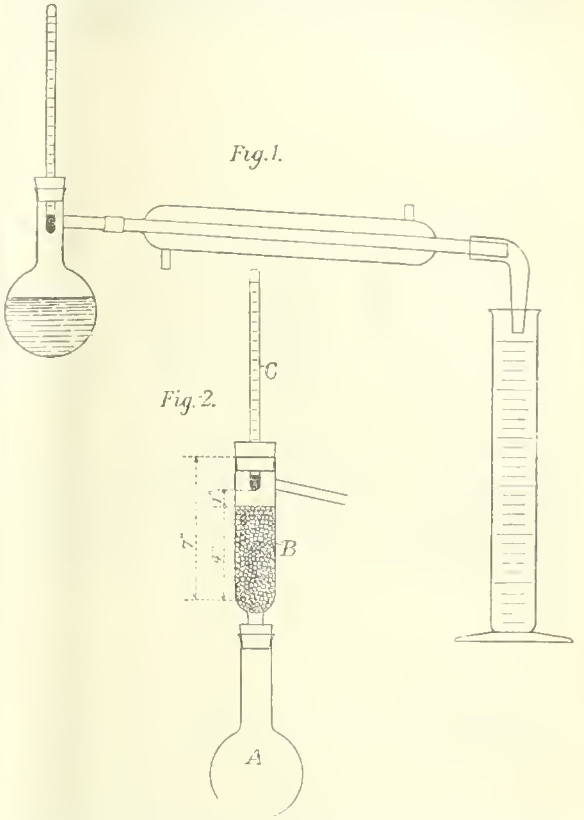

Fig. 1.

Fig. 2.

Fig. 2.—A. Copper flask distilling 100 c.c. B. Fractionating column 7 ins. long, 4 ins. being filled with glass beads. C. Thermometer, bulb 1 in. above beads, and opposite exit tube.

In the Government apparatus, not more than 100 c.c. should distil over when the temperature is just under 65° C.; from 80 to 85 c.c. should distil over between 65° C. and 72·2° C., and 97 to 98 c.c. before the temperature reaches 100° C.

The following figures show that the results with the two forms of apparatus are not comparable for the same sample of wood spirit. 100 c.c. were taken in each case; sp. gr. 0·827 at 60° F.:—

—	First Drop.	10 c.c.	20 c.c.	30 c.c.	40 c.c.
	C.	C.	C.	° C.	° C.
Old form	64·5	65·3	65·8	66·3	66·8
Somerset House	61·2	64·0	64·5	65·0	65·5

—	50 c.c.	60 c.c.	70 c.c.	80 c.c.	90 c.c.	98 c.c.
	° C.	° C.	° C.	° C.	° C.	° C.
Old form.......	67·5	68·2	69·2	71·0	75·5	98
Somerset House	66·0	66·8	67·5	68·5	71·5	92

It served the purpose, however, equally well to use the old apparatus, because, given a sample of reliable wood spirit, the distillation numbers served as a comparison for any other sample.

The boiling-point determination, as carried out, was a guide to the genuineness of the refined spirit, and samples which had been rejected by the Government, as containing too great a proportion of volatile constituents, showed that such was the case when submitted to this test.

Below are a series of boiling-point determinations of refined wood spirit, prepared from samples of crude received from different sources. These were all made in the apparatus Fig. 1, the flask distilling 90 c.c.

The strength of the wood spirit taken was, unless stated otherwise, sp. gr. 0·827 at 60° F., or by Sykes' 61° O.P. The samples tested were Scotch, American, Canadian, and Continental.

Looking at the numbers in Table I. it will be noticed that the boiling points of the Scotch samples differ very little, although they were received from several makers, distilled from different woods, and by different methods.

TABLE I.

Scotch.

No.	1st Drop.	10 c.c.	20 c.c.	30 c.c.	40 c.c.	50 c.c.	60 c.c.	70 c.c.	80 c.c.	90 c.c.
	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.
1	66·0	66·8	67·2	67·8	68·0	68·8	69·8	71·0	74·0	83·8
2	66·0	66·5	67·0	67·5	68·0	68·5	69·2	70·8	73·5	83·5
3	66·0	66·8	67·2	67·6	68·2	68·8	69·6	71·0	74·0	83·5
4	65·2	66·2	66·8	67·2	67·8	68·5	69·4	71·2	74·5	86·0
5	65·5	66·0	66·5	67·0	67·5	68·2	69·2	70·8	74·0	83·2
6	66·5	67·0	67·3	67·8	68·3	69·0	70·0	71 5	74·8	86·0
7	65·8	66·3	66·8	67·3	67·9	68·8	69·8	71·0	74·5	87·0
8	65·2	66·0	66·6	67·2	68·0	68·8	69·8	71·0	74·8	85·5
9	65·0	66·8	67·2	67·8	68·5	69·2	70·2	72·2	76·5	87·5
10	64·5	66·0	66·8	67·2	67·8	68·5	69·5	71·2	75·2	83·0
Mean	65·6	66·4	66·9	67·4	68·0	68·7	69·6	71·2	74·6	84·9

The mean should be a very fair approximation for Scotch wood spirit, with the form of apparatus used. The temperatures given for the "first drop," and also for "87 c.c.," cannot be considered reliable, as in each case the temperature was rising rapidly.

Taking the numbers for the American samples in Table II., the mean is lower than that for the Scotch samples, but they are fairly uniform.

As regards the Continental samples, Table III., there is not the same agreement, some boiling much lower than the Scotch samples, others, again, slightly higher. The mean, however, was below that for the Scotch wood spirit. Sample No. 10 had a very low boiling point, and most probably was not genuine, *i.e.*, some portion of the distillate rich in methyl alcohol having bee abstracted.

TABLE II.

American.

No.	1st Drop.	10 c.c.	20 c.c.	30 c.c.	40 c.c.	50 c.c.	60 c.c.	70 c.c.	80 c.c.	87 c.c.
	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	C.
1	65·5	66·5	67·0	67·5	68·2	68·8	69·8	71·2	74·5	85·0
2	66·5	67·5	68·0	68·5	69·0	69·8	70·8	72·2	76·0	86·0
3	64·5	65·5	66·0	66·5	67·0	67·8	68·8	70·5	73·5	81 8
4	63·5	65·7	66·1	66·5	67·0	67·9	68·8	70·6	73·5	84·0
5	64·5	65·2	65·6	66·2	66·8	67·7	68·8	70·8	75·3	87·0
6	65·0	65·8	66·3	66·8	67·5	68·2	69·1	70·6	74·8	86·0
7	65·0	65·5	66·0	66·5	66·8	67·8	69·8	70·0	73·5	85·0
8	65·5	66·5	66·8	67·3	67·8	68·5	69·5	71·2	74·5	91·0
9	64·5	65·0	66·0	66·5	67·0	67·5	68·5	70·0	73·5	86·0
10	65 0	66·0	66·5	67·0	67·8	68·5	69·5	71·0	75·0	87·0
Mean	64·9	65·9	66·4	66·9	67·5	68·2	69·2	70·8	74·4	85·9

TABLE III.

Continental.

No.	1st Drop.	10 c.c.	20 c.c.	30 c.c.	40 c.c.	50 c.c.	60 c.c.	70 c.c.	80 c.c.	90 c.c.
	° C.	° C	° C.	° C.	° C.	° C.	° C.	° C.	C.	° C.
1	65·5	66·2	66·5	67·0	67·5	68·0	68·5	69·5	72·5	80·0
2	63·5	64·0	64·8	65·3	66·1	66·8	67·5	69·2	72·2	83·0
3	64·5	65·2	65·8	66·3	67·0	67·8	68·5	69·8	72·2	78·0
4	64·2	65·2	65·8	66·3	67·1	68·0	69·0	70·3	73·8	88·0
5	66·8	67·2	67·7	68·0	68·5	69·0	69·8	71·2	74·8	97·0
6	66·5	67·0	67·3	67·8	68·3	68·8	69·6	71·0	74·8	93·0
7	66·6	67·4	67·6	68·0	68·5	69·9	70·0	71·2	75·2	97·0
8	66·3	67·0	67·2	67·6	68·0	68·5	69·5	70·8	74·0	88·0
9	66·5	67·0	67·5	67·7	68·6	68·6	69·5	70·6	74·0	91·0
10	63·5	64·5	65·3	65·5	66·2	67·0	67·8	69·0	71·8	83·0
Mean	65·4	66·1	66·5	66·9	67·5	68·1	69·0	70·3	73·5	87·8

The Canadian samples tested were too few in number to give a reliable mean for comparison.

The following is a copy of the Government tests for wood spirit which is to be used for methylation. Wood spirit submitted for approval should conform to the followi tests :—

(*a*) Not more than 30 c.c. of naphtha should be requir to decolorise a solution containing 0·5 gr. of bromir (*b*) The naphtha, which must be neutral or only slightly alkaline to litmus, should require at least 5 c.c. of decinormal acid to neutralise 25 c.c. of the spirit when methyl orange is used as the indicator.

It should contain—

(*a*) Not less than 72 per cent. by volume of methyl alcohol.

(*b*) Not more than 12 grs. in 100 c.c. of acetone, aldehydes, and higher ketones estimated as "acetone" by the formation of iodoform according to Messinger's method.

(*c*) Not more than 3 grs. per 100 c.c. of esters, estimated as methyl acetate by hydrolysis.

Then follow the details of the manner in which the tests are to be conducted.

The bromine test is a measure of those oily and empyreumatic bodies which give to the methylated spirit the necessary amount of nauseousness, so as to render it unfit for drinking purposes. The alkalinity test serves as a measure of the free ammonia and methylamine, the former being produced from the latter, when heated with alkali.

The ester test is a measure of methyl acetate and other bodies which, on hydrolysis, yield methyl alcohol.

In the estimation of acetone it is not only acetone which is determined, but all such bodies in the wood spirit, such as aldehydes, higher ketones, &c., which yield iodoform when so treated.

The following are the Government instructions for carrying out the Messinger test for acetone as applied to wood spirit :—

0·5 c.c. of wood spirit is added to 25 c.c. of normal soda in a flask. The mixture is well shaken and allowed to stand 5—10 minutes. N/5 iodine solution is run into it from a burette, drop by drop, shaking vigorously till the upper portion of the liquid, on standing a minute, becomes quite clear. A few cubic centimetres more of N/5 iodine solution are added as to get concordant results an excess of at least 25 per cent of the iodine required should be added. After shaking, the mixture is allowed to stand for 10—15 minutes, and then 25 c.c. of normal sulphuric acid are added. The excess of iodine liberated is titrated with N/10 of sodium thiosulphate solution and starch ; half the number of cubic centimetres of thiosulphate solution used is deducted from the total number of cubic centimetres of iodine solution used. The difference gives the amount of acetone by weight in the wood spirit.

As Kramer and Grodski's method had been used for a considerable time previous to the adoption of that of Messinger, it was thought necessary to make a strict comparison of the two methods. Accordingly, some pure acetone and methyl alcohol were procured, and the following mixtures made :—

No. 1, containing	16	grs. of acetone in		100	cc. of	the mixture.
No. 2,	,,	12	,,	,,	100	,,	,,
No. 3,	,,	8	,,	,,	100	,,	,,
No. 4,	,,	4	,,	,,	100	,,	,,
No. 5,	,,	2	,,	,,	100	,,	,,

The acetone was then estimated by Messinger's, and also by Kramer and Grodski's methods, with the following results :—

Sample.	Messinger's Method.	Kramer and Grodski's Method.
	Grs.	Grs.
1	16·4	14·08
2	12·6	10·04
3	8·02	7·36
4	4·14	4·00
5	1·90	2·06

These numbers show that Messinger's method gives good results, whilst that of Kramer and Grodski is reliable only for wood spirit containing a low percentage of acetone. In he above tests 0·5 c.c. of the mixture was taken for each est by Messinger's method, also for Nos. 3, 4, and 5 by Kramer and Grodski's method, but only 0·2 c.c. for Nos. 1 and 2, as the results were much lower still when taking 0·5 c.c., even although the quantities of iodine and caustic soda solution were increased.

A further comparison of these methods for the estimation of acetone was made with samples of ordinary wood spirit, taking 0·5 c.c. of wood spirit for each test. Results expressed in grs. per 100 c.c. :—

Sample.	Messinger's Method.	Kramer and Grodski's Method.
	Grs.	Grs.
1	7·8	5·0
2	5·23	3·8
3	14·00	11·2

The above tests show a wider discrepancy between the methods than those with the mixtures of pure methyl alcohol and acetone. It would almost appear as if iodine were taken up by the Messinger method to form bodies other than iodoform, which bodies are present in wood spirit, but were not present in the synthetical mixture of acetone and methyl alcohol.

As regards the test for methyl alcohol, which consists of the conversion of the methyl iodide by the addition of iodine and amorphous phosphorus, it is quite straightforward, but requires care in order to obtain concordant results. A difference of one-tenth c.c. in the volume of methyl iodide gave a difference of 1·3 per cent. of methyl alcohol: so in dealing with a sample of wood spirit containing, say, 72—73 per cent., a slight error might lead to its rejection, as the Government do not pass wood spirit containing less than 72 per cent. of methyl alcohol.

As regards the percentage of methyl alcohol in wood spirit at sp. gr. 0·829, it varied in the samples tested from 68·6 per cent. to 84·7 per cent. by volume ; but several of these could not be considered genuine. Taking those which could be considered as such, the Scotch samples gave a mean of 76·8 per cent. ; American, 75·2 per cent. ; Canadian, 77 per cent. ; but as so few of the last were examined, the number is not reliable.

The percentage of acetone varied considerably. In the refined samples, from 3·5 grs. to 14 grs. in 100 c.c. of wood spirit ; whilst in the unrefined, which was of a lower specific gravity, it varied from 11·9 grs. to 17·2 grs.

As it was only within recent time that the acetone was regularly determined, a series of numbers necessary for a good comparison are not available, except in the case of the Scotch samples, but it would be safe to conclude that in some samples the percentage of acetone was high, owing to some of the methyl alcohol having been removed by intention from the wood spirit in process of manufacture. The mean percentage of acetone for Scotch samples was 8·3 grs. in 100 c.c. of spirit at 0·829 at 60° F. No doubt the acetone varies according to the method employed in the distillation of the wood. The percentage of acetone in the crude spirit is by rectification over alkali reduced, and accordingly the refined contains a lower percentage. For instance, a sample of crude, sp. gr. 0·862 at 60° F., gave 62 per cent. methyl alcohol by volume in 100 c.c. :—12·95 grs. of acetone in 100 c.c. ; 5·05 grms. of esters in 100 c.c. This crude, when refined over alkali to 0·829 at 60° F., gave 73·8 per cent. of methyl alcohol by volume :—10·5 grs. of acetone in 100 c.c. ; 0·4 grs. of esters in 100 c.c.

The reason for this diminution in the percentage of acetone is accounted for by the splitting up of acetone, on warming with alkali, into mesityl oxide and phorone as follows :—

$$2C_3H_6O - H_2O = C_6H_{10}O\,;\quad 3C_3H_6O - 2HO = C_9H_{14}O.$$

As regards the esters, they exist only in very small quantities in the refined spirit, which is accounted for by the wood spirit having been refined over alkali. In the ordinary crude wood spirit, however, the esters amount to as much as 6 per cent., and they would probably be considerably higher in crude spirit, from the manufacture of acetate of lead.

An experiment was made to see what effect on the ester yield would result if pyroligneous acid were carefully neutralised, and then distilled. For this purpose a quantity of pyroligneous acid, sp. gr. 1·020, was procured, and neutralised with weak soda solution in the cold. The liquor was distilled, and the resulting distillate was neutral, as was the residual liquor left in the still. As the distillate was not up to strength it was again distilled, and the distillate, on analysis, gave the following numbers:—methyl alcohol, 78·18 per cent. by volume; acetone, 78 grs. in 100 c.c.; esters, 3·8 grs. in 100 c.c. Although the ester number was in excess of that usually found in ordinary wood spirit, a higher one was expected.

A trial was made with a sample of Scotch crude wood spirit, collecting the distillate in three equal fractions, in order to ascertain how the different constituents would be distributed over the three fractions. Subsequently, a boiling-point determination of each was made; also an estimation of the methyl alcohol, &c. Care was taken that the distillation was complete when the third fraction was over, and also that the strength in each case was that required for the tests, *viz.*, sp. gr. 0·829.

For comparison, a sample of the same wood spirit was distilled in the ordinary way, the distillate being collected in one lot, and tested as usual.

For the boiling-point determinations 100 c.c. were taken, sp. gr. 0·829 at 15·5° C. (60° F.):—

—	1st Drop.	10 c.c.	20 c.c.	30 c.c.	40 c.c.	50 c.c.	60 c.c.	70 c.c.	80 c.c.	90 c.c.	95 c.c.
	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.	° C.
Distillate ordinary	65·5	66·3	66·6	67·2	67·8	68·3	69·0	70·2	72·0	77·2	87·0
First fraction	63·0	64·0	64·6	65·2	66·0	66·6	67·6	68·8	71·0	74·8	85·0
Second fraction	67·2	67·6	68·0	68·3	68·6	69·3	69·8	71·0	72·6	76·5	87·5
Third fraction	67·5	68·0	68·3	68·6	69·6	69·5	70·2	71·3	73·2	78·0	88·5

The four distillates were submitted to the usual Government tests, with the following results:—

—	Methyl Alcohol.	Acetone.	Esters.	0·5 c.c. Bromine required.
	Per Cent.	Grs.	Grs.	c.c. W.G.
Distillate ordinary	78·9	8·8	0·98	24·0
First fraction	68·4	18·6	0·45	115·0
Second fraction	85·90	3·8	0·30	17·0
Third fraction	87·70	0·99	0·60	11·2

It is difficult to understand why the third fraction should give more esters than first and second fractions, and also why the mean of the three fractions for acetone, esters, and number of cubic centimetres required for 0·5 c.c of Bromine should be so different from those for the sample distilled in the ordinary way, but no doubt it would be owing to the longer time taken for the distillation of the larger quantity required for the three fractions.

The following is the formula given in the Government instructions for calculating the percentage of methyl alcohol from the yield of methyl iodide. The percentage by volume is found:—

$$\frac{\text{c.c. methyl iodide found} \times 0·647 \times 100}{\text{c.c. wood spirit taken}} = \text{percentage (by volume) of methyl alcohol;}$$

or, when 5 c.c. of wood spirit are taken:—

$$\text{c.c. methyl iodide} \times 12·94 = \text{percentage by volume.}$$

The factor 12·94 is based on the theoretical yield of methyl iodide, sp. gr. 2·285, at 15° C.; but, in order to arrive at the correctness of the above results, it was thought advisable to standardise the apparatus with commercially pure methyl alcohol. Accordingly a small quantity was procured, and, after allowing it to remain over a large excess of anhydrous sulphate of copper for 18 hours, it was distilled, the first portion of the distillate being rejected. This alcohol was tested for acetone, and gave 0·19 gr. per 100 c.c., and 0·15 gr. of esters, calculated as methyl acetate. The test for methyl alcohol gave 7·6 c.c. of methyl iodide, equivalent to 98·34 per cent. by volume; and, allowing for the acetone and esters, 5 c.c. of the methyl alcohol would have given 7·65 c.c. of methyl iodide, equivalent to 99·38 per cent. by volume of methyl alcohol. The factor obtained from these numbers is 13·08, as against the Government number 12·94.

5 c.c. of 100 per cent. wood spirit should give 7·73 per c.c. of methyl iodide at sp. gr. 2·285 at 15° C., and the factor obtained from this number is 12·94, which is the Government factor. Kramer and Grodski gave their experimental number as 7·45 c.c. of methyl iodide, which gives a factor of 13·42.

In the Government method for the estimation of the esters, a silver flask is used, so as to avoid the possible error due to alkali from glass. As all the above ester determinations were made in a glass flask, a blank was made, but no appreciable loss of acid could be detected.

As regards the quantity of oil in crude and refined wood spirit, a little difficulty was experienced in arriving at a suitable method for its extraction, owing to the volatility of the oil. The method adopted was as follows:—The wood spirit was diluted to a sp. gr. 0·985 at 60° F. This diluted wood spirit was then shaken with a good excess of ether; the ethereal layer separated, and the aqueous solution was again shaken with two instalments of ether, each time separating the ether layer, and adding it to that obtained in the first treatment. The total ether solution was placed in a flask attached to a condenser and distilled under 50° C., to a small volume. The residual oil was washed with ether into a 50 c.c. measure, so that a little water which was always present could settle out. One half of the ethereal layer was now run into a smal measure graduated into one-tenth c.c. and the ether distille off in a water-bath at 50 to 60° C., until there was no loss volume. The oil was allowed to cool, the volume read o and the volume, multiplied by two, gave the total oil in th ethereal solution.

A sample of Scotch wood spirit, which was non-miscibl with water, sp. gr. 0·953, gave 2 c.c. of oil for 100 c.c. wood spirit, or 2 per cent. by volume. A sample of th same wood spirit was then semi-refined up to sp. gr. 0·85 the distillate was slightly non-miscible. When treated wi ether as above, it gave 2·4 c.c. of oil in 100 c.c. of wo spirit, or 2·4 per cent. by volume. In the process distillation the oil, owing to its volatility, had becon somewhat more concentrated than in the crude from wh it was distilled. The semi-refined wood spirit, sp. gr. 0·85 was rectified up to sp. gr. 0·829, and this, which was qu miscible, gave 0·2 c.c. of oil in 100 c.c. of wood spirit, 0·2 per cent. by volume. A sample of American wo spirit, sp. gr. 0·855 at 60° F., which was quite miscible w water, gave 1·35 c.c. of oil for 100 c.c. of wood sp and the same spirit, rectified to sp. gr. 0·829, gave 1·2 of oil for 100 c.c. of wood spirit, or 1·2 per cent. by volu In the method used in the above determinations, it found that with wood spirit, diluted to sp. gr. 0·985, c taining 11 to 12 per cent. of methyl alcohol, a large quant of ether was absorbed in the aqueous solution—ab 200 c.c. in 1,800 c.c. of the dilute spirit. In order to av this, bisulphide of carbon and gasolin were tried. Th was practically no absorption of either by the dilute sp but the former, owing to it in certain samples reacting wh some constituent of the wood spirit, producing a crystal body, was not adopted, and the latter was rejected own the difficulty of evaporating its least volatile constitu from the oil. If the oil itself had been non-volatile, a reasonable temperature, no doubt this method would b been satisfactory. Petroleum spirit was proposed, b was thought would have the same objection as gasolin.

In this country wood spirit is bought and sold by Sykes' alcohol tables, which are used by the Government in distilleries, and also for taking the strength of wood spirit. It is urged that for the same percentage the specific gravity of ethyl and methyl alcohol does not differ appreciably; but whilst such is the case at some strengths, it is not true for others, as is shown in Table IV.:—

TABLE IV.

Proof Strength.	Sp. Gr. by Sykes.	Per Cent. by Weight, Methyl Alcohol. Dittmar and Fawsitt.	Per Cent. by Weight, Ethyl Alcohol. Hehner.	Difference.
70 over proof	0·8154	93·11	92·67	− 0·44
60 „	0·8289	88·18	87·62	− 0·56
50 „	0·8472	81·23	80·46	− 0·77
40 „	0·8639	74·59	73·42	− 1·17
30 „	0·8791	68·23	67·08	− 1·15
20 „	0·8934	62·08	60·92	− 1·16
10 „	0·9069	55·84	55·00	− 0·84
Proof........	0·9196	49·45	49·34	− 0·11
10 under proof	0·9313	43·01	44·05	+ 1·04
20 „	0·9420	37·15	38·78	+ 1·63
30 „	0·9515	31·38	33·76	+ 2·38
40 „	0·9600	25·64	28·56	+ 2·92
50 „	0·9669	20·83	23·69	+ 2·86
60 „	0·9728	16·68	19·00	+ 2·32
70 „	0·9784	12·82	14·45	+ 1·63
80 „	0·9845	8·77	9·71	+ 0·94
90 „	0·9916	4·34	4·87	+ 0·53
100 „	1·0000	0·00	0·00	..

From Table VI. it will be noticed that for sp. gr. 0·9600 there is a difference of 2·92 per cent. by weight between the numbers in methyl and ethyl alcohol tables; also that at the higher strengths the methyl alcohol numbers are higher, whilst at the lower strengths they are lower, than those for ethyl alcohol.

Another point of much importance to sellers and buyers of wood spirit is that of carriage by boat or rail. Some steamship companies refuse to carry it at any price, but will at the same time carry methylated spirit; whilst other steamship and railway companies charge exorbitant rates, besides stipulating that it must be carried at "owner's risk." The reason for the high rates is very much owing to ignorance on the part of those who have charge of such matters, and partly owing to the wood spirit being often designated as "wood naphtha." The word "naphtha" suggests something horribly explosive to railway and steamship officials, and conveys much more to their mind than any amount of explanation. The flash points of methylated spirit and spirits of wine do not warrant any preferential rate over wood spirit, as they all flash at ordinary temperatures.

A few rates by rail and steamer for wood and methylated spirit are given in the subjoined table. It will be noticed that, with one exception, the rate charged for wood spirit is much higher than that for methylated spirit. The rate for wood spirit from Rotterdam to London is 8*s*. 6*d*. per ton; from Glasgow to the same port by steamer, 33*s*. 4*d*., carried at "owner's risk."

	Wood Spirit.		Methylated Spirit.	
	Rail.	Boat.	Rail.	Boat.
	s. d.	*s. d.*	*s. d.*	*s. d.*
Glasgow to London.....	72 6	33 4	40 0	28 4
„ Manchester.	35 0	..	30 0	21 10
„ Liverpool...	23 4	22 0	28 4	10 0
„ Dublin	..	40 10	..	16 8
„ Edinburgh .	12 1	..	10 10	..
„ Newcastle..	30 0	..	21 8	..
Rotterdam to London...	..	8 6	..	..
„ Manchester	..	26 6	..	..

Before closing I should like to refer to the agitation which has been going on for some time in favour of using duty-free alcohol instead of methylated spirit in certain industries, and no doubt it would be of considerable advantage, as spirits of wine is not only cheaper than methylated spirit, but it is purer, and it is only right that the persons interested should use every effort to advance their interests, and infect as many others as possible with their enthusiasm, so that sufficient influence may be brought to bear in the proper direction. There is, however, another side to the question, and that is, the serious consequences to the wood distillers of this country which would be incurred if the concession became at all general, and if granted to one set of manufacturers it would be difficult to deny it to others. For several years past the wood distillers have had to face a very keen competition by the United States and the Continent, and they have suffered severely. One by one their products have become unprofitable, and if it had not been for their charcoal and wood spirit they must have succumbed long ago. Acetate of lime is about one-half the price it was a few years ago, and wood spirit, which used to sell at an average price of 5*s*. per gallon, is now offered freely at 3*s*., the loss on wood spirit alone amounting to 6*s*. per ton of wood distilled. If duty-free alcohol is granted freely, it will mean still lower prices for wood spirit, and make wood distillation unprofitable. Such a result is not to be desired, as we should then have to rely altogether on a foreign supply, and the foreign makers would not be slow to raise prices when the field was clear.

I hope no one will think I am advocating protection. I only wish to point out that whilst one set of manufacturers might gain by the granting of duty-free alcohol, another set would lose, and there might not be any advantage gained by the country in general. In event of war our country would be placed in an unenviable position as regards our supplies of acetone and charcoal for powder-making.

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I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Crucibles and the like; An Improved Method of Heating Substances in ——, and Apparatus therefor. G. Moller, Hohenlimburg, Germany. Eng. Pat. 9307, April 22, 1902.

The use of a bath of molten metal for uniformly heating crucibles, pots, &c., is claimed.—L. F. G.

Filters; Impts. in ——. A. J. Boult, London. From D. Rojat, Paris. Eng. Pat. 9854, April 29, 1902.

A cylindrical vessel is divided into concentric compartments by a number of permeable partitions, which are clamped into position, and make fluid-tight joints against rubber rings fixed on the cover of the vessel. The cover is hinged to a collar running round the wall of the vessel; it is fixed by bolts and nuts. The liquid to be filtered, enters in the centre, and flows radially to the circumference, passing through filtering material composed of a mixture of cellulose and amianthus fibres and placed between the partitions, decreasing in porosity towards the circumference of the vessel. The last layer of filtering material is in some cases formed of earthenware or porous stone. An annular chamber round the circumference receives the filtered liquid, which can be drawn off by taps.—L. F. G.

Concentration of Liquids; Impts. in Multiple Effect Apparatus for ——. W. S. Herriot, Glasgow. Eng. Pat. 10,844, May 12, 1902.

A revolving stirrer breaks up the bubbles arising from the evaporating tubes, and prevents the liquid in one vessel from boiling over into the next vessel.—L. F. G.

Steam; Impts. relating to Controlling the Temperature of Superheated ——. F. Bamford, Manchester. Eng. Pat. 11,622, May 21, 1902.

The temperature of superheated steam is controlled by means of a double valve, which admits steam to a chamber by one or other, or by both, of two inlets, one inlet admitting superheated steam at a high temperature, while the other admits superheated steam of a lower temperature, the chamber being also provided with a delivery pipe. The valve is thermostatically controlled by the temperature of the steam leaving by the delivery pipe, so that if the temperature of the superheated steam rise or fall, the valve increases the area of entry of the steam from one pipe and decreases it in the other inlet pipe, or *vice versâ*.

Another means of controlling the temperature of the superheated steam is by regulating the flow of the hot gases which heat the superheaters. This flow is regulated by two dampers, one controlling the admittance of the hot gases, the other opening a by-pass through which these can escape without heating the superheaters. The dampers are actuated by the piston of a cylinder filled with liquid, which is thermostatically controlled by the temperature of the steam in the delivery pipe.

Superheated steam of two different temperatures can be obtained by means of superheater tubes arranged in sets of three—one within the other—the steam first passing through the inner tube and then back by one or other of the annular spaces between the two outer tubes, these outside tubes being heated by the flame gases.—L. F. G.

Centrifugal Separators. Mme. C. Herlitschka, Düsseldorf, Germany. Eng. Pat. 3034, Feb. 9, 1903.

The separating drum is divided by vertical or inclined partitions into closed independent compartments, which are "provided alternately on opposite sides with closely fitting steps or deflecting plates," leaving passages for the liquid. With this arrangement "the liquid in each compartment is forced to ascend while taking part in the motion of the drum."—R. A.

Heating and Cooling Liquids; Improved Apparatus for ——, and for like Heating, Cooling, and Condensing Purposes. J. Edward Bennett and J. Ernest Bennett, London. Eng. Pat. 3296, Feb. 11, 1903.

In heating or refrigerating apparatus, a series of chests is arranged, and placed in combination, each chest being stopped across so as to be divided into a number of chambers. The chambers of these chests are connected by a series of parallel tubes, through which and through the chests the heating or cooling agent circulates. Through these tubes pass a series of open-ended tubes, through which and round the chests and the chest-connecting tubes, the liquid to be heated or cooled circulates. The chests are provided with trunnions, the inlet pipe for the heating or cooling agen being made to serve as one, so as to enable the apparatus to be set either in a vertical or a horizontal position.—L. F. G

United States Patents.

Furnace; Calcining or Decomposing ——. W. Hasenbach Assignor to Verein Chemischer Fabriken in Mannheim Germany. U.S. Pat. 726,911, May 5, 1903.

A muffle furnace containing an agitator is supported b a hub in the muffle, the whole being mounted on an iro framework, which also serves as a bearing for the shaft o the agitator.—L. F. G.

Furnace; Calcining ——. C. T. Heunig, London, Assigno to J. R. Hatmaker, London. U.S. Pat. 726,915, May 5 1903.

The furnace consists of a vertical chamber connected wit a number of other chambers above it but leading to it, eac of which makes an angle with the preceding chamber, an each of which is provided with an internal spiral rotatin conveyor. The heated gases are admitted into the vertica chamber, down which the materials are falling, and pas through the other chambers which contain material gradually being worked down by their conveyors toward and to the vertical furnace. The materials are discharge at the lower end of the vertical chamber, through a opening placed below the inlet for the heated gases, the escaping through an opening in the uppermost chamber the series.—L. F. G.

French Patent.

Filter; Improved ——, to Free Liquids from Suspend Matter. K. Kiefer. Fr. Pat. 325,255, Oct. 13, 1902.

Circular sheets of stiff wire netting with a circular hole in the middle, are clamped between a series of bosses whi form a hollow central circular shaft, tight joints being ma with rubber rings. Between these sheets, layers of co pressed cellulose are placed as filtering material, the wh being placed in a cylindrical vessel which is hermetical sealed, and provided with inlet and outlet taps. One half of the wire sheets abut against the bosses, and extend to the circumference of the filtering material, forming a channel for the liquid to penetrate between the layers; the other half only reach up to within a short distance of the circumference of the filtering layers, and the channel thus formed, connects through holes in the bosses with the central passage. The liquid to be filtered rises all round the annular space between the vessel and the filtering layers, and percolates through these to the central passage, whence it is drawn off.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

English Patents.

Coke; Impts. in Manufacture of ——, in Retort Ovens. J. F. Wilcox, Cleveland, Ohio. Eng. Pat. 536, Jan. 8, 1903.

A method of charging retort ovens, whereby one or more spaces are formed inside the charge, allowing a passage for the gases. By this means the formation of spongy friable coke in the centre of the coked charge is avoided.—L. F. G.

Furnaces [for Producers, Gas Retorts, &c.]; Regenerative ——. M. Graham, Leeds. Eng. Pat. 12,445, May 31, 1902.

The "feather" wall between the secondary air flue and the waste-gas flue of the furnace is constructed with dovetailed vertical joints instead of straight joints, and is provided at intervals with courses of cross-shaped bricks carrying baffles. The zigzag joints are claimed to be more perfectly gas-tight than straight joints.—H. B.

[Coal Dust] Furnaces. H. A. E. W. L. Femerling and O. Trossin, Hamburg. Eng. Pat. 18,004, Aug. 15, 1902.

Coal dust is fed in regulated quantities on to a rotating perforated cylinder, whence it is carried either by an air-blast or by the natural draught of the chimney down a charging shaft to a grate and combustion chamber, where it is burned along with an additional supply of air, admitted through the grate. To prevent ignition of the fuel before it falls through the charging shaft, the upper part of the latter is surrounded with a water coil or cooling jacket, communicating at its upper end with the steam space, and at its lower end with the water chamber of the boiler.
—H. B.

Burners applicable for use in Furnaces; Oil ——. J. W. Mackenzie, London. From The Eagle Oil Burner Co., Indianapolis, U.S.A. Eng. Pat. 21,735, Oct. 6, 1902.

The specification describes a burner in which crude oil is atomised by means of steam, and the mixture is mingled with cold and hot air prior to injection into the combustion chamber of the furnace.—H. B.

Coal-Gas, or other Gases containing Cyanogen; Treatment of ——, for the obtainment of Soluble Cyanides therefrom, and the Preparation of Materials for use in such Treatment. W. Feld, Hönningen-on-Rhine. Eng. Pat. 10,876, May 12, 1902.

Cyanogen and its compounds are removed from gases by means of ferrous compounds, or iron sulphide, free from erric compounds, in presence of alkali in excess. Lime is used in this process, either alone, or with other alkalis or lkaline earths or their compounds. Ferrous oxide, free rom ferric oxide, is prepared for this purpose by precipitating ferrous salts with insoluble alkalis, such as lime.

Ferric compounds are converted into ferrous compounds or the process, by reduction with gas which has been freed rom cyanogen compounds. If sulphuretted hydrogen be sed for this purpose, the resulting mixture of iron sulphide nd ferrous oxide is used. By this method soluble comounds of iron and cyanogen are obtained (*e.g.*, when lime s used, calcium ferrocyanide results).—T. F. B.

Semi-Water Gas; Producers for ——. C. Peters, Breslau, Germany. Eng. Pat. 4464, Feb. 25, 1903.

The gas-producer has a hollow or tubular fire-grate connected with a water reservoir disposed as an annulus round the upper part of the apparatus, and with two communicating pipes, so that the water circulates between the grate and the reservoir. The air-supply to the producer passes through the steam space of the water reservoir, and thus carries with it all the steam generated, the mixture of air and steam entering the producer at its base, as usual. Thus, if the temperature of the fuel rise, more steam is generated, and more water vapour enters with the air. This excess of steam produces a quenching effect on the fire, and so lowers the temperature. Conversely, if the fuel becomes too cool, the apparatus is automatically supplied with comparatively dry air until the fire is blown up again.—F. H. L.

Mantles; Incandescent ——. F. C. Schottmann, London. Eng. Pat. 11,280, May 16, 1902.

See Fr. Pat. 321,491; this Journal, 1903. 206.—H. B.

Filaments, or the like, for Electrical Incandescence Lamps; Manufacture of ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 12,159, May 28, 1902.

See Fr. Pat. 321,412, 1902; this Journal, 1903, 206.
—H. B.

[Filaments for Incandescence Mantles] Homogeneous Bodies from Vanadium, Tantalum, or Niobium, or from Alloys thereof; Method for Obtaining ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 12,163, May 28, 1902.

See Fr. Pat. 321,412, 1902; this Journal, 1903, 206.
—H. B.

Arc Lamps; Manufacture of Electrodes of ——. M. Lilienfeld, Berlin. Eng. Pat. 3698, Feb. 17, 1903.

Tar, resin, pitch, or other binding agent is heated to the consistency of a thin liquid, and either mixed or chemically combined with luminiferous substances, such as metals, metalloids, their salts and compounds. The compound is then mixed with powdered carbon, and is formed into electrodes. It is stated that by adding the luminiferous substances to the binding agent instead of to the carbon portion of the electrodes, many disturbing effects on the formation and maintenance of the arc are obviated.
—G. H. R.

United States Patent.

Calcium Carbide Refuse; Method of Utilising ——, and Product thereof. G. E. Cox, Assignor to Union Carbide Co. U.S. Pat. 727,095, May 5, 1903. XI. A., page 704.

French Patents.

Peat; Manufacture of Briquettes from Carbonised ——. Cie. des Charbons et Briquettes de Blanzy et de l'Ouest. Fr. Pat. 325,495, Oct. 21, 1902.

Peat, mixed with a small quantity of "nitrate or carbonate of sodium or potassium" to render it readily combustible, or without any such addition, is formed into briquettes, tar or resin being used as binding material; coal dust or wood-charcoal can also be added to increase the density of the briquettes. The briquettes are heated in closed retorts, the gases evolved being used for heating, and the heating continued till nearly all the volatile constituents are driven off, and a carbonised mass remains.—L. F. G.

Peat; Manufacture of Plastic Objects [Briquettes] from ——. Factonit-Werke Reif and Co., G. m. b. H. Fr. Pat. 325,536, Oct. 22, 1902.

See Eng. Pat. 22,016, 1902; this Journal, 1902, 289.
—L. F. G.

Muffle Furnace heated by Gas. E. Hovine. Fr. Pat. 325,525, Oct. 22, 1902.

The specification describes a muffle furnace with independent gas-producer, the vaults and soles of the muffles being heated by separate currents of gas; regenerators preheat the air to be mixed with the producer gas.—L. F. G.

Combustible Liquids, Vaporising; Arrangement for ——. H. H. Dikema. Fr. Pat. 325,314, Oct. 16, 1902.

A STORAGE vessel containing liquid is connected with a regulating chamber and a vaporiser, which carries a suitable burner. A valve carried at the end of a rod and working through a gas-tight cap closing the charging hole of the storage vessel, controls the flow of liquid from the latter to the regulating chamber. The valve either completely stops the supply of liquid, or allows it free access to the regulating chamber, the level of liquid in which is regulated on the principle of the Mariotte's bottle. A branch pipe leads from the vapour space of the vaporiser to its lower side, and serves to heat it. A valve regulates the supply of vaporised liquid to the burner, and means are provided for the initial heating of the vaporiser. When the supply of liquid is cut off by the valve, and the burner extinguished, the vapours still given off are condensed in a spiral pipe immersed in water surrounding the storage vessel, and flow back to the regulating chamber.—L. F. G.

Blast-Furnace Gases; Purifying and Enriching ——, *by Congelation.* Société des Forges d'Eich. Metz et Cie. Fr. Pat. 325,253, Oct. 11, 1902.

THE gases are, if necessary, rendered moist, and are then delivered into the upper end of a truncated cone, containing a spiral coil traversed by a refrigerating liquid. This causes the moisture in the gases to condense in the form of fog, which carries down the mechanically suspended impurities. The deposit falls into a water seal at the bottom of the cone, the water escaping by an overflow, whilst the solid matters descend into a hopper, whence they are removed through a valve.—C. S.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Ammonia Liquor; Automatic Lime-Feed in the Distillation of ——. Kordt. J. f. Gasbeleucht., 1903, **46**, [19], 375.

IN the Düsseldorf gasworks an apparatus has been introduced for the continuous, automatic supply of milk of lime to the ammonia liquor under treatment, and in conjunction with Feldmann's distilling column it has effected a considerable increase in the amount of ammonia obtained from the liquors. It consists of a tilting vessel, mounted over the milk-of-lime reservoir of the distilling apparatus, and is made to rock by the introduction of water in small quantity. The movement is transmitted to the plunger of the lime pump and to an agitator at the bottom of the lime vessel. The speed of the pump is so adjusted, by regulating the water supply, that the liquor leaves the column almost free from ammonia. A head of water of about 2 metres (6½ ft.) is sufficient to work the apparatus, and the consumption is 1⅓ cb. m., giving 120—150 strokes of the pump, per hour.—H. B.

Lutidines from Coal Tar. F. B. Ahrens and Gorkow. Chem. Zeits., **2**, 414. Chem. Centr., 1903, **1**, [18], 1031.

THE authors have isolated from English coal tar the lutidines: *β-β′*-dimethylpyridine and *α-β′*-dimethylpyridine. The last-named melted at 159°—160° C. (corrected), and formed the following crystallised salts: $C_7H_9N.HCl.6HgCl_2$ melting at 162°—164° C.; $C_7H_9NHAuCl_4$; $(C_7H_9N)_2.H_2PtCl_6+2H_2O$ melting at 192°—194° C. with frothing; $C_7H_9N.C_6H_2(NO_2)_3.OH$ melting at 156°—157° C.—A. S.

Aniline Oil; Constituents of the Neutral First Runnings from the Distillation of ——. F. B. Ahrens and W. Blumel. Chem. Zeits., **2**, 414. Chem. Centr., 1903, **1**, [18], 1023.

THE neutral first runnings from the distillation of aniline oil having a fragrant odour, consists mainly of chlorobenzene, admixed with higher chlorinated products and with iodobenzene. These chlorinated and iodized products owe their origin to chlorine and iodine contained in the nitric acid, used to nitrate the benzol in preparing the nitrobenzene employed. Together with these aromatic constituents, two ketones, namely, methyl-*α*-methylbutylketone, $CH_3.CO.CH(CH_3)C_3H_7$, and ethylpropylketone, $C_2H_5.CO.C_3H_7$, were present, and were the chief cause of the fragrant odour which the oil possessed.—A. S.

ENGLISH PATENTS.

Wood; Process of Treating ——, *for obtaining Volatile Products.* P. M. Justice, London. From E. B. Weed, Fayetteville, N. Carolina. Eng. Pat. 4355, Feb. 24, 1903.

WOOD is heated in a bath of resin, or other suitable substance, with agitation, to a temperature exceeding the boiling point of the product required, and the distillate is collected. Steam is used to aid in the distillation.—T. F. B.

Varnish, Paint, or the like: Manufacture of —— [*Use of Naphthalene*]. L. Knoche and M. Isslieb. Eng. Pat. 16,933, July 30, 1902. XIII. B., page 705.

Petroleum Discharged from Condensers, Refrigerators, Reservoirs, and the like; Process for the Continuous Extraction of Highly Inflammable Oils from ——, *or for Continuous Distillation of Liquids.* J. Fischer, Vienna. Eng. Pat. 13,936, June 19, 1902.

THE liquid to be distilled, is fed into a vessel wherein it is maintained at a constant level, and where it is heated by steam, admitted by a rose, the entering liquid being spread, by the ascending steam, over the surface of that already in the vessel. In this manner the entering liquid is caused to descend gradually, thus ensuring uniform and complete distillation of its more volatile constituents. The steam-rose may be replaced by a heating apparatus, so arranged as to produce the same effect. The water deposited in the vessel, is carried off by a rising pipe, the height of which is regulated so that no waste of the liquid under treatment can occur.—C. S.

UNITED STATES PATENTS.

Asphaltum and its Manufacture. F. J. Warren. U.S. Pat. 727,506, May 5, 1903. IX., page 698.

Asphalt Composition and its Manufacture. F. J. Warren. U.S. Pat. 727,507, May 5, 1903. IX., page 698.

Pavement [*Asphalt, &c.*]. F. J. Warren. U.S. Pat. 727,508, May 5, 1903. IX., page 698.

IV.—COLOURING MATTERS AND DYESTUFFS.

Coloured Constituents of Butea Frondosa. E. G. Hill. Proc. Chem. Soc., 1903, **19**, [266], 133.

THE dried and fresh flowers of *Butea frondosa* are exte sively used in India for the preparation of a somewh fugitive yellow dye.

Their aqueous extract contains an easily decomposab tannin which readily yields a phlobaphen; this produc which separates from the solution as a dark, tarry precipita on boiling with hydrochloric acid, is almost insoluble warm water, but readily dissolves in alcohol or in aqueo alkalis; from the former solution, it is reprecipitated water, and from the latter by acids.

The freshly prepared extract, when treated with le acetate, yielded a yellow precipitate of a lead salt whic when suspended in water and decomposed by hydrog sulphide, furnished a yellow solution, from which a yell gum was obtained by evaporation. This product, wh dissolved in water and extracted with ether, gave a lig yellow ethereal solution, from which a semi fibrous, yell mass separated. This substance was soluble in hot wat alcohol, or acetic acid, and separated from the la mentioned solvent in small, lemon-yellow crystals, whi gave the reactions of fisetin (compare Perkin and Humm. this Journal, 1895, 459, and Hummel and Cavallo, 1894, 14

After separating the ethereal extract, the aqueo solution was hydrolysed by boiling with dilute hydrochlo acid; this reaction led to the precipitation of phlobaph.

several fractions of the product being collected during evaporation.

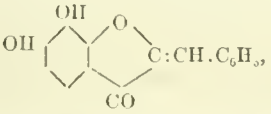
Phloroglucinol and protocatechuic acid were obtained from the phlobaphen by fusion with potassium hydroxide.

Buteïn. A Preliminary Notice. J. J. Hummel and A. G. Perkin. Proc. Chem. Soc., 1903, **19**, [266], 134.

Buteïn, the colouring matter of the flowers of *B. frondosa* (Hummel and Cavallo, this Journal, 1894, 144), $C_{15}H_{10}O_5$, probably exists in two modifications: (*a*) colourless, and (*b*) orange-yellow, which, on fusion with alkali, give resorcinol and protocatechuic acid. The *tribenzoyl* derivative, $C_{15}H_7O_5(C_7H_5O)_3$, which forms colourless needles (m. pt. 155°—157°), and the *triacetyl* compound—

$$C_{15}H_7O_5(C_2H_3O)_3,$$

have been studied. The dyeing properties of buteïn very closely resemble those of benzylidene-anhydroglycogallol (Friedländer and Rudt, Ber., 1896, **29**, 879)—



the compound being probably a member of this or some closely allied series. When it is heated with sulphuric acid a colouring matter is produced, the tinctorial properties of which are somewhat similar to those of alizarin.

Stilbene Derivatives; Electro-chemical Reduction of some ——. K. Elbs and R. Kremann. XI. A., page 703.

m-Nitro-acetophenone and m-Nitrobenzophenone; Electro-chemical Reduction of ——. K. Elbs and A. Wogrinz. XI. A., page 703.

English Patents.

Disazo Dyestuffs [*Azo-Dyestuffs*]; *Manufacture of* ——. H. H. Lake. From K. Oehler, Offenbach-on-Main. Eng. Pat. 5792, March 12, 1903.

See U.S. Pats. 724,893 and 724,894; this Journal, 1903, 549.—T. A. L.

Dialkylrhodamines [*Pyrone Dyestuffs*]; *Manufacture of Esters of* ——. O. Imray. From Farbwerke vormals Meister, Lucius und Brüning, Höchst a/Main. Eng. Pat. 11,521, May 20, 1902.

When commercial reddish-violet diethylrhodamine base is heated to 170° C., one molecular proportion of water is given off, and an anhydrous "greenish-red coloured diethylrhodamine" base is obtained. On heating this product with an aromatic sulphonic alkyl ester (*e.g.*, ethyl-*p*-toluene sulphonate) it is converted into an ester of dialkylrhodamine. See also Eng. Pat. 16,067 of 1899; this Journal, 1902, 337.—T. A. L.

United States Patents.

Indoxyl [*Indigo Dyestuffs*]; *Process of Making* ——. A. Bischler, Basle, Assignor to the Basle Chemical Works, Basle. U.S. Pat. 727,270, May 5, 1902.

See Eng. Pat. 18,127 of 1902; this Journal, 1903, 90.
—T. F. B.

Sulphur Dye [*Sulphide Dyestuffs*]; *Blue* ——, *and Process of Making same.* E. Kraus, Assignor to Society of Chem. Ind. in Basle. U.S. Pat. 727,387, May 5, 1903.

Nitrosophenols are condensed with alphylated aromatic amines, and yield, when treated with reducing agents, alphyl-*p*-amino-*p*-hydroxydialphylamino compounds, from which blue sulphide dyestuffs are obtained by heating with polysulphides. A process is also claimed for condensing nitrosoindophenols with alphylated aromatic amines. The dyestuff particularly mentioned, is that resulting from the action of polysulphides on phenyl-*p*-amino-*p*-hydroxydiphenylamine, which dyes unmordanted cotton indigo-blue shades from an alkali sulphide bath, fast to acids, milling, and light.—T. A. L.

Dye [*Anthracene Dyestuffs*]; *Blue* ——, *and Process of Making same.* H. Laubmann, Assignor to Farbwerke vormals Meister, Lucius und Brüning, Hochst-on-the-Main. U.S. Pat. 727,389, May 5, 1903

The sodium salt of anthrachrysone is treated with a sulphuric dialkyl ester, sulphonated with fuming sulphuric acid, and then nitrated. The resulting dinitroanthrachrysonedialkylether disulphonic acid is treated with a reducing agent, yielding a blue dyestuff. The alkali salts are dark-blue crystalline powders, soluble to a pure blue solution in water, and dissolving in concentrated sulphuric acid to an orange-yellow solution, which becomes blue on dilution. The dyestuffs give blue shades on unmordanted wool from an acid bath.—T. A. L.

Azo Dye; Black ——, *and Process of Making same.* A. Schmidt, Assignor to Farbwerke vormals Meister, Lucius und Brüning, Höchst a/Main. U.S. Pat. 728,021, May 12, 1903.

See Fr. Pat. 320,879 of 1902; this Journal, 1903, 141.
—T. F. B.

Azo Dye. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 727,962, May 12, 1903.

Diazotised o-aminophenol-*p*-sulphonic acid is combined with 2.6-dihydroxynaphthalene. The product dyes wool bluish-red shades, which become black on treatment with chromium compounds. (See below.)—T. A. L.

Azo Dye. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 727,963, May 12, 1903.

Diazotised *o*-aminophenol-*p*-sulphonic acid is combined with 1.7-aminonaphthol. A product is obtained giving violet shades on wool, becoming black on oxidation with chromium compounds. (See below.)—T. A. L.

Monazo Dye. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 727,964, May 12, 1903.

Diazotised *o*-aminophenol-*o*-nitro-*p*-sulphonic acid is combined with 1.7-aminonaphthol. The dyestuff gives blue shades on wool from an acid bath, which becomes black on treatment with chromium compounds. (See below.)—T. A. L.

Azo Dye. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 727,965, May 12, 1903.

Diazotised o-aminophenol-*p*-sulphonic acid is combined with 1.5.3-dihydroxynaphthalene sulphonic acid. The sodium salt is a dark brown powder dyeing wool bluish-red shades from an acid bath, which on subsequent treatment with chromium compounds become bluish-black. (See below.)—T. A. L.

Monazo Dye. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld Co, New York. U.S. Pat. 727,966, May 12, 1903.

Diazotised *o*-nitro-*o*-aminophenol-*p*-sulphonic acid is combined with 1.7.4-aminonaphthol sulphonic acid. The dyestuff obtained, gives blue shades on wool, which become black on chroming. (See below.)—T. A. L.

Azo Dye; Black ——. M. Kahn, Elberfeld, Assignor to Farbenfabriken of Elberfeld, New York U.S. Pat. 727,967, May 12, 1903.

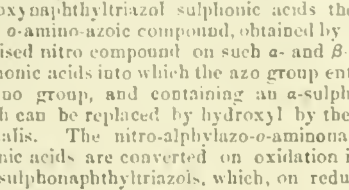
Diazotised o-aminophenol-*p*-sulphonic acid is combined with 2.6-aminonaphthol. The sodium salt of the resulting dyestuff is a brownish-black powder, giving reddish-violet shades on wool from an acid bath, becoming black on subsequent treatment with chromium compounds.

All these specifications (727,962–7) are referred to in Eng. Pat. 18,569 of 1902; this Journal, 1903, 359.
—T. A. L.

French Patents.

[*Azo-Dyestuffs*] *Amino-alphylaziminonaphthol and Amino-alphylpseudo aziminonaphthol Sulphonic Acids and New Azo Dyestuffs obtained therefrom.* Soc. pour l'Ind. Chim. à Bâle. Fr. Pat. 325,492, Oct. 21, 1902.

Azo dyestuffs for unmordanted cotton are obtained from certain amino-alphylaziminonaphthol sulphonic acids and from amino-alphylhydroxynaphthyltriazol sulphonic acids. The products can be diazotised and developed on the fibre with amines or phenols. They are obtained by combining an aminonaphthol sulphonic acid with an aromatic *o*-*p*-dinitrochloro compound, partially reducing the dinitrophenylnaphthylamine thus formed, converting it by diazotisation into a nitroalphylaziminonaphthol sulphonic acid, and finally reducing again. For the preparation of the amino-alphylhydroxynaphthyltriazol sulphonic acids the starting point is the *o*-amino-azoic compound, obtained by the action of a diazotised nitro compound on such *α*- and *β*-naphthylamine sulphonic acids into which the azo group enters, ortho to the amino group, and containing an *α*-sulphonic acid group which can be replaced by hydroxyl by the action of caustic alkalis. The nitro-alphylazo-*o*-aminonaphthalene polysulphonic acids are converted on oxidation into nitrophenylpolysulphonaphthyltriazols, which, on reduction and subsequent heating with caustic alkalis, yield amino-alphylhydroxysulphonaphthyltriazols. The *p*-aminophenyl hydroxydisulphonaphthyltriazol has the following constitution—



Instead of employing nitro-diazo compounds, these may be replaced by acidylamino-azo compounds for combination with the naphthylaminepolysulphonic acids. These products on oxidation give acidylaminoalphylpolysulphonaphthyltriazols, which are heated with caustic alkalis in order to hydrolyse the acidyl group and replace one sulphonic acid group by hydroxyl.—I. A. L.

Nitrated and Halogenated Aromatic Amines; Process for Preparing ——. R. Lesser. Fr. Pat. 325,534, Oct. 22, 1902.

This process applies to the preparation of nitro- or halogen derivatives of such aromatic amines as form a condensation product with phthalic anhydride, with elimination of water.

The condensation product is nitrated (or halogenated), and then decomposed by a primary or other amine. Or the substituted phthalimide may be converted into the corresponding phthalamic acid, which is nitrated, and then decomposed by an amine. For example, *p*-nitraniline may be prepared by nitrating a strongly cooled mixture of phthalanil and sulphuric acid; the product is poured on to ice, washed, and the precipitate heated with aniline in a closed vessel. The excess of aniline is removed by a current of steam, and the *p*-nitraniline extracted from the residue with water.—T. F. B.

Monazo Dyestuffs; Process for the Production of ——. Soc. Anon. Prod. F. Bayer et Cie. Addition, dated Oct. 9, 1902, to Fr. Pat. 323,808, Aug. 18, 1902.

See Eng. Pat. 18,569 of 1902; this Journal, 1903, 359.
—T. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

English Patents.

Peat Moss and like Material; Production of Fibre for Spinning, Paper-making, &c., from ——. J. Doull. Eng. Pat. 9408, April 23, 1902. XIX., page 708.

Dyeing Machines; Impts. in ——. E. de Pass, London. From Vacuum Dyeing Machine Co., Chattanooga, Tenn., U.S.A. Eng. Pat. 5146, March 5, 1903.

A machine for dyeing materials without access of air is claimed. The material is compressed in an inner vessel with perforated top and bottom. This is surrounded by an outer vessel containing steam pipes for heating the dye-liquor, which is circulated alternately in either direction, through the compressed material which is to be dyed, by means of a system of pumps, three-way cocks, and feed and suction pipes. The material can be washed in the same apparatus after dyeing.—E. F.

Pigment Holders or Vehicles for Applying Colours to Textile Materials; Impts. in ——, *and Processes for the Production thereof.* L. Lilienfeld, Vienna. Eng. Pat. 6645, March 18, 1902.

For the production of lustrous or other effects on printed fabrics either of the following products, dissolved in a suitable solvent, is used as a vehicle for the pigment:—(1) A product obtained by melting resinous products with caoutchouc or gutta-percha. (2) "Artificial caoutchouc," made by oxidising a drying oil with dilute nitric acid or other suitable agent. (3) The product commercially known as "rhusol," a preparation of the sap of *Rhus vernicifera*.—E. F.

Textile and other Materials and Fabrics; Impts. in Treating ——, *and in Substances to Render them Non-inflammable.* The Calico Printers' Association, Ltd., Manchester, and W. Warr, Stalcybridge. Eng. Pat 9658, April 26, 1902.

Titanium salts are used for the above purpose. The material is impregnated with sodium stannate solution, dried, impregnated with a titanium salt, dried, the titanium fixed by means of an alkaline bath, preferably sodium silicate, and the material then washed and dried. A mixed bath, containing titanium, tungsten, and a suitable solvent, may be used as an alternative. The sodium silicate in the first-mentioned process may be replaced by sodium tungstate.—E. F.

Tallow; Utilisation [*for Sizing Textiles*] *of Waste Waters from the Digestion of Rough* ——. Eng. Pat. 14,027, June 20, 1902. XII., page 705.

United States Patent.

Aniline Black; Process of Dyeing and Printing in ——. F. Cleff, Rauenthal, Germany. U.S. Pat. 727,292, May 5, 1903.

See Eng. Pat. 28,142 of 1902; this Journal, 1903, 416.
—T. F. B.

French Patent.

Black Shades on Wool; Process for Obtaining Fast —— Soc. Anon. Prod. F. Bayer et Cie. Addition, dated Oct. 9, 1902, to Fr. Pat. 323,809, Aug. 18, 1902.

See Eng. Pat. 18,139 of 1902; this Journal, 1903, 416.
—T. F. B.

Errata.

This Journal, 1903, page 361, first title, *for* "P. Herman" *read* "P. Heermann."

This Journal, 1903, page 361, col. 2, line 21 from top, *after* "although" *insert* "in the case of raw silk."

This Journal, 1903, page 492, col. 1, second title, *for* "E. Tung" *read* "E. Jung."

This Journal, 1903, page 511, col. 1, line 4 from bottom, *for* "A. P. Spy" *read* "A. P. Sy."

This Journal, 1903, page 550, col. 1, line 29 from top, *after* "discharged" *insert* "by the indigo mixture."

This Journal, 1903, page 552, col. 2, line 12 from top, *after* "print" *substitute a comma, and delete* "These are."

VII.—ACIDS, ALKALIS, AND SALTS.

Ammonia Solutions; Aqueous ——. C. Frenzel. Zeits. anorg. Chem. 1902, **32**, 319—341.

ROM a study of the relation of ammonia to the substituted mines, the author considers that ammonia in aqueous olution is very likely to undergo molecular decomposition a high degree, whilst on the other hand, the very mall tendency of trivalent nitrogen to pass into the entavalent modification appears to preclude the possibility f a combination of ammonia and water occurring to any onsiderable extent. An additional reason why the incororation of water with ammonia, with formation of an lectrolyte, can occur only slowly and to a small degree, es in the fact that hydroxyl has little tendency to pass nto the ionic state; and further confirmation is afforded y thermo-chemical data. The conductivity of ammonia olution which probably approaches very closely to that f pure water, is due to dissociation, with formation of H· nd NH'_2-ions. The author has succeeded in establishing e presence of these ions by drawing the dissociation rves. The strength of ammonium hydroxide (NH_4OH) n be adequately estimated only in the case of the acidity the ammonia being practically neutralised, so as to avoid disturbance of the experiments by the presence of nmonia, *viz.*, in the case of its salts with strong acids. nce ammonium hydroxide in these salts behaves like an kali, it is probable that liquid ammonia solutions will for e most part contain free ammonia and traces of amnium hydroxide, which latter may be considered as ing completely dissociated into its ions.—A. S.

dium Hydrosulphite [Hyposulphite]; Reaction of ——, *on Metallic Salts.* O. Brunck. XXIII., page 710.

yanide; Commercial ——. F. W. Oldfield. Eng. and Mining J., 1903, **75**, [18], 660.

E author discusses the question of the presence of soluble phides in cyanide solutions (this Journal, 1903, 493). itby states that they are not prejudicial, as they precite the zinc. The author finds, however, that if a ble sulphide be added to a cyanide solution containing in excess of that required by the equations—

$$K_2ZnO_2 + K_2S + 2H_2O = ZnS + 4KOH, \text{ and}$$
$$K_2Zn(CN)_4 + K_2S = ZnS + 4KCN,$$

zinc is only completely precipitated when excess of the ble sulphide is present. With regard to Doveton's ement that the presence of zinc sulphide is as injurious at of soluble sulphides, the author suggests that this is g to the fact that repeated washes of alkaline cyanide tion act on the zinc sulphide according to the equation: Z + $4KOH = K_2ZnO_2 + K_2S + 2H_2O$, and that the ious effect is really due to the potassium sulphide thus ed.—A. S.

gen; Manufacture of ——, *by Fractional Evaporation Liquid Air.* C. Linde. Zeits. Ver. Deutsch. Ing., 02, **46**, 1173—1176.

T btain a gas containing 33 per cent. of oxygen by the onal evaporation of liquid air, the first 18 per cent. of as must be allowed to escape, whilst a gas containing r cent. of oxygen is only obtained after allowing 65 ent. to escape. Since at least 2 h.p.-hours are required e liquefaction of 1 cb. m. of air, the escaping gases be utilised in order to render the manufacture of u by this method practicable. The author's apparatus ises a regenerator and an evaporator. In the former caping gases are made to pass through a very large of spiral channels before finally escaping into the air as-holder. The spiral channels enclose strong pipes, h which air at a pressure of two or three atmospheres ed in an opposite direction to the escaping gases, oling effect of the latter being such that the compred air reaches the interior of the apparatus at a ature not much above − 180 C. In the evaporator, is arranged within the coils of the regenerator, the compressed air is liquefied by passing through a series of vertical pipes surrounded by chambers containing liquid air. The latter evaporates, deriving the requisite heat of evaporation almost entirely from the compressed air, of which nearly an equal amount is therefore liquefied; the slight deficiency is made good from a separate liquid-air plant. All connections, &c., are made from the top, so that the cold air shall not be able to escape from the bottom of the well containing the evaporator. The evaporation of the liquid air is effected continuously in seven chambers placed vertically above one another. The evaporation is effected by means of vertical pipes containing cold compressed air from the regenerator, and as the partially evaporated liquid flows from one chamber to the other, its content of oxygen increases until, when the last chamber is reached, it yields one-third, one-half, or two-thirds, by volume, of oxygen. The yield of enriched gas per h.p.-hour depends on the size of the apparatus and on the proportion of oxygen desired in the gas, as is shown in the following table:—

Gas produced per Hour.	Gas produced per h.p.-hour.		
	One-third by vol. of Oxygen.	One-half by vol. of Oxygen.	Two-thirds by vol. of Oxygen.
c.c.	c.c.	c.c.	c.c.
1	0·32	0·16	0·08
10	0·86	0·43	0·21
100	2·00	1·00	0·50
1,000	3·40	1·70	0·85

It is stated that in a large plant the regenerative system increases the yield about twelve-fold as compared with simple non-regenerative evaporation of liquid air.

By the use of a fractionating column, similar in principle to those used for rectifying alcohol, a gas much richer in oxygen can be obtained, the maximum possible yield of 100 per cent. oxygen being about 1 c.c. from 6·6 c.c. of air.—A. S.

Ammonia Liquor; Automatic Lime-Feed in the Distillation of ——. Kordt. III., page 692.

Alkali Sulphides; Electrolysis of ——. A. Brochet and G. Ransom. XI. A., page 702.

Persulphates; Electrolytic Preparation of ——. M. G. Levi. XI. A., page 703.

English Patents.

Sulphuric Anhydride; Apparatus for the Manufacture of —— [*by the Contact Process*]. G. Eschellmann, A. Harmuth, and the Tov Tentelevskago Ximichesk Zavoda (Company of the Tentelevsky Chemical Works), all of St. Petersburg. Eng. Pat. 11,969, May 26, 1902.

The heated gases are admitted to the top of a tall vertical chamber, and pass through a perforated distributing horizontal plate towards a series of vertical tubes charged with contact material, set in the closed bottom of the cylinder. The gases traversing the contact material emerge into a small collecting chamber below, communicating with a reheater, in which the sulphuric anhydride formed gives up its heat to the gases passing into the reaction chamber. The effect of the arrangement is stated to be to give an equable and easily regulated temperature for the reaction. Another apparatus is shown having a number of superposed reaction chambers; and in a third modification, the arrangements are adapted to contact material piled in superposed separated layers. Reference is made to Eng. Pat. 15,949 of 1898; this Journal, 1899, 831.—E. S.

Ammonia; Process of Producing ——, *by Synthesis.* H. C. Woltereck, London. Eng. Pat. 2461, Jan. 30, 1902.

A mixture of air (or of oxygen and nitrogen) with a gas containing hydrogen, such as coal-gas, is passed over iron oxide, or other oxygen-carrying metallic oxide, heated to dull redness. When coal-gas is used, besides ammonia, amines are produced, which may be decomposed by mixing lime with the reacting oxide; or the effluent gases may be led through a boiling solution of caustic alkali.—E. S.

Lime; Apparatus for Slaking and Dressing Substances, especially——. T. T. Best and The United Alkali Co., Ltd., both of Liverpool. Eng. Pat. 10,723, May 9, 1902.

The apparatus consists of a rotatable cylinder, with internal projecting bars or prongs, and pockets or shoes, which, with helically arranged blades, transfer the material onward, water being supplied by numerous jets from a pipe or pipes. A current of air is caused to pass through the cylinder to a discharge opening connected dust-proof thereto, and issuing into a chimney, to carry away steam and dust. The end opposite the inlet is provided with a sieve or screen, whereby the slaked lime, or other substance, is discharged into a hopper for conveyance away, and stones or lumps of unburnt lime are discharged separately.—E. S.

Slaked Lime: Preparing ——, and Heating and Purifying Water. The Castner Kellner Alkali Co., Ltd., A. T. Smith, and H. Baker, all of Runcorn, Cheshire. Eng. Pat. 13,536, June 14, 1902.

The lime is slaked in vessels closed to the atmosphere, provided with short, wide exit pipes for the heated air, steam and lime dust, which pass into a tower for injection into a "suitable liquid," such as river or other water needing purification.—E. S.

Alkaline Salts; Electrolytic Decomposition of ——. M. Wildermann. Eng. Pat. 9803, April 28, 1902. XI. A., page 703.

Coal-Gas or other Gases containing Cyanogen: Treatment of ——, for the Obtainment of Soluble Cyanide therefrom, and the Preparation of Materials for Use in such Treatment. W. Feld. Eng. Pat 10,876, May 12, 1902. II., page 691.

Brine or other Saline Solutions; Treatment or Complete Purification of ——. W. Trantom, New Brighton, Cheshire. Eng. Pat. 23,642, Oct. 29, 1902.

Brine containing the whole of the calcium and magnesium present as sulphates, is treated with freshly-precipitated and undried barium carbonate in slight excess. When the calcium and magnesium salts are present partly as chlorides and partly as sulphates, sufficient sodium sulphate is added to form a sulphate with the calcium or magnesium chloride, and barium carbonate is added as before. The separated precipitate is treated with an acid, preferably sulphurous acid, which dissolves the calcium and magnesium carbonates, leaving barium sulphate, from which barium carbonate is reproduced. The process may be applied in the purification of sodium nitrate and other salts.—E. S.

Phosphorus; [Electrical] Production of ——. T. Parker, Wolverhampton. Eng. Pat. 16,862, July 30, 1902.

Phosphate of alumina, or similar ore, is treated with sulphuric acid, and then with an alum-forming sulphate, the alum being recovered by crystallisation, and the residual liquor, mixed with carbon or carbonaceous material, is treated in the electrical furnace, for the reduction and distillation of the phosphorus. A feature of the invention is the removal of the alumina previous to the treatment in the electrical furnace.—C. S.

United States Patents.

Muriatic [Hydrochloric] Acid; Manufacturing ——. G. E. Hipp, Buffalo, N.Y. U.S. Pat. 726,533, April 28, 1903.

To a solution of nitre cake (sodium bisulphate) an alkali sulphide is added, to precipitate arsenic and selenium; the solution is boiled to expel hydrogen sulphide, and, after clearing from insoluble matter, is concentrated to about 68° B., and is then furnaced with addition of an alkali chloride, the hydrochloric acid evolved being collected. Specific proportions of the materials are claimed.—E. S.

Soda-Ash Dust; Apparatus for Retaining ——. C. P. Carlson, Dingelvik, Sweden, Assignor to A. W. Waern, Brooklyn, N.Y. U.S. Pat. 727,088, May 5, 1903.

Gases charged with soda-ash dust are caused to traverse a tank containing a lye, in which a horizontal central rotary shaft carries frameworks with perforated baffl plates, so arranged in "staggered order" and dipping in the solution, as to arrest the dust carried by the gases. —E. S.

Permanganates; [Electrolytic] Production of ——. \ Hickmann, Assignor to Soc. Chem. Fabrik Griesh Electron, all of Frankfort-on-the-Main. U.S. P 727,792, May 12, 1903.

A mixture consisting of a solution of an alkali p manganate or manganate, and an oxygenated or halog compound of one of the metals whose permanganate to be obtained, is subjected to the action of an elect current, the electrodes being separated by a diaphra or other suitable device. It is claimed that by this meth a simultaneous production of alkaline lye, hydrogen oxygen, or chlorine is effected.—G. H. R.

Chlorates and Perchlorates; Electrolytic Manufacture ——. P. Lederlin, Chedde, France. U.S. Pat. 727,8 May 12, 1903.

See Eng. Pat. 14,387, 1902; this Journal, 1902, 1282. —G. H. I

French Patent.

Nitric Oxide and Nitric Acid; Production of — G. Pauling. Fr. Pat. 325,244, Oct. 11, 1902.

A mixture of air and water vapour, or of air and "g is passed through a thin porous tube, heated to temperature at which water vapour is dissociated. hydrogen set free passes through the sides of the t and the oxygen combines with the nitrogen to form oxide, from which nitric acid may be produced by kn processes. The process may be varied by removin dissociated hydrogen by causing it to combine wi substance (such as chlorine) to form a combination s at the temperature employed. (See Fr. Pat. 323 Aug. 12, 1902; this Journal, 1903, 495.)—E. S.

VIII.—GLASS, POTTERY, ENAMELS

English Patents.

Furnaces, especially Glass Furnaces; Impts. in — F. W. Knowles, Thornhill, Yorks. Eng. Pat. 1 2 June 3, 1902.

For charging the raw material to the furnace, a hop the outlet end of which is closed by a slide, runs o above the charging aperture of the furnace. The st of the charging aperture is attached to a lifting rod, is raised by a suitable lifting apparatus attached o bogie, running on the rails above mentioned. Wh stopper has been raised from the aperture, the b moved along, and draws the hopper with it, till the is over the aperture; at this point, by means of st the rod attached to the slide, this latter is opene allows the charge to enter the aperture. When the h arrangement is drawn back, the stops again clo hopper outlet, and the stopper can be lowered direc to the aperture again. The claims also include t of a pipe for causing cooling water to circulate rou charging aperture.—W. C. H.

Glass; Improved Manufacture of Window an ——, Vases, and other Objects of Glass, Porce other Ceramic Material. W. Storr, Berlin. E 14,727, July 1, 1902.

Veins are made in the glass or other material by a in the form of lines arranged according to any pa mixture which will melt when heated and is a cond electricity, *e.g.*, one composed of 10 parts of borax flux, 30 parts of chalk, 40 parts of powdered metal, and 10 parts of potassium silicate. The then heated until the mixture melts and adheres glass, &c., after which it is placed in a galvanic b any suitable metal deposited electrically on the re threads.—A. G. L.

Kilns or Ovens for Use in Firing Earthenware Goods. W. Cartlidge, Stoke-on-Trent. Eng. Pat. 8696, April 15, 1902.

Enamel, hardening-on, and majolica kilns are constructed with flues, so that flames or gases pass from the firing holes, transversely beneath a lower firebrick floor, supported on firebrick lumps or walls, up through flues in the wall opposite to the firing holes, over the crown of the firing box, and down through flues in the wall over the firing holes, and thence beneath the floor of the firing box, and ıp through flues between the firing holes, and in the opposite wall, to the chimney or cone.—W. C. H.

Kilns and Muffles for Firing Ceramic-ware, and the like. M. J. Adams, Leeds. Eng. Pat. 13,643, June 16, 1902.

A series of two or more kilns are built, separated from ach other by gangways, the flues being arranged so that he heated gases from each kiln pass to the next kiln in the eries, in order to economise fuel. Instead of making the lues pass over the crown of the muffle chamber or oven, hey may be made to pass around the sides and bottom of he muffle-chamber, the roof of which is then formed by he crown of the kiln proper, thus saving the necessity of aving a separate crown for the muffle chamber.—A. G. L.

Ceramic or Earthenware Masses or Articles; Manufacture of ——. J. Y. Johnson, London. From C. F. Boehringer and Sons, Mannheim, Germany. Eng. Pat. 12,796, June 4, 1902.

ee Fr. Pat. 323,088, July 16, 1902; this Journal, 1903, 20.—W. C. H.

arthenware and Ceramic Products; Manufacture of ——, and Preparation of Clays, Silicious Compounds, and Earthy Minerals for the Manufacture of such Products. P. M. Justice, London. From The Acheson Co., Niagara Falls, N.Y. Eng. Pat. 3630, Feb. 16, 1903.

he clay or other body material is exposed to the action of nnin or of a similar vegetable substance, either by lding enough water to the clay and tannin to wet the entire ass or by treating the clay with a solution of the tannin. he effect of the treatment is to render the clay more lastic, and to diminish the quantity of water absorbed, hereby the shrinkage during drying and burning is ssened very considerably, whilst the tensile strength of e finished article may be increased by more than 40 per nt.—A. G. L.

French Patents.

Glass Bricks; Manufacture of ——. L. A. Garchey. Fr. Pat. 325,436, Oct. 20, 1902.

he powdered glass to be devitrified is fed through a series adjustable hoppers, into a corresponding number of oulds on a revolving horizontal plate. To obviate the cessity for trimming the finished blocks, the moulds are ed with an insulating material consisting of magnesium rbonate, talc, calcium carbonate or sulphate, or other fractory matter that will not adhere to the molten glass, ich material is applied by spraying in suspension in ter. After passing over a source of heat, which causes devitrification and cohesion of the particles, the ntinuous bands of glass are delivered to a hydraulic tting apparatus, capable of adjustment to cut any desired gth of blocks. The thickness of the blocks is regulated adjusting the level of the feed hoppers, and the cutting ice is actuated by the completion of an electrical circuit predetermined intervals.—C. S.

lass] Synthetic Granite; Garchey ——, and Method of Manufacturing the Same. L. A. Garchey. Fr. Pat. 25,475, Sept. 27, 1902.

the manufacture of a substitute for granite, &c., lten glass is discharged through a tap hole in the nace into a heated mould, previously lined with insu- ng material, by spraying (see preceding abstract). s mould is then left to cool down gradually, so as to effect the devitrification of the glass. The resemblance to granite is increased by the addition of colouring matters (metallic oxides) in the charge of glass metal, and a little powdered mica at the moment of casting.—C. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Blast Furnace Slag; Use of ——, as Iron-Portland Cement. Jantzen. Stahl u. Eisen, 1903, **23**, 36. Chem.-Zeit., 1903, **27**, [37], Rep. 119.

Blast furnace slags are calcium-aluminium silicates, of the following percentage composition: lime 44 to 52, silica 27 to 35, alumina and iron oxide 8 to 20, magnesia 0·5 to 5, and sulphuric acid 1·1 to 3. Acid slags are hard and sound; so are also basic slags if not containing more than a certain percentage of lime. Slag sand is made by pouring molten slag into water. Blast furnace slags are used for road metal, as a filling for concrete, and as sand in mortars, but their chief use is as mortars and as Portland cement, the granulated basic slags being most suitable. Slag-bricks were first made by F. Lürmann in 1865, by compressing furnace slag and lime. Portland cement contains more lime than the slag, which may be considered as Portland cement poor in lime. It is impossible to directly produce in the blast furnace, a slag having the composition of Portland cement; the slag is therefore used as raw material for, and as an admixture to Portland cement. There are now 10 to 11 works in Germany, Luxemburg, and Lorraine, producing 1¾ million barrels of cement of 170 kilos. (375 lb.) a year. The author describes the manufacture of iron Portland cement, and shows that as regards soundness, fineness, tensile and compressive strength, it fulfils all the requirements laid down for Portland cement. The manufacture is simpler and cheaper than that of Portland cement.—L. F. G.

Blast-Furnace Slag; Portland Cement from ——. C. de Schwarz. Engineering, 1903, **75**, [1950], 671—673.

The author reviews the various processes for the manufacture of Portland slag cement, and states that there is a wide field open to English blast-furnace works for carrying on a profitable industry by the utilisation of their principal by-product—slag—for the manufacture of Portland cement. Not only the very basic slag from grey pig iron, such as is used in the production of ordinary slag cement, but also, in most cases, that from white pig iron can be used for the manufacture of Portland slag cement. A table is given showing the imports of Portland cement into foreign countries during 1900, and also, where possible, prices and approximate total values. (See also Eng. Pat. 465 of 1895, 1795 of 1897, 9030 of 1897, 27,339 and 27,008 of 1898, 16,050 of 1899, 14,278 of 1900, and 10,297, 10,857, 13,793, 22,314, and 23,443 of 1901, and 2671 of 1902; Fr. Pat. 320,310 of 1902; this Journal, 1896, 36; 1897, 1017; 1898, 354; 1899, 373, 1021; 1900, 50; 1901, 992, 810; 1902, 550, 860, 257, 347, and 1535; 1903, 95; also this Journal, 1896, 275; 1897, 680, 915, 1016; 1898, 247; 1899, 686; 1900, 48, 903, 1114; 1901, 44, 581.)—A. S.

Portland Cement [in the Brewery]. Tageszeit. für Brau. XVII., page 707.

English Patents.

Paving Blocks and Vulcanising and Preserving Timber; Impts. in ——. W. Powell, Allerton, Lancs. Eng. Pat. 11,235, May 16, 1902.

Timber is kept for a time in a boiling solution of cane or other sugar, and left till the temperature of the liquor falls to about 100° F.; the timber is then submitted to the action of dry air, which is gradually heated from 60° to 200° F. It is said that by this means the water is driven off, leaving the sugar in the pores of the wood, and that the sugar is then caramelised by the further heating, and that this "solidified" or "vulcanised" timber is non-porous, less liable to rot, and will not swell or shrink, and that "soft" wood is converted into "hard."—W. C. H.

Stone, Wood, Cork, and the like; Manufacture of Substitutes for ——. A. Weber, Cologne, Germany. Eng. Pat. 24,359, Nov. 6, 1902.

Sawdust, wood shavings, or other wood fragments, after being subjected to a preparatory boiling and treatment with lime-water or milk of lime, are mixed with pumice powder, cement, burnt clay, and acidulated clay water, after which scrap iron and sulphuric acid are added, and the ingredients made to react on each other. The mass is then thoroughly mixed and stamped or kneaded, or, if necessary, worked in a ball-mill, to produce a plastic or mouldable material, which is characterised by having all particles of the wood effectively protected from contact with the air.—R. A.

Building Materials, Artificial, and the like; Manufacture of ——. C. G. Laidet, Versailles, France. Eng. Pat. 28,679, Dec. 29, 1902. Under Internat. Conv., May 29, 1902.

A small quantity of acetate of lead is added in the manufacture of artificial stone or wood to prevent exudation or oozing from the latter; thus, *e.g.*, 20 kilos. of calcined magnesia containing 2 grms. of aluminium sulphate per kilo., 15 litres of magnesium chloride solution of 28° B., containing 4 grms. per litre of lead acetate, 15 litres of magnesium sulphate solution of 22° B., 80 kilos. of crushed stone, and 20 kilos. of sand are mixed together, with or without feldspar, and moulded without using pressure or pounding. The crushed stone may be replaced by stone or wood sawdust, &c.—A. G. L.

Slates or Roofing Tiles; Method of Manufacturing and Composition for the Manufacture of Artificial (Plain or Corrugated) ——. R. Hleman, London. Eng. Pat. 1231, Jan. 17, 1903.

A mixture of cement, coke breeze, tufa, ground clinkers, or sharp sand is moistened with water, and pressed in frames or moulds with loose plates, plain or corrugated, which are oiled or greased before the pressing process. The pressed tiles are allowed to dry and set, and may be rendered non-porous by dipping in hot tar. The tiles may be strengthened by incorporating fibrous material, as hemp, or canvas, or wire netting, with the composition. Clips or hooks may be embedded in the tiles for the purpose of fixing them to roofs, &c.—W. C. H.

Building Bricks or Blocks; Improved Process of Producing ——, and Apparatus for Use therewith. E. Eaton, W. Pfeifer, and C. H. Briggs, London. Eng. Pat. 2372, Jan. 31, 1903.

The lime for the bricks is slaked and mixed with sand in an apparatus consisting of one or more cylinders, preferably two or four, mounted in pairs suitably connected to arms keyed to a revolving shaft. The cylinders may be disconnected from the revolving arms during charging and discharging, fresh cylinders being substituted so as to make the slaking and mixing continuous. In discharging the cylinders, one or more vibrating sieves are placed under the man-hole of the cylinder, the sieved mixture falling into trucks, which take it to the moulding machines.

If hydraulic or other lime be used which gives little heat, and consequently little pressure in a closed vessel, during the slaking, a modified apparatus is employed consisting of three or more chambers for containing the lime, to which water is added. Each chamber is provided with agitators, and, as soon as the slaking has taken place in the first chamber, live steam is introduced into it, the exhaust from this chamber being admitted into the second, and so on, the first chamber being in the meanwhile emptied.
—A. G. L.

Refractory Articles, such as Bricks, Blocks, or Crucibles; Manufacture of ——. O. Imray, London. From The Carborundum Co., Niagara Falls, New York, U.S.A. Eng. Pat. 3308, Feb. 11, 1903.

The articles are made from a mixture of silica rock or ganister, reduced to the necessary degree of fineness, and powdered carborundum, which acts as the binding material. The mixture is moistened with water, moulded, and fired in the ordinary way. Bauxite, chrome ore, or magnesit may be used in place of silica rock. See Eng. Pat. 19,493 1902; this Journal, 1903, 213.—W. C. H.

Marble, Onyx, Calcareous Stones, Natural Earths Process of Dyeing or Colouring ——, in an Unbaked o Baked Condition, and the like. B. J. B. Mills, London From A. Boyeux and A. Mora, both of Lyons, France Eng. Pat. 27,804, Dec. 16, 1902.

The exterior surface, or the entire mass, of calcareou stone, marble, &c., is coloured by employing an alkalin bath of a colour which is not attacked by alkalis, such a diamine colours, orchil, cochineal, potassium permar ganate, potassium chromate, and logwood. The article may first be treated in a bath containing a 1 per cen solution of alkali, to remove grease. The objects are the dried and placed in the dyebath proper. Different colour may be applied by placing on the object a wooden fram on the bottom of which strips of metal (*e.g.*, zinc) are fixe so as to follow the lines marking the limits of each colou the compartments so made being then filled with tow other absorbent material on which the colouring solutio are then poured.—A. G. L.

Lime; Impts. relating to the Treatment of ——. B. Eldre Boston, Mass., U.S.A. Eng. Pat. 4935, March 3, 1903

"A dry, pulverulent, completely-hydrated oxide of lime" obtained by slaking quicklime with an excess of water, form a lime-putty, which may be allowed to age, and su sequently desiccating the putty by incorporating with sufficient quicklime to chemically combine with the exce water. The product is claimed as an article of manufactu
—W. C. H

Cement and other Goods; Separators for Sifting — A. Hardwick, Northfleet. Eng. Pat. 9035, April 1 1902.

The cement is supplied by a worm conveyor to a hopp in which is a coarse sieve, from which it falls on to the fa of a vibrating sieve, to which an additional jerking mot is also given. A blast of air is directed on to the face the vibrating sieve, and drives the finer particles throu into a receiver below, from which they are discharged by worm conveyor. The larger particles slide down the si into a grit discharge, also provided with a convey Beyond the sieve and receiver is placed a dust collect provided with corrugated baffle-plates, to catch the fi particles of cement blown over the sieve by the blast, a to throw them into the extension of the conveyor under sieve.—W. C. H.

United States Patents.

Asphaltum and its Manufacture. F. J. Warren, New Mass. U.S. Pat. 727,506, May 5, 1903.

An asphalt for paving purposes, &c., which is very dura is prepared by mixing a suitable asphaltum with he asphalt oils.—T. F. B.

Asphalt Composition and its Manufacture. F. J. Warr Newton, Mass. U.S. Pat. 727,507, May 5, 1903.

Asphalt is mixed with lampblack in varying proportio the mixture is to be used for paving or roofing purpo (Compare Fr. Pat. 320,828 of 1902; this Journal, 19 139.)—T. F. B.

[Asphalt] Pavement. F. J. Warren, Newton, Mass U.S. Pat. 727,508, May 5, 1903.

A binding cement for pavements is made by mi 100 parts of Trinidad lake asphalt with from 22—35 of petroleum residue of 20° B.—T. F. B.

French Patents.

Wood; Method of Impregnating ——, with Tar-o O. Heise. Fr. Pat. 325,486, Oct. 21, 1902.

The wood is placed in an impregnating cylinder, into wh tar-oil is introduced cold or hot, and with or withou help of a vacuum, until the cylinder is full. The de quantity of tar-oil is then forced into the wood by pres vhich is afterwards removed, and the excess oil withdrawn. The wood is then subjected to the action of steam under ressure.—W. C. H.

Stone; Process of Manufacture of Artificial ——. J. C. McClenahan. Fr. Pat. 325,257, Oct. 13, 1902.

See U.S. Pat. 711,436, Oct. 14, 1902; this Journal, 1903, 0.—W. C. H.

Fibrous Asbestos or Mica; Process of Using ——, *in the form of a Liquid or Plastic Mass.* J. E. R. Waitz, Successor to J. G. Grube. Fr. Pat. 325,321, Oct. 15, 1902.

To powdered fibrous asbestos or mica is added sulphate of lumina and a solution of agar-agar, to form a plastic or iquid mass, which will set hard, and, with the addition of uitable filling material, can be used as a covering or insulating material, or for an impregnating liquid, or for the roduction of articles made entirely of this material. —W. C. H.

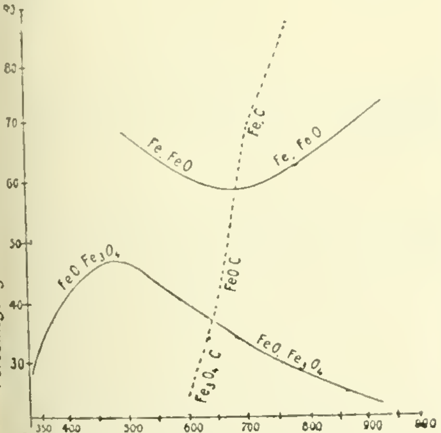
Portland Cement; Manufacture of Artificial ——, *with Silicious and slightly Aluminous Limestone.* A. Rouzet et Cie. Fr. Pat. 325,374, Oct. 17, 1902.

.N artificial silicious and ferruginous cement, poor in umina, is produced by mixing with silicious limestone, oor in alumina, the residue from roasted iron pyrites efore burning the mixture. The pyrites residue is said to omote the formation of good "clinker," and to yield a ment specially applicable to marine work.—W. C. H.

X.—METALLURGY.

xides of Iron, Carbon Monoxide, and Carbon Dioxide; Equilibrium between the ——. E. Baur and A. Glaessner. Zeits. für physik. Chem., 1903, **43**, [3], 354—368; Zeits. f. Elektrochem., 1903, **9**, [20], 422—423.

HE solid substances to be experimented on were introced into a porcelain tube closed at one end and heated an electric furnace. The temperature, which in some ses reached 980° C., was measured by a thermo-electric nction also inserted into the tube. After exhausting the from the tube, the gases were admitted and the heating s continued until equilibrium was attained. The gas was n withdrawn and the relative proportions of carbon xide and carbon monoxide determined. By plotting the ounts of carbon monoxide as ordinates against the tematures as abscissæ, the accompanying curves were ained, which show the alteration of the equilibrium with temperature.



r the equilibrium $Fe_3O_4 + CO = 3FeO + CO_2$, the ors obtained a curve which shows a maximum of on monoxide present in the gas (about 48 per cent.) at a temperature of about 490° C. The equilibrium of the reaction $FeO + CO = Fe + CO_2$, on the other hand, has a minimum at 680° C. In the presence of carbon, when the reaction $C + CO_2 = 2CO$ takes place, the dotted curve was obtained. It therefore appears that, under atmospheric pressure, and in the presence of carbon dioxide and monoxide, the oxides of iron FeO and Fe_3O_4 can only exist together with carbon at a temperature of about 647° C., while metallic iron, iron protoxide, and carbon, can, in the same circumstances, only exist together at 685° C. Between these temperatures, carbon is compatible with iron protoxide; at higher temperatures carbon and metallic iron can exist in the presence of each other; while at lower temperatures, the simultaneous presence of carbon and iron protosesquioxide (Fe_3O_4) is possible.

The curves indicate how rich a mixture of carbon dioxide and monoxide must be in the latter in order to exert a reducing action. The temperature at which iron protosesquioxide (Fe_3O_4) is most difficult to reduce is about 490° C., and at this temperature the mixture of gases must contain at least 47 per cent. of carbon monoxide. Iron protoxide can be most easily reduced at 680°, when only about 60 per cent. of carbon monoxide must be present in the gaseous mixture. The authors discuss the application of the results obtained to the processes occurring in the blast furnace, and calculate that the heat of formation of iron protosesquioxide at 490° is 267,380 cal., while that of iron protoxide at 680° is 67,350 cal.—J. S.

Carbon Monoxide; Decomposition of ——, *in the Regenerator of a Siemens-Martin Furnace.* F. Würtenberger. Stahl u. Eisen, 1903, **23**, 448; Chem.-Zeit., 1903, **27**, [37], Rep. 119.

In the original Siemens-Martin furnaces, the combustible gases were led into the hearth through long iron pipes; when, later on, the gas producers were placed close to the furnaces, gas was found to be lost in the regenerator, being decomposed. The results of experiments carried out by the author at works in Sestri Ponente are communicated. The difference in composition of the gases from the main and from the regenerator was considerable, about 22 per cent. of carbon monoxide being lost through decomposition. The heating of the regenerator by the waste gases was therefore carefully regulated, and the temperature kept at 1,000°—1,050° C.; but, even then, 12 per cent. of carbon monoxide were decomposed. The decomposition takes place according to the equation: $2CO = CO_2 + C$, and the deposition of carbon in the regenerator confirms this view. Decomposition only occurs when the gas pressure is cut off, and a partial vacuum formed through the draught from the chimney. In the newest types of furnaces, this is prevented by working the gas producers at a high pressure. The author mentions some other cases where this decomposition of carbon monoxide had taken place.—L. F. G.

Iron; State of Combination of Silicon in ——. Th. Naske. Chem.-Zeit., 1903, **27**, [40], 481—484.

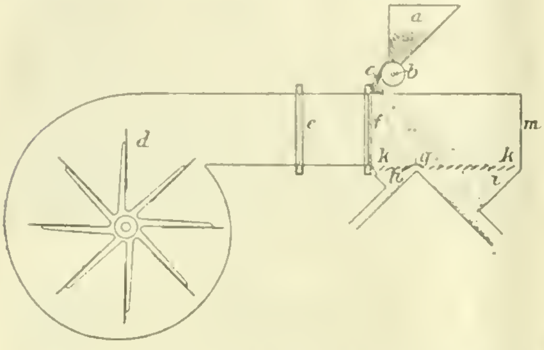
The action of dilute nitric and sulphuric acids, hydrofluoric acid, caustic potash solution, ammoniacal copper chloride, and of melted sulphur on various samples of iron-silicon alloys was investigated. The following conclusions are drawn:—(1) Iron-silicon alloys produced in the blast furnace contain silicon as Fe_2Si. If manganese be present, the iron is substituted by manganese. (2) If an excess of iron be present, complex molecules of Fe_2Si with iron atoms are formed. (3) An excess of silicon crystallises out. (4) The iron silicide Fe_2Si is sparingly soluble in the usual solvents for iron. Its solubility is increased by the number of iron atoms in the complex molecule, and decreased by any manganese present. (5) Iron-silicon alloys produced in the electric furnace contain the compounds Fe_2Si, $FeSi_2$, and $FeSi_3$, the relative proportions varying with the composition and temperature of formation of the alloy. These silicides are practically insoluble in all reagents. Excess of silicon crystallises out and is unattacked by all reagents, including sulphur. —L. F. G.

Steel; Dilatation of ——, at High Temperatures. G. Charpy and L. Grenet. Bull. de la Soc. d'Encourag. pour l'Ind. Nat., 1903, **104**, [4], 464—507.

The authors deal with the subject given in the title in a long paper with numerous illustrations, tables, and curve-diagrams. (See also this Journal, 1902, 180, 481, 616; 1903, 422.)—A. S.

Gold from Gravel; The Edison Dry Process for the Separation of ——. C. M. Chapman. Eng. and Mining J., 1903, **75**, [19], 713.

The author gives an account of the working of the Edison apparatus for the separation of gold from gravel at a placer 35 miles from Santa Fe, New Mexico. The essential features of the apparatus are shown in the figure. The



gravel is fed from the hopper *a* by means of the revolving roller *b*, on to the shelf *c*, from which it falls into the current of air created by the fan *d*, which current first passes through the screens *e* and *f*. The parting board *g* divides the heavier portion of the gravel—the gold and iron or black sand—which falls into the chute *h* from the lighter portion falling into the tailings chute *i*. The lattice *k k*, is for the purpose of preventing eddy currents of air passing down the chutes. The end *m* is open.

The gravel is first screened to a size which will include the coarsest gold the deposit is known to produce, and the screened material is further divided into a number of sizes (from 4 to 8) according to the character of the material. The material of each class is then passed through the Edison air separator adjusted to give the best results with the particular size under treatment. The following results have been obtained:—Total gravel treated, 38,896 lb. divided into the sizes A (finest) to E (coarsest).

Size.	Amount Treated.	Weight of Gold in Concentrate.	Weight of Gold in Tailings.	Per cent. of Gold saved.
	Lb.	Mgrms.	Mgrms.	
A	8,911	513·2	147·10	77·7
B	7,022	1737·5	66·65	96·3
C	8,040	3478·0	75·70	97·8
D	8,075	3667·0	341·46	91·5
E	6,848	2542·5	26·41	99·0
Total..	38,896	11938·2	653·62	95·0

The concentrates are further treated by passing them over an Edison magnetic separator (Eng. Pats. 14,354 and 14,355, of 1900; this Journal, 1901, 998), for the removal of the magnetic black sand or iron ore.—A. S.

Gold Slimes in Venezuela; Treatment of ——. L. Symonds. Read before the Inst. of Mining and Metall., May 21, 1903.

The ore, known as *cascajo*, from which the slimes were chiefly produced, consisted of decomposed slaty rocks and schists, impregnated with oxide of iron. When "stamped" through a 30-mesh screen, it produced at least 40 per cent. of slimes, *i.e.*, material which will pass through a 90-mesh screen. These slimes were similar to clay, but were of variable consistency. They were first mixed with a suitable proportion of water, and treated in an agitator with cyanid solution. The liquid in the agitator usually contained abo 0·07 per cent. of potassium cyanide, but occasionally onl 0·01—0·02 per cent., when caustic soda had been added neutralise any free acid present. The wet slimes were the introduced into a "*monteju*," and from there were force by means of air at 90 lb. pressure, into filter-presses, t effluent, which contained 0·04—0·06 per cent. of potassiu cyanide, being run into settling tanks, and thence throu zinc precipitation boxes. The effluent contained, on t average, 3 dwt. of gold per ton. The press-cakes we washed with water at 80 lb pressure. The washings co tained from 0·3 per cent. of potassium cyanide, at t beginning, to 0·2 per cent at the end, of the washi whilst the content of gold ranged from 4 dwt. to 0·2 dw the average being 1·5 dwt. per ton. The zinc slimes fr the precipitation boxes were treated with acid in a wood agitator, the precipitate was filter-pressed, and the pre cakes dried at a red heat. The roasted cakes were fin smelted with 37·5 per cent. of borax glass, 20 per cent sodium carbonate, and 5 per cent. of sand. The bulli was, on the average, 750 fine.

The best results were obtained when treating very and crumbly slimes, containing 10—15 per cent. of moistu and admixed with about 7·5 per cent. of sand, *i.e.*, s which remained on a 90-mesh sieve. When treating sli which were not dry enough to break up easily, the extr tion was always poorer. The apparent extraction calcula from the proportion of gold remaining in the residue 65·3 per cent. The actual proportion of gold recovered 60·6 per cent.; the balance of 4·7 per cent., which remai in the zinc precipitate, mixed with the fine slimes wh escaped the filter-presses and passed into the precipitat boxes, was recovered at the clean-up. The amount cyanide used was 1·47 lb. per ton of slimes.—A. S.

Calcium Carbide; Reaction during the Reduction Metals by ——. F. von. Kügelgen. Zeits. f. Elek chem., 1903, **9**, [20], 411—415.

In the case of substances which are reduced with difficu the reduction proceeds chiefly at the expense of the calc More carbide must therefore be employed to complete action. Carbon being then in excess, the formation carbon monoxide is thus rendered possible. Should h temperatures, such as those produced in the electric fura be necessary for the reduction, then carbon monoxide will be formed, but if a lower temperature suffices for reduction of oxides, and of mixtures of oxides and chlor then the equation representing the formation of car dioxide as the primary product still remains valid as previously been shown by the author.—J. S.

Cyanide: Commercial ——. F. W. Oldfield.
VII., page 695.

English Patents.

Steel and Ingot Iron; Manufacture of ——. B. Ta Harrogate, and P. Gredt. Luxembourg. Eng. Pat. Feb. 20, 1903. Under Internat. Conv., Sept 15, 19

See Fr. Pat. 322,448; this Journal, 1903, 55

—H. F. C.

Iron or Steel; Method of Deoxidising and Carbu Molten ——. Soc. Electrometall. Française, Fr France. Eng. Pat. 6950, March 25, 1903. Internat. Conv., March 25, 1902.

See Fr. Pat. 320,682; this Journal, 1903, 148.

—H. F. C.

Nickel Carbonyl; Manufacture of ——, and its Tr for Production of Metallic Nickel therefrom. J. D Cambridge. Eng. Pat. 9300, April 22, 1902.

Nickel, in a finely-divided spongy condition, is to the action of carbon monoxide under press (2 atmospheres, according to the temperature), heat applied so as to raise the contents of the vessel to 50 to 250 C. The nickel carbonyl vapour prod then passed, together with the excess of carbon mon remaining, through tubes at a higher temperature. M ickel is deposited and the liberated carbon monoxide can e returned and used over again.

The mixture of nickel carbonyl vapour and carbon monxide may, if preferred, be passed through a cool condenser. hen the nickel carbonyl is deposited as a liquid, which can e used for production of metallic nickel, while the carbon ıonoxide, still under pressure, can be returned and again tilised in the formation of the nickel carbonyl. (See this ournal, 1903, VII., May 30.)—W. H. S.

Zinc; Improved Process for Obtaining ——. E. H. Hopkins, London. Eng. Pat. 12,859, June 5, 1902.

RECEPTACLE filled with carbon, preferably in small lumps, introduced sufficiently far into the neck of the retort om which the zinc is being distilled, to keep it at a mperatnre of from 400° to 550° C. The zinc vapour as passes through the carbon condenses, and runs through rforations in the bottom of the receptacle to a receiver om which it is drawn off, while carbon monoxide escapes the mouth. Contact with oxygen or production of zinc me is thereby entirely prevented.—W. H. S.

etals; Pulverisation of ——, *and Apparatus therefor.* C. Berton, Paris. Eng. Pat. 14,036, June 20, 1902.

HE fused metal is forced out from a hermetically closed ssel in which it is contained, by means of a highly comessed elastic fluid (superheated steam) admitted to the ssel above the level of the metal. The issuing metal ixes with the elastic fluid so as to form a jet therewith, e sudden expansion of such jet causing the pulverisation the metal, which is received at the moment of the pansion in a mass of liquid.—H. F. C. G.

UNITED STATES PATENTS.

on, Electrolytically-active; Process of Manufacturing Finely-divided ——. T. A. Edison, Llewellyn Park, N.J., Assignor to Edison Storage Battery Co., Orange, N.J. U.S. Pat. 727,118, May 5, 1903.

RETORT is charged with a compound of iron (ferric ide), which is heated and reduced by hydrogen until an ctrolytically active oxide is obtained, which is then oled while still in an atmosphere of hydrogen, and the ort is finally flooded with water to prevent atmospheric idation of the mass when removed.—G. H. R.

rnace; Blast ——. N. Erzig, Chicago, Ill., Assignor to P. Huth, Chicago, Ill. U.S. Pat. 726,893, May 5, 1903.

E smelting chamber is provided with a feed-chute at the per end, controlled by a bell-valve. Below the chute is opper-shaped screen secured within a truncated conical een, both of which serve to sift the material added. other bell-valve controls the discharge of material from hopper-shaped screen, which can also be raised vertically release any retained material.—L. F. G.

rnace; Metal-Treating ——. M. J. Murdoch, Youngstown, Ohio. U.S. Pat. 726,728, April 28, 1903.

E hearth chamber has a horizontal roof, which, comncing from above the bridge wall to the fire chamber is ressed to a central apex, provided with a water chamber. om the apex, the roof is continued upwards to meet the nt wall at an acute angle, and at a certain distance below he fire-grate, so inclined as to be parallel to the crown the fire chamber where it meets the front wall. There also an inclined section reaching to the front of the ing wall to form a gas-pocket. The floor of the ashmber is inclined parallel to the fire-grate. Deflecting l sections are provided towards the vent flue at the rear of the furnace.—E. S.

rnace for Roasting and Smelting Ores. A. W. Catton, West Seattle, Wash. U.S. Pat. 726,861, May 5, 1903.

E furnace has oppositely-disposed chambers and flues necting its two sides with a smoke-stack, and containing t-absorbing, refractory materials. Hearths sloping ards a central bullion well are interposed between, and in communication with the chambers, and have bridge walls at their outer sides. A steam-nozzle surrounded by a sleeve-shaped air intake, imparts a forced draught of steam and air through the flues and chambers alternately, the steam and air being highly superheated whilst passing through the refractory materials in them. Means are provided for injecting a spray of steam and oil against the bridge walls which mingles with, and combines in combustion with the highly heated draught of steam and air as all come in contact with the ores on the hearths.—G. H. R.

Furnace; Slag ——. R. Baggaley, Pittsburg, Pa., and O. S. Garretson, Buffalo, N.Y., said Garretson Assignor to Garretson Furnace Co., Pittsburgh, Pa. U.S. Pat. 727,057, May 5, 1903.

A BOILER or other vessel is provided with a number of upright fire tubes or chambers, having downwardly diverging walls, into which the molten slag is run. Crushing apparatus is arranged immediately below the outlets to the tubes, whereby the congealed slag is gradually removed and delivered into a receptacle beneath. Compare U.S. Pat. 722,198, March 3, 1903; this Journal, 1903, 424.—E. S.

Ores; Extracting Gold from ——. F. J. Hoyt, Chicago, Ill. U.S. Pat. 726,294, April 28, 1903.

THE powdered ore is thinly distributed over a wide, long, and open sluice-way, down which it is washed by a "chemical solution," on to successive sluiceways, inclined in alternately opposite directions, one below the other, whereby it is screened and separated from the tailings. The gold is then precipitated from the solution by a suitable reagent.—E. S.

Ores of the Rare Metals; Treating Rebellious ——. W. F. Downs, Jersey City, N.J. U.S. Pat. 726,884, May 5, 1903.

To extract rare metals from ores containing such impurities as sulphur, arsenic, tellurium, &c., the ores are roasted, finely ground, and made into briquettes with a sodium compound and with an agent capable of liberating sodium therefrom, such as carbon. On heating the briquettes to a suitable temperature, the sodium set free combines with the "rebellious elements," and leaves the metals to be recovered distributed throughout the mass, from which they are finally extracted. Compare U.S. Pat. 707,214, August 19, 1902; this Journal, 1902, 1185.—E. S.

Ores; Apparatus for Crushing, or Crushing and Sorting, &c. ——. E. Ferraris, Monteponi, Italy, Assignor to W. R. Ingalls, Lynn, Mass. U.S. Pat. 726,521, April 28, 1903.

THE apparatus is of the ball-mill type, including a revolving grinding cylinder, divided by a perforated annular partition into a pulverising and a screening chamber, and a central cone, having radial blades, projecting inwardly towards the partition, and discharging into the larger chamber. The ore is fed through a hopper into a central opening at the back of the cylinder, and when crushed, is screened by the adjuncts to the cone, whilst the coarser particles return to the crushing chamber by gravity as the cylinder rotates.—E. S.

Ore-Treating Process. Bella T. Nichols, Montevista, Col. U.S. Pat. 726,802, April 28, 1903.

To prepare ores for leaching, they are powdered, mixed with lime and then with water to form a pulp, which is agitated and heated to about 90 F. by steam. They are then washed with agitation by air under pressure, drained under increased pressure, and finally dried.—E. S.

Ores; Method of Treating Refractory ——. R. McKnight and M. Satarasky; said Satarasky, Assignor to F. Acker, all of Philadelphia, Pa. U.S. Pat. 727,184, May 5, 1903.

ORES containing metalloids are roasted with access of air, the ore being agitated, but shut off from the products of combustion. An oxide of the metalloid is formed and passes off, together with the metal in the ore in a finely-divided state; the fumes are collected in a receptacle containing a solution of an alkali or alkaline-earth chloride. In this receptacle, the oxide of the metalloid is converted into an acid, and the hydrogen of the acid replaced by the alkali or alkaline-earth metal, nascent chlorine being set free. The latter combines with the metal values present in a finely-divided state with the formation of a chloride thereof. Compare U.S. Pats. 693,982 of Feb. 25, 1902, and 696,469 of April 1, 1902; this Journal, 1902, 411 and 619; also Addition to Fr. Pat. 313,695 of Aug. 22, 1901, dated July 29, 1902; this Journal, 1903, 499.—E. S.

Ores; Apparatus for Treating ——. H. Hirsching, San Francisco, Cal. U.S. Pat. 727,362, May 5, 1903.

The apparatus includes a leaching vessel, a settler, a filter, and an alkali tank connected to a steam boiler and still. There are also settlers connected with a slime washer, hot and cold and wash water tanks, and means for discharging either into the slime washer. An absorption tank consists of an outer casing communicating with the cooling water tank, an inner casing spaced from the outer casing and communicating with the stock solution tank, and an innermost casing communicating with the coil of a condenser, whereby the vapours and fluid emerging from the coil are caused to flow through the innermost casing and through the absorption water, while the latter flows through the inner casing to the stock solution tank. Suitable connections are provided throughout.—E. S.

Ores; Apparatus for Treating [Roasting] ——. T. L. Rankin, Sacket Harbor, N.Y. U.S. Pat. 727,441, May 5, 1903.

A long horizontal cylinder, built in sections, is set within the combustion flue of a furnace. The ore is fed in continuously through a pipe by a screw conveyor at one end of the cylinder, means being provided to prevent accumulation of ore and dust. At the discharge end is a plate leaving an annular space at which provision is made for separate outlet of gases and of roasted ore. The cylinder, which can be rotated, is furnished with two series of long and short inwardly extending wings, alternating, a central space being left, whereby the ore may be brought into contact with the treating surfaces as it progresses, and be agitated to allow of thorough air-circulation. The claims include many details.—E. S.

Zinc Spelter; Apparatus for Refining ——. T. Jones, Assignor to N. F. Acers, both of Iola, Kans. U.S. Pat. 726,432, April 28, 1903.

In a muffle furnace, a water-bosh, provided with a septum for effecting circulation of the water, is disposed beneath the muffle, slightly inclined towards the walls on each side, and having immediately above it an air-duct extending throughout its length. The bottom of the muffle is also similarly inclined. A condenser, beneath which a regulated supply of air is admitted, communicates with the muffle. In a furnace having a number of muffles, these have their rear ends opposed, with a fire-brick wall between, against which the muffles bear, water-boshes being beneath, and fuel-supply pipes arranged within the wall. A channel is provided to conduct the molten metal without the furnace in case of fracture of the muffle.—E. S.

Zinc Dust; Apparatus for Producing ——. G. G. Convers and A. B. De Saulles, South Bethlehem, Pa. U.S. Pat. 727,297, May 5, 1903.

The retorts or "muffles," heated from a furnace externally, are arranged in superposed rows, and the zinc vapours are collected in an expansion chamber, behind, common to the series, the rear wall of which is formed by the front wall of the combustion chamber, so as to provide direct and jointless communication between the muffles and the expansion chamber, which latter is of such size relatively as to allow of immediate expansion and solidification of the vapours into zinc dust. Openings having doors or slides are provided in the front wall of the expansion chamber, opposite the muffle-exit openings. Compare U.S. Pats. 694,137, Feb. 25, and 695,376, Mar. 11, 1902; this Journal, 1902, 620.—E. S.

Zinc Dust; Apparatus for Producing ——. G. G. Conver and A. B. De Saulles, South Bethlehem, Pa. U.S. Pat 727,298, May 5, 1903.

An apparatus similar to that described in the precedin abstract, in which the expansion chamber has a thin wa provided with an orifice registering with the vapour-outl end of each muffle, and a short nipple sealing the join between the muffle and the chamber.—E. S.

Alloy. W. G. Stevens, Assignor to S. M. Neely an J. W. May, all of Memphis, Tenn. U.S. Pat. 726,58 April 28, 1903.

The alloy is formed by fusing together 75 parts of coppe 20 parts of tin, and 2½ parts each of borax and lamp-blac —E. S.

Metallurgical or Chemical Vessels; Appliance for V. with ——. W. Lynes, Sparkhill, England. U.S. Pa 728,122, May 12, 1903.

See Eng. Pat. 22,852 of 1902; this Journal, 1903, 541. —L. F. G.

French Patents.

Metals; Coating ——, with Nickel, by means of a Nick Bath without aid of Heat. A. Mitressey. Fr. Pa 325,458, Sept. 3, 1902.

The articles to be coated, after cleansing, are attached plates of zinc, and immersed in an acidulated solution cupric sulphate, and lastly, with the same attachment, in bath containing, in each litre of water, potassium hydrog tartrate, 20 grms.; ammonium chloride, 10 grms.; sodiu chloride, 5 grms.; stannous chloride, 20 grms.; a nick salt, 30 grms.; and a double nickel salt, 20 grms. Aft some minutes, the articles are withdrawn and burnished. —E. S.

Metallic Lead: Process and Apparatus for Powderi ——. The Société Union Lead and Oil Company. F Pat. 325,471, Sept. 20, 1902.

Lead, previously granulated, is acted upon in a clos chamber by series of circularly mounted beaters, arran to revolve in opposite directions, so as to beat the l granules into powder, which, as it forms, is conveyed aw to a receiver by a regulated blast of air. A modif form of apparatus is shown, adapted for crushing or, combustibles, &c.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Alkali Sulphides; Electrolysis of ——. A. Brochet G. Ranson. Comptes rend., 1903, **136**, [19], 113- 1136.

Previous investigators have established that when dil solutions of sodium sulphide are electrolysed, oxidat takes place with production of thiosulphates, and finall sulphates, a little sulphur, however, being deposited at anode. The authors confirm this action in dilute solutio but find that when warm concentrated solutions electrolysed, the reaction is very different, no oxida products being formed. Experiments were made wit solution containing 544 grms. of crystallised sod sulphide per litre, at a temperature of 68°—70° C. w platinum electrodes at a current density of 7 ampères sq. dm. Under these conditions the action procee without oxidation, with the liberation of sulphur at anode, and of sodium (*i.e.*, caustic soda and hydrogen the cathode. The sulphur liberated dissolves in the ex of the electrolyte with the production of polysulph imparting a yellow colour to the solution. In the abs of a diaphragm, in proportion as the liquid tends to bec richer in sulphur, the latter combines with the hydr at the cathode, forming sulphuretted hydrogen, and regenerating the original sulphide. The reactio expressed by the reversible equation $Na_2S + 2H_2O \rightleftarrows 2N$ $+ H_2 + S$. With a diaphragm, the second reactio prevented; the electrical tension at the poles rem

relatively low so long as the sulphur produced redissolves n the liquid, but if the formation of polysulphides be pushed too far, the latter are themselves decomposed with the deposition of sulphur and the formation of oxidation products, accompanied by a rise in the tension at the poles.
—J. F. B.

Persulphates; Electrolytic Preparation of ——. M. G. Levi. Zeits. f. Elektrochem., 1903, 9, [21], 427—428.

During the electrolytic preparation of ammonium persulphate in the presence of chromate, and without the use of a porous diaphragm (this Journal, 1902, 706), the uthor finds that the temperature may be allowed to rise as high as 30° C. without seriously interfering with the yield.

By varying the material of which the cathodes were made, he yield was influenced to only a very slight extent. Carbon gave the best results. The physical condition of he platinum anodes on the other hand has a more marked ffect on the yield obtainable.—J. S.

Stilbene Derivatives; Electro-Chemical Reduction of some ——. K. Elbs and R. Kremann. Zeits. f. Elektrochem., 1903, 9, [20], 116—119.

The results obtained on the electro-chemical reduction of "Sonnengelb" agree with the view that this dyestuff is omposed chiefly of *p*-azoxy-stilbene-disulphonic acid. It nd also *p*-dinitro-stilbene disulphonic acid yields *p*-azo-oluene-disulphonic acid as end product when electrolysed alkaline solution. The product of the electrolytic eduction of *p*-dinitro-stilbene is *p*-azoxy-stilbene from an lkaline solution and *p*-diamino-stilbene from an acid olution, as in Boehringer's process. Under the same onditions *p*-diazo- and *p*-diammo-dibenzyl-disulphonic cids are obtained from *p*-dinitro-dibenzyl-disulphonic acid.

Boehringer's process applied to the reduction of "Sonnen-elb" yields *p*-diamino-stilbene-disulphonic acid and -toluidine sulphonic acid, while *p*-dinitro-stilbene sulphonic id under the same conditions gives only *p* diamino-stilbene-sulphonic acid.—J. S.

-Nitro-acetophenone and m-Nitro-benzophenone; Electro-Chemical Reduction of ——. K. Elbs and A. Wogrinz. Zeits. f. Elektrochem., 1903, 9, [21], 428—431.

-Nitro-acetophenone is easily reduced to *m*-azo-etophenone and to *m*-amino-acetophenone by known ectrochemical processes. Attempts to prepare *m*-azoxy-etophenone always resulted in a mixture of the azo- and oxy-compounds. The reduction to a hydrazo-compound d the transformation of this into the corresponding nzidine was only partially successful.

On the electro-chemical reduction of *m*-nitro-benzo-enone, good yields of *m*-azoxy-, *m*-azo-, and *m*-amino-nzophenone were obtained. The hydrazo-compound is ily oxidised, and the corresponding benzidine formed by lecular rearrangement is difficult to purify.

In no case was a reduction of the carbonyl-group served.—J. S.

English Patents.

ectrodes for use in Electrolytes. J. Hargreaves, Widnes, . W. Stubbs and J. Kearsley, both of Cledford. Eng. Pat. 10,204, May 3, 1902.

E electrode consists of a metallic conducting bar or bars, ered with an impervious coating. Nipples or bars of on, either perforated or plain, are passed through the ducting bars, and are mechanically and electrically nected to them by castings of lead or other suitable al. The outer ends of the nipples are fitted closely into ings or recesses in blocks of carbon which form the ace of the electrode in contact with the electrolyte.
—G. H. R.

vanic Batteries. The Halsey Electric Generator Co., td., Edinburgh. From the Halsey Electric Generator o., Ltd., New Jersey, U.S.A. Eng. Pat. 28,805, ec. 30, 1902.

S U.S. Pat. 719,659, 1903; this Journal, 1903, 304.
—G. H. R.

Electrolytic Apparatus; Device [Surface Tension Grid] for use in or with —— A. Wright, Brighton. Eng. Pat. 26,868, Dec. 5, 1902.

To obviate the tendency of mercury anodes to "sicken," a "surface tension grid" is employed, formed of platinum or platinum-iridium, or any other suitable material which is not wetted by mercury, and with orifices or interstices through which the mercury is prevented from flowing by its surface tension. It is claimed that by the use of such a grid, the under surface and sides of the mercury are also washed by the electrolytic currents owing to the electrolyte having access to it at the openings of the grids. Various forms of grid are described, some being specially adapted for use with mercury electrolytic meters of the type claimed in Eng. Pats. 2222 and 17,262 of 1900.—G. H. R.

Alkaline Salts; Electrolytic Decomposition of ——. M. Wilderman, London. Eng. Pat. 9803, April 28, 1902.

The cell is an improvement on those described in Eng. Pats. 18,958 of 1898 (this Journal, 1899, 923) and 22,902 of 1901 (this Journal, 1902, 125), and consists of a rectangular tank divided into compartments by a series of superimposed, longitudinal troughs containing mercury, a seal being formed by means of ribs on their under side dipping into the mercury of the trough below. Mechanical reciprocating stirrers project into the mercury in the decomposing compartment, and mix it and the amalgam, the latter being caused to pass under the ribs of the seals, and rise by its own buoyancy to the surface of the mercury in the combining compartment. The depth of the mercury seal is in excess of that at which surface tension effects and diffusion can alone effect circulation of the amalgam between the various compartments of the cell, so that increased current densities may be employed per unit area of mercury surface. The amalgam can be transferred at intervals to the combining compartment of the troughs faster than it is produced in the decomposing compartment by stopping or diminishing the electrolysing current for short periods, and stirring the mercury continuously, or at an increased rate, whereby the formation of fluffy or solid amalgam, and the breaking of the mercury seal due to the latter is prevented, and the efficiency of the cells improved. Two further modifications are described, in one of which the troughs are circular in form, and have rotatory stirrers projecting into the mercury, and in the other the mercury troughs are alternately fixed and rotatory, and insulated vanes on the under side of the troughs dip into and stir the mercury and amalgam. (See also U.S. Pat. 709,971, 1902; this Journal, 1902, 1336; and Fr. Pat. 325,154, 1902; this Journal, 1903, 637).—G. H. R.

Phosphorus; [Electrical] Production of ——. T. Parker. Eng. Pat. 16,862, July 30, 1902. VII., page 696.

United States Patents.

Battery; Reversible Galvanic ——. T. A. Edison, Llewellyn Park, N.J., Assignor to Edison Storage Battery Co., Orange, N.J. U.S. Pat. 727,117, May 5, 1903.

In a battery employing an alkaline electrolyte and an electrode containing an insoluble depolarising active material, such as oxide of nickel, the second electrode may consist of finely-divided metallic iron (see U.S. Pat. 727,118, page 701), or an oxide thereof, mixed with copper and flake graphite. The proportion of iron employed should be in excess of the copper, and also in excess of the capacity of the nickel, whereby oxidation of the copper on discharge is prevented.—G. H. R.

Furnace; Electric ——. J. M. Carrere, New Brighton, N.J. U.S. Pat. 726,860, May 5, 1903.

A revoluble cylinder, having a layer of asbestos between it and its graphite lining, extends between and passes into non-rotatable cap-ends on supporting bases. A supply-pipe communicates with the interior of the cylinder through one cap-end, and a discharge-pipe through the other, and a pulley, and metallic rings running on supported bases, pass around, and are secured to it. Means are provided for revolving the cylinder, and for producing a uniform heat in the inner surface of the graphite lining which is electrically connected to a source of power by contacts in the respective cap-ends, through which carbons pass, and are adjustable so that the heat generated by the arc between them may be concentrated at any given point within the cylinder.—G. H. R.

Electrolytic Processes; Apparatus for the Continuous Practice of ——. P. G. Salom, Philadelphia, Pa. U.S. Pat. 727,457, May 5, 1903.

The cell contains an upper and a lower horizontal electrode, the former carrying a supply-receptacle with a slotted outlet and a scraper in fixed relation to each other, and radially disposed in relation to the axis of rotation, and both resting on the lower electrode. Means are provided for rotating one electrode with relation to the other, and for rotating the supply-receptacle and the scraper with relation to the electrode. The scraper is in advance of the supply-receptacle, with its edge against the electrode, to the surface of which a coating of the material being electrolysed is continuously applied, and simultaneously and continuously removed therefrom. Other modifications of the apparatus are described.—G. H. R.

Electrolytic Apparatus. F. J. Briggs, Everett, Mass., Assignor to G. F. Tarbell and H. A. Locke, Cambridge, Mass. U.S. Pat. 727,889, May 12, 1903.

The cell is divided by a stationary cathode into two compartments, in each of which is suspended a vertically movable cathode and a dialyser, the latter floating in and sustained by the electrolyte. The cathode in one compartment is pivotally connected with the dialyser in the other, so that it is adapted to balance and move vertically in relation to it, and each pair acts independently of the other pair. The dialysers comprise a frame supporting a diaphragm with a curved bottom, and contain a series of anodes. Mercury cups are in electrical circuit with the cathodes and dialysers, and conducting wires connected with the latter have their free ends in the mercury, the movement of each dialyser lifting and lowering the immersed ends of the conducting wires in the mercury, so that as one dialyser rises, the resistance therein is increased, and the simultaneous lowering of the cathode connected with it increases the conductivity in the dialyser, thus automatically regulating the flow of the electric current. The movement of the cathode relatively to the electrolyte is automatic, whereby bubbles of hydrogen are destroyed, and partial or complete insulation of the cathode is prevented. There is an outflow pipe with a connection between it and the dialyser, so that the rise of the latter consequent on the increase of the decomposition of the electrolyte lowers the outflow pipe.—G. H. R.

Calcium Carbide Refuse; Method of Utilising ——, *and Product thereof.* G. E. Cox, Assignor to Union Carbide Co., both of Niagara Falls, N.Y. U.S. Pat. 727,095, May 5, 1903.

A mass of the calcium carbide refuse is placed between electrodes of higher conductivity than itself, and spaced apart further than in preparing calcium carbide, and a current is passed through of greater amperage and lower voltage than in that process using the same electrical energy. An ingot of calcium carbide is thus obtained.

—E. S.

Permanganates; [*Electrolytic*] *Production of* ——. W. Hickmann, Assignor to Soc. Chem. Fabr. Griesheim Electron. U.S. Pat. 727,792, May 12, 1903. VII., page 696.

French Patents.

Accumulators; Process for the Manufacture of Pastes for Lead Electric ——. F. W. Schmidt-Altwegg. Fr. Pat. 325,259, Oct. 13, 1902.

The paste is formed of a mixture of compounds of lead with sulphinic acids or organic sulphines, whether of the fatty or of the aromatic series, employed either alone or together, the organic compounds being applicable in neutral, alkaline or acid solutions. Or the sulphinic acids or sulphines can be mixed in a solid condition with lea compounds, and the thoroughly pulverised mixture h moistened with the neutral, alkaline or acid liquids so as t form a perfectly homogeneous paste which is used fo filling plates, grids or sheets of lead, or for making element of special shapes which are then covered with lead.

—G. H. R.

Generation and Electrolytic Application of Electri Currents; Apparatus for the ——. F. E. Elmore. F Pat. 325,325, Oct. 15, 1902.

See Eng. Pat. 26,673 of 1901; this Journal, 1903, 371.

—F. F. H.

(*B.*)—ELECTRO-METALLURGY.

Cadmium Amalgams and their Electromotive Behaviou H. C. Bijl. Zeits. physik. Chem., 1902, **41**, 641—671.

Mixtures of cadmium and mercury may be divided in two series:—(1) Mixtures containing from 0 to 65 atom per cent. of cadmium, which begin to deposit solid temperatures between − 38·8° C. and + 188° C.; and (those containing from 65 to 100 atoms per cent. cadmium, which begin to crystallise at temperatures ran ing from 188° to 320·8° C. All the mixtures solidi gradually during a certain interval of temperature. Fr the liquid amalgams of the first series, mixed crystals the mercury type, containing from 0 to 75 atoms per ce of cadmium, separate out, whilst from those of the sec series, mixed crystals of the cadmium type, contain from 77 to 100 atoms per cent. of cadmium, are deposit This gap in the mixed crystal series (from 75 to 77 ato per cent. in the above case) becomes wider the lower t temperature; at 25° C., it extends from 65 to 80 ato per cent. of cadmium, so that an amalgam containin proportion of cadmium between these two limits, separate into two phases at 25° C. These limits can determined at low temperatures by measuring the E.M of a cell having the cadmium amalgam as cathode, cadm sulphate solution as electrolyte, and a reversible merc pole as anode. So long as the amalgam contains onl small proportion of cadmium and remains liquid, E.M.F. increases regularly with the proportion of cadm in the amalgam, but for all those concentrations wh the amalgam separates into a solid and a liquid ph the E.M.F. has a constant value. In the case of solid amalgams of the mercury type, the E.M.F. a rises with the proportion of cadmium present; next becomes constant with the amalgams within the misc limits; and finally, in the case of the amalgams of cadmium type, the E.M.F. again increases regularly that of pure cadmium is reached. From the results of experiments, the author concludes that the irregular observed by Jaeger and Cohen in the earlier forms Weston cells are explained by the fact that these contained an amalgam with 22·9 atoms per cent. cadmium; such an amalgam when cooled below 20 solidifies completely to mixed crystals, hence the equilibrium can only be slowly attained.—A. S.

Zinc from its Ores; Electrolytic Separation of —— Elektrochem. Zeits., **10**, 1—3; Chem. Centr., 19 1, [13], 1074.

Zinc (and various other metals) is dissolved by the a of an alkaline solution of alkali hypochlorite, and can be electrolytically separated from the solution of zincate and chloride. The chlorine disengaged serve the formation of fresh hypochlorite. Ground sulphide can be dissolved in this way, sulphur being separated, the method also serves for the treatment of frankl for the separation of gold and silver from one and from lead.—A. S.

French Patent.

Ores, Mattes, Metals, and Alloys; New Meth Treating ——, *to obtain Merchantable Product as Plates, Sheets, Wire, and Tubes.* The Soc l'Auto-Métallurgie. Fr. Pat. 325,180, Oct. 20, 19

The invention relates mainly to obtaining electr copper from cupric sulphate solution in the forms de-in the title. The sulphate (or other cupric salt) is obtained from copper ores, mattes, or crude metal, by usual processes. Frames, on which are stretched diaphragms of insoluble albuminous or other organic substances, are set within a vessel charged with acidulated water, in which a basket containing scrap iron, to serve as anode, is placed. The frames having dialysing septa are charged with the cupric sulphate solution (acidulated), and contain the cathode, consisting of the metallic body which is to form the core or surface on which the copper is to be deposited. The deposition proceeds without the application of electricity from an external source, although the right to use such a source is also claimed. A series of communicating cathode cells may be employed. When tubes are to be obtained, the cathodes consist of copper tubes. Wire is obtained by mechanical treatment of the plates deposited. The claims relate to metals generally.—E. S.

XII.—FATS, FATTY OILS, AND SOAP.

Olives and Olive Oil in France. R. P. Skinner. U.S. Cousular Reports, No. 1639, May 6, 1903, 1—19.

It is stated that in the manufacture of a good oil, the olives should be hand-picked, at a stage of ripeness lepending on the nature of the product required. Thus, a bitter and piquant oil is obtained from green olives approaching maturity; whilst a sweeter oil with less fruity lavour is yielded by reddish-brown olives, and a rancid oil by over-ripe fruit. The bitter flavour of the oil from the green olives diminishes after a few months, whilst the fruity lavour remains.

The olive increases in weight and size until it attains the black colour of complete maturity, and there is a corresponding increase in the proportion of oil both in the pulp nd the kernel. No oil is formed in the pulp until after ignification of the kernel. The oil contained in the kernel nd the hard portion of the stone is said to deteriorate eadily, and is therefore usually extracted separately from he pulp oil.

As regards the yield, a middle-aged tree in good condition hould produce annually an average of 30 litres of fruit 18 kilos.), giving about 12 per cent. of oil.—C. A. M.

Sesamé and Cod-Liver Oils; A New Reagent for ——. Ciaperesco. XXIII., page 711.

Glycerin; Action of Alkalis on ——. Application of the Reaction to the Determination of Glycerin. A. Buisine. XXIII., page 712.

English Patents.

allow; Utilisation of Waste Waters from the Digestion of Rough ——. E. G. Scott, London. Eng. Pat. 14,027, June 20, 1902.

HE waste waters from the digestion of tallow (Eng. Pat. ,155 of 1901; this Journal, 1902, 711) when concenated to about 50° Tw. at a low temperature yield a suitable oduct for sizing cloths. The process is best carried out a tubular vacuum pan into which the waters are conveyed rough a filter.—C. A. M.

ils or other Fatty Substances; Method of Reducing Essential or Fixed ——, into a Dry Powder. G. B. Loeffler, London. Eng. Pat. 1788, Jan. 24, 1903.

HE oils, &c., are treated with a suitable absorbing base, ch as sugar, dextrin, casein, soda, magnesia, lime, or their ts, in the presence of moisture, and the resulting comund evaporated *in vacuo*, or otherwise, cooled, and wdered.—C. A. M.

French Patent.

ls, and in particular Cocoa-nut Oil; Process of Neutralising ——. E. Rocca. Fr. Pat. 325,381, Oct. 17, 1902.

E crude oil is first neutralised with caustic alkali, or ali carbonate, and decanted from the resulting soap. It is then treated with a strong acid to decompose the remaining traces of soap, and after being thoroughly washed to eliminate the mineral acid, is exactly neutralised by means of an alkaline earth (lime, magnesia, or baryta), and filtered.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

English Patents.

Paints; Manufacture from Slag of a Material for use in the Production of ——. L. Wirtz, London. Eng. Pat. 1465, Jan. 18, 1902.

Blast-furnace slag is soaked in a neutral or acid solution of a metallic chloride, such as that of iron, zinc, or copper, or in the crude solution of zinc chloride obtained when scrap tin is stripped and the tin precipitated with metallic zinc. The solution is filtered and mixed with a solution of a suitable sulphate (of iron, zinc, or copper); the precipitate which falls being separated, dried, and ground. —F. H. L.

Bronze Powder; Manufacture of ——. L. Ott, Nuremberg, Germany. Eng. Pat. 11,684, May 22, 1902.

See addition to Fr. Pat. 289,827; this Journal, 1903, 150. —H. F. C. G.

(B.)—RESINS, VARNISHES.

English Patents.

Resinous Substances; Process for the Synthetical Preparation of ——. L. Blumer, Zwickau, Saxony. Eng. Pat. 12,880, June 5, 1903.

The simultaneous condensation of phenols with organic hydroxyacids and formaldehyde yields resinous substances. Thus, a saturated solution of tartaric acid in formalin, warmed with phenol, produces a white fusible resin resembling shellac; if α-naphthol be used, the product is a red resin. These resins are readily soluble in the usual solvents, and yield lustrous varnishes and polishes. —M. J. S.

Varnish, Paint, or the like; Manufacture of —— [Use of Naphthalene]. L. Knoche, Hamm, and M. Issleib, Bielefeld, Germany. Eng. Pat. 16,933, July 30, 1902.

A varnish, or a paint vehicle, is prepared by warming 25 parts of raw or boiled linseed oil to 60° C., and dissolving in it one part of β-naphthol and 4 parts of naphthalene, the object of the naphthol being to raise the solubility of the naphthalene in the oil. If the ingredients are pure, the varnish is said not to possess a characteristic odour, yet to dry well, to be cheaper than vehicles of linseed oil alone, and not to injure any pigments.—F. H. L.

Varnishes or the like Compositions applicable as a Cement or Filling for Painters' Use. J. H. W. Stringfellow, Walthamstow, and F. X. Mainetty, London. Eng. Pat. 26,852, Dec. 5, 1902.

A transparent varnish specially adapted for the temporary protection of metallic surfaces from oxidation is prepared by dissolving a resin or resinoid substance in a suitable solvent, preferably a mixture of petroleum oil and crude turpentine. Varnish colours and bronze or other metallic powders may also be incorporated, whilst the addition of a small proportion of terebene prevents stickiness. By varying the proportion of the ingredients, a denser varnish is obtained which can be mixed with metal filings, red lead, pumice powder, &c., and used as a cement or filling material.—C. A. M.

Non-Fouling Composition for Marine Hulls. C. T. W. Piper, Vancouver, Canada. Eng. Pat. 3023, Feb. 9, 1903.

Pulverised copper ore, or a mixture thereof with arsenical mundic, incorporated with a suitable paint medium is stated to be effective, and to have no injurious effect upon the material of the hull.—C. A. M.

(C.)—INDIA-RUBBER, &c.

Gutta-Percha and Rubber of the Philippine Islands. P. L. Sherman. Report of Government Laboratories of the Philippine Islands for the year ended Aug. 31, 1902, 554—560.

The following gutta-percha- and rubber-producing trees and vines have been found and named:—

Name.	Locality.	Product.
Ficus elastica, Nois	Manila and many localities south.	Rubber.
Palaquium latifolium, Blanco.	Vicinity of Davao and as far north as Tarlac Province.	Gutta-percha.
Palaquium luzonensis, Vid.	Mindanao............	"
Balete	Throughout the archipelago.	Gum.
Artocarpus elastica, Mig.	Mindanao............	Rubber.
" incisa, Lin. ..	.. .. ..	..
Ficus concinner, Mig. ..	Throughout the archipelago.	Rubber.
" superbus, Mig.	Western Mindanao....	"
Alstonia scholaris, R. Br.	Mindanao............	Gum.
Ficus radiata, Dcne	"	Rubber.
" radicans, Roxb. ...	"	"
" [illegible], Garc.	"	"

Numerous other gutta-percha- and rubber-producing trees and vines, many of which appear to be unknown botanically, also grow in the islands.

From an examination of the gutta-percha and rubber, the author concludes that the collectors mix gutta-percha from various species of trees into one mass, which is frequently further adulterated with bark, stones, and water before being sold for exportation. The best sample of gutta-percha examined contained practically equal parts of "gutta" and resins, whilst for cable insulation a material containing two parts of gutta to one part of resins is demanded. The "gutta" contained in the various specimens examined is at least equal in quality to that contained in the best Singapore gutta-percha. The specimen of rubber examined closely resembled the best grade of Borneo rubber.—A. S.

Leather, Rubber, Wood, and the like; Manufacture of Material to be used as a substitute for ——, and of a Composition to be employed therein. W. F. Reid. Eng. Pat. 3485, Feb. 13, 1903. XIV., below.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patent.

Leather, Rubber, Wood, and the like; Manufacture of Material to be used as a Substitute for —— and of a Composition to be employed therein. W. F. Reid, Addlestone, Surrey. Eng. Pat. 3485, Feb. 13, 1903.

Fibrous material, such as wool felt, is impregnated with a solution in acetone or other solvent of the commercial product "velvril" (Eng. Pat. 21,995 of 1895; this Journal, 1899, 972), the flexibility of which may be increased by the addition of a small proportion of castor oil. The addition of a mixture of paraffin wax with mineral oil and lime increases the water-proof character of the material, the two latter ingredients preventing the paraffin wax cracking at low temperatures. Claim is also made for the use of this waterproofing composition with other fibrous materials.—C. A. M.

XV.—MANURES, Etc.

Phosphoric Acid; Ammonium Nitro-Molybdate Reagent for the Determination of ——. A. Mercier. XXIII., page 711.

XVI.—SUGAR, STARCH, GUM, Etc.

Effluents from Sugar Factories; Application of the Oxidation Process to the Purification of ——. R. Grassberger and M. Hamburg. Hygien. Rundsch., **13**, 336—356; Chem. Centr., 1903, **1**, [19], 1101.

The authors are unable from their results to express a definite opinion as to the general applicability of the oxidation process to the purification of effluents from sugar works. A rapid destruction of the easily decomposable substances is effected—although not by a process of oxidation in the usual sense of the word—and the capability of the effluents of contaminating river water is thus diminished. The results obtained, however, in no way confirm the conclusions of Dunbar (this Journal, 1902, 185), who found that the effluent from a sugar factory at Wendessen was converted by the oxidation process into a product which did not possess the characteristic beet odour, and was not liable to undergo putrefaction, with formation of sulphuretted hydrogen. The authors attribute the differences between their results and those of Dunbar to the different composition of the effluents, and especially to the fact that the one they examined was of an acid character, and much stronger than the Wendessen effluent. They found that if the effluent was allowed to ferment, then the oxidation process gave a clear, odourless product, whicl did not undergo alteration when exposed to the air fo a long time.—A. S.

Pentoses; New Bases derived from ——. E. Roux. XXIV., page 713.

English Patent.

Saccharine Juices; Purification and Concentration —— , and Products from Sugar Manufactories. J. A Besson. Eng. Pat. 9506, April 24, 1902.

See U.S. Pat. 710,113, Oct. 7, 1902; this Journal, 190 1406.—T. H. P.

United States Patent.

Sugar; Process of Converting Wood into ——. A. Classe Aix-la-Chapelle, Germany. U.S. Pat., Reissue, 12,10 May 5, 1903.

See Eng. Pat. 12,588, June 20, 1901; this Journal, 190 1008.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc

Polysaccharides of High Molecular Weight; Successi Action of Acids and Soluble Ferments on ——. Bourquelot and H. Herissey. Comptes rend., 19 **136**, [19], 1143—1146.

Continuing their researches on the carbohydra (mannans) which constitute the horny endosperms certain seeds, notably in the palm family, the authors ha remarked that, whereas these polysaccharides are all capal of being hydrolysed with the production of mannose the enzymes secreted during the germination of the se themselves, only some of them are hydrolysed by *semina* the enzyme of malted Lucerne seeds, whilst others re the action of this latter enzyme. To the latter cl belongs the carbohydrate of the seeds of *Phœnix canarien*, which yields mannose on hydrolysis with dilute ac. Fifty grms. of the powdered seeds were treated w 75 grms. of 60 per cent. sulphuric acid for 24 hours, th diluted with water; the solution was neutralised filtered. This solution was absolutely free from manno; it was then digested at 40° C. in presence of toluene w malted Lucerne seeds for two days, at the end of wh time a considerable production of mannose had occurr. A similar result was obtained by treating ivory n (*Phytelephas macrocarpa*) in a similar manner. After e action of the sulphuric acid, a solution and a residue we obtained, from both of which mannose was produced by action of malted Lucerne. Hence it follows that enzyme seminase of the Lucerne seed is lacking in som the active enzymic principles necessary to carry out first stages of the hydrolysis of certain of the more com mannans of the palms, but when these preliminary s are first effected by a suitable treatment with acid, semi is able to complete the hydrolysis from the interme products to mannose. The natural enzymes of these p may therefore be regarded as containing members w are complementary to seminase towards the mannans.

—J. F.

Malting with Bleaching Powder. Dvorak. Oesterr. Brauer und Hopfenzeit., 1903, [9], 111; through Woch. f. Brau., 1903, **20**, [20], 245.

The author describes some experiments on the addition of bleaching powder solution to the steep-waters in the malting of barley. In one case the bleach was added to the last steep-water and in another to the last water but one. The barleys which had been treated with bleach were superior, as regards the proportion of germinating corns, uniformity of growth, the development of the rootlets and the degree of modification, to the same grain steeped in the ordinary manner. The malt, however, retained an objectionable odour of bleach which was especially noticeable on the couches. The same defect was evident in the brewing process, especially during boiling; the wort from the barley which had been treated with bleach settled more apidly than that from the plain malt, but it showed a listinct opalescence, especially noticeable on discharging nto the cooler. On the cooler the wort showed a "foxy" urface and formed small flocks. On fermentation the east seemed to be rather looser than usual; the beer had o brilliancy and did not break, the opalescence still persisted. Fermentation required 24 hours longer than in the ase of the wort from the ordinary malt. The beer remained ull during cellarage, the flavour wa harsh and crude, but his might possibly be modified by longer keeping. In nother series of experiments, some inferior damaged barley as treated in the same way; a remarkable improvement as effected in the growth, the percentage of germinating orns being increased from 86—88 per cent. without bleach 92—94 per cent. with bleach. The odour of the bleach, owever, persisted throughout the brewing and rendered e beer objectionable and dull. Thus, in spite of the xcellent effect of bleaching powder on the malting process, is not to be recommended because of its disastrous fluence on the beer.—J. F. B.

'ortland Cement [in the Brewery]. Tageszeit. für Brau., 1903, **1**, [105], 462.

oslich has recently uttered a warning against the use of g cement or iron cement in breweries. Such cements ntain calcium sulphide, from which by the action of rbon dioxide, which is present to a considerable extent in ose parts of a brewery where the cement is likely to be d, sulphuretted hydrogen is produced. The author gives o simple tests by means of which the brewer can judge e nature of the cement.

1. 100 grms. of the cement are mixed with water in a k and a current of carbon dioxide passed through. rtland cement is not affected, but in the case of a cement taining calcium sulphide, sulphuretted hydrogen is evolved l may be recognised by its odour or by the blackening of d acetate paper.

. A small quantity of the cement mixed to a paste with er is placed on a bright silver coin and allowed to remain hours. If calcium sulphide be present, a black stain is duced on the coin, owing to the formation of silver hide.—A. S.

Ferments; Notes on Recent Work on Vegetable ——. W. G. Freeman. XXIV., page 714.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

ours or Starches Employed as Food; Certain Foreign —. Ballard. J. Pharm. Chim., 1903, **17**, [10], 476—478.

.—The starch known in Tahiti as apé is obtained from rhizomes of *Arum macrorhizum*, which is common in inia. The plant is cultivated in moist situations, in milar manner to the yam (*Arum esculentum*), the rcles of which are much appreciated in Polynesia, r the name of "Taro."

onophallus flour, much used as a foodstuff by the nese, is derived from the tubercles of an Aroid (*orphophallus*), which belongs to the same tribe as the yam. These tubercles may weigh as much as 2 or 3 kilos. On contact with cold water the flour forms, in a few hours, a very sticky mass, even in the proportion of 1 part of flour to 50 of water.

Tavolo is a starch derived from the tubercles of a kind of yam (*Tacca pinnatifida*, N.O. Taccaceæ) indigenous to Madagascar. The Malagasy employ it in the form of dampers.

Arrowroot is the starch of the rhizomes of *Maranta arundinacea*, widely cultivated in the tropics and much esteemed as a food. In Réunion and Tahiti, cakes of arrowroot are employed as food for infants.

Banana Flour is prepared from the unripe fruit of *Musa sapientium*, before any sugar has been formed therein. The peeled fruit is cut transversely in round slices, dried by means of a stove or in the sun, then powdered and sifted. It is much used as food in the Indian Archipelago, the Pacific Isles, on the West Coast of Africa, and in Brazil, in the form of porridge, damper, or cake. Its introduction into Europe has been attempted in recent years, but without much success.

Caryot, Sago, and Talipot.—Caryot starch is obtained from the trunk of the Indian palm (*Caryota urens*). The quality is inferior to that of ordinary sago, which is derived from the sago palm (*Sagus rumphii*). Talipot is also obtained from a palm—*Corypha umbraculifera*. The trees are cut down when 10 or 15 years old, the sap is allowed to drain away, the bark is removed, and the pith suspended in water, which is then strained through a cloth to remove the woody tissue. The starch obtained from the strained liquor is known in Ceylon as "raw palmira root flour"

Mapé.—This is a coarse starch obtained from Tahiti, derived from the fruit of *Inocarpus edulis*, which is eaten when cooked. Its ash contains traces of manganese.

Nété is the flour derived from the pulp of the fruit enveloping the seeds of *Parkia biglobosa*, a leguminous tree, widely distributed in Guinea and other parts of tropical Africa.

Bread Fruit Flour, from the dried unripe fruit of *Artocarpus incisa*, powdered and sifted, is an insipid non-saccharine substance which, under the name of "Maiore," forms, with bananas and fish, the staple food of the

—	Apé Starch.	Conophallus Flour.	Tavolo Starch.	Mapé Starch.	Nété Flour.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Water	10·60	14·60	14·10	14·80	9·90
Albuminoids.	1·26	3·69	0·98	0·79	3·63
Fat	0·55	0·40	0·35	0·10	0·90
Sugar	5·70	..	..	3·18	31·25
Starch	80·14	75·51	84·17	80·48	38·47
Cellulose.....	0·85	1·10	..	0·15	11·65
Ash..........	0·90	4·70	0·40	0·50	4·20

—	Ceylon Arrowroot.	Réunion Arrowroot.	Tahiti Arrowroot.	Tonkin Arrowroot.	Banana Flour.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Water	11·00	13·20	13·70	15·00	11·90
Albuminoids.	1·38	0·44	1·42	0·89	3·68
Fat	0·40	0·20	0·10	0·15	0·55
Starch	86·87	85·96	84·33	83·46	79·82
Cellulose.....	0·15	..	0·15	..	1·95
Ash..........	0·20	0·20	0·30	0·50	2·10

—	Caryot Starch.	Sago.	Talipot Starch.	Cape Verde Bread-fruit Flour.	Tahiti Bread-fruit Flour.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Water	15·90	12·10	12·90	13·80	14·30
Albuminoids.	1·07	2·15	4·76	2·61	1·10
Fat	0·15	0·15	0·50	0·85	0·20
Starch	82·33	80·10	77·04	80·64	83·85
Cellulose.....	0·15	4·00	2·00	0·10	0·15
Ash..........	0·49	1·20	2·80	2·00	0·40

Tahitians. The fruit weighs 1—3 kilos., and is eaten when cooked, as bread, before it is ripe, and while it is yet hard and its starch has not been converted into sugar. Three crops are obtained in a year.

The percentage composition of these flours and starches is given in the accompanying table.—J. O. B.

Formaldehyde [Use of ——, in Preparation of Nutritive Substances]. C. Goldschmidt. Chem.-Zeit., 1903, **27**, [40], 484.

If equal parts of milk and a 40 per cent. solution of formaldehyde are mixed, a precipitate is immediately formed, which, after filtering and drying, forms a white powder, containing only traces of formaldehyde. It contains the nutritive constituents of milk, and may be used as a food.

Animal blood and formaldehyde form a jelly, which dries to a brown powder. This might also serve as a nutrient. Both compounds resemble Blum's preparation from albumin and formaldehyde.—L. F. G.

English Patent.

Fruit, Vegetables, and similar Produce; Method of Desiccating ——. E. Passburg, Berlin. Eng. Pat. 12,453, May 31, 1902.

The produce is spread out on trays or plates in a vacuum drying chamber, and, if desirable, subjected to a preliminary steaming. A vacuum is then produced in the chamber, which is warmed by circulating steam through surrounding coils or plates, the temperature not being allowed to rise sufficiently high to impair the colour, quality, or aroma of the produce. To complete the drying, the steam is shut off, and the vegetable or fruit removed to a second chamber, where the final drying is carried out by heating by means of hot water, the temperature of which is gradually diminished as the desiccation proceeds.—W. H. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Effluents from Sugar Factories; Application of the Oxidation Process to the Purification of ——. R. Grassberger and M. Hamburg. XVI., page 70[illegible].

English Patents.

Sewage; Filtering Tanks for ——. H. W. Dige, Copenhagen. Eng. Pat. 9623, April 25, 1902.

After leaving the septic tank, the sewage runs into a collecting tank. This tank contains two pipes fitted with water traps, one pipe leading to the top of the filter-bed and the other to the bottom. Over the ends of the pipes in the collecting tank is placed a cap, open at the bottom, and having a partition between the two pipes. Each of the chambers formed by this partition contains an inverted U-tube, one end of which is in the pipe and the other end outside the cap. One of the water-traps is filled with water, whilst the second one is only half full. When the sewage commences to flow, it is delivered by the pipes alternately to the top and bottom of the filter-bed. The moment at which the discharges take place may be regulated by adjusting the heights of the U-tubes. The effluent from the filter passes through a perforated wall, collects in a chamber, and is intermittently discharged therefrom by a syphon.—W. P. S.

Sewage or other Liquids; Apparatus for Use in the Distribution and Sprinkling of ——. F. Candy and E. R. Candy, both of London. Eng. Pat. 15,646, July 11, 1902.

The arms of a revolving apparatus are supported by floats which also revolve in a circular tank containing water or brine. The arms discharge the sewage into a conduit, from which it is conducted by syphons connected to the revolving arms, into troughs provided with perforations through which the liquid is distributed on to the filter bed. The troughs are triangular in section and have a vertical partition reaching nearly to the top, and are covered so that they may work under pressure.—W. P. S.

(*C.*)—DISINFECTANTS.

English Patents.

Acetylene as a Disinfectant and Insecticide; Application of ——. J. Choulet, Algiers. Eng. Pat. 11,535, May 20, 1902.

See Fr. Pat. 322,281, 1902; this Journal, 1903, 315.
—W. P. S.

Fumigating and Disinfecting Match. T. Hastung, Melle, Germany. Eng. Pat. 4126, Feb. 25, 1903.

The stick of an ordinary safety match is coated or impregnated with substances which on combustion develop strong aromatic, disinfecting vapours.—G. W. McD.

French Patent.

Disinfectant. Soc. Anon. des Prod. Chimiques Spéciaux. Fr. Pat. 325,391, Oct. 23, 1902.

The compound claimed consists of a mixture of 95 parts o trioxymethylene and 5 parts of sodium sulphite. Th mixture is soluble in water.—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Peat Moss and like Material; Production of Fibre f Spinning, Paper-making, &c., from ——. J. Doul London. Eng. Pat. 9408, April 23, 1902.

Peat moss is washed in a circular open vat provided wit a mechanical agitator, the upper fibrous portion is the separated from the heavy impurities at the bottom, an passed into a tank in which it is steeped for a long t in a 2 per cent. solution of sodium sulphide or sulphat milk of lime or alkali at the ordinary temperature. T mass is then steeped in a dilute solution of any convenie acid. In order to facilitate the action of the chemica the mass is frequently subjected to compression by mea of rollers or stamps during the treatment, and the pecu method of agitation, which consists in drawing the fib through the liquor by means of long teeth or spikes set a frame with a rising and falling as well as a forwa motion, also contributes to the same end.—J. F. B.

Viscose; Manufacture of Alkaline Solutions of — W. P. Thompson, London. From Vereinigte Kun seidefabr. Act.-Ges., Frankfort-on-Main. Eng. Pat. 17, Aug. 8, 1902.

See Fr. Pat. 323,473 of 1902; this Journal, 1903, 508.
—T. F. B

French Patents.

Waste Paper; Process for Preparation and Cleans of ——, and Production of Paper Pulp therefr. Knopf Patent Paper Pulp Synd. Fr. Pat. 325, Sept. 16, 1902.

See Eng. Pat. 13,269 of 1902; this Journal, 1903, 646
—J. F.

Celluloid of Reduced Inflammability; Preparation of — N. L. Pillion. Fr. Pat. 325,336, Oct. 16, 1902.

Celluloid of considerably reduced inflammability is pared by incorporating silica with the plastic mass. This effected by adding to the celluloid solvent any conve proportion of an ethereal derivative of silicic acid, suc amyl silicate or methyl silicate; in the case of a silicic ester such as ethyl disilicate, the substanc preferably added to the celluloid in the state of a sol in an appropriate solvent.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS ESSENCES, AND EXTRACTS.

Terpenes and Essential Oils. O. Wallach. Annal 1903, **327**, [2], 125—127.

A study of pulegenic acid and its derivatives.—J. T.

Tuberose Flowers; Essential Oil of ——, *and its Development during Enfleurage.* A. Hesse. Ber., 1903, **36**, [7], 1459—1470.

The perfume of tuberose flowers, like that of jasmine, is extracted on the industrial scale by the process of enfleurage. The flowers are spread upon glass plates covered with fat and allowed to remain for three days, the fat being saturated after 30—36 of such treatments. The author has studied comparatively the essential oil extracted from the fresh flowers and that obtained from the enfleurage pomade. Distillation of the fresh flowers caused profound modification of the oil and yielded a product of objectionable odour. The fresh flowers were therefore extracted with light petroleum spirit, by which means 56 grms. of essential oil were obtained from 1,000 kilos. of flowers. The exhausted flowers, when distilled with steam, yielded a further 10 grms. of oil, so that it may be concluded that tuberose flowers contain when freshly plucked about 0·0066 per cent. of essential *tuberose oil.* The process of enfleurage on the industrial scale was then studied, the essential oil being extracted from the pomade so prepared; in this way 1,000 kilos. of flowers yielded 801 grms. of essential oil, which the author terms, for the sake of distinction, *tuberose-flower oil.*

An examination of the two oils showed that they consisted mainly of esters of the aromatic series. Both oils contained methyl anthranilate, benzyl alcohol, both free and combined, and esters of benzoic acid; benzyl benzoate was present in considerable quantities. The tuberose-flower oil contained methyl salicylate, which was not present in the tuberose oil.

The tuberose oil contained only 1·13 per cent. of methyl anthranilate, whilst the tuberose-flower oil contained about 5 per cent. of that ester, corresponding to an increase of about 56 times the original quantity.—J. F. B.

Lemongrass Oil: Adulterated ——. E. J. Parry. Chem. and Druggist, 1903, **62**, [1215], 768.

The author recently examined a sample of lemongrass oil, which, except that it had a low specific gravity, complied satisfactorily with the ordinary tests. The following figures were obtained:—Sp. gr., 0·893; optical rotation, −1° 30′; citral (apparent), 76 per cent. The oil was completely soluble in 3 vols. of 70 per cent. alcohol. On distilling the oil under reduced pressure, however, liquid commenced to come over at a very low temperature. By distilling 50 c.c. of the oil at ordinary pressure, 5·5 c.c. were obtained below 68° C., and examination of this distillate showed that the oil was adulterated with acetone.
—A. S.

Cryogenin; Distinctive Reaction for ——. Manseau. XXIII., page 712.

Cantharides; Determination of Cantharidin in ——. E. Léger. XXIII., page 712.

Cinchona Alkaloids; Indicators for the Volumetric Determination of ——. J. Messner. XXIII., page 712.

Cod Liver and Sesamé Oils; New Reagent for ——. Ciuperceseo. XXIII., page 711.

English Patents.

Acetyl Chloride; Manufacture of ——. A. Wohl, Charlottenburg. Eng. Pat. 14,032, June 20, 1902.

See U.S. Pat. 710,648 of 1902; this Journal, 1902, 1111.
—T. F. B.

Essential or Fixed Oils or other Fatty Substances; Method of Reducing ——, *into a Dry Powder.* G. B. Loeffler. Eng. Pat. 1788, Jan. 24, 1903. XII., page 705.

Salicin; Extraction of ——, *from the Bark of the Red Osier.* D. Crispo, Antwerp. Eng. Pat. 6817, March 24, 1903.

HE bark of the red osier is digested in a suitable apparatus; he juice passing from the last digestor is treated with ufficient zinc sulphate and baryta for the separation of the tannin, the filtered juice is treated with milk of lime and boiled to eliminate or decompose other undesirable matters, and is then clarified by zinc sulphate. The juice is filtered off from the calcium sulphate, and the excess of lime is removed by sodium carbonate. The filtered solution is concentrated under vacuum, and the salicin slowly crystallises out after cooling. The crystals may be purified by basic lead acetate, the excess of which is removed by sulphuretted hydrogen.—J. F. B.

United States Patents.

Camphidon; Manufacture of ——. J. Tafel, Würzburg, Germany, Assignor to C. F. Boehringer und Soehne, Mannheim, Waldhof. U.S. Pat. 727,024, May 5, 1903.

See Eng. Pat. 12,325 of 1901; this Journal, 1902, 872.
—T. F. B.

Camphidin, and Method of Preparing same. J. Tafel, Würzburg, Assignor to C. F. Boehringer und Soehne, Mannheim, Waldhof, Germany. U.S. Pat. 727,026, May 5, 1903.

See Eng. Pat. 12,325 of 1901; this Journal, 1902, 872.
—T. F. B.

Hydroxylamine; Art of Producing ——. J. Tafel, Würzburg, Assignor to C. F. Boehringer und Soehne, Mannheim, Waldhof, Germany. U.S. Pat. 727,025, May 5, 1903.

See Fr. Pat. 318,978 of 1902; this Journal, 1902, 1458.
—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

English Patent.

Photographic Film; Non-Explosive and Non-Inflammable ——. S. G. Fry, Liverpool. Eng. Pat. 12,818, June 5, 1902.

Paper is coated with collodion (*e.g.*, 5 grs. of pyroxylin in 1 oz. each of spirit and methyl ether) and allowed to dry. This backing is coated with gelatin and hardened by means of formaldehyde. This film is coated with a sensitive gelatin emulsion, exposed, and developed, &c. The film can be detached from the support by mechanical means, or by the aid of methylated spirit. If the film is to be transferred to glass, opal, &c., the first gelatin coating and the hardening are omitted. This process gives a gelatin film, which is non-explosive and non-inflammable.—T. F. B.

United States Patent.

Nitrocellulose Films or *Sheets; Process of Manufacturing* ——. F. A. Anthony, Hackensack, N.J. U.S. Pat. 726,614, April 28, 1903.

Dissolved nitrocellulose is delivered on to a web of fabric, which is then wound spirally upon a cylinder, a raised rib being formed between adjacent edges to prevent sticking.
—G. W. McD.

French Patent.

Photographic Developer; Preparation and Use of a New Substance as a ——. Soc. Anon. des Plaques et Papiers Photographiques A. Lumière et ses Fils. Fr. Pat. 325,385, Oct. 11, 1902.

Methylamino-*p*-hydroxybenzene combines with hydroquinone (quinol) in molecular proportions of two to one to form a definite compound, of m. pt. 140° C. Saturated solutions of two molecular proportions of methylamino-*p*-hydroxybenzene and one of quinol are mixed, and 100 grms. of anhydrous sodium sulphate dissolved in every litre of the solution. The compound separates after a short time in the form of small white crystals.

It is found to develop the latent image with sodium sulphite alone. Alkali carbonates increase the rapidity of its action.

A suitable developer is composed of water, 1,000 grms.; anhydrous sodium sulphite, 60 grms.; compound of methylamino-*p*-hydroxybenzene and quinol, 7·5 grms.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives in Coal Mines Order [April 24, 1903].

Under above date the following have been added to the list of permitted explosives:—

Bobbinite.—Potassium nitrate (62—65 parts), charcoal (17—19½ parts), sulphur (1½—2½ parts), copper sulphate and ammonium sulphate (13—17 parts), moisture (0—2½ parts).

Coronite.—Nitroglycerin (38—40 parts), nitro-cotton (1—1½ parts), ammonium nitrate (26—28 parts), potassium nitrate (3—5 parts), aluminium stearate (11—14 parts), rye-flour (8—11 parts), wood-meal (2—4 parts), liquid paraffin (2—4 parts), moisture (0—2½ parts).

Westfalite No. 1.—Ammonium nitrate (94—96 parts), resin (4—6 parts), moisture 0—½ part).

Westfalite No. 2.—Ammonium nitrate (90—92 parts), potassium nitrate (3—5 parts), resin (4—6 parts), moisture (0—½ part).—G. W. McD.

English Patent.

Explosives of High Disruptive Force; Manufacture of ——. R. Escales, Munchen, Bavaria. Eng. Pat. 9043, April 18, 1902.

See Fr. Pat. 320,135; this Journal, 1903, 111.
—G. W. McD.

Safety Explosives or Blasting Compositions. J. Wetter. From the Westfälisch-Anhaltische Sprengstoff A.-G., Berlin. Eng. Pat. 14,585, June 30, 1902.

The explosive consists of nitroglycerin (39 parts), liquid paraffin (4), ammonium nitrate (25·5), potassium nitrate (5), ammonium oxalate (2·5), aluminium stearate (10), and rye-flour (14 parts).—G. W. McD.

Phosphorus; Production of ——. T. Parker. Eng. Pat. 16,062, July 30, 1902, VII., page 696.

Match; Fumigating and Disinfecting ——. T. Hasting. Eng. Pat. 4426, Feb. 25, 1903, XVIII. C., page 708.

United States Patents.

Explosive, and Process for Making same. M. W. Beardsley, Oakland, Cal. U.S. Pat 727,062, May 8, 1903.

Oxygen-bearing metallic salts are thoroughly incorporated with corn-oil (maize-oil), carbon, and sulphur, to form the explosive.—G. W. McD.

[*Matches*] *Igniting Composition; and Method of making same* ——. O. Dieffenbach and A. Schäfer, Griesheim, Germany, Assignors to Chemische Fabrik Griesheim-Elektron, Frankfort, Germany. U.S. Pat. 727,758, May 12, 1903.

A non-poisonous match composition consisting of phosphorus trisulphide, zinc oxide, potassium chlorate, iron oxide, ground glass, and a solution of glue.—G. W. McD.

French Patents.

Safety Explosives containing Hygroscopic Mixtures; Process for Increasing the Stability of ——. F. Schachtebeck. Addition, dated Oct. 15, 1902, to Fr. Pat. 321,246, May 20, 1902.

See Eng. Pats. 11,325 and 22,645 of 1902; this Journal, 1903, 111, 229.—T. F. B.

Explosive; Method of Manufacture of New ——. C. F. Bichel. Fr. Pat. 325,507, Oct. 21, 1902.

A glue-gelatin, formed by dissolving one part of glue in seven parts of glycerin, at an elevated temperature, is used wholly or in part in place of collodion cotton, in nitroglycerin explosives of the blasting-gelatin type. The proportions given are:—Glue-gelatin (1 part), nitroglycerin (3 parts), and also glue-gelatin (3 parts), nitroglycerin (92 parts), and collodion cotton (5 parts).—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Sodium Hydrosulphite [*Hyposulphite*]; *Reaction of* —— *on Metallic Salts.* O. Brunck. Annalen, 1903, **327**, [2], 240—250.

Copper.—On gradually adding a solution of pure sodium hydrosulphite to a solution of copper sulphate, a reddish-yellow precipitate forms, quickly becoming red-brown. This precipitate contains no copper hydride, but consists of metallic copper, with small quantities of cupric sulphide. If the copper sulphate be added to the sodium hyposulphite, the red-brown precipitate formed changes through brownish-green to black, and then consists chiefly of copper sulphide ($CuSO_4 + Na_2S_2O_4 = Cu + Na_2SO_4 + 2SO_2$, and $Cu + 2Na_2S_2O_4 = CuS + Na_2S_2O_5 + Na_2SO_3$). Cupric chloride is reduced by hydrosulphite to cuprous chloride, and by excess to metallic copper; here also there is no formation of copper hydride. Cuprammonium solutions are first decolorised by hydrosulphite, then slowly reduced by excess to the metallic state. The hydrosulphurous acid is always oxidised to sulphurous, never directly to sulphuric acid. The precipitation of copper is quantitative, in neutral or acid solutions, and the precipitate is very compact, so that considerable quantities can be collected and washed on a small filter. It cannot be weighed direct, owing to the presence of sulphur; but may either be converted into cuprous sulphide or dissolved and deposited electrolytically. It is completely separated by this precipitation from iron, zinc, nickel, and cobalt.

Silver.—Sodium hydrosulphite throws down black-grey metallic silver from solutions of silver salts. The precipitation is complete even from solutions containing free nitric acid, but the precipitate always contains sulphur. As an analytical process it presents no advantage over other methods.

Gold.—Very dilute gold solutions are coloured purple-red by sodium hydrosulphite, but remain clear; excess causes precipitation of the metal, which occurs at once in stronger solutions. The coloration can be used as a qualitative test for gold, but the quantitative separation is not advantageously carried out by this method.

Zinc.—Zinc hydrosulphite, and the double salt of zinc and sodium, are soluble in water; but if a solution of a zinc salt be heated with excess of sodium hydrosulphite, the zinc is precipitated as sulphide ($ZnS_2O_4 + 2Na_2S_2O_4 = ZnS + 2Na_2S_2O_5 + SO_2$). The precipitation is, however, incomplete.

Cadmium.—Neutral solutions of cadmium salts give with sodium hydrosulphite a white crystalline precipitate of $2CdS_2O_4 . Na_2S_2O_4$. By the action of heat or of dilute acids this is decomposed, and cadmium sulphide is separated. If the cadmium salt solution be acidified to begin with, the sulphide comes down at once. ($CdSO_4 + 3Na_2S_2O_4 = CdS + Na_2SO_4 + 2Na_2S_2O_5 + SO_2$.) The precipitation is complete, but the precipitate is difficult to filter, and precipitation by hydrogen sulphide is therefore to be preferred, except where cadmium and zinc are to be separated, for no zinc is carried down with the cadmium when sodium hydrosulphite is the precipitant.

Mercury.—Metallic mercury is thrown down from mercury salts; in the case of the chloride, the first portions, if shaken with the liquid, react to form calomel, which, however, is again reduced to metal by further addition of hydrosulphite. Excess of hydrosulphite readily converts the mercury into sulphide. The precipitation of metal is complete, and may be used to separate mercury from metals not precipitated by hydrosulphite.

Independently of the author, J. Meyer has just published some work (see this Journal, 1903, 492) on hydrosulphites. Though in the main he has proceeded on different lines from the author, yet he has confirmed the author's conclusion that copper hydride is not formed by the reaction of hydrosulphites on copper salts.—J. T. D.

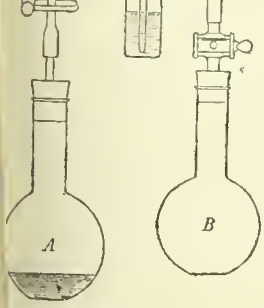
INORGANIC—QUANTITATIVE.

Carbon Dioxide; Volumetric Determination of ——, by Pressure or Liquid Measurement. A. Wohl. Ber., 1903, **36**, [7], 1412—1417. (See also this Journal, 1902, 1412—1413.)

The determination is carried out as follows:—A flask A of 100—120 c.c. capacity serves for the evolution of the carbon dioxide, and is provided with a rubber stopper, through which passes a piece of capillary glass tubing, fitted with a piece of rubber tubing and a pinch-cock. After introducing the substance or solution to be analysed, the flask is evacuated as far as possible with the filter pump, the pressure being immaterial.

Decomposition is effected by 5—10 c.c. of 5 per cent. hydrochloric acid solution, introduced through a funnel attached to the rubber tubing. The funnel is removed, and the upper end of the rubber tubing closed with the fingers, and the pinch-cock opened; this is then again closed and air allowed to fill the upper part of the tubing. These manipulations are repeated once or twice, and by this means the liquid in the capillary glass tube is completely drawn into the flask, without admitting appreciable quantities of air.

The flask A is then connected to a small washing bottle of 8—10 c.c. capacity, which is filled afresh for each determination to two-thirds of its height with concentrated sulphuric acid; and this is connected with the flask B, which is provided with a glass tap, and has been previously evacuated with the pump, the pressure in it being immaterial. If the carbon dioxide determination is to be made from pressure measurements (this Journal, 1902, 1413), the volume of the flask B up to the bore of the glass tap must be known; it is conveniently made 100 c.c. If the determination is made from liquid measurements (*loc. cit.* 1412) any flask will do.



Equilibrium is first established between the evacuated flask B and ie contents of the washing-bottle, by gradually opening e glass tap (provided with capillary notches as before scribed), and then closing it. Equilibrium is then tablished between the flask A and the washing-ttle, by very gently opening the pinch-cock, which finally left quite open. The glass tap is then again ghtly opened, and the gas sucked from A through the shing-bottle into B, at a suitable speed, without carrying y sulphuric acid over. The glass tap is at last fully ened, and the liquid in A slowly heated to boiling. When inlet tube of the washing bottle has become hot, the uid in A is kept boiling for another one or two minutes, steam being absorbed by the concentrated sulphuric d with a loud rattling noise. The sulphuric acid becomes , but should not be allowed to boil; if this precaution observed, not a trace of hydrochloric acid passes over.

Vhen the gas bubbles are completely absorbed by the centrated sulphuric acid, the heating is stopped, and the ch-cock immediately closed, the sulphuric acid of course ig in the connecting tube. The flask A is now removed n below the pinch-cock, the glass tap of B closed, and sulphuric acid driven back by cautiously opening the h-cock, equilibrium being thus established between the hing bottle and the atmosphere. The glass tap is then u cautiously opened, when the inrushing air drives the un dioxide completely into B. The glass tap is then ed, the flask B detached from the washing-bottle, ersed in water, and the contents brought to atmospheric pressure by momentarily opening the tap. The carbon dioxide is then determined by the methods previously described (*loc. cit.*).—L. F. G.

Volumetric Gas Analysis by Means of Flasks. A. Wohl. Ber., 1903, **36**, [7], 1417—1422. (See also preceding abstract, and this Journal, 1902, 1412, 1413.)

The author applies his method of gas analysis to the determination of ammonia by means of brominated caustic soda solution, and to the determination of carbon dioxide in solid carbonates. (The brominated soda is prepared by mixing 250 c.c. of caustic soda solution of sp. gr. 1·33, 1 litre of water, and 25 c.c. of bromine.) Details of the manipulations, and of the quantity to be weighed out, so that each centimetre of difference of pressure found corresponds to 1 per cent. of the constituent determined, are given.
—L. F. G.

Persulphates; Quantitative Separations by Means of ——, in Acid Solutions. M. Dittrich and C. Hassel. Ber., 1903, **36**, [7], 1423—1427. (See also this Journal, 1902, 1414; and 1903, 230).

Separation of Manganese from Cadmium.—The solution is treated in exactly the same way as described for the separation of manganese and calcium (*loc. cit.*, 400—500 c.c. of solution being treated with 3 c.c. of concentrated nitric acid, and about 20 c.c. of a 10 per cent. solution of ammonium persulphate). The first wash water is acidified with nitric acid to remove traces of cadmium. The precipitate was qualitatively tested, and found free from cadmium; the latter being precipitated from the filtrate as sulphide, and determined as sulphate.

Separation of Manganese and Copper.—In dilute nitric acid solution the separation is complete, the precipitated manganese being first washed with a 2 per cent. nitric acid solution, and then with hot water. The manganese was determined as Mn_3O_4, and the copper as Cu_2S.

Separation of Manganese and Nickel.—The separation is complete in nitric acid solution.—L. F. G.

Antimony; A Study of the Quantitative Determination of ——. L. A. Youtz. School of Mines Quarterly, 1903, **24**, [2], 135—144.

The author's experiments indicated that a separation of antimony and tin cannot be effected by distillation from a hydrochloric acid solution. In the course of the experiments it was noted that stannous chloride in hydrochloric acid solution is entirely non-volatile up to a temperature of 150° C. Antimony oxidised by nitric acid or by potassium chlorate is also non-volatile at the boiling point of aqueous hydrochloric acid, probably owing to the formation of antimonic acid.—A. S.

Ammonium Nitro-Molybdate Reagent for the Determination of Phosphoric Acid; Preparation of ——. A. Mercier. Bull. de l'Assoc. Belge des Chim.; through Ann. de Chim. analyt., 1903, **8**, [5], 185.

One hundred grms. of commercial molybdic acid are treated with 144 c.c. of a 10 per cent. solution of ammonia (sp. gr. 0·9593). The volume of the solution is then made up to 500 c.c. with distilled water, filtered, and gently poured into a litre of nitric acid (sp. gr. 1·20). The nitric acid must not be poured into the ammonium solution. After allowing the mixture to stand for a few days, it is filtered.—J. O. B.

ORGANIC—QUALITATIVE.

Sesamé and Cod-Liver Oils; A New Reagent for —— Ciuperceseo. Bull. Assoc. Pharm. de Rouman.; through Répertoire de Pharm., 1903, **15**, [5], 219.

Nine c.c. of water and 25 c.c. of sulphuric acid, sp. gr. 1·84, are mixed; 4 c.c. of sesamé oil, and 3 c.c. of nitric acid, sp. gr., 1·37, are added to 8 c.c. of the acid mixture, and the whole is well shaken for three seconds; the emulsion assumes a grass-green colour, which persists for one minute. Olive oil, under similar conditions, gives no colour reaction;

cotton-seed oil a yellowish brown colour. The presence of 5 per cent. of sesamé oil may be detected in other oils by this test.

Cod-liver oil, when treated in a similar manner, gives a cherry-red to violet tint, at the zone of contact, and on violent agitation the mixture acquires a cherry-red colour. Ultimately the oily layer becomes yellow, the acid liquid colourless. No other animal oil, it is said, gives this reaction.
—J. O. B.

Cryogenin [m - Benzamino - semicarbazide]; Distinctive Reaction for ——. Manseau. Bull. Soc. Pharm. de Bordeaux, 1903, [3]; through Répertoire de Pharm., 1903, **15**, [5], 212.

A particle of cryogenin (*m*-benzamino-semicarbazide) when heated in a test-tube with 1 or 2 c.c. of hydrogen peroxide solution, gives a marigold-yellow colour, which changes to reddish orange or even to red according to the quantity of cryogenin present. Although cryogenin is but sparingly soluble in water, the reaction is sufficiently delicate to give the colour with its aqueous solutions.
—J. O. B.

ORGANIC—QUANTITATIVE.

Glycerin: Action of Alkalis on ——. Application of the Reaction to the Determination of Glycerin. A. Busine. Comptes rend., 1903, **136**, [18], 1082—1083.

When glycerin is heated with potash-lime, hydrogen is given off; but the reaction, and consequently the yield of hydrogen from a given amount of glycerin varies with the temperature. Between 220 and 250° C., the reaction is that described long ago by Dumas—

$$CH_2OH.CHOH.CH_2OH + 2KOH =$$
$$CH_3CO_2K + HCO_2K + H_2O + 2H_2.$$

Between 250° and 280° C. the results correspond with—

$$2C_3H_8O_3 + 4KOH =$$
$$2(CH_3CO_2K) + C_2O_4K_2 + 2H_2O + 5H_2.$$

The reaction may be looked on as proceeding according to the first equation, with subsequent decomposition of the potassium formate produced. Between 280° and 320° C., the equation is—

$$2C_3H_8O_3 + 6KOH =$$
$$2(CH_3CO_2K) + 2CO_3K_2 + 2H_2O + 6H_2$$

a result which may be looked on as arising simply from the reaction of the oxalate produced in the second equation upon more hydroxide. By keeping the temperature of the mixture of glycerin and alkali at 320° C. for an hour, and measuring the volume of hydrogen evolved, we have an accurate method for the determination of glycerin.
—J. T. D.

Cinchona Alkaloids; Indicators for the Volumetric Determination of the ——. J. Messner. Zeits. angew. Chem., 1903, **16**, [19], 444—450, and [20] 468—477.

With a view of finding some indicator which is more satisfactory than hæmatoxylin for the titration of the cinchona alkaloids, the author has made experiments with a large number of indicators. The only indicator which was found to be really suitable for the purpose is lacmoid, prepared by the purification of the commercial article in the following manner:—10 grms. of ordinary lacmoid are powdered and heated on the water bath with 1 litre of water for 3 hours; the blue solution is cooled, filtered, and extracted with ether. On evaporation of the red ethereal solution, about 4 grms. of purified lacmoid are obtained. In this state it is sparingly soluble in water and in ether, but readily soluble in alcohol; all these solutions have a red colour, but are so extremely sensitive to bases that they readily turn blue by the absorption of alkali from the glass vessels. Lacmoid is relatively non-sensitive to acids, and consequently quinine and other bases can be accurately determined in presence of weak acids, such as acetic acid or tannic acid. In a similar manner Poirrier's Blue C4B in strongly alcoholic solutions is non-sensitive to weak bases and extremely sensitive to weak acids; solutions of quinine salts in alcohol behave towards this indicator as acids and can be titrated as such; alcoholic solutions of standard alkali should be used, and the presence of water avoided. An alkaline alcoholic solution containing Poirrier's Blue is extremely sensitive to exposure to the air, from which it readily absorbs carbon dioxide, which behaves as an acid, and oxygen which bleaches the colouring matter; titrations must therefore be performed in a well-stoppered bottle. Accurate titrations have been obtained with quinine acetate and oxalate, but the tannate gives misleading colorations with Poirrier's Blue. The applicability of lacmoid for bases, and Poirrier's Blue for acids, is also available for ammonium acetate, and probably for salts of other bases and alkaloids.

The method of titration in presence of lacmoid in alcoholic solutions yielded equally accurate results with the four cinchona alkaloids, quinine, quinidine, cinchonidine, and cinchonine in the pure state. For the extraction of the bases from aqueous solutions prior to titration, the author recommends a mixture of ether with 5 per cent. by volume of alcohol, which has a solvent power towards cinchonine three times as powerful as pure ether. The process is as follows:—In a glass-stoppered bottle of 175—200 c.c. capacity, 1 grm. of bark extract is dissolved in 10 c.c. of water and 5 c.c. of absolute alcohol; 95 c.c. of ether and 10 c.c. of sodium carbonate solution (1:3) are added, and the mixture is shaken vigorously for 1 or 2 minutes and then left at rest for half an hour; 50 c.c. of the ethereal extract are then placed in a flask of at least 100 c.c. capacity, and the ether is distilled off, so that there remain about 2 c.c. of alcoholic solution, evaporation to dryness being avoided; 40—50 c.c. of alcohol are then added, an a little purified lacmoid, and the solution is titrated with decinormal hydrochloric acid to a red tint; the number of c.c. of acid multiplied by 6·18 (mean factor) gives th percentage of bases in the bark extract.

Identification of the Cinchona Bases.—Aqueou solutions of normal sulphates or hydrochlorides of thes bases behave differently when treated drop by drop with 5 per cent. solution of disodium phosphate:—1 grm. of th salt having been dissolved in 100 c.c. of water, 3 or 4 drop of the reagent are added to 10 c.c. of the solution. If permanent precipitate be formed immediately or almo immediately, the base is cinchonine; if no change b produced cinchonidine is indicated; if each drop of th reagent produces a cloudiness which disappears on agitatio quinine or quinidine is present. In the last case, 1 drop 25 per cent. hydrochloric acid is added to the remainin 90 c.c. of the alkaloid solution; to 10 c.c. of the acidifi solution are added 10 c.c. of the phosphate reagent. If t mixture remain clear, the base is quinidine; if an immedia precipitate of crystals occur, the base is quinine. If exce of a 5 per cent. solution of monosodium phosphate be add to a 1 per cent. solution of neutral cinchona salt, separation of quinine phosphate occurs almost immediatel whilst salts of the other bases show no reaction.—J. O. B.

Cantharides; Determination of Cantharidin in ——. I Léger. J. Pharm. Chim., 1903, **17**, [10], 457—461.

Twenty-five grms. of powdered cantharides are introduc into a wide-mouthed flask, with 125 c.c. of benzene, a 2 c.c. of hydrochloric acid. The flask is then corked a maintained for three hours at a temperature of 60—6 with occasional agitation. It is next allowed to cool, wh the contents are transferred to a percolation tube, the lo end of which is plugged with a pad of cotton moiste with benzene. When percolation ceases, the liquid obtain is set aside, a fresh receiver placed under the percolat and extraction continued with fresh benzene until powder is exhausted. The solvent is then distilled f from the two benzene percolates in a tared flask, the sec or weaker extract being distilled first, afterwards liquid first obtained. The final traces of benzene removed by plunging the flask up to the neck in the wa bath, and blowing air into it. After cooling, the gr residual oil is taken up with 10 c.c. of light petrole spirit (b. pt. below 50° C.). The flask having been cork is set aside for 12 hours; the liquid is then decanted o a tared 7 cm. filter, previously moistened with benzene, care being taken that no crystals of cantharidin are poured upon it; these are washed in the flask with 24 c.c. of light petroleum spirit employed in four portions, each washing being carefully decanted on to the filter, leaving the crystals in the flask. After exposure to the air for a few minutes, the filter and flask, the latter placed in an inclined position, to facilitate the egress of the petroleum vapour, are dried in an oven at 60—65° C. for one hour, when the cantharidin is weighed. The amount obtained from cantharides fit for medicinal use should not be less than 0·4 per cent. The prescribed time for drying should not be exceeded, since it is found that cantharidin is slightly, but sensibly, volatile at 60—65° C.—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Light; Chemical Dynamics and Statics under the Action of —— [*Carbonyl Chloride*]. M. Wilderman. Roy. Soc., Phil. Trans., 1902, **199**, 337—397; Roy. Soc. Proc., 1902, **70**, 66—74.

The author studied the reaction $CO + Cl_2 = COCl_2$, using pure gases which had been very carefully prepared, in order to exclude the important effects of traces of air and moisture. An acetylene light was used, special arrangements being provided for keeping it constant in intensity and composition. The results obtained show that the velocity of formation of carbonyl chloride is directly proportional to the product of the reacting masses at any given moment. The results of further experiments in cases where one of the opposite reactions goes on only in the light, and the other in the light and the dark, confirm the view that chemical equilibrium in homogeneous systems follows the laws of mass action, whether the reactions take place under the influence of light or in the dark.—A. S.

Arsenious Acid; Contributions to a Knowledge of ——. J. V. Lawidzki. Ber. 1903, **36**, [7], 1427—1436.

The views as to the constitution of arsenious acid in aqueous solution differ considerably. It has been assumed by Walden and Ostwald to be $H_2As_2O_4$. Conductivity experiments indicated as formula either $HAsO_2$ or $As(OH)_3$.

The author concludes that (1) arsenious acid contains only one atom of arsenic in the molecule; (2 and 4) it acts in aqueous solution as a weak acid, and as a weak base; (3) that it is approximately as strong as boric acid $B(OH)_3$, ts dissociation constant being $k = 21\cdot10^{-9}$.—L. F. G.

Colloidal Copper Acetylide; Note on ——. F. Küspert. Zeits. anorg. Chem., 1903, **34**, 453; Chem.-Zeit., 1903, **27**, [37], Rep. 107.

N adding a small quantity of ammoniacal cuprous chloride o an aqueous solution of purified acetylene, the solution urns deep-red and remains transparent. Colloidal copper cetylide is probably formed, since the solution can be kept r some time. If the solution be filtered, it becomes olourless. Silicate of soda, which, according to the author, sually acts as a preservative in the preparation of colloidal old and silver, proved inoperative in this case. But a ·2 per cent. solution of gelatin gave bright-red solutions, hich could be filtered and were perfectly stable. Pure d solutions are obtained if oxidation is prevented, by the ldition of hydroxylamine sulphate. The setting of the latin solution, and repeated melting, did not affect the lloidal state of the copper acetylide. In time, the mass rns brown, without depositing any solid particles. The ied jelly is not explosive.—L. F. G.

rbon Bisulphide Poisoning; Contributions to the Knowledge of ——. H. G. Haupt. Arch. Internat. Pharm. et Thérap., 1903, **11**, 159; Chem.-Zeit., 1903, **27**, [37], Rep. 115.

rbon bisulphide decomposes the blood, an aqueous ution containing 0·5—8 parts per 1,000 dissolves moglobin, producing oxyhæmoglobin, and a precipitate unknown composition. To study its effect on animals, cutaneous injections of a solution in olive oil were made. With frogs, for whom 1·25—3·7 c.c. per 1 kilo. body weight was a fatal dose, no effect was produced on the blood, except the darkening of the liver blood. Mammals showed signs of death by asphyxiation. Various organs, such as the gall, intestines, lungs, were affected, the liver most of all. Absorption of carbon bisulphide by the blood takes place in the lymph glands and in the veins.—L. F. G.

Aluminium Chloride; Compounds of ——, *functioning as Ferments.* G. Gustavson. Comptes rend., 1903, **136**, [18], 1065—1067.

The author has already described the compounds $Al_2Cl_6C_8H_{16}$ and $Al_2Br_6C_8H_{16}$, resulting from the reaction of aluminium chloride or bromide on ethyl chloride or bromide (see J. Chem. Soc., 1886, Abstracts, 999). These substances, shaken with excess of benzene or toluene, form a lower layer of liquid, not miscible with the excess of hydrocarbon, and having the formula $Al_2Cl_6C_8H_{16} . 6C_6H_6$ (or analogues). By heating under reduced pressure, or even by shaking with petroleum spirit, these substances dissociate into hydrocarbon and $Al_2Cl_6C_8H_{16}$. The most important property of these compounds, $Al_2Cl_6C_8H_{16}$ and its analogues, is, however, that with alkyl halides they yield at once hydracid gas and alkyl-substituted benzenes. The substance $Al_2Cl_6C_8H_{16}$ is readily isolated from the products and made to react again on hydrocarbon and then on alkyl halide, thus behaving like an inorganic ferment.

In Friedel and Crafts' reaction, a lower layer of liquid always forms, immiscible with the upper layer; and the author has found that this lower layer contains compounds similar to those described above, $Al_2Cl_6C_6H_3(C_2H_5)_3$ for example, which similarly behave like ferments, attaching to themselves the hydrocarbon, causing it to react on the alkyl halide, and being continuously regenerated as the reactions proceed. Thus a very small quantity of the "ferment" will bring about the reaction of large quantities of hydrocarbon and halide, the speed of the reaction increasing, however, with the proportion of "ferment" present. Though the additional hydrocarbon which these "ferments" take up is easily separated by mere shaking with petroleum spirit, the hydrocarbon in the so-called "ferment" itself is strongly held, and is only separated by reagents, such as water, which will decompose aluminium chloride itself.—J. T. D.

Salol; Enzymic Hydrolysis of ——. E. Pozzi-Escot. Comptes rend., 1903, **136**, [19], 1146—1147.

Conflicting statements having been made as to the ability of the lipolytic enzymes to effect the saponification of the esters of phenols as well as that of the esters of aliphatic alcohols, the author treated 1 grm. of salol [phenyl salicylate] in 20 c.c. of water with 25 grms. of crushed castor oil seed from which the fat had been extracted. A little thymol was added, the mixture was digested for 48 hours at 25° C. and then tested for the presence of salicylic acid. The results were either absolutely negative or showed at most mere traces of saponification. Control experiments, carried out under similar conditions, with ethyl butyrate, showed that there was no deficiency in the lipolytic power of the seeds; it was also proved that the presence of free phenol had no injurious influence on the activity of the enzyme. Hence it is concluded that vegetable lipases which act very powerfully upon the fatty acid esters of alcohols have practically no saponifying action upon esterified phenols.—J. F. B.

Pentoses; New Bases derived from ——. E. Roux. Comptes rend., 1903, **136**, [18], 1079—1081.

By the reduction of the oximes of arabinose and xylose by the method formerly used for glucose (this Journal, 1901, 605), two new bases have been obtained, *arabinamine*, $C_5H_{11}O_4NH_2$, and *xylamine*, of similar formula. They seem to be respectively amino-1-pentanetetrol $\genfrac{}{}{0pt}{}{2}{3\cdot4}\cdot5$, and amino-1-pentanetetrol $\genfrac{}{}{0pt}{}{2\cdot4}{3}\cdot5$. The first is a crystalline solid, the second a thick syrup. Both are strongly basic. Several derivatives are described.—J. T. D.

Erythrol; Action of Phosphorous Acid on ——. P. Carré. Comptes rend., 1903, **136**, [18], 1067—1069.

Phosphorous acid is a much less energetic dehydrant of erythrol than phosphoric acid is. Its first result is the formation of erythrophosphorous acid, $P(OH)_2.OC_4H_7O_3$, which then reacts on more phosphorous acid to give the compound $(OH)_2.P.OC_4H_8O_2.OP.(OH)_2$. Prolonged heating gives a product which sublimes $(OH).POC_4H_6O$. This compound is decomposed by water forming $(OH)_2.POC_4H_7O_2$, the acid phosphorous ester of erythrene. This last body, and erythrophosphorous acid, are as yet only known in their salts. (Compare this Journal, 1903, 322).—J. T. D.

Ferments; Notes on Recent Work on Vegetable ——. W. G. Freeman, West India Bull., 1903, 4, [1], 22—28.

Diastase.—The functions of diastatic enzymes in the germination of seeds and in the translocation of the starch elaborated by the green organs of plants are described.

Proteid-splitting Ferments.—Of the vegetable proteolytic enzymes three have received special attention owing to their exceptional development. The milky juice of the papaw tree (*Carica papaya*) has long been known to bring about the digestion of meat fibrin, albumin, &c., a property which is due to the presence of the proteolytic enzyme *papain*. Vines is of opinion that the enzyme of the papaw tree is closely allied to the trypsin of animals, but Mendel considers that it belongs to a class distinct from both pepsin and trypsin. The papaw fruit is employed in medicine to assist digestion, and a small industry for the preparation of crude papain by collecting and drying the juice is established at Montserrat. The acid juice of the pineapple also contains a proteolytic enzyme termed *bromelin*, which can be isolated by saturating the juice with salt. This enzyme has been studied by Reynolds Green; it is most active at a temperature of 60° C. Unfortunately the heat employed in tinning the fruit probably destroys its digestive properties in the preserved state. The pitcher plants (*Nepenthes*) are a well-known class of insectivorous plants, which carry pitchers at the ends of their leaves, in which insects are caught and digested. Vines has come to the conclusion that the plant actually excretes into the pitchers a proteolytic enzyme, *nepenthin*. He states that the three enzymes papain, bromelin, and nepenthin have essentially the same proteolytic action, which is similar to that of trypsin. Nepenthin differs from the others in being active only in an acid medium, in which respect it resembles animal pepsin; there is as yet some uncertainty as to whether pepsin actually occurs in plants. More recently Vines has demonstrated that a proteolytic enzyme of a tryptic nature is very widely distributed in plants, the function of which is analogous to that of the diastase of translocation, digesting and facilitating the distribution of the proteids elaborated in the organs.

Oxydases.—Reference is made to the researches of Yoshida on *laccase*, the oxidising enzyme of the Japanese lac tree (*Rhus vernicifera*), the milky juice of which turns black on exposure to the air. The subsequent work of Bertrand (this Journal, 1894, 1071) on laccase and on the probable function of manganese in its action (this Journal, 1897, 626 and 691) is also mentioned.

Ferments of Tobacco.—A *résumé* of the work of Loew (this Journal, 1899, 1161) on the various enzymes, which take part in the process of curing tobacco, is given, also a reference to his paper on *catalase* (this Journal, 1901, 598). —J. F. B.

Optically Active Substances; Influence of Double Linking of Carbon on the Rotatory Power of ——. H. Rupe. Annalen, 1903, **327**, [2], 157—200.—J. T. D.

NATIONAL PHYSICAL LABORATORY.

REPORT OF THE EXECUTIVE COMMITTEE FROM JANUARY 1, 1902, TO DECEMBER 31, 1902, SUBMITTED TO THE GENERAL BOARD AT THEIR MEETING ON MARCH 20, 1903.

After a reference to the opening of the laboratory (see this Journal, 1902, 130—133), a tabular statement of the work done at Bushy House from March 31 to December 31, 1902, is given.

The equipment is in various ways being extended, and it will be possible shortly to undertake a number of tests similar to many which have hitherto had to be declined.

With regard to the research work, some progress has been made on each of the experiments mentioned in the Statement of Work presented a year ago to the General Board.

For the alloys research, the Metallurgical Laboratory has been equipped, and most of the apparatus is now working.

The committee is indebted to Mr. George Beilby for the gift of a complete resistance pyrometer, as used by the late Sir Wm. Roberts-Austen and Dr. Stansfield at the Mint.

In connection with an investigation of certain nickel steel alloys, a machine designed by Dr. Stanton for testing the effect of repeated stress is under construction in the Engineering Laboratory. Dr. Stanton has made some progress with his wind-pressure experiments. Funds for these last two experiments have been granted by the Government Grant Committee.

In the Thermometry Division, Dr. Harker has made a series of preliminary comparisons up to temperatures of about 1,000° C. between the constant volume nitrogen thermometer and some standard platinum thermometers. He has also constructed a set of six standard platinum thermometers for the British Association. A number of tests of both high- and low-range thermometers have been made, and one interesting inquiry related to the specific heat of iron at temperatures up to 900° C.

In the Electricity Division standard air-condensers are now installed, and their capacities have been redetermined by Mr. Campbell.

Mr. Smith has made an inter-comparison of the resistance coils of the British Association and some standards certified by the Reichsanstalt, Berlin; he has also made good progress with the construction of a number of mercury standards of resistance.

In the Metrology Division Mr. Keeling has determined a number of co efficients of expansion.

During the year work has been continued in the Observatory Department, and a number of details of interest will be found in the report of the Superintendent to the Director.

STATEMENT OF WORK FOR THE YEAR 1903, SUBMITTED TO THE GENERAL BOARD AT THEIR MEETING ON MARCH 20, 1903.

Work at Bushy House.

The work planned for the year 1902 will in the main be continued. Up to the present much of the time of the staff has been occupied in setting up and adjusting apparatus.

Metallurgy Division.—It is proposed to make a complete determination of the mechanical and other properties of a series of (*a*) medium and (*b*) high carbon nickel iron alloys of the following composition:—

Carbon.		Nickel.	Manganese.	Silicon.	Iron.
Medium. 0·45	High. 0·9	Varying amounts from 0·25 per cent. to 45·0 „	About 0·7	Small amount.	..

It is also proposed to determine the electrical and magnetic properties of a few low carbon nickel iron alloys in order to investigate the cause of the sudden rise in Barrett's curves (Figs. 2 and 9, "Proceedings of Institution of Electrical Engineers," 1902).

Carbon.	Nickel.	Manganese.	Silicon.	Iron.
0·15	10	About 0·7	Low and constant.	..
0·15	20	„		..
0·15	30	„		..

With regard to iron aluminium and iron silicon alloys, it seems desirable to repeat Barrett's work and extend the number of alloys experimented with—varying not only the aluminium and silicon contents (0—5 per cent.), but also the carbon content (0—0·9 per cent.).

Engineering Department.

The breaking down in the strength properties of materials, due to repetition of stress commonly called "fatigue," has been the subject of careful and laborious experiments by Wöhler, Bauschinger, and others; but further inquiry seems to be necessary, as little is known about this effect on some of the special kinds of steel which are now becoming of common use in construction.

Another research in progress is that on wind-pressure.

Another piece of work to which it is possible some attention might usefully be given is connected with the shape of the cutting edges of tools.

It has also been suggested to the Director that further experiments on the total heat of steam, both saturated and superheated, are required.

Physics Department.

Electricity Division.—The research work in this division will include some investigations into the conditions of ysteresis loss and the non-ageing properties of iron.

Colonel Crompton has recently urged on the Director the mmediate necessity of temperature observations to ascertain safe limit for temperature in insulations used in dynamos, notors, and transformers, and also the consideration of sing alternating test voltages of different frequencies for esting the dielectric strength of insulators. These investiations received the approval of the Electricity Sub-ommittee, and the Director hopes to undertake them.

Mr. Smith who has charge of the experiments connected ith the fundamental electrical units, hopes shortly to omplete and test the mercury resistance standards now in nd. When this is done it may be desirable to set up dditional similar tubes in order to utilise to the best dvantage the experience already gained.

On completion of this work a revision of the standards of sistance will be possible.

Manganin resistance coils have been used freely in the boratory; the results of some investigations recently blished by Professor Callendar seems to indicate a kind hysteris effect under changing temperature. No definite sults in the matter have yet been obtained, but it is sirable to investigate the question.

The intercomparison of various types of standard cells ll be continued specially with a view to preparing a paste pable of reproduction at any time.

Thermometry Division.—In this division Dr. Harker pes to carry through his comparison between the platinum istance thermometer and the gas thermometer up to 00 or 1,100° C., and to design platinum thermometers a still higher temperature.

e will then endeavour to connect our gas scale directly h that at the Reichsanstalt (Berlin) by means of the rmo-couples studied, through the kindness of President lrausch, by Messrs. Holborn and Day.

nother task is the comparison of the Kew scale of t perature with the hydrogen scale of the Bureau Inter-onal through the intermediary of some standard nelot thermometers.

knowledge of the change of temperature with pressure f sulphur vapour near its boiling point is needed in p num thermometry; the number now used is very u rtain and a redetermination would be a simple matter.

he construction of some high-range mercury standards g up to 550° C. to assist in the test work is also re ired and is now in hand, while Mr. Hugo is engaged in st ying the properties of some thermometers suitable for hi -range work, made out of a new glass manufactured by M rs. Powell and Co. for the purpose.

other problem for which as yet no provision has been m , but which calls for solution, is the determination of th eat of combination, specific heat, and latent heat of ne uels such as petrol, gasoline, &c.

Metrology Division.—In the Metrology Division the following pieces of work will be undertaken by Mr. Keeling:—

(1.) Installation of apparatus for the measurement of co-efficients of expansion at high temperatures, and determination of this expansion for various substances. For this purpose an electrically-heated oven, which is now being constructed, will be used.

(2.) The calibration of a yard measure for use in the standard screw-cutting lathe.

(3.) The determination of the co-efficient of dilatation for case-hardened nickel steel and for tool steel.

Optics and Photometry Division.—The first work will be the establishment of the Photometric Laboratory, for which the equipment is being provided by Sir Wm. Preece.

In connection with the Optical Society, the Director hopes also to carry out some investigations into the optical properties and, in particular, the absorption of certain kinds of glass; while he would be glad, if funds permit, to modify the arrangements for the testing of photographic and other lenses.

Observatory Department.

The testing of apparatus described in the annual report of this Department will be continued; together with the various meteorological and magnetic observations so far as electric trams permit.

The superintendent, Dr. Chree, hopes to be able to reduce a number of the past magnetic observations, full details of which are kept.

As to the testing work, particulars are contained in the test pamphlet for the Observatory Department, the Physics Department, and the Engineering Department respectively. The scope of this work will be increased as opportunity offers.

These pamphlets can be had on application.

Report of the Director for the Year ending December 31, 1902.

In presenting his first report since the opening of the laboratory, the Director has thought it best to give a somewhat full account of the equipment of each division.

The main part of the work for the year has been the installation and adjustment of the apparatus.

In the Engineering Department and in the divisions of Thermometry, Metallography, Chemistry (so far as it bears on Physical work) and Metrology of the Physics Department, the equipment is very satisfactory.

In the Electricity Division the arrangement for tests on capacity and inductance, standards, and for the ordinary measurements of current, resistance, and E.M.F. tc a high degree of accuracy, are complete.

The testing of ordinary meters of all kinds for direct current up to 250 ampères and 250 volts can also be undertaken. The Director hopes shortly to extend the arrangements for this work very considerably, so as to admit of a large number of instruments being tested simultaneously on a commercial scale.

The machinery given by Messrs. Siemen Bros. and Co., when it is in position, will permit of such work being extended to alternate current and polyphase instruments, for which there is considerable demand already; to do this satisfactorily, further expenditure on measuring apparatus and equipment will be required.

Apparatus for the determination of permeability curves and for the measurement of hysteresis in iron is in position and is working well.

In the Optics Division very little has been done beyond the erection of the Kew photographic lens testing apparatus. An assistant to take charge of this division is urgently needed. There have been numerous demands for photometric work, and Sir William Preece's gift announced at the end of the year will supply the apparatus required. The Optical Society have asked for assistance with regard to the optical properties of certain glasses, and have voted a contribution to the expenditure involved, while other friends also have come forward in support of the optical work.

The Director hopes it may be possible to start this division on a satisfactory footing early in the present year.

Then follow detailed reports of the various departments. In the Electricity Division of the Physics Department, magnetic ageing tests have been made on several samples of sheet iron by heating them for several weeks to moderate temperatures (60° or 100° C.). In one specimen treated thus the hysteresis loss was only slightly increased, whilst in others very large increase was observed.

Magnetic tests, made with a view to finding the influence of previous history upon magnetic properties, showed the necessity of thorough demagnetization before every test.

Standard Cells.—There are many points of interest in connection with these, even though the cells are not sufficiently aged, nor the tests complete, for the data to be published. Originally, the intention was to make up a number of Clark cells with two different samples of mercurous sulphate. The difference in E.M.F., however, was so great that an investigation was essential. The plan adopted was to isolate possible disturbing factors in turn, and so determine their contributions to the difference observed. The tests proved decisively that one of the samples of mercurous sulphate was greatly at fault. The behaviour of the faulty cells is still under observation. A third sample of the sulphate, prepared in the laboratory by Dr. Carpenter, is also being tested, and promises well. The chemical treatment of all the samples being similar, rather indicates that something more than a chemical test should be applied to the sulphate used for standard cells. It is hoped eventually to specify the mode of manufacture of the substance to be used.

An investigation of the mercury, zinc, and zinc sulphate employed has also been conducted. For these special tests, different types of cell were made up, with satisfactory results. Measurements of the difference—if any—between the H and tube form of cells, are in progress.

The Weston cells constructed are, so far, similar in every respect, and are very consistent.

In the Thermometry Division, the chief work of the department has been the installation and study of the different standards of temperature, and the apparatus required for the comparison with those of the various kinds of instruments sent for test. In the following list will be found the principal pieces of apparatus constructed in the laboratory during the year 1902:—

Two large electric furnaces for the gas thermometer, reading up to 1,200° C.
One large electric furnace for thermo-junction comparisons.
Three smaller electric furnaces for miscellaneous work.
One large thermometer comparison bath for nitrates of potash and soda, with fittings for inter-comparison of mercury thermometers and for gas-platinum comparisons, between 220° and 650° C.
One oil bath for range 50° to 220° C.
One electrically-heated comparison bath for observations in water.
Several smaller baths for fixed points and apparatus for special ranges.
Pressure-co-efficient apparatus with heating arrangement.
Ten platinum thermometers.
Three thermo-junctions platinum-platinum-iridium and platinum-platinum-rhodium.
One direct-reading potentiometer for thermo-junction comparisons to 20,000 micro-volts.
One very sensitive low-resistance galvanometer for thermal work.

The gas thermometer presented by Sir Andrew Noble, with all its necessories, which had been used at Kew for comparisons to 200° C., has been re-erected in the position made for it, and comparisons have been made up to nearly 1,000° C. in an electric furnace with a standard platinum thermometer. These experiments are still in progress.

Six new platinum thermometers of various patterns have been constructed of the wire purchased by the British Association Committee. The investigation of these is still in progress

A potentiometer of original design has been specially constructed and calibrated for work of a high accuracy with thermo-junctions, and by means of this a few comparisons have been made in the electric furnace between one of the platinum-rhodium junctions, standardised by Dr. Holborn at the Reichsanstalt, Berlin, and some other specimens of platinum-iridium and platinum-rhodium wire, which will serve as working thermometers.

The liquid-air plant—Hampson liquefier and Brotherhood compressor—has been set up and used during the year.

The original gas-analysis apparatus, presented by Professor McLeod, has been repaired and erected in a room, which has been specially fitted for it, near the chemical laboratory, where also a large Sprengel pump and accessory water-pump have been installed in permanent form.

The attention of the laboratory having been called to the discrepancies between the values obtained by different observers for the specific heat of iron at high temperatures, some experiments have been made on this question at temperatures up to 1,000° C. Two specially pure specimens of known composition were used, the heating was done in a small closed electric furnace, and the temperature, when steady, measured by a platinum thermometer. The results differed materially from the numbers most generally accepted—those of Pionchon.

It was found, however, that if Pionchon's temperature-scale, which depended on the Violle calorimetric method, were revised so as to bring the melting-point of silver as obtained by him—907° C.—into accordance with more modern measurements—962° C.—the two sets of results came into as close agreement as could be expected from specimens from different sources. The results of this work will shortly be published.

A number of tests have been made on a series of thermometers of special glass, manufactured by Messrs. Powell and Sons. These show, after proper treatment, a very slight secular rise of zero and a remarkably small temporary depression on heating. The experiments on the subject are still in progress, and a number of thermometers, made to a special design for the purposes of the test, have been received lately from Mr. J. J. Hicks, whose assistance has been of great value.

In the Metrological Division, the co-efficients of expansion of a number of specimens of steel and brass have been measured in a comparator, for comparing line measures, constructed by the Société Genevoise pour l construction d'Instruments de Physique. Amongst these have been a number of nickel-steel rods with a low co-efficient—in some cases about one-tenth that of ordinary steels.

Apparatus has also been installed for the testing an calibration of measuring vessels used in chemica laboratories and also of weights.

In the Chemistry Division, a series of 20 pipettes wit 50 stem divisions above the bulb, of sizes varying betwee 1 and 5 c.c., have been tested; and experiments wer undertaken with a view to finding out the most suitabl form of pipette for delivering a 75 per cent. solution glycerin in physiological saline solution.

A complete series of microscopical and chemical tests five first-class printing papers have been carried out, whi the necessary analysis of the tool steel, the tests on which were undertaken in the Engineering Department, were ma in the laboratory.

Experiments have also been conducted on the preparat of pure mercurous sulphate for the Clark cells.

In the Metallography Division, the following tes were made:—A photomicrographic examination of tool steel—(*a*) cast, (*b*) hammered, (*c*) rolled, and (hardened.

A photomicrographic comparison of six steel rods, dra from one bar, as bearing on their magnetic qualities a temperature co-efficients.

A photomicrographic investigation of two allo aluminium iron and silicon iron, made by Hadfield a examined by Barrett, and stated by him to have a hig permeability than pure Swedish charcoal iron.

In the Engineering Department, the standard low-pressure gauges have been compared with the mercury column and tables of corrections made.

The chief tests, which have been carried out in the department, have been a series of tests on the properties of a new steel submitted by Mr. F. B. Behr.

Specimens were prepared from a simple ingot supplied, and tensile strength and hardness tests made on the material of the ingot, and also on a bar forged from the ingot. Cutting tools were also prepared and tried in the lathe at varying rates of cutting.

A series of pressure tests have also been made on deep-sea thermometers, for which a special cylinder has been made and attached to the high-pressure gauge testing machine.

Report on the Observatory Department for the Year ending December 31, 1902, made by the Superintendent to the Director.

The work at the Kew Observatory in the Old Deer Park at Richmond, now forming the Observatory Department of the National Physical Laboratory, has been continued during the year 1902 as in the past.

This work is described under the following heads:—

I. Magnetic observations.
II. Meteorological observations.
III. Seismological observations.
IV. Experiments and researches in connexion with any of the departments.
V. Verification of instruments.
VI. Rating of watches and chronometers.
VII. Miscellaneous.

—A. S.

CENTENARY OF THE BIRTH OF JUSTUS VON LIEBIG.

At a meeting of the Chemical Society held on May 20th st, the President, Prof. Dr. Tilden, F.R.S., said that e bust of Liebig which was placed on the table was a ift which the Society owed to the generosity of Dr. R. essel.

It was probably not generally known that this year, and early at this time, was the hundredth anniversary of the rth of the famous German chemist. The day of the onth was usually stated to be May 12th, and this was the te given in Hofmann's lecture, delivered before the ciety in 1875, and was therefore probably correct.

Chemists in England should be among the first to knowledge the debt which science and the world at ge owed to Liebig. Sixty years ago, when at the ight of his fame, he visited England, and although he und but little science in this country, he had many mirers here who assisted in promoting a knowledge of principles of plant and animal physiology which had n so largely the product of his own researches. With advance of time had come so much new knowledge that big's teaching in connection with agriculture, physiology, l medicine seemed now to be less influential than it was years ago. Nevertheless his views represented at that te an immense stride in advance of the state of ignorance ch previously prevailed. Chemists more especially ognised their indebtedness to Liebig, not only as one of chief founders of modern organic chemistry, but as ing founded the system of practical instruction, which, principle, had been adopted in all universities and nical schools since his time. Whether any of the ents who worked under his direction in the laboratory Giessen still survived was uncertain, but those who t forth as teachers certainly transmitted to succeeding erations something of the spirit which animated all e who came under Liebig's influence.

t the festival at Darmstadt, on May 12th, the principal ch was made by Prof. Volhard, of Halle, who had ied under Liebig at Giessen, and worked with him at ich. He drew a very vivid picture of the great chemist's days. Liebig's father had an oil and drug business in armstadt, and had constructed a small laboratory where ade the paints, varnishes, and other materials that he Justus Liebig frequently assisted in this work, thus early gaining some chemical knowledge. At fifteen he was apprenticed to an apothecary, but soon left again, probably in consequence of an explosion occurring whilst making fulminates, in imitation of a man he had seen at a local fair. When seventeen years of age he went to Bonn to study chemistry under Kastner, but not obtaining there the knowledge he desired, he proceeded to Paris, this being rendered possible for him by the fact that he had gained a scholarship. There were then a number of prominent chemists in Paris—Chevreul, Dulong, Thenard, and Gay-Lussac. In the autumn of 1823, Liebig had arrived at Paris, and was diligently studying the various sciences. He continued his investigation on fulminate of silver, and read a paper on it before the Academy. Alexander von Humboldt, who happened to be present, was so much struck by the work that he obtained for Liebig a place in Gay-Lussac's laboratory, and in the following year recommended him so highly to the government authorities, that he was appointed extraordinary professor at Giessen. There he immediately commenced to create a teaching laboratory, the first that had ever been started, the model of all subsequent ones, and the training school for teachers of later times. Liebig's many other claims to fame were also touched upon.

At New York, on May 12th, the members of the American Chemical Society, the Society of Chemical Industry, the Electro-Chemical Society, the Verein Deutscher Chemiker, and the Chemists' Club, took part in a celebration in memory of the illustrious investigator and chemist.

In the Assembly Hall of the Chemists' Club they listened to addresses by Dr. Ira Remsen, President of Johns Hopkins University; Prof. Wm. H. Brewer, of Yale; Dr. Carl Duisberg, Vice-President of the Verein Deutscher Chemiker and managing director of the Farbenfabriken of Elberfeld, Germany.

The chair was taken by Dr. H. Schweitzer, Hon. Secretary of the New York Section, who welcomed the assembly and foreign guests, and introduced the speakers.

Prof. Dr. Remsen outlined the early life of Liebig, mentioning his inaptitude for study at school, which resulted in his giving it up and devoting himself entirely to chemistry, his first interest in which was aroused by the study of colours and dyestuffs. Later, while at a country fair, he saw an exhibition of "Pharaoh's serpents," accompanied by some chemical operation connected with their preparation; this led eventually to his study and investigation, while attending the lectures of Gay Lussac at Paris, of the cyanides, cyanates, and fulminates. This work resulted in his introduction to Gay-Lussac, who admitted him to his private laboratory. He was appointed a professor at the University of Giessen in his 21st year, 1824, where his laboratory was of the crudest character—not much better than a barn without flooring; but from this modest beginning, with only six or seven students, his work grew and his reputation spread; a new laboratory was built and students came to it from all quarters.

Coming to personal reminiscences of the time when he attended the lectures of Liebig at Munich, Dr. Remsen described the difficulty he experienced as a student in attempting to harmonise the old system, as taught by Liebig with the new, as taught by his assistant, Volhard. Speaking of his methods, he said that all Liebig's lectures were profusely illustrated by experiments, many of them so elaborate as to be unthought of in the present day lecture room—metallurgical experiments requiring wind furnace, and many others which the speaker said he would now hardly believe could have been done on the lecture table if he had not preserved his note book filled with rude drawings of all the apparatus used.

It was extremely difficult to get admission to Liebig's laboratory as a student; in fact it was one of his conditions on accepting the professorship at Munich that he should not give his time or attention to students. In appearance Liebig was large of stature and of fine bearing—one of nature's noblemen, but very emphatic in be-rating his assistants when the experiments went wrong, his language on such occasions being more remarkable for condensed energy than for rhetorical elegance.

Prof. Brewer, who is the oldest living pupil of Liebig in America, and who has been his devoted follower in the line of agricultural chemistry, told of his enthusiastic desire to study under him, aroused by reading a translation of his work on agriculture in 1846. A few years later he (Prof. Brewer) went abroad, and, with letters of introduction, went to Munich. Here he found Ogden Rood, afterwards Professor of Physics at Columbia University, who offered at once to introduce him to Liebig, and assist in every way toward the desired end.

Dr. Carl Duisberg, of Elberfeld, described the influence of Liebig on chemical industry, his teachings resulting in that knowledge of scientific method which had so largely displaced the "rule of thumb" man by trained chemists and chemical engineers in all the great chemical factories of Germany and more or less in other countries. Liebig's influence was exerted chiefly on the organic chemical industries.

A number of his pupils, making their way to all quarters of the globe, disseminated his ideas in assisting agriculture and chemical industries, and, as the most prominent teacher of systematic laboratory methods, the credit is justly due to him for influences which can hardly be described or measured. Undoubtedly to Hofmann, perhaps his most illustrious pupil, were due, first in England, then in Germany, the greatest developments in organic colouring matters. Dr. Duisberg dwelt on the systematic conduct of chemical industries in Germany as at present conducted, and instituted an interesting comparison between the scientific, technical, and economic conditions of Germany and America.

The President of the Society of Chemical Industry, Mr. Ivan Levinstein, and Dr. Ad. Liebmann, of Manchester, were among the audience.

New Books.

Technologie der Holzverkohlung und der Fabrikation von Essigsäure, Aceton, Methylalkohol und sonstiger Holzdestillate. Von M. Klar. Julius Springer's Verlag, Berlin, Germany. 1903. Price M. 7. H. Grevel and Co., 33, King Street, Covent Garden, London, W.C.

8vo volume, containing preface, 236 pages of subject-matter, illustrated with 27 engravings, and followed by a list of German patents on acetic acid, acetone, wood spirit (methyl alcohol), and the carbonisation of wood, up to the year 1902, and finally by the alphabetical index. The subject is treated under the following headings: — I. History of Wood Distilling. II. Raw Materials. III. Chemical Changes of the Wood on Destructive Distillation. IV. The Arrangement and Management of Wood Distilleries. (1) Horizontal Retorts. (2) Upright Retorts. (3) Specially large Retorts. (4) Carbonising Sawdust. V. General Arrangements of Wood Distilleries. VI. Conditions as to Establishing Wood Distilleries; Costs of Establishment, and Views as to Profits. VII. Working up the By-products: Tar, Calcium Acetate, Wood Spirit, and Wood Charcoal. VIII. Analytical: A. Analysis of Raw Materials. B. Analysis of Manufactured Products. C. Tables of Strengths, &c., of Hydrochloric and Sulphuric Acids, Caustic Soda Solutions, and Alcohol.

Die Aluminium-Industrie. Von Dr. F. Winteler. Friedrich Vieweg und Sohn, Braunschweig, Germany. 1903. Price M. 6.

This work, dedicated to Professor O. Dieffenbach, is an 8vo volume, containing table of contents and 108 pages of subject-matter, illustrated with 41 engravings. The subject-matter is subdivided into the following groups: — I. Occurrence of Aluminium Compounds. II. Historic portion on Processes for preparing Aluminium. III. Physical Properties. IV. Chemical Properties. V. Aluminium Manufacture as at present: A. Its Preparation from pure Alumina from Bauxite. B. From Pure Alumina from White Bauxite, Kaolin, and Pipeclay, &c. VI. Cryolite. VII. The Carbon Electrodes. VIII. Methods of measuring the Current Intensities IX. The Aluminium Furnace. X. Working up the Aluminium. XI. Uses of Aluminium. XII. Aluminium Alloys.

Die Herstellung der Akkumulatoren. Ein Leitfaden. Von F. Grunwald. Wilhelm Knapp's Verlag, Halle a. S., Germany. 1903. Price M. 3. H. Grevel and Co., 33, King Street, Covent Garden, London.

Small 8vo volume, containing 158 pages of subject-matter, with 91 illustrations. The text is subdivided as follows:—I. Production and Action of the Galvanic Current. II. The Development of Lead Accumulators and Details of their Construction. III. The Raw Materials of Lead Accumulators and their Constructive Use. IV. Actio and Treatment of Accumulators. V. Employment an Uses of Accumulators. VI. Appendix, with Additional Data as to Lead Accumulators, and Tables.

Report on the Mining Industries and Forestry i Turkey. Foreign Office Miscellaneous Series, No. 589 Eyre and Spottiswoode. 1903. Price 3*d*.

Contents:—Reports on mining enterprises and forestry in the Smyrna consular district; reports on mining enter prises in Vilayet of Aleppo, Vilayet of Beyrout, an Mutessarifflik of the Lebanon, Vilayet of Adana; repor on the mineral deposits of the Erzeroum Vilayet; report on the mines and forests in the Vilayets of Trebizond an Uskub; report on mines in the Vilayet of Sivas; table c mining concessions in Turkey.

Exposition Universelle Internationale de 1900 Paris. Rapports du Jury International. Groupe XIV Industrie Chimique, Classe 87. Tomes I. et II. P M. Albin Haller. Paris, Imprimerie Nationale. 190 Price 6*s*. 8*d*.

These two volumes, of about 400 foolscap pages eac may be obtained from Messrs. Belin Frères, 52, rue d Vaugirard, Paris.

German Technical High Schools. Report by Dr. Rose, H.M. Consul at Stuttgart. Foreign Office Mi cellaneous Series, No. 591. Eyre and Spottiswood 1903. Price 3*d*.

Trade Report.

I.—GENERAL.

Scientific and Technical Department of the Imperial Institute.

Bd. of Trade J., Supplementary Bulletin No. 1, *May* 21, 1903.

The laboratories of this Department, which occupy t second floor of the Imperial Institute, were established chie with the aid of grants from the Royal Commission of the 1 Exhibition, in order to provide for the investigation of new little-known products of India and the Colonies and known products from new sources, with a view to th utilisation in British commerce, and also to provide tru worthy scientific and technical advice on matters connec with the trade and industries of India and the Colonies.

The work of the Department is chiefly initiated Departments of the Governments of India and the Colon. Arrangements have also been made by the Foreign Off, whereby British Consuls may transmit to the Departm for investigation such natural products of the countries which they are appointed to reside as are likely to be of to British manufacturers and merchants.

Materials are first chemically investigated in the labc tories of the department, which includes a staff of ski assistants, and are afterwards submitted to technical tr by experts attached to the Department and finally commercially valued.

Except under special circumstances the Department does not undertake investigations for private individuals.

A few illustrations of the work of the Department may be given here.

(*a*) The examination, in the Department, of Indian plants likely to be suitable as vegetable tanning agents now largely in demand, pointed to the conclusion that several would probably be useful to European tanners. One of these (*Cæsalpinia digyna*) was submitted to complete chemical investigation with very promising results. Tanning trials were next made on the large scale by one of the tanning experts attached to this Department, whose results confirmed the conclusion that a valuable tanning agent had been found. On the publication of the report on the subject, which was widely noticed in technical journals, a demand almost at once arose for the material in England, on the Continent, and in America, and the authorities in India are now arranging for the commercial supply.

(*b*) A plant abundant in India (*Podophyllum Emodi*) vas found on chemical investigation in this Department to urnish the same constituents as the well-known drug of merican origin, *Podophyllum peltatum*. The co-operation f physicians at St. Thomas's Hospital was secured, and reparations of the plant were extensively tried as a drug, nd found to be as valuable as those made from the merican plant. A considerable demand now exists for ie plant, which has been officially recognised by the Indian Iedical Department, and arrangements are being made in ndia for a regular commercial supply.

(*c*) The same practical result has followed from the emical investigation of a plant abundant in the Egyptian esert (*Hyoscyamus muticus*) for which a commercial mand as a drug has also arisen.

(*d*) The quality of the entire series of Indian coals has en experimentally ascertained. These represented the incipal coal-seams of India, and the report has been in ge request both in this country and in India. It has now en issued as an official paper by the India Office.

(*e*) The cause of the poisonous effects produced, at certain ges of their growth, on horses and cattle by certain food ins and fodder plants of India and the Colonies has been estigated, and the nature of the poison and the conditions its occurrence determined.

f) The chemical composition of india-rubber of various ds, derived from the Colonies which do not at present re in this trade, has been determined experimentally, l on the basis of these results commercial valuations have n obtained, and in some instances sales of consignments he material have been effected.

g) Collections of minerals from British Central Africa, n Somaliland, and from Northern and Southern Nigeria, e been chemically examined. In certain cases, where seemed desirable, minerals have been subjected to nical trial on the large scale by manufacturers, and mercial quotations for the products obtained. Arrangets have also been made, through this department, the working of mineral deposits in the colonies by lish firms.

) The quality of leather tanned in several of the nies has been experimentally investigated, and with aid of experts its suitability for the English market een ascertained and suggestions made for its improvet.

) The chemical composition of certain oil-yielding nuts by British Consuls in Brazil and Portuguese South a, and from British Honduras, has been investigated their properties brought under the notice of British facturers and brokers. In several cases arrangements eing made for consignments of the products to be sent s country.

Scientific and technical information has been supplied the curing of tobacco (Bermuda), the working of mica its (Somaliland and Southern Nigeria), the suitability n ores for smelting (India), the production of wood- (Natal), the cultivation of Indian hemp, and many r subjects. It will be seen that the results of the of the department are often of as much importance itish manufacturers as to the trade of the colonies ned.

The Technical Reports and Scientific Papers which have emanated from this department since it was fully established in 1896 are about to be published.

COMPARATIVE STATEMENT OF TRADE, AREA, AND POPULATION OF THE PRINCIPAL COUNTRIES OF THE WORLD.

Washington Bureau of Statistics.

Dealing with imports, the table shows that the United Kingdom imports a greater value of goods than any other country. Germany comes next, with the United States third, and France fourth. As for exports, the United States take first place, very closely followed by this country, and Germany comes third. The meaning of these facts is that the trade supremacy of the world is being fought for by these three countries, the United States being the only one of the three whose exports are greater than the imports.

These countries are the best customers of each other. The United States, however, get the best of the deal all round, selling almost four times as much as they buy from the United Kingdom.

They also sell to Germany about twice as much as Germany sells them.

If the trade and influence of a country depended on its population, this table makes it evident that China ought to sway the world. There are 400,000,000 people in the Celestial Empire. British India comes next with 231,000,000, and Russia third with 128,962,000. Next in order come the following:—United States, 79,003,000; Germany, 56,367,000; Austrian Empire, 45,015,000; Japan, 44,261,000.

The United Kingdom is eighth on the list with 41,605,000. In all the statistics of the United States Bureau, the United Kingdom is considered by itself, without relation to the Colonies.

The population is carefully examined as to its density. Egypt is given as the most thickly populated country in the world, with 722 people to the square mile. Belgium takes second place, with 586, and then the Netherlands, with 406. The United Kingdom has 338 to the square mile, and the United States only 26.

At the other end of the list comes Canada as the most sparsely peopled country in the whole world. In the Dominion there is only an average of one person to the square mile. Australia is little better off, with an average of 1½. Argentina comes next with 3.

III.—*TAR PRODUCTS, PETROLEUM, Etc.*

REFINED PARAFFIN: U.S. CUSTOMS DECISION.

May 7, 1903.

The Board decided that paraffin, refined in Hamburg, from petroleum produced in Russia, was dutiable at the rate imposed by Russia on paraffin imported into that country.

—R. W. M.

TAR PRODUCTS; EXPORTS OF ——, FROM BILBAO.

Foreign Office Annual Series, No. 2964.

The Elorrieta Works in Bilbao exported in 1902, 1,509 tons of creosote to France, 7 tons of coal-tar naphtha for aniline manufacture to Belgium, and 22 tons of carbolic acid to Germany.

IV.—*COLOURING MATTERS AND DYESTUFFS.*

JAVA INDIGO; PRODUCTION OF ——, IN 1902.

Foreign Office Annual Series, No. 2974.

The production of indigo for 1902 amounted to 1,128,664 British lb., being the smallest during five years, as will be seen from the figures given below.

Prices at the commencement of the year were favourable, but declined later on, when the bulk of the supplies came forward. The year, however, closed with small stocks, and, owing to the partial failure of the Bengal crop, which will result in smaller quantities being exported from that quarter during the next few months, the European market has a distinctly improved tone.

The 1903 crop is estimated at about the same as that under review, the quality of which was rather above the average.

Exports during the last five years:—

	British lb.
1898	2,555,133
1899	1,784,555
1900	1,537,150
1901	1,411,310
1902	1,128,664

VII.—ACIDS, ALKALIS, Etc.

CHEMICALS; IMPORTS OF ——, INTO BILBAO.

Foreign Office Annual Series, No. 2964.

Custom-house statistics show an import during 1902 of 16,389 tons of chemicals, derived principally from the following countries:—

	Tons.
United Kingdom	6,158
Belgium	4,585
America	3,228
Germany	1,807
France	603

Small quantities also came from the Netherlands and Italy.

The chief item under this head is nitrate of soda, of which the importation, as well that of sulphate of ammonia, is likely to increase considerably in consequence of efforts that are being made to improve methods of cultivation. A momentary check has been felt owing to the difficulties encountered by the new beet sugar factories, whose production has exceeded the demand and led to stoppage of work in several cases. About 4,000 tons of nitrate are used locally every year in the manufacture of acids, and for manure. Nitrate of soda has hitherto come from Chile, *via* European ports, but receivers are now chartering direct from Chile to Bilbao.

Large quantities of caustic soda, mainly for soap making, are imported; the bulk comes from Liverpool and Newcastle.

VIII.—GLASS, POTTERY, Etc.

PREPARED KAOLIN: U.S. CUSTOMS DECISION.

May 8, 1903.

The Board decided that kaolin which had been subjected to a process of preparation was dutiable at 2 dols. 50 cents under paragraph 93 of the Tariff Act as "kaolin," and reversed the assessment of duty at 20 per cent. *ad valorem* as a "manufactured article unenumerated" under section 6.

—R. W. M.

IX.—BUILDING MATERIALS, Etc.

ASBESTOS IN SIBERIA; DISCOVERY OF ——.

Cons. Rep., May 9, 1903.

Rich mines of asbestos have been discovered in the Irkutsk district, 1½ miles from the Kitoy River, and a company has been organised to develop them. Preliminary tests are said to show that, at a depth of 1 ft., the asbestos is equal in quality to the Canadian, and superior to the Alpine product. The Kitoy River affords ample water power and cheap transportation to the railroad. The owners are receiving numerous requests from abroad for samples.

X.—METALLURGY.

METALS BY THE WACHWITZ PROCESS; PRODUCTION OF COMPOUND ——.

Foreign Office Annual Series, No. 2971.

The problem of giving cheap metals, such as iron or zinc, the appearance and qualities of the expensive, such as copper or aluminium, seems to have been solved by the invention of Heinrich Wachwitz, of Nuremberg.

The process consists of a simple method for welding the two metals together in ingots. These can then be rolled out to any desired thickness, from an inch thick ship's plate down to foil. The prominent feature of the process, which renders it so valuable, is that the metals are said to lose nothing of their inherent ductility; and, further, that they can be combined together in any proportion on either one or both sides of the metal to be plated.

The principal products of the works of the Deutsche Wachwitz Metall. A.-G., situated at Hersbruck, near Nuremberg, consist at present of copper-plated steel and copper-plated zinc sheets (used for roofing and to replace pure copper generally).

The Central Station in Nuremberg, now in course of erection, has been roofed with the latter.

Other products include aluminium-plated iron sheets, copper-plated aluminium, steel-plated aluminium (to give increased strength to aluminium sheets without appreciably increasing the specific gravity); and sheet plates, plated with aluminium bronze, which is believed to be the most suitable material for ship's plates.

The same combinations can also be produced in wire and tubes. The demand for these metals is growing, and the Company's mills are being enlarged. The erection of further mills in German metal centres is contemplated, and a company to work the Wachwitz patent in the United Kingdom has been formed in London.

NEWFOUNDLAND; MINERAL PRODUCTION OF ——.

Eng. and Mining J., May 2, 1903.

The report of Mr. James P. Howley, head of the Geologica Survey of Newfoundland, gives the mineral production o the island for the year 1902 as shown in the followin table:—

Mineral Production of Newfoundland, 1902.

——		Quantity.	Value.
			Dols.
Barytes	tons	315	630
Copper ore	"	74,608	265,810
Iron ore	"	728,721	728,721
Pyrites	"	26,000	117,000
Building materials:—			
Building stone	"	5,000	6,000
Cobble stone	"	500	500
Granite	"	2,955	17,730
Limestone	"	1,150	345
Paving stone	"	2,250	18,000
Slate	squares	11,000	44,000
Brick	M.	1,625,000	18,950
Total values		..	1,217,686

CAUCASUS; MINING IN THE ——, DURING 1902.

Foreign Office Annual Series, No. 2979.

The quantity of minerals of various kinds produced the Caucasus during the year 1902 was, according to tl most recent data to hand, as follows:—

——	Quantity.	
	Poods.	Barrels.
Naphtha	705,912,959	70,591,296
		Tons.
Coal	2,947,308	47,537
Copper ore	6,641,292	107,118
Salt	3,083,082	49,727
Manganese ore	24,913,315	402,311
Sulphur	160,000	2,581
Smelted copper	213,274	3,440

BILBAO; MINERAL PRODUCTION OF ——.

Foreign Office Annual Series, No. 2964.

The iron ore exported from Bilbao during the last 1 years to various countries is shown in the accompany table.

Other ores raised in the province of Biscay during 1 consisted of 735 tons of calamine, 79 tons of lead, a 226 tons of iron pyrites. A portion of the calamine exported, the whole of the iron pyrites being consumed

Destination.	Quantity.				
	1898.	1899.	1900.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.
United Kingdom	3,060,801	3,966,129	3,101,563	2,281,198	2,996,908
Netherlands	830,311	861,669	703,766	651,473	672,368
Germany	11,618	32,821	66,401	636,509	57,688
Belgium	154,526	205,953	207,925	193,372	224,570
France..........	285,561	282,109	200,222	196,072	199,305
Italy............	976	..	..	..	14
United States...	3,042	59,657	49,445	90,565	45,998
Austria-Hungary	1,382	..	..	..	..
Norway.........	..	4,425	..	..	..
Canada	..	..	..	7,512	..
Total	4,348,217	5,412,763	4,329,322	4,056,701	4,196,851

Note.—Nearly all the ore sent to the Netherlands and a part of hat shipped to Belgium is destined for consumption in Germany.

he local sulphuric acid works. The small amount of opper ore exported from Bilbao came from inland provinces, ome 102 tons being from Palencia.

Copper Sulphate Deposits at Copaquire, Chile.

E. Walker. Eng. and Mining J., May 9, 1903, 710.

The deposit is in the province of Tarapaca, and is about 30 miles from Iquique, and difficult of access. The ulphate occurs over a large area. in thin veins, the rock eing mostly decomposed porphyry. The deposit appears be variable in value, but a characteristic sample shows 2·77 per cent. of hydrated copper sulphate, 1·53 per cent. f copper carbonate, and 0·39 per cent. of copper sulphide, *e.*, 4·44 per cent. of copper in all. The sulphide occurs the form of chalcopyrite. The deposits also contain onsiderable amounts of iron oxide, alumina (chiefly as lphate), calcium sulphate, and magnesium sulphate.

The scarcity of fuel in the district, together with the fficulty of bringing supplies to the region of the deposit, nder the reduction of the substance, on the spot, impracticable. The writer thinks that the only possible ethod is to utilise solar heat to evaporate the solutions the salt, and carry the product to the coast.—T. F. B.

XII.—FATS, OILS, Etc.

Margarine; Production of —— in Nuremberg.

Foreign Office Annual Series, No. 2971.

The year 1902 was not favourable for the margarine lustry on account of high prices for all raw materials, ainst low selling prices, which hardly covered manufacing cost, and the keen competition of manufacturers and iolesale merchants.

The importation to Rotterdam of oleomargarine from nerica was about 75,000 barrels less than in 1901; this l explain the exceptional circumstance that the Americans re in 1902 purchasers in Europe of various fats, especially so-called press tallow, a by-product of the oleo nufacturers.

The consumption of margarine has further increased, and gaining ground, which should prove that, from an nomic point of view, it may be regarded as a substitute natural butter. The production of margarine in 1902 doubt exceeded 2,000,000 cwts.

XIII. A.—PIGMENTS, PAINTS, Etc.

Cobalt Blue: U.S. Customs Decision.

May 5, 1903.

he Board decided that cobalt blue, which an analysis wed to be a compound of cobalt oxide and alumina, was able at thirty per cent. *ad valorem* as a "colour," under agraph 58 of the Tariff Act. The importers had claimed be dutiable at 25 cents per pound as "oxide of cobalt," er paragraph 16. The evidence showed that the article generally bought and sold under the name of cobalt , and was not oxide of cobalt, but a colour prepared it.—R. W. M.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Nutgall Extract: U.S. Customs Decision.

April 27, 1903.

The Board decided that an aqueous extract of nutgalls was dutiable at fifty cents per pound, under paragraph one of the Tariff Act, holding that such extract is commercially known as tannic acid. A previous decision of the Board had held similar merchandise to be dutiable at one-fourth cent per pound and 10 per cent. at *ad valorem* as "nutgalls advanced in value, &c., by refining, grinding, &c.," under paragraph 20.—R. W. M.

XVI.—SUGAR, STARCH, Etc.

Polariscopic Test of Sugar: Interim Decision of U.S. Circuit Court.

May 4, 1903.

An important decision, regarding the duties assessed on raw sugar imported into the United States, was rendered on May 4 by the United States Circuit Court. Under the present Tariff Act the Treasury Department had instituted a system of corrections for temperature in making polariscopic tests of sugar, founded on the work of Dr. H. W. Wiley of the Department of Agriculture. These corrections were claimed by the importers to result in higher readings than those obtained by the usual methods used in the trade. The contention of the Government was that the modifications were in the line of increased accuracy. The case was first tried before the Board of General Appraisers, who sustained the position of the Government. On appeal to the Circuit Court this decision was reversed, the Court finding that the temperature corrections, when applied to refined sugars, gave readings in excess of 100. As large amounts of money are involved in this case, it will probably be carried to the higher courts for final decision.—R. W. M.

XVII.—BREWING, WINES, SPIRITS, Etc.

Japanese Sakè: U.S. Customs Decision.

April 29, 1903.

The Board gave a decision covering sakè imported at Honolulu from Japan. The evidence showed that it was prepared from malted rice and by processes which, as far as they were carried, were similar to those used in making beer. The product, however, was not effervescent, nor had hops or any other bitter flavour been added. The analysis showed the presence of 17·0 per cent. of alcohol and 2·78 per cent. of extract, which proved that it was not a distilled liquor. Duty had been assessed at 50 cents per gallon as a "still wine containing over 14 per cent. of alcohol" under paragraph 296 of the Tariff Act, while the importers claimed it to be dutiable as "beer" at 20 cents per gallon under paragraph 297, or at the same rate as "malt extract" under paragraph 298. From the fact that sakè resembles wine in composition and use more closely than either beer or malt extract, the Board decided it to be dutiable by similitude as a "still wine," as originally assessed.—R. W. M.

XIX.—PAPER, PASTEBOARD, Etc.

Celluloid Balls: U.S. Customs Decision.

April 30, 1903.

Hollow balls made of celluloid were assessed for duty under paragraph 17 of the Tariff Act at 65 cents per pound and 25 per cent. *ad valorem* as "manufactures of pyroxylin." The Board, following a previous decision, held that they were in fact toys, and, as such, more specifically provided for by paragraph 418 at 35 per cent. *ad valorem.*
—R. W. M.

Coated Paper Fluorescent Screens: U.S. Customs Decision.

May 7, 1903.

The Board decided that fluorescent screens, made of paper coated with certain chemicals, and mounted on wooden frames with cotton backing, were dutiable at thirty-five per cent. *ad valorem* under paragraph 407 of the Tariff Act as "manufactures of paper or of which paper is the component material of chief value." In this case paper was found to be the component of chief value, by considering in its value that of the chemical used to coat it, which was more than the value of the paper alone.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 11,259. Reese. Obtaining chemical products by treating their raw materials with vapours. May 18.
,, 11,453. Woolford. Crucibles. May 20.
,, 12,041. Scott. Ascertaining the density of liquids under vacuum. May 26.
,, 12,223. Löffler. Filters.* May 28.
,, 12,386. Stadtegger. Crystallising processes. (U.S. Appl., Dec. 5, 1902.)* May 30.
[C.S.] 12,867 (1902). Brooke. Apparatus for purifying fluids. May 27.
,, 16,295 (1902). Hemingway. Means applicable for use in concentrating solutions. June 1.
,, 3982 (1903). Mauser. Baskets for carboys, &c. May 27.
,, 5745 (1903). Cyon. Method of watching and controlling chemical processes. May 27.
,, 6347 (1903). Deininger and André. Evaporating apparatus. June 4.

II.—FUEL, GAS, AND LIGHT.

[A.] 11,297. Garretson. Blast furnaces. May 18.
,, 11,354. Hills. Manufacturing gas from carbonaceous material. May 19.
,, 11,750. Holmes (Guldlin). Treating coal-gas to prevent loss of illuminants.* May 22.
,, 11,820. Desgraz. Furnace. May 23.
,, 11,850. Kerslake and Turner. Process in connection with calcium carbide. May 25.
,, 12,001. Lake (Fuel and Gas Manufacturing Co.). Manufacture of fuel compounds.* May 26.
,, 12,042. Craig. Furnaces. May 27.
,, 12,127. Singer. Mantles for incandescent gas lights. May 28.
,, 12,195. Jones. Furnaces. May 28.
,, 12,236. Peaty. Apparatus for the treatment of coal-gas. May 29.
,, 12,241. Brown. Manufacture of artificial fuel. May 29.
[C.S.] 12,552 (1902). Settle and Padfield. Manufacture of coal-gas. June 4.
,, 14,166 (1902). Crossley and Rigby. Treatment of gas and air in connection with gas producers. June 4.
,, 14,563 (1902). Boult (Inchauspé). Gas generator furnaces. June 4.
,, 16,646 (1902). Keyling. Blast furnaces. May 27.
,, 1954 (1903). Berthold. Incandescent mantles. June 4.
,, 4094 (1903). Parks. Open-hearth furnaces. May 27.
,, 4335 (1903). Marks (Moore). Furnaces. May 27.
[C.S.] 4861 (1903). Bian. Purification of furnace gases. May 27.
,, 8821 (1903). Dudgeon (Soc. Anon. J. Cockerill and Savage). Blast furnaces. June 4.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[C.S.] 16,511 (1902). Archdale. Method of and means for dehydrating or distilling coal tar, &c. June 4.
,, 28,277 (1902). Rosemann. Manufacture of deodorous and soluble carbolic acid and homologues of the same. June 4.
,, 951 (1903). Wise (von May). Treatment of petroleum and other hydrocarbons, and of their distillates and derivatives. June 4.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 11,630. Imray (Meister, Lucius und Brüning). Manufacture of indigo dyestuffs. May 21.
,, 11,717. Newton (Bayer). Production of new dyestuffs of the anthraquinone series. May 22.
,, 11,882. Shillito (Aniline Colour and Extract Works, formerly J. R. Geigy). Basic dyestuffs. May 25.
,, 11,914. Imray (Meister, Lucius und Brüning). Manufacture of compounds of aromatic amidocarboxylic esters. May 25.
,, 12,099. Newton (Bayer). Production of anthracene derivatives. May 27.
,, 12,120. Johnson (Kalle). Manufacture of disazo colouring matters. May 27.
,, 12,298. Imray (Soc. Anon. Mat. Col. et Prod. Chim. St. Denis). Manufacture of sulphurised dyestuffs. May 29.
[C.S.] 14,576 (1902). Imray (Meister, Lucius und Brüning). Manufacture of secondary disazo-dyestuffs from monoacetyl-*p*-diamidohydroquinone dialkylether or amidohydroquinone dialkylether. May 27.
,, 15,599 (1902). Johnson (Badische Anilin und Soda Fabrik). Production of azo colour, lakes, and intermediate products. June 4.
,, 15,600 (1902). Johnson (Badische Anilin und Soda Fabrik). Manufacture of colouring matters containing sulphur. June 4.
,, 15,660 (1902). Imray (Meister, Lucius und Brüning). Manufacture of phenyl glycin-*o*-carboxylic acid. June 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 11,451. Mann. Process for dyeing animal an vegetable fibres. May 19.
,, 12,126. Goddard. Apparatus for dyeing warps fo weaving, and otherwise treating them wit liquids. May 28.
,, 12,299. Mathieu, Péronne, and Humbert. Method of drying and carbonising fabrics. May 29.
[C.S.] 12,373 (1902). Owens. Dyeing of fibrous materia. May 27.
,, 14,581 (1902). Ransford (Cassella). Productio of two-coloured effects on cotton and silk b dyeing with sulphur colours. May 27.
,, 5650 (1903). Dubois. Method of giving lisle threa finish to vegetable fabrics. June 4.
,, 7913 (1903). Krefting. Extraction from seawe of products suitable for use in dressing texti materials, for sizing yarn, &c. June 4.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 11,549. Johnson (Badische Anilin und Soda Fabri Purification of gases. May 20.
,, 11,558. Ryan. Utilisation of carbonic acid g May 21.

[A.] 12,081. Ashcroft. *See under* XI.

„ 12,082. Ashcroft. *See under* XI.

„ 12,377. Ashcroft. *See under* XI.

„ 12,391. Monin. Treatment and utilisation of artificial sulphates and carbonates of lime. May 30.

„ 12,419. Thompson (Wischin). Manufacture of sulphuric anhydride. May 30.

[C.S.] 11,609 (1902). Lake (Atmospheric Oxygen and Power Co.). Apparatus for liquefying air and separating the constituent gases of the same. May 27.

„ 16,206 (1902). Johnson (Verein. Chem. Fabr. Mannheim). Contact apparatus for producing sulphuric anhydride. May 27.

„ 8287 (1903). Brunck. Extraction of ammonia from distillation gases. May 27.

VIII.—POTTERY, GLASS, AND ENAMELS.

[C.S.] 11,119 (1902). Tindal. Kilns and ovens for firing earthenware goods. May 27.

„ 354 (1903). Harrison, Wharton, and Wightman. Process and apparatus for making glass. May 27.

„ 3077 (1903). Arbogast. Manufacture of hollow glassware. (Int. Appl., Feb. 11, 1902.) May 27.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 11,324. Timm. Manufacture of Portland cement.* May 18.

„ 11,779. Graham. Refractory composition applicable for furnace lining, &c. May 23.

„ 11,802. Staab. Combination of ingredients for manufacturing a water-stopping mortar or cement. May 23.

„ 12,095. Perkiewicz. Manufacture of bricks.* May 27.

„ 12,139. Taylor. Producing artificial slate. May 28.

„ 12,256. Vaughan. Continuous kilns for burning bricks and other clay goods, also for limes and cements.* May 29.

C.S.] 6400 (1902). Thomson. Manufacture of artificial stone, and apparatus therefor. May 27.

„ 12,861 (1902). Thom. Manufacture of artificial marble, dolomite, and other stone. June 4.

„ 2371 (1903). Eaton, Pfeifer, and Briggs. Production of building blocks or bricks. June 4.

„ 5090 (1903). Barratt and United Asbestos Co., Ltd. Non-conducting coverings for boilers, tanks, pipes, &c. June 4.

„ 6091 (1903). Stehmann. Kilns. May 27.

X.—METALLURGY.

A.] 23,042A (1902). Stevenson and Marquard. Alloy for use in the manufacture of steel and in the production of tinplate and sheets.* May 29.

„ 11,257. Mollard. Metals. May 18.

„ 11,284. Thwaite and Denny. Producing metallic zinc and its vapour. May 18.

„ 11,303. Garretson. Process of converting or Bessemerising matte. May 18.

„ 11,754. Taylor. Treatment of blast furnace slag. May 22.

„ 11,956. Bates and Peard. Metal annealing furnaces. May 26.

12,186. Gührs and Gührs. Treatment of metallic zinc. May 28.

, 12,232. Beckett. Manufacture of ingot iron and steel. May 29.

, 12,381. Kammerer. Welding process for use in the manufacture of plated sheet metal. May 30.

[S.] 8693 (1902). Brindley. Treatment of tin and other scrap. May 27.

, 11,671 (1902). Boult (Perron). Treatment of nickel and copper-nickel ores. June 4.

14,739 (1902). Ewan. Manufacture of sodium. May 27.

[C.S.] 14,982 (1902). Down. Treatment of zinc ores or other zinc material. May 27.

„ 20,245 (1902). Carson, Miller, and Hurst. Treating or refining molten metals, and apparatus therefor. June 4.

„ 27,122 (1902). Jones. Furnaces for smelting iron. May 27.

„ 7016 (1903). Fortun y Pelletier and Sempron y Sempron. Solder for aluminium or aluminium alloys. June 4.

„ 7855 (1903). Polte. Manufacture of articles of wolfram and lead. June 4.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 11,276. Roderbourg. Manufacture of electrodes. May 18.

„ 11,442. Vogel. Arc-light electrodes. May 19.

„ 11,579. Greenfield. Anodes for electrolytic operations. May 21.

„ 11,893. Thorp. Electrolysing apparatus. May 25.

„ 12,032. Johnson (Ford). Electrolytic apparatus and secondary batteries. May 26.

„ 12,081. Ashcroft. Production of metals of the alkali group by electrolysis. May 27.

„ 12,082. Ashcroft. Production of metals of the alkali group and alkalis by electrolysis. May 27.

„ 12,194. Müller. Apparatus for producing electrolytic deposition.* May 28.

„ 12,377. Ashcroft. Production of metals of the alkali group and alkalis by electrolysis. May 30.

„ 12,401. Allan and Cowper-Coles. Electro-deposition of metals. May 30.

[C.S.] 12,182 (1902). Imray (Oesterreich. Gasglühlicht-u. Elect.-Ges.). Manufacture of electrical glow lamps with osmium filaments. June 4.

„ 12,700 (1902). Rosenthal. Manufacture of active material for the plates of electric accumulators. June 4.

„ 14,135 (1902). Baker, Smith, and Castner-Kellner Alkali Co. Electrolytic cells. May 27.

„ 26,071 (1902). Hopfelt. Manufacture of arc lamp electrodes. June 4.

„ 964 (1903). Gin. Electrolytic manufacture of aluminium. June 4.

„ 5448 (1903). Szirmay and von Kollerich. Electrolytic zincing process. June 4.

„ 8900 (1903). Müller. Apparatus for the production of galvanic deposits. June 4.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 12,035. Haddan (Edson). Process of separating grease, &c., from raw fish and other grease-bearing material.* May 26.

[C.S.] 11,494 (1902). Majert. *See under* XX.

„ 11,778 (1902). Lake (Reale). Production of soaps and fatty acids. June 4.

„ 4412 (1903). Dean and Farrar. Soap tablets and blocks. May 27.

„ 8099 (1903). Jurgens. Manufacture of margarine. June 4.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 11,932. Codd, Deeks, Deeks, and Goodbody. Applying colouring materials by means of fluid pressure.* May 25.

[C.S.] 6521 (1903). Armbruster and Morton. Process of making pigments. June 4.

B.—Resins, Varnishes.

[C.S.] 15,890 (1902). Seeser. Process of making linoleum. May 27.

C.—India-rubber, &c.

[C.S.] 868 (1903). Smith. Apparatus for vulcanising and moulding rubber. May 27.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 11,320. Boult (Stone). Depilatories for removing hair from skin or hides.* May 18.

„ 11,625. Jensen (Maetschke). Manufacture of a limpid solution of agar-agar. May 21.

[C.S.] 17,258 (1902). Spitteler. Separation of casein. June 4.

„ 25,556 (1902). Eberhard and Mierisch. Method for making clearly soluble casein. June 4.

„ 3236 (1903). Felton. Treating hides or skins preparatory to tanning. June 4.

XV.—MANURES.

[A.] 11,890. Lehofer. Plant for extracting manure from sewage. May 25.

XVI.—SUGAR, STARCH, GUM, Etc.

[C.S.] 17,912 (1902). Spreckels and Kern. Purification of sugar crystals, and a product obtained thereby. June 4.

„ 19,028 (1902). Claassen. Controlling the oversaturation in boiling saccharine solutions or syrups. June 4.

„ 4858 (1903). Sudre. Treatment of residuary liquors of sugar factories. (Int. Appl., June 3, 1902.) May 27.

„ 5439 (1903). Steffen. Obtaining pure concentrated beetroot, expressed juices, and residues rich in sugar. May 27.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 11,325. Somló. Treatment of malt for alcoholic fermentation.* May 18.

„ 11,756. Ball. Process and apparatus for drying malt extract and the like.* May 22.

„ 12,084. Shorey and Scruby. Process for treating spent hops. May 27.

[C.S.] 16,037 (1902). Ransfords (Pharm. Inst. L. W. Gans). Obtaining the contents of yeast cells. June 4.

„ 27,068 (1902). Sanguineti. Manufacture of spirituous liquids. May 27.

„ 2688 (1903). Souter and Souter. Utilisation of brewers' and distillers' by-products. June 4.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 11,526. Douglas. Apparatus for the manufacture of vinegar.* (U.S. Appl., May 20, 1902.) May 20.

„ 11,749. Lapp. Process of softening grain.* May 22.

„ 12,045. Daseking and Paradies. Purification and preservation of milk. May 26.

„ 12,046. Leetham. Bleaching wheat, flour, &c. May 27.

„ 12,154. Adair. Manufacture of self-raising flour and preservation of the materials for use therein. May 28.

[C.S.] 8099 (1903). Jurgens. *See under* XII.

„ 8743 (1903). Just. Drying and preserving milk and milk-like products. May 27.

B.—Sanitation; Water Purification.

[A.] 11,890. Lehofer. *See under* XV.

„ 12,058. Bennis. Apparatus for renovating the surface of bacteria beds. May 26.

[C.S.] 14,366 (1902). Candy and Candy. Apparatus for distributing sewage in sewage tanks and withdrawing the effluent, and for distributing sewage, &c., over bacteria beds, &c. May 27.

C.—Disinfectants.

[C.S.] 11,351 (1902). Beater and Toppin. Disinfecting powder. May 27.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 11,517. Leiner and Cremer. Apparatus for testing paper. May 20.

„ 11,550. Lacroix. Paper-making machines. May 20.

[C.S.] 15,632 (1902). Callender. Treatment of peat, moss, or other fibres to render them suitable for paper making, &c. June 4.

„ 17,501 (1902). Thompson (Vereinigte Kunstseidefabr.). Preparation of stable alkaline solutions of cellulose hydrate and the precipitation of the hydrate therefrom. May 27.

„ 5339 (1903). Goy. Manufacture of paper. June 4

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 11,402. Richardson. Manufacture of pinene hydro chloride, camphene, and camphor from turpen tine. May 19.

„ 11,450. Schofield and Cole. Apparatus for pro ducing liquid extracts.* May 19.

„ 12,282. Zimmermann (Chem. Fabr. auf Actie vorm. E. Schering). Manufacture of produc useful in therapeutics. May 29.

[C.S.] 11,494 (1902). Majert. Preparation of bromi and iodine compounds of fats and of the meth and ethyl esters of fatty acids. May 27.

„ 14,935 (1902). Newton (Bayer). Production theophylline. May 27.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 11,605. Carolan (General Electric Co.). Bl print process. May 21.

„ 11,886. Cadett. Means for coating photograp papers and films. May 25.

[C.S.] 14,714 (1902). Fiedler. Method of developi fixing, and washing photographic films, May 27.

„ 7853 (1903). Archer. Production of photograp prints. June 4.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 11,440. Orsman. Safety detonating explosives use in coal or other mines, or for general blast purposes. May 19.

„ 11,990. Christensen. Manufacture of match May 26.

[C.S.] 4099 (1903). Huch. Manufacture of n- poisonous matches. June 4.

„ 7695 (1903). Du Pont. Apparatus for glaz blasting powder, gunpowder, &c. May 27.

„ 7712 (1903). Du Pont. Method of glazing bl- ing powder, gunpowder, &c. May 27.

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L. T. Thorne, Ph.D.
Thomas Tyrer.

Editor:

Watson Smith, 34, Upper Park Road, Haverstock Hill, N.W.

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D. Bendix	III.
E. Bentz	IV., V., VI.
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J. F. Briggs	XVI., XVII., XIX., XX.
J. K. Burbridge	XIII. C.
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J. H. Bowman
Hugo Carlsson.
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W. G. Ellis.
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Hon. Secretary and Treasurer:
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The following take office in July next:—*Vice-Chairman:* F. J. Smale. *Committee:* J. Watson Bain, Thos. Davies, W. Lash Miller, Jas. P. Murray, M. J. Taylor, Harold Van der Linde.

Liverpool Section.

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Hon. Local Secretary:
T. Lewis Bailey, University College, Liverpool.

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Committee:

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C. T. Tyrer.
Frank Wilson.

Hon. Local Secretary:
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J. Hübner.
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H. Porter.
T. Stenhouse.
H. L. Terry.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

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Newcastle Section.

Chairman: W. L. Rennoldson.
Vice-Chairman: N. H. Martin.
Committee:

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P. P. Bedson.
H. S. Collins.
J. T. Dunn.
T. W. Hogg.
H. Louis.
J. Mather.
John Pattinson.
W. W. Procter.
Harry Smith.
J. E. Stead.
C. E. Stuart.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

The following take office in July next:—*Chairman:* J. T. Du *Vice-Chairman:* W. L. Rennoldson. *Committee:* N. H. Mar A. Spiller.

New York Section.

Chairman: V. Coblentz.
Vice-Chairman: Russell W. Moore.
Committee:

L. Baekeland.
G. Drobegg.
W. F. Fuerst.
A. P. Hallock.
E. J. Lederle.
E. G. Love.
Clifford Richardson.
W. T. Schieffelin.
R. C. Schüpphaus.
G. C. Stone.
M. Toch.
D. Woodman.
F. G. Zinsser.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

The following take office in July next:—*Committee:* Capt. H Aspinwall, Prof. C. F. Chandler, Dr. Wm. McMurtrie, Wm. Nicholls, and T. J. Parker.

Nottingham Section.

Chairman: L. Archbutt
Vice-Chairman: F. Stanley Kipping.
Committee.

S. F. Burford.
F. J. R. Carulla.
R. M. Caven.
H. B. Mayfield.
Loxley Meggitt.
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S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 62, Park Road, Nottingham.

The following take office in July next:—*Chairman:* J. T. W *Vice-Chairman:* S. F. Burford. *Committee:* L. Archbutt, F. S ley Kipping, G. D. Lander. *Hon. Secretary:* S. R. Trotman.

Scottish Section.

Chairman: T. L. Patterson.
Vice-Chairman: D. J. Playfair.
Committee.

W. Carrick Anderson.
E. M. Bailey.
H. Bumby.
D. B. Dott.
C. J. Ellis.
Thos. Ewan.
W. Frew.
Jas. Hendrick.
Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.

Hon. Secretary and Treasurer:
Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glas

The following take office in July next:—*Committee:* J. A Fleming, G. H. Gemmell, J. Falconer King, J. S. Macarthur, A Parker.

Yorkshire Section.

Chairman: Jas. E. Bedford.
Vice-Chairman: T. Fairley.
Committee

C. S. Bedford.
E. A. Brotherton.
John W. Cobb.
H. Grandage.
H. Ingle.
A. J. Murphy.
S. G. Rawson.
G. W. Slater.
A. Smithells.
A. Turnbull.
H. A. Watson.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

The following take office in July next:—*Vice-Chairman:* W Slater. *Committee:* T. Fairley, W. M. Gardner, H. R. P F. W. Richardson, Geo. Ward, Thorp Whitaker. *Hon. Local tary and Treasurer:* A. Turnbull.

N.B.—The names in *italics* are those of members of Committee who retire from their respective offices at the end of the current

Notices.

ANNUAL MEETING, BRADFORD, 1903.

Abridged Programme.

Wednesday, July 15th.

0 a.m. General Meeting. President's Address. Municipal Technical College.

0 p.m. Luncheon, at Midland Hotel, by invitation of the Local Committee.

0 p.m. Garden Party at "Ashdown," Apperley Bridge, by kind invitation of W. Edward Aykroyd, Esq., J.P.

0 p.m. Reception at the Town Hall by his Worship the Mayor of Bradford (Ald. David Wade, J.P.) and Mrs. Wade.

Thursday July 16th.

le Day Excursion :—

) The Works of Messrs. Wm. Fison and Co., Burley-in-Wharfedale (Spinning and Manufacturing). Luncheon at Burley.

Afternoon visit to Farnley Hall, Otley, by kind invitation of F. H. Fawkes, Esq., J.P., to inspect Hall and Collection of Paintings by J. M. W. Turner, R.A.

ning Excursions :—

The Works of Messrs. W. and J. Whitehead, Ltd. (Combing and Spinning). The Works of Messrs. Priestley's, Ltd. (Manufacturing).

The Works of Messrs. Jas. Drummond and Sons, Ltd. (Combing, Spinning, and Manufacturing).

The Works of Messrs. John Smith and Sons, Ltd. (Combing, Spinning, and Dyeing). The Works of Messrs. H. B. Priestman and Co. (Spinning and Manufacturing). The Works of Messrs. A. Priestman and Co. (Manufacturing and Finishing).

The Works of Messrs. Sir Titus Salt, Bart., Sons, and Co., Ltd. (Combing, Spinning, Manufacturing, and Dyeing).

The City Conditioning House (Testing of Wool, Tops, Yarns, &c.).

Note.—Luncheon will be provided: for Excursion 1 at Burley, and for all others at the Midland Hotel, Bradford.

oon Excursions :—

The Works of Messrs. Geo. Hodgson, Ltd. (Loom Makers).

The Works of Messrs. W. H. North and Co., Ltd. (Cotton Warp Dyeing, Sizing, and Mercerising).

The Works of Messrs. Ed. Ripley and Son, Ltd. (Piece Dyeing and Finishing).

The Warehouse of Messrs. Law Russell and Co., Ltd. (Dress Goods).

Note.—This Excursion is specially suitable for Ladies.

The following has been arranged so that all Afternoon Parties may participate, with exception of Excursion I:—

The New City Fire Brigade Station, at 5 p.m. (Special turn-out of the Brigade.)

0 m. Annual Dinner at the Midland Hotel. President's Reception, 7 to 7.30. Ladies are especially invited to attend the Dinner.

Friday, July 17th.

Excursion to Ripon, Studley Royal, and Harrogate.

m. Ladies' Evening, Midland Hotel.

.m. Smoking Concert, Midland Hotel.

A detailed programme, with request form for tickets, was issued with the Journal for May 30.

In accordance with the provisions of Rule 18 of the Bye-laws, notice is hereby given that those Members whose names are printed in *italics* in the list of Council will retire from their respective offices at the forthcoming Annual Meeting.

Sir William Ramsay has been nominated to the office of President under Rule 8; Prof. P. Phillips Bedson, Mr. E. Carey, Mr. W. H. Nichols, and Prof. H. R. Procter have been nominated Vice-Presidents under Rule 8; and Mr. Ivan Levinstein has been nominated a Vice-President under Rule 11.

The Hon. Treasurer and Hon. Foreign Secretary have been nominated for re-election to their respective offices.

Mr. B. E. R. Newlands, Prof. W. J. Pope, F.R.S., and Dr. W. S. Squire have been nominated under Rule 18, and Mr. H. Hemingway under Rule 19, to fill four vacancies among the Ordinary Members of Council. No Ballot will be required.

NEW SECTION AT SYDNEY, NEW SOUTH WALES.

The Council has granted the application of thirty members of the Society residing in New South Wales to be allowed to form a section, to be called the Sydney Section of the Society.

ST. LOUIS EXHIBITION, 1904.

The invitation to British manufacturers to participate in the St. Louis Exhibition next year, which has been issued by the Royal Commission, with the endorsement of the Prince of Wales as President, may perhaps be regarded by some as an appeal to the patriotism rather than to the business instincts of British manufacturers, but it is to be hoped that on the higher ground indicated it will not be ignored.

It would be most regrettable if other nations made a better display than this country, for, as has been pointed out by His Royal Highness, conclusions respecting the relative industrial importance of various nations will certainly be drawn from the respective exhibits, and thus, indirectly, if not directly, the manufacturing interests of this country will suffer unless they are adequately represented at St. Louis.

The Commission is seeking to encourage the adoption of the principle of collective exhibits, and is offering important advantages to those who co-operate on this basis. The chemical industries lend themselves readily to such a method of representative illustration, and it is satisfactory to learn that already many important firms have signified their willingness to become exhibitors under those conditions.

In order that adequate space may be secured, it is necessary that the Commission should at once receive full information as to the extent to which chemical manufacturers are prepared to support the action now being taken, and those who have not responded to the appeal should do so without loss of time. Full particulars can be obtained from the Secretary of the Liberal Arts Committee at the office of the Royal Commission for the St. Louis Exhibition, 1904, 47, Victoria Street, S.W.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR 1902.

(Made up to the 16th May 1903.)

REVENUE.

	£	s.	d.	£	s.	d.
Annual Subscriptions for 1902:—						
1 subscription received in 1900	1	5	0			
142 subscriptions received in 1901	177	2	0			
3,301 subscriptions received in 1902	4,126	5	0			
18 subscriptions received in 1903	60	0	0			
(Sundry balances and excess payments)	4	12	10			
3,492				4,369	4	10
Entrance Fees (326 at 1*l.* 1*s.*)	342	6	0			
Life Composition Fees (4 at 20*l.*)	80	0	0			
"Collective Index" Subscriptions	..			11	0	0
Investments:—						
Interest on Metropolitan 3 per cent. Consolidated Stock	126	0	10			
Interest on Gas Light and Coke Company's 3 per cent. Consol. Deb. Stock.	16	18	8			
Interest on North British Railway 3 per cent. Consolidated Lien Stock	30	12	0			
Interest on Midland Railway 2½ per cent. Perpetual Preference Stock	17	6	2			
Interest on Great Eastern Railway 4 per cent. Irredeemable Guaranteed Stock	21	12	1			
Interest on New Zealand 3 per cent. 1945 Stock	28	3	8			
Interest on New South Wales 3 per cent. 1935 Stock	14	13	6			
Interest on South Eastern Railway 4½ per cent. Preference Stock	28	9	8			
Interest on Southwark and Vauxhall Water Company 3 per cent. Debenture Stock	28	3	9			
Interest on Nottingham Joint Stock Station 3 per cent. Debenture Stock	5	12	11			
Interest on Great Western Railway 5 per cent. Guaranteed Preference Stock	14	1	11			
Interest on Great Northern Railway 3 per cent. Debenture Stock	22	11	6			
Interest on Deposit Account at Bank	20	17	1			
				377	3	10
Journal:—						
Sales				532	8	7
				£5,289	17	3

EXPENDITURE.

	£	s.	d.	£	s.	d.	£	s.
Journal Expenses:—								
Publishing				1,360	1	1		
Editorial:—								
Editor's Salary	600	0	0					
Editor's Expenses	58	12	10					
Abstractors	673	19	9					
Indexing Journal	154	14	0					
Patent Lists	19	8	9					
Sub-Editor's salary	150	0	0					
Foreign Journals	11	8	0					
Sundry Journals	9	8	6					
				1,677	11	10		
Insurance of Stock	..			7	2	6		
Patents and Specifications:—								
French	20	3	9					
United States of America.	30	4	8					
				50	8	5		
							3,095	3
Sectional Expenses				764	4	5		
Annual Meeting Expenses				167	17	11		
							932	2
Secretary's Salary				500	0	0		
Assistant				100	0	0		
							600	
Printing Sundries				44	7	5		
Stationery				48	5	6		
Library (Binding Books)				6	5	6		
Clerical Assistance				14	10	0		
Honorarium to Treasurer's Assistant				52	10	0		
							165	
Office Expenses				..			149	13
Solicitor's Charges				7	7	0		
Auditors' Fee				10	10	0		
Sundries				14	5	1		
Bank Charges				6	11	2		
							38	1
Treasurer's Petty Cash, Postage and writing up Subscriptions				25	1	2		
Secretary's Petty Cash and Postage				73	15	5		
							98	16
National Physical Laboratory (First Donation)				..			100	
Decennial Index (1896—1905)				..			258	
Investment:—								
Great Western Railway 5 per cent. Preference Stock (600*l.*)				976	12	0		
Balance of Revenue over Expenditure							478	
							£5,289	1

List of Members Elected

23rd JUNE 1903.

Arnott, John S., Fabrica Nacional, Trubia, Oviedo, Asturias, Spain, Chemist and Metallurgist.

Brewer, Leonard A., Prior Well Brewery, Worksop, Notts, Brewer and Chemist.

Bryant, V. Seymour, The Bank, Camborne, Cornwall, Analytical Chemist.

Donald, J. T., 112, St. François Xavier Street, Montreal, Canada, Analytical and Consulting Chemist.

Dubuque, Edwin D., 310, Realty Building, Elmira, N.Y., U.S.A., Chemist.

Francksen, Dr. Aug., Bridesburg, Philadelphia, Pa., U.S.A., Chemist.

Free, R. E., The Elms, Mistley, Essex, Maltster.

Gray, Wm. S., 76, William Street, New York City, U.S.A., Chemical Merchant.

Hazen, Chas. R., Collingwood, Ohio, U.S.A., Chemist.

Helps, D. H., c/o Reading Gas Co., King's Road Works, Reading, Engineer and Manager.

Hoffmann, W. F., 23, Division Place, Newark, N.J., U.S.A., Chemical Merchant.

Leerburger, Henry, 54, Beekman Street, New York City, U.S.A., Essential Oil Merchant.

McKenny, Charles, Bayview House, Drogheda, Ireland, Chemical Engineer and Manure Manufacturer.

McMullan, Charles, 20, Corn Market, Belfast, Ireland, Chemist.

Mommers, Richard, c/o Illinois Sugar Refining Co., Pek Ill., U.S.A., Chemical Engineer.

Ohlenschlager, J. G., jun., 2, Fowkes Buildings, G Tower Street, London, E.C., Chemical Merchant.

Reading, Richard W., Knights' Deep, Ltd., P.O. Box Germiston, Transvaal, South Africa, Assayer d Mechanical Engineer.

Richardson, F. J., Chemical Works, Ringsend Do Dublin, Ireland, Chemical Manure Manufacturer.

Roelofsen, Dr. J. A., c/o Coal Distillation Co., Midd brough, Yorks, Works Manager.

Running, D. A., 60, Market Street, Melbourne, Australia, Assayer.

Shenk, F. D., 138, Monroe Avenue, Detroit, Mich., U Chemist.

Changes of Address.

When notifying new addresses, members are request write them distinctly, and state whether they are tempor or permanent. Multiplication of addresses is also t avoided as tending to create confusion. When sen subscriptions, the use of the form attached to the applica helps in the verification of addresses, on which the delivery of the Journal depends.

Anty, A. M. (*not* Anty, A. M., as in list); addre before.

THE TREASURER—IN ACCOUNT WITH THE SOCIETY OF CHEMICAL INDUSTRY FOR THE YEAR 1902.

r.

		£ s. d.	£ s. d.
ash on Deposit (1st January 1902)		500 0 0	
alance at Bank (1st January 1902). ...		317 6 8	
		817 6 8	
Less Cash due to Secretary		0 0 1	
nnual Subscriptions:—			817 6 7
3 for the year 1900		3 15 0	
54 for the year 1901		67 10 0	
3,301 for the year 1902		4,126 5 0	
318 for the year 1903		397 10 0	
3 for the year 1904		3 15 0	
(Sundry balances and excess payments)		4 12 10	
3,679			4,603 7 10
ntrance Fees (326 at 1*l.* 1*s.*)		..	342 6 0
ife Composition Fees (4 at 20*l.*)		..	80 0 0
Collective Index" Subscriptions.......		..	14 0 0
nterest from Investments:—	£ s. d.		
Metropolitan 3 per cent. Consolidated Stock....	(4,476 9 2)	126 0 10	
Gas Light and Coke Company's 3 per cent. Consolidated Debenture Stock.................	(600 0 0)	16 18 8	
North British Railway 3 per cent. Consolidated Lien Stock	(1,084 13 4)	30 12 0	
Midland Railway 2½ per cent. Perpetual Preference Stock.........	(736 0 0)	17 6 2	
Great Eastern Railway 4 per cent. Irredeemable Guaranteed Stock	(654 0 0)	24 12 1	
New Zealand 3 per cent. 1945 Stock	(1,000 0 0)	28 3 9	
New South Wales 3 per cent. 1935 Stock	(485 4 8)	13 13 6	
South Eastern Railway 4½ per cent. Preference Stock................	(673 0 0)	28 9 8	
Southwark and Vauxhall Water Company's 3 per cent. Debenture Stock	(1,000 0 0)	28 3 9	
Nottingham Joint Stock Station 3 per cent. Stock................	(200 0 0)	5 12 11	
Great Western Railwsy 5 per cent. Guaranteed Preference Stock	(600 0 0)	14 1 11	
Great Northern Railway 3 per cent. Debenture Stock................	(800 0 0)	22 11 6	
	(12,309 7 2)		
terest on Deposit Account at Bank ...		20 17 1	
urnal:—			377 3 10
Advertisements		48 0 0	
Sales		482 9 7	
			530 9 7
			£ 6,764 13 10

Cr.

	£ s. d.	£ s. d.	£ s. d.
By Journal Expenses:—			
Publishing		1,471 1 9	
Insurance of Stock		7 2 6	
Editorial:—	£ s. d.		
Editor's Salary	600 0 0		
Editor's Expenses	58 16 4		
Abstractors	669 14 10		
Indexing Journal......	104 7 0		
Patent Lists...........	36 4 9		
Foreign Journals	11 8 0		
Sundry Journals	9 8 6		
Sub-Editor (Secretary)	150 0 0		
		1,639 19 5	
Patents and Specifications:—			
United States of America	30 4 8		
French	20 3 9		
		50 8 5	
			3,168 12 1
Sectional Expenses:—			
Canadian Section....................		5 13 8	
Liverpool Section....................		42 16 9	
London Section......................		78 19 3	
Newcastle Section		10 11 0	
Manchester Section		56 7 8	
New York (U.S.A.) Section.........		118 10 0	
Nottingham Section		18 10 11	
Scottish Section		13 7 10	
Yorkshire Section		19 7 4	
			364 4 5
Annual Meeting—Expenses in connection with..........................		..	167 17 11
Secretary's Salary (see also Sub-Editor)		300 0 0	
Assistant		100 0 0	
			400 0 0
Printing Sundries		59 3 11	
Stationery		52 16 0	
Library (Binding Books)		14 15 9	
Clerical Assistance		14 10 0	
Honorarium to Honorary Treasurer's Assistant (1901)		52 19 0	
			193 15 8
Office Expenses, &c.:—			
Rent		95 0 0	
Fire Insurance......................		0 5 0	
Cleaning, Attendance, &c...........		18 0 6	
Gas and Electric Light		6 2 5	
Sundry Requisites, Repairs, &c......		23 11 6	
			142 19 5
Solicitors' charges......................		7 7 0	
Auditors' Fee		10 10 0	
Sundries		14 5 1	
Bank Charges		6 11 2	
			38 13 3
Treasurer's Petty Cash and Postage		25 1 2	
Secretary's Petty Cash and Postage.....		73 15 5	
			98 16 7
National Physical Laboratory (First Donation)		..	100 0 0
Decennial Index (1895–1904), paid on account............................		..	258 0 0
Investment:—			
Purchase of 600*l.* Great Western Railway 5 per cent. Guaranteed Preference Stock		..	976 12 0
Cash on Deposit (31st December 1902)..		250 0 0	
Balance at Bank (31st December 1902).		587 5 1	
Cash in Secretary's hands (31 Dec. 1902)		17 17 5	
			855 2 6
			£ 6,764 13 10

have compared the above Statement with the Vouchers, Counterfoils of the Receipts issued, and other records, and are of opinion it tly exhibits the Cash transactions of the Society for the year 1902. The amounts of the Metropolitan 3 per cent. Consolidated, 3 per New Zealand, and 3 per cent. New South Wales Stocks havo been confirmed by the Chief Accountant to the Bank of England. cates for the remaining investments have been inspected, and the Bank Balances have been certified to us by the Bankers.

St. Swithin's Lane, London, E.C., (Signed) MIALL, WILKINS, RANDALL, & Co.,
22nd April 1903. Chartered Accountants.

---

t, Bertram, l/o Broadway; 76 & 78, York Street, Vestminster, S.W.

Dr. W. Norman, l/o Westminster; The Vicarage, leaford, Lincolnshire.

, Dr. Edw., F.R.S., l/o Addison Bridge; 3, Canning lace, Palace Gate, London, W.

Duckworth, Wm. H., l/o Northenden Road; Moorfield, Sylvan Avenue, Sale, Cheshire.

Folsom, H. A., l/o Brighton Street; 254, Knight Street, Providence, R.I., U.S.A.

Greenway, T. J., l/o Adelaide; Chillagoe, North Queensland.

Hilton, Edgar G., l/o Russia; 7, Doon Terrace, Midton Road, Ayr, N.B.

Ichioka, T., l/o Nishikatamachi; 19, Maruyama Shinmachi, Hongo, Tokio, Japan.

Levy, A. G., l/o Broadway; c/o Bertram Blount, 76 & 78, York Street, Westminster, S.W.

Lomas, T., l/o Minehead; 5, Osmond Gardens, Bedford Park, W.

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Marshall, Wm., l/o Balham; Barkley, Teddington, Middx.

North, E. Gordon N., l/o Peña del Hierro; retain Journals.

Ratcliffe, F. D.; Journals to Bromsgrove, Worcestershire (*not* Staffordshire).

Sherman, G. W., l/o Liverpool; Akron, Ohio, U.S.A.

Thorburn, Jas., l/o Stanford-le-Hope; Rein's Villas, Stevenston, Ayrshire.

Turnbull, Dr. A., l/o Leeds; Manchester and Liverpool District Tanners' Federation, 3, Lord Street, Liverpool, Consulting Chemist.

Death.

Free, Robt., The Elms, Mistley, Essex.

Canadian Section.

THE DETERMINATION OF SHRINKAGE IN RAW WOOL AND WOOLLEN YARNS.

BY ALFRED TINGLE, B.SC., PH.D., AND WILLIAM MORRISON, B.A.

Determinations of the shrinkage (*i.e.*, the loss of weight by scouring) of wool must depend on one of two principles: the wool may be washed with some such solution as would be used in scouring, then rinsed, dried, and weighed, or it may be extracted by some solvent suitable for removing fatty matter, washed with water to remove sand and other insoluble impurities, then dried and weighed as in the previous case.

At first it might appear that the best results would be obtained by the first method, since the conditions under which the actual scouring will be performed are then most closely approached. It is, however, very difficult to properly scour raw wool, even in small quantities, by hand, and still more difficult to thoroughly rinse it. Before adopting one of the extraction methods for laboratory use it was necessary to institute comparisons, in order to be sure that results obtained in this way would agree closely enough with those obtained by any other. The object was to find a method which would be sufficiently accurate, fairly rapid, and which would require the minimum of care and attention during the operation. It may be pointed out that an agreement within 2 per cent. between two determinations in such an operation as this may be considered as extremely fair.

Experimental.—In every determination, no matter by what method, the last steps consist in washing the wool with water, drying at about 105°, and weighing it. Since this drying causes a permanent loss of weight in wool, and since the first weighing is made upon an air-dried sample, it is obviously necessary to introduce a correction by drying the wool at 105° before cleaning it, and adding the loss of weight so produced to the final weight of dry and clean wool. This will be best understood from the following example:—Weight of wool taken (air dry), 100 grms.; loss of weight after drying for one hour at 105°, 3 grms.; weight of wool after being so treated, scoured, rinsed, and again dried, 70 grms. The t shrinkage would be 27 per cent., not (as when uncorrecte 30 per cent.

First Series.—Determinations were made on two samp of the same wool, in order to show that a scouring meth and an extraction method might be relied on to g results sufficiently close to one another.

By the scouring method the wool was washed twice w water, then soaked, and constantly stirred for 30 minu in a solution containing 5 per cent. of soap, and maintain at 65° to 67°. It was next washed repeatedly in boi water, dried at 105°, and weighed. Skrinkage = 25 p cent.

For the extraction method the wool was placed in ordinary extractor, and extracted with ether for 30 minu It was then washed twice with boiling water, dried, a weighed. Shrinkage = 28·5 per cent.

The results thus obtained were sufficiently close justify another series of experiments, in which seve solvents might be compared together.

Second Series.—In these experiments the wool used of different origin from that previously investigated. shrinkage was, however, nearly the same.

Scouring with soap solution gave a shrinkage of 27·6 p cent. Scouring with a solution containing 5 per cent. sodium carbonate, which was applied in exactly the sa way as the solution of soap, gave a shrinkage of 24·7 p cent.

All extraction experiments were carried out, except the variations in the solvent used, exactly as was the et extraction in the first series. Ether gave a shrinkage 24·2 per cent. Alcohol, 27·9 per cent. Petroleum et 27·2 per cent.

Third Series.—It seemed most probable that deviations noticed in the first two series of experime were due more to the difficulty of fairly sampling raw w than to any other cause. Check experiments were the fore made on two samples of unscoured carpet y "No. 1 ingrain" is a fair grade of yarn, running very e in quality. "No. 5 ingrain" is a low grade yarn, une and coarse, much of the skrinkage of which is d inorganic matter and to partial mechanical disintegrat of the yarn itself, while being scoured and subsequ handled. The "factory shrinkage" shows the los weight of the yarn after being scoured, dyed, dried, passed on to the winding room, where it is weighe second time:—

	Shrinkage.	
	No. 1 Ingrain.	No. 5 I
	Per Cent.	Per Cent
Ether extraction................	12·6	11·9
Petroleum ether extraction.....	13·1	15·9
Factory shrinkage....	14·0	19 to

Conclusions.—The figures obtained by the diffe methods in the first and second series of experim probably differ no more than would those obtained by same method on different samples of the same wool. deduction is supported by the close agreement of results obtained by ether and petroleum ether respe in the third series, where the material offered no d in sampling.

It makes little difference what common organic so is employed in an extraction method. Petroleum et probably the most useful, being easily obtained, cheap, readily volatile.

An extraction method is more quickly and easily formed, and requires less care and attention than a scou method. The advantages of the former can only appreciated by those who have used both. An extrac method is hardly suitable to use as a check on facty ractice when low grade yarns, containing much cows' hair, re to be tested. The results on No. 5 ingrain yarn ufficiently shows this.

We wish to convey our thanks to Mr. F. B. Hayes, nanager of the Toronto Carpet Manufacturing Co., for his indness in supplying the wool and carpet yarn on which hese determinations were made.

London Section.

Meeting held at Burlington House, on Monday, May 25th, 1903.

MR. WALTER F. REID IN THE CHAIR.

THE ACTION OF HYPOCHLORITE SOLUTIONS ON METALS.

BY HERBERT P. PEARSON, M.Sc.

Referring to the communication by Dr. White, in the urnal of the 16th Feb. this year, on the "action of lutions of bleaching powder and of hypochlorous acid on etals," the following observations made by me may be of terest to the author and possibly to the readers of the urnal.

Pieces of the metals mentioned below, about 3 cm. square d 2 mm. thick, were placed 12 months ago in half-litre, de-mouthed, tightly-stoppered bottles, with 100 c.c. of alkaline solution of sodium hypochlorite (containing per cent. available chlorine and 57 per cent. Na_2CO_3) to h piece. The bottles were kept below 16° C., and the servations made were :—

Iron.—The action set in at once, and in a few days a ious brown precipitate of ferric hydroxide was produced. ter three weeks the solution became of a deep claret our, probably due to the formation of ferrates. The our thus developed gradually faded again until the ution became colourless.

Zinc.—Very slight action at first, but at the end of a tnight a decided deposition of ZnO. After six months, ious powdery deposition of the same substance.

Lead.—Formed puce-coloured lead peroxide at almost same rate as ferric hydroxide was produced.

opper and Zinc Alloy.—The upper side of the piece thickly covered with a dull-green deposit at the of 12 months, and the lower side next the glass had light scarlet coating, having the appearance of pure rous oxide.

o trace of any of the metals was found in the solutions, each solution contained small quantities, varying from per cent. to 0·05 per cent. of chlorates. Gas was ved in all cases, but was not examined.

have, unfortunately, no opportunity of making a thorough stigation into the subject, but I think the difference een the action of a solution of calcium hypochlorite an alkaline solution of sodium hypochlorite is sufficiently ing to be of interest to those working on the subject.

he observation of Drs. Dobbin and White, in the same nal, that bleaching liquor can form nascent oxygen with c hydroxide, is highly interesting, and provides a possible anation of the uneven dyeing obtaining in the case of in cotton goods which have been bleached. The cause ld appear to be the local formation of oxycellulose by nascent oxygen formed by the action of the "chemic" on stains produced in the boiling and not thoroughly oved before "chemicing."

Yorkshire Section.

Meeting held at the Midland Hotel, Bradford, on Monday, March 30th, 1903.

MR. JAMES E. BEDFORD IN THE CHAIR.

METHODS OF STANDARDISING PERMANGANATE OF POTASH, AND THE USE OF THIS SUBSTANCE IN THE VOLUMETRIC ESTIMATION OF IRON.

BY W. M. GARDNER, F.C.S., B. NORTH, A.R.C.Sc., AND A. R. NAYLOR.

Results which we obtained some time ago indicated that the gravimetric and volumetric methods of determining iron were not in perfect agreement, and we therefore decided to make a critical examination of the methods of standardising and of using permanganate of potash in volumetric determinations of iron in various substances.

With regard to the standardisation of the permanganate, Thiele and Deckert (Zeits. angew. Chem., 1901, **14**, 1233—1214) state that oxalic acid is preferable to the various kinds of so-called pure iron recommended for the purpose.

Rust (Zeits. anal. Chem., 1902, **41**, 606—608) states that manganese oxalate dried over strong sulphuric acid always contains two molecules of water, and, being non-hygroscopic, serves as a convenient salt for standardising permanganate.

Dupré, jun., and E. Mülle (Zeits. angew. Chem., 1902, **15**, 1244—1246) have experimented with various double oxalates, and state that the most accurate results are obtained with lead oxalate, as suggested by Stolba, and with sodium oxalate, as suggested by Sörensen.

These methods introduce substances which, with the exception of oxalic acid and sodium oxalate, are not readily available, and it was therefore decided to recrystallise the permanganate of potash, and from the pure and dry salt make up a standard solution by exact weighing.

The pure salt was finally obtained in the following manner. A hot saturated solution was rapidly filtered through recently ignited asbestos, the salt allowed to crystallise, and the mother-liquor drained off ; the crystals were again dissolved in a small quantity of boiling distilled water and then recrystallised, the mother-liquor being again rejected. In this way very fine needle-shaped crystals were obtained, which were dried in a steam oven in the crystallising dish used in the preparation. A decinormal solution was then prepared. In all the experiments, boiled distilled water was used, and the measurements made with vessels accurately calibrated at 15° C. Decinormal solutions of ammonium oxalate, granular ferrous ammonium sulphate, and oxalic acid were made from the materials sold as "pure" without any attempt being made to further purify them, and the results in Table I. show that these substances may each be satisfactorily used, if necessary, for the standardisation of permanganate. Experiments were also made with one of the samples of ammonium oxalate, after powdering the salt and drying in a desiccator, first over calcium chloride and then over sulphuric acid and phosphorus pentoxide. The results show that the salt gradually loses water of crystallisation, and it is therefore preferable to use the dry crystals without further treatment.

These solutions were further tested at intervals during a period of one month to ascertain whether they retained their strength. We find that the pure permanganate of potash retains its strength both in the solid state and in solution, whereas after one week the strength of the ammonium oxalate begins to slowly deteriorate, and the ferrous ammonium sulphate, even in a slightly acidified solution, shows a continual and regular deterioration amounting to about 3 per cent. in a fortnight. These results were obtained by making up fresh standard solutions of each substance from time to time, and then crossing the solutions against each other, as shown in Table II.

Table I.

Permanganate against Ammonium Oxalate.

N/10 oxalate used, 25 c.c.; 1:4 dil. H_2SO_4, 10 c.c.; temp., 60° C.

—	N/10 Permanganate.	Percentage of Ammonium Oxalate + Aq.
Sample I.	25·03 25·03	100·12 100·12
Sample II.	25·06 25·04	100·24 100·16
Sample III.	25·01 25·01	100·04 100·04
Sample III. (transparent crystals only).	25·07 25·03 25·05	100·28 100·12 100·20
Sample IV.	25·01 25·02	100·04 100·08
Sample V.	25·06 25·06	100·24 100·24

Permanganate against Oxalic Acid.

N/10 oxalic acid, 25 c.c.; H_2SO_4, 10 c.c.; temp., 60° C.

—	N/10 Permanganate.	Percentage of $H_2C_2O_4 + 2H_2O$.
Sample I.	25·03 25·04	100·12 100·16
Sample II.	25·01 25·01	100·04 100·04

Permanganate against Ferrous Ammonium Sulphate.

N/10 ferrous ammonium sulphate, 25 c.c.; H_2SO_4, 10 c.c.

—	N/10 Permanganate used.	Percentage of Ferrous Salt.
I. Bottle newly opened	25·01 25·06	100·04 100·24
II. Opened 2 months previously..	24·97 24·99	99·88 99·96

Table II.

Stability of N/10 Permanganate, N/10 Ammonium Oxalate, and N/10 Ferrous Ammonium Sulphate.

(a) Permanganate and Oxalate.

Date of Experiment.	N/10 Permanganate used.	N/10 Oxalate used.	Percentage of $(NH_4)_2C_2O_4.H_2O$ in Sample.
1903.			
March 3rd	No. 1	No. 1	100·16
March 10th	"	"	100·32
"	No. 2	"	100·20
March 17th	No. 3	No. 2	100·00
"	"	No. 1	99·32
"	No. 1	No. 2	100·00
"	No. 2	"	100·08
March 30th	No. 4	No. 1	98·98
"	"	No. 3	100·04

No. 1 permanganate and No. 1 oxalate prepared March 3rd; No. 2 permanganate, March 10th. No. 3 permanganate and No. 2 oxalate, March 17th; No. 4 permanganate and No. 3 oxalate, March 30th.

(b) Permanganate and Ferrous Ammonium Sulphate, both prepared March 3rd.

Date of Experiment.	Percentage of $FeSO_4Am_2SO_4 6H_2O$ in Sample.
1903.	
March 3rd	99·88 99·96
March 6th	99·40 99·64
March 10th	98·44
March 17th	96·80
March 30th	94·32

Experiments with Powdered and Desiccated Ammonium Oxalate.

Permanganate used.	Oxalate used, Dried.	Percentage of $(NH_4)_2C_2O_4.H_2$
No. 2	Sample 3 (*see* Table I.) 14 days over $CaCl_2$.	100·84 100·80
"	Sample 3 (*see* Table I.) over P_2O_5 for two days.	102·28 102·28

Experiments were then made with iron alum, usi various methods of reducing the iron to the ferro condition before titration with permanganate.

The method of reducing with zinc and sulphuric ac was ultimately found to be most suitable and reliab though considerable difficulty was at first experienc in obtaining concordant results. The errors were final found to be due to the use of ordinary granulated zi and varied within very considerable limits, as shown the annexed results, according to the amount of zi used. Further, different specimens of zinc varied co siderably in composition, results obtained in blank te being frequently very discordant. By using pure zi results were obtained which were in perfect agreeme and these, although high, are also in agreement w gravimetric estimations. The pure zinc should be pref ably granulated. The high results are probably account for by the presence of basic compounds, as no attempt w made to ensure the absence of basic ferric sulphate in t iron alum used.

Table III.

Estimations of Iron in Iran Alum: Effect of Purity of the Zinc.

Iron Alum.	40 c.c diluted (1:4) H_2SO_4 used for Solution of Zinc in each case.	Percentage of $Fe_2(SO_4)_3K_2SO_4,24H$
Sample I.	Ordinary zinc (6 grms.)	118·00 126·80
	Pure zinc (2 grms.)	104·58 101·96 101·72 101·41
Sample II.	Pure zinc (6 grms.)	105·24 105·[illegible]
Blank	6 grms. ordinary zinc	3·08 3·[illegible]
	6 grms. pure zinc	0·16

Gravimetric No. 1 = 105·08 per cent.

Finally, the volumetric process was applied to estimation of iron in iron wire, the latter being "flo wire," generally accepted as 99·6 per cent. iron. Ma of these estimations were made before the above ment method of obtaining standard permanganate of potash been arrived at, and consequently the percentages of given in some of the results in Table IV. are low comparison with the results which were later obtained the same wire.

The method usually recommended for standard permanganate was found to give very variable results, shown in the annexed table.

TABLE IV.

Estimations of Iron in Flower Iron Wire.

(a) Carbon not removed from Solution.

Weight of Iron used.	Percentage of Fe.
Grm.	
0·1490	98·40
0·1095	99·52
0·1180	100·70
0·1064	101·41

(b) Carbon removed by Filtration.

Weight of Iron.	Percentage of Iron.
Grm.	
0·7611	98·34
0·7760	98·32
0·7189	98·30

t was ultimately found that these discrepancies were due t the small amount of graphitic carbon remaining when t iron was dissolved in dilute acid. For this method of s dardising permanganate it is therefore advisable to d olve, say, about 0·75 grm. of the fine wire in dilute a , using a flask the neck of which is covered with a w ch glass or provided with an ordinary Bunsen valve, t cool quickly and make up to 250 c.c. with recently b ed distilled water. The solution is then rapidly filtered t ugh a dry folded filter and dry funnel direct into a b ette, and 50 c.c. run off into a flask and at once titrated. he amount of ferric iron thus formed is quite inappre- c le, and results are obtained which agree excellently with o another, as shown in Table IV.

he results obtained with iron wire show that this method c not be considered as a very accurate one for the s dardisation of permanganate even after the removal of graphitic carbon, and this is probably to be accounted f by the presence, in small quantities, of other impurities in e iron. We are continuing the investigation of this q tion.

he conclusions arrived at from the foregoing experi- m ts are—

That an accurate permanganate solution may readily b obtained from the pure salt prepared as already d cribed.

That, if necessary to standardise it, either pure a onium oxalate, oxalic acid, or granular ferrous a onium sulphate may be used with extremely accurate re ts.

"Select Methods of Chemical Analysis," latest edition, Cr es states: "The titration of the permanganate solution can on be properly made by means of metallic iron, and when the a metal, in a sufficiently pure state for this purpose, is not at h oxalic acid should be used. The use of iron ammonio-sul- ph for obtaining the standard should be rejected. Unless the e composition of this salt is repeatedly ascertained, it is not t relied upon, and this testing is a loss of time."]

Ammonium oxalate crystals should be used in the ordinary state, as when finely powdered and desiccated they are liable to lose water of crystallisation. If pure ferrous ammonium sulphate is dissolved in very dilute acid, the solution is permanent for perhaps 24 hours, and this forms a very rapid and reliable method of standardising permanganate.

3. In the estimation of iron in a commercial sample of metallic iron, it may be preferable to standardise the permanganate with iron wire, but the method is only reliable when the graphitic carbon present is removed by filtration previous to titration.

4. In the reduction of ferric salts by means of zinc, it is very important that pure zinc should be employed, the use of ordinary zinc introducing large errors.

5. It is essential to remove the graphitic carbon before titrating a solution of iron with permanganate.

DISCUSSION.

Mr. **Richardson** referred to the difficulty in getting pure permanganate, and said that errors of 2 or 3 per cent. might be traced to this if one assumed the ordinary permanganate to be pure. Ferrous ammonium sulphate gave the best results as a standard.

Mr. **Fairley** agreed that ferrous ammonium sulphate, if weighed out just as required, gave accurate results, but if the solution were kept for any length of time the results were not reliable. In reducing ferric solutions to ferrous by means of sodium sulphite it was best to work in nearly neutral solutions, as anything over a slight excess of acid interfered with the reaction.

Mr. **Richardson** asked if pure oxalic acid had been tried for standardising

In reply Mr. **Gardner** stated that pure oxalic acid had been found very satisfactory. Discrepancies between volumetric and gravimetric estimations of iron had led to this investigation.

Mr. **North** said that pure granular ferrous ammonium sulphate gave accurate results when dissolved in boiled distilled water slightly acidified with sulphuric acid. Oxalic acid gave perfectly sharp end reactions if the titration was carried out at a temperature of 60° C. The ferrous ammonium sulphate solution should be freshly made, results being unreliable after the lapse of 12 to 24 hours. Ordinary crystallised permanganate, as stated by Mr. Richardson, gave errors amounting to about 2 per cent., but there was no difficulty in obtaining the permanganate in a pure state by recrystallisation as described, and this formed, by weighing, the most reliable method of obtaining a standard permanganate.

Mr. **Fairley** said that ferrous ammonium sulphate was readily prepared pure by adding to ferrous sulphate solution the proper amount of ammonium sulphate solution and precipitating the double salt as a crystalline powder by the addition of alcohol. In presence of manganous salts the reaction between oxalic acid and permanganate took place more quickly in proportion to the amount of manganous salt present.

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United States.—9*d.* each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3e).

I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Heating Air or Liquids to a Constant Temperature; Apparatus for ——. V. Eltz, Abbazia, Austria. Eng. Pat. 10,724, May 9, 1902.

"A column of metallic liquid" (mercury) is arranged in the interior of a receptacle heated by electric coils, so that the liquid itself, or a movable contact floated by the liquid, short-circuits or cuts out the coils when the desired temperature is attained, and again establishes the circuit through the coils when the temperature falls below the desired limit. —R. A.

Cooling, Distilling, Heating, Evaporating, and Condensing Apparatus. L. von May, Ungarisch Ostra, Austria. Eng. Pat. 11,217, May 15, 1902.

A rotary heat-exchanging device, made up of a number of separate vertical hoop-shaped heating or cooling pipes, arranged in sets of one or more, is mounted on a hollow shaft. Each separate pipe is connected at one end to a common inlet passage for the heating or cooling medium, and at its other end to a common discharge passage for the condensed or heated liquids or gases. The common inlet and discharge passages are connected with corresponding passages formed in the hollow shaft. Modifications in detail are also claimed.—R. A.

Crushing Ice; Machines for ——, or for Crushing Soda or other Crystals or the like. R. Bridge, Castleton, Lancashire. Eng. Pat. 14,073, June 21, 1902.

The machine has two sets of rollers or crushers, provided with projecting spikes or pegs, which may be arranged spirally or in other suitable formation. The rollers are driven by suitable gearing, and the lower set of rollers is adjustable.—R. A.

Separation of Solid Matter from Liquids, or Liquids from each other. L. C. Reese, London. Eng. Pat. 18,830, Aug. 27, 1902.

In extracting or separating matter from liquids by means of a liquid-extracting agent, as and by the apparatus described in Eng. Pat. 29,387 of 1897 (this Journal, 1899, 22), the liquid to be treated, is heated by mixing it with vapours of the extracting liquid, before the former liquid undergoes the usual operations. In the apparatus employed, the vapours are mixed with the liquid to be treated, in a vessel provided with an agitator, with inlets for the liquid and vapours near the bottom, with an escape pipe for the uncondensed vapours near the top, and with an overflow pipe connected to the extraction chamber. The connections are arranged so that the column of the mixture within the overflow pipe balances the column of liquid within the extraction chamber.—R. A.

Extracting Apparatus. E. Heimann, Brunswick, Germany. Eng. Pat. 24,447, Nov. 7, 1902.

See Fr. Pat. 324,202 of 1902; this Journal, 1903, 618.
—T. F. B.

United States Patents.

Evaporating Apparatus. H. Howard, Brookline, Mass. U.S. Pat. 728,395, May 19, 1903.

A longitudinally-movable endless conveyor is mounte above and adjacent to the bottom of the evaporating pa and is provided with a series of pivoted scrapers, whic when on the lower run of the conveyor, sweep over t bottom of the pan. Means are provided for swinging t scrapers into working position as they pass from t upper to the lower run, a guard registering with the e wall of the pan serving to limit the swinging movement the scrapers, and to direct them into the pan.—R. A.

Filter. G. Engel, Baltimore, Md. U.S. Pat. 729,147, May 26, 1903.

A filtering chamber and a chamber for receiving t filtrate are formed within a tank by means of a partiti A support for a channelled filter-bag is fitted at one e into a socket in the partition, and at the other end supported by a swinging hanger, which normally occupi an angular position, and is adapted, under the influence gravity, to press the filter-bag support into its socket.
—R. A.

Still [Ether, &c.]. E. Huber, Brooklyn, N.Y., Assignor M. C. Wick, Youngstown, Ohio, and S. V. Huber, Pit burg, Pa. U.S. Pat. 729,179, May 26, 1903.

The distilling vessel for the ether or similar liquid enclosed in an outer vessel containing a liquid, such glycerin, of comparatively high boiling point, the heat bei transmitted from the outer vessel to the inner vessel thr this liquid, and also through metallic connections betwee metallic body in the outer vessel and a similar body in inner or distilling vessel. In addition to suitable su and discharge pipes, controlling valves, injector, &c., apparatus is provided with means for automatically ma taining the level of the ether or other liquid in the in vessel within certain predetermined limits.—R. A.

French Patents.

Explosions within Receptacles for Volatile Combust Liquids or Gases [Petrol, Acetylene, &c.]: Means Preventing ——. E. Bouchaud-Praceiq. Fr. Pat. 32[illegible], Oct. 25, 1902.

The reservoir, pipe, cylinder, or other container or cond for the combustible substance is filled wholly or at differ points with balls, prisms, or the like, made of thin perfora metal or wire gauze, preferably of aluminium or oth light metal. An explosion cannot be propagated thro such a mass.—H. B.

Evaporating Liquids containing Crystallisable Compou; Apparatus for ——. E. von Seemen. Fr. Pat 325,[illegible] Sept. 6, 1902.

See Eng. Pat. 19,034 of 1902; this Journal, 1902, 138[illegible].
—L. F. G.

Vacuum; Process, and Means used therein, for the Production of ——. F. Fanta. Fr. Pat. 326,090, Nov. 4, 1902.

See Eng. Pat. 15,687 of 1902; this Journal, 1902, 1523. —L. F. G.

II.—FUEL, GAS, AND LIGHT.

Benzene in Illuminating Gas; Determination of ——. L. M. Dennis and J. G. O'Neill. XXIII., page 763.

Carbon Monoxide in Mine Gas; Determination of ——. A. Fillunger. XXIII., page 762.

English Patents.

Fuel; Artificial ——. H. P. Brown, Manhattan, N.Y. Eng. Pat. 5566, March 10, 1903.

ome carbonaceous material (*e.g.*, ash or cinder) is mixed ith the residue of an acetylene gas generator, or its equialent. Ferrous sulphate (about 1 per cent.) may be added o the mixture.—T. F. B.

Furnaces; Impts. in ——. J. MacNaull Wilson, New York. Eng. Pat. 14,050, June 20, 1902.

ir, which may be preheated, is blown into the fuel, the urrents of air being directed towards the centre of the urnace. The nozzles supplying the air are made of fireesisting material, and in two parts.—L. F. G.

Burners for Liquid Fuel. W. J. Osborn, Leyton. Eng. Pat. 15,857, July 16, 1902.

stream of air is supplied to the interior of the flame, hich is formed by allowing an annular jet of steam or ompressed air to impinge on an annular stream of liquid el. This has for an object the securing of more complete ombustion of the fuel.—T. F. B.

aseous Product adapted for Use in Furnaces and for other Purposes; Improved Means applicable in the Conversion of Steam into a ——. L. P. Burrows, Washington, D.C. Eng. Pat. 3714, Feb. 17, 1903.

eam is allowed to expand in an expansion chamber, the ndensed water is drawn off, the low-pressure steam is ated to a high temperature, injected into a fire-box, and urnt in conjunction with other fuel."—H. B.

s Producers; Apparatus for Treating Gas and Air in connection with ——. W. J. Crossley and T. Rigby, Openshaw. Eng. Pat. 12,362, May 31, 1902.

e specification relates to a heat-interchanging apparatus, nsisting of two vertical concentric pipes, having the nular space between them partly filled with water. The gases from the producer pass down the inner pipe, ating its walls, and thus imparting heat to the water rounding it. The air supply for the producer is led nd the upper part of the annular space, where it omes heated and at the same time saturated with the ter vapour. Devices for facilitating the cleaning of the er and inner pipes, and for washing the gas, are vided.—H. B.

s; Impts. in and Apparatus for the Manufacture of ighting and Heating ——. J. Y. Johnson, London. rom Deutsche Continental Gasgesellschaft and J. Bueb, essau. Eng. Pat. 15,154, July 7, 1902.

: Fr. Pat. 323,712; this Journal, 1903, 487.—H. B.

etylene] Gas Generators; Impts. in ——. W. L. Wise, ondon. From H. W. Webb, New York. Eng. Pat. 261, March 18, 1903.

rhin the lower part of a carbide receptacle is arranged a plementary open receptacle, the sides of which fit the sides of the main receptacle so closely as to leave only a capillary space all round. At the bottom the capillary space is in communication with a valve-controlled water supply. The water reaches the carbide by rising in a capillary film between the two receptacles and overflowing upon the carbide.—H. B.

Lamps; Impts. in Electric Incandescence ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 12,156, May 28, 1902.

See Fr. Pat. 321,412; this Journal, 1903, 206.—H. B.

Filaments or the like for Electrical Incandescence Lamps; Manufacture of ——. C. D. Abel, London. From Siemens and Halske A.-G., Berlin. Eng. Pat. 12,162, May 28, 1902.

See Fr. Pat. 321,413; this Journal, 1903, 206.—H. B.

Photometers or Apparatus for Measuring the Intensity of Light; Impts. in ——. W. Frisby. Eng. Pat. 13,442, June 13, 1902. XXIII., page 761.

Photometers; Impts. in ——. W. P. Thompson. From L. B. Marks. Eng. Pat. 14,688, July 1, 1902. XXIII., page 761.

United States Patents.

Fuel Compound Emulsion. W. F. Browne, New York, Assignor to Fuel and Gas Manufacturing Co., West Virginia. U.S. Pat. 728,854, May 26, 1903.

Peat in a state of "molecular division" is made into an emulsion with water, and forced into heated conduits for making fuel-gas.—L. F. G.

Fuel Compound Emulsion. W. F. Browne, New York, Assignor to Fuel and Gas Manufacturing Co., West Virginia. U.S. Pat. 728,855, May 26, 1903.

Peat reduced to a state of "molecular division" is made into an emulsion with powdered coal and water, the peat serving to keep the heavier matter in suspension.—L. F. G.

Furnace; Double-hearth Heating ——. P. Patterson, McKeesport, Pa., Assignor to National Tube Co., Pittsburg, Pa. U.S. Pat. 729,092, May 26, 1903.

Pillars rising from the main hearth of the furnace support a secondary hearth. Air and gas inlets are arranged in such a manner that the products of combustion will maintain a substantially equal temperature for the two hearths. —L. F. G.

Gas; Process of Enriching ——. F. W. C. Schniewind, Everett, Mass., Assignor to the United Coke and Gas Co., Charleston. U.S. Pat. 728,991, May 26, 1903.

This process of enriching gas, manufactured in closed externally heated retorts, consists in separating the richer and poorer gases generated; subjecting tar which contains benzene, &c., to fractional distillation so as to separate the valuable illuminants; and, during the stage of the distillation at which the benzene is volatilised, forcing through the still some of the richer gas generated in the retorts; and finally mixing the remainder of the richer gas with the enriched gas from the still.—H. B.

Gas-drying Apparatus. G. G. Smith, Florence, Italy. U.S. Pat. 729,514, May 26, 1903.

See Eng. Pat. 12,240 of 1900; this Journal, 1900, 1001. —H. B.

French Patents.

Peat; Apparatus for Powdering and Carbonising ——. A. Duclos. Fr. Pat. 325,554, Oct. 23, 1902.

Peat is fed from a hopper on to a plate fixed on a revolving shaft, round which a perforated cylinder revolves in an opposite direction. The peat is projected by centrifugal force against the sides of the cylinder, all the moisture being forced out through the perforations, and drained off. The peat then falls through a grinder consisting of two truncated cones with roughened surfaces, one within the other, the inner tapering more than the outer, and rotating on the shaft carrying the above mentioned plate. The cones are connected to the two poles of a dynamo, and a current of electricity is sent across the space between them, thoroughly drying and carbonising the peat. The lowest part of the grinder is electrically insulated, no current passing through it; the peat, in falling through this part, becomes cooler, and is thus prevented from igniting spontaneously on issuing from the apparatus.

The carbonised peat is mixed with a small quantity of petroleum, and formed into briquettes. (See this Journal, 1903, 411.)—L. F. G.

Combustible; Method of Producing and Burning a Hydrogenated ——. A. G. Ingalls. Fr. Pat. 325,674, Sept. 16, 1902.

Air compressed to a little above atmospheric pressure is heated by passing through a pipe lying in the furnace, and is used for spraying water of a certain temperature into the furnace through an opening. The water thus injected in the spheroidal state is said to augment the heat given out by the furnace.—L. F. G.

Briquettes Unalterable in Air; Process for Making ——, *with a Binding Material soluble in Water.* R. Boek. Fr. Pat. 325,708, Oct. 27, 1902.

Briquettes manufactured with a binding material, such as dextrin, molasses, resins, disintegrate in the air. To avoid this, the briquettes are heated to such a temperature (if necessary, in absence of air) that the binding material is completely or partially charred, and thus rendered insoluble. —L. F. G.

Furnaces; Impts. in Regenerative ——. F. Siemens. Fr. Pat. 325,622, Oct. 25, 1902.

See Eng. Pat. 770 of 1902; this Journal, 1903, 357.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

English Patent.

Sulphate of Ammonia Saturators; Discharger for ——. J. Ballantyne, Hamilton, Scotland. Eng. Pat. 27,070, Dec. 8, 1902.

A discharger to a sulphate of ammonia saturator has at its neck a seating, against which an upwardly closing cone, attached to a vertical spindle passing through a stuffing-box in the bottom, can be screwed up by mechanical means. When the discharger is full of crystals, the valve is closed, and a sliding side door is moved upwards by suitable apparatus to admit of removal of the contents of the vessel.—E. S.

United States Patent.

Petroleum; Apparatus for Continuously Distilling ——. M. Livingston, Assignor to Refining Co., Philadelphia, Pa. U.S. Pat. 728,257, May 19, 1903.

A number of separate stills are connected together in pairs, by means of pipes fitted with internal extensions and sliding sleeves for regulating the outflow of oil from each still to the next, and maintaining the contents of the stills at given levels. Other pipes connect various members of the series of stills, leaving the intermediate stills disconnected. Each still has a separate fire-box, and these fire boxes, with the flues leading to the smoke-stack, are situated below, the level of the liquid in the stills and out of contact with the uncovered portions of the still walls.—C. S.

French Patent.

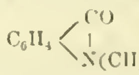
Mineral Oils; Process and Apparatus for Refining ——. The Alcohol Syndicate, Ltd. Fr. Pat. 325,636, Oct. 27, 1902.

The crude or refined mineral oil is placed in a vessel charged with granular material (coarse sand, broken wood, charcoal, or coke) previously saturated with dissolved salts, such as those of potassium, sodium, calcium, barium, and magnesium. The vessel is fitted with a false bottom and tap, through which latter the mineral oil is drawn off after having been in contact with the saline solution for 1—10 hours, according to the character of the oil. This treatment is said to render the oil more susceptible of oxidation by an air-blast or other oxidising agents.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

o-Nitroacetophenone; Reduction of ——: *A Contribution to the Explanation of the First Indigo Synthesis.* E. Bamberger and F. Elger. Ber., 1903, **36**, [8], 1611—1625.

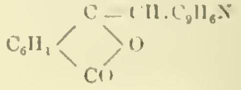
Engler and Emmerling synthesised indigo by the action of zinc-dust and soda-lime on o-nitroacetophenone (Ber., 1870, **3**, 885). R. Camps has shown that an intermediate product is formed in this reaction (this Journal, 1902, 1273). The authors show that this product is methylanthranil—



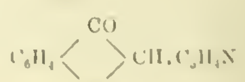
the reaction being analogous to the formation of anthranil from *o*-nitrobenzaldehyde. Methylanthranil, C_8H_7NO, is a colourless oil, b. pt. 110·5°—111° C. at 10 mm. pressure, smelling like anthranil, and forming white needles when cooled in a mixture of ice and salt. These melt at the ordinary temperature. On heating, methylanthranil i converted into its isomeride indoxyl. On superheating, it yields indigo, together with indoxyl. Methylanthranil is best prepared by reducing crude *o*-nitroacetophenone as prepared by Camps (this Journal, 1902, 495) with tinfoi and glacial acetic acid, neutralising after reduction, and distilling off the product in a current of steam. 48·5 per cent. of pure methylanthranil is obtained, calculated on the weight of the crude nitro body.—E. F.

Pyrophthalone and its Derivatives. H. v. Huber. Ber., 1903, **36**, [8], 1653—1666.

When quinaldine (α-methylquinoline) is heated with phthalic anhydride and zinc chloride, Quinoline Yellow i formed. α-Picoline (α methylpyridine) treated in the sam way yields pyrophthalone, which also dyes wool and sil yellow, though far less intensely than Quinoline Yellow It has been shown by Eibner and Lange (Annalen, **315** 303—356) and by Eibner and Simon (Ber., **34**, 2303) tha Quinoline Yellow has the asymmetric constitution—



The author shows that pyrophthalone, on the other hand has the symmetrical constitution—



He also succeeded in preparing the asymmetric isomerid isopyrophthalone, which is analogous in constitution t Quinoline Yellow, but was not able to convert eith isomeride into the other.

A number of derivatives of pyrophthalone and of t isomeride are described.—E. F.

Galleïn. R. Meyer. Ber., 1903, **36**, [8], 1561—1565.

RYSTALLISED hæmatoxylin was subjected to dry distilla- ion. The distillate was diluted and extracted with ether. n evaporation of the ether, a semi-fluid brown residue was btained, which, on standing over sulphuric acid, solidified. hen this was fused with phthalic anhydride and the melt issolved in dilute alkali, an intense green fluorescent olution was obtained. The fluorescence, however, was not ermanent, and it was proved not to be due to resorcinol. yrogallol, however, exhibits quite the same behaviour as is substance obtained from hæmatoxylin.

When phthalic anhydride is fused with twice its weight f pyrogallol, a melt is obtained which is soluble in alkali ithout fluorescence; but if excess of the anhydride be sed, a fluorescent solution results. The fluorescence, owever, gradually disappears. If the fused mass be boiled ith alcohol, instead of being dissolved in alkali, gallein is btained. The fluorescent substance appears therefore to e first formed, and then changed by alkali or alcohol into allein.

Galleïn itself, when fused with phthalic anhydride, gives substance which fluoresces in alkaline solution, but the uorescence is not permanent.

Galleïn was fused with other acids and anhydrides in der to ascertain if fluorescing substances were produced. f the substances examined only dicarboxylic acids yielded orescing compounds, and only those which are stable on ating or which give anhydrides.

Phenolphthaleïn, quinolphthaleïn (hydroquinonephtha- in), and catechol (pyrocatechin), when fused with phthalic hydride, do not give fluorescent compounds.—J. McC.

zobenzene; Electrolytic Preparation of ——. Farbwerke vorm. Meister, Lucius und Brüning. XI. A., page 748.

English Patents.

digo; Manufacture of Bromination Products of ——. O. Imray, London. For Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 13,430, June 13, 1902.

E Fr. Pat. 322,348 of 1902; this Journal, 1903. 360.
—T. F. B.

digo and Intermediate Products; Manufacture of ——. G. B. Ellis, London. From Soc. Chim. Usines du Rhône, anciennement Gilliard, P. Monnet et Cartier, Lyons, France. Eng. Pat. 16,917, July 30, 1902.

the manufacture of indigo from nitrophenyl-lacto- thylketone, obtained by the condensation of *o*-nitro- nzaldehyde with acetone or acetaldehyde in presence of ali by Baeyer and Drewson's process, it is found that the toketone is obtained in a state of greater purity, if a t with alkaline reaction be employed as condensing agent tead of caustic alkali; sodium sulphite gives particularly od results. 25 grms. of *o*-nitrobenzaldehyde are dis- ved in 125 grms. of acetone, 40—60 c.c. of water are led, and a solution of 3·5 grms. of crystallised sodium phite in 15 c.c. of water; the lactoketone is obtained in crystalline state.—J. F. B.

United States Patents.

Bromindigo; Process of Making ——. A. Rahtjen, Hamburg. U.S. Pat. 729,217, May 26, 1903.

E Eng. Pat. 18,127 of 1902; this Journal, 1903, 90.
—T. F. B.

o Dye [*for Pigments*], *and Process of Making same.* A. Fourneaux, New York, Assignor to H. A. Metz, rooklyn. U.S. Pat. 728,388, May 19, 1903.

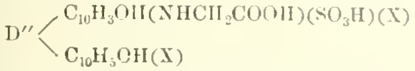
azo dyestuff suitable for the manufacture of red lake l pigment colours is obtained by mixing equimolecular portions of a diazo-compound, a nitrodiazo-compound, an alkaline solution of β-naphthol. The dyestuff is luble in water, but in the form of a gelatinous paste it o finely divided that it readily reacts with metallic salts, produces a lake which is very fast to light.—J. McC.

Azo Dye [*for Pigments*], *and Process of Making same.* E. A. Fourneaux, New York, Assignor to H. A. Metz, Brooklyn. U.S. Pat. 728,455, May 19, 1903.

See preceding abstract. Other phenolic compounds besides β-naphthol may be used in producing the dyestuff.
—J. McC.

Disazo Dye [*Azo Dyestuffs*]; *Blue* ——. L. Laska, Offenbach-on-the-Main, Assignor to K. Oehler, Anilin- und Anilin-farben-Fabrik. U.S. Pat. 728,477, May 19, 1903.

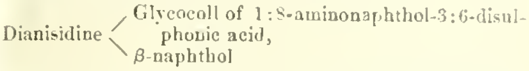
Blue substantive disazo dyestuffs of the constitution—



$$D'' \begin{cases} C_{10}H_3OH(NHCH_2COOH)(SO_3H)(X) \\ C_{10}H_5OH(X) \end{cases}$$

where D″ is a diazotised paradiamine and X is a hydrogen atom or a sulphonic group, are obtained by combining the intermediate product from paradiamines and the glycocoll derivatives of aminonaphtholsulphonic acids with a naphthol derivative. They are soluble in water, and dye unmordanted cotton fast-blue shades.

The dyestuff represented by the scheme—



Dianisidine ⟨ Glycocoll of 1:8-aminonaphthol-3:6-disulphonic acid, β-naphthol

is a brownish-black powder, soluble in water to a blue solution which becomes redder on addition of alkali, and gives a flocculent violet precipitate with hydrochloric acid: it dissolves in concentrated sulphuric acid with a bluish-green colour. It dyes unmordanted cotton blue shades very fast to light and acids.—J. McC.

Sulphur Dye [*Sulphide Dyestuffs*]; *Blue* ——, *and Process of Making same.* A. Schmidt and F. Bethmann, Höchst-on-the-Main, Assignors to Farbwerke vorm. Meister, Lucius und Brüning. U.S. Pat. 728,623, May 19, 1903.

New products which are soluble in warm sodium sulphide solution and dye unmordanted cotton blue in an alkaline sulphide bath are prepared by heating dialkyl-*p*-amino-*p* (1)-hydroxydimetadichlorodiphenylamine with sulphur and sodium sulphide in presence of a solvent.—J. McC.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Nitroso Blue on Silk Fabrics; Employment of ——. E. Sifferlen. Rev. Gén. des Mat. Col., 1903, **7**, [78], 162.

Nitroso Blue needs a strongly acid bath in order to develop on silk. A white reserve, consisting of 750 grms. of roasted starch, 1 litre of sodium bisulphite solution of 32° B., and 200 litres of alumina jelly, is first printed on the fabric, which is then padded with Nitroso Blue as a paste by means of caoutchouc rollers and a small wooden reservoir. Nitroso Salt M or the free base is worked up to a paste for this purpose with a mixture of glycerin, alcohol, water, dextrin, acetic acid, "oxynaphthol," resorcinol, tannin, and hydrochloric acid. The fabric is then dried, passed through the Mather-Platt apparatus, rinsed, and soaped. Coloured discharges may be printed directly on to the padded tissue. The reserve may contain appropriate basic dyestuffs.—E. F.

Nitrous Fumes; Utilisation of Residual ——, *from the Preparation of Persalts* [*Mordants*] *by Means of Nitric Acid.* E. Blondel. VII., page 740.

Fibres from Sierra Leone. Bull. of the Imperial Inst., Supplement to the Board of Trade Journal, May 21, 1903, 21—23.

The specimens examined, included the fibres of *Sansevieria guineensis*, *Furcræa cubensis*, and *Elaeis guineensis*, also a fibre named "Hibiscus fibre" by the natives, but probably derived from *Abutilon periplocifolium*, and varieties of banana and plantain fibres. The samples had all been very imperfectly prepared. For the chemical examination, a portion of each was carefully combed out. The following results were obtained:—

Name.	Moisture.	Ash.	Loss on Hydrolysis (a).	Loss on Hydrolysis (b).	Loss on Acid Purification.	Loss on Mercerising.	Gain on Nitration.	Cellulose.	Length of Ultimate Fibre.	Remarks.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Ins.	
1. *Sansevieria guineensis*	10·6	0·4	8·9	13·9	1·8	8·6	29·6	78·0	$\frac{1}{16}$—1	White-coloured fibre of considerable strength, apparently identical with that known commercially as "African Bowstring Hemp," having many of the qualities of Manila hemp.
2. *Furcræa cubensis*	9·8	0·8	13·5	19·1	4·1	12·0	29·1	75·3	$\frac{1}{16}$—[illegible]	Long white fibre, not so strong as No. 1; closely resembles Sisal hemp.
3. Hibiscus fibre (*Abutilon periplocifolium* ?).	12·3	0·5	8·5	10·9	0·1	6·7	28·1	75·2	$\frac{1}{16}$—$\frac{1}{8}$	Strong pale yellow fibre; value about that of medium jute.
4. Plantain fibre	9·1	2·12	13·9	22·9	2·2	16·8	23·9	68·9	$\frac{1}{32}$—$\frac{1}{8}$	Fibres of very poor quality, brittle and unfit to work.
5. Long banana	10·3	1·7	17·6	32·2	1·1	8·7	34·9	65·6	$\frac{1}{16}$—$\frac{1}{4}$	
6. Silver banana	10·0	1·9	18·6	23·5	2·1	9·8	31·2	63·2	$\frac{1}{32}$—$\frac{1}{8}$	
7. *Elæis guineensis*	10·9	2·2	9·4	13·8	1·7	7·2	32·1	81·5	$\frac{1}{16}$—$\frac{1}{8}$	Very strong, pale-yellow fibre of fine appearance and great length. If a constant supply of this fibre could be guaranteed, it is probable that it could be sold at 20*l.* per ton and upwards.

—A. S.

English Patents.

Mercerising Cotton Rovings and Yarns; Method of ——. J. W. Nasmith, Manchester. Eng. Pat. 25,163, Nov. 17, 1902.

Cotton rovings, in a normally twisted condition, are "cross wound" upon a perforated drum, and are successively soaked in hot water (to cleanse the fibres and to cause the several layers of the material to adhere closely together), treated with a mercerising liquor, washed, and dried. The yarns obtained from rovings which have been thus treated are, it is stated, more lustrous than those produced from tightly twisted rovings.

Yarns may be similarly treated, the method being advantageous in the case of fine, single yarns which are not strong enough to resist the tensile strain to which they are commonly subjected when they are mercerised in the form of hanks.—E. B.

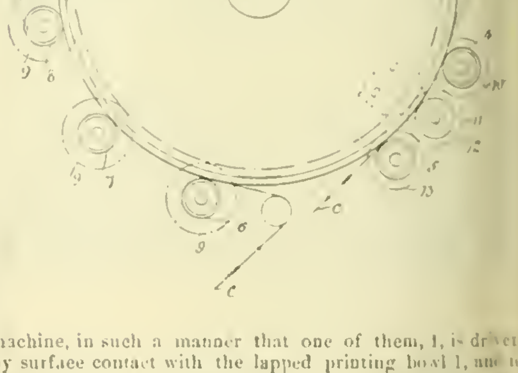
Dyeing Fibres, Yarns, and Fabrics; Impts. in ——. G. Caux, Boulogne-sur-Seine, France. Eng. Pat. 1, Jan. 1, 1903.

The object of this invention is to produce by dyeing processes, on cotton or linen fibres or fabrics, Alizarin Red, Rose and Lilac, and blue and "other compound colours," faster than usual to washing and the "chemicals used in laundries." In the case of the Alizarin dyes, the textile materials are impregnated with an animal or vegetable fat or oil dissolved in an organic solvent (*e.g.*, 50—400 grms. of palm oil in $\frac{1}{2}$—3 litres of benzol), the excess of the solution being removed by pressure and the solvent by heat. The materials are then subjected to the action of ozonised air or of an oxidising compound in aqueous solution, immersed in a mordanting bath, dried, the mordant fixed with silicate or phosphate of soda, and the materials dyed and brightened as usual. A fast blue dye is obtained by grounding the materials with Aniline Grey (Aniline Black formed from a smaller proportion of aniline than is needed to produce a Black), and then dyeing them in a vat of Indanthrene (50—300 grms. of Indanthrene reduced in the presence of caustic soda, and the solution diluted to 35—50 litres), oxidising in an alkali bichromate bath, rinsing, soaping, rinsing, and drying.—E. B.

Calico-printing Machines; Impts. in ——. The Calico Printers' Association, Ltd., Manchester; and W. W. Wilson, Buckton Vale. Eng. Pat. 19,207, Sept. 2, 1902.

Tissues can be printed with a single roller, and be covered and padded in one continuous operation, according to Eng. Pat. 13,755 of 1901 (this Journal, 1902, 703).

The object of the present invention is to enable tissues to be printed with two or more printing rollers, and to be covered and padded in a single, continuous operation. This is accomplished by mounting, *e.g.*, two rollers, 4 and 5 (see figure), clear of the crown wheel 2 of the printing machine, in such a manner that one of them, 1, is driven by surface contact with the lapped printing bowl 1, and is geared by a box wheel 10, and an intermediate carrier wheel 11 upon a stud 12, with a box wheel or gear 13 on the mandrel of the printing roller 5, which is also in contact with the printing bowl. After being printed by the rollers, 4 and 5, the tissue is guided away from the bowl and dried. It is then returned to the bowl and printed (covered and padded) by one or more of the rollers 6, 7, and 8, which are driven from the crown wheel 2 by gears, 9, in the ordinary way.—E. B.



United States Patents.

Skein-dyeing Machine. W. H. Fletcher, Paterson, N.J. U.S. Pat. 727,775, May 12, 1903.

The claims relate to mechanical details.—A. S.

zing [for Yarn or Thread]. G. A. Fredenburgh, Pawtucket, R.I. U.S. Pat. 728,697, May 19, 1903.

ater, 40 galls.; potato-starch, 17 lb.; tin oxide and zinc ide, ½ lb. of each, are mixed together, steamed, and then pint each of wood-alcohol, "naphtha," and caustic soda lution are added.—R. L. J.

French Patents.

ouring Machine for Fibrous Substances. W. McNaught. Fr. Pat. 325,629, Oct. 27, 1902,

is machine is intended especially for wool. The goods placed at one end of a perforated tray, which is fixed in ank with an inclined bottom (to admit the easy removal of y deposit). A series of spiked arms, worked mechanily, drag the material across the tray, and thence they are ked out of the bath and pressed between rollers.—T. F. B.

rns in the Form of Hanks; Machine for Mercerising ——. P. Hahn. Fr. Pat. 325,239, Oct. 11, 1902.

e operations of stretching yarns, in the form of hanks, ening and closing caustic soda-lye and water admission l exit valves, squeezing the hanks to remove from them excess of lye and water absorbed by them, and releas- the tension upon the hanks to enable them to be hdrawn from the machine and to be replaced by another of hanks, are successively and automatically performed by ans of mechanism actuated by a series of cams mounted on a common axis, as the latter is revolved.—E. B.

eing Animal or Vegetable Fibres; Process for ——, by Amino-, Imino-, and Hydroxy-Derivatives of Benzene nd Naphthalene, with the Assistance of Hydrogen Peroxide, in presence of Metallic Salts. H. Mann. Fr. Pat. 326,010, Oct. 31, 1902.

bres are dyed by treatment with a solution containing no- or poly-amino-, imino-, or hydroxy-derivatives of zene or naphthalene, together with metallic salts (except se of the alkalis or alkaline earths) and hydrogen oxide. The organic compounds may be either simple or stituted, tertiary amines being quite suitable.

he hydrogen peroxide can be replaced by ozone, Caro's l, hypochlorites, permanganates, &c.

With aniline and a copper salt, for instance, a green our is stated to result.—T. F. B.

phurised Dyestuffs on the Fibre; Process of Developing with Neutral Sulphites] ——. Farbenfabriken vorm. . Bayer and Co. Fr. Pat. 325,462, Sept. 6, 1902.

phur dyestuffs, such as Katigen Indigo B extra and extra, Pyrogen Black, Immedial Black V extra, &c., ch are changed in hue from black or blue-black to dark e when oxidised on the dyed fibre, are similarly affected reatment with neutral sulphites. Example 1:—Cotton d with 10 per cent. of Immedial Blue CR, after rinsing exposing to the air for a short time, is worked for half hour, at a temperature of 80° C., in a bath contain- 2 grms. per litre of sodium sulphite. It is then washed dried. Example 2:—The dyed cotton is rinsed and ersed three or four times in a 2 per cent. solution of um sulphite. It is then centrifugated and dried. The ge in colour takes place during the drying.—E. B.

ng and Finishing Textile Materials; Process for ——. .S., J. H., and F. R. Carmichael, Assignees of Fr. Pat. 8.956, granted to F. Jean. Addition, dated Jan. 10, 03, to Fr. Pat. 318,956, Feb. 22, 1902.

Eng. Pat. 5998; this Journal, 1903, 211. (See also Journal, 1902, 1533, and 1903, 92.)—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patents.

ting or Colouring Floor Coverings, Wall Papers, and er Fabrics; Method of and Apparatus for ——. F. Lundeberg, Stockholm. Eng. Pat. 2707, April 26, 02.

apparatus consists of a plate upon the under side of h a pattern is made with thin pieces of sheet-metal with projecting edges, each of the shallow cells thus formed being put into communication with a colour receptacle. Air, in which colour dust is suspended, is drawn through the pattern plate to the fabric, the air passing through the latter to a suction box placed under it, while the dust is retained by the fabric, which it more or less completely penetrates. The fabric is then rolled, &c., to give it a firm, even surface.—E. B.

Wall-Papers; Producing Washable ——. E. F. W. F. Grabau, Leipzig, Germany. Eng. Pat. 3301, Feb. 11, 1903.

To enable washable wall-papers to be produced by means of printing rollers, which are not specially reserved for the purpose, printing mixtures are used consisting of:—(1) "Potato flour," borax and water, heated together till thickened, then cooled and mixed with a soluble "aniline or transparent" dyestuff, suspended or dissolved in water, and, lastly, diluted with alcohol in the proportion of 1 part to 6 parts of the mixture; or (2), "potato flour," 2 parts; borax, 0·05 part; and water, 21 parts; thickened at the ordinary temperature with caustic soda, 1 part; mixed with a dyestuff dissolved in glycerin and water, and with a sufficient quantity of sulphuric acid to neutralise the alkali in the paste mixture; diluted with alcohol, and further thinned, if necessary, by the addition of a mixture of alcohol, glycerin, and water. The alcohol is added, it is asserted, for the purpose of causing the dyestuff to penetrate deeply into the paper.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Cyanide Reactions. A. Chiddey. Eng. and Mining J., 1903, **75**, [20], 710.

The author has determined the action of potassium cyanide solution on silver sulphide in presence of an alkaline solution of lead oxide. Three equal quantities of freshly-precipitated silver sulphide were treated with:—(1) 80 c.c. of a 0·25 per cent. solution of potassium cyanide; (2) the same as (1), plus 5 c.c. of a 10 per cent. solution of sodium hydroxide; (3) the same as (2), plus 2 c.c. of a 10 per cent. solution of lead acetate; the mixtures were allowed to digest for 12 hours, and then the proportion of silver in solution determined. The results obtained were:—(1) 0·0082 grm. or 6·35 per cent.; (2) 0·003 grm. or 2 per cent.; and (3) 0·027 grm. or 21·2 per cent. The author points to the importance of these results with regard to the cyanide treatment of tailings, where the latter contain a fair quantity of silver. He states that he has used lead acetate in the sump solutions for some time past with very favourable results, the extraction of silver being increased from 50 to 80 per cent.—A. S.

Lithium Carbonate; Decomposition of ——, by Heat. P. Lebeau. Comptes rend., 1903, **136**, [21], 1256—1257.

Lithium carbonate in a platinum boat was heated in a porcelain tube connected with a mercury pump and vacuum gauge. The heating was effected by Charpy's electrical resistance furnace, so that the temperature, recorded by a thermo-electric pyrometer, could be very closely regulated. In the vacuous tube no decomposition occurred below 600° C., but between 600° C. and 1,000° C. the dissociation pressure rose gradually to 91 mm. of mercury-column. By heating to a temperature above 600° C., and pumping out the carbon dioxide as formed, complete decomposition of the lithium carbonate was effected; but on taking out the boat afterwards, the whole of the lithia was found to have volatilised, and to have acted on the upper portion of the porcelain tube. Lithium carbonate is thus differentiated sharply, on the one hand from the alkali carbonates by its ready dissociation, and on the other from the alkaline-earth carbonates by the volatility of the remaining oxide.
—J. T. D.

Lead Chloride, Bromide, and Iodide; Solubility of ——, in Water at Temperatures from 0° C. upward. D. M. Lichty. J. Amer. Chem. Soc., 1903, **25**, [5], 469—471.

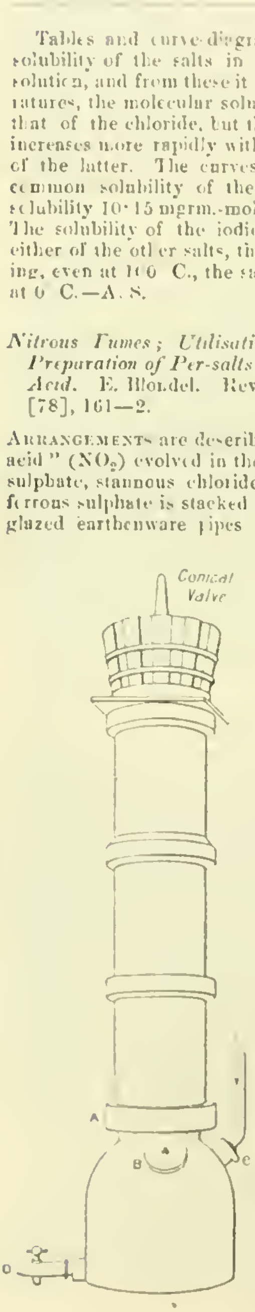
The results obtained by the author, using pure salts, and also very pure water, such as is employed in determinations of electric conductivity, are shown in the following table.

Temp.	Lead Chloride.		Lead Bromide.		Lead Iodide.	
	Grms. in 100 c.c. of Solution.	Grms. in 100 Grms. of Water.	Grms. in 100 c.c. of Solution.	Grms. in 100 Grms. of Water.	Grms. in 100 c.c. of Solution.	Grms. in 100 Grms. of Water.
° C.						
0	0·6728	0·6728	0·4554	0·4554	0·0442	0·0442
15	0·9070	0·9090	0·7285	0·7305	0·0613	0·0618
25	1·0786	1·0842	0·9701	0·9744	0·0762	0·0764
35	1·3150	1·3244	1·3124	1·3220	0·1035	0·1042
45	1·5198	1·5673	1·7259	1·7457	0·1440	0·1453
55	1·8019	1·8263	2·1024	2·1376	0·1726	0·1755
65	2·0810	2·1265	2·5161	2·5736	0·2140	0·2183
80	2·5420	2·6224	3·2350	3·3430	0·2937	0·3023
95	3·0858	3·1654	4·1767	4·3613	0·3814	0·3960
100	3·2080	3·3420	4·5500	4·7510	0·4200	0·4360

Tables and curve-diagrams are also given, showing the solubility of the salts in mgrm.-molecules per 100 c.c. of solution, and from these it appears that at the lower temperatures, the molecular solubility of the bromide is less than that of the chloride, but that the solubility of the former increases more rapidly with the temperature than does that of the latter. The curves show that the temperature of common solubility of the two salts is 88·5° C. and the solubility 10·15 mgrm.-molecules in 100 c.c. of the solution. The solubility of the iodide is decidedly less than that of either of the other salts, the molecular solubility not reaching, even at 100° C., the same value as that of the bromide at 0° C.—A. S.

Nitrous Fumes; Utilisation of Residual ——, from the Preparation of Per-salts [Mordants] by means of Nitric Acid. E. Blondel. Rev. Gén. des Mat. Col., 1903, **7**, [78], 161—2.

Arrangements are described for utilising the "hyponitric acid" (NO_2) evolved in the action of nitric acid on ferrous sulphate, stannous chloride, and similar substances. The ferrous sulphate is stacked in a vertical scrubber A made of glazed earthenware pipes with a perforated plate below. The whole stands in a cast-iron pot also containing ferrous sulphate, into which nitric acid is introduced through the tubulure B. A mixture of air and steam is blown into the nitric acid through the side-tubes C. Nitrous fumes are thus obtained mixed with hot air and steam. This mixture does not render the ferrous sulphate in the scrubber impermeable as undiluted nitrous fumes tend to do. Water trickles slowly down the scrubber from a small flat-bottomed tub at the top, the flow being regulated by a conical valve. Ferric sulphate solution runs through the perforated plate into the pot, and can be removed at intervals through the tap D. The yield of ferric sulphate is stated to be more than double that obtained in the ordinary way, and the workmen are protected from the dangerous nitrous fumes. To utilise nitrous fumes from other processes they are simply led into the cast-iron pot and the ferric sulphate produced is collected as usual.—E. F.



Persulphates; Action of ——, on Metallic Mercury. N Tarugi. Gaz. chim. ital., **33**, [1], 127—133; Chem Centr., 1903, **1**, [20], 1116.

Ammonium persulphate in ammoniacal solution act vigorously upon metallic mercury. The chief product o the reaction is stable at 60° C. and, on cooling, separate as an agglomerate of white needles, of the composition $(NH_4)(Hg)S_2O_8.2NH_3$, which are insoluble in nitric an sulphuric acids, soluble in hydrochloric acid and colou warm guaiacum tincture. The same product is formed b the action of ammonium persulphate on mercurous chlorid It is decomposed by water, forming ammonium sulphate an the mercury ammonium salt of Caro's acid, $NH_4.HgSO$ which colours cold guaiacum tincture blue. It to the mothe liquor from the first mentioned compound, $NH_4HgS_2O_8$ $2NH_3$, a large quantity of water be added, a basic salt the composition, $2[NH_4HgSO_4]2NH_33Hg_2O$, separates i the form of a white amorphous mass, insoluble in nitr and sulphuric acids, soluble in hydochloric acid. (See a this Journal, 1903, 493.)—A. S.

Magnesium: Action of Metallic ——, on Aqueous Solutio L. Kahlenberg. J. Amer. Chem. Soc., 1903, **25**, [4 380—392.

The author first refers to the work of Tommasi (th Journal, 1900, 79), Lemoine (Comptes rend., **129**, 291 and Mouraour (this Journal, 1900, 245). In his ow experiments, a perfectly bright bar, 57·5 × 5 × 5 mm of very pure magnesium was introduced into each of th solutions examined, and the quantities of hydrogen evolv in definite periods of time were measured. The solutio examined were:—(1) Distilled water and solutions alcohol, glycerin, cane sugar, mannitol, urea, sodiu chloride and sodium sulphate containing 2 grm.-molecul (1 grm.-molecule in the case of mannitol and sodi sulphate) per litre; (2) solutions of magnesium chlorid bromide, sulphate, and nitrate containing 1, $\frac{1}{10}$, and grm.-molecule per litre; solutions of potassium chloride a of potassium and magnesium chlorides containing 1 grm molecule per litre, and solutions of sulphuric acid and hyd chloric acid containing $\frac{1}{10}$ and $\frac{1}{100}$ grm.-molecule per li All the solutions under (1), with the exception of that glycerin, had a stronger action on magnesium during the fi $23\frac{1}{2}$ hours than distilled water. After $47\frac{1}{2}$ hours mo hydrogen was evolved from pure water than from solutions glycerin, cane sugar, and mannitol. The solution of alcoh had a distinctly stronger action on magnesium than distill water. The evolution of hydrogen from the solution urea was relatively large, although ammonia was al produced. Sodium chloride solution was more active th sodium sulphate solution of the same concentratio Hydrogen was evolved fairly rapidly from solutions magnesium salts, magnesium chloride being most acti at all concentrations. With the solutions containing 1 grm molecule per litre, the evolution of hydrogen was strong from magnesium sulphate than from magnesium brom solution; with $\frac{1}{10}$ grm.-molecule per litre, the activity the two salts was about the same; whilst with $\frac{1}{100}$ grm molecule per litre, magnesium sulphate was again m active than the bromide. Only a small quantity of hydrog was evolved from magnesium nitrate solution, as magnesi nitrite was formed. In solutions containing 1 grm.-molec per litre, potassium chloride was quite as active as magnes chloride; potassium-magnesium chloride was still m active.

After criticising the various explanations proposed the action of magnesium on aqueous solutions, the auth states that an explanation is easy if the process of solut be looked upon as a chemical one, and solutions be co sidered as chemical compounds of solute and solvent variable proportions. The action of magnesium on aqueous solution must then be dependent upon the chemi affinity between the magnesium and the solution (regard as a chemical compound of solute and solvent). This v is in accord with the fact that the difference of poten between the various solutions and magnesium correspo to the degree of action of the one on the other, be greater in the case of the solutions most readily attacked —A. S.

quefied Gases; Distribution of Gas and Liquid in ylinders of ——. A. Lange. Zeits. angew. Chem., 903, **16**, [22], 511—514.

filling cylinders of liquefied gases, the danger of bursting, ough the expansive force of the liquid caused by rise temperature, if the cylinders should be full of liquid, lers it necessary to fill them only partially with liquid. author has calculated, for various temperatures, the ribution between liquid and gas of a given mass of on dioxide, ammonia, sulphur dioxide, and chlorine essels of known content, making use for that purpose he specific volumes of liquid and gas given by Mollier. results are given in the following tables:—

1. *Carbon Dioxide.*

10 kilos. in a cylinder of 13·4 litres capacity.

emp.	Weight in Kilos.		Volume in Litres.		Percentage of Total Volume occupied by Gas.
	Liquid.	Gas.	Liquid.	Gas.	
C.					
-30	9·858	0·142	9·56	3·84	28·6
-25	9·836	0·164	9·64	3·76	28·0
-20	9·816	0·184	9·82	3·58	26·8
-15	9·796	0·204	9·99	3·41	25·4
-10	9·774	0·226	10·16	3·24	24·1
- 5	9·757	0·243	10·44	2·96	22·1
0	9·742	0·258	10·72	2·68	20·0
5	9·730	0·270	11·00	2·40	17·9
10	9·731	0·269	11·39	2·01	15·0
15	9·783	0·217	12·03	1·37	10·2
20	9·923	0·077	13·00	0·40	3·0

ns, the volume of the gas steadily diminishes; but the ht of the gas increases up to 5°, so that vaporisation rs from − 30° to + 5° C., while only compression occurs out any change of state from 5° to 10°, and above 10° ensation to liquid occurs and is almost complete at C.

2. *Ammonia.*

10 kilos. in a cylinder of 18·6 litres capacity.

mp.	Weight in Kilos.		Volume in Litres.		Percentage of Total Volume occupied by Gas.
	Liquid.	Gas.	Liquid.	Gas.	
C.					
30	9·9975	0·0025	14·89	3·71	20·0
25	9·997	0·003	15·02	3·58	19·2
20	9·996	0·004	15·16	3·44	18·5
15	9·995	0·005	15·30	3·30	17·7
10	9·994	0·006	15·45	3·15	16·9
5	9·9925	0·0075	15·60	3·00	16·1
0	9·991	0·009	15·76	2·84	15·3
5	9·9895	0·0105	15·92	2·68	14·4
10	9·987	0·013	16·09	2·51	13·5
15	9·9855	0·0145	16·27	2·33	12·5
20	9·983	0·017	16·45	2·15	11·5
25	9·980	0·020	16·65	1·95	10·5
30	9·977	0·023	16·86	1·74	9·4
35	9·973	0·027	17·08	1·52	8·2
40	9·9695	0·0305	17·32	1·28	6·9

vessel would be filled with liquid at about 62°; isation goes on steadily from − 30° to + 40°, but must be a temperature between 40° and 60° C. at vaporisation ceases, and above which condensation .

remarks made in the case of ammonia apply to r dioxide also. The liquid would completely fill the at about 65°.

weight of gas in Table 4 reaches the maximum en 50° and 60°, and the volume steadily diminishes ising temperature till the cylinder is full of liquid tle above 100° C.

3. *Sulphur Dioxide.*

10 kilos. in a cylinder of 8 litres capacity.

Temp.	Weight in Kilos.		Volume in Litres.		Percentage of Total Volume occupied by Gas.
	Liquid.	Gas.	Liquid.	Gas.	
C.					
-30	9·999	0·001	6·626	1·374	17·2
-25	9·9985	0·0015	6·680	1·320	16·5
-20	9·998	0·002	6·734	1·266	15·8
-15	9·9975	0·0025	6·787	1·213	15·2
-10	9·997	0·003	6·847	1·153	14·4
- 5	9·996	0·004	6·905	1·095	13·7
0	9·995	0·005	6·965	1·035	12·9
5	9·994	0·036	7·027	0·973	12·2
10	9·993	0·007	7·090	0·910	11·4
15	9·992	0·008	7·156	0·844	10·5
20	9·9905	0·0095	7·223	0·777	9·7
25	9·989	0·011	7·294	0·706	8·8
30	9·9865	0·0135	7·367	0·633	7·9
35	9·9845	0·0155	7·445	0·555	6·9
40	9·9815	0·185	7·525	0·475	5·9

4. *Chlorine.*

10 kilos. in a cylinder of 9 litres capacity.

Temp.	Weight in Kilos.		Volume in Litres.		Percentage of Total Volume occupied by Gas.
	Liquid.	Gas.	Liquid.	Gas.	
C.					
-30	9·988	0·012	6·457	2·543	28·3
-25	9·986	0·014	6·510	2·490	27·7
-20	9·985	0·015	6·561	2·439	27·1
-15	9·982	0·018	6·615	2·385	26·5
-10	9·980	0·020	6·671	2·329	25·9
- 5	9·976	0·024	6·732	2·268	25·2
0	9·974	0·026	6·794	2·206	24·5
5	9·972	0·028	6·856	2·144	23·8
10	9·968	0·032	6·922	2·078	23·1
15	9·965	0·035	6·988	2·012	22·4
20	9·961	0·039	7·059	1·941	21·6
25	9·959	0·041	7·137	1·863	20·7
30	9·954	0·046	7·213	1·787	19·9
35	9·950	0·050	7·301	1·699	18·9
40	9·948	0·052	7·380	1·620	18·0
60	9·940	0·060	7·771	1·229	13·7
80	9·948	0·052	8·269	0·731	8·1
100	9·998	0·002	8·980	0·020	0·2

—J. T. D.

Ammonium Nitrite; Conditions of Decomposition of ——. V. H. Veley. Proc. Chem. Soc., **19**, [267], 142.

The decomposition of ammonium nitrite into nitrogen and water proceeds according to the general law—

$$\log A/A - x = a\theta,$$

whether the reaction follows its normal course or is accelerated by the addition of another substance. The decomposition is either impeded or stopped by ammonia liberated in the solution by the addition of a metallic oxide, this effect being likewise produced by aliphatic, benzenoid, and pyridine amines, also by aromatic hydrazines, and to a less degree by oximes; it is temporarily accelerated by amides of the aliphatic series, but other amides are ineffective. Benzoyl-sulphonic imide ("saccharin"), the only imide tried, produces a considerable acceleration, but the reaction proceeds according to the general law.

It does not appear that solutions of ammonium nitrite, prepared from silver nitrite and ammonium chloride, become alkaline in the course of the decomposition. Incidentally it was shown that finely-divided barium sulphate, although producing no permanent effect when added to a solution of ammonium nitrite evolving nitrogen, nevertheless temporarily increased the rate of evolution of nitrogen, owing to some alteration in the amount of dissolved gas.

Carbon Dioxide; Pressure of ——, in Cylinders of the Compressed Gas. A. Lange. Zeits. angew. Chem., 1903, **16**, [22], 514—516.

The author has previously determined the densities of liquefied gases by noting the temperature at which a known weight completely filled a vessel of known volume (compare preceding abstract), this temperature being ascertained by the sudden rise of the rate of change of pressure with temperature. This method does not give sharp results with carbon dioxide, on account of the high compressibility of liquid; but the pressures actually determined by the are useful data, and are collected by him in the follo table:—

Pressure in Atmospheres in a Cylinder of 11·1 *litres capacity, with Varying Amounts of Carbon Dioxide.*

Amount in Kilos.	Temperature, ° C. 5.	10.	15.	20.	25.	30.	35.	40.	45.	50.	55.	60.	Kilos. of CO_2 per Litre.	L. per K of C
1·0	38	39	41	42	43·5	44·5	46	47·5	49	51	52	53	0·090	11·
1·5	..	47	51	54	57·5	60	62	64	66·5	68·5	..	..	0·135	7·
2·0	..	..	53	59	63	68	71·5	75	78·5	81	83·5	86·5	0·180	5·
2·5	..	..	..	59·5	65	71	76·5	82	85·5	89·5	93	97	0·225	4
3·0	42	47	53	59	65	72·5	81	87	92	97	102	106·5	0·270	3·
3·4	..	..	..	..	60	74	82	90	96	102	107	112·5	0·306	3·
3·9	..	..	..	..	66	74	84	92	99	105	111	117·5	0·351	2·
4·4	..	..	..	..	..	74	84·5	94	102·5	112	..	..	0·396	2·
5·0	..	47	53	59	66	74	84·5	95·5	105	116	..	..	0·450	2·
5·5	41	47	53	59·5	66	74	85	96	107·5	118·5	..	..	0·495	2·
6·0	..	..	53	59·5	66	74	86	98	110·5	123	..	..	0·540	1·
6·5	..	47	52·5	59·5	66	75	88	102	115	129	..	..	0·586	1·
7·0	..	..	..	..	66·5	77	92	108	123	139	..	..	0·631	1·
7·5	..	47	53	59·5	67·5	82	101	120	138·5	158	..	..	0·676	1·
8·0	..	..	54	61	73	94·5	116·5	138	160	182	..	..	0·721	1·
8·5	..	47·5	54	61·5	86	110·5	134·5	159·5	..	..	..	..	0·766	1
9·0	..	47	54	81·5	111·5	140	169	..	..	..	..	..	0·811	1
9·6	..	53	85	117	150	182	..	..	..	..	..	..	0·865	1·

—J. T

Nitrous Acid; Behaviour of ——, towards Methyl Orange. G. Lunge. XXIII., page 761.

Alkali-Earth-Metal Sulphides; Electrolysis of ——. A. Brochet and G. Ranson. XI. A., page 748.

Barium Sulphide; Electrolysis of ——, with a Diaphragm. A. Brochet and G. Ranson. XI. A., page 748.

English Patents.

Sulphuric Anhydride; Process and Apparatus for Manufacturing ——. A. M. Clark, London. From W. C. Ferguson, Flushing, New York. Eng. Pat. 6824, March 24, 1903.

See U.S. Pats. 723,595 and 723,596, March 24, 1903; this Journal, 1903, 495.—E. S.

Alkali-Metal Oxides; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, of Ludwigshafen-on-Rhine. Eng. Pat. 12,204, May 28, 1902.

See Fr. Pat. 321,416, May 26, 1902; and compare Fr. Pat. 323,793, Aug. 16, 1902; this Journal, 1903, 212 and 495.—E. S.

Soda or other Crystals or the like; Machines for Crushing Ice or for Crushing ——. R. Bridge. Eng. Pat. 14,673, June 21, 1902. I., page 734.

Lime Kilns; Economisers for ——. T. Ryan, Buxton. Eng. Pat. 20,874, Sept. 25, 1902.

The economiser, which is placed above an open kiln, consists of a pair of arches with a space between spanning the kiln. These arches support a hopper containing unburnt material, which is heated by the products of combustion from the kiln. The ends of the arches have feed holes for the fuel, whilst their inner faces are provided with air inlets. Metal sheaths are combined with the arches so as to form chambers in which the air receives a preliminary heating. In some cases, air under pressure may be forced into the air inlets.—A. G. L.

Alkaline Chlorides; Process for the Electrolytic Decomposition of ——, and Apparatus therefor. H. Cuénod and C. Fournier, Geneva. Eng. Pat. 12,691, June 3, 1902.

See Fr. Pat. 321,422, 1902; this Journal, 1903, 216.
—G. H. R.

Sulphate of Ammonia Saturators; Discharger for J. Ballantyne. Eng. Pat. 27,070, Dec. 8, 1902 page 736.

United States Patents.

Sulphuric Acid; Apparatus for Making ——. H Heinz, Lasalle, Ill. U.S. Pat. 728,914, May 26, 19

In apparatus comprising an acid chamber and a G tower, the flues are arranged to enter the chamber sides near the front end, and to pass out at the side the rear end, at different levels, and transversely t length of the system. The gases thus enter and pa of the chamber in opposite directions, at different l and transversely to their general course.—E. S.

Chromium Compounds and Alkalis; [Electrolytic duction of ——. H. Specketer, Griesheim-on-M Germany, Assignor to Chemische Fabrik Grie Elektron, Frankfurt-a-M., Germany. U.S. Pat. 72 May 19, 1903.

See Eng. Pat. 12,250, June 15, 1901; this Journ 548.—W. G. M.

Dry Alkaline [Acid] Sulphates; Process of Making— S. Trivick, Clapham. U.S. Pat. 728,335, May 19,

To obtain a "dry salt composed of Na_2O chemically with not less than four units of SO_3, and associated w more than three units of H_2O," 100 parts of con sulphuric acid are heated to not above 250° C., with 30 parts of dry sodium chloride, the mass being while cooling, and subsequently exposed to a curr warm dry air. The sodium chloride may be replaced process by an equivalent proportion of another sub alkali metal salt.—E. S.

Carborundum and Alumina; Process of Treating for the Production of ——. F. C. Weber, Cl U.S. Pat. 728,528, May 19, 1903.

Water, both hygroscopic and combined, is remove kaolin or fire-clay by means of heat. The po clinker is mixed in atomic proportion with coke a mixture subjected to the action of the electric ar, aluminium and silicon carbides and carbon monox produced. The mixture of carbides is then treat water, which acts only on the aluminium carbide, pr aluminium hydroxide and methane, the former bein rated from the crystalline carborundum by washi may be heated in order to form anhydrous alumina
—A.

omine [Used in Treating Ores]; *Process of Recovering* ——. C. D. Grove, Colorado Springs, Col. U.S. Pat. 28,566, May 19, 1903.

bromates formed in alkaline solution in brominating ores reduced to bromides by hydrogen sulphide or other table agent.—E. S.

v Temperatures, the Liquefaction of Gases, and the eparation of the Constituents of Gaseous Mixtures; rocess of Producing ——. C. Linde, Munich, Germany, ssignor to C. F. Brush, Cleveland, Ohio. U.S. Pat 27,650, May 12, 1903.

pressed air, cooled by expansion, is caused to absorb t "to its fullest capacity" from air about to be expanded, these processes are continued until the gases are efied, when the liquid is caused to absorb heat from pressed air before expansion, the process being repeated the nitrogen thus volatilised, the residual liquid gen, as well as the resulting gas, being similarly utilised. separation of liquefied air into parts rich respectively oxygen and in nitrogen by fractional distillation by t derived from compressed air about to be liquefied, is claimed, as well as the application of the process to separation of other mixed gases.—E. S.

Temperatures, the Liquefaction of Gases, and the eparation of the Constituents of Gaseous Mixtures; rocess of Producing ——. C. Linde, Munich, Germany, ssignor to C. F. Brush, Cleveland, Ohio. U.S. Pat. 28,173, May 12, 1903.

apparatus, which is for carrying out the process ribed in the preceding abstract, comprises a high-sure conduit, a gas compressor and cooler in connection ewith, an expansion chamber into which the compressed expands through a throttle valve, combined with a low-sure conduit adapted to conduct the gas backwardly and in direct contact with the high-pressure conduit, cause it to absorb heat to its fullest capacity from the pressed gas about to be expanded. Various other details laimed.—E. S.

French Patents.

lkali Carbonates; Process of Manufacturing ——. P. Germain. Fr. Pat. 325,793, Sept. 13, 1902.

tion of sodium sulphate or potassium sulphate is ed with barium carbonate to obtain an alkali carbonate lution and barium sulphate. The latter is furnaced carbon to produce barium oxysulphide, which, treated ferric oxide, gives baryta and iron sulphide. The a is then transformed into carbonate for re-use.—E. S.

um Salts; Process of Making Soluble ——. C. S. adley and C. B. Jacobs. First addition, dated Oct. 21, 02, to Fr. Pat. 284,302, Dec. 22, 1898.

J.S. Pat. 720,927, Feb. 17, 1903; this Journal, 1903, Compare also this Journal, 1902, 391.—E. S.

Oxygen; Preparation of ——. G. F. Jaubert. Fr. Pat. 325,627, Oct. 27, 1902.

the rapid preparation of oxygen, catalysing bodies lded to clear solutions of hypochlorites, with or without resence of free alkali; or to milk of bleaching powder. catalysers are salts of iron, copper, manganese, t, nickel and lead, used singly or together; but a ure of sulphate of iron or manganese with cupric sulphate commended. The claims include the use of the salts e metals named Dry mixtures of bleaching powder oue or more of the salts mentioned (which mixtures be compressed into suitable forms) are claimed as an e of commerce, since they liberate oxygen on addition ater. Such a mixture may consist of bleaching er, 100 parts; dried ferrous sulphate, 15 parts; and cupric sulphate, 75 parts. Compare Eng. Pat. 11,466, 4, 1901; this Journal, 1901, 931; and U.S. Pat. 58, Jan. 14, 1902; this Journal, 1902, 408.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

French Patent.

Stone; Artificial [Devitrified Glass] ——, *and Manufacture of same.* Soc. La Pierre de Verre Garchey. Fr. Pat. 325,584, Oct. 24, 1902. IX., page 744.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Rock Powders; Cause of the Cementing Value of ——, *and the Plasticity of Clays.* A. S. Cushman. J. Amer. Chem. Soc., 1903, **25**, [5], 457—468.

The author states that, save in exceptional cases, the cementing power of rock powders is due to the physical condition of the particles and their relation to water: (*a*) uncombined water; (*b*) hygroscopic water; (*c*) water of crystallisation; (*d*) water of constitution or combination. From the results obtained, he concludes that the cementing power of the rock powders is a property similar to the plasticity of clays. All rock powders that have cementing power show the same peculiar relation to water that is shown by substances that possess an amorphous colloid structure, *i.e.*, they can be de-hydrated and re-hydrated, but lose this property after prolonged heating at a high temperature. Particles which are entirely crystalline in their nature have no influence so far as plasticity is concerned, except to act as a diluent; but the amorphous particles, by reason of their characteristic structure, are able to absorb water and assume the condition which causes them to exhibit that coherence which in the mass is denominated plasticity.—A. S.

Portland Cement; History of the Development of the Theories as to the Constitution of ——. Ed. Jordis and E. H. Kanter. Zeits. angew. Chem., 1903, **16**, [20], 463—468; [21], 485—492.

The existing theories are criticised, and at the end of the paper a bibliography is given.—A. S.

English Patents.

Lime Kilns; Economisers for ——. T. Ryan. Eng. Pat. 20,874, Sept. 25, 1902. VII., page 712.

Clay; Apparatus for Separating the Coarse and Fine Particles of Insoluble Material such as ——. M. W. Phillips, Philadelphia, Pa. Eng. Pat. 26,572, Dec. 2, 1902.

The apparatus claimed is used in connection with the process described in Eng. Pat. 28,788, 1902; this Journal, 1903, 496.—A. G. L.

Silicon, Oxygen, and Carbon in Chemical Combination [Refractory Material]; Production of Compounds Containing ——. P. M. Justice, London. From the Acheson Co., Niagara Falls, N.Y. Eng. Pat. 3629, Feb. 16, 1903.

A mixture of powdered silica and powdered carbon, in such proportion that the quantity of carbon present is insufficient for the reduction and conversion into carbide of the whole of the silicon, is heated, preferably in an electrical furnace, to a temperature below that at which the formation of carborundum takes place. The product is a chemical compound approximating to the formula C_2Si_2O if the original proportion of carbon to silica is 1:2. By varying this ratio other bodies, *e.g.*, C_7Si_7O may be obtained. They are all comprehended under the general term "siloxicon," and form a very refractory material, greyish green when cold, light yellow above 300° F., of sp.gr. 2·73, and self-binding when ground, moistened with water, and fired. (See also U.S. Pat. 722,793, 1903, this Journal, 1903, 497; and U.S. Pat. 722,792, 1903; this Journal, 1903, 500.)

—A. G. L.

UNITED STATES PATENTS.

Fireproof Wood, &c., and the Art of Making the same. J. L. Ferrell, Philadelphia, Pa. U.S. Pat. 728,152, May 19, 1903.

THE wood is impregnated with an aqueous solution of sodium chloride mixed with another salt, *e.g.*, aluminium sulphate, calculated to destroy the hygroscopic tendency of commercial sodium chloride.—A. G. L.

Wood, Impregnated; Process of Obtaining ——. G. F. Lebioda, Boulogne-sur-Seine. U.S. Pat. 729,362. May 26, 1903.

THE wood is impregnated with an aqueous solution of gelatin and formaldehyde containing four times the quantity of the latter which the wood is required to contain after drying, which is carried out at a temperature of 100° to 120° C., the formaldehyde driven off being collected and used again.
—A. G. L.

[*Fireproof Blocks and Bricks*], *Compositions of Matter, and Process of Forming same.* H. Molchin, St. Louis, Mo. U.S. Pats. 729,202, 729,203, and 729,204, May 26, 1903.

THE composition consists of 45 parts of pulverised plaster of Paris, 50 parts of sifted coal-cinders, 2 parts of comminuted mica, and 3 parts of slaked lime; sodium silicate (0·002 per cent. of the whole mixture) may be added. The ingredients may be used in any other proportions, or the composition may be made by mixing slaked lime with water, then adding enough comminuted mica mixed with plaster of Paris to form a clinging mass, mixing the whole with a porous material like sifted coal-cinders, and adding 0·002 per cent. of sodium silicate. The composition is poured into moulds, and allowed to set by exposure to the air.—A. G. L.

FRENCH PATENTS.

Stone, Artificial [*Devitrified Glass*] ——, *and Manufacture of same.* Société La Pierre de Verre Garchey. Fr. Pat. 325,584, Oct. 24, 1902.

THE new artificial stone, which is called "silicate porphyrisé," is a devitrified glass made by pouring melted glass into moulds of such capacity that they will just hold the quantity required for one block, &c., of the finished product. In these moulds the glass is allowed to remain until just plastic, when it is removed to others previously heated and composed of refractory material lined with a substance, *e.g.*, plaster of Paris or calcium carbonate, which does not act on the glass. These moulds are of exactly the same shape as the first, but are slightly deeper, so as to admit of a cover of the same material being placed on the glass. In these closed moulds the glass is kept in a plastic condition by means of a suitable fire until it has become completely devitrified, when it is allowed to cool slowly. By re-heating the devitrified glass to a temperature at which it becomes plastic, any desired shape may be given to it by means of a suitable press. This re-heating does not affect the devitrification.—A. G. L.

Stone; Artificial ——. Mielek's Stone and Terra-Cotta Co. Fr. Pat. 325,787, Sept. 11, 1902.

SEE U.S. Pat. 711,329 of 1902; this Journal, 1902, 1397; and Eng. Pat. 20,492 of 1902; this Journal, 1903, 213.
—A. G. L.

Cement, Hydraulic; Manufacture of ——. J. Gresly. Fr. Pat. 325,661, Sept. 3, 1902.

THE cement is made by mixing any natural or artificial silicate of alumina with calcium carbonate in such proportions that the mixture corresponds to the formulæ $x\ (SiO_2, 2CaO) + y\ (Al_2O_3, 2CaO)$, or $x\ (SiO_2, 2CaO) + y\ (Al_2O_3 2CaO) + z\ (SO_3, CaO)$, which express the composition of natural Roman cements, and burning the mixture at a temperature below its clinkering point, that is at about 1,190° to 1,250° C. The materials used should be as free from iron as possible.—A. G. L.

X.—METALLURGY.

Cyanide Solutions; Cupriferous ——. H. A. Barker. Inst. Mining and Metall., 1903. Paper read May 21, 3 p

ZINC at first precipitates the copper freely, but soon becon less active, even if it be first covered with a good spon deposit of lead. Even with the aid of electricity the action very slow. It is a question whether the method can rea be economical, and the author is of opinion that the ol method of discarding a certain proportion of the soluti and replacing it with fresh solution at intervals, m perhaps be found more economical. In this way the liq may readily be kept within the limit of copper conte permissible. He suggests that, instead of precipitating le on zinc, where that method is used, a mixture of lead zinc solidified together should be employed. Experime recently made suggest that a more efficacious method eliminating the copper would be the acidification and filtrat of the solution, followed by an addition of caustic alkali recover the free cyanide. The precipitation of the coppe complete, and the loss of hydrocyanic acid, even if solution be warmed before adding the sulphuric acid, trivial.—W. G. M.

Reduced Copper: Hydrogen contained in ——. A. Led. Comptes rend., 1903, **136**, [21], 1254—1256.

GAUTIER, in his work on atmospheric hydrogen, hav expressed doubt as to the absorption of hydrogen by redu copper, the author has made further experiments on point. Copper planings were first oxidised completely in current of hot air and then reduced in hydrogen, the stre of hydrogen being kept up for an hour after comp reduction. The tube (internal diameter 2 cm. and len 25 cm.) containing the copper (about 45 grms.), after cool was exhausted and 10 litres of dry air passed through cold; no change in weight occurred in a tared phospho pentoxide tube attached to the apparatus. The copper then heated to redness, and successive passages of 5 and litres of air gave increases of 3·8 and 3·4 mgrms. res tively in the tared U-tube, equivalent to about 7·5 c.c hydrogen. Not only, then, did hydrogen exist, occlude combined, in the copper, but a weighable amount of hydrogen still remained after the passage over the red copper of 5 litres of air.—J. T. D.

Copper and Antimony; Alloys of ——. M. Baykf. Bull. de la Soc. d'Encourag. pour l'Ind. Nat., 1903, [5], 626—640.

THE author has observed that copper-antimony alloys taining from 50 to 70 per cent. of copper are not always the same structure, this latter varying with the degre rapidity with which the alloys are cooled after solidifica Le Chatelier has shown that copper-antimony alloys solid solutions, and it is probable that the difference structure depend on the fact that with rapid cooling, solid solution remains permanent, whilst with slow coo separation takes place. In the well-known case of separation from the solid solution is accompanied b calescence: in the case of the copper-antimony allo similar phenomenon was observed, a break occurring cooling curve at about 400° C., indicating a transform accompanied by a disengagement of heat. The author made a detailed study of copper-antimony alloys, deter ing the number and the composition of definite compo of the two metals; the fusibility, hardness, and ele motive force of the alloys as functions of their composi the behaviour of the alloys during cooling; and th fluence of the rapidity of cooling on the micro-structu the alloys. The results are set out in a number of t and curve-diagrams, and photographs are given show micro-structure of the alloys.—A. S.

Tin Ore from the Bautschi Tin Fields, Northern Ni Bull. of the Imperial Inst., Suppl. to the Board of Journal, May 21, 1903, 21.

THE sample examined consisted of small fragments, m them less than one-eighth of an inch in diameter. chiefly composed of cassiterite, but contained a n garnets and red grains of rutile, together with very quantities of magnetite and topaz. On analysis, the ving figures were obtained:—Tin dioxide (SnO_2),); silica (SiO_2), 1·0; titanium dioxide (TiO_2), 5·46; is oxide (FeO), 6·63; alumina (Al_2O_3), 4·60; mag- (MgO), 0·35, and lead oxide (PbO), 0·25 per cent. ample conthined no calcium, copper, gold, or arsenic.

—A. S.

anide Process; Analytical Work in connection with the ——. J. E. Clennell. XXIII., page 762.

yanide Reactions. A. Chiddey. VII., page 739.

The Chemical Reactions Involved in the Rusting ——. W. R. Dunstan. Proc. Chem. Soc., **19**, 267], —152.

s been proved that whilst both liquid water and oxygen ecessary for the formation of rust, the presence of n dioxide is not essential, although it may accelerate tion. The well-known effect of alkalis and alkaline in preventing the oxidation of iron has been hitherto uted to the withdrawal of the carbon dioxide. It has found, however, that the phenomenon is not due to ause, but to the establishment of conditions in which oduction of hydrogen peroxide is inhibited.

en highly purified iron, containing mere traces of ity, is left in contact with dry gases (oxygen, carbon le, mixtures of oxygen and carbon dioxide), rusting not take place. In the presence of the same gases and vapour, no rusting occurs so long as a constant rature (34° C. in the actual experiments) is maintained, the temperature be allowed to fluctuate, liquid water nses on the surface of the iron and rust is produced. hus shown that pure iron is not oxidised in presence ses and water-vapour only, but that the presence of water is necessary for rusting to take place.

nother series of experiments, pieces of iron were left tact with water saturated with a particular gas and an atmosphere of the same gas above the solution. hydrogen, carbon dioxide, or nitrogen which had carefully freed from oxygen was employed, rusting t occur, but if oxygen or a mixture of oxygen and dioxide was used, oxidation took place. From these , it is evident that for the formation of rust both n and liquid water are required. In the experiments ch a mixture of oxygen and carbon dioxide was used, sults observed indicated that in this case a secondary proceeds simultaneously.

rder to investigate the influence of solutions of various on the production of rust, small pieces of highly d sheet iron were enclosed with the different solutions ed glass tubes, the space above the solution in each being filled with pure oxygen. The following sub- s were found to prevent to a greater or less extent rmation of rust: sodium carbonate, ammonium car- , borax, disodium hydrogen phosphate, calcium ide, ammonia, potassium bichromate, potassium anide, chromic acid, sodium nitrite, and potassium ate. Rusting occurred in the presence of the following unds: sodium chloride, potassium chlorate, ferrous te, potassium ferricyanide, potassium nitrate, and sulphate. The reagents which prevent the rusting are those in presence of which decomposition of en peroxide takes place and which are consequently al to its formation. There can be little doubt, there- at hydrogen peroxide plays an important part in emical process of rusting. By the direct action of en peroxide on metallic iron, a red basic ferric ide, identical with ordinary rust, is rapidly produced, s found that in general those metals rust in air which idised by hydrogen peroxide, whilst those metals are not oxidised by hydrogen peroxide do not rust in ron, zinc, and lead are examples of the first class, and sting of all these metals is stopped by contact with nces which prevent the formation of hydrogen le. Copper, silver, and nickel are examples of the class; these metals do not rust in air and are not d by hydrogen peroxide.

The analysis of a number of specimens of iron rust has shown that its composition may be represented by the formula $Fe_2O_2(OH)_2$.

The chemical reactions concerned in the process of rusting may therefore be represented by the following equations:—

$$Fe + O_2 + H_2O = FeO + H_2O_2.$$
$$2FeO + H_2O_2 = Fe_2O_2(OH)_2.$$

The presence of water in the liquid state is essential alike for the occurrence of rusting and for the formation of hydrogen peroxide.

In the case of certain metals, notably that of zinc, hydrogen peroxide can be detected during the process of rusting. It has not been possible, however, to detect with certainty the presence of hydrogen peroxide during the rusting of iron. This may be due to the fact, previously mentioned, that iron is very rapidly oxidised by hydrogen peroxide with formation of rust, so that under ordinary conditions the hydrogen peroxide is quickly destroyed.

The influence of certain other reactions on the process of rusting has been studied and may be summarised as follows:—

(I.) The direct decomposition of water by metallic iron with liberation of hydrogen can take place only at a relatively high temperature, and is not affected by the presence of alkaline salts, such as sodium carbonate.

(II.) The action of aqueous carbonic acid on iron in the absence of oxygen results in the liberation of hydrogen and formation of ferrous carbonate or bicarbonate. If oxygen is present, the ferrous salt subsequently undergoes oxidation, the rust obtained in this case containing a varying amount of carbonate.

(III.) Electrolytic action occurs when the iron is impure or when another metal is present. The electro-positive metal suffers oxidation and hydrogen gas is evolved. This action is not prevented by the presence of sodium carbonate.

Iron; The Rusting of ——. G. T. Moody. Proc. Chem. Soc., 1903, **19**, [268], 157.

The contention of Dunstan (Proc. of the Royal Artillery Inst., 1899, No. 5; also see preceding abstract) that carbon dioxide is not essentially concerned in the process of rusting, and that this change is caused by hydrogen peroxide, is based on the observation that solutions of chromium trioxide, potassium dichromate, potassium ferrocyanide, sodium nitrite, and other substances which decompose hydrogen peroxide, entirely or nearly entirely prevent rusting. The author finds that the retarding action exercised by these substances is due to the influence they exert on the absorption of carbon dioxide. For example, when exposed to the gas under exactly the same conditions, water absorbed 90·6 volumes, whilst a 15 per cent. solution of chromium trioxide and a 20 per cent. solution of sodium nitrite absorbed 4·2 volumes and 5·6 volumes respectively. A solution of chromium trioxide—which itself does not attack iron—appears all the more to exert a protecting influence because of the ease with which it dissolves ferric oxide. Iron, when placed under a 1 per cent. solution of chromium trioxide exposed to air, remains bright for some weeks, although the metal is slowly passing into solution. Eventually rust commences to form on the metal, although the solution still contains free chromic acid.

When iron is exposed to water and oxygen previously freed as far as possible from carbon dioxide, the volume of oxygen remains practically unchanged. On admitting carbon dioxide, the volume of oxygen diminishes rapidly and rusting becomes visible.

The interaction of iron with aqueous carbonic acid appears to be strictly comparable with that occurring between iron and sulphuric acid. A solution of carbonic acid, formed by saturating 2·4 litres of water at 18° with carbon dioxide, when left in contact with 500 grms. of clean iron turnings, yielded 635 c.c. of hydrogen in seven days. After remaining for one week, the solution contained 0·1 per cent. of iron present as ferrous bicarbonate—a substance which is readily decomposed by atmospheric oxygen, yielding a mixture of ferrous carbonate and ferric oxide, whilst a part of the carbonic acid is regenerated. On account of the ease with which this change takes place, it follows that in presence of oxygen a definite weight of carbonic acid will exert a greater corroding influence on iron than will its equivalent of sulphuric or hydrochloric acid.

The author contends that the primary action in rusting involves the interaction of iron and acid, and that rust is formed by the subsequent oxidation of ferrous salt.

English Patents.

Iron; Improved Process for Hardening ——. J. B. Kuigge and J. P. van Holt, both of Ruhrort, Germany. Eng. Pat. 13,714, June 17, 1902.

Iron is superficially hardened by heating it in an "organic nitrogenous substance having a high percentage of fusible ash," such as bone-dust, to which is added a certain proportion of red phosphorus, together with potassium ferrocyanide and cyanide. The use of phosphorus in the hardening process is stated to facilitate the immigration of the carbon into the iron.—E. S.

Iron Ores; Process for Working-off or Reducing Pulverulent or Dust ——. O. Dobbelstein, Saarbrücken, Germany. Eng. Pat. 1519, Jan. 21, 1903.

The dust iron ores, mixed with dust of "fat coke-coal," anthracite, or glance coal, are coked in a series of small closed furnaces, used successively, to utilise residual heat and generate gases which burn in passages around the furnace chamber, wherein they mix with incoming air. The iron oxides being thus reduced, a hot blast is admitted, and fusion is effected within the same chamber, provision being made for tapping the molten metal.—E. S.

Metallurgical Converters. A. Reynolds, Hove, Sussex. Eng. Pat. 12,834, June 5, 1902.

A gas producer and converter are contained within one casing, and communicate by a series of vertical channels leading from the bottom of the producer into a horizontal flue opening into the lower part of the converter. Pipes for injecting air with liquid or gaseous fuel enter the front of the producer (which is charged with solid fuel) at different heights, and also the communicating channels. —E. S.

Drying Apparatus for Pyrites and Blendes Applicable to the Herreshoff Roasting Furnace and similar Apparatus. A. M. Clark, London. From The Metallurgische Gesellschaft, Frankfort-on-the-Main, Germany. Eng. Pat. 15,041, July 5, 1902.

At the top of a roasting furnace of the Herreshoff type, a drying chamber is arranged, provided with a shallow annular trough, to which the heated air of the furnace is conducted, and in which the ore is placed, and moved towards the feeding hopper by rakes fitted to the upper end of the furnace shaft.—E. S.

Aluminium; Manufacture of ——. P. Jensen, London. From W. Rübel, Berlin. Eng. Pat. 13,025, June 7, 1902.

See Fr. Pat. 322,353, June 20, 1903; this Journal, 1903, 369.—E. S.

Aluminium; Manufacture of Certain Alloys of ——. H. and H. J. Warrington, Stoke-on-Trent. Eng. Pat. 14,936, July 4, 1902.

"Alumina" is enclosed in an envelope of wrought iron, which is then raised to a "blood-red" heat, and subjected to a rolling process. When about equal weights of "alumina" and iron are used, the resulting alloy is stated to resemble aluminium in appearance, but to be more capable of resisting tensile strain, and to permit of an elongation of 25 per cent., and of a reduction of 70 per cent. in sectional area before fracture takes place. To produce wire of the alloy, a wrought-iron tube filled with alumina is treated as described, and then drawn.—E. S.

Copper Regulus: Process for Freeing ——, *from Arse and Antimony.* F. B. Stone, Belvedere, Kent. Eng. P 15,222, July 8, 1902.

Copper regulus, or material consisting chiefly of cop sulphide, is mixed with roasted copper regulus and co dust; or with copper or iron scrap, or with any compou that will produce iron or copper on heating and melti and the mixture is heated until it becomes plastic, but fluid, in which state it is maintained for some hours, af which the temperature is raised, and the molten metal tapped. If the arsenic and antimony are not t completely removed, the treatment is repeated.—E. S.

Ores of Zinc; Method of Treating —— [*for Preci Metals*]. C. W. Sexton, Brooklyn, N.Y. Eng. P 7693, April 2, 1903.

Zinc ores containing precious metals, and previou roasted if sulphur is present, are mixed with stated prop tions of carbon and of iron, and subjected to distillation closed retorts. From the carbonaceous residue, the i associated with the metals other than zinc present in ore, is magnetically separated and subjected to suita treatment to recover the metals with which it is alloyed. —E. S

United States Patents.

Ores; Process of Chlorinating and Brominating — J. D. Hawkins and H. W. Fox, Colorado Springs, U.S. Pat. 727,626, May 12, 1903.

The ores are brought into contact with a halogen hydr e.g., chlorine hydrate, or with chlorine hydrate crystals with such crystals enclosed in ice, and heat is applie decompose the hydrate and set the chlorine free.—E. S.

Bromine [*used in Treating Ores*]; *Process of Re ing* ——. C. D Grove. U.S. Pat. 728,566, May , 1903. VII., page 743.

Materials [*Ores*]; *Process of Subjecting* ——, *to Action of Air or other Gases.* C. E. Mark, Chic Ill. U.S. Pat. 728,261, May 19, 1903.

The materials are heated or roasted in a furnace havin porous bed or hearth, and air or other suitable ga forced upwards through the hearth into the materials. —R.

Ores; Means for Treating ——. F. D. Gross, Assign T. Goodwin and the Colorado Iron Works Co., Denver, Col. U.S. Pat. 728,908, May 26, 1903.

The furnace has a roasting chamber with a lateral disch opening, in combination with a separate covered rabl chamber. The hearth is annular and movable relativel to the chambers, and means are provided for causi g revolve. Series of rods carrying rabble blades are incl to the direction of movement of the ore, part of such being fixed, and part rotatable, the latter being prov with blades on both sides inclined in the same direc the blades on one side working in opposition to the bl of the fixed rods, and those on the other side working the former to discharge the ore through the dis opening, means being provided for simultaneously remo the rabbles from the path of the ore.—E. S.

Ore-Roaster. H. M. Sutton, W. L. Steele, and E. G. S Dallas, Tex. U.S. Pat. 729,008, May 26, 1903.

Ore is conveyed through a pipe by a blast of heat tangentially against the inclined inner sides of a h shaped furnace, heated by a number of burners, arra tangentially to the inner wall, the furnace being vided with a relatively wide outlet in its top for h expanded air, and with a discharge spout at its bottor the roasted ore. The latter is conveyed, with acce cool air, and by means of a fan, into a separating cha of similar shape to the furnace, from the discharge ing of which it passes into a receptacle.—E. S.

Or; *Process of Roasting* ——. H. M. Suttou, W. L. ele, and E. G. Steele, Dallas, Tex. U.S. Pat. 729,009, y 26, 1903.

Th process cousists in suspending the particles of the ore n a moving body of compressed air, and subjecting the to heat and to a spiral centrifugal movement downwa to precipitate the ore during expansion of the air, by e means described in the preceding abstract, followed by e subsequent treatment there described.—E. S.

Roasting Furnace. J. B. F. Herreshoff, New York. U.S. Pat. 729,170, May 26, 1903.

furnace comprises a series of superposed shelves for e, having apertures alternately at the side and centre cessive shelves, rakes carried by a ceutral shaft being ranged as to move the ore inwardly or outwardly ds the openings in the respective shelves. Spouts d by the rakes receive the ore below the peripheral ires, and other spouts secured to the shaft, serve for ntral openings.—E. S.

Furnace. O. S. Garretson, Buffalo, Assignor to retson Furnace Company, Pittsburg, Pa. U.S. Pat. ,700, May 19, 1903.

urnace stack is composed of upright water jackets ged side by side, secured by side and end tie-beams. ackets are in two sets, the lower set "overlapping he upper portion of their water spaces the lower n of the water spaces of the upper jackets on the sides of the latter." Drain pipes exteud from the 1 of each jacket downwards to a manifold pipe ed underneath the furnace bottom, the flow of water hout being controlled by suitable valves.—E. S.

or Pyritic Smelting; Method of ——. O. S. retson, Buffalo, Assignor to Garretson Furnace Comy, Pittsburg, Pa. U.S. Pat. 728,701, May 19, 1903.

nolten matte is subjected to a blast underneath a n of material containing a flux, and the slag is ed and subjected to a blast under a columu of r-bearing material. The molten matte resulting he last process is then treated as in the first case. —E. S.

Slag Furnace. O. S. Garretson, Buffalo, N.Y. U.S. Pat. 728,794, May 19, 1903.

olten slag is conducted by a hopper into a rotary or drum, having a hollow hub from which hollow radiate, and a rim of hollow detachable connected s, also connected to the spokes. Means are provided circulation of a cooling agent through the hollow entioned. A hollow segmental shield (also traversed cooling agent) confines the slag in the pockets by the spokes in the drum, during part of its n, until such slag is congealed, and discharged on rotation, in the solid state, into a slag chamber h which air is circulated.—E. S.

Slag Furnace. O. S. Garretsou, Buffalo, N.Y. U.S. Pat. 728,795, May 19, 1903.

x slag is caused to flow on to the uppermost of a of descending hollow steps. Reciprocating horizontal arranged to slide over the top faces of the steps, the slag as it passes down the latter, adjacent bars moved in opposite directions. A cooling agent is l to the cavities in the steps, these steps having at ends heads with communicating ports. The hot led slag passes from the steps into a slag chamber ed by an air current, which passes on to heat a boiler, a return passage being provided through the air returns to the slag chamber.—E. S.

Metals; Method of Extracting ——. W. Martino, Sheffield. U.S. Pat. 727,659, May 12, 1903.

oe or other solutions of the "noble metals" are at a raised temperature with "barium-sulpho-." Compare Eng. Pat. 9501, April 24, 1902; this l, 1902, 1141; and U.S. Pat. 716,847, Dec. 23, this Journal 1903, 97.—E. S.

Gold-Extracting Process. T. B. Joseph, Salt Lake City, Utah. U.S. Pat. 728,397, May 19, 1903.

Ores containing gold and silver are subjected to the leaching action of a solution containing potassium cyanide and barium hydroxide, with or without calcium hydroxide. The claims also include the use in certain cases of carbon dioxide gas, alone, or forced in with compressed air to agitate the pulp. Compare U.S. Pat. 718,633, Jan. 20, 1903; this Journal, 1903, 214.—E. S.

Metals; Means for Precipitating Dissolved ——. P. W. McCaffrey, Assignor to the Union Ore Extraction and Reduction Company, both of Denver, Col. U.S. Pat. 728,746, May 19, 1903.

A rectangular precipitating tank is provided with alternate upwardly and downwardly extending partitions, with horizontal perforated cylinders, containing scrap metal, revolving between the latter, partially immersed in the solution to be precipitated. Means for causing the solution to flow from end to end of the tank, and thus through each of the cylinders in turn, are provided. The apparatus is especially claimed for the precipitation of copper from cupric solutions on to scrap iron.—E. S.

Aluminium and its Alloys; Process of Producing ——. D. A. Peniakoff, Huy, Belgium. U.S. Pat. 728,129, May 12, 1903.

Porous aluminium sulphide, or a porous double sulphide of aluminium and another metal, is heated in contact with a hydrocarbon gas or other reducing agent to a temperature sufficient to effect the reduction of the aluminium. The resulting product is melted with a flux.—E. S.

Welding Compound. M. P. Shaper, Vandergrift, Pa. U.S. Pat. 729,428, May 26, 1903.

The compound consists, approximately, of iron or steel chips, shavings, or filings, 16 parts, with 4 parts each of ammonium chloride and of "burnt" borax.—E. S.

French Patents.

Iron and Steel; Plates and Powders for Cementing, Hardening, and Tempering ——. Société Delmas et Cie. Fr. Pat. 325,916, Oct. 30, 1902.

Turnings or filings of cast-iron are incorporated with fused borax, to which a little potassium ferrocyanide may be added. The mixture is rolled into plates, or is powdered, for application to the purposes named in the title.—E. S.

Antimony; Metallurgical Treatment of ——, *and Apparatus for that purpose.* F. M. E. Basse. First Addition, dated Oct. 30, 1902, to Fr. Pat. 319,534, March 13, 1902.

The furnace employed under the main patent (see this Journal, 1902, 1537) is supplemented by a chamber, described in detail, wherein the fumes arising from the roasting ore are condensed, serving at the same time to heat air which is directed to various parts of the furnace, by various adjuncts, in such manner as simultaneously to promote the draft, assist in the roasting process, and enable the temperature to be so regulated as to enable certain constituents of complex ores to be fractionally set free, *i.e.*, in succession. The condensing chamber is divided into compartments by inner walls, leaving spaces alternately at the top and the bottom for passage of the fumes; but these are shut off entirely from the end compartment, into which a great number of horizontal pipes traversing the chamber, and open to the atmosphere at the opposite end, enter. From this end compartment the air heated by the condensing fumes is led to the furnace for application as described. —E. S.

Zinc Furnace. A. J. Ash. Fr. Pat. 325,589, Oct. 24, 1902.

See U.S. Pat. 702,526, June 17, 1902; this Journal, 1902, 978.—E. S.

Zinc and other Volatile Metals; Process of Extracting ——, from their Ores. Société Trollhättans Elektriska Kraftaktiebolag. Fr. Pat. 325,895, Oct. 21, 1902.

The powdered zinc ore, mixed with carbon, chalk, and, in some cases, with iron ore, is continuously fed into a shaft or pipe in the roof of an electric furnace, and against a side wall, so that the descending ore presents an inclined face or surface between the roof and the floor, receiving radiation from the arc. As the ore fuses on the inclined surface, it flows over a step in the furnace floor on to a depressed part of the same, and the slag issues through a suitably arranged vent. Provision is made for conducting away the metallic vapours, as they form, to a condenser.—E. S.

Zinc; Metallurgy of ——. E. H. Hopkins.
Fr. Pat. 325,903, Oct. 25, 1902.

See Eng. Pat. 22,554, Dec. 11, 1900, and U.S. Pat. 708,044, Sept. 2, 1902; this Journal, 1902, 54 and 1401 respectively.
—E. S.

Briquettes from Powdered or Crushed Ores, and from Substances containing Ores; Process for the Manufacture of ——. A. Rónay. Fr. Pat. 325,964, Oct. 30, 1902.

The ore is submitted to high hydraulic pressure, applied at first gradually, and in such a manner that the moisture and air contained in the ore are allowed to escape between the sides of the mould and a second ram which forms the baseplate of the mould. The final compression is made at a pressure of from 800 to 2,000 atmospheres, both the baseplate ram and the ram proper moving into the mould and forming the briquette.—L. F. G.

Gas Furnace; Reverberatory ——. P. Schmidt.
Fr. Pat. 326,106, Nov. 5, 1902.

In a reverberatory gas furnace for heating ingots, forgings, &c., the hot products of combustion leave the furnace through a ∩-shaped flue which surrounds the passage for the air-supply. The waste gases pass out in the opposite direction to the inflowing air, which becomes heated and then mingles with the combustible gas in an arc-shaped chamber above the arch of the furnace. The burning mixture enters the furnace chamber through ports in the arch. Cross bricks are arranged in the flues for the air and hot gases, to facilitate the interchange of heat.—H. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Alkali-earth-metal Sulphides: Electrolysis of ——. A. Brochet and G. Ranson. Comptes rend., 1903, **136**, [20], 1195—1197.

The results, both in dilute and concentrated solutions, are exactly parallel to those in the case of sodium sulphide (see this Journal, 1903, 702), and are represented in the case of barium by $Ba\left\{\begin{matrix}OH\\SH\end{matrix}\right. + H_2O \rightleftarrows Ba(OH)_2 + H_2 + S$.

Platinum, iron, or nickel may be used as anode, as may also carbon or lead; under certain circumstances, however, the carbon anode may be slightly attacked and oxidised, or the lead anode coated with peroxide. Copper acts as a soluble anode. Sodium chloride may be added without interfering with the course of the reaction, but in this case iron and nickel become soluble anodes. If the reduction of the polysulphide were prevented, this electrolysis might become an industrial method of preparation of barium hydroxide; but alteration in the cathode density is of no effect, and the addition of chromate is out of the question here.—J. T. D.

Barium Sulphide; Electrolysis of ——, with a Diaphragm. A. Brochet and G. Ranson. Comptes rend., 1903, **136**, [21], 1258—1260.

The primary electrolytic decomposition (see preceding abstract) is not altered by interposing a porous diaphragm; but the reduction of the polysulphide by cathodic hydrogen is prevented, and there is a transport of barium hydroxid to the anode, so considerable that in certain cases practicall the whole of it is found in the anodic compartment. Th addition of barium chloride or alkali chloride does not modify the general course of the reaction, but it prevent the use of an iron anode. Barium hydroxide may be used however, in the cathode compartment, without modifyin the electrolysis; hence the mother liquors of one operatio may be used in the cathode compartment for the nex The barium hydroxide produced is readily separated, b cooling, from the very soluble polysulphides. By saturatin the remaining polysulphide solution, hot, with bariun sulphide, the polysulphide is precipitated, and may be use as a source of barium salts and sulphur, while the anod liquor is thus prepared for the next operation. The metho promises to be an economical plan of preparing bariu hydroxide.—J. T. D.

Azobenzene; Electrolytic Preparation of ——. Farbwerk vorm. Meister, Lucius u. Brüning. Ger. Pat. 141,53 March 28, 1902; Zeits. angew. Chem., 1903, **16**, [2 502.

According to Ger. Pat. 127,727, if nitrobenzene, held i suspension in a weak solution of alkali, be subjected t electrolysis, without the use of a diaphragm, it is rapidl reduced to azoxybenzene. It is now found that if th electrolysis be carried out at a high temperature (ab 95° C.), and with use of a concentrated solution of alkal azobenzene is produced, together with small quantities c hydrazobenzene. The containing vessel is made to serv as cathode.—A. S.

Electrolytic Separations: Manganese from Iron, Alu nium from Iron or Nickel, Zinc from Iron. Hollar and Bertiaux. XXIII., page 762.

English Patents.

Electric Batteries. D. H. Wilson, Chicago, Ill., U.S.
Eng. Pat. 27,720, Dec. 16, 1902.

See U.S. Pat. 715,920, 1902; this Journal, 1903, 99.
—G. H. R

Galvanic Batteries; Impts. in ——. The Halsey Electr Generator Co., Ltd., Edinburgh. From the Hals Electric Generator Co., of New Jersey, U.S.A. Pat. 28,807, Dec. 30, 1902.

See U.S. Pat. 717,394, 1902; this Journal, 1903, 148.
—G. H. R.

Electrodes; Negative ——, for Electric Accumulators a the Method of Forming them. The Chloride Electr Storage Co., Ltd., Clifton Junction. From La S Anonyme pour le Travail Electrique des Metaux, Pa Eng. Pat. 28,013, Dec. 18, 1902.

The negative plates are composed of, or coated with, t active metal in a crystalline form; this being effected keeping the electrode on which the active mass is to reduced at an electrical pressure considerably remov from that corresponding with the evolution of hydrog Various examples are given of the methods of obtain the crystalline metal, and it is stated that the electroly should be effected in an electrolyte in which the act material, if at first too insoluble, becomes less so, or, first too soluble, becomes less soluble.—G. H. R.

Alkali Chlorides; Process for the Electrolytic Deposit of ——, and Apparatus therefor. H. Cuénod a C. Fournier. Eng. Pat. 12,691, June 3, 1902. V., page 742.

Photometers or Apparatus for [Electrically] Measur the Intensity of Light; Impts. in ——. W. Frisby. E Pat. 13,412, June 13, 1902. XXIII., page 761.

United States Patents.

Cell; Electrolytic ——. H. K. Moore, Lynn, Ma Assignor to Moore Electrolytic Co., Portland, Me., U.S. Pat. 728,274, May 19, 1903.

The cell has a cover, beneath which is a chlorine sp Carbon anodes are used, the carbon having a socket c aining a copper block, with a casing in the block having a oefficient of expansion between those of copper and arbon respectively. A conductor passes through the cover nd makes a threaded connection with the block. On the nd of the conductor is another block; and a glass tube nclosing the conductor is clamped between the two blocks. —W. G. M.

hromium Compounds and Alkalis; [Electrolytic] Production of ——. H. Specketer, Assignor to Chem. Fabr. Griesheim Elektron. U.S. Pat. 728,778, May 19, 1903. VII., page 742.

French Patent.

Vater; [Electrical] Purification of ——. E. Pellas and J. Legrand. Fr. Pat. 326,086, Nov. 4, 1902. XVIII. B., page 757.

(B.)—ELECTRO-METALLURGY.

letallurgy; Application of the Electrical Furnace in ——. A. Keller. Paper read before the Iron and Steel Inst., Spring Meeting, 1903.

lanufacture of Ferro-chrome.—With slight modifications, lcium carbide furnaces are suitable for the production of rro-chrome, in which as much as 7 or 8 per cent. of rbon is admissible. In the production of ferro-chrome in e cupola furnace, difficulties were frequently experienced ving to the "hanging up" of the charge. By reason of e high temperature of the hearth, this difficulty is not countered in the electric furnace, and the ferro-chrome n be tapped off in the liquid state. The electric process s now entirely superseded the old method.

Special Iron Alloys.—Alloys of iron with tungsten, anium, molybdenum, vanadium, and other rare metals n all be produced in the electric furnace.

Electro-Metallurgy of Silicon.—By means of the electric rnace, even when working at moderate temperatures, oys can be produced without difficulty, richer in silicon ontaining from 25 to 80 per cent.) than those obtained in e blast furnace. Ferro-silicon made in the electric rnace is characterised by its high degree of purity, is being in general greater, the higher the content of icon in the alloy. A 50 per cent. ferro-silicon examined the author, contained as impurities only 0·02 per cent. of osphorus and traces of sulphur and carbon. The energy quired for the production of 1 ton of 30 per cent. ferrocon is 3,500 kw.-hours, but the manufacture can only be nomically carried on in a large installation consisting of werful electric furnaces of the resistance type. The raw terials are preferably quartz, scrap iron, and coke.

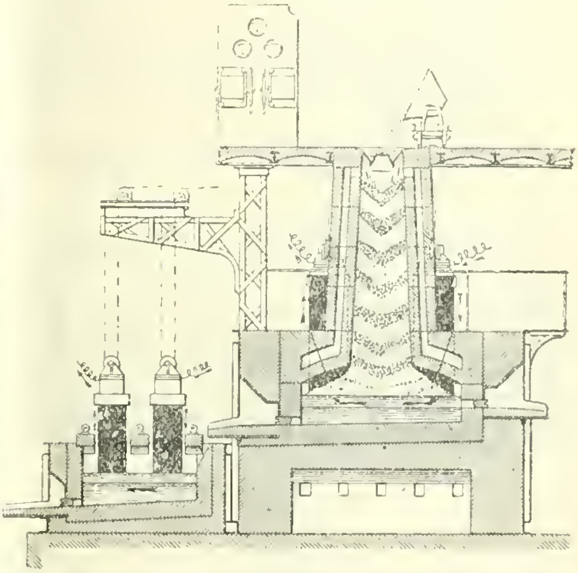
Reduction of Iron Ores.—The electrical reduction of n ores is only practicable from an economic point of w: (1) in the production of special qualities of iron m pure ore delivered at the works on favourable terms;) in cases where iron ore of good quality is abundant, l where natural sources of power are available in the nediate neighbourhood of the ore deposits. One kilott-year utilised in an electric reducing furnace is capable yielding about 4 tons of steel-making pig-iron; in eral, therefore, electrical reduction is only practicable he cost of 1 kilowatt-year does not exceed 25*s.* 6*d.*

Manufacture of Steel.—It is stated that about 1·10 watt-years are required for the melting and fining of ou of steel by the fusion of scrap iron and steel; thus, n if the motive power be supplied by a steam engine, the t of the electric energy will approximately amount to y 32*s.* per ton of steel.

lectric Blast Furnaces for Reducing Iron Ores.—The uisite conditions for successful working are: (1) icient power for treating a large quantity of ore; (2) tinuity of working. To comply with these conditions, author uses vertical, adjustable electrodes, so that the t can be focussed at several points; also several elecles are placed in parallel, so that any one of them can enewed without stopping or varying the working of the aratus. Each furnace contains at least two groups of electrodes each, the two latter being arranged in llel, and the two groups themselves in series. These four electrodes project through refractory walls, and each one can be independently raised or lowered. A pressure of 25—30 volts for each focus is employed. The furnace hearth is constructed in the same manner as that of an open-hearth furnace. The melting chamber is surmounted by a shaft of brickwork containing the ores, fuel, and fluxing materials, which are charged in from the top. The reduction of the metal at first takes place on the hearth only, but after a time it extends throughout the whole shaft, which is kept constantly full.

Electric Fining Furnace.—The method of electric distribution is similar to that described above. The fining furnace, however, contains only molten metal, together with the substances necessary for completing the elimination of the non-metals, and the surface of the bath is kept at a sufficiently low level to allow of samples being taken during working. A pressure of 50—75 volts for each focus is employed, and it is important to prevent the electrodes from coming into contact with the slag.

The author concludes by giving a description of the arrangement of an electrical steel works, with fining furnaces worked in conjunction with reducing furnaces (see igure). It is stated that in a works with an available force of 10,000 h.p. on the shaft of the turbines, 60 tons of steel could be produced per day, *viz.*, 50 tons from the reducing furnaces working on 55 per cent. ore, and 10 tons from the smelting of scrap in the fining furnaces. The total cost (exclusive of royalties) of producing 1 ton of ingot steel is estimated at 72*s.*—80*s.*, taking the cost of 1 kilowatt-year of 8,400 hours to be 2*l.*, including amortisation.—A. S.



Zinc Extraction; Electrolytic ——, *by the Hoepfner Process.* E. Guenther. Eng. and Mining J., 1903, **75**, [20], 750—752.

The author gives a description of the Hoepfner process for the extraction of zinc, as successfully worked at Fuhrfort-a d-Lahn, Germany, from 1895 to 1897. The raw material used was the cinder from zinciferous pyrites used in the manufacture of sulphuric acid. It contained from 10 to 16 per cent. of zinc. It was ground to 1·5 mm. size, mixed with 18—20 per cent. of common salt, and roasted in a muffle furnace for 20—22 hours at a temperature not exceeding 650° C. The consumption of coal was one-fifth of the weight of the zinciferous cinder. The hot furnace charge was leached with water or with dilute liquor from a subsequent stage of the process. The solution thus obtained contained 10 per cent. of zinc together with sodium chloride and sulphate, and small amounts of lead, copper, cadmium, arsenic, manganese, and thallium. Sodium sulphate was separated by cooling to −5° C., iron and manganese were precipitated by addition of bleaching powder and marble dust, and electro-negative metals (to zinc) by zinc dust. The clear solution then contained, on the average, 20 per cent. of zinc chloride, 22 per cent. of sodium chloride, 0·05—0·06 per cent. of sulphuric acid, and traces of lead, iron, and thallium. It was acidified with hydrochloric acid free from arsenic, and subjected to electrolysis in a series of V-shaped vats, shown in plan in Fig. 1. Each vat contained eight anode cells and seven cathode compartments; the former were separated from the latter by diaphragms of nitrated cloth, and were closed in on top. The anodes, *d*, were of hard artificial carbon, whilst the cathodes, *a*, consisted of discs of zinc or iron, fixed vertically, by means of iron sleeves, *b*, to the shaft, *c*. The current was transmitted through the conductors, *i*, *k*. The electrolyte entered each vat on one of the longitudinal sides, and passed out at the top of the opposite side, so there was only a circulation past the cathodes, but the solution could pass beneath the anode cells. The acidity of the electrolyte was maintained at 0·08—0·12 per cent. of hydrochloric acid, 0·03—0·05 grm. of acid being added per ampère-hour during the electrolysis. The proportion of zinc in the bath was not allowed to fall below 2 per cent. A current density of 100 ampères per square metre was used, the terminal voltage being 3·3—3·6. The current efficiency was 97 per cent. or more, and the zinc wa deposited in dense form, silver-white in colour, but there was a tendency to irregular deposition at the circumference of the discs, as the result of the locally higher current density. The deposited zinc was remelted in a reverbera tory furnace and lost from 1·5—2 per cent. of its weight; the consumption of coal was 7—8 per cent. of the weight of metal. The final product contained 99·97—99·98 pe cent. of zinc, 0·01—0·02 per cent. of lead, and traces o iron and thallium. The chlorine gas from the anode cell was led into bleaching powder chambers (see Fig. 2), o which there were four, arranged in series in such a way that any one could be used as the first. Detailed estimates based for the most part on practical experience, are give of the cost of a plant capable of producing 650 metric ton of electro-deposited zinc per annum, the extraction of zi from the roasted chloridised material being 7·5 per cent For a plant of this capacity the capital outlay would b 162,500 dols.; the cost of working, 116,779·5 dols. pe annum; and value of products, 130,313·5 dols. per annum or an annual profit of 13,534 dols.—A. S.

Fig. 1.

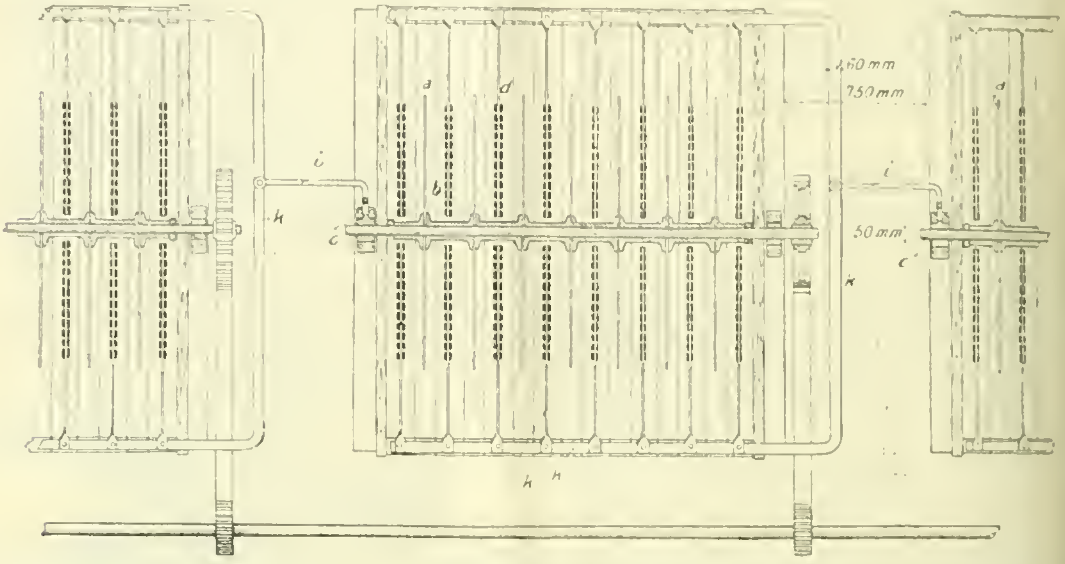
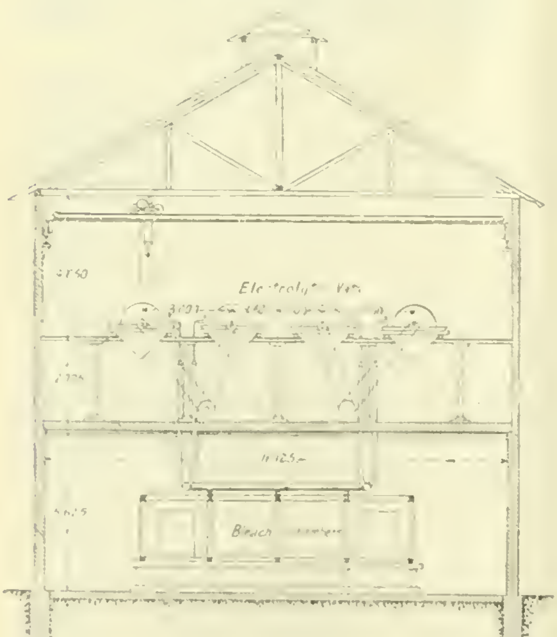


Fig. 2.



XII.—FATS, FATTY OILS, & SOAP.

Olive Oil: Does Cholesterol Occur in ——? A. H. Gi and C. G. Tufts. J. Amer. Chem. Soc., 1903, 25, [498—503.

In order to elucidate the question of the occurrence cholesterol in olive oil, the authors treated a Californ virgin oil, pressed from fully ripened olives and of know origin, according to the method previously described maize oil (this Journal, 1903, 501 and 513). A samp of the fatty alcohol from olive oil was prepared by tw saponifying the propionate melting at 101·5—103·5 a recrystallising the product three times.

From the melting points and properties of this alcohol a its esters, the author concludes that the compound fr olive oil is phytosterol.—A. S.

laeis Guineensis ; Fruit and Oils from —— [*Palm and Palm-kernel Oils*]. G. Fendler. Ber. d. pharm. Ges., 1903, **13**, 115. Chem.-Zeit., 1903, **27**, [41], Rep. 128.

HE author has examined the fruit from the four varieties f oil palm growing in Togo, and has determined the conants of the oils yielded by the fruit-pulp and the kernels. he pulp contained from 58·5 to 66·5 per cent. of oil, 5·3 6·9 per cent. of moisture, and 28·2 to 35·8 per cent. of sidue ; whilst the kernels gave the following results:—il, 43·7 to 49·2 ; moisture, 5·9 to 8·2 ; and residue, 44·9 48·1 per cent

The palm oils had the following characteristics :—Melting oint, 35°—43° C. ; solidification point, 31°—39° C. ; saponification value, 200·8—205·5; free acid (as oleic acid), 4·06—57·18 per cent. ; Reichert-Meissl value, 0·74—1·87 nd iodine value, 53·18—57·44.

The characteristics of the palm-kernel oils were as llows :—Melting-point, 28°—30° C ; solidification point, 3°—24° C. ; saponification value, 246·3—250 ; free acid s oleic acid), 3·19—4·13 per cent. ; Reichert-Meissl value, 95—6·82 ; and iodine value, 14·9—16·8.

The fruit pulp constitutes from 24 to 70 per cent. of the hole fruit, according to the variety of palm, whilst the rnel (without the shell) constitutes from 9 to 25 per cent.

—C. A. M.

ohune Nuts from British Honduras. Bull. of the Imperial Inst., Suppl. to the Board of Trade J., May 21, 1903, 25—26.

IE nuts are the product of the Cohune palm, *Attalea ohune*, which is very abundant in British Honduras. ie kernels are about the size and shape of large nutmegs, d when cut present the appearance and odour of cocoa-it. By extraction with ether they yielded rather more an 40 per cent. of oil, which gradually solidified to a llowish fat. The oil-cake contained 2.5 per cent. of trogen. The oil had the following physical and chemical nstants :—Melting point, 18° — 20° C. ; solidification int, 15° —16° C. ; saponification equivalent, 253·9 — 5·3 ; iodine absorption, 12·9 — 13·6 ; melting point fatty acids, 27°—30° C. Cohune-nut oil thus closely sembles cocoa-nut and palm-nut oil ; it can be readily ponified, and yields a soap entirely free from smell. The elled nuts have been valued at about 15*l*. per ton.—A. S.

afoureira Nuts from Portuguese East Africa. Bull. of the Imperial Inst., Suppl. to the Board of Trade J., May 21, 1903, 26—29. (See this Journal, 1901, 955.)

IE sample examined consisted of small brown nuts (about n. long by ¼ in. diam.), covered with a thin shell, which easily detached by rubbing. The kernels have an acrid te, and contain such a large proportion of oil that they nnot be ground to a powder. The kernels amount to and the shells to 12 per cent. of the total weight. By raction with ether, 61 per cent. of oil was obtained from entire nuts, 68 per cent. from the kernels alone, and per cent. from the shells. The oil is solid at the ordinary nperature, and consists chiefly of palmitin and olein, ether with some free fatty acids, chiefly oleic acid. The lowing figures were obtained by the examination, respecely, of the oil from the entire nuts and that from the rnels only :—Melting point, 37° C., and 40° C. ; soliditiou point, 20°—25° C., and 25°—30° C. ; acid value, 5 and 42·4 ; saponification value 240 and 241 : ine value, 55·8 and 47·8. The oil would probably be considerable value for the manufacture of soap and dles. The oil-cake contains nearly the same percentage nitrogen as linseed cake.—A. S.

Glycerin ; Determination of ——. A. Buisine.
XXIII., page 763.

ENGLISH PATENTS.

tty Substances from Fats, Fatty Acids, and Fat-like Substances of Animal and Vegetable Origin ; Process f Manufacturing ——, *and of Fat-like Substances of Mineral Origin.* O. Liebreich, Berlin. Eng. Pat. 2,957, June 6, 1902.

Ger. Pat. 136,917 of 1900 ; this Journal, 1903, 149.

—C. A. M.

Lubricating Oils ; Apparatus for Testing ——. J. Y. Johnson, London. From Elektrizitats-Act.-Ges. vorm. W. Lahmeyer, Frankfort a/M., Germany. Eng. Pat. 15,897, July 16, 1902.

THIS apparatus, which is specially intended for testing oils for shaft bearings and journals, consists of a shaft supported in a single bearing and provided on each side with a symmetrical disc or fly-wheel, on which concentric rings may be placed to increase the pressure on the bearing. The amount of friction may be determined from the number of revolutions made by the shaft during a specified time after the driving power has been discontinued.

—C. A. M.

Oils in Powder Form ; Process of Manufacturing Solid Iodized and Bromized ——. F. Boehm, London. From H. Winternitz, Halle a/S., Germany. Eng. Pat. 3430, Feb. 13, 1903.

THE oil, notably sesamé oil, after treatment with iodine or bromine (Ger. Pat. 96,495), is mixed with concentrated milk or its principal constituents (casein salts, milk sugar), and evaporated to dryness at a low temperature *in vacuo*.

—C. A. M.

FRENCH PATENTS.

Fats and Oils, particularly Cocoanut Oil ; Purification of ——. C. Fresenius. Fr. Pat. 325,768, Sept. 2, 1902.

SEE Eng. Pat. 19,171 of 1902 ; this Journal, 1903, 102.

—C. A. M.

Olive Oil "Crasse" ; Extraction of Oil from ——. R. Bernard. Fr. Pat. 325,966, Oct. 30, 1902.

THE black product, known as "crasse," obtained in the expression of olive oil, consists of a mixture of water and fruit pulp impregnated with oil. Hitherto this oil has been extracted by means of carbon bisulphide, but, according to this patent, the impurities are precipitated from the emulsion by treating the substance with an acid at a temperature of about 100° C. The oil rising to the surface is neutralised if necessary.—C. A. M.

XIII.—PIGMENTS, PAINTS ; RESINS, VARNISHES ; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

ENGLISH PATENT.

Pigments, and Process of Making Same. W. J. Armbruster, St. Louis, Mo., U.S.A. Eng. Pat. 3769, Feb. 17, 1902.

SEE U S. Pat. 724,234, 1903 ; this Journal, 1903, 562.

—M. J. S.

UNITED STATES PATENTS.

Furnace for Oxidising Metals [*for Producing Pigments*]. J. W. H. James, Philadelphia, Pa. U.S. Pat. 728,109, May 12, 1903.

A ROTATABLE inclined cylinder, having an enlargement forming a pool for molten metal, is connected at its bottom by a descending flue to a second rotatable cylinder below the first, and inclined the contrary way, having a discharging device at its outlet. Means are provided for charging the pool, for agitating the molten metal in it, and for causing a flow of oxidising agent throughout.

—E. S.

Azo Dye [*for Pigments*], *and Process of Making Same.* E. A. Fourneaux, Assignor to H. A. Metz. U.S. Pats. 728,383 and 728,455, May 19, 1903. IV., page 737.

Pigment [*Lead Sulphate*] ; *Apparatus for Manufacturing* ——. J. B. Hannay, Loch Long, Scotland. U.S. Pats. 729,192 and 729,493, May 26, 1903.

SEE Eng. Pat. 2297 of 1901 ; this Journal, 1902, 356.

—T. F. B.

Paint-Oil; Process of Producing ——. E. C. Holton, Cleveland, Assignor to the Sherwin-Williams Co., Cleveland, Ohio. U.S. Pat. 728,918, May 26, 1903.

Blown oils are treated with a solution of sulphur chloride in a hydrocarbon, and the mixture thinned with a petroleum product (benzine). Suitable proportions of the ingredients are specified.—C. A. M.

French Patents.

Zinc Salts [*Oxide, Sulphide, Oxysulphide*] *extracted directly from Zinc Ores; Process for Adaptation of* ——, *for Painting.* Compagnie des Mines d'Arrigas. Fr. Pat. 325,587, Oct. 24, 1902.

Zinc ores (calamine, smithsonite) treated with ammonia, give up practically the whole of their zinc, together with any other metals whose oxides are soluble in ammonia. The foreign metals are removed from the solution by treatment with any suitable reagent. The filtered solution is then either evaporated or it is treated with sodium sulphide, and the resulting zinc compounds are calcined. The sodium carbonate obtained as a secondary product when zinc sulphide is precipitated, is employed for the preparation of sodium sulphide by causing it to act on calcium sulphide, and both this reaction and the recovery of the foreign metals form part of the claim. The ammonia is also recovered by distillation.—M. J. S.

Paint and Varnish; Composition for Removal of ——. C. Ellis. Fr. Pat. 325,659, Sept. 1, 1902.

A wax, or substance of analogous character, is dissolved in an aromatic hydrocarbon, or a derivative of such a hydrocarbon. To this solution there is added an aliphatic alcohol capable of admixture with the aromatic solvent, but in which the wax is insoluble. The result is a gelatinous product, which has the property of softening the varnish or paint to which it is applied.—M. J. S.

(*B.*)—RESINS, VARNISHES.

English Patents.

Siccatives; Process of Manufacturing ——. W. Traine, Wiesbaden, Germany. Eng. Pat. 5261, March 6, 1903.

Various mixtures composing liquid driers are claimed, which consist of mixtures of linseed oil with red lead, litharge, manganese borate, lead resinate, or manganese resinate, the essential feature of the compositions being that they all contain a certain quantity of naphthalene. The presence of this latter is said to increase the solubility of the driers, especially those containing resinates, and to yield an easily drying, elastic, and perfectly clear varnish.
—F. H. L.

Linoleum or the like with Veins passing completely through the Material; Processes for Making ——. W. P. Thompson, Liverpool. From the Bremer Linoleumwerke, Delmenhorst, Germany. Eng. Pat. 15,656, July 14, 1902.

The linoleum material is fed vertically from a hopper between a pair of rollers placed side by side and running on horizontal axes, the foundation stuff being guided by one of the rollers, and passing between them also. By this arrangement it is possible to make linoleum having veins resembling wood grain, solid all through, the usual distortion of the markings which occurs owing to the greater friction (and therefore retardation) of the material against the lower of two superposed rollers being avoided through the vertical feed.—F. H. L.

United States Patent.

Linoleum or like Coated Fabrics; Composition for Use in the Manufacture of ——. J. A. Shepherd, Glasgow. U.S. Pat. 728,507, May 19, 1903.

See Eng. Pat. 267 of 1902; this Journal 1903, 36.
—T. F. B.

(*C.*)—INDIA-RUBBER.

Rubber Cultivation in the Congo Free State. M. Bemelmans. Rev. des Cult. Colon., No. 116; through Bull. of the Imperial Inst., Suppl. to the Board of Trade J., May 21, 1903, 32—34.

The author gives a description of the attempts made to cultivate various foreign species of rubber plants in the Congo Free State. The species planted include *Manihot Glaziovii* (Ceara rubber tree), *Hevea brasiliensis* (Pará rubber tree), *Castilloa elastica* (Central American rubbe tree), *Funtumia elastica* (Lagos rubber tree), *Urceola esculenta* (Borneo), and the plant yielding balata, a gutta-percha substitute. Details are given of the methods of importing and of cultivation found to be most suitable.
—A. S.

Rubber; Method for Recovery of ——, *from Soft Vulcanised Rubber.* C. J. Polôny. Gummi-Zeit., 1903, **17**, [35], 773.

The waste or other vulcanised rubber to be treated i cleaned and cut into pieces about the size of a pea. Resin or amber oil is heated to 80° C., and the rubber then added gradually with constant stirring, 100 kilos. of rubber requiring 300 kilos. of oil. Solution is aided by adding to the oil 5 to 8 per cent. of its weight of water. Th boiling is most simply and quickly done in a vacuu apparatus, otherwise in a distilling apparatus with condensing arrangement. In either case, the temperature do not rise above 160° C. during the whole process. Steam at, at least, 8 atm. pressure is necessary for th temperature.

After one hour's boiling, the rubber and oil have becom a uniform mass which resembles thick Venetian turpentine On being allowed to stand some hours several layers form the lowest containing loading materials, sulphur, and al other constituents excepting the rubber or its congeners which are contained in the upper layer.

To the upper layer, pumice stone, chalk, gypsum, o other suitable substance is added, and the mass treate with alcohol in an automatic extraction apparatus to extrac the resin or amber oil. The alcohol is driven off by heat and the rubber obtained by extracting the residue with rubber solvent, such as petroleum spirit, benzene, turpentine, or ether. The solution may be used as such, o evaporated to obtain solid rubber.—J. K. B.

Gutta-Percha; Chemical Analysis of ——, *as a Guide t its Cultivation and Valuation.* Van Romburgh an Tromp de Haas. J. d'Agric. Tropic., [19], 11; throug Bull. of the Imperial Inst., Suppl. to the Board of Trad J., May 21, 1903, 30—32.

In selecting gutta-percha trees for cultivation, the botanic identification of the different species is extremely difficul and many species almost identical with regard to botanic characters yield gutta-percha of very different qualities.

Commercial Name.	Impurities.	Water.	Resin.	Gutta.	Valu
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Dols. p Pic
Bila red Soondi	33·6	7·0	31·4	28·0	150
Sarawak Soondi, No. 2	37·1	6·8	26·5	29·6	175
Pinang gutta Palelo, No. 1	2·1	5·8	53·8	38·3	100
Sarawak red Soondi, No. 1	19·0	3·9	35·5	41·6	300
Bagar white Soondi, No. 1	0·7	8·6	36·5	54·2	350
Kertei guta Merah, No. 2	21·7	5·1	28·5	44·7	300
Indragiri white Soondi..............	2·0	4·1	46·2	47·7	370
Sambas white Soondi	1·0	4·4	53·6	41·0	380
Kertei guta Merah, No. 1	14·8	3·8	34·8	46·6	500
Pahang white Soondi, No. 1	4·2	0·5	12·8	82·5	500

Note.—1 picul about 135 lb.

As showing the value of a determination of the "gutta" ı cases of doubt as to the identity of particular trees, the esults of some experiments in the Botanic Gardens at uitenzorg are given. Of seven trees reported to belong) the species *Palaquium borneense*, the gutta-percha from x of them contained from 81—86 per cent. of true "gutta," hereas that from the seventh tree only contained 50 per ent.—A. S.

English Patent.

aoutchouc, Gutta-Percha, and Similar Substances: Treatment of Waste ——. A. Theilgaard, Copenhagen. Eng. Pat. 25,044, Nov. 14, 1902.

ROUND waste caoutchouc or the like is treated in closed receiver in presence of steam, and under essure if so desired, with a solution of a normal or acid lt, such as magnesium sulphate, zinc chloride, calcium sulphite, &c. It is stated that by this means the egetable or animal fibres present in the material are so converted" as not to be prejudicial to the further use the substance; or, if the operation is more prolonged, e fibres become so brittle that they can be subsequently ound or rolled into the rubber, thus acting as ordinary ling stuff.—F. H. L.

United States Patent.

erite Compound; Vulcanised ——. W. R. Brixey, Seymour Conn. U.S. Pat. 728,851, May 26, 1903.

OAL-TAR, asphalt, linseed-oil, and sulphur are mixed, her alone or with the addition of talc, and the mixture vulcanised. The compounds produced may be mixed th natural india-rubber.—A. G. L.

French Patents.

dia-Rubber; A New Substance destined to replace ——, *and Method of Preparation.* W. Prampolini. Fr. Pat. 325,773, Sept. 5, 1902.

IE gum obtained from the shrub called "*Synanthcrescas exicanas*," also known as "Yule," "Copalin," "Yerba l Negro," "Guayule," "Jiguhite," and "Hule," is vulanised with from 1—10 per cent. of sulphur, and mixed th loading materials, colouring matters, &c., in the usual anner, the mixing rolls, however, being kept preferably a temperature of from 6° to 8° C.—J. K. B.

Gutta-Percha; Regeneration of ——. P. Germain. Fr. Pat. 325,969, Oct. 31, 1902.

E deteriorated gutta-percha is treated with a convenient vent, such as petroleum spirit, in an extraction apparatus, l then subjected to the reducing action of nascent hydro ı in an alkaline or acid solution. In the latter case, the uction is followed by an alkaline wash to remove acid. —J. K. B.

IV.—TANNING; LEATHER, GLUE, SIZE.

ebracho Extracts treated with Sulphites; Contribution o our Knowledge of ——. R. Lepetit. Chem. Ind., 1903, 6, [10], 221—228.

TER some commercial information as to the source and ply of quebracho wood, and a *résumé* of the work that been published on the chemical constituents of this ning material, the author gives a detailed account of eriments made to determine the action and functions of l or normal sodium sulphite when added to quebracho ract for the purpose of increasing its solubility and imving its colour. Of a definite amount of sulphur dioxide ed in this form a small quantity is separable, but the ount diminishes as the temperature of treatment or time tact is increased, and another small quantity appears to oxidised into a sulphate, but the major portion forms anic compounds with the constituents of the tannin.

he general conclusions of the author are (1) that the hur becomes wholly or very largely organically comd; (2) that the addition of acids to sulphited extracts does not liberate sulphur dioxide; (3) that the tinctorial properties of quebracho extract are definitely modified by the addition of sulphites.—R. L. J.

Tannin; Absorption of ——, *by Filter Paper.* F. A. Blockey. XXIII., page 763.

English Patent.

Tanning Extracts and other Liquids; Material for Decolorising and Clarifying ——. R. L. Jenks, G. A. Clowes, both of London, and E. P. Hatschek, Needham Market, Suffolk. Eng. Pat. 10,628. May 8, 1902.

Yeast is extracted by successive treatment with water, dilute acid, dilute alkali, and finally dilute acid, and then washed with water. The residue of dead cells thus largely deprived of their contents, is added to the liquor to be decolorised.—R. L. J.

United States Patents.

Hides and Skins; Method of Treating ——. A. H. Peter, New York, U.S.A. U.S. Pat. 727,832, May 12, 1903.

The hides or skins are immersed in a solution of common salt, to which relatively small quantities of acid are added at intervals, and are subsequently placed in a tanning bath of approximately the same specific gravity as the salt bath. —R. L. J.

Tanning Extracts [*from Waste Lyes of the Sulphite Cellulose Process*]; *Process of Making* ——. M. Honig, Brunn, Austria-Hungary. U.S. Pat. 727,798, May 12, 1903.

The waste lye obtained in manufacturing cellulose by the sulphite process, is treated with zinc to produce hydrosulphurous acid, whilst sulphuric acid is added at the same time to liberate the combined sulphurous and acetic acids present, and render calcium salts insoluble.—R. L. J.

Gelatin; Process of Making ——. W. Cormack, Eskbank, Scotland, Assignor to J. G. F. Lawson, Poulton, Scotland. U.S. Pat. 728,205, May 19, 1902.

See Eng. Pat. 20,800, Sept. 24, 1902; this Journal, 1903, 563.—R. L. J.

French Patents.

Tannin; Extraction of ——, *in a State of Purity.* A. Thompson. Fr. Pat. 325,248, Oct. 11, 1902.

An aqueous extract of bark, wood, or other tanning material is evaporated to dryness; the residue is powdered, agitated with five times its weight of cold water and a similar volume of cold water containing pyridine (1 part per 1,000 of dry residue), and the liquor is filtered and treated with sulphur dioxide gas (400 litres per 1,000 kilos. of dry extract), or with a saturated solution of the same (10 parts per 1,000 of extract).

The clarified liquor is then evaporated rapidly and the pure tannin extracted with methyl alcohol, which is removed by distillation. It is still further purified by solution in a mixture of water and ether.—R. L. J.

Tannin; Production of ——, *from Vegetable Tanning Materials.* C. Schmalfeldt. Fr. Pat. 325,601, Oct. 25, 1902.

See Eng. Pat. 23,392, Oct. 27, 1902; this Journal, 1903, 152.—R. L. J.

Glue and Gelatin from Leather and Leather Waste; Manufacture of ——. The Chemische Düngerfabrik Vogtmann und Cie. Fr. Pat. 325,365, Oct. 17, 1902.

See Eng. Pat. 22,738, Oct. 18, 1902; this Journal, 1903, 219.—R. L. J.

Gelatin; Manufacture of ——. W. Cormack and J. G. F. Lowson. Fr. Pat. 326,095, Nov. 4, 1902.

See Eng. Pat. 20,800, Sept. 24, 1902; this Journal, 1903, 563; and U.S. Pat. 728,205, above.—R. L. J.

XVI.—SUGAR, STARCH, GUM, Etc.

i-Mannose; Crystallised ——. C. Neuberg and P. Mayer. XXIV., page 765.

Maple Syrup. R. O. Brooks. Report on the Examination of Foods, Drugs, &c. in the Laboratory of Hygiene of the State of New Jersey, U.S.A., May 1, 1903.

The chief adulterant used is liquid glucose. Of 45 samples examined, 40 were genuine, containing from 59·1 to 64·2 per cent. of sucrose, average 62 per cent. In the remaining samples the amount of sucrose ranged from 37 to 59·5 per cent., and that of liquid glucose from 4·6 to 34·0 per cent. A pure maple syrup gives a reading of about 60 on the cane-sugar scale, and a reading of 65 indicates with certainty adulteration with liquid glucose. The reading for the liquid glucose used as adulterant, may be taken as about 175, and thus the approximate amount of glucose present, may be estimated by polarisation before and after inversion.—A. S.

Glucose; Determination of ——. E. Gudeman. XXIII., page 763.

Gluten Foods; Determination of Fat and Acidity in ——. E. Gudeman. XXIII., page 764.

English Patent.

Starch; Preparation of Adhesive or Cement from ——. A. F. J. S. Haake and H. A. R. A. Haake, Hamburg. Eng. Pat. 885, Jan. 13, 1903.

Starch is mixed with substances, such as calcium hypochlorite, adapted to act either directly or indirectly as oxidising agents, and to oxidise the starch particles. Mixtures, such as air-dry starch 100 parts, calcium hypochlorite 6 parts, or starch 100 parts, calcium hypochlorite 7 parts, and sodium bicarbonate 1 part, are specified.—J. F. B.

United States Patent.

Sugar Constituents; Process of Extracting ——. L. Naudet, Paris. U.S. Pat. 728,600, May 19, 1903.

A body of liquid at a suitable temperature is caused to traverse, either at ordinary or increased pressure, a cell of a diffusion battery containing a sugar-bearing body until the latter has been heated to approximately 77° C.; the cell is then arranged as the last cell of a diffusion battery. Each cell is removed from the battery as exhausted, refilled with fresh material, heated to the temperature of the other cells, and re-introduced into the battery.—T. H. P.

French Patents.

Sugar; Process of Extraction and Instantaneous Crystallisation of ——. P. Lagrange. Addition, dated Oct. 28, 1902, to Fr. Pat. 324,777, Sept. 29, 1902. (See this Journal, 1903, 643.)

The claims relate to: (1) The method of cooling a concentrated, supersaturated syrup in two portions, one by the action of vacuum alone, and the other by a stream of cold water, these two operations being carried out in separate vessels. (2) Combined cooling by means of vacuum and cold water, in one and the same apparatus, for the extraction and instantaneous crystallisation of the sugar. (3) An apparatus for this purpose.—T. H. P.

Sugar: Process of Purifying and Preserving Raw ——. M. Weinrich. Fr. Pat. 325,882, Sept. 26, 1902.

See U.S. Pat. 711,603, Oct. 21, 1902; this Journal, 1902, 1545.—T. H. P.

Beetroot Residues; Preparation of Fodder from ——. J. C. F. Lafeuille. Fr. Pat. 326,035, Oct. 21, 1902. XVIII. A., page 756.

Charcoal known as Animal Black; Process for the Production of ——. [*Purification of Sugar Juices, &c.*] A. Klingelhoefer and C. A. Halse. Fr. Pat. 326,125, Nov. 5, 1902.

See Eng. Pat. 7119, March 24, 1902; this Journal, 1903, 504.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast Maltase [*Glucase*]. Th. Bokorny. Allgem. Brauer und Hopfenzeit., 1902, 1869; through Zeits. Spiritusind 1903, **26**, [22], 233.

The author dried 13·3 grms. of pressed yeast by spreadin it out upon paper, and then allowed it to act upon 25 grm of maltose in 10 per cent. solution. After 17 hour fermentation the dried yeast had produced only 2·5 grm of alcohol, whereas fresh yeast under similar condition produced 10 grms. of alcohol in the same time. Fro this it is concluded that the maltase of yeast is considerabl weakened by the process of careful drying, wherea previous experiments have shown that the invertase c yeast is practically unaffected.

Action of Alcohol.—Pressed yeast, after remaining f two days under 5 per cent. alcohol, had lost little of it power of fermenting maltose; 10 per cent. alcohol ha rather more effect, whilst 20 per cent. alcohol brought abo a considerable decrease in the activity of the yeast malta In another series of experiments, 10 grms. of pressed yea were allowed to remain in contact for four weeks wi 50 c.c. of 20, 10, and 5 per cent. alcohol respectively. Th alcohol was then poured off and replaced by a 5 p cent. solution of maltose. The yeast which had bee treated with 5 per cent. alcohol did bring about a slig fermentation, but that which had been in contact with t 10 per cent. and 20 per cent. alcohol had no fermentati effect on maltose. On the other hand, when cane sug was added, fermentation set in, though rather more slow than with fresh yeast. It is concluded that the maltase yeast is very sensitive to alcohol, whereas the invertase very resistant.—J. F. B.

Yeast Cell; Influence of Oxygen on the Activity of th Living ——. H. Buchner and R. Rapp. Ann. de Brasserie, 1903, **6**, [6], 121—126; [7], 145—151; 169—179. See also this Journal, 1901, 734.

The results obtained, show that passing a current of a through a solution of sugar in course of fermentation by thin sowing of yeast, does not impair the activity of t latter, provided the mechanical agitation does not exce certain limits. The contrary results obtained by Chudiak were due to errors of experiment. The only differen observed between the influence of air and hydrogen is th with the former, the reproduction of the yeast proce more rapidly and the liberation of carbon dioxide is mo active; but the fermentation, and probably also t production of zymase, remain unaffected, whether in atmosphere of oxygen, hydrogen, or nitrogen. Exces mechanical agitation retards the activity of the cells, t effect being greater as the conditions of nutrition are le favourable.

Abundant aeration has no influence on fermentation, b the yeast firmly retains its adaptive function and acts a ferment even under aerobic conditions of life; and it only in surface cultures that the respiratory functions the cell can be augmented, the latter still retain however, the greater part of its fermentative activi Pasteur's biological conceptions require modification, lack of oxygen being in no wise an essential condition f the inception of fermentation; and his views on the nat of the chemical action resulting in the decomposition of t molecule of sugar should be abandoned, the action zymase alone furnishing a satisfactory explanation.

—C. S

Yeast; Heating Tendency of ——. M. Delbrück. Woch. f. Brau., 1903, **20**, [22], 257.

Under the designation "hot" it is customary to def those bodies which possess more than the avera proportion of enzymes for their species, ready at opportunity to enter into excessive or untimely acti As instances of such "hot" bodies, barleys, which h an excessive tendency to become hot during malting, potatoes and hops, which readily become hot and deco pose during storage, may be mentioned. In all cases t "hot" tendency is connected with a high proportion lbumin, *i.e.*, the protoplasm from which enzymes are roduced.

The same definition is applicable to yeasts. Yeasts with igh fermentative power are "hot"; the more sugar ermented in a given unit of time the more heat is evolved. 'east may be brought into this condition by cultivation in ighly nitrogenous media, whereby the percentage of lbumin in the yeast is increased. Lange has shown that east which is rich in nitrogen is also rich in zymase. But chness in enzymes in yeast may take one of two courses: n the one hand, the yeast-diastases and zymase may be eveloped in a higher degree, or, on the other hand, the estructive enzyme peptase may predominate. Whether ne "heating tendency" is manifested in the one or the ther of these ways depends on the conditions brought to ear upon the protoplasm. A "hot" yeast, rich in proto-lasm, may either be one with a high fermentative power one with a great tendency to auto-digestion, according to hether the conditions of nutrition favour external activity r create internal demands.

The term "hot yeast" signifies further that such yeast characterised by too great activity, a tendency to develop o strong inner charges. It would be interesting to deter-ine if the development of heat were accompanied by sorption of oxygen, either as in Effront's experiments, or ring the normal respiration in fermenting liquids.

—J. F. B.

rewery Yeasts; The Transmitted Tendencies of ——. E. R. Moritz. J. Fed. Inst. Brewing, 1903, **9**, [3], 222—245.

HEN a change of yeast is made, the new yeast retains for me time specific properties, imparted to it by its old vironment, which cause more or less deviation from the ual character of the beer, in spite of the continuity of e brewing conditions. This tendency of the yeast to nsmit its acquired properties to its immediate descendants ables the brewer to bridge over any temporary or acci-ntal variations in the quality of his materials, but at the me time must be taken into consideration when a change yeast is made. One of the most important factors of trition, which determine the direction of these transmissible dencies, is the average gravity of the worts which the yeast s been accustomed to ferment. The gravity represents the ative quantity of the food, the work required to be done, concentration of the products of fermentation and the cosity of the medium. A high-gravity wort requires a atively far greater proportion of yeast to bring about same percentage attenuation than a low-gravity wort. e lower the average initial gravity of the various worts ough which the yeast has been passed, the higher, erally, will be the attenuative power of the yeast, and it y become necessary to check this tendency by reducing temperature of fermentation. Conversely, it is often essary to increase the temperatures to assist the attenua-n with yeasts which have been grown for a long time worts of high gravity. Exchanges of yeasts between weries of these two types frequently prove to be very eficial. The next factor in importance is the average ree of curing of the malts employed; the higher the ing heat, the smaller will be the attenuative tendency of yeast, whilst yeast grown for the most part in worts m pale malts will, unless the factor of gravity be over-elming, generally possess a higher attenuative power. hird series of factors, of a lower degree of importance ng to the narrow limits of their variation, are the con-ons of fermentation, notably temperature and aeration. high temperature throughout the whole process of entation favours the attenuation. A high proportion hops tends to lessen the attenuative power. With ard to other tendencies than the attenuative power, ch are more or less transmissible by the yeast, it is arked that yeast accustomed to the presence of high portions of sugar is likely to convey a certain degree of etness to other beer; the flavour of coarse inferior hops also be conveyed in this manner. In general terms it be stated that any condition which is known to have stinct temporary effect upon the course of fermentation, if continued sufficiently long, impress its influence n the properties of the yeast. The effects of the characters of the yeast, when transported to another brewery, will be more profound, the greater the difference between the conditions prevailing in the two breweries, but they will be more lasting, the greater the resemblance between the two sets of conditions. Other causes which render a change of yeast desirable are weakness or degeneration of the old stock, owing either to bad nutrition, infection, or deficient ventilation of the fermenting rooms, also an upsetting of the balance of varieties the symbiosis of which makes up the peculiar type of the yeast. Considering that the adverse circumstances affecting the stocks of two different breweries are not likely to be absolutely identical, judicious importations of yeast from other breweries are more likely to act beneficially than the reverse.—J. F. B.

Alcoholic Fermentation. J. H. Aberson. Rev. trav. chim. Pays-Bas, **22**, 78—132. Chem. Centr., 1903, **1**, [21], 1188.

The experiments made by the author related to the velocity of fermentation of glucose, and to the question whether equilibrium between the sugar and its reaction products can be attained. The reacting mixture was maintained with vigorous agitation at a constant temperature (up to 32° C.), and at definite intervals of time the amount of glucose present was determined, whilst on the completion of the reaction the increase in the amount of yeast was ascertained. The velocity constants, calculated according to the equation for monomolecular reactions, shewed a considerable increase during an experiment, owing to the retarding influence of the glucose (and of the alcohol formed) and to the increase of the amount of yeast. If these factors be taken into consideration, a modified equation is obtained, in which the velocity coefficients make a nearer approach to constancy. The temperature coefficient of the reaction-velocity, determined by numerous experiments between 12° and 33° C., was found to be 2·34—3·18 referred to an interval of 10° C.

Pressure exerted (up to 35 atmospheres) by an atmosphere of nitrogen is without influence on the fermentation. If, on the other hand, the carbon dioxide produced be prevented from escaping by carrying on the fermentation in strong closed metal vessels, or if solid carbon dioxide be previously introduced, then the fermentation ceases before the glucose is wholly consumed. The fermentation is more complete when lower than when higher temperatures are employed. In the same way a previous addition of alcohol causes a diminution in the extent of the fermentation. The condition of equilibrium attained is independent of the quantity of the yeast, although the velocity increases with this; with a higher concentration of glucose, on the other hand, the percentage decomposed is smaller.—A. S.

Beer; Old Pasteurised ——. R. Braun and G. Graf. Zeits. ges. Brauwesen, 1903, **26**, [16], 249—254.

A number of samples of pasteurised beers, bottled between 1868 and 1879, were examined by the authors. With the exception of the oldest, none of them liberated any appreciable amount of gas when opened. In all cases the flavour of beer was absent, being replaced by a fruity acid taste, recalling that of Madeira wine, and indicating considerable internal changes which, in the practical absence of bacteria, could only be due to chemical modifications during storage. Except in two instances, the sediment was of normal character, consisting mainly of gluten substances which gave no tannin reaction and were soluble in 10 per cent. caustic potash solution and in concentrated acetic acid. In the exceptions mentioned, the gluten substances were insoluble even in 20 per cent. potash solution and in acetic acid, and they also gave the tannin reaction with gold chloride, indicating the presence in the original beer of soluble compounds of tannin and albumin, gradually rendered insoluble during storage. Only in one case were a few individual cells of live wild yeast detected, and in none of the samples could the presence of bacteria be determined with certainty.

The chemical examination revealed the presence of 0·0149—0·0276 per cent. of volatile esters, and 0·192—0·2472 per cent. of non-volatile esters, or a total of 0·2095—0·2794 per cent. Since the average figures yielded by new Munich beers are 0·0122, 0·1493, and 0·1703 per cent., it is concluded that the alteration in flavour is connected with the formation of these esters, more particularly since the samples with the most pronounced vinous flavour exhibited the largest percentages of volatile esters. On the other hand, the percentage of volatile acids remained within the permissible limit of 0·01—0·02 per cent.—C. S.

Pressed Yeast; Detection of Bottom-fermentation Beer Yeast in ——. P. Lindner. XXIII., page 762.

Diastatic Activity; Method for Determination of ——. A. Pollak. XXIII., page 763.

English Patent.

Distillery Refuse or By-Products; Evaporating and Drying Liquid ——. F. L. Grant, Rothes, and J. Duff, Longmorn. Eng. Pat. 11,645, May 22, 1902.

In the main chimney-flue of the distillery a series of fire-brick evaporating beds is erected in vertical tiers. The liquid is fed into the top bed, and is caused to flow in a direction opposite to that of the flame. When it reaches the end of the top bed, it overflows into the second tier, and so on, towards the bottom of the series, in a zigzag course. The hot flue gases travel by the same path, but in an upward direction, to the chimney, and are directed by baffles, so as to play upon the surface of the liquid. The residue is raked out at any convenient stage, either in the form of a concentrated product or in the state of ash.—J. F. B.

United States Patent.

Carbonic Acid Gas produced by Fermentation in Breweries; Collection and Utilisation of ——. O. Zwietusch, Milwaukee. U.S. Pat. 728,070, May 12, 1903.

The gas produced by fermentation in a closed vessel is led out by means of a pipe controlled by a valve, from which it passes, through a column of water contained in a transparent observation vessel, to one of two gasometers. The mixed air and carbon dioxide which come off in the earlier stages of fermentation are collected in one of the receptacles, whilst in the other is stored the pure carbon dioxide which is evolved in the later stages. After purification, the mixed gases are employed for moving the beer and for establishing a counter-pressure in the racking apparatus, whilst the purer gas from the second vessel is employed for carbonating the beer.—J. F. B.

French Patents.

Grain; Process and Apparatus for Germinating ——. V. Lapp. Fr. Pat. 326,114, Nov. 5, 1902.

Grain is caused to germinate in a closed vessel under pressure, and is subjected throughout the process to a current of air supercharged with oxygen or impoverished in nitrogen which has first been moistened by conducting it through a layer of water. The apparatus consists of a closed cylindrical vessel with a conical lower portion, the latter being partially filled with water. The steeped grain is charged into the cylindrical portion and rests upon a perforated bottom, which is fitted with discharge openings, through which the malt can be removed after the water has been drawn off from below. Heating and cooling pipes are placed in the conical portion, and at the lowest point is situated the inlet for the oxygenated air, which bubbles through the water before it reaches the grain. A water-spray for sprinkling, when required, is provided above the grain.—J. F. B.

Alcohol; Column for the Rectification of ——. J. Bernheimer. Fr. Pat. 326,117, Nov. 5, 1902.

The vapours from the still are conducted to the top of a column, which is divided into several compartments by horizontal plates surmounted by perforated cones, at the apices of which are basins, in which the tubes dip which conduct the vapours from one chamber to the next. These basins become filled with condensed phlegms, and the vapour being led beneath the surface of the liquid displaces some of the latter, whilst being itself dephlegmated. The displaced liquor and vapour pass through the perforate cones, and the former falls upon the horizontal plate whence it is conducted by means of siphons back to th still whilst the vapour escapes by the central tubes to th next compartment below.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Gluten Foods; Determination of Fat and Acidity in —— E. Gudeman. XXIII., page 764.

Fodder-plants; Hydrogen Cyanide in ——. J. C. Brünnich Proc. Chem. Soc., 19, [267], 148.

After the important discovery, by Messrs. Dunstan an Henry, of a glucoside, "dhurrin" (this Journal, 1902, 996 in the young plants of sorghum, which on decomposition i presence of water, yields hydrogen cyanide, the author, o behalf of the Queensland Department of Agricultur carried out a series of experiments in order to ascertain a what stages and conditions of growth the fodder-plan belonging to the sorghum family are most dangerous. T varieties of sorghum, and also a variety of maize, we grown on unmanured and heavily manured plots an analysed at various stages. The results show that sorghum should never be used as fodder in very young and immatur stages of growth.

English Patent.

Preserving Organic Substances [Foods]; Process an Apparatus for ——. L. F. Heather, Wimbledon, Surre Eng. Pat. 10,503, May 7, 1902.

The substances are placed in air-tight receptacles, int which is then pumped dry carbon dioxide, a mixture carbon dioxide and alcohol vapour, or carbon dioxide an ammonia, under pressure. The mixture of gases employe corresponds to those gases produced by the substanc under treatment when exposed to moist atmospheric a under ordinary conditions.—W. P. S.

United States Patent.

Albumose; Process of Making ——. D. Finkler, Bon Germany. U.S. Pat. 728,385, May 19, 1903.

Substances containing albumin are treated with a l dilute acid to dissolve collogenic tissue, fat and oth impurities, which are removed, and the remaining albumin then washed till free from acid. Alternatively, dilate alka may be used, and the solution is then acidulated.—R. L. J

French Patents.

Caseïn freed from Grease: Manufacture of - O. Mierisch and O. Eberhard. Addition, dated Oct. 1 1902, to Fr. Pat. 321,490, May 17, 1902.

Milk, from which the cream has been removed as co pletely as possible, is precipitated with acids, which for soluble calcium salts; the solid matter is then washe dissolved in alkali, and reprecipitated one or more tim The casein is finally redissolved, the liquor treated w fat solvents, or filtered through kieselguhr and ultimate precipitated by acid.—R. L. J.

Fruit Juices; Preservation of ——. D. Sandmann an Eichelbaum. Fr. Pat. 325,811, Sept. 29, 1902.

To 100 litres of freshly-pressed fruit juice, about 50 c. c a 40 per cent. solution of hydrofluoric acid are add Before use, the acid may be precipitated by the addition chalk or neutralized by adding an alkali carbonate. T clear juice is then decanted from the precipitate.—W. P.

Fodder from Beetroot Residues; Preparation of —— J. C. F. Lafeuille. Fr. Pat. 326,035, Oct. 31, 1902.

The dried residues are pressed into blocks to form feeding-stuff. The sugar of the beetroot may or may n be removed, and other substances, such as cereals, may be added. If required, the sugar may be subjected to partial fermentation, and the alcoholic residue then mixed with other food materials.—W. P. S.

(*B.*)—SANITATION.

Water; Purification of ——, by the Simultaneous Action of Iron Peroxide and Hypochlorous Acid ("Ferrochlor"). M. Duyk. Ann. Chim. anal. appl., **8**, 13—17, 1—56, 88—92, and 132—136. Chem. Centr., 1903, **1**, [20], 1160.

If a clear solution of chloride of lime be treated with a solution of ferric chloride, a reddish-brown precipitate is formed, which re-dissolves on adding excess of the ferric chloride solution. The following reactions probably occur:—

$$Cl_6 + 6CaOCl_2 + 3H_2O = Fe_2O_3 + 6CaCl_2 + 6HClO.$$
$$3HClO + Fe_2O_3 = 3HCl + 2FeO_3.$$

If the deep brown solution be diluted with water and crystals of sodium sulphate added, ferric hydroxide is separated. The solution—containing hypochlorous acid, ferric oxide, and iron peroxide—the author names "ferrochlor"; it is a powerful oxidising agent, and is stated to be very suitable for the purification of waste waters of all kinds. The chloride of lime may be replaced by sodium hypochlorite. The method has been in use for six months, with good results, for the purification of canal waters at Passchendaele-Nieuport.—A. S.

Methyl Violet decolorised by Sulphurous Acid; Reaction of ——. [Test for Contaminated Waters.] H. Causse. XXIII., page 761.

English Patent.

Water-softening and Liquid-purifying Apparatus. W. Paterson, London. Eng. Pat. 10,719, May 9, 1902.

The water on entering the measuring tank actuates a float which raises and lowers a pipe for regulating the supply of the softening reagent. The inlet to the settling tank is arranged to cause the water and reagent to thoroughly mix, and the tank contains a series of baffle plates to bring the water to rest after the mixing. A filter, through which the treated water is passed, if necessary, and means for cleansing the filter by compressed air, are provided. A weighted piston controls the flow of water from the filter to prevent a too rapid current through the same. The treated water may be passed through a special heating apparatus before being filtered. (See also Eng. Pat. 7170, 1901; this Journal, 1902, 493.)—W. P. S.

French Patents.

Sewage; Process for Clarifying and Disinfecting ——. E. Burmeister. Fr. Pat. 325,944, Oct. 30, 1902.

Milk of lime is added in excess to a portion of the sewage. This mixture is added to a further quantity of the sewage, until the clear effluent ceases to have an alkaline reaction.—W. P. S.

Water; Purification of ——. E. Pellas and J. Legrand. Fr. Pat. 326,086, Nov. 4, 1902.

An alkali or alkaline-earth permanganate is added to the water, which is then subjected to the action of an electric current. The current aids the action of the permanganate on the organic matter in the water, and also decomposes any excess of the permanganate.—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Fibres and other Material [Straw Board, &c.]; Apparatus for Drying ——. F. V. L. Hiorth, Christiania. Eng. Pat. 11,305, May 16, 1902.

The apparatus is of the character described in Eng. Pat. 14,0 of 1901 (this Journal, 1901, 1095). The material is conveyed on wagons running on rails through a long flue or chamber wherein air is circulated. This chamber communicates about midway of its length with a shorter adjoining flue provided with a fan and an air-heating apparatus. By means of suitable dampers, small quantities of heated air are admitted from the short chamber to the long chamber, while equal quantities of moist air are emitted through a chimney in the latter chamber, the greater part of the air being circulated through the system. The apparatus may be arranged in duplicate.—R. A.

Cellulose, Paper-pulp, &c.; Preparing and Spinning Threads from ——. A. Leinveber, Hilbersdorf, Saxony. Eng. Pat. 10,530, May 7, 1902.

See Fr. Pat. 320,529 of 1902; this Journal, 1903, 25. —J. F. B.

Vegetable Fibres or Goods woven from Vegetable Fibres; Treating ——, in the Production of Pulp for Paper-making and other Purposes. C. T. Lee, Boston, U.S.A. Eng. Pat. 23,964, Nov. 3, 1902.

See U.S. Pat. 713,116; this Journal, 1903, 42.—J. F. B.

United States Patent.

Tanning Extracts [from Waste Lyes of the Sulphite Cellulose Process]; Process of Making ——. M. Honig. U.S. Pat. 727,798, May 12, 1903. XIV., page 753.

French Patents.

Short-fibred Asbestos and Similar Materials: Process for Making Moist Rolls of ——, suitable for Spinning. R. Kron, jun. Fr. Pat. 325,705, Oct. 25, 1902.

Short-fibred asbestos or similar material is converted into a pulp and run as a broad endless web on the paper machine. After draining and pressing, the web is reeled in the usual manner, being slit longitudinally during reeling into strips of a suitable width, which form an apparently coherent roll. If preferred, the web may be slit after reeling by cutting the whole roll transversely into a number of discs. Still another method of slitting consists in directing the web of pulp in the moist state under a series of jets of air, steam, or liquid, which have the effect of dividing it into a series of strips which can be reeled as a coherent web. The strips, in whichever way prepared, are subsequently unreeled in a separated condition from the moist rolls and subjected to the action of suitable twisting machinery to form threads.—J. F. B.

Resin Size; Manufacture of ——. M. Erfurt. Fr. Pat. 325,901, Oct. 24, 1902.

Mechanical details are given of an apparatus for making a resin size containing a large percentage of free resin in a perfect state of emulsion.—R. L. J.

Celluloid-like Substance: Preparation of ——. E. Zühl. Fr. Pat. 325,585, Oct. 24, 1902.

See Eng. Pat. 23,445 of 1902; this Journal, 1903, 315. —T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Glycin (Glycocoll); Separation of ——, and its Homologues from Inorganic Substances. Farbwerke vorm. Meister, Lucius und Brüning, Hochst a M. Ger. Pat. 141,976, Aug. 24, 1902. Zeits. angew. Chem., 1903, **16**, [22], 527.

The glycocoll or its derivative is extracted from the mixture by solution in glycerin.—J. T. D.

p-Chloro-o-nitro-anisol. F. Reverdin. Ber., 1903, **36**, [8], 1689—1690.

The Badische Anilin und Soda Fabrik have described (Ger. Pat. 140,133) a *p*-chloro-*o*-nitro-anisol, obtained by the action of methyl alcohol and caustic alkali upon nitro-*p*-dichlorobenzene, which, it is stated, differs in melting point (96 C.) from the body of similar constitution previously prepared by the author by the nitration of *p* chloroanisol, the melting point of which was given as 98·5 C. The author has compared the two bodies in question and finds that they are absolutely identical; the corrected melting point is 97·5° C.—J. F. B.

Pyrazole Series; Investigations in the ——. *Contribution to the Knowledge of Antipyrine.* L. Knorr. Annalen, 1903, **328**, [1], 62—87.

The subject is treated under the following headings:—(1) Behaviour of nitrosoantipyrine to hydrazines; (*a*) Action of hydrazine hydrate on nitrosoantipyrine; (*b*) Action of phenylhydrazine on nitrosoantipyrine; (*c*) Action of *p*-bromophenylhydrazine on nitrosoantipyrine; (*d*) Behaviour of the compounds, $C_{17}H_{19}N_5O_2$ and $C_{17}H_{18}BrN_5O_2$ (obtained by the action of phenylhydrazine and *p*-bromophenylhydrazine, respectively, on nitrosoantipyrine) on boiling with sodium hydroxide solution; (*e*) Comparison of the compound $C_{17}H_{19}N_5O_2$ with the phenylhydrazone of isonitrosoacetacetanilide. (2) Constitution of antipyrine. Michaelis has recently (this Journal, 1902, 363) proposed a formula of the phenolbetaïne, or as he prefers to call it, the 2·5 pyrazole type for antipyrine. The author points out that he fully discussed, as far back as 1896, the applicability of the phenolbetaïne formula, and he now brings forward fresh evidence, mainly based on the analogous behaviour of *n*-methyl-*y*-quinaldone and antipyrine, of the correctness of the old formula for antipyrine, according to which the latter is 1·0 phenyl, 2·3 dimethyl, 5·0 pyrazolone.—A. S.

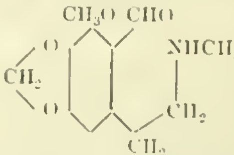
Apocodeine and Piperidocodide. E. Vongerichten and F. Müller. Ber., 1903, **36**, [8], 1590—1594.

Apomorphine, which is obtained by the action of acid reagents on morphine, has been shown to contain two phenolic hydroxyl groups, whilst morphine contains only one; its formation is accompanied not only by the elimination of the elements of water, but also by an opening of the ring which contains the indifferent oxygen atom of morphine. Apocodeïne has hitherto been regarded as the complete analogue of apomorphine, and should, therefore, contain a free hydroxyl group. The authors find, however, that this is not the case. Apocodeïne was prepared by the action of sodium methylate on chlorocodide; the product was found to be an amorphous base, differing from codeïne by the elements of water, but containing no free hydroxyl group and in no way analogous to apomorphine.

Chlorocodide readily combines with piperidine, yielding *piperidocodide*, which crystallises with one molecule of methyl alcohol of crystallisation; after drying at 100° C. the base melts at 118 C. Piperidocodide combines readily with either one or two molecules of methyl iodide according to conditions. Both these methyl iodide compounds beh towards caustic soda solution in a similar manner to code methyl iodide, the nitrogen ring being broken and tertiary base free from iodine, *piperidomorphimeth* produced. Piperidomorphimethine also combines with o and two molecules of methyl iodide; the compounds obtained are decomposed by alcoholic potash, yielding phenolic compound, which, however, is not identical w morphenol.—J. F. B.

Cotarnine. M. Freund and F. Becker. Ber., 1903, 3 [8], 1521—1537.

The results obtained by the authors confirm the view Roser that the constitutional formula for cotarnine is—



Consequently that of narcotine is of similar type. Co nine condenses with aniline to form an anil, the C group being converted into $CH:N.C_6H_5$. When met iodide is caused to react with cotarnine anil in benz solution, there is produced the anil of a substitu ammonium iodide, *cotarnmethine methyl iodide*, in wh the $NH.CH_3$ group of the base is converted into $N(CH_3$ If, however, cotarnine anil be added to methyl iod without a diluent, a violent reaction ensues, and when product is warmed with dilute acids to decompose anil, a new compound, *norcotarnmethine methyl iodide* obtained, differing from the previous product by C whilst methylaniline is found in the residual liquors. new compound is split up by alkalis into trimethylami and a non-nitrogenous body, *norcotarnone*, $C_{10}H_8$ Norcotarnone is a hydroxy-aldehyde, the methoxyl gro of the cotarnine, during the treatment with methyl iodi having coupled up to form an intermediate product with nitrogen of the anil, being subsequently hydrolysed w the production of a phenolic group and methylani Norcotarnone showed other properties corresponding wi those of a substituted ortho-hydroxy-benzaldehyde. Fr the anil of bromocotarnine an exactly analogous body w obtained.—J. F. B.

Alkaloids; Solubility of some ——, *in Various Solve* H. Beckurts and W. Müller. Apoth.-Zeit., **18**, 20 209, 218—219, 223—225, 232—234, 248—250, 25 and 266—267. Chem. Centr., 1903, **1**, [20], 1141.

The results of the authors' experiments, which were carri out at a temperature of 18°—20° C., are shown in following table, the figures referring to parts by weight solvent required to dissolve 1 part of alkaloid:—

——	Ether, Sp. Gr. 0·720.	Ether saturated with Water.	Water saturated with Ether.	Benzene, Sp. Gr. 0·885.	Chloroform, Sp. Gr. 1·487.	Acetic Ether, Sp. Gr. 0·900.	Light Petroleum Spirit, b. pt. 59°—64° C., Sp. Gr. 0·663.	Carbon Tetrachloride, Sp. Gr. 1·599.	Water.	M. P. C.
Aconitine, amorphous....	69·4	58·9	570·4	Less than 1	Less than 1	Less than 1	4,237·9	50·2	1,845·7	85–8
Atropine, crystalline.....	45·3	26·95	67·5	25·05	1·47	25·8	1,211·7	151·2	56·1	114–
Brucine, ,, ...	133·5	1,466·1	467·4	90·1	Less than 1	23·5	1,140·5	1,28[illegible]·4	1,775·8	176–1
Conquinine, ,, ...	128·8	61·4	3,217·7	40·8	,,	56·8	4,155·3	177·0	4,943·0	167
Quinine hydrate, 6·37 per cent. of H_2O.	61·7	17·8	1,197·8	486·9	,,	21·5	9,750·7	191·6	1,4[illegible]·2	172
Quinine, anhydrous......	114·2	35·8	1,176·9	58·8	,,	40·5	4,729·3	189·0	1,975·7	173
Cinchonidine, crystalline	474·5	191·8	3,266·3	1,010·2	10·75	333·0	2,103·1	1,067·0	3,918·8	201
Cinchonine, ,,	1,000·8	811·4	3,985·1	1,833·8	143·3	1,390·0	2,985·9	2,770·1	5,182·6	2
Cocaine, ,,	8·62	2·94	391·4	1·0	Less than 1	1·69	42·2	Less than 1	563·3	98
Colchicine, amorphous...	736·2	554·2	8·3	106·5	,,	74·5	1,737·1	825·6	10·4	126
Hydrastine, crystalline ..	197·3	125·9	2,608·8	11·25	,,	24·7	1,566·1	810·9	20,000·0	1[illegible]–1
Hyoscyamine, ,, ..	49·5	25·75	32·0	130·0	,,	20·4	1,018·8	1,722·7	2,1[illegible]·5	1[illegible]
Morphine, ,, ..	7,082·1	10,622·0	2,229·0	1,590·1	1,525·7	737·2	1,170·7	6,396·4	5,332·8	243–4
Strychnine ,, ..	2,317·1	1,951·7	6,023·8	129·9	Less than 1	507·0	10,715·5	632·0	4,804·2	2

—A. S.

Digitalis; Active Principle of ——. H. Ziegenbein. Apoth.-Zeit., 1903, **18**, 280.

additional proof that the physiological activity of talis leaves and of preparations made from them, cannot udged from their content of digitoxin, the author gives results of the examination of two samples of liquid act and one of tincture of digitalis. Although all three ples contained approximately the same proportion of toxin, the actual figures being 0·23, 0·23, and 0·25 per t. respectively, yet the tincture was just twice as active he fluid extracts.—A. S.

Clove Oil: Determination of Eugenol in ——. E. C. Spurge. XXIII., page 764.

Civet. E. J. Parry. XXIII., page 764.

English Patent.

s in Powder Form: Process of Manufacturing Solid odised and Bromised ——. F. Boehm. From H. Vinternitz. Eng. Pat. 3430, Feb. 13, 1903. XII., age 751.

United States Patent.

l [for Ether, &c.]. E. Huber, Assignor to M. C. Vick and S. V. Huber. U.S. Pat. 729,179, May 26, 1903. , page 734.

XI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photography; Review of ——. A. Granger. Monit. Scient., 1903, **17**, [738], 385—392.

Developers.—"Edinol," the hydrochloride of *m*-amino-*o*-roxybenzyl alcohol (see Eng. Pat. 12,421A of 1901; Journal, 1902, 872), is said to produce no stain on the es or on the hands.

ntensifiers and Reducers.—Negatives with too little rast are first hardened in a slightly acid solution of ome alum, and then intensified in a solution containing, every 3·2 litres of water, 10 grms. of gallic acid and ms. of silver nitrate.

latinum prints are intensified by means of a solution aining quinol (hydroquinone), 2 parts, silver nitrate, art, citric acid, 30 parts, water 600 parts. Prints tinum) having too harsh contrasts may be improved treatment, before development, in a 1·6 per cent. tion of sodium carbonate for from 5 to 20 seconds, rding to the degree of reduction desired.

ositive Processes.—Negatives taken direct on gelatino-nide paper may be converted into positives by exposing ıll daylight after development (without fixing). The ıced silver is then oxidised by immersion for 30 seconds 2 per cent. solution of chromic acid, washed, developed he usual way, and fixed. The high lights can be red, if necessary, by means of a dilute solution of ssium ferricyanide. Diaminophenol, or other developer h does not require alkali, is recommended, since silver mate is insoluble in fixed alkali, but soluble in sodium hite.

oning with Uranium Ferricyanide.—A solution of ium ferricyanide, to which an alkali salt of an organic is added to render the solution stable, has been introd. Thurneyssen (Bull Soc. Franc. Phot., 1902, 457), ers to use nitric acid solution, with subsequent immer- in a dilute solution of sodium carbonate.

olour Photography.—Neuhaus (Bull. Soc. Franc. Phot., , 308) has worked with the process suggested by ner, which depends on the selective action of coloured on the black pigment, produced by mixing red, ow, and blue colours:—*i.e.* in white light, the mixture ecolorised; in yellow light, the red and blue are royed, leaving only the yellow; and so on. Neuhaus Erythrosin, Uranin, and Methylene Blue as the colours film of collodion or gelatin, together with a small quantity of Chlorophyll. Hydrogen peroxide increases the sensibility of the film. The resulting prints are fixed with a solution of copper sulphate.

Vidal (Bull. Soc. Franc. Phot., 1903, 138) has examined the carbon process for obtaining three-colour prints.

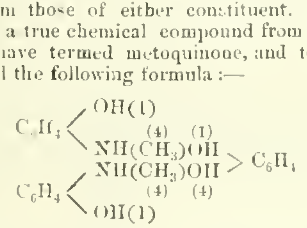
The pigment, incorporated with a solution containing gelatin, 30 grms.; sugar, 6 grms.; glycerin, 6 grms.; water, 200 c.c., is applied to a support which has been coated with collodion. The film is dried over calcium chloride, sensitised with a three per cent. ammonium bichromate solution, and detached from the support; it is now exposed, fixed on a rigid support (*e.g.*, a varnished glass plate), developed in water at 30°—40° C., and removed. The three monochrome prints (yellow, red, and blue) obtained in this way are superposed in register, a 5 per cent. solution of gelatin being used to fasten them together, and the collodion is dissolved out by means of a mixture of ether and alcohol.—T. F. B.

Silver Iodide; Photo-Chemistry of ——. Lüppo-Cramer. Zeits. wissenschaftl. Phot., 1903, **1**, 11. Chem.-Zeit., 1903, **27**, [41], Rep. 136.

A comparison of the different silver halides shows that silver bromide is much more sensitive to the action of light than silver chloride, but that the latter is much more readily reduced. For the Daguerrotype and wet collodion processes, silver iodide is the most sensitive to light of the three halides, but in these cases no reduction of the silver salt takes place and the development is a mechanical one. In order to determine whether silver iodide is not also the most sensitive to light in the case of chemical development, the author has made experiments with plates coated with a gelatin emulsion of silver iodide. From the results it appears that these are of no practical use, for even when the most rapid developer is employed, a very long exposure is necessary, and even after the longest development only a very faint image is obtained. It was proved that the greater sensitiveness in the wet collodion process of silver iodide is not due to the presence of excess of silver nitrate. The spectroscopic sensitiveness of the author's silver iodide gelatin emulsion reached its maximum at G and fell off sharply on either side.—C. A. M.

Metoquinone; Preparation and Developing Properties of ——. A. and L. Lumière and Seyewetz. Rev. gen. Chim. pure et appl., 1903, **6**, 156. Chem.-Zeit., 1903, **27**, [41], Rep. 136.

Methyl-*p*-aminophenol sulphate ("Metol") can be used with quinol (hydroquinone) to form a developer with properties differing from those of either constituent. The authors have isolated a true chemical compound from the mixture, which they have termed metoquinone, and to which they have assigned the following formula:—



$$\begin{array}{l} C_6H_4\left<\begin{array}{l} OH(1) \\ \overset{(4)\qquad(1)}{NH(CH_3)OH} \end{array}\right. \\ C_6H_4\left<\begin{array}{l} \underset{(4)\qquad(4)}{NH(CH_3)OH} \\ OH(1) \end{array}\right. \end{array} > C_6H_4$$

Metoquinone acts without alkali, and does not alter the gelatin of plates or bromide papers, and has also the following advantages:—

(1) The solutions do not change to any notable extent even when exposed to the air.

(2) It can be used to develop a large number of negatives without becoming exhausted.

(3) The reducing power can be intensified by the addition of alkalis, carbonates, or (preferably) formosulphite without danger of fogging the negative.

(4) Since it is sensitive to the action of potassium bromide, it can be advantageously used with over-exposed plates.—C. A. M.

"Dichroic Fog": Removal of ——. A. L. Lumière and A. Seyewetz. Monit. Scient., June 1903, **17**, [738], 393—395.

"Dichroic fog" may occur either while developing or fixing a plate. It occurs when the developer contains a solvent of silver bromide (*e.g.*, thiosulphate, ammonia, potassium cyanide, &c.), and when the fixing solution contains small quantities of the developer and sodium sulphite (in the case of developers of the type of diaminophenol), or an excess of alkali carbonate (when alkaline developing solutions are used).

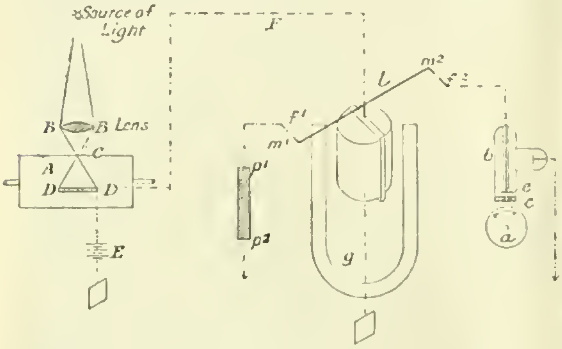
The "fog" does not contain silver bromide, but appears to be similar to "collargol" (colloidal silver solution), and behaves, chemically, much as metallic silver.

Fog produced in the fixing solution may be removed by treatment with a slightly acid solution of ammonium persulphate (about 3 per cent.), followed by treatment with sodium bisulphite. Neutral solutions of persulphate have no appreciable effect on the fog.

The best method, however, is to oxidise the silver by means of a neutral solution of potassium permanganate (about 1 in 1,000), and subsequently to remove the manganese dioxide by sodium bisulphite. This method gives good results with fog produced either during development or during fixation.—T. F. B.

Photographs; Transmission of ——, by Telegraphy. Korn. Comptes rend., 1903, **136**, [20], 1190—1192.

The diagram shows the arrangement of the apparatus. The photograph to be transmitted, on a transparent film, is wrapped round a glass cylinder A, which rotates on a slow spiral, like a phonograph cylinder. A narrow pencil of light, focussed by the lens B, passes through the photographic film, and falls on a rod of selenium D, which forms part of the telegraphic circuit, through which passes a current from the battery E of constant EMF. The variations in the current produced by alterations in the resistance of the selenium as thinner or denser parts of the photograph pass over it, cause movement of the galvanometer needle m_1 m_2. These movements alter the length of the spark-gaps between the vacuum tube *b* and the Tesla apparatus p_1 p_2, and thus cause variations in the intensity of the light emitted by the electrode. The light passes through a little window *c* in the otherwise opaque tube, and falls on a sensitised film on the cylinder *a*, which rotates in synchronism with the other cylinder. The photograph on A is thus reproduced on the film on *a*. The same receiver can be used, with an appropriate transmitter, as a teleautograph.—J. T. D.



United States Patent.

Photographic Printing. E. S. Shepherd and O. M. Bartlett, both of London. U. S. Pat. 728,310, May 19, 1903.

A transparent support, coated with bichromated gelatin, is exposed under a negative and developed. The resulting positive is stained and applied to a damped film of soft gelatin, which absorbs the colour from the positive, producing a picture by reason of the varying thickness of the positive.

This process can be applied to multicolour printing, by using a number of "colour record-negatives," and applying the resulting stained positives successively, in register, on a soft gelatin surface.—T. F. B.

French Patent.

Nitrocellulose; Use of Nitroglycerin in the Souplin (Assoupplissement) of —— [for Manufacture of Photographic Films]. H. Lüttke. Fr. Pat. 325,548, Oct. 23 1902.

See Eng. Pat. 24,955 of 1902; this Journal, 1903, 318. —T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patents.

Explosives; Impts. in ——. J. M. Az, Hilversum, Holland Eng. Pat. 13,111, June 9, 1902.

A safety blasting explosive, consisting of ammonium nitrat (91—93 parts), anthracene (5—7 parts), and bariu sulphide (1 part).—G. W. McD.

Explosive Compounds for Signal, Blasting, and othe Purposes; Impts. in ——. A. Brock, Sutton, Surrey Eng. Pat. 2,977, Feb. 7, 1903.

The explosive consists of barium chlorate (25 parts), an aluminium powder (3 parts), for a rocket or shell wher sound is more important than flash, and of barium chlorat (20 parts), and aluminium powder (12 parts) in cases wher visibility is required.—G. W. McD.

Matches, Cartridge Fuzes, and the like; Igniting Materia for ——. W. Muir, Edmonton, and R. E. Bell, Bromley Eng. Pat. 11,503, May 20, 1902.

The compounds described by Berzelius as red modification of phosphorus sulphides of the formulæ P_4S, P_3S, and P_2S are stated by the patentees to be identical and a modifica tion of phosphorus itself. This "bright red phosphoru is said to be non-poisonous, but chemically more active tha red phosphorus, and its use is claimed as a substitute for th latter, and for yellow phosphorus in igniting compositions —G. W. McD.

United States Patent.

Pyrotechnics; Process of Preparing ——. N. De Grande, Assignor to Virginia Fireworks Co., Petersbur Va. U.S. Pat. 728,878, May 26. 1903.

A method of making whistling bombs, which consists i slowly incorporating a boiling solution containing 3 part by weight of saltpetre (potassium nitrate) with a boil n solution containing 1 part by weight of picric acid. Th resulting yellow precipitate is dried and pulverised. —G. W. McD.

French Patents.

Explosives, Impts. in ——. E. Callenberg. Addition, dated Oct. 28, 1902, to Fr. Pat. 322,916, June 27, 1902.

The addition of from 0·5 to 1 per cent. of naphthalene t turpentine hydrochloride, lowers its melting point fro 78° C. to 10° C. Advantage is taken of this fact to prod a chlorate explosive of the following composition :—Potassium chlorate (80 parts), potassium nitrate (10 parts) turpentine hydrochloride (with 0·5 to 1 per cent. of naph thalene) (10 parts). (See also this Journal, 1903, 380.) —G. W. McD.

Explosive; A New ——. J. Luciani. Fr. Pat. 326,0 Oct. 31, 1902.

Nitrocotton containing a high percentage of nitrogen, an insoluble in nitroglycerin, is added to blasting gelatin com positions (nitroglycerin and collodion cotton). Its presenc is said to render the explosive porous, increase its effect and prevent its freezing at winter temperatures. Admixtu of the above with chlorates, &c. is also claimed. —G. W. McD.

Primers and Caps; Charge for ——. Westfalis Anhaltisch Sprengstoff-A.-G. Fr. Pat. 326,055, Nov. 1902.

The composition consists of :—Trinitronaphthalene (2 parts), diaminophenol dinitronaphtholsulphonate (10 parts mercury thiocyanate (30 parts), and potassium chlorate 3 parts).—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS.

mperature Determinations by means of the Le Chatelier ind Wanner Pyrometers. W. Feld. Chem. Ind., 1903, 26, [11], 256—262.

E author gives a description of the Wanner pyrometer l the results of comparative experiments showing that it a considerable advance on Le Chatelier's pyrometer.
—A. S.

English Patents.

otometers; or Apparatus for Measuring the Intensity of Light, Impts. in ——. W. Frisby, London. Eng. Pat. 3,442, June 13, 1902.

s change in the electric resistance of a cell of selenium, t uriam, or sulphur, sensitive to light, when illuminated by t source of light the intensity of which is to be determined, i neasured by a voltmeter, ammeter, or ohmmeter. The d of the measuring instrument is calibrated for the direct r ling off of the intensity of the illumination.—L. F. G.

tometers, Impts. in ——. W. P. Thompson. From . B. Marks, New York. Eng. Pat. 14,688, July 1, 902.

Series of mirrors are arranged in a semi-circle around t source of light to be tested, in accordance with mathe- a ical principles, so as to illuminate one side of a screen p ortionately to the mean spherical or hemispherical c lle power, the source of light being rapidly rotated on i axis. The other side of the screen is illuminated by t reflected by means of mirrors from a standard source o ight; the intensity of this illumination is varied by e r moving the standard source of light, or by altering th ngle of the reflecting mirrors.—L. F. G.

French Patent.

otometers. E. T. Turney. Fr. Pat. 325,678, Sept. 19, 1902.

S Eng. Pat. 20,458 of 1902; this Journal, 1903, 619.
—T. F. B.

INORGANIC—QUALITATIVE.

B rbonates; Note on Perkin's Test for ——. F. O. ylor. J. Amer. Chem. Soc., 1903, 25, [5], 537. (See s Journal, 1902, 1375.)

T test is based on the fact that bromine is liberated from a ixture of solutions of a bromide and sodium hypo- c ite, if a dilute acid be added. Bicarbonates are su iently acid to bring about the reaction, and may, in th way be distinguished from normal carbonates. The au or has found the test very satisfactory, but mentions th following exceptions. The test will not show the pr nce of ammonium bicarbonate nor can ammonium br ide be substituted for the sodium or potassium salt. F er the presence of ammonium salts entirely prevents th eaction.

e hypochlorite solution must not be kept too long, and m be protected from the action of light, or it will b ne sufficiently acid to interfere with the reaction.
—A. S.

ad and Manganese; Detection of ——. A. Trillat. Comptes rend., 1903, 136, [20], 1205—1207.

f limethylamino-derivative of diphenylmethane—

$$CH_2[C_6H_4.N(CH_3)_2]_2,$$

n etic acid solution, gives with certain peroxides (lead, ma anese, copper) a fine blue coloration, stable even w warmed.

eparation of the Reagent.—Heat for an hour on the wa -bath a mixture of 30 grms. of dimethylaniline, 10 ms. of formaldehyde, and 200 c.c. of water acidulated wi 10 grms. of sulphuric acid. Cool, add a large excess of diam hydroxide, and expel all remaining dimethyl- an e by a rapid current of steam. On cooling, crystals deposit: recrystallise these from alcohol. Dissolve 5 grms. of the base so made, in 100 c.c. of water, and keep the solution in a well-closed bottle in the dark.

Detection of Lead.—Incinerate the substance, after addition of sulphuric acid or a sulphate. Treat the residue, in a little capsule, with saturated sodium hypochlorite solution (2 drops for 0·01 grm. of residue). Expel the chlorine by washing or heating, and add the reagent. The reaction is extremely delicate; the author has detected lead in water drawn from lead pipes, where the ordinary reagents failed to show any, and rain-water after 48 hours' contact with granulated lead gave a strong reaction. In certain cases, it may be necessary to know that manganese is absent; this is assured by well washing the incinerated residue of sulphates before adding hypochlorite.

Detection of Manganese.—The substance is incinerated after addition of a little pure sodium hydroxide. The residue is treated with the reagent, and a little water acidulated with acetic acid, and boiled. The blue colour produced disappears on cooling, but is regenerated on heating again. The absence of copper should be proved, as this gives, though with difficulty, a blue coloration. The author has found manganese in a great many vegetable substances; in some cases, though by no means in all, it seems to exist in the vegetable in the state of peroxide.
—J. T. D.

Methyl Violet decolorised by Sulphurous Acid; Reaction of —— [Test for Contaminated Waters]. H. Causse. Comptes rend., 1903, 136, [21], 1269—1270.

In a system formed by water containing dissolved oxygen, the leuco-compound of Methyl Violet (hexamethylpararosaniline hydrochloride) decolorised by sulphurous acid, and sulphurous acid, the oxygen is at first absorbed by the leuco-salt, which becomes violet, the violet compound is again reduced by the sulphurous acid, which is converted into sulphuric acid, and so on till the dissolved oxygen disappears. Experiments with this reagent and various waters show that the presence of small amounts of alkali carbonate or calcium carbonate in solution render the water much more active as an oxydant; the amount of carbonate should be enough to convert the bisulphite of the reagent into normal sulphite. Thus, any cause which diminishes the amount of calcium carbonate in a natural water will diminish its oxidising activity on the reagent; and the substances introduced by contamination—fatty substances, carbohydrates, albuminoids—all yield by hydrolysis, alone or followed by fermentation, fatty acids, which decompose carbonates. Hence the inertness, towards the Methyl Violet-sulphurous acid reagent, of contaminated waters (this Journal, 1902, 642).—J. T. D.

INORGANIC—QUANTITATIVE.

Titanium Trichloride in Volumetric Analysis. E. Knecht and Eva Hibbert. Org. Quantit., page 762.

Nitrous Acid; Behaviour of ——, towards Methyl Orange. G. Lunge. Zeits. angew. Chem., 1903, 16, [22], 509—511.

The author combats the contention of Arndt and of Wegner, that nitrous acid does not redden Methyl Orange. He shows that the indicator is destroyed by nitrous acid when present in any considerable concentration, but that if the acid be greatly diluted and the indicator be added not long before the point of saturation is reached, nitrous acid behaves towards Methyl Orange exactly like the strong mineral acids.—J. T. D.

Halogens; Determination of ——, in Organic Compounds. H. Baubigny and G. Chavanne. Comptes rend., 1903, 136, [20], 1197—1199.

This method allows a separation of iodine from chlorine and bromine. Into a 200 c.c. conical flask put 40 c.c. of concentrated sulphuric acid and a slight excess (say 1—1·5 grms.) of solid silver nitrate. Heat to dissolve the latter, add 4—8 grms. of powdered potassium bichromate, and, when this is dissolved, cool. Add 0·3—0·4 grm. of the substance in a tiny glass tube, and shake round in the liquid. Heat, if necessary, to start the action, and, in any case, to ensure its completion, to 150°—170° C. (evolution of oxygen bubbles indicates a temperature of 180° C., which should not be exceeded). Take away the source of heat, and continue the agitation for 4 or 5 minutes. Chlorine and bromine are evolved as such, and must be collected if to be determined; iodine remains as iodate. To the cooled liquid add 140—150 c.c. of water and a slight excess of sulphurous acid solution (if silver chromate, containing iodate, deposits on cooling, add ammonium nitrate and warm till all is dissolved; then go on with the reduction). If too much sulphurous acid has been added, the iodide may be grey from metallic silver; the latter can be dissolved out by nitric acid (1 vol. 1·333, 3 vols. water), and the iodide remains pure. This is washed, dried, and weighed.—J. T. D.

Cyanide Process; Analytical Work in connection with ——. J. E. Clennell. Inst. Mining and Metall., 1903. Paper read May 21, 20 pp.

The analytical work in connection with a cyanide plant includes tests by the foreman to regulate the daily working of the plant (usually titration of cyanide and titration for alkalinity), special tests when difficulties arise, and tests at frequent intervals made by the works chemist to control operations, check the output, and maintain efficiency. For the workman, Liebig's method is best used to determine the cyanide, using standard silver solution containing 6·519 grms. of silver nitrate per litre (1 c.c. = 0·005 grm. of potassium cyanide), and working with 50 c.c. of the test solution. The essentials are that the glass vessels used should be absolutely clean, the test be always conducted in the same way, and turbid solutions be filtered, but not cleared with lime unless a determination of the total cyanide is to be made. The protective alkali (independent of cyanide) is best found by adding silver nitrate until a slight turbidity is produced and then titrating with decinormal acid, using phenolphthalein as indicator. If zinc be present, Green's modification (adding an excess of potassium ferrocyanide before the silver nitrate) should be used. Of the tests made by the works chemist the following are considered, one or two of the most suitable methods for industrial use in cyanide works being given in each case:—Free cyanide; total cyanide; hydrocyanic acid; ferrocyanides; thiocyanates; total cyanogen; zinc; copper; gold; silver; sulphides; and alkalis.—W. G. M.

Electrolytic Separations: Manganese from Iron, Aluminium from Iron or Nickel, Zinc from Iron. Hollard and Bertiaux. Comptes rend., 1903, **136**, [21], 1266—1268.

Manganese from Iron.—To the solution of the sulphates, containing a few drops of free sulphuric acid, add 5 grms. of citric acid, 25—50 c.c. of saturated solution of sulphur dioxide, and 25 c.c. of ammonia of sp. gr. 0·92, neutralise with sulphuric acid, and finally render alkaline with a few c.c. of ammonia. Dilute to 300 c.c., keep at 48° C., and electrolyse with a current of 1 ampère, using the authors' electrodes. When the iron is completely deposited (which will be before the manganese peroxide begins to show on the anode), remove and wash the cathode, dissolve off the iron by sulphuric acid without access of air, and determine by permanganate. Replace the cathode (or meanwhile substitute it by another), raise the temperature to 90°—95° C., and after some hours the manganese is completely deposited. If the bath be not alkaline, make it so with ammonia, interrupt, remove the cathode, and allow the bath and anode to stand half an hour. Wash the anode with boiling water, and place in a narrow stoppered tube. Filter the liquid through asbestos, wash with boiling water, and place the asbestos, with any adhering peroxide, in the tube. Add 50 c.c. of hydrochloric acid (sp. gr. 1·035), 5 c.c. of 60 per cent. potassium iodide solution, water to cover the electrode, and 5 c.c. of carbon bisulphide; stopper the tube, shake well, and allow to stand half an hour. Titrate with thiosulphate.

Aluminium from Iron.—The preparation of the solution, and the electrolytic deposition of the iron, are similar to the case of manganese and iron. The sulphurous a prevents, on the one hand, the precipitation of alum which might carry down iron mechanically, and, on other, the precipitation of basic salts of iron.

Zinc from Iron.—To the solution of the sulphates 25—50 c.c. of sulphurous acid, nearly neutralise with sod hydroxide, add 15 c.c. of 20 per cent. potassium cya solution, then 50 c.c. of sodium hydroxide solution sp. gr. 1·12; dilute to 300 c.c., electrolyse cold wit current of 1 ampère. The zinc alone deposits (someti contaminated with 2—3 mgrms. of iron, which can titrated with permanganate).—J. T. D.

Carbon Monoxide in Mine Gas; Determination of —. A. Fillunger. Oesterr. Zeits. Berg- u. Hüttenw., 1 **51**, 216; Chem.-Zeit., 1903, **27**, [41], Rep. 126.

The following simple method has been devised Molterski and Nowicki:—A measured quantity of the previously freed from carbon dioxide, is passed over io pentoxide heated to 120°—150° C. The carbon monox is oxidised to dioxide and iodine liberated ($I_2O_5 + 5C$ $5CO_2 + I_2$), whilst the hydrocarbons in the mixture not affected. The carbon dioxide formed is received standard barium hydroxide solution and determined titration, whilst the residual gas may be ignited o red-hot copper oxide for the determination of the hyd carbons. In a series of experimental determinations m by the author, the errors from the theoretical amount carbon monoxide were 0·01 to 0·1 per cent.—C. A. M.

ORGANIC—QUALITATIVE.

Pressed Yeast; Detection of Bottom-fermentation B Yeast in ——. P. Lindner. Zeits. Spiritusind., 19, **26**, [22], 229.

In 1891, the author proposed to test top-fermentat pressed yeasts from grain mashes for the presence bottom-fermentation beer yeast, by a purely biolog examination, based on the flocculent appearance of b yeast when suspended in water and on the behaviour of various colonies, isolated on a gelatin plate, as rega fermentation, spore formation, and germination. T process of Bau, depending on the complete fermentation raffinose (melitriose) by bottom-fermentation yeasts, wh top-fermentation yeasts only carry the fermentation to formation of melibiose, appeared however to be so mu simpler and more definite that it was soon almost gener adopted. Recently the absolute validity of Bau's meth has been called into question.

The author in the course of his experience has met w several yeasts which are exceptions to Bau's rule.

Most wine yeasts and many wild yeasts of a botto fermentation type have no fermentative action on melibio.

The type can only be determined accurately by ferm tation experiments; a yeasty head, and a loose sedim which gives a cloudy suspension in water, also a tende to form linear budding chains and ready spore formati characterise the top-fermentation pressed yeasts. Ba test is not sufficiently general to afford a strict indicat of type, and the analyst must be able to separate the vari constituents of mixed samples and apply biological tests each of them, utilising Bau's method as an access indication.—J. F. B.

ORGANIC—QUANTITATIVE.

Titanium Trichloride in Volumetric Analysis. E. Kne and Eva Hibbert. Ber., 1903, **36**, [8], 1519—15. (See this Journal, 1903, 232.)

A standard solution of titanium trichloride may, account of its reducing properties, be used for the vo metric estimation of iron in the ferric condition. Chlo acid may be determined by reducing with a known quant of standard titanium trichloride solution and titrating t excess with a standard ferric salt solution, the process bei carried out in a current of carbon dioxide.

Azo compounds are quantitatively reduced by titani trichloride. If the dyestuff be soluble in hydrochloric ac a boiling solution is titrated until the colour disappea

, if the dyestuff be insoluble, it is boiled with excess of nium trichloride in a current of carbon dioxide and then ated back when cold with a ferric solution.

n acid solution, nitro-compounds are reduced to amines, molecules of titanium trichloride being required for the uction of one nitro group. As the nitro-compound is, a rule, not sufficiently coloured to act as indicator, indirect method is the most convenient for the rmination.—J. McC.

zene in Illuminating Gas; Determination of ——. . M. Dennis and J. G. O'Neill. J. Amer. Chem. Soc., 903, **25**, [5], 503—511.

m the results of their experiments, the authors conclude (1) Alcohol does not completely remove either zene or ethylene from gas mixtures; (2) the use of an noniacal solution of nickel nitrate (40 grms. of nickel ate dissolved in 160 c.c. of water and 2 c.c. of nitric of sp. gr. 1·44, and the liquid poured slowly, with stant stirring, into 100 c.c. of ammonia solution of sp.gr. 98) furnishes a rapid and exact method for the deter- ation of benzene in mixtures of that substance with air ethylene, and in coal-gas. In the analysis of coal-gas, following order of procedure is recommended:—(1) orption of carbon dioxide by potassium hydroxide; (2) rption of benzene by ammoniacal solution of nickel ate; (3) absorption of "heavy hydrocarbons" by ing sulphuric acid; (4) absorption of oxygen by line pyrogallol or by phosphorus; (5) absorption of on monoxide by cuprous chloride; and (6) determina- of the methane and hydrogen.

s the authors have been unable to try this new method ny commercial gas mixtures other than the local supply lluminating gas, they invite chemists using the method ther gas mixtures to communicate to them, at Cornell versity, Ithaca, N.Y., U.S.A., the results obtained, and all their attention to any difficulties that may arise. —A. S.

cerin; Determination of ——. A. Buisine. Comptes rend., 1903, **136**, [20], 1204—1205.

he temperature of the mixture of glycerin, potassium oxide, and potash-lime (this Journal, 1903, 712) be d to 350° C., the final result is represented by $C_3H_8O_3$ $KOH = 2K_2CO_3 + 3H_2 + CH_4 + H_2O$, and 1 grm. of erin evolves 967 c.c. of gas at N.T.P. Pulverise 4—5 s. of potassium hydroxide in a mortar, add from a ping bottle 0·2—0·5 grm. of the glycerin to be tested ghing by difference), then 15—20 grms. of powdered sh-lime. Place the mixture in a small flask connected the gas-burette, and heat to 350° C. in a mercury bath he evolution of gas ceases (about an hour).—J. T. D.

nin; Absorption of ——, *by Filter Paper.* F. A. ockey. Collegium, 1903, **2**, [52], 76—80. (Compare is Journal, 1902, 1100.)

iew of the rule now adopted by the International Asso- on of Leather Trades Chemists, *viz.*, that in the ysis of those tanning materials which do not give a solution, a definite correction for the tannin absorbed ng filtration is to be applied (see this Journal, 1903, , the author has investigated the value of this correc- for a number of different materials. The results show for the same material and same mode of filtration, the correction holds for different samples. Thus, six rent oakwood extracts filtered through paper 605 d S., gave a mean value of 5 mgrms. per 50 c.c. of dard liquor (3·5—4·5 grms. per litre), and this value probably be assumed as the correction for all samples akwood extract. The accompanying table shows the es of the correction found for different samples of ous materials and modes of filtration.

per 590 S. and S. fails to clarify turbid solutions, and a very limited use, whilst some batches of 590 S. and sed in conjunction with kaolin were found to yield le matter, and any such should be discarded when l. As a general result papers 605 alone, 590 with u and 311 with kaolin, may all be employed for most of sual tanning materials, and the above figures indicate that a correction of 5 mgrms. per 50 c.c., which should be added to the residue of "total soluble matter" (found by filtering 150 c.c., and then evaporating the next 50 c.c.) would give results very near the truth. For hemlock and quebracho extracts and certain other materials containing a large percentage of finely-divided insoluble matter, where paper 605 with kaolin is required, a correction of 8 mgrms. per 50 c.c. would be necessary. Dreverhoff's paper 311, whilst much cheaper than the others, gives generally the best results. These results are published as a contribution towards establishing recognised average values.—R. L. J.

Filter Paper.	Tanning Material.	Correction in Mgrms. for 50 c.c. of Liquor.
—		
Schleicher and Schull's, 605	Oakwood extract.	5·0, 5·5, 5·5, 3·3, 4·5, 4·5.
,, ,, ,,	Sumach.........	5·5, 5·7, 6·1.
,, ,, ,,	Chestnut extract.	5·0, 4·5, 3·5.
,, ,, ,,	Oak-bark	7·1.
,, ,, ,,	Mimosa bark.....	5·3, 5·5.
,, ,, ,,	Mimosa extract ..	6·4.
S. & S.'s, 590	Various..........	1·0 (average).
S. & S.'s, 590 + kaolin (A.O.A.C. method: this Journal, 1903, 130).	,, ...	5·0 (average).
S. & S.'s, 605 + kaolin......	Solid quebracho extract.	7·8, 9·2.
Dreverhoff's, 311 + kaolin .	Oakwood extract.	5·5, 3·0.
,, ,, ,, ..	Chestnut extract.	5·0.
,, ,, ,, ..	Sumach..........	4·3.

Glucose; Determination of ——. E. Gudeman. Proc. of 19th Annual Conv. of Assoc. Offic. Agric. Chem., 1902. U.S. Dept. of Agriculture, 1903. Bulletin, [73], 65—69.

The provisional official method for the determination of commercial glucose in presence of cane sugar, by subtracting the Clerget value for the cane sugar from the direct polarisation and employing a factor, can only give correct results by accident, because the factor employed depends on the polarisation value of the particular sample of glucose with which the mixture was made. In America the term commercial "glucose" is only applied to the syrupy products: these contain from 40 to 55 per cent. of reducing substance on the total solids. The solid products are termed "grape sugar" and contain 80—92 per cent. of reducing substance on the dry solids. The ratio of reducing to non-reducing substances depends on the point at which conversion has been arrested, and no two batches are quite identical. The author shows that when the polarisation method alone is employed, mixtures of "grape sugar," cane sugar, and invert sugar may be prepared which will show an error for the "grape sugar" up to 100 per cent. The following method of analysis is put forward:—(1) In mixtures free from invert sugar, determine the total directly reducing sugars $= a$: determine cane sugar by reduction after inversion at 67° C. $= b$ (or by Clerget's method, calculating reducing power $= b$); invert with malt and determine total reducing sugars $= c$ (as in determination of starch). Then $c - (a + b) \times 0·932 - d$; $d =$ non-reducing substance from either "glucose" or "grape sugar"; $a + d =$ either "glucose" or "grape sugar," the composition of the latter also being indicated by the ratio $a : d$. (2) If invert sugar be present it must be determined by double polarisation, at 20° C. and at 87° C. $= i$. Then $a - i = A$ reducing substance from "glucose" or "grape sugar"; $c - (a + b + i) \times 0·932 = d$; $A + d =$ glucose or grape sugar. The error due to the use of the factor 0·932 is very small, averaging about 1 per cent. and never more than 3 per cent. of the glucose present. If the mixture contain starch it must be separated by cold filtration; starch in solution will be determined as part of the non-reducing substance.—J. F. B.

Diastatic Activity; Method for Determination of ——. A Pollak. Zeits. Spiritusind., 1903, **26**, [23], 241—243.

A solution of the diastatic substance is prepared at a concentration, as near as possible, of 2 per cent. of dissolved solids. A 3 per cent. starch paste is then made by dissolving 9 grms. of best arrowroot, with all the precautions necessary for obtaining an absolutely uniform paste, in about 250 c.c. of boiling water. After heating at the boiling point for half an hour, the paste is cooled and the volume is made up to 300 c.c. A preliminary experiment is first made by withdrawing exactly 50 c.c. of the starch paste, heating it in a flask to 39°—40° C., adding 10 c.c. of the 2 per cent. diastatic solution and digesting it in a water bath at an internal temperature of exactly 37·6° C. The progress of saccharification is closely watched and any abnormalities are noted, the iodine reaction is tested from time to time, and the number of minutes from the start to the time when the iodine reaction of the products becomes pure brown, is observed. For each minute of this period 1 c.c. of the 2 per cent. solution of malt extract is taken for the determination proper. This determination is made with the remaining 250 c.c. of starch paste in the flask of 300 c.c. capacity. The contents of the flask are brought to a temperature of 39°—40° C., the determined number of c.c. of diastatic solution are added and the saccharification is carried out for 30 minutes at exactly 37·6° C. The reaction is then stopped by the addition of 3 c.c. of a 10 per cent. solution of caustic potash, and after cooling, the contents of the flask are made up to 300 c.c. The cupric reducing sugars [as maltose] in this solution are then determined volumetrically by adding it from a burette to 50 c.c. of boiling Fehling's solution. A correction must of course be made for the cupric reducing sugars, determined in the same manner, already existing in the diastatic solution employed. When the diastatic power of malt has to be determined, 25 grms. of the finely-ground sample are mashed with 250 c.c. of water at 40° C. for half an hour, the wort is filtered clear and diluted in the ratio of 1:5 for the preliminary test. The main advantage of this method lies in the fact that, owing to the preliminary test, the proportion of diastase to starch in the determination proper is always approximately constant, and the quantity of reducing sugar in the resulting product is also nearly constant.—J. F. B.

Gluten Foods; Determination of Fat and Acidity in ——. F. Gudeman. Proc. of 19th Annual Conv. of Assoc. Offic. Agric. Chem., 1902. U.S. Dept. of Agriculture, 1903. Bulletin, [73], 42—47.

The starch and glucose factories of the United States consume about 3 per cent. of the total output of maize, and obtain about 15 lb. per bushel in the form of cattle foods, *viz.*, maize oil-cake from the "germs" and gluten food. Gluten food consists of the maize bran mixed with the gluten meal from which the starch has been separated by sedimentation; these are mixed in the wet state, pressed, and dried down with the concentrated steep waters (originally containing sulphurous acid) to a content of about 12 per cent. of moisture. The standard official methods for the determination of the water, ash, fibre, and nitrogen in these foods give satisfactory results, but the method for the determination of fat is open to criticism. According to this method, it is directed that the fat extraction be performed on a sample of food dried as in the determination of moisture, *i.e.*, by prolonged heating in a current of hydrogen or under vacuum, which treatment produces a profound modification of the material. Accurate results can only be obtained by extracting the material either without drying or after drying over sulphuric acid. For the determination of the acidity of the food, 100 grms. are digested with agitation with a litre of water for 1 hour, the liquid is then poured through a double filter paper, the first 100 c.c. are rejected, and 200 c.c. = 20 grms. of material are titrated with normal alkali. The results vary largely according to the indicator used; phenolphthalein gives very high results (owing to the acidity of the proteids), and the author prefers to employ rosolic acid, which gives somewhat higher numbers than litmus. Fermentation of the food before drying does not increase the acidity.—J. F. B.

Clove Oil; Determination of Eugenol in ——. E. C. Spurge. Pharm. J., 1903, **70**, [1718], 757—758.

As the result of a comparative examination of the various methods proposed for estimating eugenol in clove oil, the author concludes that none of the methods give stric accurate results. Clove oil contains a considerable amou of esters of eugenol (7 to 17 per cent., calculated a acetate), and this should be taken into consideration i determining the percentage of eugenol.

Thoms' method (this Journal, 1893, 184) is inaccur, and only partially determines the eugenol as est Umney's method is more accurate, but gives high resul owing to the presence of esters, since it determines the to eugenol.

Free eugenol can be determined within 1 per cent. Verley and Bölsing's method (this Journal, 1901, 1250).

To value a clove oil, either Verley and Bölsing's meth together with a determination of the eugenol by sapon cation, or Umney's method, less a saponification correcti should be used. The former method is probably m accurate, but the author considers that the simpler meth of Umney, uncorrected, together with a specific grav determination, would be sufficiently accurate for a pharm copœia test.—T. F. B.

Civet. E. J. Parry. Chem. and Druggist, 1903, **62**, [1218], 871.

It is stated that the chief adulterants in commercial ci can be detected by the following process:—5 grms. of t sample are mixed with a small quantity of kieselguhr other suitable diluent, and exhausted with acetone. T residue is extracted with petroleum spirit, which will d solve any petroleum jelly present, and is then dried a weighed. The residue should not weigh more than t amount of kieselguhr used plus 5 per cent. of the weight the sample; pure civet, when exhausted with aceto leaves a residue of from 3 to 5 per cent.

In 22 out of 38 samples examined by the author, t residue amounted to from 18 to 26 per cent., and a la proportion of it was soluble in water. The solution did reduce Fehling's solution, but did after inversion w hydrochloric acid.

The author also isolated the characteristic fatty acids cocoa-nut oil from the saponification (with alcoholic pota products of a sample of commercial civet. (See also t Journal, 1902, 1347, 1553; 1903, 571.)—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES

Cæsium-Ammonium and Rubidium-Ammonium; Preparat and Properties of ——. H. Moissan. Comptes ren 1903, **136**, [20], 1177—1179.

These substances are prepared by the direct action liquid ammonia on the metal. The manipulation in t case of cæsium is difficult, as the metal ignites in cont with air, and the whole operation must be conducted in c carbon dioxide or hydrogen. The cæsium compound readily formed, even ammonia gas at 40° C. attacking t metal, while the reaction when the mixture is cooled acetone and carbon dioxide is very rapid. Cæsiu ammonium is a crystalline solid of the colour of tern silver. It takes fire and burns brilliantly when it com into contact with air. It dissolves readily in liquid ammon forming a blue liquid with golden reflexion. When t liquid is heated, or brought into a vacuous space, compl dissociation occurs, and metallic cæsium is deposited minute shining crystals. Rubidium is not attacked ammonia at − 75° C., but rapid action occurs at a f degrees higher. Ammonia gas at atmospheric press attacks the metal at and below − 3° C. Rubidiu ammonium also dissolves readily in liquid ammonia, and t dissociation leaves the metal partly in minute shini prisms, partly as a silver-white solid. The two compou follow the general formula NH_3M. The author has utili their ammoniacal solutions in preparing the carbides a acetylides of the metals.—J. T. D.

Light: Chemical Action of ——. G. Ciamician and P. Silber. Ber., 1903, **36**, [8], 1575—1583.

In continuation of their previous work (see this Journ 1901, 844 and 913; 1902, 876 and 1477; 1903, 50) t thors give the following results of experiments on the tion of light on various compounds.

Benzaldehyde alone undergoes polymerisation to a subnce which separates from a mixture of benzene and ht petroleum as a white powder, having the composition $_7H_6O)_9$. In benzyl alcohol solution, benzaldehyde yields drobenzoïn and isohydrobenzoïn, while, in the same vent, benzophenone gives mainly benzopinacone, together h hydrobenzoïn, isohydrobenzoïn, and a crystalline npound melting at 168° C. and having the probable istitution, $OH.C(C_6H_5)_2.CH(C_6H_5).OH$. Benzophene remains unchanged in presence of formic acid, ilst its solution in cymene gradually deposits benzopinae. Benzophenone and benzaldehyde yield a compound lting at 236°—237° C. and having the composition $H_{34}O_5$. Benzil dissolved in alcohol yields mainly inous bodies, which are accompanied by small quantities benzaldehyde and ethyl benzoate and by somewhat ger proportions of benzoïn. A solution of benzil in aldehyde deposits first of all benzylbenzoïn, which issolves, the liquid later yielding benzoïn and desoxyızoïn. An alcoholic solution of opianic acid yields the eudo-ester of the acid, the action of light accelerating the erification. A solution of alloxan in ethyl alcohol gives ehyde and alloxantin; this transformation accords well h the view that the last-named substance is a pinacone alloxan of the constitution—

$$CO : (NH.CO)_2 : C(OH).C(OH) : (CONH)_2 : CO.$$

aqueous solution of acetone in a loosely-stoppered k yields formic and acetic acids, whilst in a sealed tube, tic acid and methane are formed, according to the ation—

$$CH_3.CO.CH_3 + H_2O = CH_3.COOH + CH_4.$$

—T. H. P.

omic Chloride; Action of Liquefied Ammonia on ——. V. R. Lang and C. M. Carson. Proc. Chem. Soc., **19**, 267], 147.

IEN liquefied ammonia acts on violet chromic chloride, lmon-coloured powder is produced, from which water racts two distinct compounds, which are easily crystalble *in vacuo* and correspond in composition with the nulæ $Cr_2Cl_6, 12NH_3, 2H_2O$, and $Cr_2Cl_6, 10NH_3$. The ner substance is yellow, whilst the latter has the colour obalt nitrate. The salmon-coloured powder, when kept 5° C., yields both yellow and red crystals, but if heated to 1° it gives the red substance only. These compounds are npletely decomposed at 180° C.

ones; Acetylenic ——. New Method of Synthesis of Pyrazoles. C. Moureu and M. Brachin. Comptes rend., 903, **136**, [21], 1262—1265.

ketones of formula R.C : C.CO.R′, formed by the tion of acid chlorides or anhydrides on the sodium vatives of the acetylene hydrocarbons R.C ⋮ CNa, t with hydrazines in the same manner as the β-diketones, ning pyrazoles. This method of synthesis allows the stitution of the pyrazoles so formed to be determined.

—J. T. D.

annose; Crystallised ——. C. Neuberg and P. Mayer. eits. physiol. Chem., **37**, 545—547. Chem. Centr., 1903, , [22], 1217.

sugar obtained by E. Fischer (this Journal, 1890, 527) a syrup by the reduction of the lactone of *i*-mannonic , the authors have now obtained in a crystalline form by lecomposition of equal parts of *d*- and *l*-mannosephenylrazone by means of formaldehyde. Like the crystallised annose obtained by A. van Ekenstein, it melts at —133° C. (corrected); it is not a racemic compound. crystallised *d*- and *i*-mannose both have a perfectly sweet taste, and this fact confirms the view that the er taste of ordinary mannose is due to traces of omposition products.—A. S.

New Books.

PATENTS, DESIGNS, AND TRADE MARKS. Twentieth Report of the Comptroller-General. 177. Price 3*d*.

THIS report deals with the work of the Patent Office during the year 1902. The number of applications for patents and for registration of designs and trade marks in 1902, as compared with the two preceding years, is shown by the following table:—

——	1900.	1901.	1902.
Patents—	No.	No.	No.
Applications	23,922	26,777	28,976
Specifications—			
Provisional	18,119	20,816	22,609
Complete	13,093	13,583	14,877
Sealed	13,170	13,062	13,764
Designs—			
Applications	16,952	16,934	17,825
Registered	16,282	16,217	17,106
Trade Marks—			
Applications	7,937	8,775	8,899
Registered	3,223	3,246	3,404

The report also contains a statement on the principal enactments in foreign countries and British possessions during 1901, which either introduced legislation in regard to patents, trade marks, &c., or modified existing laws.

ANNUAL STATEMENT OF THE TRADE OF THE UNITED KINGDOM WITH FOREIGN COUNTRIES AND BRITISH POSSESSIONS, 1902. Vol. II. (Cd. 1,617.) Price 5*s*.

THIS is the second volume of the Annual Statement of Trade, the first volume having been noticed on page 380 of the *Board of Trade Journal* for the 21st May. This volume contains statements of the trade of the United Kingdom with each foreign country and British possession during the years 1898—1902, and of the imports and exports at each British port during the same period, as well as accounts of transhipment, warehousing, and goods passing in transit.

LES INDUSTRIES CHIMIQUES ET PHARMACEUTIQUES. Par ALBIN HALLER, Professeur à la Faculté des Sciences de Paris, &c. Librairie Gauthier-Villars, Quai des Grands-Augustins 55, Paris. 1903. Price 20 fr.

THIS is a report on the Chemical and Pharmaceutical Industries, as represented in the Paris Industrial Exhibition of 1889—1900. It occupies two large 8vo. volumes, Vol. I. containing 402 pages of subject-matter, and Vol. II. 411 pages, exclusive of the tables of contents. The two volumes are illustrated with 109 engravings. The following subjects are those represented in the Exhibition which here receive descriptive treatment and illustration:—CHAP. I. The Chemical Industries (Inorganic Chemicals) represented, are those of France, Germany, Austria, Belgium, United States, Great Britain, Greece, Hungary, Italy, Japan, The Netherlands, Roumania, Russia, Sweden. II. Products of the Organic and Pharmaceutical Chemical Industry. III. Artificial Dyestuffs and Primary Substances serving as raw Material. Dyewood Extracts. (France, Germany, Great Britain, Italy, Nicaragua, Russia.) IV. Products of the Distillation of Wood, of the Resins, of Coal, and of Mineral Oils. V. Natural and Artificial Perfumes. VI. Colours or Mineral Pigments, Lakes, Varnishes, Pigment-Colours, Inks, Blacking, &c. VII. Soaps, Stearines, Vegetable and Animal Oils, Waxes, &c. VIII. Glues and Gelatins. IX. Artificial Silk. X. The Colonies.

PRACTICAL TANNING. A Handbook of Modern Processes, Receipts, and Suggestions for the Treatment of Hides, Skins, and Pelts of every description. By LOUIS A. FLEMMING, American Tanner. Henry Carey Baird & Co., 81, Walnut Street, Philadelphia, U.S. America. 1903. Price 25*s*. Crosby Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London.

8vo volume, containing preface, table of contents, 432 pages of subject-matter, and the alphabetical index. The following subjects are treated of in this volume :—I. Sheep-skins. II. Manufacture of Chrome-tanned Sheep Leather. III. Alum, Oil, and Napa Processes (Sheep-skins). IV. Wool Skins. The Tanning of Shearlings, &c. V. Sheep-skins. Bark, Extract, and Chamois Tanning. VI. Goat-skins. Preparing for Tanning. VII. Chrome-tanning of Goat-skins. VIII. Finishing of Chrome-tanned Goat-skins into Coloured and Black, Glazed and Dull Leather. IX. Dongola and India-tanned Goat- and Sheep-skins. X. Patented Processes of Tanning and Tawing. XI. Deer-skins. XII. Patented Methods of Depilating. XIII. Patented Processes of Bating. XIV. Manufacture of Calf-skin Leather. XV. Calf-skins and Chrome Processes. XVI. Calf-skins. Vegetable and Combination Tanned. XVII. Calf-skins Tanned for Glove and Mitten Purposes. XVIII. Tanning Furs and Hair Skins. XIX. Kangaroo Leather. XX. Bleaching Leather. XXI. Preparing Heavy Skins for Tanning. XXII. Side Leathers for Shoes, and Methods of Tanning them. XXIII. Colouring, Fat-liquoring, and Finishing of Hemlock, Gambier, Palmetto, Quebracho, and Combination-tanned Sides into Shoe Leather. XXIV. Horse-hides and Colt-skins. XXV. Harness, Line, Strap, Belt, Bag, Case, Lace and Russet Leather. XXVI. Miscellaneous.

Determination of Radicles in Carbon Compounds. By Dr. H. Meyer. Translated by J. Bishop Tingle, Ph.D. 2nd Edition. John Wiley and Sons, New York. 1903. 1 dol. (4*s.* 6*d.*) Chapman and Hall, Ltd., London.

Small 8vo volume, containing 146 pages and indexes. Methods are given for the determination of alkyls, carbonyl, and nitroso- and methylene groups, &c.

Trade Report.

I.—GENERAL.

Russia; Chemical Industry of ——, in 1902.

St. Petersburg Messenger of Trade and Industry; through Bd. of Trade J., June 4, 1903.

The characteristic feature of last year was the almost total suspension of the import of chemical products and the very perceptible decrease in their prices, due to the growth of competition and improvements in manufacture. The demand for mineral acids, salts, and alkali has been largely supplied by home manufacturers, the import being confined to small ports and frontier towns. In addition to the works at Warsaw and Moscow, a new plant, with modern improvements, was completed at St. Petersburg, which caused, during the last year, a reduction of 30 per cent. in the price of sulphuric acid and its by-products.

There has been a marked increase in the amount of sulphur and sulphuric pyrites produced, while as regards the importation of these articles there has been a considerable falling-off, as a reference to the subjoined table will show :—

—	Imports of Sulphur.		Imports of Sulphuric Pyrites (containing about 2 per cent. of copper).	
	Pouds.	Tons.	Pouds.	Tons.
1900	1,102,000	17,918	3,317,000	53,934
1901	944,000	15,349	3,693,000	60,048
1902	93,000	1,512	3,106,000	50,504

The price of sulphur and sulphuric pyrites is gradually increasing, while that of nitric and hydrochloric acids has dropped from 75 and 80 kopecks (1*s.* 7*d.* and 1*s.* 8½*d.*) to 65 and 70 kopecks (1*s.* 4½*d.* and 1*s.* 6*d.*) per poud (36 lb.). The price of chloride of lime decreased from 2·25 rbls. (4*s.* 9*d.*) in 1901 to 1·40 rbls. (3*s.*) at St. Petersburg, 1·30 rbls. (2*s.* 9½*d.*) at Moscow, 1·45 rbls. (3*s.* 1*d.*) at Riga, and 1·60 rbls. (3*s.* 5*d.*) at Odes This decrease was due to the erection of a new factory 1902, which used the electrolytic method.

The trade in chemical products for manufacturi purposes shows a considerable increase in respect indigo and oxalic acid. The supply of the latter h almost doubled during the last two years, and now amou to from 3,000 to 3,500 pouds (48 to 56 tons) per month.

Competition and cheap varieties of foreign tannin ha reduced the price of this product from 35 to 36 rb (74*s.* to 76*s.*) to 30 to 31 rbls. (63*s.* 4*d.* to 65*s.* 5*d.*) poud.

A plant has been recently erected at Kineshma, in Kostroma government, for manufacturing benzol a aniline from petroleum.

Baden; Chem. Industry of ——, in 1902.

Foreign Office Annual Series, No. 2982.

With the exception of some branches, chemical indust suffered less from the indifferent state of trade in gener Heavy chemicals left little or no profit. Benzol fell heav Toluol was saleable only at greatly reduced price. Cru carbolic acid, imported mainly from the United Kingdo fell 17 per cent.; crystals, however, nearly 60 per ce Naphthalene was steady throughout. In fine, the chem trade was fair, but suffered from a falling-off in the Unit States, which now manufactures increasingly for its o consumption. Aniline and alizarin colour factories had good year's business, and were able to pay the usual la dividends. Superphosphate makers complain bitterly Swiss competition; they say they cannot stand it, a demand protection.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Duty on Aniline Oil Drums in Spain.

Gaceta de Madrid, May 19, 1903.

By Royal Order, dated 25th April, sheet-iron dru which aniline oil is imported are, for the purpose of assessment of duty, to be included in the weight of merchandise, provided that the weight of the empty dru after deduction of the weight of any exterior packing, d not exceed 10 kilos., and that the sheet iron of which th are composed does not exceed 1 mm. in thickness.

Casks and drums of sheet iron weighing more than kilos., and composed of metal exceeding 1 mm. in thickne are to pay duty under No. 58 of the Customs Tariff, at rate of 17 pesetas per 100 kilos. (6*s.* 11*d.* per cwt.).

IV.—COLOURING MATTERS, Etc.

Indigo; Trade of New York in ——, during 1902

Foreign Office Annual Series, No. 2972.

In former years the importation of indigo from In averaged about 2,000,000 lb., representing over 50 cent. of the total importation into the United States, chief ports of entry being New York and Boston. Dur the year 1902 the importation of this article from In at the port of New York was reduced to very sm proportions during the first six months, *viz.*, 239,500 valued at 30,600*l.*, and ceased entirely after the mon of June. The cause is no doubt the impossibility maintaining competition with the product derived fr coal-tar, which can be sold profitably at about one-fou of the price of the true vegetable dye.

VII.—ACIDS, ALKALIS, Etc.

Cyanide Industry; Present Position of the ——

G. Beilby. Internat. Congress of Appl. Chem., Berlin, 1903. *Engineer*, 1903, **95**, [2477], 609.

The author opened his paper by referring to the collap in December last, of the arrangement between the lead opean manufacturers of cyanide for regulating prices, to the inauguration of a period of fierce competition reen the producers. After giving some details of the er processes patented for the production of cyanides, author gave the following figures for the present and pective producing capacity of the potassium cyanide ks in Europe :—

——	Present	Prospective.
	Tons.	Tons
nany	2,500	4,100
ce	300	1,800
t Britain	4,800	4,800
Total per annum..	7,600	10,700

dding 5,000 tons as the aggregate output of sodium ide by the countries named, he obtained a total of 0 tons as the prospective capacity of the European ide works, while the estimated consumption of cyanide in Europe is not more than 5,500 tons per annum. ew of this unfavourable position of the industry, from roducers' point of view, the price of cyanides for some must necessarily be low, and in the author's opinion it be unwise for manufacturers to attempt to raise it above or 8*d*. per lb. In an appendix to his paper Mr. Beilby figures for the gold production by the cyanide process the leading gold-mining countries.

FICIAL CALCIUM SULPHATE : U.S. CUSTOMS DECISION.

May 21, 1903.

lcium sulphate, specially prepared for water-hardening oses in the manufacture of beer, was decided to be ble as a "chemical salt" at 25 per cent. *ad valorem* r paragraph 3 of the Tariff Act. The claim of the rter that it was dutiable at $2\frac{1}{4}$ dols. a ton as "ground um" under paragraph 91, was overruled.—R. W. M.

X.—*METALLURGY.*

SOUTH WALES ; MINERAL PRODUCTION OF ——, IN 1902.

Bd. of Trade J., June 4, 1903.

e following table, based on returns published in the *nsland Government Mining Journal* of 14th March, s the value of minerals produced in New South Wales g the year 1902. Figures for 1901 are added for ses of comparison :—

——	1901.	1902.
	£	£
	921,282	1,080,773
(concentrates, &c.)	..	1,440,179
(ingots and matte)	50,484	..
-lead, ore, and sulphide	1,803,979	..
	2,178,929	2,206,598
r	413,302	308,923
	120,000	140,000
	105,665	89,605
(from scrap)	123,750	82,273
ne shale	41,189	59,717
	77,315	53,706
	100,501	47,658
ulic cement	..	46,500
minerals	69,940	77,713
Total value	6,006,636	5,633,645

RASS FOUNDRY ASHES : U.S. CUSTOMS DECISION.

May 15, 1903.

ss foundry ashes, which on analysis were found to n $10\frac{1}{2}$ per cent. metal, the remainder consisting of inert and valueless matter, were decided by the Board of General Appraisers to be free of duty under paragraph 505 of the Tariff Act, as "old brass, &c., fit only for re-manufacture."—R. W. M.

PHOSPHOR TIN : U.S. CUSTOMS DECISION.

May 21, 1903.

Phosphor tin, which chemical analysis showed to be composed of 98·80 per cent. of tin and 1·17 per cent. of phosphorus, was decided to be free of duty as "tin" under paragraph 683 of the Tariff Act, and not at 45 per cent. *ad valorem* as a "manufacture of tin" under paragraph 193.
—R. W. M.

XII.—*FATS, OILS, Etc.*

COTTON-SEED OIL ; DENATURING OF —— : AUSTRALIAN CUSTOMS DECISION.

Australian Gazette, April 9, 1903 ; *through Bd. of Trade J., May* 28, 1903.

A by-law, issued by the Department of Trade and Customs on April 3, provides that the denaturing substances which may be used for denaturing cotton-seed oil shall be resin cod oil or whale oil in the proportion of not less than 5 per cent. of the quantity of cotton-seed oil to be denatured.

The present Customs By-law is to be read with the by-law which was published in the *Commonwealth of Australia Gazette* on December 3, 1901 (see this Journal, 1902, 200).

WAX ; CARNAÜBA ——.

Chem. and Druggist, June 6, 1903.

The exports from Pernambuco during 1902 amounted to 2,003 tons, of which the United Kingdom received 314 tons, United States 408, and other countries 1,281 tons. In 1901 only 900 tons were exported, of which the United Kingdom received 327 tons, and the United States 234 tons. From Ceará 129 tons were shipped in 1902, against 108 tons in 1901, and 169 tons in 1900.

XIII. A.—*PIGMENTS, PAINTS, Etc.*

MINERAL BLACK : U.S. CUSTOMS DECISION.

May 14, 1903.

The Board decided that black, composed of 61·85 per cent. of carbon, and 38·15 per cent. of ferruginous mineral matter, is not dutiable at 25 per cent. as "black made from bone, ivory, or vegetable substance," under paragraph 47 of the Tariff Act, but at 30 per cent. *ad valorem* as a "colour" under paragraph 58.—R. W. M.

LITHOPONE : U.S. CUSTOMS DECISION.

May, 1903.

The United States Circuit Court of Appeals has decided that lithopone white, consisting of 70 per cent. of barytes (barium sulphate) and 30 per cent. of zinc sulphide, is dutiable at one and one-fourth cents per pound under paragraph 57 of the Tariff Act as "sulphide of zinc white," and not at one cent per pound under the same paragraph as "white paint or pigment containing zinc." This decision affirms those of the Board of General Appraisers and the United States Circuit Court.
—R. W. M.

XIII. C.—*INDIA-RUBBER, Etc.*

THE RUBBER INDUSTRY.

Times, June 10, 1903.

Mr. John Holt, of Liverpool, whose firm is very largely engaged in trading with both West and South West Africa, has just received, according to Reuter's agent in Liverpool, a sample of a rubber-producing herb which has been discovered in the French Congo, and a sample of the rubber it produced. Unlike other rubber obtained from plants, trees, or vines, this rubber grows under ground, and Mr. Holt is of opinion that it probably exists in the English West African Colonies. The rubber grows just beneath the bark or root, and is of a quality which will compare with the finest brought from Africa. When the bark is broken, the two pieces are held together by the rubber lining, which is of great elasticity. It is described as the root of the plant called *Landolphia Tholloni, Olitandra gracilis,* or *racines de Gaukele.* There are several sorts in the Congo, but the *Landolphia Tholloni,* of which the French Congo is full, gives the best "latex." Mr. Holt is sending out the sample to his representative in Nigeria, in the hope that the root may be found growing there. He expresses the fear, however, that certain ordinances which have been promulgated in several of the British West African Colonies with the object of protecting other rubber plants may operate against the utilisation of this new rubber herb even if found.

XVIII. A.—FOODS.

Prohibition to import Adulterated Food Products into United States of America.

Bd. of Trade J., June 11, 1903.

A recent Act of the United States Congress (the Agricultural Appropriation Act for 1903–4) confers upon the Secretary of the Treasury, in co-operation with the Secretary of Agriculture, the power to prohibit the importation into the United States of deleterious or falsely labelled consignments of foods, liquors, and drugs.

When the Secretary of Agriculture has reason to believe that articles are being imported which, owing to adulteration, are dangerous to public health, or which are forbidden to be sold, or are restricted in sale in the countries in which they are made or from which they are exported, or which are falsely labelled in any respect, he is empowered to demand samples for the purpose of analysis, and, in the event of it being proved by the analysis that adulteration exists, the Secretary of the Treasury may, at the instance of the Secretary of Agriculture, refuse to allow the delivery of the goods to the consignee.

The Secretary of Agriculture is also authorised to establish standards of purity for all kinds of food products and beverages.

A copy of the Act may be seen at the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

XIX.—PAPER, PASTEBOARD, Etc.

Wood-Pulp Market; The Swedish.

Cons. Rep., May 16, 1903.

Swedish newspapers state that by reason of the unsatisfactory condition of the wood-pulp market, Swedish and Norwegian manufacturers have agreed to diminish their production. According to reports, 39,834 tons of paper were exported from Gothenburg during the year 1902, or nearly 64 per cent. of the total export from Sweden, and 7,497 tons of pasteboard or building paper (nearly 92 per cent. of the whole). The quantities of wood-pulp exported from Gothenburg were: Chemical, dry, 40,064 tons, or nearly 25 per cent.; chemical, moist, 4,753 tons, or more than 47 per cent.; mechanical, dry, 22,339 tons, or more than 69 per cent.; and moist, 7,604 tons, or more than 14 per cent. of the total export from Sweden.

XX.—FINE CHEMICALS, Etc.

Essence of Jasmine; Concrete ——: U.S. Customs Decision.

Merchandise of the above description was assessed for duty as "alcoholic perfumery" at 60 cents per lb. and 45 per cent. *ad valorem* under paragraph 2 of the Tariff Act. The importers claimed it either to be dutiable at 25 per cent. *ad valorem* as an "essential oil," under paragraph 3, or of duty as "oil of jasmine" under paragraph 626. evidence showed that it was obtained from ordinary jas pomade, made by the enfleurage process by extraction alcohol, the latter being removed by distillation, the res forming the merchandise in question. The Board held the above article was "oil of jasmine," and that the us alcohol was necessary for its production, and decided be free of duty as claimed by the importers.—R. W. M.

Litmus Paper in Rolls: U.S. Customs Decisio

May 10, 1903.

The Board decided that litmus paper was dutiable 25 per cent. *ad valorem,* under paragraph 402 of the T Act, as "paper not otherwise provided for," reversing action of the collector, who had assessed duty at 35 cent. *ad valorem,* as a "manufacture of paper," paragraph 407.—R. W. M.

Fruit Essences: U.S. Customs Decision.

May 20, 1903.

Certain merchandise invoiced as "Extrait de fruit," consisting of "essence de Kirsch" containing 50 per of absolute alcohol by volume, and "essence de citr with $67\frac{7}{10}$ per cent. of alcohol, were decided to be duti at 2 dols. per pound as "fruit essences" under paragraph of the Tariff Act of 1897. The claims of the import that they were dutiable as "distilled spirits or spiritu beverages" at 2·25 dols. per gallon or as fruit juices w overruled.—R. W. M.

XXII.—EXPLOSIVES, MATCHES, Etc.

Yellow Phosphorus in Match Manufacture.

Chem. Trade J., **32**, [339], 572.

The German Reichstag has passed a Bill forbidding use of white or yellow phosphorus in match-making. Secretary of the Interior, speaking in favour of the said that phosphorus not only caused necrosis three or years after a workman had left a match factory, but the disease thus contracted was hereditary, so that w families were affected. So subtle were the effects that bones were fractured without the person being even un of the fracture at first. (See this Journal, 1903, 600.)

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application asterisk is affixed. The dates given are (i) in the case of App tions for Patents, the dates of application, and (ii) in the cas Complete Specifications Accepted, those of the Official Jour in which acceptances of the Complete Specifications are advert

Complete Specifications thus advertised as accepted are ope inspection at the Patent Office immediately, and to opposi within two months of the said dates.

1.—PLANT, APPARATUS, AND MACHINERY

[A.] 12,459. Tabrett and Lewin. Evaporators.* Jun

„ 12,559. King. Separation and grading of bo organic and inorganic. June 3.

„ 12,580. Calmant. Apparatus for concentration rapid extraction of liquids by evaporat June 3.

.] 12,970. Thilo. Containers for chlorethyl and other volatile liquids. June 9.

12,984. Sláma. Apparatus for continuous distillation, and steam superheating apparatus therefor. June 9.

[.] 16,723 (1902). Western. Collection and treatment of certain fumes. June 17.

2702 (1903). Hall. Crushing and pulverising machines. June 10.

II.—FUEL, GAS, AND LIGHT.

] 12,477. Maréchal and Barrière. Gas producer.* June 2.

12,506. Soc. Franc. Constructions Mécaniques (anciens Etablissements Cail). Gas producers. (French Appl., July 11, 1902.)* June 2.

12,528. Milne. Treatment of peat immediately prior to compressing.* June 2.

12,823. Wollhuver and Sjögren. Furnaces. June 8.

12,848. Birkbeck (Cullum). Mantles for incandescent burners. June 8.

12,955. Carolan (Gen. Electric Co.). Fluorescent screens. June 9.

12,976. Leistner. Furnaces. June 9.

13,011. McEwen and Curle. Manufacture of hydrocarbon gas. June 10.

13,031. Gerard. Electrodes for arc lamps. June 10.

13,047. Beavan. Treatment of coke. June 10.

13,202. Jensen (Hiorth). Revivifying gas purifier waste.* June 12.

13,222. Jas. Apparatus for the purification of gas. June 12.

13,235. Hartley and Hartley. Treatment of firewood with resin, &c. June 12.

[ ] 13,114 (1902). Leistner. Furnaces. June 17.

14,057 (1902). Johnson (Cie. Franc. Acetylene dissous). Apparatus for use in the production and supply of explosive gas. June 17.

14,771 (1902). Thwaite. Rough cleaning of blast-furnace gases. June 17.

15,043 (1902). Stratton. Furnaces. June 10.

16,175 (1902). Bloxam (Treat). Regenerative furnaces. June 10.

16,207 (1902). Johnson (Verein Chem. Fabr. Mannheim). Furnaces for roasting, calcining, &c. June 17.

16,668 (1902). Clapham. Condensing apparatus for use in gas manufacture. June 17.

23,511 (1902). Bartlett and Thomas. Waterproof artificial fuel. June 10.

, 3626 (1903). De Mare. Liquid combustible for explosion motors. June 17.

, 6060 (1903). Blondel. Electrodes for electric arc lamps. June 10.

, 6061 (1903). Blondel. Electrodes for electric arc lamps. June 10.

, 6142 (1903). Baughan. Acetylene generator. June 10.

,, 6387 (1903). Kratochvil. Cleansing waste and other gases. June 10.

,, 6845 (1903). Schwartz Incandescent gas mantles. June 17.

[C.S.] 8166 (1903). Carpenter and Somerville. Obtaining cyanogen compounds from gas. June 17.

,, 9087 (1903). Wolters. Coking ovens. June 17.

,, 9401 (1903). Wilke. Coking ovens. June 17.

,, 9504 (1903). Lindemann (Korting). Gas producers. June 17.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 12,518. Haddon (Edson). Evaporating apparatus for separating naphtha, &c. from oil or other liquid.* June 2.

,, 12,696. Oppenheimer and Kent. Elimination of water from tar, and recovery of the volatile products. June 5.

,, 13,185. von Wirkner. Manufacture of pitch.* June 12.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 12,681. Johnson (Badische Anilin und Soda Fabrik). Manufacture of soluble compounds or salts of basic colouring matters. June 5.

,, 12,879. Ellis (Chem. Werke vorm. Sandoz). Manufacture of blue sulphur dyes. June 8.

,, 13,035. Imray (Soc. Chem. Industry in Basle). Manufacture of a black sulphurised dyestuff. June 10.

,, 13,192. Newton (Bayer). Manufacture of new dyestuffs of the triphenylmethane series. June 12.

[C.S.] 16,823 (1902). Ransford (Cassella). Manufacture of new aromatic compounds and of colouring matters therefrom. June 17.

,, 16,897 (1902). Imray (Meister, Lucius und Brüning). Sulphurised dyestuffs for printing fabrics. June 10.

,, 16,931 (1902). Johnson (Kalle). Manufacture of green dyes containing sulphur. June 10.

,, 16,932 (1902). Johnson (Kalle). Manufacture of sulphur dyes for dyeing cotton directly. June 17.

,, 7025 (1903). Imray (Soc. Chem. Industry in Basle). Manufacture of condensation products from nitroso-oxy compounds or quinone chlorimides and aromatic amines, of leuco-indophenols therefrom, and of sulphurised dyestuffs derived from the said condensation products and leuco-indophenols. June 17.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 12,632. Byrne. Apparatus suitable for performing cleansing and analogous operations on textile fabrics, for decocting organic substances, &c. June 4.

,, 12,854. Finegan. Machine for scouring and dyeing skeins. June 8.

,, 12,919. Wood. Gig mills, or machines for raising, dressing, and finishing textile fabrics. June 9.

,, 13,116. Imray (Meister, Lucius und Brüning). Printing fabrics with indigo. June 11.

[C.S.] 13,982 (1902). Lang Bridge, Ltd., and Wood. Apparatus to be used in connection with the mercerisation of cotton and other yarns. June 10.

„ 14,149 (1902). Crochet. Treatment of textile vegetable fabrics. June 10.

„ 15,537 (1902). Cock and Cock. Pressing, dyeing, and washing cotton. June 17.

„ 15,633 (1902). Callender. *See under* XIX.

„ 16,372 (1902). Grimshaw. Fireproofing of textile fabrics. June 10.

„ 16,438 (1902). Calico Printers' Association and Nuttall. Colour effects on woven fabrics by embossing and printing. June 10.

„ 17,174 (1902). Printing Arts Co., Black, and Mowbray. Multi-colour printing machines for calico, &c. June 17.

„ 22,673 (1902). Carter. Producing *moiré* effects on fabrics. June 17.

„ 770 (1903). Ter Weele. Machines for sizing yarns, &c. June 17.

„ 7562 (1903). Wild. Apparatus for oxidising dyed textile material. June 17.

„ 7872 (1903). Jackson and Hunt. Machines for variously treating fabrics in the open state. June 17.

„ 8201 (1903). Barbay. Machines for producing *chiné* effects on yarn. (Int. Appl., July 22, 1902.) June 10.

„ 8399 (1903). Hulse and Co. Adams and Wallwork. Apparatus for printing textile fabrics, linoleum, &c. June 17.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 7836 (1902). Schulthess. Process for colouring building materials, such as lime, mortar, bricks, and artificial stone. June 10.

„ 5211 (1903). Dreher. Process for dyeing skins or partly prepared leather. June 17.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 12,773. Johnson (Kalle and Co.). Manufacture of colloidal bismuth oxide. June 6.

„ 12,779. Castner-Kellner Alkali Co. and Haddock. Manufacture of alkali metal. June 6.

„ 13,119. Thompson (Savon Frères et Cie.). Process for producing carbonate of soda, caustic soda, carbonate of potash, caustic potash, and the like, and apparatus therefor.* June 11.

[C.S.] 14,111 (1902). Linde British Refrigeration Co. (Linde). Separating gases from a liquefied mixture thereof. June 17.

„ 16,238 (1902). Spence and Peter Spence and Sons, Ltd. Manufacture of a new titanous chloride. June 10.

„ 17,650 (1902). Naylor. Obtaining ammonia from towns' refuse or other nitrogneous organic matter. June 17.

„ 18,427 (1902). Pauling. Process and apparatus for the production of nitric acid. June 10.

„ 21,828 (1902). Pauling. Manufacture of nitric dioxide and nitric acid. June 10.

„ 2199 (1903). Schlutius. Treating gases by electric spark discharges. June 17.

[C.S.] 2200 (1903). Schlutius. Manufacture of am nium formate or ammonia. June 17.

„ 8166 (1903). Carpenter and Somerville. *under* 11.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 12,861. Dinz. Drying kilns for ceramic ware the like. (Fr. Appl., Dec. 17, 1902.)* June

„ 13,046. Dansette. Manufacture of ceramic artic June 10.

IX.—BUILDING MATERIALS, CLAYS, MORTAR AND CEMENTS.

[A.] 12,472. Brandner and Miller. Building block June 2.

„ 12,584. Mack. Manufacture of a composition fr calcined gypsum.* June 3.

„ 12,698. Liesel. Composite material for decorat and like purposes.* June 5.

[C.S.] 7836 (1902). Schulthess. *See under* VI.

„ 12,762 (1902). Martin. Making white Portl cement for decoration. June 10.

„ 15,437 (1902). Kœniger. Manufacture of bri or artificial stone. June 10.

„ 16,066 (1902). Thwaite. Manufacture of Portl cement. June 10.

„ 16,215 (1902). Collins. Manufacture of a ref tory material. June 17.

„ 17,580 (1902). Mills (Seigle). Manufacture f artificial building materials. June 17.

„ 17,745 (1902). Heany. Water, acid, and firep insulating compositions. (Internat. Appl. Nov. , 1901.) June 10.

„ 18,829 (1902). Salamon and Williams. Manu ture of artificial stone or other refractory mate June 10.

„ 20,534 (1902). Rigby. Manufacture of bricks artificial stone. June 10.

„ 6849 (1903). Haddan (Crozier). Bricks, blo or artificial stone. June 17.

X.—METALLURGY.

[A.] 12,644. Spooner (Magnetic Ore Separating Proprietary). Separation of zinc blende fr ores.* June 4.

„ 12,727. Auchinachie. Manufacture of met vanadium from its ores or compounds. June

„ 12,732. Hatton. Treatment of slag in ma turing steel. June 6.

„ 12,778. Turner. Apparatus for separating me from their crushed ores or material conta same. June 6.

„ 12,813. Ker and Ker. Engraving or et metallic surfaces. June 8.

„ 13,182. Croucher. Plating of aluminium or to metals. June 12.

„ 13,239. Smith and McIlwraith. Furnaces reducing metals or ores. June 13.

„ 13,271. Cattermole. Separation of metallic constituents of ores from gangue. June 13.

[S.] 5604 (1902). Hadfield. Toughening of manganese steel. June 17.

, 12,778 (1902). Lake (Froment). Concentration of ores. June 10.

, 13,614 (1902). Dick. Separation of pieces of iron and steel from zinc refuse or dross of galvanising works. June 17.

, 13,669 (1902). Boult (Wachwitz and Dunkelsbühler). Manufacture of compound metal plates, wire, and the like. June 17.

19,981A (1902). Hyde (Union Lead and Oil Co.). Lead in the form of powder. June 10.

8591 (1903). Elbers. Treatment of fine iron ores for blast furnaces. (Int. Appl., May 9, 1902.) June 10.

I.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[ ] 12,897. Warren and Crowley. New electrolyte or battery solution. June 8.

[.] 12,702 (1902). Gin. Electrical production of iron alloys, with simultaneous production of alkaline oxides and alkaline earths. June 10.

13,739 (1902). Lake (General Electric Co.). Electric insulating material. June 10.

16,358 (1902). Gurwitsch. Electrolytic processes and apparatus. June 17.

16,824 (1902). Marichal. Apparatus for use in electroplating. June 17.

2199 (1903). Schlutius. *See under* VII.

2200 (1903). Schlutius. *See under* VII.

5693 (1903). Schiele. Electroplating of metals. June 10.

8964 (1903). Yai. Electric batteries. June 10.

X.—FATS, FATTY OILS, WAXES, AND SOAP.

A 12,896. Elias. Antilithic soap. June 8.

7410 (1903). Meusel. Manufacture of oils. June 17.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

A 12,713. Lake (Synd. l'Exploitation Invent. Prof. Oettli). Manufacture of white lead. June 5.

„ 12,719. Lake (Synd. l'Exploitation Invent. Prof. Oettli). Manufacture of oxide of zinc. June 5.

„ 13,102. Armbruster and Morton. Processes of making pigments.* June 11.

„ 13,298. Scholz. Manufacture of white paint. June 13.

S. 3768 (1903). Armbruster and Morton. Process of making pigments. June 10.

B.—Resins, Varnishes.

A. 12,645. Stempel. Protective composition.* June 4.

„ 12,712. Abelmann. Manufacture of quick-drying varnishes. June 5.

[A.] 13,033. Glinsky. Protection of metallic surfaces from oxidation and from the action of liquids. June 10.

„ 13,178. De Liebhaber. Preparation for removing paint, varnish, &c., from wood, iron, &c. June 12.

[C.S.] 15,889 (1902). Seeser. Making linoleum and the like with double layers. June 10.

C.—India-rubber, &c.

[A.] 13,306. Velvril Co., Ltd., and Howkins. Manufacture of india-rubber substitutes. June 13.

[C.S.] 17,014 (1902). Gubbius. Treatment of india rubber waste. June 17.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[C.S.] 19,661 (1902). Dymond (MacMillan). Method of making leather. June 17.

XVI.—SUGAR, STARCH, GUM, Etc.

[C.S.] 9078 (1903). Meyer (Meyer and Arbuckle). Means of evaporation for the concentration of syrups, &c. June 17.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 12,609. Kier. Procedure for gaining wine and cognac out of plums of every kind. June 4.

[C.S.] 27,063 (1902). Slaviček. Fractional distillation, condensation and rectification of liquids, particularly mash, for obtaining extra fine spirit direct from the mash. June 10.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 12,555. Bendixen. Sterilisation of milk. June 3.

„ 12,867. Marks (Pfaff). Process for, and materials for use in, the preservation of eggs.* June 8.

„ 13,302. Simcocks. Preservatives for milk or other alimentary substances. June 13.

[C.S.] 9242 (1903). Seiffert. *See under* XX.

„ 9615 (1903). Baker. Treatment of coffee. June 17.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 12,674. Hawke. Manufacture of blotting paper. June 5.

„ 12,675. Hawke. Manufacture of blotting papers. June 5.

[C.S.] 15,633 (1902). Callender. Treatment of waste liquors from manufacture of peat, moss fibre, or paper. June 17.

„ 16,633 (1902). Hoffmann. Process of making strengthened paper or pasteboard. June 10.

„ 17,503 (1902). Thompson (Verein. Kunstseidefabr. A.-G.). Manufacture of colourless cellulose films and threads. June 17.

„ 7023 (1903). Stearn. Manufacturing filaments from cellulose. (Int. Appl., April 3, 1902.) June 10.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 12,798. Langheld. Therapeutic products. June 6.

„ 13,263. Ambrose. Medicinal compound.* June 13.

[C.S.] 14,699 (1902). Ellis. (Soc. Chim. Usines du Rhône). Manufacture of acetyl salicylic acid and its esters. June 10.

„ 1944 (1903). Boehm (Fischer). Preparation of ureides of dialkyl acetic acids. June 10.

„ 9242 (1903). Seiffert. Sterilising organic liquids. June 17

[C.S.] 9340 (1903). Wideen and Carbon Hydrate Chemic Co. Obtaining carbon compounds having th general formula $C_{10}H_{16}O$. June 17.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 12,513. Selle. Dyeing photographic plate June 2.

[C.S.] 13,093 (1902). Krayn. Pigment process of phot graphy. June 17.

„ 27,607 (1902). Plummer. Photographic print and apparatus therefor. June 10.

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Notices.

NEW SECTION AT SYDNEY, NEW SOUTH WALES.

The Council has granted the application of thirty members of the Society residing in New South Wales to be allowed to form a section, to be called the Sydney Section of the Society.

ST. LOUIS EXHIBITION, 1904.

The invitation to British manufacturers to participate in the St. Louis Exhibition next year, which has been issued by the Royal Commission, with the endorsement of the Prince of Wales as President, may perhaps be regarded by some as an appeal to the patriotism rather than to the business instincts of British manufacturers, but it is to be hoped that on the higher ground indicated it will not be ignored.

It would be most regrettable if other nations made a better display than this country, for, as has been pointed out by His Royal Highness, conclusions respecting the relative industrial importance of various nations will certainly be drawn from the respective exhibits, and thus, indirectly, if not directly, the manufacturing interests of this country will suffer unless they are adequately represented at St. Louis.

The Commission is seeking to encourage the adoption of the principle of collective exhibits, and is offering important advantages to those who co-operate on this basis. The chemical industries lend themselves readily to such a method of representative illustration, and it is satisfactory to learn that already many important firms have signified their willingness to become exhibitors under those conditions.

In order that adequate space may be secured, it is necessary that the Commission should at once receive full information as to the extent to which chemical manufacturers are prepared to support the action now being taken, and those who have not responded to the appeal should do so without loss of time. Full particulars can be obtained from the Secretary of the Liberal Arts Committee at the office ot the Royal Commission for the St. Louis Exhibition, 1904, 47, Victoria Street, S.W.

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CHANGE OF ADDRESS REQUIRED.

Berg, Julius, l/o Waburg, Germany.

Deaths.

Crosbie, Adolphe, Walsall Street Chemical Works, Wolv hampton. June 12.

Finlay, Kirkman, 123, Bishopsgate Street Within, E July 1.

Foulis, Wm., 2, Montgomerie Quadrant, Glasgow. June

Little, J. G., l/o Coquimbo, Chile—at sea. May 15.

Robertson, G. H., 30, Hemstall Road, West Hampste N.W. July 5.

London Section.

Meeting held at Burlington House, on Monday, May 25th, 1903.

MR. WALTER F. REID IN THE CHAIR.

NEATSFOOT OIL.

J. H. COSTE, F.I.C., AND E. T. SHELDOURN, F.I.C.

January 1898 a paper on neatsfoot oil was read before th Section by E. J. Parry and one of us (this Journal, 1·, 4). In this paper some analytical figures for les of pure neatsfoot[*] oil prepared under the supervi n of the authors and some results of the examination of mmercial samples were published.

e authors also expressed the intention of examining fully the nature of the fatty acids of this oil.

e present authors have examined a considerable er of samples of the neatsfoot oil of commerce and, ew of the scanty information as to this oil,[†] have ined several samples of oil prepared under their immediate supervision. This opportunity is taken of publishing the results of :—(I.) The examination of pure oil from neatsfeet; (II.) A preliminary investigation of the constituents of neatsfoot oil; (III.) Some experiments on the alteration of this oil and its fatty acids on keeping, and; (IV.) The examination of commercial samples of this oil.

I. *The Examination of Pure Oil from Neats' Feet.*—The specimens of pure oil examined by us for the purpose of determining the probable limits of variation of the usual analytical figures were all prepared by us or under our supervision in the manner described in 1898, which is, we think, a fair imitation of the process probably used in commercially preparing this oil.

The oil is of a golden yellow colour; on cooling it slowly deposits "stearine," and becomes, in consequence, opaque; after some considerable time the "stearine" falls to the bottom of the vessel containing the oil. If carefully separated from all gelatinous and albuminous matters a reasonable time after boiling, the oil is of a not unpleasant beefy odour and contains very little free fatty acid. On keeping for a very considerable time, exposed to light, the oil becomes colourless and other changes, which will be discussed in Part III., occur.

The more important details of the chemical and physical examination of these specimens are set out in Table I.

TABLE 1.

Examination of Pure Neatsfoot Oil.

	I.	II.	III.	IV.	V.	VI. American Shorthorn.		VII.	VIII.	Mean, including 1898 Samples.
—	Feet of Shorthorn.	Feet of Hereford.	—	One Foot only.	Two very Large Feet.	(a) Interdigital Oil.	(b) Main portion of Oil.	Calf's Feet.	Norfolk 2-year old Bullocks.	
p. , D 60°/60° F.	0·9161	0·9156	0·9151	..	0·9152	0·9180	0·9158	0·9156	0·9181	(of 10) 0·9164
tage of caustic potash ired to neutralise free a	0·11	..	0·77	0·05	0·12	..	0·05	0·04	0·11	(of 9) 0·15
to oleic acid	0·56	..	3·95	0·28	0·61	..	0·27	0·19	0·56	,, 0·75
tage of caustic potash ired for saponification (l)	*20·42	*20·67	19·72	19·36	19·78	19·72 19·85	19·97	19·62	19·81	,, 19·71
absorption (Hübl)	70·4	69·9	73·1	70·3	68·5	66·0	70·6	66·4	71·3	(of 11) 70·0
ble fatty acids (by ner's method)	*92·5	*93·7	95·2	95·4	94·8	94·5	95·9	..	..	(of 7) 95·2
e fatty acids from 5 ., saturate c.c. N/10 ic potash	*1·8	*2·6	1·1	0·9	0·9	..	1·2	..	..	(of 4) 1·0
onifiable matter	..	0·51	0·48	0·65	0·34	0·32	0·34	0·39	0·12	(of 8) 0·39
tive index (Abbé re- ometer corrected to .)	*1·4700	*1·4699	1·4691	1·4681	1·4678	..	1·4683	1·4676	1·4680	(of 6) 1·4681
tion figure (Zeiss bu- refractometer cor- d to 20° C., sodium)	*66·7	*66·7	64·3	63·9	63·8	..	64·4	63·0	64·6	,, 64·2
ctive index	1·4702	1·4702	1·4686	1·4684	1·4683	..	1·4687	1·4678	1·4688	,, 1·4685

Note.—The figures marked * were obtained after keeping the sample for three years, and were not included in averages.

The refractive indices and Zeiss butyro-refractometer numbers were obtained through the kindness of Mr. H. E. Burgess, of the London Essence Company, who placed his refractometers at our disposal. We take this opportunity of expressing our best thanks to this gentleman.

The mean correction for this oil per 1° C. between 12·4° C. and 32° C. was, for the Abbé instrument, 0·00036, and for the Zeiss instrument, 0·61.

We give the refractive indices calculated from the Zeiss figures by means of the table supplied with the instrument.

The unsaponifiable matter, which is small in amount is, according to Holde and Stange, principally cholesterol, melting, in the case of 10 samples, between 145 and 147° C., and in one case between 147° and 148° C.

The Mixed Insoluble Fatty Acids of Neatsfoot Oil.—The fatty acids of most of the pure samples prepared by us have been examined quantitatively. In some cases the acids were liberated before, and in others after, the removal of the small amount of unsaponifiable matter which this oi contains. The presence of this in the acids made very little difference in their properties, as is shown in the case of the two preparations from specimen III.

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[*] at (nete, neet) is an old English word for oxen. It is used ucer—

His lordis scheep, his nete, and his dayerie.
Canterbury Tales, Prologue (*The Reve*).

Shakespeare—

" . . . . The steer, the heifer, and the calf are all
called neat . . . . "
Winter's Tale, i.

neatsfoot, as sold, includes the whole of the leg below the or tarsus, according as it is from the fore- or hind-leg. appears to principally occur at the articulation of the bone (formed by the fusion of metacarpals III. and IV.) e two sets of digital bones forming the cloven foot and the digits immediately above the junction of the s.

[†] e the above was written the authors have noted a paper tsfoot oil by Holde and Stange (Mitt. aus den konigl. Versuchanst. zu Berlin, 1900, 18, [5], 255—261, abstracted Journal, 1901, 484). Dr. Holde, during a visit to London, e conversation with one of us, and we found that his ice with this oil was in general agreement with our own. and Stange's figures were obtained on pure oils, and will ed to in this paper.

In most cases the mixed acids were nearly white. Those from VIII. were slightly coloured.

The low amount of caustic potash required for the neutralisation of the fatty acids of VIII. led us to determine the total amount required on saponification, which was about 1·0 per cent. higher. This difference has been noticed l Philippe (Ann. de Chim. anal., 1902, 7, 447—450) in tl case of kapok oil, and by Tortelli and Pergami. Philip is of opinion that anhydrides are formed during the washi with water.

In a later part of this paper we call attention to anhydride formation, accompanied by other alterations a apparently due to keeping.

Table II.

Examination of Fatty Acids of Pure Neatsfoot Oil.

——	I.	II.	III.	IV.	V.	VI*a*.	VI*b*.	VII.	VIII
Sp. gr., D 100°/100° C.	..	..	(1) 0·8721 (2) 0·8728	..	0·8720	..	0.8749	0·8713	0·87
Solidifying point, ° C.	29·2	29·2	(1) 24·5 (2) 24·9	..	27·8	..	27·0	28·7	27·3
Melting point	..	..	..	..	..	..	..	..	..
Percentage of caustic potash required to neutralise	..	..	(2) 20·37	..	20·29	20·29	20·63	20·36	19·34 19·46
Mean combining weight	..	..	275·4	..	276·5	276·5	271·9	275·5	..
Iodine absorption (Hübl)	..	..	(2) 77·0	..	72·4	..	72·6	71 0	73·3
= oleic acid per cent.	..	..	85·5	..	80·4	..	80·6	78·9	81·4

* 20·45 per cent. required for saponification.

The fatty acids of the samples examined in 1898 gave the following figures :—

——	II	III.
Sp. gr. D 100°/100° C.	0·8742	0·8800
*Iodine absorption	74·5	75·8
Percentage of caustic potash for neutralisation	20·12	20·06
Mean combining weight	279·0	280·0
Solidifying point	..	26·1° C.
Melting point	29·2° C.	28·5° C.
* = oleic acid per cent.	82·7	84·2

II. *The Constituents of Neatsfoot Oil.*—Neatsfoot oil, which is usually seen as a saturated solution of a solid fat in a liquid oil, with some solid matter separated out, can, by warming and then allowing to cool slowly, be obtained as a super-saturated solution, from which, however, the solid separates after a time. This change of condition does not, we find, sensibly affect the density of the oil.

The yellow colour of the oil is due, we think, to a pigment of the nature of a lipochrome. The absorption spectrum of the oil shows bands corresponding roughly to the lines F. and G. of the solar spectrum.

It is difficult to examine this pigment as, though it is, to a great extent, extracted by ether after saponification, it is mixed with cholesterol which complicates any attempt to identify it by colour reactions.

That the unsaponifiable matter is principally cholesterol has been shown by Holde and Stange, who considers the presence of phytosterol to indicate admixture with vegetable oils. This is doubtless the case.

The high iodine absorption of the oil, corresponding to about 80 per cent. of triolein, accompanied as it is by an amount of solid glycerides so great as to cause a turbidity at ordinary temperatures, has led some to suggest that glycerides of other less saturated acids than oleic may be contained in the oil. We find, however, that very little "stearine" is obtained on adopting the obvious method of filtration of the oil in the cold, and when it is remembered that tallow, which contains only about 50 per cent. of solid glycerides is a solid, it is not so remarkable that an oil containing 20 per cent. should be a turbid liquid at ordinary temperatures. We have not been able to investigate the fatty acids of this oil as fully as we could wish, but our experiments so far give confirmation to the view that no less saturated glycerides than triolein are present in any quantity.

An experiment, on a very small scale, with the fa acids of a very good commercial sample gave, by the eth lead salt method, 24 per cent. of insoluble acids, wh however, were by no means free from unsaturated aci as the iodine absorption 25·1 per cent. indicated. T liquid acids absorbed 86·1 per cent. of iodine (oleic a absorbs 90 per cent., linolic acid 181·1 per cent., li lenic acid 273·7 per cent.) The low amount of s acids and the nearness of the iodine absorption of liquid acids to that of oleic acid agrees with the view t this acid is the least saturated body present, in fact, unl we suppose the liquid acids to be enormously contamina with solid acids, there is no reason here for supposing presence of less saturated acids than oleic acid.

An experiment on a larger scale showed that the s acids were mainly, if not entirely, a mixture of stearic palmitic acids, in which the latter would appear to p dominate. The oxidation by alkaline permanganate the liquid acids in dilute alkaline solution yielded only addition to some unattacked oleic acid, and some aze acid, dihydroxystearic acid ($C_{17}H_{33}(OH)_2 COOH$), wh was recognised by the amount of caustic potash require neutralise and by the increase on acetylation.

——	Found.	Calculated t $C_{18}H_{36}O_4$.
	Per Cent.	Per Cent.
Caustic potash to neutralise	17·79, 17·87	17·72
Increase on acetylation ...	24·0	26·6

The melting point (130°) was rather lower than of pure dihydroxystearic acid, but the chemical fig are conclusive of the absence of higher hydroxy-a in this part of the oxidation product; in fact, we entirely unable to detect any evidence of their presen

The aqueous filtrate from the insoluble products f oxidation only contained azelaic acid and mineral s The absence of tetra- and hexa- hydroxystearic acids the presence only of dihydroxystearic acid and aze acid, as products of mild oxidation confirm the view t the only unsaturated acid present in any quality is ic acid.

We conclude that the fatty acids of neatsfoot contains from 80—85 per cent. of oleic acid, and 20-15 per cent. of mixed palmitic and stearic acid, palmitic being present in the larger quantity.

III. *The Alteration of Neatsfoot Oil on keepi*— The common explanation, in the oil trade, of the prese of an excessive amount of free fatty acids in animal is that acidity develops with great rapidity, especial in rm weather; that this is not necessarily so is shown by e following figures obtained on samples of neatsfoot oil amined by us:—

TABLE III.

Sample Number (see other Tables).	Free Acid calculated as Oleic Acid in			
	Fresh Oil.	Oil after 1 Year.	Oil after 2 Years.	Oil after 3 Years.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
. 1898	Trace	0·14 (10 months)	..	..
. 1898	0·37	0·38 (10 months)	..	..
. 1903	Not determined.	0·55	0·89	1·69
. 1903	„	Not determined.	Not determined.	0·62
. (Table IV.)	2·5	„	„	3·30

From these figures, incomplete as they are, it may be n that animal oil, if carefully prepared, can be kept for very considerable time without becoming unduly acid. however, due care has not been taken to free the oil m albuminous and gelatinous matter, and from water, e acid develops very quickly, as was shown in the case specimen III, 1903, which, owing to an accident to one us, was left for five weeks over the stock formed on ling the feet. This sample, when ultimately skimmed l filtered, contained free acid equal to 3·95 per cent. ic acid, and had a rank, unpleasant odour. We have ially noticed that excessively acid oils are dirty looking l not well rendered, containing suspended connective sue, &c.

We therefore conclude that an excessive amount of free ty acid is evidence, not so much of age, as of careless paration of this oil.

The increase in the amount of free fatty acid would pear to be only part of the change which occurs on ping neatsfoot oil.

Samples I. and II. had been kept for three years, and l become colourless. The fatty acids were prepared and l very low iodine absorptions:—I. 62·3 per cent. iodine. 61·3 per cent. iodine. These preparations of acids re both coloured. The oils themselves originally, as will seen in Table I., absorbed considerably more iodine, and re yellow in colour.

Some old, but unexamined preparations of the fatty acids these oils had distinct "ester numbers." The fatty acids II. kept two or three years gave the following figures examination:—

Melting point .... 35° C.
Caustic potash required to neutralise .... 18·46 per cent.
„ „ „ hydrolyse .... 3·14 „
Iodine absorbed .... 55·6 „

This preparation was separated by the lead salt process o solid and liquid acids. The solid acids consisted of aric and palmitic acids. The liquid acids, on examination, ve the following figures:—

——	——	Oleic Acid requires	Stearolactone requires
	Per Cent.	Per Cent.	Per Cent.
ıstic potash required to neutralise.	17·23	19·89	Nil.
ıstic potash required to hydrolyse.	3·84	Nil.	19·89
ine absorbed	70·6	90·0	Nil.

The evident change of an acid unsaturated body into a ıtral saturated body, taking place in the liquid fatty ds, is explained by the assumption that some oleic acid s become converted into a stearolactone; as this lactone es not, on hydrolysis and subsequent liberation, easily re- m from its corresponding hydroxy-acid (this was shown the product requiring almost as much caustic potash to neutralise as the original mixture did to hydrolyse), it is improbable that a γ-lactone is formed. The decrease in iodine absorption in the oil itself on keeping is partially explained by this lactone formation, but we think that a change of direct oxidation also takes place; for the following reasons:—(*a*) The amounts of caustic potash required to hydrolyse specimens I. and II. (Table I.) are much higher than those required by any of the fresh oils examined by us, indicating that, notwithstanding the fact that stearolactone requires exactly the same amount of caustic potash to hydrolyse as oleic acid does to neutralise, a considerable decrease of mean molecular weight has occurred. The same is true of the fatty acids, which require, II., 21·60 per cent., and the liquid acids of II., 21·07 per cent. (oleic acid requires 19·89 per cent.). (*b*) The percentages of insoluble fatty acids in specimen I. and II. are lower than those in any of the freshly examined samples, and the volatile acids are very slightly higher. The decrease in insoluble acids is explained by the presence of such a direct oxidation product as azelaic acid. (Gröger, this Journal, 1889, 202, found suberic acid, $C_6H_{12}(COOH)_2$, and azelaic acid, $C_7H_{14}(COOH)_2$, in various fats.)

An oil which had been kept for about two years in the dark, and for one year on a shelf away from direct sunlight, gave the following figures on examination:—

——	Fresh Oil.	Oil after keeping.
	Per Cent.	Per Cent.
Caustic potash required to hydrolyse.	19·98	20·33
Iodine absorbed	71·9	68·4

The alteration in free acid is shown in Table III. We think it fair to assume that very little change has taken place on keeping, under these conditions.

We therefore conclude:—

I. That clean neatsfoot oil, on keeping in the dark, alters but very little, but that the presence of other (nitrogenous?) organic matters favours the liberation of fatty acids and the change known as rancidity.

II. That on exposure to light in corked bottles (we cannot say that these samples were hermetically sealed, as we had no intention originally of examining the changes on keeping), the colouring matter of this oil is converted into a colourless substance which, however, imparts a colour to the fatty acids prepared from the oil.

III. The changes undergone by the fatty acids of neatsfoot oil on keeping with exposure to light, appear to be twofold (*a*) an isomeric transformation of oleic acid into a stearolactone, and (*b*) an oxidation of oleic acid to azelaic acid, and possibly to acids of lower molecular weight—volatile acids. The lactone formation may account for the apparently slow formation of free fatty acid.

These changes appear to be accompanied by a raising of the refractive index. See Table I.

Note.—The experiments recorded in this section are by no means as complete as we should wish. They are the result rather of accident than of design, and as they would take some years to repeat, we have thought it better to place them before the Society rather than withhold them, as they certainly throw some light on very interesting problems.

IV. *The Examination of Commercial Neatsfoot Oil.*—Neatsfoot oil is much used for leather dressing, and to some extent for lubricating purposes. It commands a sufficiently high price to render it subject to much adulteration and even substitution.

Table IV. shows the results of the examination of some of a number of samples examined by us since 1898. We have in most cases found that the determination of the specific gravity at 60° F., the iodine absorption, the amounts of caustic potash required to saponify and to neutralise the free fatty acids (usually expressed by us as equivalent to free oleic acid), considered together with the appearance, odour, behaviour on warming (as indicating the presence or absence of connective tissue or other insoluble matter), give sufficient information to enable one to form an opinion

TABLE IV.

Examination of commercially obtained Samples of Neatsfoot Oil.

	Oil.								Mixed Fatty Acids.				
No.	Appearance.	Colour.	D 60° 60° F.	Per Cent. Caustic Potash for free Acid.	= Oleic Acid.	Per Cent. Caustic Potash for Saponification (Total).	Iodine Absorption (Hübl).	Unsaponifiable Matter.	D100°/100° C.	M. Pt.	S. Pt.	Caustic Potash to Saturate.	Iodine Absorption (H.).
										° C.	° C.		
1	Turbid	Bright yellow	0·9168	0·50	2·5*	19·98	71·9	0·44 0·55	0·8767	28·1	27·4	..	..
2	,,	,,	0·9158	1·12	5·6	19·90	69·2	0·53	0·8762	30·3	27·6	20·67	..
3	,,	,,	0·9149	0·98	4·9	19·70	70·3	0·25	0·8717	36·0	26·9	20·50	..
4	,,	,,	0·9160	0·90	4·5	19·68	71·8	0·40	0·8733	33·0	27·5	20·43	..
5	,,	..	0·9382	0·82	4·1	14·00	55·9	29·40	..	36·0	..	20·52	..
6	,,	..	0·9212	0·52	2·6	18·80	58·2 (*bis*)	5·80	0·8693	..	..	..	..
7	,,	..	0·9155	0·17	8·4	19·82	50·1	..	..	..	..	..	..
8	,,	..	0·9173	0·06	0·3	20·22	70·8	..	..	..	..	..	..
9	,,	..	0·9169	0·20	1·0	20·22	68·7	..	..	..	..	..	..
10	,,	..	0·9181	1·80	9·0	20·20	84·4	0·58	0·8752	31·4	27·4	..	.
11	,,	..	0·9162	0·52	2·6	19·28	72·6	0·33	0·8730	28·0	28·0	..	..
12	,,	..	0·9166	0·28	1·4	19·79	69·8	..	..	..	..	..	..
13	,,	..	0·9162	0·26	1·3	19·11	71·0	..	..	..	..	..	..
14	,,	..	0·9216	1·24	6·2	19·49	87·5	..	..	..	..	..	..
15	,,	..	0·9168	0·84	4·2	19·79	76·0	..	..	..	..	..	..
16	,,	..	0·9195	0·38	1·9	19·50	86·6	..	..	..	..	..	..
17	,,	..	0·9207	2·00	10·0	20·09	84·9	..	..	..	..	..	..
18	,,	..	0·9166	0·28	1·4	19·74	70·2	0·20	..	..	..	..	..
19	,,	Dull yellow	0·9314	0·60	3·0	15·35	53·7	22·40†	0·8733	..	35·2	20·77	59·9
20	,,	,,	0·9182	0·80	4·0	19·58	60·1	3·60	..	..	..	..	..
21	,,	Deep yellow	0·9211	0·08	0·4	19·64	82·5	..	..	..	..	..	..

* After three years increased to 3·3 per cent.

† D 60°/60° F., 0·9886.

as to the purity and quality of a sample. Holde and Stange recommend the identification of cholesterol, as distinguished from phytosterol, or mixtures, in the unsaponifiable matter as a means of detecting adulteration, more especially with vegetable oils. This method is certainly useful in suspicious cases, or when it is necessary to form an opinion as to the nature of a subtle adulterant.

On comparing the figures in the above table with those obtained from pure oils it will be seen that several of these commercial samples are of very unsatisfactory character.

Note.—Nos. 19, 20, and 21, were kindly examined by Mr. Burgess who obtained at 20·5° C., the following figures :—

—	n_D (Abbé).	Zeiss Refractometer Number.	n_D
19	1·4841	89·9	1·4839
20	1·4689	65·0	1·4691
21	1·4688	65·0	1·4691

The Abbé figures would be 0·00018, and the Zeiss figures 0·3 higher at 20·0°.

No. 19 is obviously not neatsfoot oil, and Nos. 20 and 21, though within the limits found, are sufficiently far from the mean figure 1·4681 to arouse suspicion.

Conclusion.—We hope that the work described in the four preceding sections, though not, in all respects, as complete as we would wish, may, with that of Holde and Stange, have placed our knowledge of the chemistry of this oil on a firmer basis and may enable those called upon to examine this and allied oils to feel some certainty as to the physical properties and empirical chemical figures of this oil. It is, in our opinion, extremely desirable that some other relatively common oils should be obtained in a state of known purity and examined. Many cases of wide variation in published figures would then, we think, be shown to be most probably due to impurities and not to natural variation.

NOTE ON THE NITRIC ACID TEST FOR COTTONSEED OIL.

BY J. H. COSTE, F.I.C., AND E. T. SHELBOURN, F.I.C.

Cottonseed oil when agitated with an equal volume of nitric acid of sp. gr. 1·37 (containing 59—60 per cent. nitric acid*) assumes a coffee-brown colour (Lewkowits "Oils, Fats, and Wax," 1st Edit., p. 310). We ha considered this test to be useful in detecting the prese of cotton-seed oil in neatsfoot oil. Recently, however, examined an oil from which the following figures w obtained :—

Density 60°/60° F.	0·9170
Free acid (= oleic acid)	0·23
Caustic potash required to saponify	19·29
Iodine absorbed (Hübl)	73·2
Unsaponifiable matter	0·65
A microscopical examination of this after crystallisation indicated the absence of phytosterol.	
Solidifying point of fatty acids	28·5
(The fatty acids were white.)	

This oil had the appearance and odour of neatsfoot but gave a brownish colour similar to, but less in intens than, that given by pure cottonseed oil; as some of above figures while agreeing with those given by a p oil were not inconsistent with the presence of 10 per ce of cottonseed oil we decided to examine those of known pure specimens of neatsfoot oil which w available, and also some other samples. The results obtained are shown in the following table :—

Sample.	Colour of Oil immediately after Shaking.	Colour of Oil on Standing.	Colour of Al Layer.
I., pure	Yellow	Brown	Pink
II. ,,	,,	,, (deeper than I.)	,,
III. ,,	Pink	Dirty crimson	,,
V. ,,	Pale pink	Pink	,,
VI*b*. ,,	Smoky pink	Smoky pink	Colourle
VIII. ,,	Yellow	Brown	Pink
Sample in question	Dull orange	Reddish purple	Colourle
A supposed pure sample	Yellow	Dirty brown	Pink
Pure cottonseed oil	Dull orange	Reddish-brown	Colourle
A known adulterated sample. (See preceding paper, Table IV.)	Pale brown	Brown	Slightly br

The behaviour of pure neatsfoot oils towards nitric acid on the one hand, and the considerable divergence of inion as to which sample the known adulterated sample sembled in its behaviour to this reagent on the other, s led us to reject this test as conclusive of the presence absence of cottonseed oil. We consider that the mple which was the occasion of these experiments was nuine neatsfoot oil, as the character of the unsaponifiable atter did not indicate the presence of vegetable oil and e solidifying point of the fatty acids was not high enough suggest the presence of cottonseed oil.

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* The actual sp. gr. (15·5°/15·5°) of our acid was 1·375, and was found on titration to contain 59·4 per cent. HNO_3.

This oil gave a slight indication of the presence of ttonseed oil with Halphen's test, but judging from mparative experiments this would not have corresponded th more than about 3 per cent. of that oil, and in any se it would be difficult to condemn a sample on a colour st alone.

Mr. Coste remarked that Halphen's test had been ndered somewhat unreliable by the discovery that the of stock fed on cottonseed cake or meal gave an lication of the presence of cottonseed oil when examined this method.

Discussion.

Dr. Lewkowitsch said, with regard to the nitric acid t, that he must disclaim any particular affection for it, he had stated elsewhere (Chemical Analysis of Fats, &c., Edit., p. 381). He looked upon most colour tests as reliable. To judge from the melting point of a mixture to a few per cents. of cottonseed oil, was altogether safe. The iodine absorption of the liquid fatty acids, and examination of the unsaponifiable matter would give a inite answer as to the question of adulteration. Most our tests should only be regarded, in cases of doubt, as liminary tests. Halphen's test was much more reliable indicating the presence of cottonseed oil in mixtures, l should be used for that purpose merely as a prelimin- test, and with such limitations as the author had icated. A negative Halphen test did not prove the ence of cottonseed oil, because the colouring matter ing this test was destroyed at temperatures above 200° C. e nitric acid test would frequently give indications of tonseed oil with samples which had been heated and longer gave the Halphen test. But even a positive lphen test was not always reliable, as Mr. Coste had ntioned, since cattle and pigs fed on cotton cake, wed in their milk, fat, or lard, the colouring matter ginally contained in cottonseed oil. Pigs fed experi- ntally, in the United States, with cotton cake yielded lard wing this reaction as strong as would be given by lard taining 25 per cent. of cottonseed oil. If it was essary to prove the presence or absence of cottonseed in animal oils or fats the unsaponifiable matter should examined.

Ir. Grant Hooper said he had been specially inter- d in the figures given by the authors as representing constants for neatsfoot oil of undoubted purity, and he hered that since the former investigation Mr. Coste had reason to extend the maximum range of specific gravity n 0·9174 to 0·9185. He should be inclined to divide the erous adulterations he had met with into three classes : Adulteration with mineral oils—unsaponifiable oils, ch in many cases were clearly not resin oil but oleum. 2nd. Adulteration with vegetable oils, in nection with which they had a most important test of ch Mr. Coste had not made much, *viz.*, the refraction. r times out of five determinations of the specific gravity refraction sufficed to clearly indicate if an oil were lterated. Speaking in terms of the Amagat-Jean instru- it, a refraction varying from −2 to −4 might be looked with genuine neatsfoot oil, and if there was a *plus* tion adulteration was indicated. With that there ld be probably an increase of gravity and almost oubtedly an increase in the iodine absorption. With rd to the latter he gathered that Mr. Coste used the l method of determination. He thought the Wij was er and quicker, but he would like to ask whether the iors, in determining the iodine absorption, were in the t of providing a good excess of the reagent and for t time the reaction was allowed to proceed. The third of adulteration was the addition of other animal —practically tallow oil in greater or less proportion. This was probably more difficult to deal with, though the appearance of the oil frequently indicated the character of the sample. With these the reaction, instead of being −4 on the Jean refractometer, dropped away to −6 or −9 ; and the iodine absorption similarly dropped. A mixed adulteration of course increased the difficulty, but he thought that a determination of the iodine and saponification values, the specific gravity and the refraction, sufficed to render it clear whether one had to deal with pure neatsfoot oil or not. In many cases it was not necessary to identify the adulterant. It was always interesting, but time did not always permit. But where this was done he agreed with Dr. Lewkowitsch that there were points to which attention might be given in preference to obtaining colour reactions. He did not much like colour reactions, and though he admitted that the nitric acid test was sometimes useful he preferred the Halphen test for cottonseed oil. They were much indebted to Mr. Coste and his colleague for the further investigation of samples of pure neatsfoot oil.

The Chairman said the paper was an interesting one and showed much patient investigation. It was a great advantage to have tests made on substances above suspicion, produced by the analyst himself, or under his supervision. He was rather inclined to doubt the purity of much of the neatsfoot oil in the market, even though it might be of animal origin. He had seen very large quantities of such oil made in the Argentine, where in some factories they killed a thousand or so head of cattle daily, and if a few hundred horses were killed at the same time probably their feet would be utilised with the rest. They were not so particular as an analyst would be in the laboratory, so long as they got an animal oil, which was liquid and looked like neatsfoot oil, and he was inclined to think that some of the reactions which would be found with these mixed oils would puzzle the average analyst. For many purposes, probably, oil from the feet of horses or mares would be as good as neatsfoot oil ; but for others it should be left out. With regard to acid colour tests, he thought these were a little inaccurate, to put it mildly. If you took the nitric acid test you had to consider the specific gravity of the acid, and to make sure there was no nitrous acid present, and also to take precautions that the conditions, especially as regards temperature, were always the same. In the majority of cases these conditions differed, so that you might get the same tests carried out by half a dozen careful analysts, and unless there were the most rigid specification of all the conditions, the results would all be different. As the result of many years' experience he had long since abandoned such tests.

Mr. Coste, in reply, said he was glad to find that Dr. Lewkowitsch agreed pretty much with Mr. Shelbourn and himself, as to the value of colour tests. They rather gathered from his published remarks that he was inclined to attach considerable value to the nitric acid test.

Dr. Lewkowitsch said that was eight years ago.

Mr. Coste said he was glad to hear what he had now said, in which he was supported by Mr. Grant Hooper and the Chairman. Their experience rather led them to disbelieve in colour tests altogether. It was difficult to see what scientific signification they had. They evidently depended rather on the presence of certain impurities than anything else, and they were likely to be very misleading. It was quite true, however, that they had used the nitric acid test and found it apparently rather reliable, and he should not like to say it was useless. But, most certainly, if that or any similar test were used, it should be employed with great care, and of course only as a sort of preliminary test. As to the Halphen tests, those experiments were made, not with the view of getting any determination of the impurities present, but to see whether the indications they obtained should be taken at all seriously, and the conclusion they came to was in the negative, especially as the unsaponifiable matter indicated the absence of the phytosterol.

The reason they had not said much about the unsaponifiable matter was because that had been worked out by Holde and Stange, whose paper had been abstracted in this Journal. Mr. Grant Hooper said he had great faith in the refractometer numbers, and they would have been glad to do so also, but they found the variation was really rather considerable, and the effects of free acids and keeping seemed to make considerable differences in the numbers. They were, therefore, more inclined to adhere to the chemical tests, especially the iodine absorption, and the percentage of potash, the latter indicating the probable amount of any unsaponifiable adulterant. When pure samples were examined the variation was so great that evidently great caution must be used in coming to an opinion as to the presence of small quantities of an adulterant. They had in this case used the Hübl iodine method, and did not think that if properly worked the results were materially different from those obtained by the iodine-chlorine method, at any rate in oils of this character. They usually left the test either for four hours or over night, as the case may be, but did not find much variation; of course they took care to see there was sufficient excess of iodine present, but did not think that was quite so important in the case of such oils as these, as in the case of linseed oil, and others with a higher iodine absorption.

New York Section.

Meeting held at Chemists' Club, on Friday, May 22nd, 1903.

DR. V. COBLENTZ IN THE CHAIR.

MANUFACTURE OF NITRIC ACID. PART III.

BY DR. C. W. VOLNEY.

Practically all the concentrated nitric acid consumed in the arts is made by decomposing sodium nitrate by sulphuric acid. By decomposing the nitrate in other ways and at a high temperature, only a dilute acid can be produced. In all such cases the nitric acid is decomposed, and has to be regenerated, as described before, by contact with water and air, and it may be considered as only a by-product, the residues left in the retorts being the desired product, and which is supposed to bear the cost of the nitric acid. Such schemes abound in early chemical literature, though it is doubtful whether any considerable amount of nitric acid has been produced commercially by these means. Gatty (Génie ind., 1858, 302), for the purpose of regenerating manganese dioxide from chlorine residues, mixed the resulting manganese chloride or sulphate with sodium nitrate in equivalent proportions, and heated the mixture to a dark red heat, the resulting nitrous vapours being used in the manufacture of sulphuric acid. The mixture remaining in the retorts, consisting of dioxide and oxide, with sodium chloride or sulphate, was available again in the production of chlorine. De H. Gilles (Rép. de chim. appl., 1862, 338) examined Gatty's process at length, and reported favourably upon it, though he did not consider it a process for the manufacture of nitric acid. F. Kuhlmann (Comptes rend., **55**, 246) went over the details of the processes, and his experimental work resulted in a representation of the process as $3MnCl_2 + 6NaNO_3 = 2MnO + MnO_2 + 6NaCl + 6NO_2 + 2O$, the escaping gas being regenerated to nitric acid by contact with water, or used in the manufacture of sulphuric acid.

The above processes were devised for use in alkali works, and were not intended for the production of concentrated nitric acid.

The fresh processes for an independent manufacture of nitric acid (other than by sulphuric acid) were suggested by Rudolf Wagner, who, up to 1865, called attention to the convenient supply of alumina from cryolite and bauxite, then a rising industry (Jahresb. der Chem. Techn., 1865). He found that alumina was capable of decomposing nitrate with ease, at a comparatively low temperature; and he also recommended for the same purpose the use of silicic acid, adding that the alchemists had long ago made nitric acid by distilling it in the same way from a mixture of nitrate and clay, as in the case of fuming sulphuric acid from green vitriol. Garraway (Eng. Pat. 2466, Feb. 1895) claimed the distillation of a mixture of sodium nitra and the sulphates of alumina and iron with superheat steam, and the same treatment of a mixture of alk nitrates and silicic acid (U.S. Pat. 590,143, Sept. 1897).

J. H. Johnson had already obtained for Mr. H. Baker a patent to manufacture nitric acid by distilling mixture of alkali nitrate and alumina. Here, however, t main value lay in the residue, which was converted by carb dioxide into alumina and soda (Eng. Pat. 2866, Oct. 1870

The decomposition of sodium nitrate by calcium carbon was suggested by Isidor Walz (Deutsche Ind. Zeit., 186 He describes the treating of the mixture of these two su stances by steam, and states that nearly the theoreti quantity of nitric acid was obtained by condensation in t then used bombonnes (Woolfe's bottles). The dry resid consists of soda and caustic lime, and is then easily convert into caustic soda and calcium carbonate.

K. Lieber (Ber., 1875, 49) in Charlottenburg carried o this process without steam and on a fairly large scale. T results as to production of caustic soda appear to have be satisfactory for those days, and the nitric acid can, of cour have been only of the character of that produced regeneration from the nitrous oxides. The practical wor ing of the process was, however, greatly hampered by t destruction of apparatus, as could be expected, and t was given as the grounds for discontinuing the work.

This process—of Walz as well as modified by Liebe has been revived and further modified by Vogt (Ger. P 69,059 of Jan. 1892) and by Wichmann (Chem. Ind., 189 The temperature for the decomposition of the alkali nitr by calcium carbonate is too high, and furnishes the low oxides of nitrogen only; they propose to mitigate this, a effect the decomposition at a lower temperature by heati a mixture of caustic lime and sodium nitrate in a granula state to nearly the decomposing temperature of the nitr and thus forcing into the retort a current of hot carbo acid gas and steam; by this they claim to effect a perf decomposition and easy development of nitric acid.

The process of decomposing a porous mixture of fe oxide and sodium nitrate by hot air and steam, propo by G. Lunge (Ger. Pat. 74,487 of 1893), in revolving cyl ders which are partly, for a length of five or six feet, hea in a furnace (Ger. Pat. 90,654 of 1898), has been work and described as giving favourable results. The practi working has been described in detail (J. Vogel, Eng. Mining J., 1900, 408), and the results are very interesti especially as to the composition of the residues passing revolving retorts. According to Mr. Vogel's statem the sodium of the nitrate is recoverable to the extent 92 per cent. as hydroxide, and the oxides of nitrogen valuable for the manufacture of sulphuric acid.

As already explained, the economy of all these proce rested mainly with the residues in the retorts or furna and with possibilities of other local application, as the of the nitrous vapours in the manufacture of sulphuric a To combine with such processes the manufacture of co mercial nitric acid, the adoption of a perfect system for regeneration and subsequent concentration of the becomes necessary.

Seeing that the present supply of nitric acid is depend on the South American nitre deposits, that the consump in industry and agriculture is daily increasing, and t constant new uses and applications of this acid are com forth, it becomes natural to seek for other sources of assi able nitrogen; and as the atmosphere is the only remain source of supply, the development of the electro-chem industry has necessarily led to the engagement of capi knowledge, and energy towards utilising the air for production of nitric acid.

The observations made by Lord Rayleigh (J. Chem. S **71**, 181) on the flame of burning nitrogen, followed the report by Sir Wm. Crookes (*Electric World*, 1 No. 33), have stimulated enterprise and hope for practical solution of this problem. The data for formation of sodium nitrate, supplied by Sir Wm. Croo include the supposition that by the discharge of str induction currents in atmospheric air, nitrous and n acid are formed primarily. Evidently this is don presence of water under appropriate conditions, as ele di arges produce from dry air only nitric oxide and pe xide. His experiments lead to the statement that for th roduction of 74 grms. of sodium nitrate one kilowatt-ho is required, and therefore for one ton of nitre 1 00 kilowatts. From the calculations he concludes th cheap water-power would render the manufacture of ni by electricity profitable. At the general meeting of th British Association in Bristol, in September, Sir Wm. C kes concluded that the Niagara Falls power would be ore than sufficient to supply annually 12,000,000 tons of tre, thus covering the demand for it.

ite lately such observations and experiments have be continued and complemented; so by von Lepel (l ., 1897, 1097 and 1903), and by Muthmann and H r (Ber., 1903, 438), the formation of nitrous oxides fr atmospheric air in presence and absence of water is e rimentally described in these articles.

he patent literature of the current day forms naturally an iteresting feature, and as the proposals set forth are pr ically untried up to the present time and no infor- m on procurable as to their workings, there is nothing e but a reference to those which seem to possess a li iguishing feature, as follows :—

mens and Halske (Ger. Pat. 85,103 of 1899) refer to ectrolysis of ammonia gas, oxygen, and atmospheric u

. Ostwald (Eng. Pat. 698 of 1902) claims the conducting of mmonia and air over red-hot platinum contact sub- sta es for the purpose of producing ammonium nitrate.

adley and Lovejoy (Eng. Pat. 8230 of 1901, and U.S. P 709,687 of 1902) for the production of nitric acid from at spheric air.

ese patents are used by the Atmospheric Products Co. wi works at Niagara Falls. A description of the now x ng plants and of the process is given, as far as any in nation could be obtained, in No. 1 of the periodical Tl *Electro-Chemical Industry* of 1902.

om this journal and from the *Electrical Review* of Iay 1902, as also from the description given by M ougall and Howles in the *Manchester Memoirs* of e same year, we can conceive that a current of dry an ool air is forced to pass a succession of small electric is arges of high-tension currents, by which the nitrogen f e air is burned and dioxide formed; the current of air hen passes into other reaction chambers, where it ne water and such other substances as may bind the or d nitric acid. The intention seems to be the forming of lcium nitrate. I have been under the impression tha his process also is still in the experimental stage, and I c ld not obtain definite information.

I s generally conceded that in all cases of oxidation f rogen by the electric influences, the monoxide NO is t produced, and that this is converted into dioxide, N as soon as any free oxygen comes in contact with it.

T quantities of monoxide in presence of free oxygen can herefore be deduced only from the determination of the ioxide. And, in the absence of water, the dioxide s e highest oxidation product which is formed by e ic discharges in a mixture of nitrogen and oxygen. t also shown experimentally that by the effect of high tem rature, which exists in the sphere of the discharges, a c stant deoxidation of the already formed nitrogen oxi takes place; but, as the monoxide is a colourless gas he formation of the dioxide is under all circumstances nd ted by its yellow or brown colour.

T reduction of dioxide by the electric discharges sets he limit to production of nitric acid, and is the cause of comparatively limited yield in acid by electrolytic infl nces. The examination of these effects of electric d sc rges on nitric oxide and on nitric dioxide led to exp ments on these two gases in a closed space, and re ng the results to the amounts of the products from ,00 c.c of oxide gas and 1,000 c.c. of dioxide gas, I arri l at the following:—1 litre of nitric oxide gas furi hed 36 mgrms. of nitric dioxide and 8·5 c.c. of nitr en gas under the discharges of a strong current dur twenty minutes; this indicates the decomposition of 3·5 r cent. of the nitric oxide, although during the whole time the formation of yellow and dark brown vapours takes place, which is hardly explicable otherwise than by assuming reversed reactions.

If the dioxide gas is subjected to the same influences, 1 litre furnishes 1·7 c.c. of gas, not absorbed by concentrated sulphuric acid, so that only very little of it appears to be decomposed at the end of twenty minutes; still, the changes in the colour of the gas in the zone of reaction shows that decomposition takes place, and it may be admitted as feasible that reversible reactions occur.

The results here described differ in many ways, apparently, from those rendered by former investigations. Priestley already says that the nitrogen oxide is decomposed electrolytically; Buff and Hofmann (Ann. der Chem., **113**, 138), in 1860, describe their experiments on nitric oxide under discharges of induction currents, obtaining the total quantity of free nitrogen, or nearly so; but it will be seen that they used iron wires as electrodes. These wires, in burning, removed the free or nascent oxygen, thus preventing the reversible reaction, which I have indicated.

In the foregoing I have shortly described the action of electric discharges on an enclosed volume of dry nitrogen oxides. The reaction on dry atmospheric air under the same conditions differs but little therefrom, and admits equally the assumption of reversible reactions, so that 1 litre of dry atmospheric air gave 4 mgrms. of nitrogen peroxide, or not quite $1\frac{1}{2}$ per cent. of the theoretical quantity.

The direct formation of nitric acid under the named conditions or from dry atmospheric air is entirely excluded. We have several records of the present day on the formation of nitric acid by electric energy on moist or wet atmospheric air. I may repeat that the production of the peroxide from dry air leads to the formation of nitric acid when this gas comes in contact with water. Von Lepel (*loc. cit.*, and Ber., 1903, 1251) describes an extensive series of experiments on air and water, the latter being brought into the sphere of electric reaction in vapour or "atomised" forms. He is led to the conclusion that not only the conditions of the electric discharges, but also the material of the electrodes, influences the yield of nitric acid.

The present practice of experiments appears to be based on the acknowledged facts that a current of air conducted through a succession of short sparks insures the best yields of nitric oxide; the use of water in an atomised or dust form is entirely a question of construction of apparatus, as the reaction chamber would be otherwise affected by acid vapours.

The Niagara Falls Works use dry and cool air. These, as well as Muthmann and Hofer, von Lepel and others, employ a current of air to overcome the decomposing influence of the discharges on nitric oxide. In all cases, however, the air passes from the reaction chamber into a regenerating apparatus, and thus invariably a diluted nitric acid is produced, entirely independent from the amount of nitric oxide formed in the reaction chamber.

We have here again before us the problem to make such diluted acid of commercial value—the Niagara Falls Company proposes to form nitrates; but as only diluted solutions of nitrates and nitrites would result in that case, the aspect which is at present offered by this interesting industry is invariably offering the question of costs: that of producing electric energy and that of concentration, to enable the product to compete with the natural nitrates.

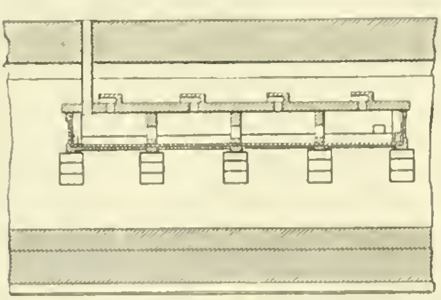
THE CONCENTRATION OF SULPHURIC ACID.

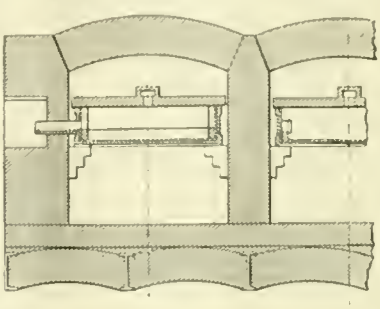
BY DR. FRANZ MEYER.

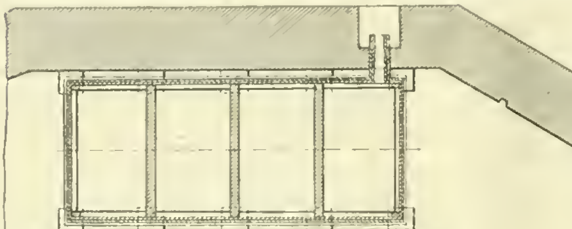
When, a few years ago, large quantities of sulphuric acid were made by catalysis, it was predicted that the chamber process would soon be replaced by the contact process. Now it is admitted that, while for the production of concentrated acid the contact processes are superior to the old processes, for the manufacture of weak acid the chamber process still exists. This standpoint is also taken by Luety and Niedenfuehr, in their "Comparative Studies on the Advantages of Manufacturing Sulphuric Acid by means of the Anhydride Process and by the Modern Lead-Chamber Process," which are published in the Zeitschrift für angew.

Chemie, 1902; and Geo. C. Stone says, in his paper read before this Society on March 31:—

"The advantage of the contact process is greater the stronger the acid made, the cost being the same per unit of sulphur for all strengths. For acids stronger than 60° B. it is cheaper than the chambers, but for 50° and perhaps for 60° B. it has at present little, if any, advantage."







Luety and Niedenfuehr wind up their paper by expressing their hopes that the rapid development of the contact processes may stimulate the manufacturers of sulphuric acid who are working according to the lead chamber process to efforts that will bear fruit, and as one of the means which may enable the owners of the lead chambers to compete, even in the manufacture of strong acids, against the works using the contact processes, they mention Dr. A. Zanner's method and apparatus for concentrating sulphuric acid by utilising the heat of the roasting gases (U.S. Pat. 693,695; this Journal, 1902, 476).

As will be seen from the drawing, Zanner places pans of suitable sizes in the gas flue between the roasting kiln and the Glover tower. The pan consists of a shell of cast iron about ¾ in. thick, which is lined with earthenware plates about ½ in. thick. It is covered with earthenware slabs, which have holes for allowing the distillate to escape. These holes are covered, in the manner shown on the drawing, so as to prevent any flue-dust from falling into the pan. Inside the pan several partitions are placed, which serve a double purpose. As they are put right over the joints between the earthenware slabs, they protect these joints, so that no primary joints come into contact with the acid. Futhermore, they compel the acid to a zigzag and therefore longer way, as their openings for the passage of the acid are arranged alternately. The primary joints at the corners are covered by suitable pieces of earthenware, as shown on the drawing. The pans are so placed in the flue that almost its entire width is occupied by them, thus forcing the roasting gases to pass through the large spaces left below and above the pan. The life of a pan is from 9 to 12 months; the flue must therefore be provided with a bye-pass, which is used in case a pan has to be replaced. The best way is to put an auxiliary pan in this flue, as shown on the drawing, and to have it always ready for operation, so that no interruption in the concentration of the acid takes place whenever a pan has to be replaced.

The acid is fed to the pan continuously either fro Glover tower or from lead pans at a strength of at 60° B. and at a temperature of about 150° C. Wo under these conditions, and if pyrites containing about 5 cent. sulphur is used, 100 lb. of sulphur will produce 120 lb. of acid of 66 and, if working on blende with about 2. cent. sulphur, 100 phur will produce 90 lb. of sulphuric a 66° B. These resul obtained from ros gases of a temperat 400°—425° C., and a temperature 1 sq. the bottom of the will produce about 4 of acid of 66° B. i hours. If chamber alone is concentrat the pans, the produ in quality equal to concentrated in plat stills.

The inventor ha stalled his apparat several European and he now intends t the pan under a p vacuum in order t crease its capacity.

The pans may be in place of the heated cast-iron still so largely in America also for evaporating liquids by the he waste gases, as, for stance, boiler flue ga .

ALKALI LANDS AND SUGAR-BEET CULTU

PAPER III.

BY HENRY C. MYERS, Ph.D.

In this Journal for May 31, 1901, I called attenti the possibilities of sugar-beet culture in the alkali soi Utah, giving analysis of soils, available water, beet In the Journal for June 30, 1902, I demonstrated the bility of profitably reclaiming such lands through beet culture. In this third paper of the series I desi call attention to some of the difficulties encountered, a offer suggestions for overcoming them, and to poin some newly demonstrated properties of both the sugar and alkali soils.

Beets of Low Purity.—In Syracuse, Davis County, sugar-beets are rarely up to factory requirements in p even where the required 12 per cent. of sugar is pres much alkali or mineral salts are taken up that the per cent. in the beet juice is far below the required cent. of total dissolved material, frequently being below 70 per cent. Out of 34 analyses, showing 12 to 16 per cent. sugar in the beet, the purity av was but 77·9. In studying the problem I selecte samples as well as white alkali crust from the Bodily R the beets having been tested as shown in the subj tables.

An examination of a surface foot of soil tells very regarding its agricultural value. The analyses, how show that very little alkali lies within reach of the roots, and that the low purity of the beets was d improper irrigation and the bringing up of alkali below the first foot.

In West Weber, Utah, beets having a purity avera 81·3 were raised on soil containing 1,880 lb. of alkali the surface acre-foot, and when the content of alka lowered to 376 lb., the beet purity went up to 84·9. In tests of similar soils of Hooper and West Weber, Uta second acre-foot of soil seems to vary from 3,120 to 5,6 of alkali—surely an ample supply to ruin almost any

Date.	Sugar in Beets.	Purity.
August 27	11·7	72·3
September 9	12·9	73·1
„ 19	15·8	79·6

Soil of Bodily Ranch (Surface Foot).

Salts.	Per Cent. in Soil.	Lb. per Acre-Foot.
Carbonates	0·013	520
Nitrates	0·003	120
Sulphates	0·002	80
Chlorides	Trace	..
Total	0·018	720

Composition of White Alkali.

Salts.	Grms. per 100 c.c. Solution.	Per Cent.
Chlorides	0·5916	69·41
Sulphates	0·2329	27·33
Nitrates	0·0198	2·32
Carbonates	0·0080	0·94
Total	0·8523	100·00

improperly irrigated. By irrigating continually during the growth of the beet, and by ploughing repeatedly it is possible to keep the alkali down to below the beet roots, and to prevent the rising of these soluble salts of the soil. It is also possible to take advantage of this "rising of the alkali" by flooding the soil to a given depth and allowing the total alkali to rise to the surface during the dry season, the alkali being then removed, with a few inches of surface soil by means of scrapers. Hilgard has demonstrated (Bulletin 128) that in a single season from one-third to one-half the total salts may be got rid of in this way. This method, however, would hardly apply in the case under consideration, being suited only to particularly corrosive soils. Irrigation with under-drainage removes alkali successfully, but is expensive, and necessitates a loss of soluble plant food.

Soils about Greeley, Colorado.—These soils have been reclaimed from the desert by a very ingenious plan of rotating potatoes, wheat, and alfalfa. The higher lands, above the basin of the Cache La Poudre River, are free of alkali, and have yielded enormous crops without the addition of plant food to the soil other than alfalfa. White alkali asserts itself in the bottom lands, but is not excessive, and black alkali is quite rare, the problem being largely one of proper irrigation and drainage. For these bottom lands, as well as those of the South Platte River, the sugar-beet is a most suitable crop, as it will tolerate quantities of alkali corrosive to common crops, and gradually remove alkali from the soil. The following table shows the amount of alkali removed from one acre of soil by a beet crop which tested as follows:—

Beet Crop at Maturity.

Average weight of beets tested	1,255 grms.
„ „ tops „	300 „
„ sugar, per cent.	14·8
„ purity „	81·3

Alkali removed.

Salts.	Beets.	Tops.
	Lb.	Lb.
Sulphates	68·6	30·9
Chlorides	64·9	44·2
Nitrates	54·7	59·2
	188·2 134·3	134·3
Total alkali	322·5 lb. per acre.	

Uplands about Greeley.—These rich potato lands have been so profitable, and the method of rotation so well balanced, that I felt much could be learned by comparing their composition with that of the original desert soil which so discouraged the early settlers. It did not seem possible to me that a soil could remain rich and productive after removing crops of wheat, potatoes, and alfalfa for 30 years, and adding only alfalfa to the soil as fertiliser, as in case of the "Wheeler and Watson Ranch," and this condition, I am informed, is not at all unusual upon these lands.

I collected samples of virgin desert soil from lands situated similarly to the Wheeler and Watson holdings and quite near to that ranch, as well as from the ranch itself after the first sugar-beet crop had been harvested.

Analysis of Original Desert Soil, in per Cent. and Pounds per Acre-foot.

Salts.	Surface Foot.		Second Foot.	
	Per Cent.	Lb.	Per Cent.	Lb.
Carbonates	0·003	120	0·002	80
Chlorides	0·009	360	0·005	200
Sulphates	0·009	360	0·011	440
Nitrates	0·004	160	0·007	280
Phosphates	0·040	1,600	0·050	2,000
Potash	0·523	20,920	0·430	17,200
Humus	0·516	..	..	..

Soil from "Wheeler and Watson Ranch," in per Cent. and Pounds per Acre-foot.

Salts.	Surface Foot.		Second Foot.	
	Per Cent.	Lb.	Per Cent.	Lb.
Carbonates	Absent	..	Absent	..
Chlorides	0·009	360	Trace	Trace
Sulphates	0·005	200	0·009	360
Nitrates	0·001	40	0·001	40
Phosphates	0·025	1,000	0·040	1,600
Potash	0·624	24,960	0·061	42,440
Humus	0·696	..	..	..

Comments.—In both tables the nitrates, phosphates, and humus are low. Potash averaged well in the original soil, and becomes very high after 30 years' cultivation. The humus per cent. has also raised.

Direct Comparison of Two Acre-feet in Pounds.*

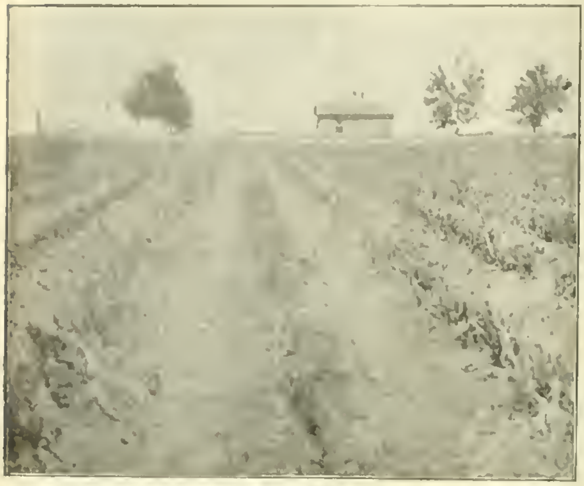
Salts.	Virgin Prairie Soil.	After 30 years' Cultivation.
Carbonates	200	..
Chlorides	560	360
Sulphates	800	560
Nitrates	440	80
Phosphates	3,600	2,600
Potash	38,120	67,400

* An acre to the depth of 2 ft.

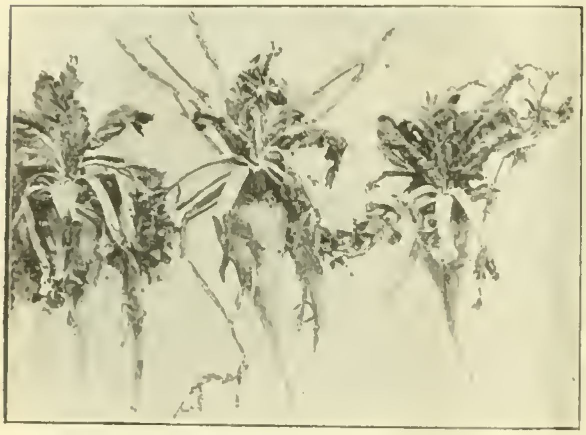
It is quite evident that if this scheme of rotation is to be interrupted by the introduction of sugar-beet culture, analyses of the soil should be made from year to year, after maturity of the crop, and such plant food as is found to be decreasing added to the soil in the form of fertiliser. Sugar beets raised on this ranch produced 19·3 tons per acre, and at 4·50 dols. per ton paid 86·85 dols. The beets were naturally of high purity, and tested as follows:—

Date.	Sugar.	Purity.
September 10	17·0	88·5
„ 17	16·5	86·4
October 17	16·2	85·3

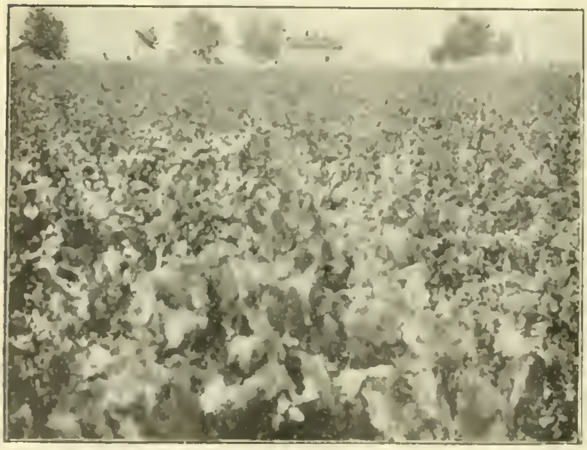
A Crop that refuses to Perish.—The severe hailstorm near Greeley, Colorado, on June 27, 1902, destroyed the potato crop; grain and alfalfa were cut down close to the ground as if a mower had passed over them, and insura companies ceased to insure against hail. Beet tops w removed, but it mattered not, for new ones were produ



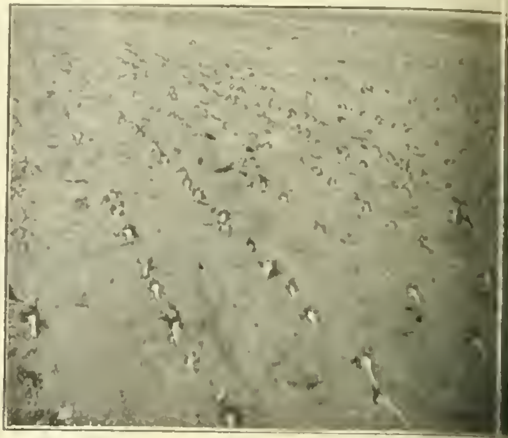
C. F. Alden Beet Field after Hailstorm.



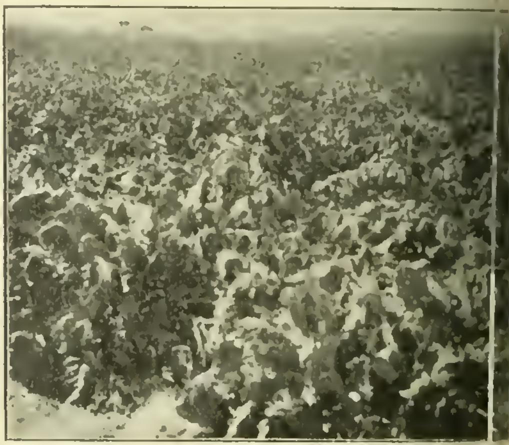
Beets Showing New Tops Five Days later.



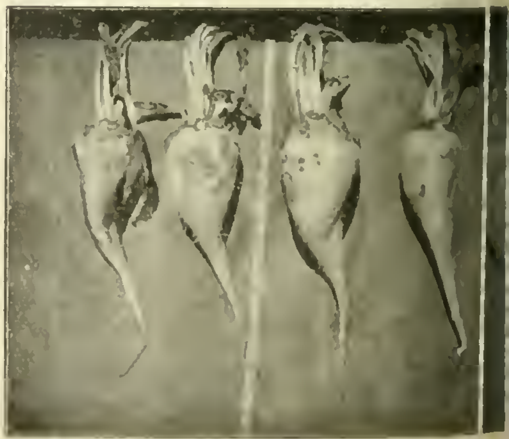
Alden Field on October 5.



Jesse Forbes Beet Field. Taken July 2.



Taken July 22.



Beet Sample taken September 6.

e days, and the crop was eventually an excellent one. changes can be best illustrated by photographs taken time.

Field Records of Alden Beets.

Date.	Sugar.	Purity.
er 31	17·0	84·2
nber 2	17·6	85·4
16	16·8	84·0

st interesting and valuable records were obtained from inch of Jesse Forbes, whose beets not only lost their , but were washed out of the ground by the bursting litch; or rather, the soil was washed away, leaving entire beet proper exposed. These beets were htened up by packing earth about them as far as conditions would allow, and a most excellent crop ed.

Forbes Beets on October 5.

Field Records of Jesse Forbes Beets.

Date.	Sugar.	Purity.
nber 12	14·4	83·7
23	15·8	84·5
r 20	16·7	87·4

eds as Indicators of Alkali.—The various weeds ng profusely and seeming to thrive upon alkali soil, rue indicators of the nature of such soils. The fication of such weeds and their relation to the soil osition is of extreme importance, for it enables the d eye to judge the nature of the soil at a glance. "Tussock-grass," for example, of Utah, Nevada, iska, Kansas, and California indicates that the soil is n sal-soda to a degree making fruit trees and even , corn, and wheat impossible. If properly irrigated, ver, such lands would grow sugar beets. In Bulletin 28, Hilgard points out that the natural plant growth to indicate the quality as well as the quantity of constituents, and Davy calls attention to the "maxi- optimum, and minimum" of salts tolerated by certain plants.

ce publishing the second paper of this series, Mr. . Hall, of the Agricultural Experiment Station of the ersity of California, has classified the weeds collected e upon the virgin alkali soil of West Weber, Utah. and was reclaimed from the desert, and analyses of efore and after the introduction of sugar-beet culture . The classification is as follows.

1. *Artemisia tridentata* (true sage brush)
2. *Distichlis spicata* (salt grass).
3. *Atriplex confertifolia.*
4. *Suaeda Torreyana* (sea-blite).
5. *Atriplex canescens.*
6. *Lycium Andersonii.*
7. *Gutierrezia Euthamiæ.*
8. *Amaranthus albus* (tumble weed).
9. *Bigelovia graveolens.*

Yorkshire Section.

Meeting held at Leeds, on June 26th, 1903.

PROF. A. SMITHELLS IN THE CHAIR.

NATURAL SODA DEPOSITS IN EGYPT.

BY V. SEYMOUR BRYANT, B.A.

The largest and most important deposit of natural soda in Egypt is in the Libyan Desert, about 40 miles north-west of Cairo. In a valley extending from Benisalaama to Gaar, and running in a north-westerly direction for 21 miles, there is a string of lakes, all of which contain a high percentage of salt, and most of them in addition are strongly alkaline The bed of these lakes consists of natural soda, covered with a layer of salt of varying thickness. The soda itself consists of several distinct varieties, the richest of which is gem natron, a hard, crystalline deposit containing a high percentage of alkali. The crystals are monoclinic. On the other hand, kortai is an exceedingly soft deposit, composed of a mass of small needle-shaped crystals, and is usually found occurring under a layer of salt of from 15 to 20 cm. in thickness. Where kortai occurs the other varieties of natron are usually absent. Gem natron, on the other hand, is generally found underlying strata of a third variety of trona sultani. This variety, occurring in larger quantities than the others, and also having the merit of being easily extracted in the summer when the lakes are dry, has been chiefly used in the past as the raw material for the manufacture of soda ash, since up to the present time the solid has been used in preference to lake water for that purpose.

There are two other varieties of trona which are of considerable interest, although they do not occur in the bed of the lakes. Around the shores of the lakes, and especially on the south side, are extensive fields of korcheff, which forms an incrustation on the surface of the sand. Borings made on these korcheff fields show that, under a metre of yellow sand, there is a layer of sand which contains crystals of natron to an average depth of about half a metre. Below this layer we find a thickness of 40 to 50 cm. of wet clayey sand, and finally we have a thick greenish clay bottom. Water percolates in below the crystal-containing stratum, is drawn to the surface by capillarity, and arriving there, charged with alkali, is evaporated by the sun, thus leaving this yellowish-white crust, which slowly increases in depth from year to year.

I have recently found a very pure form of natron efflorescing on the surface of the korcheff and between the incrustations. This occurs as a pure white powder containing over 80 per cent. of total alkali estimated as sodium carbonate. This efflorescence, although occurring in small quantities, may be of practical importance in the future, as, by the action of water and subsequent exposure to the heat of the sun, the alkali appears to effloresce in a very pure form, and to leave the mechanical and other impurities behind.

The following analyses of samples of the three more important varieties of Egyptian natrons show their composition.

—	Gem Natron.	Sultani.	Korcheff.
Sodium carbonate	42·71	36·85	35·56
Sod. hyd. carbonate	33·79	28·59	17·22
*Water	16·56	15·68	14·80
Sodium chloride	1·83	8·43	7·49
Sodium sulphate	1·91	5·01	6·63
Insols (silica, calcium sulphate, calcium carbonate, ferric oxide)	3·19	5·38	18·30

* Chemical and mechanical.

There has been considerable discussion as to the composition of natural soda, but the first two analyses correspond almost exactly to the formula Na_2CO_3, $NaHCO_3$, $2H_2O$. This confirms Chatard's opinion that natural soda is not the sesquicarbonate, but a "four-thirds carbonate." The korcheff, however, has not sufficient free carbon dioxide to correspond with this formula. Rapid evaporation and constant exposure to the heat of the sun account for this deficiency.

The lakes are 11 in number, and are red in colour; this is due to the presence of artemia in large numbers. The surface of the water is a few metres below the surface of the Mediterranean, and the lakes are bordered on the northern side by a reed called "bourdi" by the natives.

The injurious action of blown soda on plants has been remarked by Römer and others. On the Wadi natron estate the prevailing wind is from the north, and constantly sweeps the korcheff dust over the southern shores of the lakes, and as a consequence there is no vegetation on that side of the valley.

The names, areas, and alkalinity of the lakes are given in the following table, starting from the north-western extremity:—

Lake.	Area in Square Metres.	Average depth in April.	Percentage of Sodium Carbonate in April.	Sodium Carbonate in Solution.
		cm.		Tons.
Gaar	2,500,000	21·0	1·53	8,032
Khadra	300,000	46·0	7.36	10,157
Baida	1,600,000	17·0	2·50	6,800
Zukum	1,200,000	22·0	6·13	16,183
Homra	650,000	57·0	5·00	18,525
Abu Ma'Ma	100,000	10·0	10·39	1,039
Abu Gebara	208,145	46·0	4·62	4,423
Ruzaniah	916,917	29·4	1·91	5,148
*Um Risha	2,358,230	15·0	3·50	6,003
Fazda	1,200,000	61·3	3·51	25,819
Muluk	200,000	9·0	1·81	326
				102,455

* Water surface, 1,113,500 sq. m.

The total area of the lakes, taking into consideration outlying sheets of water, is therefore about 12,000,000 sq. m., containing about 100,000 tons of alkali in solution. The level of the water in the lakes varies greatly, being at a maximum in April and at a minimum in September, when, in fact, the lakes are either to a large extent or even wholly dried up. As a rule there is from 15 per cent. to 25 per cent. of sodium chloride in solution, and in addition sulphate, carbonate, and bicarbonate. The percentage of sulphate in solution is usually approximately the same the total alkalinity. The variations in alkalinity are sho in the foregoing table, the alkali being estimated as sodi carbonate.

Lake.	Minimum Percentage.	Maximum Percentage.
Gaar	1·66	3·18
Khadra	6·13	13·47
Baida	1·61	6·83
Zukum	3·80	8·46
Homra	5·20	9·45
Abu Ma'Ma	10·39	13·02
Abu Gebara	1·96	10·96
Ruzaniah	1·96	7·42
Um Risha	3·10	6·46
Fazda	2·59	8·00

The lakes have no outlet, and are fed by numero springs, which are mainly on the northern border. Lake Homra, however, there are three artesian sprin in the bed of the lake. The evaporation just balanc the supply of water from these sources, and consequen the variation of level in the lakes from year to year not great. The rainfall is very small; in fact, rain o falls during one or two days in the year, so that this d not affect the levels in the least degree.

All the springs contain chloride, sulphate, and carbona of soda to a small extent. In 20 springs which I analy the percentage of alkali varied from 0·02 to 0·08 per ce the mean percentage being 0·0377 of sodium carbona The evaporation from the surface of the lakes bei 40,000,000 cb. m. per year, this alone would account for t annual deposition of about 15,000 tons of sodium carbona

The water of the springs passes through strata of sa limestone, and alkaline rocks. The latter are decompo by the combined action of air, carbon dioxide, water, he and pressure, the alkalis being dissolved as carbonat Oxidised pyrites also aids in the formation of sodi sulphate by its action on the natural salt, and this a reacts on the calcium carbonate. Thus the spri eventually contain these three sodium salts. But, ap from the soda formed in the valley by the evaporation these dilute solutions, there is probably another facto at work, namely, the decomposition of the bourdi roots the moist ground in the summer, which reacts on salt, sodium carbonate passing over. Abich ascribes t formation of soda in Armenia to a similar cause.

In the lakes, natron is deposited during the win months, and salt during the summer. The explanation this is due to the following two facts: (A) Solids naturally be deposited from solutions by either (1) a r of temperature, causing evaporation of water from previously saturated solution, and thus precipitating out solid; (2) a fall of temperature, causing crystallisat from a solution previously saturated at a higher temperat (B) The variation in the solubilities of the carbon sulphate and chloride at different temperatures. T former two compounds increase in solubility to a mark extent with rise of temperature, the latter but slightly.

What actually takes place during the year's cycle appe to be as follows:—At the end of the summer the lake be covered with a coating of salt, under which the natron lay run, the surface water being saturated with salt and having a high percentage of alkali, owing to the imme solar evaporation. As the weather becomes cooler towa the end of November the temperature of the water fa The lake water, therefore, which was almost saturated w alkali at the higher temperature, now becomes saturated the fall in temperature, and actually begins to deposit cryst of natron on the salt to the depth of half a centimetre. this point, however, the flow of fresh water into the la increases enormously, and, since the chloride is almost soluble at low as at high temperatures, the salt layer on top of the lake bed begins to dissolve rapidly, and by beginning of February has almost entirely disappea The new natron, which has previously been deposited the surface of the salt, now has the layer of salt dissol from under it, and comes to rest on the previous ye natron deposit. The large dilution of lake water at point seems to counteract, to a marked extent, the act of the cold in crystallising out the natron, and the deposit consequently does not increase in thickness to appreciable extent. At the beginning of the follow summer the temperature again rises; the natron is the a certain extent redissolved, and the bed of the lake is again covered with a salt coating, owing to the diminis quantity of water not being sufficient to hold the chlo in solution.

The actual quantity of natron on the estate is known; borings have not been made in sufficient num or of sufficient depth to gauge the resources, but ther an almost inexhaustible supply. The utilisation of t deposits and the development of the other large soda deposits in the States, South America, Mexico, East Africa, and other parts, is occupying much attention at the present time, and in the near future natural soda will probably be a product of great importance as a raw material for alkali manufacture.

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I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

ids [Steam, &c.]; Apparatus for Purifying ——. Brooke, Macclesfield. Eng. Pat. 12,867, June 5, 1902.

The apparatus, which is specially adapted for extracting water or grease from steam, is of the kind described in Eng. Pats. 11,279 of 1892, 2931 of 1897 (this Journal, '89 139), and 12,619 of 1900 (this Journal, 1901, 694), comprising an arrangement of slotted or perforated cylinders, &c. through and around which the steam is compelled to flow with frequent change of direction, and is thereby an[illegible] to deposit its suspended matter. According to the present invention, the extracting capacity and efficiency of the apparatus are increased by the provision of internal dividing plates or baffles, adapted to reverse the direction of flow of the steam, or to cause it to travel in a zigzag course. Various constructional arrangements are claimed. —R. A.

Aerating Liquids [Water, &c.] or Causing Liquids to Absorb Gas; Apparatus for ——. K. S. Murray and I V. R. Read, London. Eng. Pat. 12,115, May 27, 1902.

The apparatus comprises two vessels and a valve controlling passages arranged so that the energy of gas under pressure is employed to spray, or atomise, liquid in a vessel containing gas under a less pressure, so as to cause the absorption of the gas by the liquid, the gas which so sprays or forces the liquid being afterwards absorbed by a following charge of liquid.—R. A.

Controlling Chemical Processes, and Apparatus therefor; Method of Ascertaining, Watching, and ——. C. Cyon, St. Petersburg. Eng. Pat. 5745, March 12, 1903.

The method is adapted to chemical processes in which gases are developed, and to materials in a closed room, or in a heap, furnace, package, ship's hold, silo, &c. The gases developed are sucked out through a slotted or perforated pipe or pipe system, by means of a suitable suction apparatus, and are passed to a testing device. Dense or tightly packed materials may be loosened by the preliminary introduction of compressed air or gas through the pipe system, and steam, gases, or vapours may be introduced in the same way for the purpose of developing, regulating, or counteracting the chemical process. To facilitate the introduction of the suction pipe into the material, it is made of flat or oval section, tapered at the end, and slotted or perforated on its length, the pipe being connected by a hose, &c., to the suction apparatus. The pipe may also be provided with electric contacts, adapted to close the circuit of an alarm, &c., in case the temperature exceeds a prescribed limit.—R. A.

Evaporating Liquids; Apparatus for ——. H. Deininger, Bernau, and H. Andre, Buch, both in Germany. Eng. Pat. 6847, March 24, 1903.

The Pistorius pans used for spirit rectification are employed, with suitable constructional modifications, for the vacuum evaporation of liquids of all kinds. The pans are superposed in a chamber and heated outside by hot steam. For the purpose of heating the pans internally at the same time, baffle-plates provided with tubes are arranged in the interior of the pans, to conduct upwards the steam generated from the liquid below the baffle-plates, in such a manner that this steam serves to effect the internal heating without coming again into contact with the liquid. Tubes are connected to the pan covers, and extend through the bottom of the pan next above to below the corresponding tube thereof, to form a conduit for the steam generated above, and at the sides of, the baffle-plates. The pans are separated by plates, extending from the walls of the enclosing chamber to the connecting tubes, and provided with condensed steam pipes, to compel the steam to flow along the pan surface in the direction opposite to that of the liquid.—R. A.

Concentrating Solutions; Means Applicable for Use in ——. H. W. Hemingway. Eng. Pat. 16,295, 1902. VII., page 795.

United States Patents.

Furnace. T. G. Selleck, Assignor to Acme Steel Company, Chicago, Ill. U.S. Pat. 729,681, June 2, 1903.

The furnace is provided with a box, opening at its forward end through the wall, the opening being surrounded by a recess formed in the wall. The recess is closed on the face by removable means, and serves as a pocket to receive a mass of material for closing the open end of the box. The combustion chamber is arranged behind the box, and communicates with a series of horizontal and vertical flues surrounding the box, mainly in the longitudinal direction, the face of the box exposed within the combustion chamber being inclined and arranged to deflect the flame from the combustion chamber into the first of the flues. —R. A.

Furnace; Regenerative ——. J. A. Durfee, Chardon, Ohio. U.S. Pat. 730,620, June 9, 1903.

The furnace is combined with checker-brick regenerators located below the level of the furnace, and with means for clarifying the furnace gases from the products of combustion and deleterious matter in their passage to the regenerators. These means comprise a descending passage leading from each side of the furnace to an intermediate slag-pocket, which is similarly connected by a descending passage to a second slag-pocket underneath the regenerators. A downward passage leads from the top of each regenerator. —R. A.

Agitation-Tank. J. Stoveken, Cripplecreek, and L. Stoveken, Florence, Col. U.S. Pat. 729,806, June 2, 1903.

The tank is provided with a rotary agitator, and has a series of wings extending inwardly from its vertical wall, a lateral opening adjacent to its lower end, and a conduit extending from near the bottom to an outlet adjacent to the top of the tank. The agitator consists of a series of curved inclined blades fixed to a vertical shaft, which is stepped on the upper end of the piston of a vertical cylinder arranged centrally within the tank, the cylinder being adapted to be connected to a source of fluid-pressure supply. The agitator is driven from a suitable motor, which is geared to a pinion feathered on the above-mentioned vertical shaft.—R. A.

Filter-Press. J. Stoveken, Cripplecreek, and L. Stoveken, Florence, Col. U.S. Pat. 729,807, June 2, 1903.

The press consists of one or more elements, each comprising a fixed and a movable abutment, with means for moving the latter, a bag interposed between the abutments having a supply conduit connected to its upper end and a discharge gate at its lower end, means for closing the conduit while the bag is being pressed between the abutments, and means for holding the gate closed during the pressing.—R. A.

Filter-Press. C. Kolb, Maxéville, France. U.S. Pat. 730,776, June 9, 1903.

See Eng. Pat. 19,619 of 1902; this Journal, 1903, 410. —T. F. B.

Drying Apparatus; Vacuum ——. W. C. Perkins, Brookline, Mass. U.S. Pat. 730,564, June 9, 1903.

The apparatus is built up of a number of unit sections, each comprising an outer wall adapted to be fitted air-tight to the walls of similar adjacent sections, an internal portion adapted to receive a quantity of material and to expose it to the drying agencies, and a hollow bottom portion having a horizontal top surface and provided with an opening surrounded by a ledge, for the discharge of the material. A revolving shaft, mounted in the central openings of the sections, is provided with feed devices, consisting of a distributing blade and a scraper blade for each compartment. The apparatus is connected to an exhauster, and is provided with valves of special construction by means of which the material can be introduced and withdrawn without impairing the vacuum.—R. A.

Salt-Brine Evaporators. H. Holmes. U.S. Pat. 730,210, 1903. VII., page 796.

French Patents.

Preventing Explosions of Containers for Gas or (*pressed Fluids; Apparatus for* ——. Soc. d'Es et Meuse. First addition, Nov. 4, 1902, to Fr. 324,350 of Sept. 10, 1902. (See this Journal, 1903, 6

The plate referred to in the original patent, is strengthe to prevent it from being ruptured before the determi pressure has been reached, and it is fastened down b annular nut in such a way that when the pressure beco excessive, it is cut cleanly through by the lower edg the nut, and leaves a sufficiently large opening for escape of the gas.——H. B.

Distilling Liquids; Process and Apparatus for —. United States Distillation Co. Fr. Pat. 326,252, Nov 1902.

See U.S. Pats. 713,297-8 of 1902; this Journal, 1 1523. (Also Eng. Pat. 24,780 of 1902; this Journal, 1 287.)—L. F. G.

Concentration of Liquids; Apparatus for the ——. Kestner. First addition, dated Nov. 15, 1902, to Pat. 315,973, Nov. 16, 1901.

A number of tubes are enclosed in a vertical to through which pass hot gases. At the top and base of tower are chests divided into three compartments, upper compartment being connected by a number of tubes to the corresponding lower compartment. The u compartments are open at the top, to allow the vap rising from the hot liquid to escape. The liquid t concentrated enters the first of the lower compartm through a regulating valve, and rises through the first s of tubes to the corresponding upper compartment, w the disengaged vapours escape. From here it flows thr an external pipe into the second lower compartment, rises through the second series of tubes into the se upper compartment, and again through an external p the third lower compartment, from which, through third series of tubes, it enters the third upper compart and is drawn off. As the liquid in its passage bec concentrated, its bulk diminishes, and hence the n of tubes connecting each pair of compartments is dimini as the concentration proceeds.

A number of the towers can be arranged in a batter multiple effect, and the number of compartments in chests may be varied to suit the degree of concentratio —L. F.

II.—FUEL, GAS, AND LIGHT.

Candles and Calories. V. B. Lewes. Lecture deliv before the Inst. of Gas Engineers, June 9, 1903. of Gas Lighting, 1903, **82**, [2092], 766—770.

A paper in which the relation between the calorific va and candle power of illuminating gas is discussed.—A.

Incandescent Gas Light; Theory of the ——. C. Kil J. f. Gasbeleucht., 1903, **46**, [23], 445—450.

The author describes his latest experiments in suppo of his "contact" theory of the action of ceria in the in- descent gas light (this Journal, 1896, 794), the su being studied calorimetrically. As variations in the diam shape, and disposition of the mantles were found to the results seriously, each pair of tests was made with same mantle. The mantle was first made of pur thoria, and, after the calorimetric examination, was verted into thoria-ceria by immersing it in an alco solution of cerium nitrate, after which it was again te calorimetrically. The average result from a numbe tests was as follows:—Calorific value of gas alone, 4 calories; with mantle of pure thoria, 4,133 calories; th mantle of thoria-ceria, 4,015 calories. The additio ceria, therefore, increased the radiation from the mantl 13·9 per cent. Similarly, it was found that when ma of pure thoria were dipped, after examination, into a weak solution of iridium or rhodium, the loss by radi was increased by 13 per cent. On the other hand, tles of pure thoria were treated with thoria, yttria, or a, the loss by radiation was not appreciably affected.

another series of tests, a delicate thermometer, having ulb covered with soot, was fixed 20 cm. from the testing er, and the rise in temperature indicated by the thermo-r when the various mantles were used was noted. The produced by a mantle of pure thoria was increased by 5 per cent. on addition of ceria, by 14·54 per cent. on tion of the platinum metals, and was not appreciably ted by coating with thoria, yttria, or erbia. These bers agree well with those obtained by the first od.

e ceria in the Auer mixture therefore exercises a fic function, consisting in increasing the radiation from nantle. Since the temperature of the mantle must be r than that of a mantle of pure thoria, the author ders these facts to be opposed to the views of Nernst Bose (this Journal, 1901, 791), and Le Chatelier and ouard (this Journal, 1898, 1129). The ceria cannot eplaced by any other rare earth, but the platinum ls have a very similar effect. With the latter, the iosity is not so great, and the light has a red colour. he emissive power is almost as great in respect of heat tion. The author adheres to his hypothesis that the a of the ceria is chemical and catalytic in its nature; by its rapid alternation between the two stages of tion, it induces an intense local combustion of the and air upon the surface of the mantle; and that a r proportion of the heat produced is radiated in the of light. (See also this Journal, 1902, 1012.)—H. B.

English Patents.

ke Ovens; Impts. in ——. C. A. Baglin, Balham. Eng. Pat. 7448, March 31, 1903.

coke-oven of the Coppée type, the gas-distributing is arranged inside the air-distributing canal. Conical ngs on the upper side of the former allow the issuing mingle with the air, and the mixture rises through l openings on the top of the air-distributing canal e combustion flues, where it is ignited.—H. B.

r Fuel Briquettes or Blocks; Manufacture of ——. C. Berntrop and M. L. Q. v. L. Hulseboch, both of sterdam. Eng. Pat. 13,447, June 13, 1902.

ntrated sulphuric acid is added to a solution of n petroleum, and the mixture ground up with slaked After a time the whole solidifies, and can be pressed e form of briquettes, small coal or peat being added, red.—T. F. B.

ettes; Manufacture of ——. J. R. Bock, Merseburg, Prussia. Eng. Pat. 16,105, July 19, 1902.

ettes are made weatherproof by wholly or partially ising the binding material to render it insoluble in If necessary, the heating is carried out *in vacuo*, n atmosphere of some inert gas.—T. F. B.

r; Liquid Fuel ——, *for Boiler and other Furnaces.* Lane, London. Eng. Pat. 26,681, Dec. 3, 1902.

mbustible oil is sprayed, together with steam, into nace, the mixture issuing through apertures arranged the circumference of a circular nozzle, and impinging undle of rods radiating from within the mouth of zle and projecting into the furnace. The rods, being heated by the furnace, serve to thoroughly vaporise and ensure perfect combustion. The nozzle is ed by a cylindrical tube placed around it, which may ell-mouthed shape.—L. F. G.

as; Manufacture of ——. T. Settle and W. A. dfield, Exeter. Eng. Pat. 12,552, June 2, 1902.

e top of a retort, having a vertical portion consti-about one-half its length and tapering slightly s, an inclined portion at its lower end, and a curved connecting the vertical and inclined portions, coal is ed in small quantities, at regular short intervals, from r which is joined to the top of the retort by a cylindrical n. Within the latter a rod carrying two conical s works up and down, acting as a coal-measuring and gas-sealing device, the lower plunger directing the falling coal outwards towards the walls of the retort. Thus the fresh coal always forms a cup-shaped layer on the top, and the gas escapes to the ascension-pipe without coming into contact with the red-hot coke.—H. B.

Gas and Air in connection with Gas Producers; Treatment of ——. W. J. Crossley and T. Rigby, Manchester. Eng. Pat. 14,166, June 23, 1902.

The gases, either directly on leaving the producer, or after passing through an air superheater, enter a long chamber, partly filled with water and divided into compartments by transverse partitions which extend upwards from the bottom to some distance above the water level, ports being arranged in the partitions below the water level. Beating paddles revolve in the compartments and fill them with spray. The solid matters collected are removed through water lutes at the sides of the washer. The water passes through the washer in a direction opposite to that of the gases. Part of the heated water is pumped up to an air-saturating tower and returns to the cool end of the washer, whilst the heated, water-laden air is led into the producer. —H. B.

Producer-Gas Generators; Construction and Working of ——. C. H. Schill, Manchester, and H. G. Hills, Hyde. Eng. Pat. 18,867, Aug. 28, 1902.

In the upper part of the generator is a steam-raising and heat-storing device, consisting of a mass of cast-iron, perforated for the passage of the products of combustion and having wrought iron pipes embedded in it. The pipes are connected to a water supply at a suitable pressure, and with a steam jet in a chimney at the top of the generator. A valve, closing the chimney above the steam jet, is actuated by the rise and fall of a gas-holder. The outlet for the producer gas, having a non-return valve, leads from the lower part of the apparatus to the gas-holder. The air-supply pipes also have non-return valves. When the generator is in action, the steam produced by the water flowing into the wrought-iron pipes issues from the jet in the chimney, and since the valve in the latter remains closed so long as the gas-holder is not full, the steam passes down through the mass of fuel, and the gas is forced into the gas-holder. When the latter is filled the chimney valve opens automatically, and the steam jet, acting as an injector, draws air into the generator up through the fuel, raising the heat of the latter and storing heat in the steam-raising device.—H. B.

Furnace Gases; Process and Apparatus for Purifying ——. E. Bian, Luxemburg. Eng. Pat. 4861, March 2, 1903.

Within a closed casing revolves a horizontal shaft carrying a number of perforated discs, the lower parts of which dip into the water or other purifying liquid which flows through the apparatus. Baffle plates, fastened to the casing and extending between the perforated plates, prevent the gases from escaping along the walls of the casing. If it is desired to cool the gases, the baffle plates are made hollow, with refrigerating coils within them.—H. B.

Mantles; [Self-Lighting] Incandescent ——. R. Berthold, New York. Eng. Pat. 1954, Jan. 27, 1903.

Stripes of rhodium chloride solution are painted on the mantle and lead to a catalytic lighting pellet, such as a pellet of platinum black.—H. B.

Electrical Glow Lamps with Osmium Filaments; Manufacture of ——. O. Imray, London. From Oesterreichische Gasglühlicht u. Electricitäts Ges., Vienna. Eng. Pat. 12,182, May 28, 1902.

It has been found that the formation of deposits on the globes of osmium lamps is prevented if a small quantity of an oxidising gas is present. On filling the bulb with air, for example, a pressure of 0·1 mm. is suitable. The oxidising gas, or substance that will generate such gas, is introduced into the closed vessel or globe, in which the filament is heated to incandescence either during the manufacture or during its use, and the gas is either left permanently in the globe or partly removed.—H. B.

Arc-Lamp Electrodes; Manufacture of ——. R. Hopfelt, Berlin. Eng. Pat. 26,071, Nov. 26, 1902.

See Fr. Pat. 319,893, 1902; this Journal, 1902, 1525.
—H. B.

United-States Patent.

Fuel; Process of Making Artificial ——. G. Adrot, Marseilles. U.S. Pat. 729,711, June 2, 1903.

Powdered or granular carbonaceous matter is added to a mixture of petroleum and sodium resinate; the resulting product is heated, mixed with a solution of a metallic salt, cooled, and dried.—T. F. B.

French Patents.

Alcohol and Petroleum Oil or Spirit; Process for Making a Permanent and Homogeneous Mixture of ——. L. Stouvenant. Fr. Pat. 326,637, Nov. 24, 1902.

The mixture of alcohol and petroleum is stirred in a bath, and acetone or amyl acetate added drop by drop till a clear liquid results.—L. F. G.

Carburetting of Illuminating Gas: Process and Apparatus for ——. J. Grzybowski. Fr. Pat. 326,281, Nov. 11, 1902.

See Eng. Pat. 25,425 of 1902; this Journal, 1903, 290.
—T. F. B.

Arc-Lamp for Producing Short Rays. Siemens and Halske Akt. Ges. Fr. Pat. 325,802, Sept. 20, 1902.

An arc-lamp intended to produce short (violet and ultraviolet) rays is made with steel electrodes with spherical ends. The electrodes may consist of bars of about 4 cm. in diameter with renewable spherical ends.—W. G. M.

Mantles; Manufacture of Incandescence ——. T. Terrell. Fr. Pat. 326,300, Nov. 12, 1902.

See Eng. Pat. 11,042 of 1902; this Journal, 1903, 619.
—H. B.

Filaments for Incandescent Electric Lamps: Manufacture of ——, *and Apparatus therefor.* W. L. Voelker. Fr. Pat. 326,394, Nov. 17, 1902.

See Eng. Pat. 16,653 of 1901; this Journal, 1903, 18.
—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Petroleum; Distinction of Crude ——, *from its Distillates and Residues.* C. Engler. Zeits. angew. Chem., 1903, **16**, [23], 544. (Fifth Internat. Congress of Applied Chem., Berlin.)

Crude petroleum and petroleum residues are distinguished from the distillates by the presence of asphalt and pitch. Considerable admixture of distillates is detected by means of a fractional distillation, aided, in the case of crude petroleum, by a knowledge of the source. Residues from the distillation of illuminating oil are distinguished from crude petroleum by the almost invariable presence in the latter of portions boiling below 275°—290° C. Normal residues from lubricating oils are almost always heavier than water. The temperature at which they commence to flow should also be determined.—E. F.

Petroleum; Argentine ——. L. Harperath. Zeits. angew. Chem., 1903, **16**, [23], 545. (Fifth Internat. Congress of Applied Chem., Berlin.)

Samples examined by the author in former years were of asphaltic character and technically useless. A few years ago, however, a cloudburst caused a large landslip which disclosed a new source of petroleum. Under a layer of hydraulic limestone a layer of sandstone was discovered, at 11—20 m. depth, impregnated with oil. Below this, and separated by 7 m. of shingle, was another sandstone layer containing oil of lower density.—E. F.

Naphtha [Petroleum]; Fractionation of ——, *in the by Means of Alcoholic Mixtures.* C. Charitsch Zeits. angew. Chem., 1903, **16**, [23], 545. (Internat. Congress of Applied Chem., Berlin.)

Naphtha, or its residues, is treated with a solvent, suc amyl alcohol, and fractionally precipitated with spirit of wine. The heaviest and least volatile fractions are cipitated first. The author considers the method suit both for analysis and for technical application.—E. F.

Petroleum; Examination of Commercial ——. L. Ber Zeits. angew. Chem., 1903, **16**, [23], 545. (Internat. Congress of Applied Chem., Berlin.)

The so-called soda- or Charitschkow-test is no guide the purity of a commercial petroleum, as naphthenic are formed by slight oxidation. The author cons determination of ash and tests for efficient purification alkali to be the only proper criteria.—E. F.

Ammonium Sulphate Process; A New ——.
J. Ballantyne. VII., page 794.

Shale Oil; The Bases contained in Scottish ——. *Pa* F. C. Garrett and J. A. Smythe. Proc. Chem. Soc., **19**, [268], 164.

The only bases obtained in a state of purity fr fractions of Scottish shale oil boiling between 164 180° C. are 2:3-*dimethylpyridine* and 2:4:6-trime pyridine. The lower homologue, which has not, up t present, been described, is a liquid lighter than, an soluble in, water, having a pleasant aromatic smell, boiling at 163°—164° under 768 mm. pressure. Its curichloride melts at 120° and its aurichloride at its platinichloride melts and decomposes at 216° C. trimethylpyridine boils at 171° under 768 mm. pressure gives an aurichloride containing one molecule of wat crystallisation and melting at 53°; when anhydrous salt melts at 112°.

English Patents.

Coal-Tar; Method of and Means for Dehydrating Distilling ——, *applicable also for other and Purposes.* J. Archdale, Manchester. Eng. Pat. 1 July 25, 1902.

The still is in the form of a long rectangular, co trough, with a furnace at one end, and at the same e outlet pipe for the dehydrated tar. At the other end inlet pipe for the tar and an outlet hole for the vap The bottom of the still slopes slightly towards the fu end, and is provided with baffle plates, so that the ta gradually downwards, sudden heating being avoided. whole is supported on a brick framework, forming under the still.—T. F. B.

Carbolic Acid and Homologues of the same; Proce Manufacturing Deodorous and Soluble ——. R. mann. Eng. Pat. 28,277, Dec. 22, 1902. XVII C page 816.

Ammonia; Extraction of ——, *from Distillation* R. Brunck. Eng. Pat. 8287, April 9, 1903. page 795.

Petroleum and other Hydrocarbons; Treatment of and of their Distillates and Derivatives. W. L. London. From L. von May, Austria. Eng. Pa Jan. 14, 1903.

The substances under treatment are heated or coo means of heat-transferring devices, which are rotat otherwise moved whilst in contact with the oil, &c., treatment, and which are traversed by a heating m (*e.g.*, steam) or a cooling medium.—C. S.

United States Patent.

Creosote Oil; Treating ——. C. W. Bilfinger, As to W. M. Morgan. U.S. Pat. 729,838, June 2, XIII. B page 808.

French Patents.

Substances; Process of Heating [Destructive Distillation] ——. to Extract Distillation Products and luable Residues. L. Zechmeister. Fr. Pat. 326,326, r. 14, 1902.

ocess is claimed for distilling "oil, peat, &c." The rature is maintained at about 160° C., until acid fumes to come off; the distillation is then continued at 300° C. The residue forms a valuble fuel, giving smoke, and yielding, on further distillation, a pure nating gas.

vood distillation, heating is continued so long as the ite is free from tarry matter. In this way, wood r is obtained free from tar.—T. F. B.

halene and Anthracene from Tar Distillation; cess and Apparatus for Crystallisation and Imme- e Separation from the Mother Liquor of Products e Crystallised, particularly applicable to ——. Fourcy and G. Buire. Fr. Pat. 325,163, Nov. 8,

ng. Pat. 24,884 of 1902; this Journal, 1903, 291.
—T. F. B.

ines Industrielles" and Lubricating Mineral Oils; ufacture of ——. J. Girard, J. Tabourin, and ortevin. Fr. Pat. 326,348, Nov. 15, 1902.

al hydrocarbons, such as petroleum or naphtha, are with chlorine, or with a mixture of chlorine and a lorite, and the product decanted and washed.
—C. A. M.

IV.—COLOURING MATTERS AND DYESTUFFS.

nt Dyestuffs. C. Liebermann. (Fifth Internat. ress of Applied Chem., Berlin.) Zeits. angew. Ch., 1903, **16**, [24], 577.

thor maintains the view expressed by himself and anecki (this Journal, 1887, 724), that only those anthraquinones containing at least two hydroxyl (or a hydroxyl and a carboxyl group) in the ortho- a-) position, dye with the usual inorganic mordants.
—J. McC.

yestuffs of the Santonin Group. O. Schmidt and edekind. Zeits. f. Farben- u. Textil-Chem., 1903, 229—233.

in, $C_{15}H_{18}O_3$, the active principle of *Santonica*, is a hol derivative, and the lactone of santoninic acid. On n it forms *d*-santonous acid. It is easily transformed isomeride, desmotroposantonin, or into santonic isomer of santoninic acid. Neither santonin nor ic acid react with diazo compounds. Santonic acid ith 2 mols. of a diazo compound in alkaline solution fatty aromatic azo compounds which are yellowish- alkaline solution. On partial reduction with chloride, these yield amino-azo compounds which l, silk, tannined cotton, and jute in pink to violet-red fairly fast to light. Desmotroposantonin, its reduc- oduct desmotroposantonous acid, and *d*-santonous t quantitatively with 1 mol. of a diazo compound ly alkaline solution, forming true aromatic azo ds which are yellow to dark red crystalline dye- Unless the diazotised component contains acid he dyestuffs are not very soluble. Those formed smotroposantonin and diazosulphonic acids are n sodium carbonate solution with a yellow colour, ntensely violet or red with caustic alkalis.—E. F.

digo; The Best Method of Determining ——. Möhlau. XXIII., page 825.

s, Nitro Compounds, &c.; Volumetric Process for Determination of ——. E. Knecht. XXIII., 25.

oluidine; Electrolytic Reduction of ——, in Hy- oric Acid Solution in the presence of Formic dyde. E. Goecke. XI. A., page 803.

English Patents.

Disazo Dyestuffs from Monoacetylparadiamidohydroquinonedialkylether or Amidohydroquinonedialkylether; Manufacture of Substantive Secondary ——. Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a M., Germany. Eng. Pat. 14,576, June 30, 1902.

A product dyeing unmordanted cotton reddish-blue is obtained by diazotising monoacetyl-*p*-diaminoquinol [hydroquinone] dialkylether, combining with one equivalent of α-naphthylamine-6- (or 7-) sulphonic acid, diazotising the resulting amino-azo compound, combining the product with one equivalent of 2-naphthol-6-sulphonic acid, and eliminating the acetyl group. When diazotised on the fibre and developed with β-naphthol, a pure greenish-blue is obtained, fast to washing. By replacing the 2-naphthol-6-sulphonic acid in the above process by 2-amino-8-naphthol-6-sulphonic acid, a blue-black dyestuff is obtained, which, when diazotised on the fibre and developed with the usual developers, such as β-naphthol, a *m*-diamine, or resorcinol, yields a blue-black, black, or greenish-black, fast to washing. The monoacetyl-*p*-diaminoquinoldialkylether, which has not hitherto been used for preparing dyestuffs, may be manufactured from aminoquinoldimethylether in the usual manner. The above dyestuffs are also prepared by diazotising monoacetyl-1.4-naphthylenediamine 6- (or 7-) sulphonic acid, combining with 2-naphthol-6-sulphonic acid, eliminating the acetyl group, diazotising, and combining with aminoquinoldialkylether.—E. F.

Phenylglycine-ortho-carboxylic Acid; Manufacture of —— [Indigo Dyestuffs]. O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 15,660, July 14, 1902.

See addition dated July 12, 1902, to Fr. Pat. 305,302 of 1900; this Journal, 1903, 414.—T. F. B.

Azo Colouring Matter, Colouring Matter Lakes, and Intermediate Products relating thereto; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 15,599, July 12, 1902.

See Fr. Pat. 322,985 of 1902; this Joural, 1903, 414.
—T. F. B.

Colouring Matters containing Sulphur [Sulphide Dyestuffs]; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 15,600, July 12, 1902.

See Fr. Pat. 322,784 of 1902; this Journal, 1903, 361.
—T. F. B.

Green Dyes Containing Sulphur [Sulphide Dyestuffs]; Manufacture of ——. G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine. Eng. Pat. 16,931, July 30, 1902.

See Fr. Pat. 323,489 of 1902; this Journal, 1903, 491.
—T. F. B.

United States Patents.

Anthracene Dye. M. Kugel, Wiesdorf, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 729,675, May 26, 1903.

See Fr. Pat. 326,122, following these.—E. B.

Azo Dye, and Process of making same. M. Kuhn, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 729,601, June 2, 1903.

See Eng. Pat. 18,559, Aug. 23, 1902; this Journal, 1903, 359.—E. F.

Sulphur Dye [Sulphide Dyestuffs]; Olive-Green ——, and Process of making same. A. L. Laska, Assignor to K. Oehler, Anilin- und Anilin-Farben Fabrik, Offenbach a/M., Germany. U.S. Pat. 729,874, June 2, 1903.

Dyestuffs are obtained by melting diformyl-*m*-phenylenediamine with sulphur and sodium sulphide. A salt of a heavy metal, such as zinc chloride, may be added to the melt. The substance produced in presence of zinc chloride is a black mass soluble in water to a greenish-yellow solution, is precipitated by acids, and redissolved by dilute ammonia, and dissolves in strong sulphuric acid to a dirty green solution.—E. F.

Indigo Colouring Matter containing Halogen, and Process of making same. P. E. Osbert, Assignor to Badische Anilin- und Soda-Fabrik, Ludwigshafen a/Rh., Germany. U.S. Pat. 730,148, June 2, 1903.

Cyanomethylanthranilic acid is brominated and the monobrom compound converted by caustic alkali into bromo-phenylglycocoll-o-carboxylic acid. This is converted by the action of acetic anhydride into acetylbromo-indoxyl, which forms a dibromo-indigo by the action of caustic alkali and air. The product imparts no blue colour to glacial acetic acid, cold carbon bisulphide, cold chloroform, or hot ethyl alcohol.—E. F.

Acridine Dye; Yellow ——, and Process of making same. K. Jedlicka, Basle, Assignor to Society of Chemical Industry, Basle, Switzerland. U.S. Pat. 730,771, June 9, 1903.

Orange dyestuffs are prepared by the action of acetaldehyde on the leuco compounds corresponding to the amino-acridines, in aqueous solution and in presence of a mineral acid. The products dissolve easily in cold water to an orange coloured solution, and dye leather and mordanted cotton orange shades. The dyestuff obtained in this way from the leuco compound corresponding to the Acridine Yellow is specially claimed. (Compare addition to Fr. Pat. 241,916; this Journal, 1902, 1529.)—E. F.

Aromatic Amines; Process of making Substitution Products of ——. R. Lesser, Berlin. U.S. Pat. 729,876, June 2, 1903.

See Fr. Pat. 325,534 of 1902; this Journal, 1903, 694.
—T. F. B.

French Patents.

p-Aminotolyl-p-Hydroxyphenylamine, and Sulphur Dyestuffs therefrom [Sulphide Dyestuffs]; Preparation of ——. Manuf. Lyonn. de Mat. Col. Addition, dated Oct. 20, 1902, to Fr. Pat. 317,219, Dec. 24, 1901.

The hitherto unknown base, p-hydroxy-m-chlorophenyl-p-aminotolylamine, is obtained by reducing the product formed by the simultaneous oxidation of equimolecular quantities of chloro-p-aminophenol (Kohlrepp, Ann., **234**, 5) and o-toluidine. It forms colourless crystals, which are sparingly soluble in water, and gives soluble salts with both acids and alkalis. When fused with alkali polysulphides it yields a dyestuff similar to that produced from p-aminotolyl p-hydroxyphenylamine (this Journal, 1902, 967), but greener in shade. The dyeings obtained from the new dyestuff are, it is stated, very fast.—E. B.

Sulphur Dyestuff [Sulphide Dyestuffs]; Blue ——. Act. Gesell. für Anilin-Fabrik. Fr. Pat. 325,639, Oct. 27, 1902.

By heating p-dihydroxydiphenylamine with sulphur at 180° C., Schneider (Ber., **32**, 690) obtained a compound which dissolves in alkali solutions with a blue colour and dyes unmordanted cotton blue. The dyestuff so produced is of no technical value, its affinity for the fibre being too slight. By heating together the substances named at a temperature (e.g., 230° C.) exceeding 180° C., until hydrogen sulphide ceases to be evolved, a product is obtained which dissolves in caustic alkali and sodium sulphide solutions with a deep greenish-blue colour and which dyes cotton bright indigo-blue shades, which are rendered redder and deeper by after-treatment with hydrogen peroxide.—E. B.

Indophenols; Process for Preparing Certain ——. Act. Gesell. für Anilin-Fabrik. Fr. Pat. 326,088, Nov. 4, 1903.

Equimolecular quantities, on the one hand, of the p-amino derivatives of phenol, o-cresol, m-cresol, or o-chlorophenol, and, on the other hand, phenol, o-cresol, or m-cresol, on the other hand, are simultaneously oxidised by alkaline agents at a temperature below 0° C., instead of at or above this temperature as hitherto. Greatly increased yields of t dyestuff products are thus obtained.—E. B.

Colouring Matters [Sulphide Dyestuffs] containing Su phur, derived from m-Toluylenediamine; Manufactu of ——. Soc. J. R. Geigy et Cie. Third Addition, dat Oct. 31, 1902, to Fr. Pat. 306,655, Dec. 27, 1900 (t Journal, 1903, 490).

Mono- or diformyl-m-toluylenediamine is melted w sulphur without addition of sodium sulphide. The p ducts are soluble in hot sodium sulphide solution w an intense yellow colour, and dye unmordanted cotton a f golden-yellow shade.

Yellow dyestuffs are also obtained by melting mono- diformyl-m-toluylenediamine with sulphur and benzidine its derivatives. (See also U.S. Pat. 722,639; this Journ 1903, 490.)

When the benzidine is replaced by diformylbenzid dyestuffs are obtained giving on unmordanted cot yellow-orange shades.—E. F.

Dyestuffs [Sulphide Dyestuffs] from Hypourates of M diamines; Manufacture of ——. Chem. Fabr. vorm Weiler-ter Meer. Fr. Pat. 326,113, Nov. 5, 1902.

The hypourates which are formed by the action of car bisulphide on alcoholic solutions of m-diamines and diamine sulphonic acids, yield dyestuffs when fused sulphur and alkali sulphides; thus, the hypourates of phenylenediamine give, when so treated, olive-green stuffs, whilst the hypourates of m-toluylenediamine for yellow to red-brown dyestuffs. The proportion of sulp employed in the melt has an influence upon the shad the dyestuff produced.—E. B.

Anthracene Dyestuffs containing Nitrogen [Oxazin F. Bayer and Co. Fr. Pat. 326,122, Nov. 5, 1902.

1.2-Alphylaminohydroxyanthraquinones and t derivatives are converted, by oxidation, into colou matters, probably of the oxazine class, the sulphonic d derivatives of which constitute, it is asserted, a series dyestuffs of great technical importance. These dye mordanted wool fast violet, blue, and blue-green, chrome-mordanted wool fast violet and green colours. intermediate alphylamino compounds may be obtained the corresponding 1.2-nitrohydroxyanthraquinones by placing the nitro groups by alphylamino groups by con sation. The colouring matters may, moreover, be d ly prepared by heating the nitro compounds with alp l-amines, with or without the addition of other oxid compounds, the nitro compounds acting as the latter i absence of other oxidising agents.—E. B.

Dyestuffs [Anthracene Dyestuffs] derived from An a-quinone; Production of ——. Société Anonyme Prod. F. Bayer and Co. Fr. Pat. 326,201, Nov. 8, 1902.

New α-β-disulphonic and tetrasulphonic acids are obt by vigorous sulphonation of α-hydroxyanthraquinones, c as erythrohydroxyanthraquinone, anthrarufin, and azin, by means of fuming sulphuric acid at 120°—1 A sulphonic acid group first enters in the β position, on further heating the hydroxyl group is replaced. products dye unmordanted wool yellow, chrome-mord wool being dyed brownish-yellow shades.

When these new sulphonic acids are condensed aromatic amines, the sulphonic acid groups in the α-pos are replaced by alphyl-amino groups, thus form hydroxyalphylaminoanthraquinones, which are va blue-green dyestuffs. They dye unmordanted wo green-blue shades.—E. F.

Indigo Derivatives of Benzene and Naphthalene Intermediate Products; Preparation of ——. (H. Dreyfus. Fr. Pat. 326,168, Nov. 8, 1902.

Hydrocyanocarbodiphenylimides are prepared by ing the thioureas derived from aniline and α- naphthylamine with a mixture of a lead salt, s calcium hydroxide or carbonate, and an alkali cyan aqueous or alcoholic suspension.

α and β-hydrocyanocarbodinaphthylimides obt the above-mentioned reaction are converted by me m concentrated sulphuric acid into α- and β-α-naphthyl-in-naphthalides.

hese compounds, and also the corresponding benzene vative, are converted into indigos by acting on them in eous suspension or alcoholic solution with an ammonium phide solution in which excess of sulphur is dissolved. s solution may be replaced by sulphur and an alkali rosulphite solution.

he indigo derivative manufactured in this way from phthylamine gives a violet solution with sulphuric acid, a blue to greenish-blue solution with aniline. The esponding β-naphthylamine compound gives with sulric acid a green solution changing to blue, and wit ine a green solution.—E. F.

ehydes; Preparation of Sulphonated Aromatic ——. ab. Prod. Chim. Sandoz. First addition, dated Nov. 13, 902, to Fr. Pat. 320,621 of April 23, 1802. (See this ournal, 1903, 41.)

phonic acids of the benzene series, containing one or e methyl groups, are converted into the corresponding hydes by oxidation by means of manganese sesquile, Mn_2O_3, and a suitable acid, or by salts of this oxide. stuffs are prepared by the condensation of the aldehydes ared in this manner with tertiary aromatic amines and subsequent oxidation of the condensation products.

—J. F. B.

.—PREPARING, BLEACHING, DYEING, RINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

ing Process; Theory of the ——. G. v. Georgievics. ifth Internat. Congress of Applied Chem., Berlin.) its. angew. Chem., 1902, **16**, [24], 574—575.

author discusses the dyeing process as a chemical ation and as a purely mechanical action.

e fact that the dyestuff distributes itself in a constant between the fibre and the liquor of the dye-bath ks in favour of Witt's hypothesis of the dyed fabric a solid solution. Against this theory there is the that powdered wool and mercerised cotton take up dyestuff than the untreated fibre, and consequently process is, at any rate partially, one of absorption nding upon the nature of the surface. The fact that rocess is not reversible is also against the theory of solution.

e dyestuff does not fix itself on the fibre in any ite molecular proportion, and the chemical properties e dyestuff are not altered. These facts show that no chemical compound is formed by the dyestuff and the —J. McC.

eighting of Silk; New Method for the Quantitative ermination of the ——. H. Zell. XXIII., page 825.

English Patents.

ile Vegetable Fibres; Treatment of [Retting] ——. Crochet, Brussels. Eng. Pat. 14,149, June 21, 1902.

Fr. Pat. 322,224 of 1902; this Journal, 1903, 295.

—T. F. B.

ring and Mercerising Machines and the like; pts. in ——. J. Spenle, Salford. Eng. Pat. 5249, rch 6, 1903.

invention relates to the construction of clips for use tering and mercerising machines with horizontally-ng chains. The improvements claimed consist in ing a feeler pivoted at the back or outside of the nd a movable jaw at the front or inside of the clip, rts being so constructed that an arm attached to the locks the moving jaw of the clip in its closed on, and also retains it in its open position, the feeler eing provided with an arm by which the moving jaw e opened or released, and the parts being so proporl that great leverage can be obtained during the stage of opening the jaws."—E. B.

Dyeing of Fibrous Materials. C. Owens, Manchester. Eng. Pat. 12,373, May 31, 1902.

A soluble dyestuff is applied to the fabric in the form of powder. It is then saturated with water, and the superfluous liquid expelled.—E. F.

Two-coloured Effects on Tissues composed of Cotton and Silk by Dyeing with Sulphur Colours; Production of ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-M., Germany. Eng. Pat. 11,581, June 30, 1902.

See Fr. Pat. 322,740, July 2, 1902; this Journal, 1903, 363.—E. F.

Dyeing, Bleaching, and the like Operations; Perforated Skewers for use in ——. J. Brandwood, Bury. Eng. Pat. 22,285, Oct. 14, 1902.

Perforated skewers, as used for cop-dyeing, are provided with a cone of india-rubber or metal above the flanges in order to make a tight joint between the skewer and the cop. Cylindrical, perforated metal tubes are also claimed for cheese-dyeing. The cheese of yarn is slipped over this and secured at both ends by india-rubber or metal cones, which in this case also make water-tight joints between the inner tube and the cheese.—E. F.

Sizing Yarn, and other Purposes; Extraction or Preparation, from Seaweed, of Products suitable for use in Dressing Textile Materials ——. [Calcium Alginate.] A. Krefting, Christiania. Eng. Pat. 7913, April 6, 1903.

Fresh seaweed is extracted with about ten times its weight of a one per cent. solution of sodium carbonate. The sodium "tangate" (alginate) solution thus obtained is precipitated by milk of lime, and the dried precipitate of calcium "tangate" mixed with 20 per cent. of "powdered" sodium carbonate. The filtrate can be treated with carbon dioxide and re-used for extracting the seaweed. (See also Eng. Pat. 11,538 of 1896; this Journal, 1896, 720.)

—T. F. B.

United States Patents.

Cotton; Method of Cleaning Ginned ——. H. Rembert, Houston, Tex. U.S. Pat. 730,158, June 2, 1903.

The cotton is first subjected to a current of air, and is then brushed whilst air is blown through it from a point in advance of it and in a direction oblique to the path of movement.—E. F.

Bleaching Textile Fabrics; Apparatus for ——. M. Haas, Aue, Germany. U.S. Pat. 729,574, June 2, 1903.

The apparatus consists of a closed cylindrical vessel, to which is fixed a feed-pipe "provided with slots," and perforated distributing pipes connected to the feed-pipe by means of flanges.—T. F. B.

French Patents.

Dyeing Apparatus. Bernh Siegel and Schütze. Fr. Pat 326,245, Nov. 10, 1902.

See Eng. Pat. 24,631 of 1902; this Journal, 1903, 211.

—T. F. B

Dye-Vat; Rocking ——. P. Durando. Fr. Pat. 326,355, Nov. 15, 1902.

A vat, mounted on rockers, has a valve in the bottom, of simple construction, which is described in detail.—E. F.

Dyeing Furs; A Machine for ——. Soc. Baruoncel, Billaud et Cie. Fr. Pat. 326,364, Nov. 17, 1902.

The fur is passed between a revolving cylinder above and revolving brushes below, which are pressed against the fur by springs. Two of these brushes dip into a reservoir filled to a constant level with dye-liquor.—E. F.

Dyeing Skins; Machine for ——, with Moving Carriage and Flowing Dye-liquor. P. Aubrey. Fr. Pat. 326,456, Nov. 19, 1902.

The liquor enters the bath near revolving screws, or pumping arrangements, which drive it across the skeins. The rods supporting the skeins rest in notches on a framework beneath the surface of the liquor, and are lifted up, shaken, and replaced, one by one, by moving arms descending from a carriage which runs along an upper framework from one end of the vat to the other.—E. F.

Dyeing Machine. Soc. T. Robatel, J. Buffaud et Cie. Fr. Pat. 326,597, Nov. 22, 1902.

The skein is placed on two rods, one of which is of angular cross-section. The two rods are mounted across a frame which oscillates up and down about one end, in a direction at right angles to the rods supporting the skein. By this means the skein is alternately dipped into the dye-bath and taken out again. At the same time the prismatic rod supporting one end of the skein is slowly revolved so that the skein itself travels round the supporting rods.—E. F.

Dry Cleaning: New Process for ——. L. E. Barbe. First Addition, dated Nov. 5, 1902, to Fr. Pat. 321,542, June 4, 1902.

In the original patent a process was described for dry cleaning by the consecutive use, in a closed apparatus, of vacuum, radiant heat, and hot air, with the object of recovering the benzene or other cleansing agent without danger of explosion or fire.

In the present addition the use of an inert gas, such as carbon dioxide or nitrogen, instead of air in the apparatus, is claimed, in order to further obviate any possibility of explosion by means of sparks caused by electricity or friction. To this end, the chamber in which the goods are placed is isolated from the rest of the apparatus, whilst these are being introduced or removed. This chamber is then exhausted, carbon dioxide introduced from outside, and the process continued as usual.—E. F.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Anhydride and Sulphuric Acid by Means of Contact Substances; Preparation of ——. V. Hölbling, Vienna, and H. Ditz, Brünn. Ger. Pat. 142,144, April 9, 1902. Zeits. angew. Chem., 1903, **16**, [24], 583.

In the preparation of sulphuric anhydride and sulphuric acid from sulphur dioxide and oxygen (air), sulphates of the rare earths (cerium, lanthanum, didymium, yttrium, thorium, &c.) are used as contact substances. The contact substance, obtained in the form of mixed oxalates, as a by-product in the manufacture of thorium salts and subsequently converted into sulphates, is used at a temperature between 300 and 600° C.—J. McC.

Ammonium Sulphate Process; A New ——. J. Ballantyne. J. of Gas Lighting, 1903, **82**, [2092], 755.

The author has devised a new "continuous vacuum process" for the manufacture of ammonium sulphate from gas liquor. The plant, which in general arrangement resembles an ordinary continuous plant for working under pressure, is maintained under a high vacuum during the process. It is claimed that all overhead tanks can be dispensed with, as the liquor and acid can be drawn into the still and saturator from very little above the floor level. The ammoniacal liquor is first heated by waste gases in a superheater or economiser, and is then drawn into the still at the top. In the upper portion of the still it passes backwards and forwards over steel-plate trays, with baffles on one-half of each tray, the other half containing "½-inch perforations" through which the steam and gases rise. The liquor passes from each tray to the next lower one by an overflow-pipe, which is so arranged that the liquor on the tray is about ½ in. deep. The steam and gases, as they ascend through the perforations, prevent the liquor passing down, and at the same time bubble through it in small streams, whereby the free ammonia is driven off. In the middle portion of the still is the liming chamber, through which the liquid next passes; it contains a perforated steam coil. In the lower portion of the still is another series of trays with serrated edges, over which the liquor passes. A second perforated steam coil is placed in the bottom of the still. From the still, the gases pass, on the way to the saturator, through a large baffle vessel or which is furnished with a small steam-jet, for the pur of blowing any liquor which may get into the trap, into the top of the still. The gases pass into the cylind copper saturator through a central leaden pipe, from w radiate three or four distributors, placed just above conical bottom of the saturator. The discharger (see Pat. 27,070 of 1902; this Journal, 1903, 735) opens the bottom of the saturator by an internal valve, ope by a hand-wheel and pinions from without. The a finds that the best time for "salting-out" is when the in the saturator is at 56—57 T.

The vacuum on the pump and saturator is 22—24 and that of the still, 13—15 ins. of mercury. Acid, c mercially free from arsenic, must be used in the satura this can be prepared cheaply by passing the waste g from the plant through ordinary "tower acid" until all arsenic is precipitated as sulphide.

The total consumption of fuel is stated to be 4 cw coke per ton of ammonium sulphate; and with an ou of 2—2¼ tons of sulphate per 24 hours, the extra fuel in the boiler when the plant is in operation is 8—10 per 24 hours.—A. S.

Borax; Molecular Condition of ——, in Solution. Shelton. Zeits. physik. Chem., **43**, 494—498; Cl Centr., 1903, **1**, [23], 1248.

Borax in solution is partially hydrolysed into so hydroxide and boric acid, the extent of the hydro being in N/10 solution about 0·5 per cent., and in N solution, 4 per cent. at 25 C., and 6 per cent. at 5 The non-hydrolysed salt is probably split up into N and B_2O_3, possibly also into NaH_2BO_3 and boric The author confirms the statement of Kahlenberg Schreiner (Zeits. physik. Chem., **20**, 547) that the hydrolysed salt contains one atom of boron to one ato sodium. The view that the salt present in solut $NaBO_2$ and not NaH_2BO_3 is strengthened by the fact silver nitrate precipitates from the solution of bora salt $AgBO_2$. The filtrate from the silver metaborat tains the same proportion of free boric acid as the or solution of borax.—A. S.

Calcium Cyanamide: A New Starting-point in Cyanide Manufacture. (Fifth Internat. Congres Applied Chem., Berlin.) G. Erlwein. Zeits. a Chem., 1903, **16**, [23], 533—536. See also under page 809.

In the manufacture of cyanides from atmospheric nitro the nitrogen is passed over barium carbide heat redness in iron retorts, and the resulting mass fused sodium carbonate. On treating the melt with w barium carbonate remains undissolved, and is reconv into carbide to go through the process again, whil crude sodium cyanide is converted into ferrocyanide purified. In the retorts, only some 30 per cent. o barium carbide is converted into barium cyanide remainder forming *barium cyanamide*, CN.NBa, carbon separates; the cyanamide is converted into cy during the fusion with sodium carbonate, taking up the separated carbon. The process gave good resul the manufacturing scale, the (80 per cent.) carbide t up at least 90 per cent. of the theoretical quanti nitrogen, giving a product containing 11 per cen nitrogen, a melt with sodium carbonate conta cyanogen equivalent to 22 per cent. of potassium cy and a final product of pure cyanide corresponding to 80 per cent. of the nitrogen absorbed. Later, the easily prepared calcium carbide was successfully subst for barium carbide; and this alteration permitted of changes in the later treatment of the material, eff considerable economies. The whole of the carbide is verted into calcium cyanamide and carbon, and the (20—23 per cent. of nitrogen) is fused with commo instead of sodium carbonate, 90—95 per cent. of its nit appearing finally as cyanide. Two further improveme the process have been worked out since the middle of In the first place, it was discovered that the separate pre tion of calcium carbide was unnecessary, and that ca cyanamide could be formed by the action of nitrogen ic resistance furnace on a mixture of lime and carbon; econdly, it was found possible, by a simple lixiviation ss, to convert the calcium cyanamide into the crystal- e, easily purified dicyandiamide—

$$2 N.NCa) + 4(H.OH) = (CN.NH_2)_2 + 2Ca(OH)_2.$$

fused with sodium carbonate, is largely converted pure sodium cyanide, ready for the market without treatment, while ammonia escapes as gas, to be bed in sulphuric acid in the usual way, and the ning dicyandiamide is polymerised, and sublimes as a re of polymerides, which is returned to the melting-pot next operation. The author suggests as an equa-

$$NH_2)_2 + Na_2CO_3 + 2C = 2NaCN + NH_3 + H + 3CO + N.$$

ides pure cyanide, other products having a high rial value are manufactured by the process; and the production of cyanamide and its polymerides opens y to the industrial synthesis of many of the derivatives ea. (See also U.S. Pat. 708,333; this Journal, 1902,)—J. T. D.

r Sulphate; Manufacture of ——. G. Gin. (Fifth ernat. Congress of Applied Chem., Berlin.) Zeits. ew. Chem., 1903, **16**, [24], 566.

copper or copper ore is roasted in the air, and on g the oxide with sulphur dioxide, copper sulphate is d. The mass is extracted with water, the ferric te reduced to the ferrous condition, and the solution l under pressure in a copper boiler at 150° C. Under conditions the ferrous sulphate separates and the is forced through a filter-press. Pure copper te crystallises from the solution on cooling.—J. McC.

ic; Action of ——, on Copper. A. Granger. Comptes rend., 1903, **136**, [23], 1397—1399.

compounds formed by direct action of arsenic on vary in composition with the conditions of the ment. At the temperature (440° C.) of boiling r, the compound (easily formed by heating arsenic opper in separate boats in a glass tube in a bath of r vapour, and carrying forward the arsenic vapour stream of carbon dioxide) has the formula Cu_5As_2. ame as the arsenide formed in Reinsch's process. ch's arsenide is amorphous, however, while this forms steel-grey crystals with metallic lustre, belonging to ubic system; sp. gr. 7·56; attacked by chlorine, ne, nitric acid; tarnishes in air. At higher tempera- the action of arsenic on copper furnishes compounds in arsenic; and Cu_5As_2, when heated in an inert ses arsenic. The same compound can be prepared reaction of arsenious chloride on copper, or of cupric le on arsenic. A corresponding copper phosphide, , can be formed synthetically, but at a higher rature than the arsenide. At 440° C. phosphides in phosphorus are formed; but the author has not ble to obtain, by lowering the temperature, arsenides in arsenic than Cu_5As_2.—J. T. D.

ony and Silver Sulphides; Fusibility of Mixtures ——. H. Pélabon. Comptes rend., 1903, **136**, [24],)—1452.

elting-point curve of mixtures of these sulphides can nstructed completely; it shows two maxima, corre- ing with the compositions $Sb_2S_3.Ag_2S$ and Sb_2S_3. , and indicating definite compounds with these læ; and three minima, corresponding to three dif- eutectic mixtures.—J. T. D.

gen; Preparation of Pure ——. G. von Knorre. Chem.-Zeit., 1903, **27**, [46], 550.

potassium chromate is added to the mixture of solu- of sodium nitrite and ammonium sulphate.—A. S.

gen; Purification of ——, on the Industrial Scale, Cold. C. Renard. Comptes rend., 1903, **136**, [22], 7—1318.

OGEN, prepared from commercial zinc and acid, is ed through petroleum spirit cooled by liquid air. A temperature of −110° C. suffices to insure the removal in this way of all the arseniuretted hydrogen even from a rapid stream of the gas.—J. T. D.

Chlorine Producer; The McDonald Electrolytic Cell as a ——. T. Ulke. XI. A., page 802.

Pyrites; Determination of Sulphur in ——. M. L. Lemaire. XXIII., page 822.

English Patents.

Sulphuric Anhydride; Contact Apparatus for the Production of ——. G. W. Johnson, London. From Verein Chemischer Fabriken in Mannheim. Eng. Pat. 16,206, July 21, 1902.

See Fr. Pat. 323,491 of 1902; this Journal, 1903, 495.
—T. F. B.

Nitric Acid [from Air]; Process for the Production of ——, and Apparatus therefor. H. Pauling, Brandau, Austria. Eng. Pat. 18,427, Aug. 21, 1902.

See Fr. Pat. 323,760 of 1902; this Journal, 1903, 495.
—T. F. B.

Nitric Dioxide and Nitric Acid; Process for the Manufacture of ——. G. Pauling, Olbernhau, Saxony. Eng. Pat. 21,828. Oct. 7, 1902

See Fr. Pat. 325,244 of 1902; this Journal, 1903, 696.
—T. F. B.

Ammonia; Extraction of ——, from Distillation Gases. R. Brunck, Dortmund, Germany. Eng. Pat. 8287, April 9, 1903.

Gas evolved in the dry distillation of coal, wood, &c., and especially coal gas, whether from coke ovens or otherwise, is led into a concentrated acid, preferably sulphuric acid, contained in an open vat, and maintained at a temperature not lower than 80° C. The vat is partially covered by a closed chamber having an entrance and an exit pipe, and intermediate divisions dipping into the acid in such manner that the gases are brought into intimate contact with the latter. The solid ammonium salt formed is removed when necessary, and replaced by fresh acid. The treatment of the gases with concentrated acid before entering or after leaving the open washer is also claimed, this acid being then run into the open washer.—E. S.

Concentrating Solutions; Improved Means applicable for Use in ——. [Sulphate of Iron, &c.]. H. W. Hemingway, Walthamstow, Essex. Eng. Pat. 16,295, July 22, 1902.

For the purpose of preventing the formation of a solid deposit upon the bottom of the concentrating trough during the heating operation, the patentee uses scrapers, to which he imparts a vibratory movement. Each scraper consists of a metal bar of suitable form arranged in jaws or sockets, to which the vibratory movement is imparted, wooden backings being employed to prevent undue wear of the jaws by the bar.—R. A.

Air; Apparatus for Liquefying ——, and for Separating the Constituent Gases of the same. H. H. Lake, London. From The Atmospheric Oxygen and Power Co., Glen Ridge, N.J. Eng. Pat. 11,609, May 21, 1902.

See Fr. Pat. 321,860 of 1902; this Journal, 1903, 298.
—T. F. B.

United States Patents.

Sulphuric Anhydride: Process of Manufacturing ——. A. Clemm and W. Hasenbach, Mannheim, Germany. U.S. Pat. 729,735, June 2, 1903.

The hot gases from the pyrites kiln are first led over copper oxide, or a mixture of copper and chromium oxides, and after passage through a filter of porous substances, are caused to traverse platinum contact material. See U.S. Pat. 690,133, Dec. 31, 1901: this Journal, 1902, 254; and U.S. Pat. 716,985, Dec. 30, 1902; this Journal, 1903, 145.
—E. S.

Hydrated Calcium Peroxide; Process of Making ——. G. F. Jaubert, Paris. U.S. Pat. 729,767, June 2, 1903

Dry slaked lime and sodium peroxide hydrate are mixed and exposed to moist air, free from carbon dioxide, until a small proportion of water is absorbed without heating the mixture.—E. S.

Salt-Brine Evaporator. H. Holmes, Sterling, Kans. U.S. Pat. 730,210, June 2, 1903.

The evaporator consists of a covered pan, or a series of such pans, heated by means of a fire-arch under the first pan, &c., to produce evaporation from the surface of the brine at a temperature below the boiling point, means being provided for rapidly renewing the air above the surface of the brine, and for imparting the heat of the air and vapour driven out of the pan to the air entering the same. When a series of pans are employed, the steam generated in the first pan is caused to pass through the last pan of the series, in which it serves as an auxiliary heating agent. Reciprocating scrapers are arranged to convey the salt from the sides towards the middle line of the pan, from which it is taken up by an endless belt conveyor and discharged at the end of the pan.—R. A.

French Patents.

Sulphuric Anhydride; Process of Manufacturing ——, *by the Catalytic Method* [*Contact Material*]. V. Holbling and H. Ditz. Fr. Pat. 326,321, Nov. 13, 1902.

For contact material, sulphates of the rare earths (cerium, lanthanum, didymium, yttrium, thorium, &c.) are used, singly or in combination, after undergoing a preliminary calcination at from 300° to 600° C. A claim is also made for similar application of mixed sulphates obtained by treatment of the insoluble residues occurring as waste in the preparation of thorium compounds.—E. S.

Sodium Oxide; Production of ——. Société anon. Badische Anilin und Soda Fabrik. First Addition, dated Nov. 15, 1902, to Fr. Pat. 323,793, Aug. 16, 1902. (See this Journal, 1903, 495.)

To sodium heated in an iron vessel, a stated proportion is gradually added of calcium nitrite or nitrate, to obtain a mixture of sodium oxide and calcium oxide. A mixture may, in like manner, be obtained of sodium oxide with strontium or barium oxide. The violence of the reaction may be moderated by adding a caustic alkali. To produce potassium oxide, singly, or mingled with sodium oxide or the oxide of an alkaline earth, or with both, a corresponding process is used, suitable proportions of the ingredients being taken, and air being as far as possible excluded.

Potassium oxide is said to be obtained as a grey, crystalline mass, rapidly oxidising in the air to peroxide, and inflaming on contact with water. See also Fr. Pat. 321,416, May 26, 1902; this Journal, 1903, 212, in which only the obtaining of the simple alkali metal oxides is claimed.—E. S.

Chlorates and Perchlorates of the Alkali Metals or Alkaline Earths; Production of ——. R. Threlfall and G. E. Wilson. Fr. Pat. 326,460, Nov. 19, 1902.

See U.S. Pat. 716,789, 1902; this Journal, 1903, 99; and Eng. Pat. 2987, 1902; this Journal, 1903, 304.—G. H. R.

Chlorine; Process and Apparatus for the Electrolytic Production of Oxygenated Compounds of —— [*Hypochlorites*]. Soc. Elektrizitäts A.-G. vorm. Schuckert and Co. Fr. Pat. 326,598, Nov. 22, 1902.

Small quantities of resin are added to the solutions of alkali or alkaline earth chlorides in the presence of compounds of the alkaline earth metals in order to obtain strongly concentrated solutions of the oxygenated compounds of chlorine. The electrolysing apparatus is composed of separate cells traversed by the electrolyte in a serpentine course. Intermediary cells, in which the electrolyte is cooled or heated by suitable means, are placed between the different electrolytic cells, or between groups of such cells. The electrodes of the same potential, directly adjacent the intermediary cells, may be formed in a single piece, not.—G. H. R.

Electrolyser [*for Sodium Chloride*] *with Revolving Pla form.* A. Epplé. Fr. Pat. 326,787, Nov. 28, 190 XI. A., page 864.

Oxygen; Manufacture of ——, *by the Aid of Liquid A* G. Claude. First Addition, dated Nov. 15, 1902, Fr. Pat. 321,460, Sept. 15, 1902. (See this Journ 1903, 554.)

In apparatus of the class described in the main patent, the is now applied an arrangement permitting the return the liquid air formed in the liquefying part of the apparatu in such manner as to circulate in "inverse sense" and contact with the gaseous air undergoing partial condens tion for separation of its oxygen. The liquid air th enriched is then passed to the coldest side of the eva rator, so as to circulate methodically about the liquefier, a direction the inverse of that of the circulation of gaseous air. The uncondensed portion of the latter (chie nitrogen) is allowed exit to the atmosphere after utilisat of its cooling capacity.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Silvering of Glass: Influence of Copper on the — L. Vignon. Bull. Soc. Chim., 1903, **29**, [515—517.

The deposition of a silver mirror on glass by the reduci action of a tartrate on ammoniacal silver nitrate, takes pl at much lower temperatures in presence of a trace copper. Thus, a silver solution which did not yield a deposit at 50° C., in the absence of copper, furnis excellent mirrors at 30° C. when 0·4 mgrm. of copper sulphate) was added to 250 c.c. of it. Larger amounts copper than 0·8 mgrm. tend to hinder the formation o mirror and alter its colour. Water distilled with a cop still, always contains traces of copper, and this m explain the irregular results sometimes obtained in silvering of glass.—M. J. S.

Porcelain; Pitting of ——, *in Glazing.* L. Thiri Sprechsaal, 1903, **36**, [21], 773—774.

The pitting occasionally produced on the surface of por lain ware when glaze is applied to the biscuit, is found the author to be due to insufficient baking in the biscu kiln. This leaves the ware unusually porous and particles of clay imperfectly hardened; so that the gl entering the pores compresses the air therein, and latter, in escaping, breaks away portions of the superfi substance of the ware.—C. S.

English Patents.

Glass: Process and Apparatus for Making ——. Harrison, J. Wharton, and S. R. Wightman, all Monongahela, U.S.A. Eng. Pat. 354, Jan. 6, 1903.

Molten glass is led directly from the tank over a wat cooled trough, between a pair of rolls also water-coo thence passing on to a delivery table, where it is cut i sheets of any desired size by means of a travelling kn The sheets are then placed in a finishing oven to rest transparency to the glass.—W. H. S.

Earthenware Goods; Kilns and Ovens for Firing — T. Tindal, Stoke-on-Trent. Eng. Pat. 11,119, May 1902.

A combustion chamber is constructed under the firing of the kiln, and beneath and around this chamber and firing box is a system of flues through which gases gener in the furnace of the kiln are conducted to ensure e distribution of heat, proper combustion, and eliminatio smoke.

A similar arrangement is also employed for ovens, heated gases being drawn into the oven and circula around the "saggers" containing the earthenware articl —W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Portland Cement ; Detection of Adulteration in ——. W. Fresenius. XXIII., page 822.

English Patents.

Stone ; Manufacture of Artificial ——. G. F. Thomson, Wellingborough. Eng. Pat. 6400, March 15, 1902.

The materials (cement and granite chippings, sand or blast-furnace slag) are mixed with water to the "consistency of liquid," which is run into a multiple mould so divided that the stones are cast on edge, the liquid overflowing from one division to the next, and the excess of water running off. Pressure is then applied by means of a plunger, to the upper edges of the stones, and after the initial set has taken place water is poured on to the mould. The sides and bottom of the mould are made in sections held together by bolts or clamps, which are withdrawn when the stone has fully set, allowing the stone slabs or the like to be removed and stacked ; or the moulds may be removed bodily on a specially constructed trolley, consisting of a fixed frame, with supporting chains, mounted on an axle. It is claimed that by the above process thorough oxidation is obtained, its rate being under control, and that the stone produced is of a very close texture, the finer particles of the materials coming towards the surface, whilst the coarser pieces remain in the middle.—W. H. S.

Marble, Dolomite, and other Stone ; Manufacture of Artificial ——. Th. M. Thom, London. Eng. Pat. 2,861, June 5, 1902.

Waste products obtained in the working of crystalline marble (such as Carrara and white Sicilian) are cleansed, crushed to a fairly fine condition, and washed to remove fine powder. The small crystals of calcium carbonate left, are then thoroughly mixed with one-third their weight of ground calcined limestone ; the whole is slaked and moulded under a pressure of one ton and upwards per square inch, into blocks, which are then dried and exposed to the action of carbon dioxide under gradually increasing pressure as described in Eng. Pat. 13,467 of 1900.

By adding coloured oxides during the mixing and slaking, various coloured marbles may be imitated, whilst dolomite, &c. may be obtained by adding the requisite proportion of magnesia, &c.—A. G. L.

Bricks or Blocks ; Process for Producing Building ——, *and Apparatus for use therewith.* E. Eaton, W. eiffer and C. H. Briggs, all of London. Eng. Pat. 2371, Jan. 31, 1903.

A mixture of 5 per cent. of sand with 5 per cent. of clay, silica, ground clinker, ashes, quartz, &c., is dried, mixed with 5 per cent. of unslaked lime, placed in a special slaking cylinder and slaked, the mixture being very thoroughly agitated by means of blades or other mixers, so as to ensure the complete slaking of the lime. The mixture is then screened and added to 85 per cent. of sand, and the whole moulded under a total pressure of not less than 130 to 50 tons, after which it is placed on trays and run into a steaming chamber, and gradually subjected to the action of steam up to a pressure of 120 lb. per square inch, which is maintained uniformly for 12 to 16 hours. The hardness of the bricks may be improved by making the steam pass through a pipe containing alkali, a portion of which is carried over by the steam. The bricks are then allowed to cool gradually in an annealing chamber, and are sprayed with water of a suitable temperature during this process. Until they are thoroughly cold, they are very sensitive to vibrations and require careful handling. (Compare also Eng. Pat. 2372 of 1903 ; this Journal, 1903, 698.)—A. G. L.

Kilns [Portland Cement, &c.] ; Impts. in ——. Dora ehmann, White Cliffs, Ark., U.S.A. Eng. Pat. 6091, March 16, 1903.

Immediately below the top of the kiln shaft, and slightly inclined towards it, is fixed a rotating drying and feeding drum, into the upper end of which gases from the burning chamber are drawn by a suction fan, partially drying the material before it reaches the shaft. The drum is traversed by longitudinal plates placed at an acute angle with its inner wall, and as the drum revolves, the material gradually discharges into the shaft, just below the entrance into which is a preliminary heating chamber, formed by supporting bars arranged in step form. Below this is the burning chamber, into which the material finally passes. At the lower end of the drum its wall is perforated with small holes, through which any pulverised material passes, thus preventing its entrance into the shaft of the kiln.

—W. H. S.

Kilns for Burning Bricks, Sanitary Tubes, and the like. E. Jenkinson, Halifax. Eng. Pat. 12,648, June 3, 1902.

The invention, which is especially adapted for use with the Hofman kiln, is for the purpose of utilising waste heat. A hot-air tube is built in the roof of the kiln and traverses all the chambers, in each of which a junction provided with a damper is fitted to it. A short, removable metal tube fits the junction, and reaches nearly to the bottom of the chamber. As soon as a chamber has been charged with green goods, the dampers leading from the burning chamber are closed and waste heat from the last burning chamber is admitted by means of the hot-air tube, first to the bottom, and then, by removing the short tube, to the top of the chamber, giving a preliminary drying and heating to goods, which are afterwards exposed to the waste gases from the burning chamber.—A. G. L.

United States Patents.

Clay ; Petrifaction of ——. B. J. Fallon, Summit, N.J. U.S. Pat. 729,562, June 2, 1903.

Bricks, sufficiently burned to render them porous, are, after cooling, subjected in a closed chamber to the action of steam under pressure, so that the steam may penetrate the entire bodies of the bricks, which are then reheated, with the steam pressure still retained, to the former temperature, when the pressure is reduced to a minimum, and the burning is completed.—E. S.

Stone, Artificial ; Manufacture of ——. J. T. Saltiel, Denver, Col. U.S. Pats. 730,479 and 730,480.

The composition is made by adding to a dry mixture of crushed granite, powdered glass, sand grit, clean hard cinder-clinkers, pebbles, hydraulic cement, and ochres, a mixture of "salt-water suet or tallow soup," crushed eggshells boiled in vinegar, acetic acid, and water. Both the mixtures are also claimed separately, as components which may be used in artificial stone-making. The liquid mixture may also be used for proofing and strengthening artificial stone, bricks, tiles, and plasters, by damping the mixed dry constituents thereof with it.—A. G. L.

Statuary Marble ; Manufacture of Compositions forming Imitations of ——. L. Beaumel, Toulouse, France. U.S. Pat. 730,600, June 9, 1903.

See Eng. Pat. 18,476 of 1902 ; this Journal, 1903, 30.

—T. F. B.

Tiles, Slabs, or the like ; Manufacture of ——. G. Kunick, London. U.S. Pat. 730,778, June 9, 1903.

A mixture of sand and lime is moulded to the required shape, treated with carbon dioxide, with or without using pressure, and finally heated to a high temperature. The mixture of sand and lime may be moulded to a form having perforations through which the carbon dioxide is led to the interior of the articles.—A. G. L.

White Cement ; Manufacture of ——. O. Friz, Nuremberg, Germany. U.S. Pat. 730,630, June 9, 1903.

Lime and clay, both as free as possible from iron, are mixed with porcelain frits and burned approximately at the fusing point.—A. G. L.

FRENCH PATENTS.

Wood; Manufacture of Artificial ——. J. Erdin and A. Erne. Fr. Pat. 326,246, Nov. 10, 1902.

WOOD sawdust is intimately mixed with any waste material of the colour trade, *e.g.*, waste oil colours, varnish, fatty oils, &c., or with resin, all previously dissolved in turpentine, a little litharge and a binding agent being afterwards added in such proportions that the mass obtained is not sticky, but rather granular. The mixture is introduced into smooth moulds and subjected to a considerable pressure for five or six hours, after which it is exposed to the air and dried at a temperature not exceeding 35 to 40° C. Mineral pigments may be mixed with the mass to colour it; or, by the addition of coloured wood shavings, a structure imitating marble or wood may be obtained.
—A. G. L.

Marble; Transformation of Limestone into Artificial ——. J. P. Veillard. Fr. Pat. 326,465, Nov. 19, 1902.

THE blocks, &c., of limestone are first dehydrated by heating in an oven to a temperature of 70 to 120° C., according to the hardness and porosity of the stone. They may then be placed in "a bath of silicate of 50 acidity," heated to 80° C., to increase their hardness. They are then again heated in a stove and colouring tinctures applied to the surface by means of a pump worked from without. The chief colouring tinctures used are made as follows:—Red, by dissolving 100 grms. of iron oxalate in one litre of water and mixing with a solution of 100 grms. of iron sulphate in one litre of water. Sienna-yellow, by mixing two solutions, one containing 50 grms. of chrome alum, the other 50 grms. of barium chloride per litre. Violet, by mixing 200 grms. of nickel chloride dissolved in one litre of water with 100 grms. of potassium ferrocyanide dissolved in one litre of water. Sea-green, by mixing 250 grms. of copper sulphate dissolved in one litre of water, with 250 grms. of barium chloride also dissolved in one litre. Green, by mixing 250 grms. of copper sulphate dissolved in one litre of water, with 50 grms. of sodium bichromate dissolved in one litre of water.—A. G. L.

Marble, Artificial; Manufacture of ——. J. Czermak. Fr. Pat. 326,534, Nov. 10, 1902.

ON a smooth foundation, which must not itself react with the materials, liquid colours are applied in bands, the pattern of which may be varied at pleasure. A paste of cement, plaster, &c., is then applied, these operations of applying colours and cement, &c., being repeated several times until a smooth, even mass is obtained.—A. G. L.

Stone, Artificial; Manufacture of ——. J. Jaffé. Fr. Pat. 326,625, Nov. 24, 1902.

To prevent the cracking due to spontaneous heating which takes place two or three hours after the hardening of artificial stone made from Sorel cement, the mass is allowed to harden in a receptacle, which may be exhausted, surrounded completely by water, which is renewed so as to keep the mass within always at the same temperature.
—A. G. L.

X.—METALLURGY.

Steels; Cementation of ——. L. Guillet. Comptes rend., 1903, 36, [22], 1319—1321.

IN ordinary steels, the rate of penetration of carbon is independent of the original carbon content, and varies with the cementing material, though it tends, with most of these, towards the same limit (reached after about 8 hours' heating at 1000° C.); the rate increases rapidly with the temperature. The maximum initial rate is given by wood-charcoal containing potassium carbonate. The potassium carbonate seems to be essential, and experiments of the author's indicate that its action is due to the formation of cyanide from the nitrogen of the enclosed air. Attempts to determine the solubility of carbon in iron have not been successful; a stable and homogeneous condition seems to be reached, but to be destroyed by further action. Certain nickel-steels attain by cementation alone to the same hardne which ordinary steels only acquire by cementation followe by hardening. Steels containing γ-iron cement at mu lower temperatures than ordinary steels. (Compare th Journal, 1903, 631.)—J. T. D.

Steels; Decarburisation of ——, *by Evaporation in vacu* G. Belloc. Comptes rend., 1903, 136, [22], 1321—1322

CONTINUING his work (this Journal, 1903, 422), the auth finds that occluded gases are necessary to start the decarb rising action, but will not continue it without an extern source of energy, electrical or chemical. The occlud gases raise the electrical resistance of the metal. Th evaporation of the metal *in vacuo* occurs to a considerab extent (20 per cent. of the total iron in one instance) wh the metal is electrically heated in proximity to a co surface; the iron alone volatilises, so that the carb concentrates in the residue. Evaporation is retarded by film of oxide and accelerated by traces of hydrogen. It not peculiar to iron, but occurs with nickel, silver, coppe &c.; the thin films of metal thus formed on glass plat show colours by transmitted light peculiar to each metal.
—J. T. D.

Iron; Rusting and Passive State of ——. M. Mugda Zeits. für Elektrochem., 1903, 9, [22], 442—455.

PIECES of carefully cleaned iron wire of about 0·8 mm. diameter and 60 mm. in length were immersed in solutio maintained at 25° C., and were weighed in the liquid befo and after the treatment. When air was blown through t liquid, it was first completely freed from carbon dioxi In the solutions of normal chlorides, bromides, sulphate chlorates, perchlorates, bromates, iodates, nitrates, a chromates examined, as also in water, the alteration weight after an immersion of 24 hours in no case exceed 5 mgrms.; in many cases it was less than 0·1: in alkali solutions it was less; in (0·0001 normal) acid solutio it was still below 3·3 mgrms. in every case. With mo concentrated acids the loss was greater. In all these cas air was blown through the liquid during the experime Under similar conditions a loss of 70—90 per cent. w observed when potassium persulphate was employed doubtless due to acidification caused by a dissociation the salt. Cast-iron rusts more readily than iron wi Reduced iron behaves like soft iron. It may be consider that potassium chlorate, potassium cyanide, potassiu hydroxide, oxalate, acetate, and the like reduce the te dency to rusting, whilst potassium chloride, potassiu sulphate, and potassium perchlorate increase it. Fr measurements of potential and other evidence it appe that the passive state of iron is not a result of the fo mation of a film of protective oxide. It is a state whi may be attained by the sudden contact of the metal w a solution without the application of an electric cu rent, and it appears therefore that the solution exerts catalytic influence on the metal, which thus becomes mo electro-negative, and possesses a smaller solution pressu than before. The passive state can be brought about apparently indifferent substances having but little common. The tendency of salts with weak anions w found to be to render the metal passive, whilst those w strong ions had the opposite effect. A mixed solution 0·03-N silver nitrate and 0·06-N potassium chlorate a as a good test solution for the grade of passivity the metal. Fresh metal shows a brisk deposition of sil after five minutes; iron that has been immersed sodium acetate solution does not begin to deposit sil for half an hour, that immersed in potassium chlor solution only after three-quarters of an hour, in caus soda solution after a longer period, and in nitric ac only after several hours. This is so, even if the wi be rinsed in water before placing them in the test so tion. A wire which had become covered with oxide heating, deposited silver from this solution after an imme sion of three minutes. The resisting power of iron agai strong sulphuric acid is probably due to the iron assumi the passive state. Indeed soft iron in dilute sulphuric a shows + 0·2 to 0·3 volt when opposed to the hydrog electrode, whilst in pure strong sulphuric acid it sho ly + 0·04 volt. Specimens of cast-iron showed only 0·1 volt. Tin in the same acid showed −1·06 volt. uminium in strong nitric acid showed − 0·96 volt. The ssive condition occurs therefore more widely than is mmonly supposed.—W. G. M.

Iron ; Corrosion of ——. W. R. Whitney. J. Amer. Chem. Soc., 1903, **25**, [4], 394—406.

the process of corrosion, iron always passes through or o a state of solution, and since there is no evidence of a passing into solution except in the form of ions, the thor considers that the process is an electrochemical e, the rate of corrosion being a function of the electro- tive force between iron and the surrounding media, and resistance of the circuit. The corrosion of iron is marily dependent only upon the concentration of drogen ions in the surrounding medium, whilst secondary cesses determine whether or not insoluble compounds deposited as a coating on the surface of the iron. It been previously shown that iron reacts with pure ter. J. A. Collins, in 1898, found that iron dissolves the water, and that the formation of rust is due to a ondary reaction. A clean iron tube was filled with ling distilled water, and the boiling continued for some ie. A cap was then screwed on whilst the water was ling, and the tube heated for an hour to 125° C. On ling and removing the water, it was found to be quite ar and colourless, but on exposure to air in a glass sel, a precipitate of rust rapidly separated. Iron dissolves water at a rate corresponding to the concentration of hydrogen ions, the process being similar to the solu- of iron in copper sulphate solution, hydrogen being arated in place of copper. Alkaline reagents which, ier by dissociation or hydrolysis, produce hydroxyl ions consequently diminish the concentration of hydrogen in the solution, are the substances mostly used to der corrosion. The favourable effect of alkalis is due to the fact that they combine with any carbon dioxide sent. It is shown by experiments that the presence of bon dioxide is not essential for the corrosion of iron, this is in accord with the fact that, especially in boiling er, the concentration of the hydrogen ions is reduced ier than increased by dissolved carbon dioxide. Carbon xide, however, plays an important part in the corrosion iron. If, for example, the feed water of a steam or hot- er heating apparatus is not of an alkaline nature, a tion of the carbon dioxide will be expelled on boiling. will again redissolve in the cooler parts of the apparatus the condensing water. This water will then exert a eut action on the iron of the return pipes of the em, according to the equation, $Fe + 2CO_2 + 2H_2O =$ $H_2(CO_3)_2 + H_2$. In the boiler, the dissolved iron bi- bonate is decomposed into iron oxide or hydroxide and bon dioxide. The latter is thus free to again exert a ent action on the iron of the return pipes, and so on, for unlimited period. In the author's opinion, sufficient ntion has not been paid to the fact that the corrosion of by carbon dioxide is a cyclic process, and that, under able conditions, a trace of carbon dioxide has the er of causing an unlimited amount of iron to pass solution. (See also this Journal, 1903, 745.)—A. S.

d from Cyanide-House Slimes ; Extraction of —— *by Wet Method.* J. Fleming. J. Chem. Metall. and ining Soc. of S. Africa, 1903, **3**, [12], 187—194.

LIMINARY experiments have been made successfully, ollows :—The slimes were treated with sulphuric acid water, more water was added after some hours, and mixture was allowed to settle. The residue, after ing off the liquid, was treated with sodium chloride, ganese dioxide, and sulphuric acid ; the chlorination twice repeated. The solutions were run into a lower and precipitated with ferrous sulphate. The deposited was finally collected and run together. The residue, chlorination, was treated with cyanide, which dis- ed out the silver with a little gold that had been left. king with 451 lb. of slimes, "containing $\frac{15}{16}$ths of zinc e, zinc shavings, and mud," and under unfavourable con- ns, the cost of the treatment worked out at 11*d.* per oz. of gold extracted, and the extraction was equal to 99·87 per cent. Of the 121·6 oz. of gold recovered, 94½ per cent. was obtained by chlorination, and 5½ per cent. by the final cyanide treatment. The gold was not all capable of extraction by chlorine ; it is probable that it exists in part as a double oxychloride salt of gold with alumina, manganese, or iron, insoluble in the acid liquid, but broken up by cyanide.—W. G. M.

Copper ; Process for Extracting ——, *from Low-Grade Ores.* G. D. Van Arsdale. Eng. and Mining J., 1903, **75**, [23], 853.

UNDER suitable conditions, sulphur dioxide is capable of precipitating copper from solutions of copper sulphate, with the production of free sulphuric acid. The main reactions may be expressed by the equations—

$$(1)\ 3CuSO_4 + 3SO_2 + 4H_2O = Cu_2SO_3.CuSO_3 + 4H_2SO_4;$$

$$(2)\ Cu_2SO_3.CuSO_3 + 4H_2SO_4 =$$
$$Cu + 2CuSO_4 + 2H_2SO_4 + 2SO_2 + 2H_2O.$$

At atmospheric pressure, a cold solution of copper sulphate, saturated with sulphur dioxide, gradually deposits a small amount of cupro-cupric sulphite. On boiling the solution and passing a current of sulphur dioxide through it, metallic copper is precipitated in a proportion corresponding to equation (2). If the liquid saturated with sulphur dioxide be heated in a closed vessel, the yield of precipitated copper is increased to 40—50 per cent. of that originally present. Practically the whole of the copper can be recovered, if the free acid formed, be neutralised, the solution again saturated with sulphur dioxide and heated, these operations being repeated as often as necessary. The author proposes a method based on the above reactions for the extraction of copper from low-grade ores. The ores (after roasting, in the case of sulphide ores) are leached with sulphuric acid, the solution of copper sulphate is saturated with sulphur dioxide (converter flue gases, &c.), the saturated solution is heated in a closed vessel to nearly 100° C. (equivalent to a pressure of about 30 lb. per sq. in.) to effect precipitation of the copper ; the sulphur dioxide is then expelled from the solution by releasing the pressure and, if necessary, heating for a short time ; the acid liquor, after separation of the precipitated copper, is used for leaching a fresh quantity of ore, and the copper sulphate solution produced, after being, if necessary, neutralised, is saturated with sulphur dioxide, and treated as before.

—A. S.

Copper ; Casting —— *in Sand.* J. W. Richards. Eng. and Mining J., 1903, **75**, [23], 854.

FOR the production of copper castings, free from blowholes, the addition of silicon is recommended. One pound of "silicon-copper," containing 10 per cent. of silicon, is sufficient for 100 lb. of copper, if the metal be kept well covered with charcoal and be not overheated. A clean crucible should be used, the bath mixed with a plumbago stirrer, and time allowed for the silica formed, to rise to the surface. The molten copper is then skimmed and poured. The amount of silicon added may be double that stated if high electrical conductivity of the castings is not the main requirement.—A. S.

Copper with Magnesium : Alloys of ——. O. Boudouard. Comptes rend., 1903, **136**, [22], 1327—1329.

THE three compounds formerly described (this Journal, 1902, 1456) are all indicated by the micrographic analysis of an ingot formed by melting copper under sodium chloride, and then adding magnesium. For the isolation of the separate compounds, ingots are cast of approximately the desired composition, and the matrix is dissolved away by the long-continued action of very weak acid (1 to 5 per 1,000 of HCl).—J. T. D.

Tin Amalgams. Bakhuis Roozeboom and Van Heteren. Konink. Akad. Wetensch., Amsterdam, 1902, [11], 420—423.

THE authors have determined the temperatures at which a solid phase will separate from different mixtures of tin and mercury, which, in the liquid state, are miscible in all proportions. The solid phase which separates at 25° C. contains 91 atoms per cent. of tin. On measuring the potential differences of amalgams containing from 0·001 to 100 atoms per cent. of tin with respect to an amalgam containing 16 atoms per cent., it was found that the potential increases with the percentage of tin up to 1·2 atoms per cent., and then remains constant up to 99 atoms per cent. Between these limits, therefore, two phases of constant concentration exist, one being the liquid phase (1·2 atoms per cent. of tin) and the other the solid phase (99 atoms per cent of tin). The heat of amalgamation was calculated from a comparison of the potential differences of amalgams liquid at 25° and 50° C. respectively. On cooling amalgams containing from 0·3 to 85 per cent. of tin below − 34·5° C., a modification takes place accompanied by evolution of heat and diminution of volume. The maximum effect is attained with an amalgam containing 50 per cent. of tin. Between − 34·5° C. and − 38·5° C. mixed crystals separate, and expansion takes place. At − 38·6° C. all amalgams containing up to 60 per cent. of tin solidify completely. The modification of tin which occurs in mixtures below − 34·5° C. has a lower specific volume than grey tin, but greater than ordinary tin. —A. S.

Barium; Preparation of ——. Guntz. Bull. Soc. Chim., 1903, **29**, [11], 483—490.

Pure metallic barium cannot be obtained by any of the methods hitherto described. It can, however, be prepared by the distillation of barium amalgam *in vacuo* with certain precautions. The amalgam, after a preliminary concentration to about 10 per cent. of barium in a glass retort, is placed in an iron boat in a porcelain tube, which is lined internally with sheet nickel, and contains coils of nickel wire in its cooled ends. Without this precaution the tubes invariably break. The tube is kept vacuous throughout the heating, which is effected in a very slow and regular manner by the author's electric furnace. At 950° C. the residual metal retains only about 1 per cent. of mercury, together with traces of iron, silicon, carbon, nitrogen, and oxygen.

Barium is a tin-white metal, slightly harder than lead; its specific gravity is 3·8 at 0°. It melts at about 850°, is distinctly volatile at 950°, and boils at 1150° C. *in vacuo*. It rapidly oxidises when exposed to air, and decomposes water with evolution of hydrogen. When fused, it alloys with all metals except iron. It dissolves easily in absolute alcohol; dry benzene, toluene, and petroleum oils have no action on it. It is not affected by dry carbon dioxide. It is attacked by ammonia gas below 28° and above 280°, but not between those temperatures. (See also this Journal, 1902, 54.)—M. J. S.

Metals in High Vacuua; Vaporising and Boiling ——, in Quartz Vessels, Heated in an Electric Furnace. F. Krafft. Ber., 1903, **36**, [8], 1690—1714.

In the high vacuum of the cathode light, the quartz vessels could be heated up to about 1400° C. without collapsing. Temperatures were measured with a thermo-electric junction. The quartz vessels and Heraeus' laboratory electric furnace are described in great detail.

Silver, copper, and gold were vaporised with difficulty. Zinc, cadmium, selenium, tellurium, lead, antimony, and bismuth were readily boiled and distilled. Tin behaves more like silicon and carbon, and is much more difficult to volatilise than lead.

The boiling points of the metals are dependent on the weight of the superincumbent column of vapour. The temperature of boiling zinc varied from 545°—560° C., while the height of the vapour varied from 60—135 mm. Under similar conditions bismuth boiled at 995°—1045° C. Antimony boiled at about 735° C., while lead boiled at about 1140°—1173° C.—J. S.

Chromium; Silicides of ——. P. Lebeau and J. Figueras. Comptes rend., 1903, **136**, [22], 1329—1331.

By fusing together in various proportions, copper, chromium, and silicon, and treating the ingots formed alternately with nitric acid and sodium hydroxide solution, the author has obtained $SiCr_3$, $SiCr_2$, Si_2Cr_3, and Si_2Cr. The third of these is new; the first two have been described by Zettel ar Moissan respectively, and the last was apparently obtaine by De Chalmot, though he was unable to separate it fro its matrix. The compound Si_2Cr_3 is obtained by fusi in the electric furnace (or a wind furnace) 100 grms. copper silicide (12 per cent. of silicon) and 4 grms. chromium. It forms long quadrangular prisms, density 5· between glass and quartz in hardness, not oxidised by d or moist air when cold, and only superficially at 1100° C attacked violently by chlorine at 400° C., and by bromi at a bright red heat, dissolved readily by warm concentrat hydrochloric acid, and destroyed by fusion with alk carbonates, though not by nitrates or chlorates. The seri of chromium silicides is not analogous to those of iro cobalt, and manganese, SiM_2, SiM, Si_2M.—J. T. D.

Chlorine [for Chlorination of Gold Ores] Producer; T McDonald Electrolytic Cell as a ——. T. Ulk XI. A., page 802.

English Patents.

Blast-Furnaces; Impts. in ——. L. Keyling, Berlin. Eng. Pat. 16,646, July 26, 1902.

A plate is fixed above the gas outlet of the furnace, t diameter of the plate being greater than that of the outl A jet of water is thrown on to the upper side of the plat the water rebounds from the plate to the sides of a su rounding chamber, from which it again rebounds, formi a sheet of water round the outlet, extinguishing the fla and cooling the gases, and collecting all dust and ash The water collects in a trough surrounding the gas outl and is drained off.—L. F. G.

Blast Furnaces; Impts. connected with ——. A Dudgeon, London. From Soc. Anon. John Cocker and H. Savage, Seraing, Belgium. Eng. Pat. 882 April 18, 1903.

To prevent the entry of air into the pipes, &c., conveyi the gases discharged by blast furnaces, a bell apparatus placed in the path traversed by the gases. This bell ris and falls under fluctuations in the gas pressure, bei connected to a tubular shutter or valve, which works in casing provided with exit openings for the gases, whi openings are controlled by the said valve in accordan with the position of the bell as determined by the g pressure; so that when the mouth of the furnace is clos the gases lift the bell and escape through the openings, a when the furnace mouth is closed, the bell descends a closes these openings, thus preventing any admission of a —C. S

Furnaces for Smelting Iron. H. A. Jones, Brooklyn, N. Eng. Pat. 27,122, Dec. 9, 1902.

See U.S. Pat. 715,269 of 1902; this Journal, 1903, 96. —T. F. B.

Furnaces; Impts. in Open-Hearth ——. F. E. Par Duquesne, Pa., U.S.A. Eng. Pat. 4094, Feb. 20, 1903.

A mould, with a forming cavity having upwardly and o wardly diverging sides, is placed a considerable distan from and below the taphole of an open-hearth furna The drippings from the taphole solidify around a ho previously placed in the mould; this casting is pulled by the hook and recharged into the furnace in the us way.—L. F. G.

Furnaces; Impts. in ——. G. C. Marks, London. Fr W. E. Moore, Peru, Ill., U.S.A. Eng. Pat. 43 Feb. 24, 1903.

The two regenerators in use with furnaces have usua been placed side by side, the retorts to be heated bei placed between, and heated in series, the last retort receivi considerably less heat than the first. According to t invention, the two regenerators are placed one above other; the gas and air passing through the heated regenera issue through parallel passages into the retort chamb thus heating the retorts in parallel, each receiving proximately the same amount of heat. The gases th issue through parallel passages into the other regenerat heating it up and passing out to the chimney.—L. F. G.

n and other Scrap; Treatment of ——. [*Pigment.*]
C. D. Brindley, London. Eng. Pat. 8693, April 15,
1902.

E scrap is heated in an oven upon stepped, inclined, and
forated plates to which jigging movements are imparted
suitable machinery. In passing down the steps, the
der melts and flows through the perforations, and is
lected from below. At the bottom of the steps the
ap passes into a hopper, and thence into a chamber, in
ich it is cut into strips by an arrangement of mechanically
rked steel blades. After cleansing, and dissolving off
tin or zinc coating by a suitable acid, the shearings are
istened with a solution of an acid or mineral salt, and
posed in heaps to the air. When oxidised, the mass is
ound. and the ferric hydroxide is calcined to form a
gment.—E. S.

ickel and Copper-Nickel Ores; Treatment of ——
A. J. Boult, London. From C. Perron, Rome. Eng.
Pat. 11,671, May 22, 1902.

OR copper-nickel ores are powdered, and treated with
solution of ammonium sulphide or of an alkali sulphide,
ferably, in either case, containing free ammonia. The
kel dissolved may be recovered by known processes.
—E. S.

ne Ores and other Zinc Material; Treatment of ——.
I. R. Down. Swansea. Eng. Pat. 14,982, July 5, 1902.

c ores are made into briquettes with coal by the use of
m ½ to 2 per cent. by weight of sago flour, the proportion
coal being about 30 per cent. The ground mixture is
amed in the pug-mill, to render the sago plastic and
ding. The blocks are formed to fit accurately into the
tillation retorts.—E. S.

ad; Method and Apparatus for Pulverising Metallic
——, *which Apparatus is applicable to Pulverising other*
Materials. G. T. Hyde, London. From Union Lead
nd Oil Co., New York City. Eng. Pat. 19,981, Sept.
12, 1902.

E Fr. Pat. 325,471 of 1902; this Journal, 1903, 702.
—T. F. B.

lfram [*Tungsten*] *and Lead; Manufacture of Metal*
Articles of ——. E. Polte, Sudenburg, Magdeburg,
Germany. Eng. Pat. 7855, April 4, 1903.

RIFIED wolfram (tungsten) and lead are intimately
npounded, in the pulverulent state, by means of drop
mmers or other suitable appliances, and the mixture is
n moulded under pressure.—E. S.

lten Metals; Method of Treating or Refining ——, *and*
Apparatus Employed therein. G. C. Carson, A. Miller,
nd F. Hurst, California. Eng. Pat. 20,245, Sept. 16, 1902.

E U.S. Pats. 714,449, 714,450, and 714,451, Nov. 25,
2; this Journal, 1903, 32.—E. S.

uminium or Aluminium Alloys; Solder for ——. R. F. y
Pelletier and E. S. y Sempruu, Madrid. Eng. Pat. 7016,
March 26, 1903.

E following metals, in the order named, are successively
into a red-hot crucible: copper (6 grms.); silver
grm.); bismuth (3 grms.); antimony (0·5 grm.); tin
grms.); and aluminium (29·5 grms.); and to the
lten mass a mixture of sulphur (1 grm.) and arsenic
·5 grm.) is added.—E. S.

United States Patents.

tals; Process of Uniting ——. H. Goldschmidt, Essen-
on-the-Ruhr, Germany, Assignor to C. B. Schultz, Berlin.
J.S. Pat. 729,573, June 2, 1903.

MIXTURE of a metal compound with aluminium is
nited," and the resulting alumina removed. The hot
tal remaining is used to join metal pieces, &c.—T. F. B.

Silver; Process of Reducing and Separating ——. G. V. Guzman, Sucre, Bolivia. U.S. Pat. 729,760, June 2, 1903.

Roasted silver ore is subjected to the action of a solution containing predetermined proportions of cupric and cuprous chlorides; after which the solution is passed through a reducing agent, such as granulated copper, from which the precipitated silver is removed and collected.—E. S.

[*Precious*] *Metals from Ores; Apparatus for Extracting* ——. J. Stoveken, Cripplecreek, and L. Stoveken, Florence, Col. U.S. Pat. 729,805, June 2, 1903.

The ore is pulverised or comminuted in the presence of a cyanide or other suitable solvent, and the mixture is passed through a series of overflow tanks provided with agitating means, and then to a filter, which separates the ore from the solution. The filtrate is delivered into a decanting tank or tanks, from which the clear solution is passed into a precipitating tank, and from thence transferred back to the solution tank, the slimes being returned from the decanting tank to the filter. Feeding arrangements are provided for the ore and solvent, and are so arranged that the quantity of solvent delivered is commensurate with the quantity of ore treated.—R. A.

Agitation Tank. J. Stoveken and L. Stoveken. U.S. Pat. 729,806, June 2, 1903. I., page 788.

Filter Press. J. Stoveken and L. Stoveken. U.S. Pat. 729,807, June 2, 1903. I., page 788.

Metals; Apparatus for Use in Extracting ——, *from Ores.* J. F. Webb, Denver, Assignor to Pneumatic Cyanide Process Co., Col. U.S. Pat. 729,819, June 2, 1903.

A tank, in which the ore is treated by a chemical solution, has a filter bottom inclined towards the centre, in proximity to which a perforated horizontal pipe, having parallel lateral branches, and connected to an air supply, discharges small streams of air downwards upon the bottom, thus preventing clogging, and furnishing oxygen to the solution. —E. S.

Metals; Apparatus for the Precipitation of ——, *from Solutions.* P. W. McCaffrey, Assignor to the Union Ore Extraction and Reduction Co., Denver, Col. U.S. Pat. 730,385, June 9, 1903.

The solution to be treated is contained in a tank having a hopper-shaped bottom, an outlet for drawing off the precipitate, and valve-controlled inlets for the injection of live steam. A perforated cylinder, the curved walls of which are composed entirely of "sheet metal" or of sheet copper, filled with scrap iron, is so mounted as to rotate in the tank, partially immersed in the solution, which solution is thus caused to circulate through the scrap iron. A number of such perforated cylinders may be thus mounted and used in a tank. (Compare U.S. Pat. 728,746, 1903; this Journal, 1903, 747.)—E. S.

Ores; Process of Treating ——. E. D. Kendall, Brooklyn, N.Y. U.S. Pat. 730,462, June 9, 1903.

Powdered auriferous magnetite and pyrites are mixed, and the mixture is heated, at first, "without the oxidising action of air," and subsequently, with access of air. The cooled mass is lixiviated with water containing chlorine, bromine, or a suitable cyanide. (Compare U.S. Pats. 698,292 and 702,305, 1902; this Journal, 1902, 711 and 977.)—E. S.

Smelting Furnace. E. Campbell, Assignor to A. G. Street and J. J. Campbell, all of Rossland, Canada. U.S. Pat. 730,610, June 9, 1903.

A receiver used in connection with smelting furnaces, has inner and outer plates spaced apart, forming a water-jacket, and having an opening for the tapping-jacket, which latter has a discharge opening, and a water-jacket around it, the securing device to which has portions overlapping the tapping-jacket and the body of the receiver. There is an inner cup-shaped section, fitting in the opening of the tapping-jacket, having its base plate provided with a central opening, and the outer section threaded at its outer edge into the said section, and provided with a central tube threaded at its end in the central opening of the base plate of the same. Many other details are claimed.—E. S.

Copper, Nickel, or Zinc Ores containing Precious Metals; Ammonia-Cyanide Process of Treating ——. D. Mosher, San Francisco, Cal., Assignor to P. Beatty, Berkeley, Cal. U.S. Pat. 730,835, June 9, 1903.

REFRACTORY ores of copper, nickel, or zinc, containing precious metals, are roasted at a low red heat to oxidise sulphides, arsenides, and tellurides. The resulting mass is treated with very dilute ammonia to oxidise "reducing compounds," and is then lixiviated with an ammoniacal cyanide solution, to which a cupric, or other soluble metallic oxide or hydroxide, is added, in excess of the proportion required to form the corresponding double cyanide.—E. S.

FRENCH PATENTS.

Steel; Adaptation of the Ordinary Martin Furnace to the Process of Fusing ——, in a Continuous Manner. S. Surzycki. Fr. Pat. 326,752, Nov. 25, 1902.

SEE Eng. Pat. 21,829, Oct. 7, 1902; this Journal, 1903, 268.
—E. S.

Castings; Process for Obtaining Homogeneous ——. Soc. dite Allgemeine Thermit-Gesellschaft. Fr. Pat. 326,196, Nov. 8, 1902.

A BRIQUETTE is made up, preferably of aluminium, with an oxide, a haloid, or other metallic salt; but for aluminium, magnesium, silicon, or certain other metals, alloys, or carbides may be substituted in the mixture. The briquette, enclosed in tinned sheet iron and attached to an iron tool, is immersed considerably below the surface of the liquid metal, and is maintained there until the reaction is complete. Alloys may thus be formed of iron or steel with titanium (aluminium and titanic acid being used); or nickel-steel may be similarly formed. To produce manganiferous copper, the briquette contains aluminium and manganese oxide added to a copper bath. The process is stated to give homogeneous castings, besides other advantages.—E. S.

Copper and other Metals; Manufacture of Homogeneous ——. Soc. H. Pfaffenberger and Co. Fr. Pat. 326,703, Nov. 26, 1902.

A TALL and relatively narrow graphite crucible has its interior constricted, to about half-way up, to leave a narrow conical space, above which the interior is cut away to form a ledge, on which rest blocks so shaped as to nearly meet centrally, forming conical spaces above and below. The upper conical or hopper-shaped space, as well as the entire upper part of the crucible, is filled with pieces of the raw copper to be melted, and is closely covered. The charged crucible is then set in a closed furnace, which is entirely filled with fuel, passage for gases being left near the top. After firing, the copper, as it melts, trickles through the aperture above the cavity, which it entirely fills, the respective spaces being adjusted for that purpose. As access of air is prevented in the process, a homogeneous ingot is formed.—E. S.

Copper; Process and Apparatus for Extracting ——, from its Ore. Von Gernet Copper, Ltd. Fr. Pat. 326,325, Nov. 14, 1902.

SEE Eng. Pat. 24,360 of 1902; this Journal, 1903, 214.
—T. F. B.

Furnaces, Reduction; Impts. in ——. H. E. Vosburgh. Fr. Pat. 326,463, Nov. 19, 1902.

SEE U.S. Pat. 712,161 of 1902; this Journal, 1902, 1538. (Also Eng. Pat. 24,366 of 1902; this Journal, 1903, 557.)
—L. F. G.

Compound Metal; Process for the Manufacture of any ——. Soc. d'Électrométallurgie de Dives. Fr. Pat. 326,489, Nov. 20, 1902.

COPPER is electrolytically deposited on the surfaces of two metals, which are subsequently heated together, under pressure, at a temperature below the melting point of the more fusible metal. The metals thus joined are then rolled, or drawn into wire.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Diaphragms; Metallic ——. A. Brochet. Zeits. f. Elektrochem., 1903, 9, [22], 439—442.

THERE is a close connection between bi-polar electrodes a metallic diaphragms. A perforated metal plate may used like an ordinary earthenware diaphragm, in so far it allows the current and the solution to pass through it. I (provided that the holes are small enough) neither ga nor solid precipitates. A perforated plate suspended acro an electrolytic cell will function in part as a bi-pol electrode if the holes are few in number; but as th are multiplied it acts less and less in this sense, so t wire gauze behaves as a diaphragm, and, unless, und exceptional conditions, not as a bi-polar electrode at a If two points be taken close together, one on either si of an intermediate electrode, the latter will act at that poi as a diaphragm, provided that the potential differen between the two points is of less magnitude than t decomposition pressure, but otherwise it will behave as bi-polar electrode. Hence the thinner the plate, the small the current, and the lower the resistance of the electroly the more likely is the plate to function as a diaphrag The area of the perforations should also be as large possible compared with that of the whole plate, but t perforations themselves should be as widely distributed a as small as possible.—W. G. M.

Electromotive Forces of Saline Solutions; Gener Relations among ——. M. Berthelot. Comptes ren 1903, **136**, [23], 1357—1373.

IF we have three electrolytes, A, B, and AB (AB being t result of mixture of A and B, and the substances be supposed always to be in solutions of equivalent conce tration), then the electromotive force of the elemen A + B, formed of the two solutions A and B separated b a porous vessel, is the algebraic sum of the electromot forces of the corresponding elements A + AB a B + AB. The author has proved this experimentally i several instances in the cases of:—(1) Salts of stro acids; (2) Salts of weak acids; (3) Acid with normal s of a strong acid; (4) Base with normal salt of a stro acid; (5) Double salts stable in solution; (6) Oxidati cells. The relation appears to be independent of t thermo-chemical origin of the electromotive force of the cells, though that origin plays an important part wh batteries of the cells do external work, especial electrolysis. In two-liquid cells the energy required for th work may be furnished entirely from chemical reactio between the liquids, more especially in the walls of t porous vessel, and be quite independent of any action the electrodes.—J. T. D.

Chlorine Producer; The McDonald Electrolytic Cell a ——. F. Ulke. Eng. and Mining J., 1903, 7 [23], 857.

THE McDonald electrolytic cell for the production chlorine by the electrolysis of brine, consists of rectangular cast-iron tank, 5 ft. 2 ins. long by 1 ft. wi and 1 ft. deep. It is divided into three compartments b two longitudinal perforated iron partitions, which serve cathodes. The graphitised carbon anodes, 10 in numb extend into the closed central chamber, and the out cathode compartments are separated from the anodes b asbestos diaphragms lining the inner surface of th partitions. The cathode compartments are furnished w siphon pipes for the removal of the caustic alkali solut produced, and may be closed by covers carrying pip through which the evolved hydrogen may be drawn o and utilised. The chlorine gas is led off from the ano compartment, through leaden pipes into a gas main.

At the Clarion Paper Mill, Johnsonburg, Pa., U.S.A., a installation of 50 McDonald cells, arranged in two parall rows, is in use, and with a current of 420 ampères a 225 volts, about 1,100 lb. of chlorine are produced daily.

laimed that with a current of 500 ampères at 250 volts, 00 lb. of bleaching powder, containing 35 per cent. of ilable chlorine, could be produced daily; this being ivalent to 2·5 tons of bleaching powder per 167·5 trical horse-power. It is also claimed that the cost of duction of one ton of bleaching powder is only 12—15 s., exclusive of the value of the caustic alkali and lrogen obtained as by-products. It is stated that for the orination of gold ores, the chlorine required could be ained by means of the McDonald electrolytic apparatus a cheaper rate than hitherto, whilst no sulphuric acid uld be required, as the chlorine would be employed in form of chlorine water, instead of being produced by omposing bleaching powder with acid.—A. S.

itrotoluene; Electrolytic Reduction of ——, in Hydrohloric Acid Solution in the Presence of Formic ldehyde. E. Goecke. Zeits. f. Elektrochem., 1903, 9, 23], 470—473.

s found that *p*-nitrotoluene, when electrolytically reduced alcoholic hydrochloric acid solution in the presence formaldehyde, gave *p*-dimethyltoluidine together with olid substance provisionally supposed to be dimethyleneolnidine. In presence of an excess of formaldehyde, s now found that the second product is trimethyleneoluidine.—J. S.

tals; Use of a Rotating Cathode in the Electrolytic Determination of ——. F. A. Gooch and H. E. Medway. XIII., page 823.

English Patents.

ctricity; Method of Generating ——. J. H. Reid, Newark, N.J., U.S.A. Eng. Pat. 1670, Jan. 23, 1903.

externally heated metallic vessel is filled with a fused trolyte such as caustic soda. Through the cover of the sel are passed a number of porous carbon tubes closed he bottom, and insulated from the vessel itself. Coal-, or other gas rich in carbon, is forced into the tubes, passing through the pores of the tube, oxidises at the ense of the oxygen contained in the electrolyte. A e tube, also passing through the cover and bent over side so as to deliver into a funnel communicating with bottom of the vessel, allows for the escape and recovery any of the liquid carried over by frothing. In another n of the apparatus the electrolyte is contained in a ous carbon vessel set within an outer vessel, the carbonring gas being then forced into the space between the vessels, and so into the electrolyte. Oxygen may be vn into the electrolyte to renew the supply of that gas. production of electrical energy depends upon the lation of the gas in or at the surface of the carbon sel, which therefore forms one of the poles, and is vided with a terminal connecting screw; the other is ched to the outer vessel in the apparatus first described, o a metallic conductor immersed in the electrolyte for purpose.—W. G. M.

ive Material [Urea Sulphate], for the Plates of lectric Accumulators; Manufacture of ——. S. A. osenthal, London. Eng. Pat. 12,700, June 3, 1902.

part by volume of a solution of $1\frac{1}{2}$—2 parts of urea hate and 4—6 parts of water is mixed with $1\frac{1}{2}$—2 parts olume of a solution of sulphuric acid of 1·200 sp. gr., a stiff paste is formed with the mixed solution and an e of lead which can then be compressed or moulded into required shape. It is claimed that active material thus e has a maximum storage capacity and durability with nimimum weight which renders it very suitable for loyment for miners' lamps and traction purposes.

—G. H. R.

trodes; Connecting Carbon ——, with Electric Leads. . Baker, Runcorn, and The Castner-Kellner Alkali Co., ondon. Eng. Pat. 14,133, June 21, 1902.

cks or pieces of carbon are placed between the carbon trodes and the electric leads, and are pressed into close act with each by clamps or otherwise.—W. G. M.

Electrodes for Reversible Galvanic Batteries. H. Cottrell, Newark, N.J., U.S.A. Eng. Pat. 4368, Feb. 21, 1903.

The electrode is formed of layers of carbonised textile fabric as an absorbent of a metallic salt in solution, and coated with a metallic oxide to be made active in the battery. These plates are enclosed between exterior ones, made preferably of coarser cotton fabric, carbonised to a higher degree, and usually saturated with a solution of resin and again carbonised to give greater rigidity.

—G. H. R.

Electrolytic Cells; Impts. in [Mercury] ——. H. Baker, Runcorn, A. T. Smith, Liverpool, and The Castner Kellner Alkali Co., London. Eng. Pat. 14,135, June 21, 1902.

In cells employing a mercury cathode, a comparatively large and deep pool of mercury or amalgam is provided in front of one or more of the mercury seals or inverted siphons, so that in its comparative tranquillity the lighter foreign substances in suspension may rise to the surface and be removed. A partition or division, with its lower edge deeply immersed in the electrolyte, reaches nearly to the surface of the mercury, and forms a cleaning compartment to which the electrolytic gases evolved have no direct access, but into and through which the whole of the electrolyte and of the mercury or amalgam passes Any cleaning compartment where the noxious gases are generated, is provided with a gas-tight cover which can be easily removed and replaced, and with means for removing the gases by blowing or drawing air through the part filled with them before opening the cover. The cleaning compartment is also supplied with an outlet or outlets close to the surface of the mercury or of the electrolyte, so that all sediments in the latter, or on or in the mercury or amalgam, may be easily got at and removed without stopping or interfering with the working of the cell.—G. H. R.

Interrupters; Electrolytic ——. G. E. Gaiffe, Paris, and G. Gallot, St. Maur, France. Eng. Pat. 14,583, June 30, 1902.

The platinum wire forming one electrode is, with the exception of a short length at the bottom, encased in an insulating sheath. The bottom of the wire rests upon a sheet of insulating material held at any desired distance below the sheath, so that the length of exposed platinum is constant, and if, in use, any of the point should wear away, it would be replaced by the wire fed downwards, either by gravity or with the aid of a spring. The distance between the sheath and the plate (and, therefore, the length of platinum unprotected) is regulated by a screw adjustment in the holder carrying the former. An electro-magnetic adjustment, involving the use of a solenoid, may be used where automatic regulation is required.—W. G. M.

Titanous Chloride; [Electrolytic] Manufacture of a New ——. H. Spence and P. Spence and Sons, Ltd., both of Manchester. Eng. Pat. 16,238, July 22, 1902.

See Fr. Pat. 324,835 of 1902; this Journal, 1903, 678.

—T. F. B.

United States Patents.

Generator; Thermo-Electric ——. A. Tissier, Paris. U.S. Pat. 729,108, May 26, 1903.

See Eng. Pat. 18,035 of 1900; this Journal, 1901, 1160.

W. G. M.

Primary Batteries; Solution for ——. H. S. Anwake, Camden, N.J. U.S. Pat. 729,833, June 2, 1903.

Where the battery is of the porous-diaphragm type, the electrolyte on one side of the diaphragm is composed of 7 parts of sodium hydroxide and 10 parts of water, and on the other side of 5 parts of sodium bichromate, 9 parts of sulphuric acid, and 10 parts of water.—G. H. R.

Galvanic Battery. J. R. Lord, Tottenville, N.Y. U.S. Pat. 730,833, June 9, 1903.

The process of rehabilitating exhausted batteries consists in arranging the electrodes so that any solids formed during evaporation will be deposited by gravity on, or in proximity to, the anode, but will be prevented from lodging on the active surface of the cathode. The battery is then heated to a temperature sufficient to evaporate the exhausted or partially exhausted electrolyte, and to deposit the non-volatile constituent of it in a chemically and electrically active form on the anode. The volatile portion is condensed and collected, both parts of the electrolyte being thus recovered.—G. H. R.

French Patents.

Thermophores; Process and Apparatus for the Electrical Production of Heat in ——. Deutsche Thermophor Akt.-Gesellsch. Fr. Pat. 325,751, Aug. 1, 1902.

This is an automatic device for making or breaking an electric circuit employed for the heating of thermal accumulators (such as sodium acetate, which is alternately fused and allowed to crystallise). This is accomplished by means of a float on a mercury-column immersed in the material that is being heated. The float in rising, at a certain point (chosen in accordance with the temperature at which the apparatus is to operate), raises one end of a hollow vessel made in the shape of a dumbbell, and pivoted at the centre, and so brings about a short circuit. But this dumbbell-shaped vessel is half full of water, and, it being now slightly raised above the horizontal, the water flows to the opposite end of the vessel, and, disturbing the equilibrium, causes it to swing over, and, in so doing, to break the electric circuit completely. As the mercury column contracts again during the cooling process, the float gradually sinks, until, at last, an arm attachment, pressing against the raised contact arm, depresses it until it again makes electrical contact, and so completes the circuit once more. When the apparatus is not required to act automatically, it is of simpler construction, and it suffices that the mercury column shall, at a certain temperature, complete an electric-bell circuit, and so give an audible signal.—W. G. M.

Batteries; New Fluid for Electric ——. E. Durant. Fr. Pat. 325,631, Oct. 27, 1902.

Manganous chloride (350 grms.) and ammonium sulphate (150 grms.) are dissolved in water (800 cb. m.) and the solution is carefully mixed with a solution of ammonium carbonate (180 grms.) in 200 cb. m. of water to which hydrochloric acid (15 grms.) and "*sal gloria*" (50 grms.) have been added. The resulting precipitate is filtered before use.
—W. G. M.

Pile; Thermo-Electric ——. A. Wolf, jun., and Co. Fr. Pat. 326,065, Nov. 3, 1902.

The negative element of the couple is made of strip metal so cut that there is a long horizontal arm supported by an upright sheet of copper, and connected by a short vertical strip with a short horizontal arm turned back parallel with the longer arm above. The positive element is attached to the end of the short horizontal arm, and the flame used for heating is allowed to play on the angle of this arm and its vertical connecting strip, so that the heat is conducted through the strip to the positive element. In order to avoid loss of heat as far as possible, the short portion of the strip between the flame and the positive block may be made of a metal, such as silver, of high thermal conductivity.—W. G. M.

Heating by Electricity; Electrical Resistances and Apparatus for ——. C. Grivolas, jun. Fr. Pat. 326,102, Nov. 4, 1902.

The electrically heated wires of the apparatus are covered with asbestos saturated with a strong solution of acetate, tartrate, oxalate, or similar salt, of aluminium, after which the mixture is heated to from 120° to 200° C. for a few minutes, until no more gas is evolved or smell is noticeable. The asbestos coating thus formed, acts both as protector and insulator.—W. G. M.

Insulator; Electrical and Thermal ——, *and its Process of Manufacture.* C. Grivolas, jun. Fr. Pat. 326,103, Nov. 4, 1902.

Asbestos (whether as card, cord, powder, fibre, or otherwise) is treated with a solution of commercial silicate of soda or of potash. After immersion for a sufficient peri (3 hours for card 3 mm. thick), it is dried for 48 hours 20—30° C. The material is now very hard and rig For some purposes the soda or potash should be remov subsequently from the pores by immersion in boiling wat
—W. G. M

Cellulose from Wood; Manufacture of ——, *by Chlor developed by the Electrolysis of Metallic Chlori* C. Kellner. Fr. Pat. 326,313, Nov. 13, 1902. XI, page 817.

Chlorine; Process and Apparatus for the Electroly Production of Oxygenated Compounds of —— [*Hy chlorites*]. Soc. Elektrizitäts A.-G. vorm. Schuck et Cie. Fr. Pat. 326,598, Nov. 22, 1902. VI page 796.

Electrolyser [*for Sodium Chloride*], *with Revolvi Platform.* A. Epplé. Fr. Pat. 326,787, Nov. 1902.

The apparatus consists of a circular stoneware recei divided by two partitions diametrically placed. T upper part of the receiver is closed by a circular cov carrying two tubes diametrically opposed to each oth and placed in a plane perpendicular to the partitio One tube collects the chlorine and the other the hydro evolved during decomposition. The electrodes enter receiver through openings in the sides or in the co The bottom of the receiver is formed by a circular ho zontal cast iron platform, mounted on a vertical sh capable of a slow rotatory movement. It is claimed th the regular circulation of the mercury cathode is assu by the moving platform, and that the evolved hydrog collected can be utilised for the heating and concentrat of the soda lye formed in the apparatus.—G. H. R.

Liquids of all Kinds; Electrolytic Treatment of —. C. Arzano. Fr. Pat. 326,435, Nov. 18, 1902.

See Eng. Pat. 25,354 of 1902; this Journal, 1903, 636.
—T. F. B

(*B.*)—ELECTRO-METALLURGY.

Metals; Quantitative Determination of ——, *by Elect lysis.* P. Denso. XXIII., page 824.

English Patents.

Magnetic Qualities of Materials [*Iron, Steel, &c. Apparatus for Testing* ——. The British Thom-Houston Company, Ltd., London, and F. Holden, Rug Eng. Pat. 15,113, July 7, 1902.

The apparatus comprises a permanent magnet in the fi of which a movable closed conductor is suspended (w the minimum possible of friction), a closed magne circuit being formed wholly or in part by the test samp having an exciting winding linked therewith, through wh known electrical currents may be passed for determin the magnetic constants of the material of the sample by displacement of the closed conductor (indicated by pointer), resulting from the changes of the magnetis current.—E. S.

Sodium; Manufacture of —— [*Electrical*]. T. Ewa Glasgow. Eng. Pat. 14,739, July 2, 1902.

Fused sodium hydroxide is electrolysed in a cell divided i compartments by a porous diaphragm of sodium alumi or alumina, or a mixture of these. A current of air or a suitable gas is passed over or through the electro in the anode compartment to remove the water as it form
—E. S

Zinc; Apparatus for Electrolytically Coating Sheet M with ——. A. G. Bloxam, London. From "Columb Elektricitäts-Gesellsch., Ludwigshafen a. Rhein, G-many. Eng. Pat. 15,128, July 7, 1902.

The plate to be coated is suspended between anodes, an held in place by distance-pieces of glass or other non-c ducting material so shaped that the end in contact with plate is a point or a knife-edge. The distance-pieces m nted on a frame facing the sheet, one or both of the fr es being movable. The plate may be supported at the bo om as well as at the sides, and may have shields for co ring its edges. The movable frames may be suspended fr rollers running on the edge of the bath.—W. G. M.

Z ing Process; Electrolytic —— I. Szirmay and L. n Kollerich, both of Budapest. Eng. Pat. 5448, arch 9, 1903.

T process, which is an improvement on that described in ng. Pat. 19,659, 1900 (this Journal, 1901, 1003), consis in adding the double sulphate of aluminium and m nesium, obtained by crystallisation from a mixture of al inium and magnesium sulphates in solution, to the zi ng bath for the purpose of obtaining denser and firmly ad rent zinc precipitates on the articles placed in the bath as thodes.—G. H. R.

G anic Deposits; Apparatus for the Production of ——. . Müller, Berlin. Eng. Pat. 8900, April 20, 1903.

It stated that in apparatus for the production of galvanic sits the electrolytes have not hitherto been fully ut ed, inasmuch as a fairly large percentage of the de it has been attracted by the cathode. To remedy this le t it is proposed to employ a cathode consisting of a m , such as aluminium, that has little or no attraction fo e deposits.—G. H. R.

inium; Process of Electrolytic Manufacture of ——. G. Gin., Paris. Eng. Pat. 964, Jan. 14, 1903.

In is process the electrolytic solvent and the intermediate rea nts used are continuously recuperated. Bauxite is tre d with a solution of hydrofluoric acid in sufficient qu ity to combine with all its component parts so as to or alaminium fluoride (first element of the electrolyte) ll as iron fluoride and the fluosilicates and fluotitanates f uminium, the silica, the titanic acid, and the iron being sub quently precipitated by an addition of alumina. The hy fluoric acid is obtained by the decomposition of the oc m fluoride which is the residue of the electrolysis, the ecomposition being effected by means of the sulphuric aci recuperated through the oxidation of the sulphur dis gaged at the anode. The sodium sulphide (second e nt of the electrolyte) is made by reducing the sodium ul ate resulting from the decomposition of sodium u le by sulphuric acid, the various operations thus constit ng a continuous closed cycle. Aluminium is produc by decomposing with an electric current an electrolyte r d by a molten mixture in definite proportions of alu nium fluoride and sodium sulphide (1 mol.: 3 mols.). Ref ence is made to Ger. Pats. 63,993, of Bucherer, and , of the Aluminium Ind. Ges., Neuhausen, and to Go 's Eng. Pat. 16,555, 1899 (this Journal, 1889, 1030). —G. H. R.

United States Patents.

Ste: Making ——, direct from Iron Ore. M. R. ley, Brooklyn, Assignor to Electric Furnace Co., v York. U.S. Pat. 730,746, June 9, 1903.

See ng. Pat. 7660, April 1, 1902; and compare U.S. I 697,810, April 15, 1902; this Journal, 1902, 915 a 623. (See also this Journal, 1902, 622.)—E. S.

Ele ic Furnaces; Process of Treating Materials by iated Heat in ——. C. G. P. De Laval, Stockholm. . Pat. 729,614, June 2, 1903.

The aterial is introduced into an electric furnace chamber so o form a stack, first increasing and then decreasing ght in the direction of flow. The temperature, and the nsequent rate of consumption at the sloping side of the ack facing the source of heat, is controlled by coninu sly and mechanically feeding fresh material to the bac f the stack.—G. H. R.

Lea Electro-deposited ——. A. G. Betts, Lansingberg, N.Y. U.S. Pat. Re-issue 12,117, June 9, 1903.

Ele ro-deposited lead is claimed as "a new product char terised by substantial purity, coherency, and uniform of structure throughout, practically free from crystalline form, and having substantially the homogeneity of cast lead, with a density of about 11·3, and retaining the normal structural characteristics due to electrolysis." —G. H. R.

French Patents.

Alloy; A kind of ——, or a Ternary Metallic Composition, Melted and Refined. Soc. anon. La Néométallurgie. Fr. Pat. 326,140, Nov. 6, 1902.

Iron, nickel, and chromium are melted together and refined in an electric furnace. It is preferred that the proportions of the metals taken should be between minima, for iron of 16, for nickel of 5, and for chromium of 24 per cent.; and maxima for the respective metals of 38, 60, and 57 per cent. A small proportion of one of these ternary alloys, fused with steel or iron, is stated to impart to the latter great resistance to corrosion, as well as increased toughness and elasticity.—E. S.

Manganese; Process for the Electrometallurgical Treatment of the Silicated Ores of ——. G. Gin. Fr. Pat. 326,438, Nov. 18, 1902.

To produce ferromanganese, silicated ores, previously mixed with sufficient lime to saturate the silicic acid to the condition of bisilicate, are fused in an electric furnace with the amount of carbon sufficient to reduce the protoxide of manganese, the scoriæ being afterwards reduced in a second furnace to obtain silicide and carbide of calcium. Silicide of manganese is produced by fusion in an electric furnace without other addition than that of an amount of carbon regulated according to the richness in silica of the alloy to be obtained. In order to obtain compounds increasingly rich in silica, the fractional reduction of the scoriæ is carried out in several successive furnaces, each of which is fed by the scoriæ of the preceding one. —G. H. R.

Copper and Zinc; Process for the Extraction of ——, by the Electrolytic Treatment of their Ores. S. Laszczynski. Fr. Pat. 326,542, Nov. 20, 1902.

In order to prevent the anodic oxidation of the cations, porous and absolutely permeable envelopes are closely packed round the insoluble anode, or tissues may be used, the thickness of which is in inverse ratio to the density of the current employed.—G. H. R.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fats; Splitting of ——, by Enzymes. W. Connstein. Fifth Internat. Congress of Applied Chemistry, Berlin; Zeits. angew. Chem., 1903, **16**, [24], 570—571.

Fifty kilos. of seeds of *Ricinus communis* are coarsely crushed and rubbed with part of the fat. The rest of the fat is added along with 300 to 500 litres of acidified water (N/30 to N/50 acetic acid) and the mixture is stirred until an emulsion is formed. After standing for 24 hours the mixture is heated to 70°—80° C. and sulphuric acid is added. Three layers are formed; the uppermost contains glycerin and water, the middle one is an emulsion containing solid portions of the seeds, 5 per cent. of fatty acids, and 20 per cent. of glycerin, the lower one being a clear layer of fatty acids. The glycerin can be removed from the middle layer by washing with water.—J. McC.

Oils; Characteristics of some Less Known —— J. J. A. Wijs. Zeits. Untersuch. Nahr.-u. Genussm., 1903, **6**, [11], 492—496.

Echinops Oil.—This was obtained from the seeds of *Echinops retro*, a plant growing on the coasts of the Mediterranean and in Asia. The seed contains about 27·5 per cent. of a semi-drying oil of a pale yellow colour. It is soluble in the ordinary solvents and in an equal volume of hot glacial acetic acid. A sample after neutralisation with sodium carbonate dissolved in absolute alcohol at

15° C. to the extent of 51 grms. in a litre. It gives neither Halphen's nor the Baudouin reaction.

Perilla Oil is contained in the nuts of *Perilla ocymoides*, which is cultivated in British India, China, and Japan. The kernels extracted by the author yielded 35·8 per cent. of a dark yellow oil, which resembled linseed oil in taste and odour, but had smaller drying power than that oil. It does not react with Halphen's or Baudouin's reagent.

Water-Melon Oil is obtained from the seeds of *Curcumis citrullus*, and is sold in France under the name of *bereff* or *beraf*. The seeds examined by the author were derived from Senegambia. They contained 62 per cent. of kernels, yielding 65·8 per cent. of oil, whilst the oil-free residue contained 52·8 per cent. of proteid matter. The extracted oil was pale yellow in colour and nearly odourless. It did not give Halphen's or Baudouin's reaction. The acid and saponification values were identical, so that a formation of inner anhydrides, as observed by Tortelli (this Journ 1902, 1187), had not taken place.

Tea-Seed Oil.—This oil, obtained from Japanese t had a yellow colour and a characteristic odour.

Garden Cress-Seed Oil.—The first sample in the su joined table was obtained by extraction with petrole spirit, and the second by cold expression from seeds co taining 25·2 per cent. of oil. Both oils had the characteris odour of the plant, which was more pronounced in t case of the extracted sample. On saponification the odo disappeared, being replaced by a fishy odour, but acidification the original odour again appeared.

Radish- and Mustard-Seed Oils.—These were obtai from the seeds by cold expression. The radish oil, whi had an odour recalling that of rape oil, was derived fr the seeds of *Raphanus sativus*, var. *niger*.

The constants of these different oils were as follows:—

Oil.	Oil.						Fatty Acids.					
	Specific Gravity at 20° C.	Free Acid as Oleic Acid.	Saponification Value.	Iodine Value (Wijs).	Acetyl Saponification Value.	Acetyl Value.	Melting Point.	Solidification Point.	Saponification Value.	Acid Value.	Mean Molecular Weight	I d Val
		Per Cent.					° C.	° C.				
Echinops oil, I.	0·9285	4·38	189·2	138·1	211·2	26·5	11—12	..	..	192·3	292·0	13
„ II.	0·9253	7·31	190·0	141·2	..	..	..	..	..	192·[illegible]	291·0	14
Perilla oil	0·9306	0·48	189·6	206·1	..	..	5	..	..	197·7	284·0	2
Water-melon oil	0·9160	1·20	189·7	118·0	..	..	34	32	197·1	197·1	284·1	12
Tea-seed oil	0·9110	8·07	188·3	88·9	..	..	10—11	..	..	195·9	286·0	
Garden-cress oil, I.	0·9221	0·51	185·6	139·1	..	..	20—21	..	..	193·4	290·0	14
„ II.	0·9212	0·56	186·4	133·4	..	..	..	..	..	193·0	291·0	1
Radish-seed oil	0·9142	1·68	179·4	112·1	..	..	..	..	..	189·5	296·0	11
White mustard-seed oil	0·9121	1·27	174·6	103·0	..	..	..	..	..	185·8	302·0	1
Black „	0·9143	1·10	175·8	125·3	..	..	..	..	..	187·1	304·0	1

—C. A. M

Pumpkin-Seed Oil. H. Strauss. Chem.-Zeit., 27, [44], 527.

Contrary to the statement that pumpkin seeds yield only 20—25 per cent. of oil, the author has obtained 47·43—47·95 per cent. from various samples of decorticated seed, and 36·60—37·46 per cent. from the whole seeds, by extraction with the usual solvents, the largest percentage being furnished by ether. These results were also confirmed by trials on a practical scale, the seeds being decorticated, crushed in edge-runner mills, heated to 80°—90° C., and pressed. The first pressing left 10—11 per cent. of oil in the cake.

The iodine value given by the oil was found to be 120·5 in the case of that extracted with ether, 117·2 of that extracted with benzene, and 116·5 in the case of that extracted with petroleum spirit. The oil is of a reddish colour, and withstands the action of the usual bleaching agents. Caustic soda reduces the colour to pale yellow, but this treatment involves considerable loss by saponification.

Complete analysis of the seeds furnished the following results:—

	Whole Seeds.	Decorticated Seeds.	Oil Cake.
	Per Cent.	Per Cent.	Per Cent.
Moisture	8·10	7·08	11·14
Mineral matters	4·76	4·46	6·77
Fat	36·60	47·43	10·97
Crude proteids	30·19	28·00	37·95
Non-nitrogenous matter (by difference).	20·35	13·03	30·17

—C. S.

Kadam Seeds (Hodgsonia Kadam). J. Sack. Pharm. Weekblad., 40, 313—315; Chem. Centr., 1903, 1, [24], 1313.

Hodgsonia (Trichosanthes) Kadam, Miq., is a climbing plant which grows to a height of 30 m., and is found in the neighbourhood of Padang, in Sumatra. Its seeds attain a weight of 100 grms. and a length of nearly 10 cm.; ty consist of (1) a skin-like husk which, on the average, fo 46 per cent. of the total weight, and contains only 0·7 r cent. of ash; (2) a spongy inner layer, that forms 2·5 r cent. of the total weight, and contains 61 per cent cellulose and 14·2 per cent. of water; and (3) an e bitter kernel, composed of 21·5 per cent. of albumin, t l per cent. of fat, 3·7 per cent. of cellulose, 2·6 per cen of ash, and 3·5 per cent. of water. By pressing the kerne a white, tasteless, and odourless semi-liquid fat is obtaind, which melts at 21° C., has the sp. gr. 0·919, and consis 80 per cent. of triolein and 20 per cent. of tripalmitin.

An old sample of Indian kadam fat, examined by e author, was coloured slightly yellow, it was quite solid, id had the m. pt. 45° C. and sp. gr. 0·998; it consist of 20 per cent. of triolein and 80 per cent. of tripalmn. This sample was probably prepared by warming and n after cooling, removing only the solid portion of the fat

—A.

Cholesterol; Derivatives of ——. H. Schrötter. Mon h f. Chem., 1903, 24, [3], 220—228.

The cholesterol used in the author's investigation obtained from gall stones by extraction with ether. Tw y five grms. of the purified product were brominated, id after spontaneous evaporation of the excess of brom the residue was dissolved in ether, and the solution w with dilute sodium hydroxide solution. On distillati o the ether, a greasy deposit soon appeared which, e separated and dried *in vacuo* over sulphuric acid, for l brown powder. The distillation was then continued t only a third of the ether remained, and on now add large volume of alcohol, a light yellow powder was re cipitated, whilst a further amount was deposite concentrating the filtrate. Finally, by the additic water to the alcoholic filtrate, the remainder of the bro le separated in the form of an oil which gradually solic The total yield of bromides was 66 grms., and consis the following fractions:—(*a*) A brown amorphous p soluble in chloroform, benzene, acetone, and (with diffic) in ether, insoluble in alcohol. It melted (decompos 150°—160° C. and at 140°—145° C. after purification o alcohol, and its composition corresponded with the ula, $C_{27}H_{23}Br_9O$. Amount = 40 grms. (*b*) A compound ble in chloroform, benzene, acetone, and ether, inble in alcohol. This formed microscopic crystals, ed (decomposed) at 145° C. after reprecipitation, and the same composition as the first fraction. Amount = rms. (*c*) A compound soluble in alcohol and insoluble ater, decomposing at 112° C., and having the compo- $C_{27}H_{26}Br_6O$. The fractions thus consisted, in the , of two bromides, a nono- and a hexa-bromide of dro-cholesterol $C_{27}H_{32}O$, formed by the elimination of toms of hydrogen, as hydrogen bromide, from the sterol. On treatment with nascent hydrogen both ides behaved in the same manner, yielding a dark n amorphous compound readily soluble in benzene, ngly soluble in ether, and not melting below 250° C. his could not be purified it was not further examined. also yielded a dibromide, $C_{27}H_{30}Br_2O$, which dissolved ly in alcohol, but was insoluble in water (m. pt. not), 62°—64° C.).

is dibromide slowly dissolved in strong nitric acid the evolution of nitrous vapours, and on pouring the ion into a large volume of water it yielded a yellow lent amorphous deposit. This was readily soluble in , benzene, chloroform, alcohol, and sodium hydroxide ion. When purified by reprecipitation it melted (not ly) at 198° C., and had a composition corresponding the formula, $C_{27}H_{21}Br_2(NO_2)_3O_6$. It was an acid ound and yielded dark brown, amorphous silver and m salts.—C. A. M.

olfat Oleins; Examination of ——. J. Marcusson. XXIII., page 825.

Pakoe Hadji (*Cycas circinalis, L.*). J. van Dongen. XX., page 818.

rin; New Process for the Extraction of ——, *from stillery Residues.* L. Rivière. XVII., page 815.

English Patents.

and Methyl- and Ethyl-esters of Fatty Acids; ocess for the Preparation of Bromine and Iodine mpounds of ——. W. Majert, Gruenau, near Berlin. g. Pat. 11,494, May 20, 1902.

r. Pat. 320,993 of 1902; this Journal, 1903, 164.
—T. F. B.

s and Fatty Acids; Production of ——. H. H. Lake, ndon, from G. Reale, Lauria, Italy, Eng. Pat. 11,778, y 23, 1902.

r. Pat. 321,510 of 1902; this Journal, 1903, 218.
—T. F. B.

[*ing Machine for Liquid Soap, Gelatin, &c.*] *Sheets Plates; Process and Apparatus for Manufactur-* ——, *from Warm Liquids which become hard or latinise in the Cold.* F. and E. Fischer, Vienna. g. Pat. 3774, Feb. 17, 1903.

anical details are given of a plant similar to a filter-press. The hot liquid is run into alternate rtments and cold water is circulated through the ening compartments so as to rapidly set the liquid olid plates.—R. L. J.

French Patents.

of the Sebacic and Hydro-aromatic Series serving for thesis of Fatty Substances; Manufacture of ——, *Naphtha.* N. Zelinsky. Fr. Pat. 326,665, . 25, 1902.

is made for the process of subjecting chlorinated ns of petroleum to the successive action of magnesium rbon dioxide (this Journal, 1903, 149).—C. A. M.

nd Oils readily forming Emulsions; Manufacture ——. Soc. Allendorff and Kopp. Fr. Pat. 326,668, . 25, 1902.

xture forming a permanent emulsion with water is ed by adding pure cholesterol or wax alcohols to fats.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Zinc Paints; Substitution of ——, *for Lead Paints.* J. L. Breton. Comptes rend. 1903, **136**, [24], 1446—1447.

White lead paint resists, better than paints of zinc oxide or lithopone, the action of certain strong acids, and the penetration of effloresences of saltpetre; but it is inferior to them in resisting heat, sudden variations of temperature, hydrogen sulphide, and energetic oxidising agents like sodium hypochlorite. White lead paints adhere less firmly, and show a greater tendency to blister, than zinc oxide or lithopone paints. The addition of turpentine, while thinning all paints, whatever their base, does not sensibly alter the resisting power of either lead or zinc paints. The mixture of white lead with linseed oil is less nearly homogeneous than the mixture of the same oil with zinc oxide. For equal weights the covering powers of white lead, lithopone, and zinc oxide are approximately represented by the figures 3, 4, 6, respectively. For all these reasons, as well as from sanitary considerations, the substitution of zinc paints for lead paints is recommended.—J. T. D.

English Patents.

Tin and other Scrap; Treatment of ——. [*Pigment.*] C. D. Brindley. Eng. Pat. 8693, April 15, 1902. X., page 801.

Pigments [*Mixtures of Zinc Hydroxide and Barium Sulphate*]*: Processes of Making* ——. W. J. Armbruster and J. Morton, St. Louis, Miss. Eng. Pat. 6521, March 20, 1903.

Processes are described for making mixed pigments of the above-mentioned composition by consecutive double decompositions, the by-product of the first being caused to react with a third substance so as finally to yield a solution of the same ingredient as originally taken. For instance, a solution of zinc (or barium) chloride is mixed, in proper proportion, with one of barium hydroxide (or zinc sulphate); when a precipitate of zinc hydroxide (or barium sulphate) falls and a solution of barium (or zinc) chloride is left. To this is added a solution of zinc sulphate (or barium hydroxide), when the first precipitate is coated with one of barium sulphate (or zinc hydroxide), leaving in solution the equivalent quantity of the original zinc (or barium) chloride. The use of a solution of zinc sulphate to decompose one of barium hydroxide is disclaimed; for this known process is said to have the defect of yielding a crystalline barium sulphate; but other salts of barium, and of zinc, may be employed.—F. H. L.

United States Patents.

"*Calcimine*" *Composition and Process of Producing same.* C. Adams, Bellows Falls, Vt., U.S.A. U.S. Pat. 730,505, June 9, 1903.

A composition consisting of a mineral base, casein, an alkali, borax, and alum.—F. H. L.

Paint and Process of Producing same. C. Adams, Bellows Falls, Vt., U.S.A. U.S. Pat. 730,506, June 9, 1903.

A paint composition consisting of a mineral base, casein, an alkaline substance, lime, and alum.—F. H. L.

French Patent.

Wood, Artificial; Manufacture of —— [*Utilisation of Waste Materials of the Colour Trade*]. J. Erdin and A. Erne. Fr. Pat. 326,216, Nov. 10, 1902. IX., page 798.

(*B.*)—RESINS, VARNISHES.

Exudation Resins. Oxidation of Lariciresinol. M. Bamberger and H. Renezeder. Monatsh. f. Chem. 1903, **24**, [3], 209—217.

On oxidising with chromic acid the lariciresinol,

$$C_{17}H_{12}(OCH_3)_2(OH)_4$$

isolated from the exudation resin of larch (this Journal, 1899, 1134; 1901, 50, 262), or its tetracetyl derivative, $C_{17}H_{12}(OCH_3)_2(OCH_3CO)_4$, an oxidation product with the formula, $C_{17}H_{12}O_2(OCH_3)_2(OCH_3CO)_4$, is obtained. When saponified this substance yields a body of the composition, $C_{17}H_{10}O(OCH_3)_2(OH)_2$ melting at 180°—181° C., and yielding a diacetyl derivative, $C_{17}H_{10}O(OCH_3)_2(OCH_3CO)_2$ and a dimethyl ether, $C_{17}H_{10}O(OCH_3)_2(OCH_3)_2$.—C. A. M.

Copals; Solubility of Hard ——. C. Coffignier. Bull. Soc. Chim., 1903, **29**, [11], 551—557.

Operating in a similar manner to that employed in a previous investigation (this Journal, 1902, 918), the author has examined the action of various solvents on specimens of copal from Zanzibar and Madagascar. The characteristi the two specimens were as follows:—

—	Density at 19°.	Melting Point.	Acid Value.	Kott-torfer saponi Valu
Zanzibar copal.....	1·057—1·068	Above 300	93·0	70·1
Madagascar „	1·051—1·060	Above 300	78·5	65·9

In the following table, A signifies the percentage insoluble matter when the resin was exhausted in Soxhlet extractor; B the percentage left undissolved wh

—	Oil of Turpentine.	Alcohol (96 per cent.)	Amyl Alcohol.	Chloroform.	Ether.	Carbon Tetrachloride.	Benzene.	Acetone.	Benzaldehyde.	Aniline.	Methyl Alcohol.	Amy Acetat
Zanzibar........	100·0	A 86·5	A 84·5 to 86·9	..	A 72·7	100·7	A 87·9	A 76·4	..	..	A 81·4	..
	..	B 85·9	B 62·7 to 63·9	B 86·5	B 75·0	..	B 88·3	B 77·3	B 72·7	B 31·5	B 84·2	B 15
Madagascar.....	60·3	A 91·4	A 49·8 to 51·2	..	A 84·3	..	A 89·3	A 84·5	..	..	A 88·9	..
	..	B 73·8	B 21·5 to 23·2	B 69·0	B 65·0	B 85·0	B 78·4	B 64·3	B 21·8	B 17·8	B 79·6	B 21

3 grms. of the resin were boiled with 20 c.c. of the solvent for two hours, and the residue washed with 20 c.c. of the same thrice.

In some old varnish formulæ, the addition of camphor or ground glass is recommended for assisting the solution of resins. The solubility of Zanzibar copal in ether is not materially modified by either of these additions.—M. J. S.

Oil Varnishes; Composition and Practical Testing of ——. A. Heupel. Chem. Rev. Fett-u. Harz-Ind., 1903, **10**, [6], 125—128.

Oil varnishes consist almost exclusively of copal resin which has been rendered soluble by heat, linseed oil, and oil of turpentine. Amber has been used to a small extent instead of copal; Chinese wood-oil (tung oil) and (latterly) perilla oil in place of linseed oil; and benzene and benzine (petroleum spirit) in lieu of oil of turpentine. With the object of cheapening production, attempts have been made to substitute ordinary colophony for copal resin, but the dry varnishes are deficient in hardness. The so-called "resinate of lime," prepared by fusing colophony with calcium hydroxide, is free from this defect, but is liable to decompose when the film of varnish is exposed to moisture. The glycerin-ester of abietic acid introduced by Schaal is less affected by water, but the varnishes do not dry so satisfactorily as those made with copal. Within the last few years, however, it has been found possible, by the combination of various drying oils, and by submitting them to new methods of preparatory treatment, to make varnishes from calcium resinate which are absolutely unaffected by moisture, although they do not resist the action of weather so well as those made with copal.—M. J. S.

English Patents.

Linoleum; Processes for Making ——. L. W. Seeser, Delmenhorst, Germany. Eng. Pat. 15,890, July 16, 1902.

The invention relates to the manufacture of linoleum on a lighter (and therefore cheaper) foundation material than has hitherto been possible. This is effected by the use of a strong auxiliary fabric, which runs in a straight line from the compression rollers to the polishing rollers, and is capable of resisting the stretching pull exerted by the latter. The linoleum sheet with its light foundation material is separated from the auxiliary fabric whilst passing from the compression to the polishing rollers, and is carried over a loose roller suspended by springs, so that it is not exposed to the pull of the polishing rollers, and the finished material is again separated from the auxilia fabric after passing between the latter rollers. By maki the auxiliary fabric of wide mesh, or with a rougher surface, a linoleum may be produced with its under surf roughened or ribbed, and the separate threads of the li foundation material are pressed into the linoleum co position, thus promoting their adhesion and permane Compare Fr. Pats. 323,836, 325,129; this Journal, 19 362, 641.—M. J. S.

Linoleum or the like, having Patterns resembling Wood Fabric; Processes for Producing ——. L. W. See Delmenhorst, Germany. Eng. Pat. 15,891, July 1902.

See Fr. Pat. 323,836, this Journal, 1903, 562; also E Pat. 15,890, 1902, preceding.—F. H. L.

Linoleum Carpets in Multi-coloured Patterns; Ma facturing ——. F. K. M. af Ekström, Stockholm. E Pat. 6086, March 16, 1903.

The web of cloth travels in a horizontal direction, and o it is a frame or stencil with perforated bottom, divided compartments conforming with the desired pattern. T stencil is fed with parti-coloured linoleum from a suita number of hoppers, and is arranged to travel with the cl backing for a distance equal to its own length. The forations are then automatically closed, the cloth pass to the heating rollers, and the stencil returns to its origi position.—F. H. L.

United States Patents.

Paint Vehicle. C. W. Bilfinger, Assignor to W. Morgan, both of Fayetteville, N.C. U.S. Pat. 729,8 June 2, 1903.

A mixture of about equal quantities of creosote oil cotton-seed oil, to which lead oxide is added.—T. F. B.

Creosote Oil; Treating —— [*Linseed Oil Substitu* C. W. Bilfinger, Assignor to W. M. Morgan, both Fayetteville, N.C. U.S. Pat. 729,838, June 2, 1903.

Creosote oil (50 galls.) is agitated with powdered cau soda (1 lb.); the mixture is allowed to settle and sediment is removed. The oil is now washed with equal volume of water, and air is blown through it. A the addition of lead oxide (1 lb. for every 10 lb. of the mixture is suitable for use as a linseed-oil substitute —T. F.

(C.)—INDIA-RUBBER, &c.

Vulcanisation Process; The ——. C. O. Weber. Gummi-Zeit., 1903, **17**, [37], 812.

T cause of longer time being required to vulcanise C go rubber by the air-cure process than by the water-cu is the difference between the co-efficients of heat-co luctivity of the two media, air and water, and has nothing to lo with the pressure under which vulcanisation takes p c in the water-cure.

ara and Congo rubber give practically the same results w vulcanised in the water-cure, whether under atmospheric o ncreased pressure. The former vulcanises as quickly a in the air-cure, but Congo rubber takes much longer. T e is no ground for the statement that Para and Congo r er behave differently under varying pressures.

follows from the above that Para rubber is vulcanised w the absorption of less energy than Congo rubber, which is accordance with the thermo-chemical data for the sa reaction with isomeric hydrocarbons.—J. K. B.

English Patents.

anisation of India-Rubber; Machines for the ——. Frankenberg, Hannover, Germany. Eng. Pat. 24,573, ov. 10, 1902.

trough containing the sulphur chloride solution is pr ided with a lid, specially constructed to make vapour-ti joints at the ends. There is a slot each side to allow o e passage of the cloth and the curing solution is in duced and removed by means of a draw-off valve and fi g-hole, thus avoiding removal of the lid.—J. K. B.

anising and Moulding Rubber; Apparatus for —— H. Smith, Springfield, Mass., U.S.A. Eng. Pat. 868 n. 13, 1903.

T apparatus is a vulcanising press specially designed for m ding and vulcanising sheets of rubber type and st otype, but also for small articles.

e construction is such as to ensure great compactness an reedom from superfluous iron, whereby saving of time, fu and a more uniform temperature of the upper co ressing surface, are obtained. The steam connections ar nade by means of flexible metallic tubing.—J. K. B.

United States Patents.

G Balls; Process of Manufacturing Composition for —. R. Hutchison, Prestwick, Scotland. U.S. Pat. 0,126, June 2, 1903.

G a-percha or balata, freed from resins, and with or wi out the addition of rubber, is mixed with lime and su ur in the usual manner. When thoroughly incor-po ed, the temperature is raised sufficiently on the friction ro to cause vulcanisation to take place by local frictional he —J. K. B.

lf-Ball. R. Hutchison, Prestwick, Scotland. U.S. Pat. 730,127, June 2, 1903.

A ew composition for golf-balls or parts of golf-balls, co sting of hardened gutta-percha or balata, with or wi out rubber, 5 per cent. of lime, and $1\frac{1}{2}$ to 2 per cent. of su ur. (See preceding abstract.)—J. K. B.

French Patent.

In a-Rubber, Gutta-Percha, or Similar Materials contain- Fibres or Tissues of Animal or Vegetable Origin; eatment of ——. A. Theilgard. Fr. Pat. 326,403, v. 17, 1902.

T material is treated with hot water or steam under pr ure, with or without the addition of normal or acid sa such as magnesium sulphate, zinc chloride, calcium bis hite. See also Eng. Pat. 8041, 1899; 20,081 and 25. 4, 1902; and addition Fr. Pat. 287,928 (this Journal, 18 694; also 1902, 1461; and 1903, 563).—J. K. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Degras; Determining the Specific Gravity of ——. A. Gawalowski. XXIII., page 825.

English Patents.

Hides or Skins; Treating ——, *Preparatory to Tanning.* S. K. Felton, Jr., Camden, N.J. Eng. Pat. 3236, Feb. 11, 1903.

See U.S. Pat. 721,553 of 1903; this Journal, 1903, 429.
—T. F. B.

[*Cooling Machine for Liquid Soap, Gelatin, &c.*] *Sheets or Plates; Process and Apparatus for Manufacturing* —— *from Warm Liquids which become Hard or Gelatinise in the Cold.* F. and E. Fischer. Eng. Pat. 3774, Feb. 17, 1903. XII., page 807.

United States Patents.

Decolourising and Clarifying Material [*For Tanning Extracts, &c.*]; *Manufacture of a* ——. R. L. Jenks, London, Assignor to G. A. Clowes, London, and E. P. Hatschek, Needham Market. U.S. Pat. 729,350, May 26, 1903.

See Eng. Pat. 10,628, May 8, 1902; this Journal, 1903, 753.
—R. L. J.

Glueing Articles together; Method of ——. F. Renken, New York, U.S.A. U.S. Pat. 729,220. May 26, 1903.

One of the two surfaces is treated with formaldehyde, casein paste or cement is applied to the other, and the two are placed in contact.

Labels for bottles, &c., are soaked in formaldehyde, dried, and applied with casein, paste, or cement.
—R. L. J.

French Patent.

Leather; Process and Apparatus for Making Substance Resembling ——. H. Karle. Fr. Pat. 326,600, Aug. 8, 1902.

See Eng. Pat. 17,585, Aug. 11, 1902; this Journal, 1903, 308.—R. L. J.

XV.—MANURES, Etc.

Nitrogen, Atmospheric; Utilisation of ——, *for Agriculture and Industry.* Frank. Zeits. angew. Chem., 1903, **16**, [23], 536—539. (Fifth Internat. Congress of Applied Chemistry, Berlin.) See also Calcium Cyanamide, &c., G. C. Erlwein, under VII., page 794.

A history of the use of natural and artificial nitrogenous manures, and of the early attempts to convert atmospheric nitrogen into ammonia or nitrates, is given in the first part of the paper. In 1895, Caro and the author found that barium and other carbides under certain conditions absorbed nitrogen, and proceeded, with Siemens and Halske, to work out from this reaction an industrial process more especially for the production of cyanides. For this purpose, barium cyanide seemed most suitable; but when it was found that calcium carbide yielded, not cyanide directly, but calcium cyanamide, CN.NCa, so that 40 parts of calcium fix 28 of nitrogen, the manufacture of manurial products suggested itself, especially as it was found that by heating with water under pressure all the nitrogen of the substance (or of the pure cyanamide made from it) was converted into ammonia ($CN.NCa + 3H_2O = CaCO_3 + 2NH_3$. Experiments conducted by Wagner at Darmstadt and Gerlach at Posen have shown that calcium cyanamide, applied directly to land, has a manurial value at least as high as that of ammonium sulphate containing an equivalent amount of nitrogen, and not far below that of sodium nitrate. More experience is of course yet needed, but it seems as though the crude calcium cyanamide (14—22 per cent. of nitrogen) and possibly cyanamide itself (66 per cent. of nitrogen) may become valuable artificial manures.—J. T. D.

Nitrate Nitrogen in the Presence of Organic Matter; Schlösing's Method for the Determination of ——. P. Liechti and E. Ritter, XXIII., page 824.

French Patent.

Phosphated Chalks; Treatment of ——, to obtain "Phosphated Lime," as an Agricultural Product, involving the working of Beds poor in Phosphoric Acid, by augmenting the proportion therein of Tribasic Calcium Phosphate. C. H. Cochet, called Lecomte. Fr. Pat. 326,406, Nov. 19, 1902.

The sorted ores are calcined to convert the calcium carbonate present into lime, while the phosphate is left unaffected. Separation of the latter from foreign matters is carried out by crushing selected portions of the material, and subjecting the powder to a continuous current of steam in suitable apparatus.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Diffusion [Sugar]; Influence of the Quantity of Juice Extracted in ——, on Exhaustion and Density. V. Goutière. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [11], 1118—1123.

The author criticises the suggestions of Collignon (this Journal, 1903, 37) on the influence of the quantity of juice extracted in diffusion on the exhaustion and density. If the diffusers are only partly filled, there is danger of unequal charging and consequent irregular working, and the chips collect unequally so that the juice makes channels, particularly in diffusers of large diameter. The less space occupied by the chips, the greater is the volume of juice, and as it is necessary for good exhaustion to draw off from each diffuser not only the juice it contains, but a certain quantity of that from the preceding diffuser, the quantity drawn off becomes excessive. It is not advisable to keep the chips in the diffuser as long as an hour and three-quarters owing to the risk of fermentation.

The author recommends a method he has used at a sugar works in South Russia in 1895, wherein he exhausts the air from the diffusers which have been charged as fully as possible with chips. Owing to the absence of air there is no froth, and the contact of the juice with the chips is most intimate; the diffusers being filled from below, the densest juice is for a time at the top and passes first to the measuring tank. Circulation becomes incomparably easier, and the diffusers may be charged as rapidly as possible without fear of bad circulation, and the quantity of juice drawn off is a minimum. The absence of froth hinders fermentation and gives purer juice, and the daily work is increased. A sketch and description of the apparatus is given.
—L. J. de W.

Beet Juice; Determination of the Purity of ——. P. Hermann. Zeits. Vereins. Deutsch. Zuckerind., 1903, [568], 485—489.

The author discusses the value of a determination of the purity of beet juice and gives the method employed in Dormagen for this determination. He arrives at the following conclusions:—(1) A determination of the purity of the juice in the beet is of great value for the evaluation of the juice extraction process, of manurial and cultivation experiments, and of the selective cultivation of seed beets; (2) The expression method is quite unsuitable for this purpose; (3) When the conditions of experiment are kept constant, the digestion method proposed by Krause gives sufficiently concordant values for the purity quotients; (4) The purity quotients found by Krause's method correspond relatively with the purity of the juice in the beet; (5) Krause's method, therefore, answers all the requirements of a process for determining the purity of beets; (6) The following conditions for carrying out the method are proposed:—(*a*) The use of coarsely chopped beet pulp; (*b*) A digestion temperature of 90°; (*c*) A digestion period of 30 minutes.—T. H. P.

Crystallisation [Sugar] under Pressure. E. Delafou Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 190 **20**, [10], 1057—1058.

The author has based his process for the extraction sugar from molasses on the employment of carbon dioxi under pressure.

The carbon dioxide dissolves in the masseeuite, rend it more fluid, and allows and facilitates molecu attraction.

When a molasses of very low purity is treated w carbon dioxide, the saccharose that it contains crystalli almost completely, but the crystals are very small. T crystals, however, re-dissolve when the pressure removed.—L. J. de W.

Sugar Candy: Crystallisation of ——. E. Nisoli. B de l'Assoc. des Chim. de Sucr. et de Dist., 1903, 2 [11], 1105—1110.

The syrup after being filtered and passed through char boiled under a vacuum of 60 cm., corresponding to 62 When the requisite degree of concentration is reached, t syrup is heated to 92°—93° C. before being run into candy pots.

The pots are then placed in the stoves and all apertu closed to prevent the entrance of cold air. They rem here for 9 to 12 days during which crystallisation ta place gradually owing to the slow cooling. There is a l of sugar due to inversion and further decomposition. T amount of uncrystallisable sugar formed was found to 0·229 and the further loss, 0·311 per cent. of the su entering the stove.

The rate of cooling influences the character and quant of candy formed. The lower shelf, cooling most rapi especially at the start, gives a greater yield, but of infe quality. It is better to correct this by regulating the r of cooling methodically, and varying the concentratio the syrup, rather than by adding water to the pots in lower tier, which is too empirical.—L. J. de W.

Sugar Manufacture. Claassen's Process for Boiling After-Products. E. Stuyvaert. Chem.-Zeit., **27**, [527—528.

Claassen's researches enable the most suitable proporti of water in the masseeuite at any degree of purity and temperature to be accurately calculated. At 45°—50° C. e same amount of sugar is dissolved by a saturated solu of syrup, 75 per cent. purity, as in a solution of pure su the quantity soluble in the former being relatively hig the lower the degree of purity of the syrup. The efficient of saturation for saturated syrups is as follows:-

Syrup 75 per cent. pure, 1·00; 75—70 per cent. p 1·00—1·05; 70—65 per cent. pure, 1·05—1·10; 65-6 per cent. pure, 1·10—1·25; 60 per cent. and under, 1 The coefficient varies with the temperature, being in the case at 80° C., 1·6; 70° C., 1·5; 60° C., 1·4; 50° C., 1 35° C., 1·2; 20° C., 1·15.

Assuming the molasses to be 60 per cent. pure, and final temperature 35° C. and that 1·05 supersaturatic required; then, since 1 part of water will dissolve 2·29 p of sugar at this temperature, and the coefficient of satura of the molasses under the conditions stated is 1·2, 1 par water in the molasses must correspond with 2·29 × × 1·05 = 2·88 of sugar. The proportion of wate the molasses will be $[(2{\cdot}88\,x) \div (100 - x)]\ 100 = 0$ *i.e.*, $x = 17{\cdot}25$; and the molasses therefore cont 17·25 per cent. water, 49·65 per cent. of sugar, and 3 per cent. of non-sugar.

Though a high degree of supersaturation is desirab in the product, the resulting excessive viscosity ret crystallisation, especially at low temperatures and th impure solutions. Up to the point at which granul commences, a coefficient of 1·2—1·4 (68—80 per t purity) may be maintained, but at this stage the su saturation must be considerably reduced, to be a restored when the grain is distinctly formed, and fi reduced once more during cooling; and this objec accomplished by adding water. An important point in the Claassen method is the introduction of dry steam d into the boiling pans, thus ensuring uniform mixing and regularity of temperature.—C. S.

Sugar Manufacture; Treatment of the After-Products of ——, by the Karlik-Czapikowski Method. J. B. Pavrez de Groulart. Chem.-Zeit., 27, [44], 528.

After a careful purification of the juice, the first products are concentrated to 3½—4 per cent. of water. the yield of crystals being then easily prepared for refining. The runnings, which are 77—79 per cent. pure, are diluted to a density of 32—35° B. (at 80° C.), and treated with sulphur dioxide (about 1·8 parts of sulphur per 1000 of syrup). They are next passed, without pressure, through a Karlik sand filter (filtering stratum 40—50 cm. in depth), an operation shortening the treatment of the massecuite and increasing the yield. The Karlik-Czapikowski vacuum pans are horizontal cylinders, heated with a rotating system of crossed steel steam tubes connecting the steam-admission and condensed water chambers. The heater makes one revolution per minute, thus ensuring a thorough stirring of the massecuite. This treatment enables the water content to be reduced to 4 per cent., and furnishes a uniform, well-defined grain, with a high yield. The temperature of the massecuite is lowered in the mash, from 70° C. to 30° and even 25° C., and must subsequently be raised again to 45—50° C. before centrifugalising, this furnishing a molasses of only 54 per cent. purity. Three coolers suffice for one boiling pan, and the operations of cooling, rewarming, and centrifugalising take 72 hours. With beet sugar, the process furnished at Nymburk, a 15·52 per cent. yield of first and second product, out of 16·80 per cent. of total sugar in the beet, with 0·78 per cent. of molasses and only 0·5 per cent. loss.—C. S.

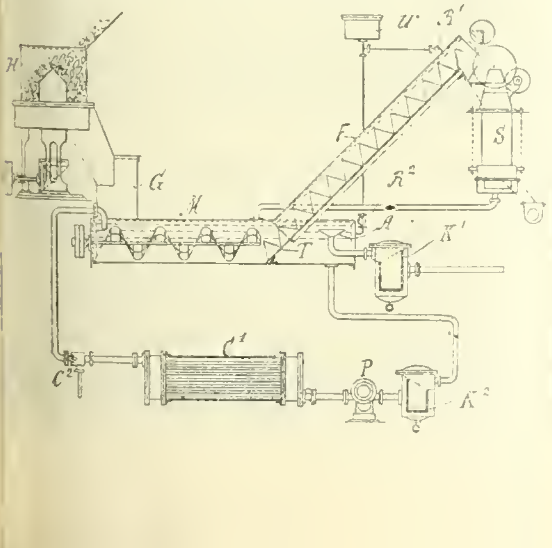
Sugar Analysis; Source of Errors in Optical ——. F. G. Wiechmann. XXIII., page 826.

Glucose; Mutarotation of ——, as Influenced by Acids, Gases, and Salts. T. M. Lowry. See under XXIV., page 828.

English Patents.

Beet-root Expressed Juices: Process and Apparatus for Obtaining Pure Concentrated ——, and Expressed Residues Rich in Sugar. C. Steffen. Vienna. Eng. Pat. 5439, March 9, 1903.

Fresh beet-root chips, sliced or similarly disintegrated fresh beet-roots, which have been suddenly heated up to temperatures of 60° to 97° C. (preferably 80° C.), by using as a heating agent sufficient quantities of pressed raw juice at temperatures of from 60° C. up to boiling point (preferably from 97° C. to boiling point), are subjected, after the entire or partial separation of the pressed raw juice employed for heating, or together with this juice, to a juice extraction by pressing the beet-roots. The pressed raw juice obtained is then heated and caused in its turn to act upon new quantities of fresh disintegrated beet-roots in the same manner and for the same purpose before being manufactured into sugar. In a modification of the process, the heated beet-root chips and the like, freed more or less from the heating juice, are disintegrated before being expressed, and then the mass is separated into pressed juice and pressed residue. The process may be employed in connection with cold produced beet-root pulp. Instead of the pressed raw juice being used as a heating juice, for acting upon the fresh chips, a beet-root raw juice obtained according to the diffusion process may be employed. The apparatus for carrying out the process comprises a mixing vessel M, receiving, at one end, the chips through a channel G, and the heating juice heated by means of a heating apparatus, C¹, or by a steam injector, C², and conveying them to the other end by means of a worm conveyor, F, in combination with a separating press, F, and a pump, P, for effecting the circulation of the juice which passes through a heating device and returns to the vessel; the quantity of juice accumulating during this cycle of operations is removed by means of an overflow arrangement.—T. H. P.



Saccharine Solutions or Syrups; Process for Controlling the Over-saturation in Boiling ——. H. Claassen, Dormagen, Germany. Eng. Pat. 19,028, Aug. 29, 1902.

See U.S. Pat. 723,990, March 31, 1903; this Journal, 1903, 564; also Fr. Pat. 324,271, Sept. 4, 1902; this Journal, 1903, 643.—T. H. P.

Sugar Crystals; Purification of ——, and a Product obtained thereby. C. A. Spreckels and C. A. Kern, New York. Eng. Pat. 17,912, Aug. 14, 1902.

The process described consists in treating sugar crystals with a defecating agent, preferably a sulphonated agent (see U.S. Pat. 698,150, April 22, 1902; this Journal, 1902, 715), which does not dissolve sugar, then separating from the mass the said agent together with the absorbed impurities, which are then removed from the defecating agent so that the latter can be used again. The partially cleansed sugar crystals are freed from the remaining traces of the defecating agent by treatment with a non-solvent of sugar, such, for example, as a saturated sugar solution, which is then removed, together with the absorbed impurities, by centrifugal action. Claim is made also for the products obtained by this process.—T. H. P.

United States Patents.

Sugar; Process of Making ——. J. W. de Castro, New York. U.S. Pat. 729,920, June 2, 1903.

The claims relate to methods of defecating saccharine liquids in which (1) lime is mixed with the liquid while the latter is "protected" by carbon dioxide; (2) the liquid is mixed with lime and carbon dioxide simultaneously; (3) the liquid is brought under pressure of carbon dioxide to the lime.—T. H. P.

Sugar-Cane Syrup; Process of Making ——. J. Tillman. U.S. Pat. 729,976, June 2, 1903.

The process described, for making syrup from sugar-cane, consists in evaporating the juice to the syrup state, while repeatedly skimming the same, then adding water and potassium nitrate in certain proportions, and again repeatedly skimming with fine skimmers.—T. H. P.

Sugar Solutions; Process of Boiling ——. A. Gräntzdörffer, Magdeburg, Germany. U.S. Pat. 730,111, June 2, 1903.

In boiling down thick and thin liquids, carbon dioxide is introduced into the juice after being heated to approximately the same temperature as the latter.—T. H. P.

Lactose from Whey; Process for Producing ——. A. S. Ramage, Cleveland, Ohio. U.S. Pat. 730,703, June 9, 1903.

Whey is rendered slightly alkaline, concentrated to about one-half its bulk, and the proteid matter is removed. After again concentrating to about one-sixth its volume, sufficient methyl alcohol is added to precipitate the lactose.—W. P. S.

Saccharimeter. A. B. Lyons, Assignor to Nelson, Baker, & Co. U.S. Pat. 730,674, June 9, 1903. XXIII., page 822.

French Patents.

Sugar Beet and Fermentable and Putrescible Materials; Preservation by Sterilisation and Subsequent Drying of ——. J. C. F. Lafeuille. Fr. Pat. 326,750, Nov. 21, 1902.

The materials, after being chopped, crushed, or decorticated, are sterilised according to the process described in Fr. Pat. 322,284 (this Journal, 1903, 310). After leaving the sterilising chamber, the materials are fed upon a travelling wire table which carries them through a series of chambers in such a manner that warm, dry, air is delivered in each chamber below the wire, and is withdrawn through pipes situated in the top of each chamber in connection with a shaft leading to a mechanical exhauster. The hot gases after being used for sterilising purposes are drawn by the same exhauster through a flue situated in the supply conduit for cold air, to which they impart their heat.
—J. F. B.

Beetroot Expressed Juices; Process and Apparatus for obtaining Pure Concentrated ——, and Expressed Residues rich in Sugar. C. Steffen. Fr. Pat. 326,299, Nov. 12, 1902.

See above. Eng. Pat. 5439, Mar. 9, 1903.—T. H. P.

Cooling, Sifting, and Mixing Sugar: Apparatus for ——. G. Boutellier. Fr. Pat. 326,427, Nov. 18, 1902.

This apparatus, shown in elevation and part vertical section in Fig. 1, and in plan and part horizontal section in Fig. 2, comprises:—(1) A sugar elevator, consisting of a strap, 1, with buckets, 2, moved by a pulley: (2) A conveying screw, 6 [Fig. 2], on a rotating axle, 7, fitted at one end with a pulley, 8, carrying a belt, 9, passing over another pulley, 10, fixed to the driving axle, 4. This screw rotates in a metal trough, 11, provided with large or small perforations for sifting the sugar, the residual matter being carried by the screw, 6, to a shoot, 13, having at the bottom a receptacle 14. The other end of the rotating axle, 7, carries a pulley, 15, fitted with a belt which rotates another pulley, 17, below. (3) A sugar reservoir, composed of metal cone, 18, surmounted by a cylindrical chamber, in which are fitted superposed horizontal perforated plat The lower plate, 20, is fixed, whilst the others rotate rou a vertical axle, 21. Each of the rotating plates, 22, furnished below with projections, 23, of sheet iron, w the object of pushing the sugar into the perforations.
—T. H. P

Fig. 1.

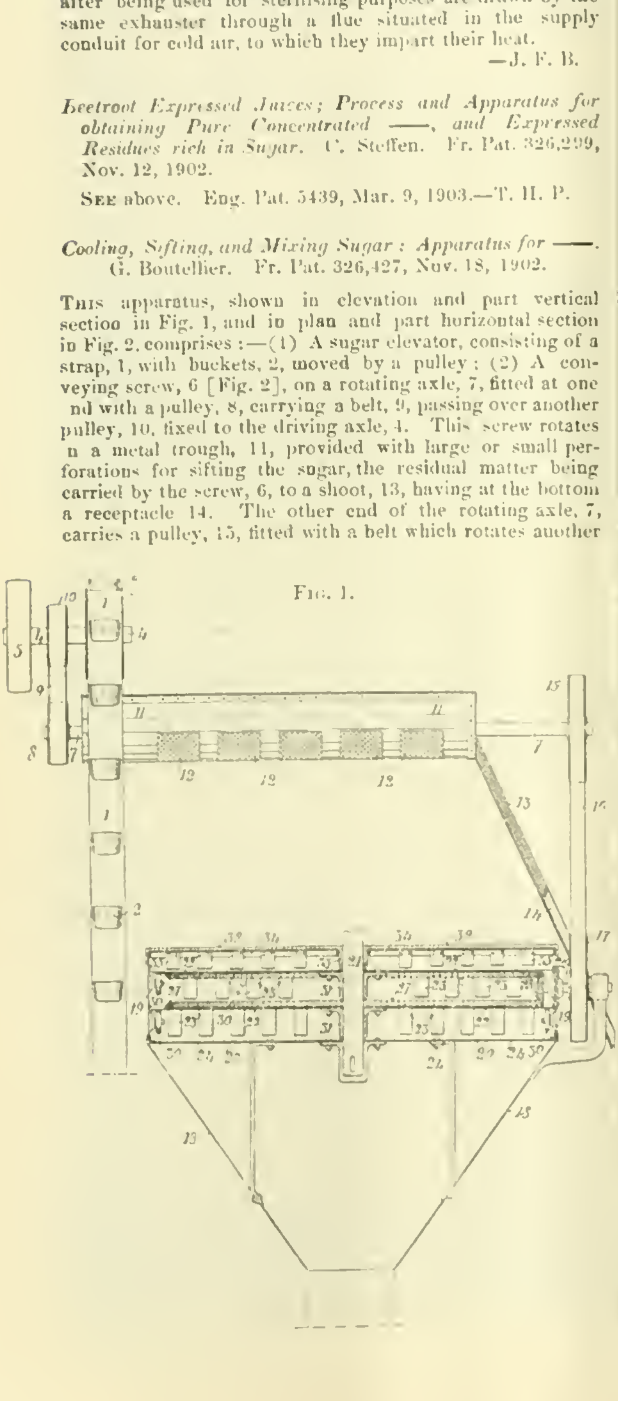
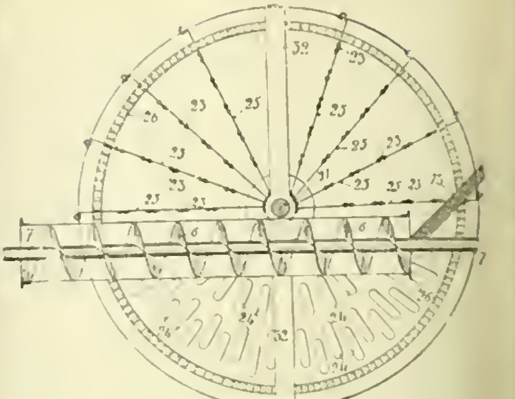


Fig. 2.



Sugar; Boiling and Crystallisation of ——, at a Hi Temperature. J. B. L. Aurientis and R. Fontenill Fr. Pat. 326,433, Nov. 18, 1902.

The process described can be applied both in the refine and in the sugar-house. In the refinery the procedure as follows:—180 kilos. of water, as pure as possible, placed in a suitable vessel with 1,000 kilos. of sugar, fre from straw, dirt, &c., and the whole melted. The syr obtained is removed and concentrated in another vessel a temperature of, say, 128°, after which it is left to crystall at a temperature of 90°—105° C. When the crystallisation fairly well advanced, the mass is submitted to slow and int mittent malaxing, after which the remainder of the syrup gradually injected into it. By this means more crystals formed or the original ones are increased in size, and t process is continued until the mass is ready to be run i moulds, after which it is treated as usual. In the sugar-ho concentrated syrops of, say, 28° B from the evaporat, are defecated and then submitted to a second evaporat so as to yield a syrup similar to that obtained by meltin third runnings sugar. Part is then removed, concentrat, cooled, and the crystallisation carried out as descril above.—T. H. P.

Agglutinants and Adhesives; Manufacture of ——, fr Starch. J. and R. Haake. Fr. Pat. 326,286, Nov. , 1902.

Starch is intimately mixed without the addition of wa, with substances such as chloride of lime, sodium peroxi. &c., which directly or indirectly liberate oxygen, particles of starch being thus oxidised. The process m also be modified by previously mixing and boiling starch with an appropriate quantity of water.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc

Reducing Enzymes [Reductases or Hydrogenases]. Pozzi-Escot. Amer. Chem. J., 1903, 29, [6], 517—56

In 1888 de Rey-Pailhade announced the presence in ye of a substance, which he termed *philothion*, capable of converting free sulphur into hydrogen sulphide. Philoth is a reducing enzyme; it may be isolated, according to original method, by extracting 100 grms. of top yeast w 55 grms. of water and 45 grms. of alcohol for 24 hou The author, however, obtains far more active soluti from bottom-fermentation yeast by plasmolysis:—500 gr pressed yeast are triturated cold with 100—150 grms. cane sugar. Complete liquefaction soon takes place, d the liquid is allowed to stand for 12 hours, with the dition of a little thymol. When all fermentation is ded, the liquid is slightly diluted and filtered. The luctase may be purified by precipitation by ammonium magnesium sulphate. Philothion combines with oxygen, d the activity of its solutions is destroyed somewhat pidly in contact with air. Although these solutions are marily reducing agents, they may, by a secondary action, ng about the indirect oxidation of readily oxidisable ganic substances, perhaps in the following manner :—

$$H_2 + O = R + H_2O; \; R + H_2O + R' = RH_2 + R'O,$$

ductase) (oxidisable substance)

th regeneration of the original enzyme.

In this way philothion in the presence of air brings about oxidation of salicylic aldehyde to salicylic acid, the dation being materially assisted if a readily reducible ly, such as an iodate or arsenate, be also present. Under combined influence of oxygen and an oxydase, philothion xidised in a few hours; by the action of an oxydase ne the philothion is not destroyed; oxygen alone oxidises lothion slowly (6—7 days). Potatoes contain both dases and reductases, but in presence of air the dising action predominates, and the reducing action is troyed. Unfermented grape juice contains sufficient dase to bring about the complete breaking down [*casse*] the wine, but the reductases of the fruit, and especially philothion of the yeast under normal conditions of nentation, destroy or precipitate the oxydase, which ght be the cause of the breaking down.

n a slice of potato only the peripheral layers show the tions for oxydases. The author has found, however, all parts of the tuber are apparently equally rich in dases, but that in the deeper parts there is an equilibrium ween the oxydases and the reductases.

Besides sulphur, philothion reduces selenium, tellurium, nic, and phosphorus. It also reduces indigo carmine ndigo white; the reduction is somewhat slow, but it be considerably accelerated by the addition of an rmediary substance, such as sulphur. The natural tions of philothion have a slight acid reaction; if they made alkaline they become far more sensitive to the ructive action of free oxygen. The reductases destroy colour of guaiacum-blue, and their presence may efore mask the guaiacum reaction of other enzymes n in the presence of hydrogen peroxide.

hilothion reduces arsenates, iodates, and bromates, also ates in very dilute solutions. The reduction of nitrates ffected in a still higher degree by yeast in active neutation, and by the reducing enzymes in the sap of ng growing plant tissues. Philothion also reduces nitrozene to aniline.

solution of philothion has a most vigorous catalytic on upon hydrogen peroxide. The evolution of oxygen ery rapid at first, slowing down gradually until the me becomes inactive. The paralysing influence of ain salts upon this catalytic action has been studied. author has prepared from tobacco leaves the enzyme *lase*, discovered by Loew (this Journal, 1901, 598). inds it to be not an oxydase, but a reductase, capable educing sulphur to hydrogen sulphide, and probably tical with philothion. Reductases occur in blood, and bine with the fibrin as it coagulates. Heat accelerates action of the reductases up to 45° C.; their activity ears to be destroyed at 60° C.

living tissues the reactions which take place in the hs of the protoplasm are not oxidations, but hydrolysis reduction. When internal oxidation does take place it is to secondary action, closely dependent on the reducing mes. The author states, in opposition to the conclus of Effront and Grüss, that the presence of oxydases east has not been demonstrated.

e reductases are practically of universal occurrence in rowing tissues; they are especially abundant in white gg. In the moulds large quantities of reducing enzymes are often found. The author has isolated one, which he terms *jacquemase*, from Japanese "Koji," *Eurotium oryzae*. Jacquemase possesses most of the reducing properties of philothion, but differs from the latter in not being able to reduce sulphur to hydrogen sulphide; it exists also in many tubers.—J. F. B.

Anaerobic Respiration and Alcoholic Fermentation; Identity of ——, and the Isolation of Fermentative Enzymes from the Cells of Higher Plants and Animals. J. Stoklasa Woch. f. Brau, 1903, **20**, [23], 270—274. (See also this Journal, 1903, 374.)

In continuation of the preliminary paper (*loc. cit.*) certain additional facts and experimental details are now described, which are summarised as follows:—The presence of a fermentative enzyme similar to zymase may be easily demonstrated, not only in the cells of certain plant organs, but also in various organs of the animal body. The enzyme is elaborated by the living protoplasm, both in normal and in anaerobic respiration. By-products, other than alcohol and carbon dioxide, are produced only in insignificant quantities; the proportion of alcohol to carbon dioxide is the same as in fermentation with zymase. From a study of the fermentation of various sugars it would appear that the cells of the different organs secrete also the enzymes invertase, diastase, lactase, and maltase, in degrees varying with the different organs. Together with these enzymes the active preparations always contain proteolytic enzymes. These proteolytic enzymes come into action when the alcoholic fermentation is suppressed by any means. If alcoholic fermentation do not take place, a decomposition of the nitrogenous constituents of the fermentative enzyme itself ensues.—J. F. B.

Enzymes; Combative or Protective ——. M. Delbrück. Woch. f. Brau., 1903, **20**, [23], 269—270.

Yeast is endowed with the power, under favourable conditions, of suppressing competitive organisms even to the last cell. On this property is based the process of "natural" pure cultivation of yeast. All organisms excrete products which are poisonous to bacterial life generally, but to which the organism producing them is to a certain extent inured, thus retaining predominance by poisoning the infecting organisms. Thus, yeast excretes carbon dioxide and alcohol inimical to the lactic and butyric ferments; lactic acid is inimical to the butyric ferment, whilst butyric acid is extremely poisonous to yeast. Thus, in addition to the digestive enzymes and energy-producing enzymes, there is a third class of combative or protective enzymes which produce the specific poisons. Zymase is both an energy-producing enzyme and a protective enzyme; the acetic acid enzyme of acetifying bacteria is a very powerful protective enzyme, which keeps the culture liquids free from infecting organisms. In short, it would appear that all fermentative enzymes are protective.

But it is observed that the protective influence of the living organism itself is far more powerful than the mere addition of the product of its action in a chemical form. For instance, the presence of active butyric bacteria is far more fatal to yeast than the addition of butyric acid. The whole of the metabolic products of the ferment take part in the struggle, so that one organism may be said to contain several combative enzymes. The protective influence of the enzymes secreted by these organisms is in close analogy with the action of blood towards disease germs. The addition of butyric acid to yeast stimulates the latter to increased fermentative activity, as a counter-reaction to the effect of the poison. The peptases constitute another class of protective enzymes; these in yeast, as in the blood, attack and dissolve the intruding bacteria. Still another class of protective bodies are those which cause the infecting bacteria to clot together in zooglea masses, enclosing them in glutinous layers, thus separating them from activity in the liquid. An example of this phenomenon is shown in the non-virulent zooglea form of sarcina as compared with the extreme virulence of the free-living individual form. Yeast secretes a coagulative enzyme, *casease*, which effects the coagulation of milk.

Besides alcohol and carbon dioxide, yeast excretes small quantities of a large number of by-products, each the product of an enzyme, the formation of any of which in increased quantity may perhaps be caused by the stimulus of the presence of particular sorts of infecting organisms. The wild yeasts and wine yeasts produce large quantities of esters, which may be protective in the natural state, but which are no longer necessary in the cultivated state.

—J. F. B.

Yeast; Influence of Colouring Matters and Tannin on the Activity of——. A. Rosenstiehl. Woch. f. Brau., 1903, **20**, [24], 291—292.

Some time ago (see this Journal, 1900, 261) the author recorded some observations which showed that when certain yeasts, isolated from cider, were sown in apple must, reproduction took place unaccompanied by fermentation, and this result was proved to be due to the presence of tannin in the must. According to a process devised by the author, red-coloured musts are prepared from black-skinned grapes with a colourless juice. When such musts are fermented by pure cultivated yeast, it is found that the red wine obtained possesses a colour of only about one-third of the intensity of that of the original must.

Examination showed that the colouring matter had been absorbed by the yeast, which had a red tint. Moreover, yeast is able to combine not only with the colouring matter of grapes, but also with tannin and with aniline dyestuffs. From dilute, faintly acid baths, such as are employed for dyeing wool and silk, yeast will withdraw the whole of the dyestuff; in presence of excess of the latter, the yeast may take up as much as 8 per cent. of Magenta or 5 per cent. of Malachite Green. These dyed yeasts are not dead, but only weakened in fermentative power; when sown in red must, they reproduce, but gradually lose their power of fermenting sugar. The modifications of the properties of yeast, brought about by the absorption of matters from the must, are only temporary; when the causes are removed the original properties are regained.

Wortmann has investigated a converse phenomenon by adding to a litre of fermented wine 2 grms. of sugar and 1 or 2 c.c. of active yeast. He found under these conditions that fermentation, with evolution of carbon dioxide, took place, but that the cells produced no buds.—J. F. B.

Yeast; Use of Pure-cultivated ——, for Preparing Top-Fermentation Beers. F. Schonfeld. Woch. f. Brau., 1903, **20**, [23], 275—278.

Owing to the extreme liability to infection of the yeast in top-fermentation breweries in Germany, it was considered highly desirable that the Berlin Research Brewery should isolate a suitable top-fermentation beer yeast, and issue it in the form of pure cultures to the breweries for pitching purposes. For some two years fortnightly batches of the yeast have been prepared on the large scale under the author's direction, and a considerable demand has been met.

The requirements of such a yeast are small attenuation in sweet worts of low gravity, with production of mild and full-bodied beers, complete and rapid clarification, and solid sediments after secondary fermentation in bottle. For various reasons it was impossible to find a yeast of the Saaz type (low attenuative power) to answer the requirements, and it was therefore necessary to select one of the Frehberg type, curtailing its attenuative tendency by causing it to "break" and separate out from the liquid at a comparatively early stage.

When a yeast of a suitable nature had been found, it was cultivated on the large scale by the "Lufthefe" process, introduced by Delbruck with great success for the cultivation of yeast for distillers. This process consists in growing the yeast in dilute wort of 6—7 Bg. at a temperature of 30° C., with powerful aeration during the first 14—20 hours. In spite of the forced nature of the growth, the method was applied with satisfactory results, and batches were prepared every fortnight for about 18 months. After this time complaints began to arrive alleging that the character of the yeast had entirely changed: its attenuative power was enormously increased: it no longer gave a "break," but remained suspended in the beer, causing turbidity and a yeasty flavour; at the same time an increase in the yeas crop was noticed. This sudden reversion of type too place without apparent cause, but it was doubtless influence by the method of forcing the growth. The difficulty wa finally overcome by considerably curtailing the aeration an agitation during the cultivation on the large scale, an shortening the intervals at which cultures were made fro the original stock, since long keeping at elevated tempera tures might cause alterations in function, the zymase bein destroyed and the flocculating substances which induce th "break" being dissolved by the peptases. Storage at lo temperatures delays these alterations, and the yeast, afte its arrival at the brewery, should be freshened up befor pitching by passing it through a stronger wort at comparatively high temperature.—J. F. B.

Asporogenic Budding Fungi occurring in and aroun Breweries. H. Will. Zeits. ges. Brauw., 1903, **26**, 17 265—268; [18], 281—285; [20], 313—316.

Seventeen specimens (five of them decidedly aerobic of asporogenic budding fungi, discovered in and ne breweries, were examined by the author. The result of his investigations show that none of them produce an injurious symptoms, such as bad smell, turbidity, ropiness, in beer wort, and it is assumed that they a practically harmless.—C. S.

Spent Hops. G. Barth. Zeits. ges. Brauw., 1903, **26**, [20 316—318.

Spent hops, when pressed, still retain about 14½ per cent. their own weight of extract, which can only be recover by washing with water, and for this purpose the auth recommends a pressure apparatus, introduced by We g containing a perforated inner vessel, fitted with a stirrer a retaining the hops, whilst the washings drain into t bottom of the outer vessel, and are thence discharged to t cooler by means of compressed air or steam pressure, th precluding risk of infection.—C. S.

Fermentation of Grape Juice; Changes correlative w the Formation of Alcohol during ——. Distinctio between Entirely Fermented and Alcoholised Win A. Gautier and G. Halphen. Comptes rend., 1903, 13 [23], 1373—1379.

The authors have examined the differences in compositi among "mistelles" (musts to which alcohol has be added), "vins de liqueur" (half-fermented musts with som added alcohol), and "vins complets" (completely ferment wines). Their conclusions are as follows:—1. Ammon nitrogen disappears almost immediately after fermentati begins. 2. Organic basic nitrogen, always small in amou increases or remains constant. 3. Albuminoid nitrog hardly varies. 4. Total nitrogen diminishes. 5. Vola acids increase throughout the fermentation. 6. The crease of volatile acids (always, in grape-must, bel 0·1 grm. per litre, expressed as H_2SO_4) beyond 0·15 gr per litre, with the almost complete disappearance ammonia, is the best characteristic of a fermented wi 7. Traces of glycerin exist in grape-must, and increase w the formation of alcohol. 8. Mixed must and wine a characterised by ammoniacal nitrogen above 5 mgrms. litre, volatile acidity above 0·1 grm. per litre, and appro mate equality of dextrose and levulose. 9. "Vins liqueur" contain ammoniacal nitrogen below 10 mgrms. litre, volatile acidity above 0·1 grm. per litre, and unequ amounts of dextrose and levulose.—J. T. D.

Spirit; Manufacture of ——, from Sawdust. Sim nse Fifth Internat. Congress of Applied Chem., Ber Zeits. angew. Chem., 1903, **16**, [24], 572. (See t Journal, 1898, 365, 481, and 1164.)

An installation capable of dealing with 64 tons of sawd daily would cost M. 350,000. For fuel, the carbonace residues obtained by the process are sufficient. 6—7 l of pure spirit are obtained from 100 kilos. of sawdust, a methyl alcohol and acetic acid are obtained as by-produc In Norway, sawdust compares favourably with potato raw material for the manufacture of spirit.—A. S.

pirit ; Denaturing of ——. A Bannow. Fifth Internat. Congress of Applied Chem., Berlin. Zeits. angew. Chem., 1903, **16**, [24], 572.

he author describes the different methods of denaturing irit, especially with wood spirit, pyridine, &c. The last nnings obtained in the distillation of acetone cannot be tained in sufficient quantity to serve as a general denaturg agent. Pyridine, also, is not sufficiently abundant in countries. Of the denaturing agents in present use, od spirit appears to be the most suitable, because it can readily procured ; with regard to its denaturing action, stands next to pyridine.

The author draws attention to the advantages of acetone s as denaturing agents. They can only be separated from cohol with great difficulty : consequently their use would ow of less stringent regulations being prescribed by the thorities.—A. S.

lycerin ; New Process for the Extraction of ——, from Distillery Residues. L. Rivière. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **20**, [10], 1043—1045.

e quantity of glycerin produced as a consequence of the nufacture of two million hectolitres of commercial alcohol r annum in France is about 11·5 million kilos., the total nsactions of the world in glycerin from fats being at st 60 million kilos.

Instead of distilling the vinasse, the glycerin is separated far as possible from the other constituents, by an osmosis th alcohol of about 95°, in a special osmogene arranged by rbet. It is not necessary, and is even disadvantageous, to ncentrate the vinasse too much. The mixture of alcohol d glycerin is then distilled and the aqueous glycerin contrated to 80 per cent. of anhydrous glycerin. The asse from the distillation of molasses often contains per cent. of substances other than glycerin, and it is n indispensable to proceed to a second osmosis to obtain eable crude glycerin.

The process may also be applied to the purification of cerin from stearine and soap works. Such glycerins, by single osmosis, have had their impurities reduced from ·98 to 2·55 per cent.—L. J. de W.

Vinegar ; Detection of Free Mineral Acids in ——. D. Ganassini. XXIII., page 822.

lt ; Determining the Starch-liquefying Power of ——. C. J. Lintner and P. Sollied. XXIII., page 826.

English Patents.

ast Cells : Obtaining the Contents of ——. R. B. Ransford, Upper Norwood. From Pharm. Inst. L. W. Gans, Frankfort-on-Main, Germany. Eng. Pat. 16,037, July 18, 1902.

addition to Fr. Pat. 310,349 ; this Journal, 1903, 434 : npare also original Eng. Pat. 8722 of 1901 ; this rnal, 1902, 491.—J. F. B.

irituous Liquids ; Manufacture of ——. J. M. Sanguineti, Lille. Eng. Pat. 27,068, Dec. 8, 1902.

special ferment for use in the manufacture of whisky, , or other spirituous liquor is prepared by selecting a st from a wort, which may be sterilised or not, having a nposition identical with that of the wort from which the uired spirit will be produced, cultivating this yeast, after minating the impure ferments, in a wort having a comition identical with that from which the required spirit l be produced, and stopping its increase or propagation means of a certain quantity of spirit like that for whose duction it is prepared.—T. H. P.

tillers' and Brewers' By-Products ; Utilisation of ——. Cattle Food.] G. Souter and J. S. Souter, Elgin, N.B. Eng. Pat. 3688, Feb. 17, 1903.

e burnt ale extract obtained by the process described in g. Pat. 11,532 of 1898 (see this Journal, 1899, 510) is ed with distillers' or brewers' draff, cut straw, hay, ff, or such like fodder, with or without condiments, for as a food for cattle or other animals.—J. F. B.

Residuary Liquors of [Beet] Sugar Factories [Vinasses] : Treatment of ——. C. Sutre, Paris. Eng. Pat. 4858, March 2, 1903. Under Internat. Conv., June 3, 1902.

Claim is made for the treatment of distillery vinasses as described in Fr. Pat. 321,701, June 3, 1902 (this Journal, 1903, 225).—T. H. P.

United States Patent.

Brewing. H. A. Hobson, London, Assignor to the Concentrated Beer Co., London. U.S. Pat. 730,651, June 9, 1903.

See Eng. Pat. 4943 of 1901 ; this Journal, 1902, 558.
—J. F. B.

French Patents.

Fermentation and other Purposes ; Glass Vessels for ——. A. Weber. First addition, dated Nov. 24, 1902, to Fr. Pat. 323,777, Aug. 14, 1902.

See Eng. Pat. 25,350 of 1902 ; this Journal, 1903, 223.
—J. F. B

Spirits ; Apparatus for the Continuous Rectification of ——. E. Barbet. Tenth addition, dated Nov. 21, 1902, to Fr. Pat. 296,750, of Feb. 1, 1900.

A simplified plant for the continuous rectification of crude spirits or clear fermented liquids is described. This form is especially adapted for the use of small distilleries, as, by a simple adjustment of cocks, it can be employed at will either for the production of strong alcohol (rectified spirits) or for the distillation and purification of brandies, rum, or gin. The speed of working is controlled by the observation of the pressure existing in the apparatus which effects the concentration of the "head" products.—J. F. B.

Distilling Apparatus. W. E. Lammus. Fr. Pat. 326,670, Nov. 25, 1902.

See Eng. Pat. 25,967 of 1902 ; this Journal, 1903, 202.
—J. F. B.

XVIII.—FOODS ; SANITATION ; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

English Patents.

Casein ; Separation of ——. A. Spitteler, Prien, Bavaria. Eng. Pat. 17,258, Aug. 5, 1902.

Caustic alkalis, when used for precipitating casein from solution, have a prejudicial effect ; alkali carbonates are therefore employed instead. Compare Eng. Pat. 17,657, Aug. 31, 1899 ; this Journal, 1900, 755.—R. L. J.

Caseïn ; Manufacture of Clearly Soluble ——. O. Eberhard, Ludwiglust, Mecklenburg, and O. Mierisch, Dresden. Eng. Pat. 25,556, Nov. 20, 1902.

See addition, dated Oct. 16, 1902, to Fr. Pat. 321,490, May 19, 1902 ; this Journal, 1903, 756.—R. L. J.

Milk and Milk-like Products ; Drying and Preserving ——. J. A. Just, New York. Eng. Pat. 8743, April 17, 1903. Under Internat. Conv., May 23, 1902.

See U.S. Pat. 712,545, 1902 ; this Journal, 1902, 1548.
—W. P. S.

Distillers' and Brewers' By-Products ; Utilisation of —— [*Cattle Food*]. G. and J. S. Souter. Eng. Pat. 3688, Feb. 17, 1903. XVII., Col. 1.

Margarine ; Manufacture of ——. R. Jurgens, Goch, Germany. Eng. Pat. 8099, April 7, 1903.

The addition of cereal (preferably wheat) albumin to margarine in the proportion of, say, 2 to 5 per cent. gives a product which turns brown on roasting, does not spirt, and has an aroma of butter. Claim is also made for the addition of a small amount of sodium carbonate with the albumin.
—C. A. M.

French Patents.

Maize; Extraction of an Albuminoid Compound from ——. E. Donard and H. Labbé. Addition, dated Nov. 3, 1902, to Fr. Pat. 320,027, March 28, 1902.

The substance extracted from maize by amyl alcohol (this Journal, 1902, 1548) is treated with a current of steam and then dried at a temperature of 110° C.; or, after steaming, the substance may be dissolved in alcohol (90°), precipitated by adding excess of water, and finally dried by gradually increasing the temperature to 110° C.—W. P. S.

Milk; Apparatus for Mixing ——. A. Gaulin. Addition, dated Nov. 15, 1902, to Fr. Pat. 323,875, July 16, 1902.

The milk, or other liquid, is vigorously churned before passing into the mixing apparatus (this Journal, 1903, 568), the churning apparatus being in connection with the mixer. —W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Sewage, Acid Iron; Action of the Septic Tank on ——. L. P. Kinnicutt and H. P. Eddy. From the Fourth Annual Report of the Connecticut Sewerage Commission.

The results of another year's work confirm the authors' preliminary conclusions (this Journal, 1902, 1092), and show that by the slow passage through a closed septic tank of an acid iron sewage containing, in 100,000 parts, 5—8 parts of dissolved iron, about 10 parts of free (sulphuric) acid, and about 1 part of albuminoid ammonia:—

1. About 25 per cent. of the total solid matter, including about 20 per cent. of the total soluble matter, is removed.

2. The amount of suspended matter removed will not greatly exceed 30 per cent., unless special means are taken to retain in the tank the finely-divided iron sulphide. Of this suspended matter, 60—70 per cent. will remain in the tank, and will have to be removed as sludge, only 40—30 per cent. being rendered soluble or gaseous by bacterial action. The actual weight of sludge, however, will only be half as great as it would be if formed in a precipitation tank, owing to the smaller proportion of water in the sludge formed in a septic tank. If the sewage contain street washings, about half the total solid matter will be mineral, and more than one-third of this will be iron sulphide.

3. The amount of organic matter removed will average 20—25 per cent., including nearly 50 per cent. of the suspended organic matter, and not much more than 10 per cent. of the dissolved organic matter.

4. The gases given off contain methane (about 75 per cent.), carbon dioxide (about 6 per cent.), and nitrogen (about 19 per cent.). Hydrogen and hydrogen sulphide are absent. Gas is always evolved at temperatures above 45° C., averaging, with Worcester (Conn., U.S.A.) sewage, about 0·25 cb. ft. in the coldest months, and about 1 cb. ft. in the warmest months, per 100 galls. of sewage.—L. A.

Water; Recent Advances in the Bacteriological Examination of ——. W. H. Jollyman. Analyst, 1903, 28, [327], 169—183.

In the author's opinion, a pure water generally develops a larger number of bacteria on a neutral 10 per cent. solution of gelatin in pure water than on Koch's meat extract-gelatin medium, but a polluted water usually gives the reverse result. The methods of isolating *B. coli communis* are discussed, anaerobic cultivation at 37° C. in broth containing 2 per cent. of glucose and 0·4 per cent. of sodium formate being preferred. Pake's method was found to be well adapted for proving the presence of *streptococci*, although the occurrence of the latter being due to pollution is considered questionable. As regards the separation of *B. typhosus*, the isolation of this organism is deemed to be a matter of chance. The author, in conclusion, is of opinion that a bacteriological examination of a sample of water affords a more delicate and definite means of detecting pollution than a chemical analysis.—W. P. S.

Formaldehyde in Air; Determination of ——. G. Romyn and J. A. Voorthuis. XXIII., page 826.

English Patents.

Sewage Sludge; Destructor particularly applicable for —— J. R. Lord, Bury. Eng. Pat. 13,970, June 20, 1902.

The wet sludge cakes are placed in retorts in the upp part of a furnace. The inflammable gases produced a led into the furnace or separately collected, the retor being arranged to retain the dried sludge or to dischar it through a perforated bottom into the furnace.—W. P. S

Sewage in Sewage Tanks; Apparatus for Distribut. ——, and Withdrawing the Effluent therefrom, al Apparatus for Distributing Sewage and other Liqu over Bacteria Beds and other Areas. F. Candy a E. R. Candy, both of London. Eng. Pat. 14,366, June 2 1902.

The apparatus consists of a series of bent or inclined pip by which the sewage is discharged from a delivery chann into a tank such as that described in Eng. Pat. 72 1902 (this Journal, 1903, 377). The pipes are provid with an adjustable top, by lowering or raising which t amount of sewage discharged is regulated. The pip deliver below the surface of the liquid in the tank, a similar pipes collect the liquid and discharge it fro the tank into a common effluent channel. The seco portion of the invention relates to a means for int mittently supplying a number of bacteria beds with equ quantities of sewage, and consists of a combination of revolving distributor and a series of annular conduits a chambers. A travelling distributor running on tooth rails and actuated by a motor, which automatically t verses at each end of the filter bed, is also claimed; a further, a combination of a central feed revolving d tributor with a motor constructed of curved blades plac in a chamber affixed to the vertical supply pipe—W. P.

(*C.*)—DISINFECTANTS.

English Patents.

Disinfecting Powder. G. P. Beater and P. Toplin, both Dublin. Eng. Pat. 11,351, May 17, 1902.

A disinfecting powder containing peat, 112 lb.; eucalyp oil, 4 lb.; pine oil, 12 lb.; mercuric chloride, $\frac{1}{4}$–$\frac{1}{2}$ lb.; a "izal," 5–10 lb.—T. F. B.

Carbolic Acid, and Homologues of the same: Process Manufacturing Deodorous and Soluble ——. H. Ro mann, Schöneberg, near Berlin. Eng. Pat. 28,277, Dec 1902.

"Crude colourless carbolic acid" (or its homologues) deodorised by the addition of formaldehyde or formal hyde soap. The product is soluble in water, giving clear solution, and possesses all the germicidal proper of pure carbolic acid. For instance, to every 100 lb crude carbolic acid, 2 lb. of "formalin" and 240 of liquid formaldehyde soap are added. After standi for some time the mixture is filtered through a pre The formaldehyde soap consists of potash soap, 60 part water, 24 parts; formaldehyde, 10 to 15 parts.—T. F. B

United States Patent.

Antiseptic and Deodorising Compounds. H. P. Bus Philadelphia. U.S. Pat. 730,231, June 9, 1903.

A five per cent. solution of formaldehyde contain chlorides of zinc, calcium, sodium, and potassium, chlor of lime and alum.—T. F. B.

French Patents.

Perfumes, Antiseptics, or Disinfectants having for th Base "Solidified" Alcohol; Manufacture of —. J. Bardin. Fr. Pat. 326,243, Nov. 10, 1902.

Alcohol, containing sufficient soap to solidify it wh cold, is warmed and mixed with an ethereal solution of su substances as eucalyptus oil, salicylic acid, menthol, be- donna, arnica, &c. The ether is distilled off and recover, whilst the alcoholic mixture is allowed to cool and solidi —W. P. S *infectants ; Preparation of Non-Drying ——.* E. B. larin and G. Demoussy. Fr. Pat. 326,334, Nov. 14, 902.

rcuric chloride, zinc sulphate, phenol, thymol, chloride ime, or other substances are mixed with glycerin to form disinfectants claimed.—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

od-Pulp [Mechanical] ; Reagents for ——, and Metanil Yellow. C. Würster. XXIII., page 824.

od ; Determination of Cellulose in ——, and Valuation f Sulphite Wood-Pulp. Klason. XXIII., page 826

English Patents.

t-Moss or other Fibres ; Treatment of ——, for Paper-aking. W. M. Callender, London. Eng. Pat. 15,632, uly 14, 1902.

t-moss or other fibres are saturated with water and ted with bromine or its equivalent ; alkali is added, and mass is boiled under pressure or in open vessels ; the duct is then washed and drained so as to free it from my by-products. Good results are obtained by the use lb. of bromine and about 100 lb. of soda-ash per ton of . The treatment may sometimes have to be repeated. —J. F. B.

er ; Manufacture of ——. O. Goy, jun., Eichberg, Germany. Eng. Pat. 5339, March 7, 1903.

he manufacture of paper only that proportion of mineral er is added to the pulp which it is intended that the hed paper shall contain. All the water running from whole of the wet end of the machine and containing eral matter and fibres in suspension is collected in a gh and filtered by means of a continuous rotary or other . The solid matter removed by the filter is mixed with rtain proportion of the unfiltered "back-water" and inuously returned to the pulp after it leaves the mixing nd while it passes over the machine. In this way the e of the mineral matter is utilised and is evenly ibuted in the finished paper.—J. F. B.

ılose Hydrate ; Preparation of Stable Alkaline lutions of ——, and Precipitation of the Hydrate erefrom. W. P. Thompson, London. From Vereinigte nstseidefabr. Act.-Ges., Frankfort-on-the-Maine. Eng t. 17,501, Aug. 8, 1902.

Fr. Pat. 323,475 of 1902 ; this Journal, 1903, 508. —T. F. B.

United States Patents.

P r Pulp ; Refining Engine for ——. M. A. Mills, awrence, Mass. U.S. Pat. 729,953, June 2, 1903.

T machine consists of a shell and a grinding plug carried e shaft ; outside the shell is a stationary support which supports the bearing for the driven end of the shaft riving-gear, including a pulley with a thrust-bearing interlocked swivelled connection with the stationary ort and direct feathered connection with the shaft. T rrangement allows of the complete withdrawal of the shaft without disturbing its mounting on the support. bearing also allows of the longitudinal adjustment of rinding plug by turning a screw in connection with an table bearing at the other end of the shaft, the tment being indicated by means of a dial.—J. F. B.

B ing Engines ; Removable Bed Plate for ——. M. A. lls, Lawrence, Mass. U.S. Pat. 729,954, June 2, 1903.

bed plate for beating engines comprises a permanent section embodying a series of alternating supporting and spacing fillers extending above the bars, the upper s of the supporting bars being planed in a common concentric with the beater-roll, and a renewable blade on embodying a number of working blades alternating the spacing fillers, and each having an individual rigid ort on one of the supporting bars.—J. F. B.

Wood-Pulp ; Process of Making ——. V. Drewsen, New York. U.S. Pat. 730,439, June 9, 1903.

In the manufacture of wood-pulp by the bisulphite process, the wood is submitted to a preliminary treatment by soaking it in a solution of a monosulphite soluble in water, *e.g.*, magnesium sulphite, at the ordinary temperature, before introducing it into the digester and the cooking liquor, for a length of time sufficient to enable the solution to permeate the wood.—J. F. B.

Celluloid Compound, and Process of Making same. F. Zühl, Berlin. U.S. Pat. 729,990, June 2, 1903

A composition of the nature of celluloid is made by mixing nitrocellulose with cellulose acetate or other organic ester of cellulose, and incorporating the mixture with camphor or any of its substitutes in the usual manner. —J. F. B.

French Patents.

Cellulose from Wood ; Manufacture of ——, by Chlorine developed by the Electrolysis of Metallic Chlorides. C. Kellner. Fr. Pat. 326,313, Nov. 13, 1902.

Wood or other vegetable matter is moistened with water or preferably with milk of lime or dilute solution of alkali, and then exposed to the gaseous chlorine developed at the anode during the electrolysis of metallic chlorides. The incrusting substances (lignin) are thus oxidised and chlorinated, and converted into bodies which are completely soluble either in water or in dilute alkalis, leaving the pure cellulose unattacked. The cathode products [*e.g.*, caustic soda] may be recovered for sale.—J. F. B.

Nitrocellulose and Casein ; Treatment of Compositions containing ——. H. Ensminger. Fr. Pat. 326,576, Nov. 21, 1902.

Celluloid products composed of a basis of nitrocellulose, casein, and camphor are steeped in a solution of formaldehyde until they are completely penetrated by the liquid, and then dried. In this way the camphor is extracted by the formaldehyde, and can be recovered for future use by distillation. At the same time the formaldehyde so acts upon the casein that the composition, after treatment, loses its plasticity and acquires the consistency of horn ; the products are also devoid of the odour of camphor. —J. F. B.

Cork and Corkwood ; Substitute for ——, and Process of Making the same. E. P. Smith, M. L. Morrison, and G. F. Schindler. Fr. Pat. 326,580, Nov. 22, 1902.

See Eng. Pat. 25,324 of 1902 ; this Journal, 1903, 569. —T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cyclogeraniolene Aldehyde ; Preparation of ——. Farbwerke vorm. Meister, Lucius und Brüning, Höchst a. M. Ger. Pat. 142,139, Jan. 11, 1902. Zeits. angew. Chem., 1903, **16**, [24], 583.

Cyclogeraniolene aldehyde, $C_{10}H_{16}O$, is prepared by the dry distillation under reduced pressure of the calcium salt of cyclogeraniolene carboxylic acid (Ger. Pat. 141,699) and calcium formate in equimolecular proportions. —J. McC.

Nicotine ; Studies on ——. C. Kippenberger. XXIV., page 828.

Clove Oil ; Occurrence of Methylheptylketone in ——. Schimmel's Report, April, 1903, 26.

Methylheptyl-ketone, which has previously been recorded in rue oil, has been detected in the first runnings of clove oil, in which it accompanies methyl benzoate. The boiling point of the two compounds lying so close, they could not be separated by fractionation. After removing the methyl benzoate by saponification, the methylheptylketone was isolated by distillation.—J. O. B.

Basil Oil: Optical Rotation of —— Schimmel's Report, April, 1903, 13

The freshly distilled oil of *Ocimum basilicum* has the optical rotation + 0·35°. On fractionating this with steam, the first 10 per cent. has the higher rotation + 5°, while the residue is lævorotatory − 6°, but if the latter be heated to near its boiling point, 215° C., and cooled, it acquires a marked dextro-rotation of + 2°; by prolonged heating, this is further increased to + 3·4°. On distilling *in vacuo*, a body of lower rotation is obtained. (The above figures for rotation are for a 200 mm. tube.)—J. O. B.

Dill Oil from Spanish Herb. Schimmel's Report, April, 1903, 30.

A specimen of dill herb oil of Spanish origin has been examined and found to possess the following characters:—Sp. gr. 0·9282; $[a]_D$ + 45° 47′; it was insoluble in 80 per cent. alcohol, but slightly soluble (about 1 : 5) in 90 per cent. alcohol. It contained much phellandrene, only about 16 per cent. of carvone, with a small amount of dill-apiol. Since authentic oil of dill fruit contains no phellandrene, although that body is occasionally met with in commercial dill oil, it would appear that the oils containing this constituent have not been distilled solely from the fruit, but from a mixture of fruit and herb.—J. O. B.

Geranium; Distribution of certain Organic Substances in the ——. E. Charabot and G. Laloue. Comptes rend., 1903, **136**, [24], 1467—1469.

The proportion of volatile acid present in the geranium in leaf, petiole, and stem, diminishes from leaf to stem. The terpenic compounds are entirely localised in the leaves. Being generated in the leaves, and not traversing the stems or petioles, they do not reach the flowers; hence the lack of odour in the flowers while the leaves are fragrant. There is confirmation here of the hypothesis that the essential oils in plants, or at least the substances from which they are immediately derived, are formed in the chlorophyll-containing organs, and thence distributed to the other parts of the plant, where they undergo transformation.—J. T. D.

Bidji Pakoe Hadji (Cycas circinalis, L.). J. van Dongen. Pharm. Weekblad., **40**, 309—313; Chem. Centr., 1903, **1**, [24], 1313.

The fruits of *Cycas circinalis, L.*, which are poisonous, are known in the Dutch Indies under the names "Bidji Pakoe Hadji," "Pakis Hadji," and "Boewah von Pakoe." The author has examined specimens of the undried fruits, and of a coarse powder obtained by pulverising the seeds, after drying them at about 30° C. Both the fruit juice and the powder were found to be poisonous. On extracting the dried powder with light petroleum spirit, phytosterol was obtained, together with a small quantity (0·154 per cent.) of a fat, which melted at 21°—22° C., had an iodine value, 51·5, and yielded fatty acids melting at about 44° C. From the powder, after separation of the phytosterol and fat, a sugar was isolated, in the form of small rectangular plates, which had the optical rotation $[a]_D = + 17°$, reduced Fehling's solution, and yielded a crystalline osazone melting at 184°—188° C. By extracting the powder with water, a poisonous glucoside, *pakocin*, containing no nitrogen, was isolated. It forms an amorphous, light yellow powder, soluble in water and dilute alcohol, but insoluble in absolute alcohol and ether; with tannin it gives a precipitate which re-dissolves in excess of tannin solution.

The seeds contain a large amount of water and lose 83 per cent. of their weight by drying at 105° C. The dry powder contains 1·428 per cent. of cellulose, and 4·5 per cent. of nitrogen; it gives 2·509 per cent. of ash, containing sulphates, chlorides and phosphates, and iron, aluminium, magnesium, potassium, and sodium.—A. S.

Euphorbone. W. M. Ottow. Archiv der Pharm. **241**, [3], 223.

Euphorbone has been shown by Henke and Dragendorff and others to be a distinctive and characteristic constituent of the milky juice of many euphorbiaceous plants. According to the author it has the formula $C_{27}H_{44}O$. To obtain it, euphorbium resin was extracted by percolation with light petroleum spirit (b. pt. 60°—70° C.). The first percolat were filtered, half the solvent distilled off, and the residu set aside to crystallise. A crop of yellow acicular crystal of crude euphorbone was thus obtained, which, when treate with various solvents, in which it was readily soluble in th cold, gave fluorescent solutions. With ethyl alcohol an methyl alcohol a trace of a flocculent body remaine insoluble.

The characters of the crystalline substance obtained wit various solvents showed marked differences. Thu petroleum spirit solution after slow evaporation gives loo white needles, and aggregated masses or rosettes, th crystals of which frit at 67°—68° C., melt at 71° C., but d not give a perfectly clear liquid until the temperatur reaches 75° C. The crystals from methyl alcohol solution form white brittle crusts composed of more or le definite spherical structures. These crystals frit at 110° C melt at 114° to 115° C., and give a clear solution at 116° C Crystals having a similar character to those crystallised fro methyl alcohol are obtained from acetone and from eth alcohol. Ether and acetic ether give two forms of crystal long silky needles on the sides of the flask, and afterward dull white granules on the bottom of the vessel.

The mother liquor, after separating methyl alcoh euphorbone, gives several amorphous bodies of low meltin points, the lowest of which is 60°—61° C.

Euphorbone is profoundly modified by heat; petroleu spirit euphorbone, when exposed to 60°—70° C. f 14 hours, has its melting point markedly raised from 70° 85° C., and finally to 90°—91° C. At higher temperatur and under more prolonged exposure, the melting point w first raised, then lowered. Methyl alcohol euphorbone converted into a resinoid mass slowly at 60°—70° C., an more quickly at 100° C. The melting point is at the sa time much lowered. Euphorbone evidently yields crysta of varying melting point according to whether petrole spirit, methyl alcohol, ether, &c., are used as solvents.

Euphorbone is tasteless, and almost insoluble in wat It is precipitated from alcoholic or aqueous solutions tannin, and gives a colour reaction with ferric chloride. dissolves in strong sulphuric acid with a yellow colo passing to brick-red, changing on heating to blood-red. —J. O. B.

Strychnine: Wenzell's Test for ——. G. Guerin. XXIII., page 824.

English Patents.

Theophylline; Manufacture and Production of — H. E. Newton, London, from Farbenfabr. vorm. Bayer and Co., Elberfeld, Germany. Eng. Pat. 14,93 July 4, 1902.

See U.S. Pat. 716,994 of 1902; this Journal, 1903, 163. —T. F. B.

C-C-Dialkyl Barbituric Acids from Mono-alkyl Malo Esters; Method of Preparing ——. F. Bo London. From E. Fischer, Berlin. Eng. Pat. 19 Jan. 27, 1903.

Mono-alkyl malonic esters are condensed with u by means of metallic alcoholates, forming mono-alk barbituric acids, which are converted by further alkylati into dialkylbarbituric acids of the general formula

$$R_2:C:(CO.NH)_2:CO.$$

—T. F. B.

United States Patents.

Glandular Extractive Product. •J. Takamine, New Yo U.S. Pat. 730,176, June 2, 1903

The product claimed is that obtained from the supraren glands by the process described in Eng. Pat. 14,491 of 19 (see this Journal, 1901, 746). It is a whitish crystalli substance, of melting point 207° C., with difficulty solu in water, but readily in acids and alkalis. It has an alkali reaction, and forms salts with acids. It gives a gre coloration with solutions of ferric salts, and a red colorati with iodine, and has reducing properties. Its compositi is approximately represented by the formula $C_{10}H_{15}NO$. —T. F. B.

prarenal Glands; Process of Obtaining Products from ——. J. Takamine, New York City. U.S. Pat. 730,175, une 2, 1903.

Eng. Pat. 14,491 of 1900; this Journal, 1901, 746.
—T. F. B.

prarenal Glands; Process of Isolating the Active Principle of the ——. J. Takamine, New York City. .S. Pats. 730,196 and 730,197, June 2, 1903.

: Eng. Pat. 14,491 of 1900; this Journal, 1901, 746.
—T. F. B.

prarenal Glands; Process of Preparing Extracts of he ——. J. Takamine, New York. U.S. Pat. 730,198, une 2, 1903.

Eng. Pat. 14,491 of 1900; this Journal, 1901, 746.
—T. F. B.

French Patents.

fumes, Antiseptics, or Disinfectants having for their ase Solidified Alcohol; Manufacture of ——. J. ardin. Fr. Pat. 326,243, Nov. 10, 1902. XVIII. C., age 816.

thine; Process for Preparing ——. C. F. Boehringer und Söhne. Fr. Pat. 326,267, Nov. 11, 1902.

oxanthine is converted by oxidation into xanthine. hur dioxide or sulphuric acid being formed according he oxidising agent used. The process may be carried in acid, neutral, or alkaline solution. In hydrochloric solution, sodium nitrate may be used; hydrogen xide is suitable for use in alkaline solutions; while ing with a suspension of manganese dioxide in water effect the oxidation in neutral solutions.—T. F. B.

ethylxanthines; Preparation of Chlorinated Derivaves of ——. C. F. Boehringer und Söhne. Fr. Pat. 26,268, Nov. 11, 1902.

Eng. Pat. 27,485 of 1902; this Journal, 1903, 378.
—T. F. B.

ethylxanthine Derivatives; Process for Eliminating e 8-Methyl Group from ——. C. F. Boehringer und hne. Fr. Pat. 326,295, Nov. 12, 1902.

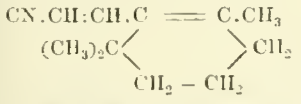
Eng. Pat. 27,532 of 1902; this Journal, 1903, 378.
—T. F. B.

erol": Extraction of an Alcohol termed ——, *and its pplication in the Manufacture of Synthetical Perfumes.* c. Heine et Cie. Fr. Pat. 326,658, Nov. 25, 1902.

ew terpene alcohol "nerol" (see this Journal, 1903,), isomeric with geraniol and possessing an odour of s, is extracted from oil of petit-grain by converting the ary alcohols present in the fractions which contain the l, after saponification, into their acid esters by treatt with phthalic anhydride or the anhydrides of other sic acids, separating from the products a mixture coning the esters of nerol and geraniol, saponifying the ture, rectifying the alcohols by distillation *in vacuo*, or team, and separating the geraniol from the nerol by tment with anhydrous calcium chloride. Nerol and its rs are applicable for perfumery by dissolving them in suitable solvents with or without the addition of other rous substances.—J. F. B.

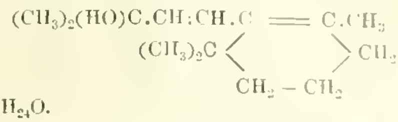
ylidene-acetic Acid; Compounds Derived from ——, *itable for Perfumes.* A. Verley. Fr. Pat. 326,774, ov. 27, 1902.

en citrylidene-acetic acid, its esters, or nitrile, is ted with ten times its weight of phosphoric acid, aining 8 per cent. of sulphuric acid, at 60° C., and the uct diluted, and extracted with ether, cyclic compounds formed. For instance, from the nitrile, the compound $_{17}$N, or



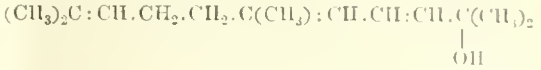
tained. All these substances have fragrant odours.

When cyclo-citrylidene acetic ester reacts with two molecules of magnesium iodomethylate, and the resulting magnesium compound is decomposed by water, a tertiary alcohol is obtained, of the constitution



or $C_{14}H_{24}O$.

The "β derivative" of this alcohol also results from the action of magnesium iodomethylate on β-ionone. These alcohols can also be obtained direct from citrylidene acetic esters, by means of magnesium iodomethylate, the intermediate compound



$$(CH_3)_2C:CH.CH_2.CH_2.C(CH_3):CH.CH:CH.\underset{\displaystyle OH}{\underset{|}{C}}(CH_3)_2$$

being converted into the cyclic isomers by boiling with dilute acids. This is probably the α-compound, which results from the action of magnesium iodmethylate on α-ionone.—T. F. B.

Protocatechuic Aldehyde and Vanillin; Preparation of ——. A. Verley. Fr. Pat. 326,775, Nov. 27, 1902.

Methoxy-iso-eugenol is converted, on oxidation with ozone, in the cold, into methoxyvanillin,

$$C_6H_3(CHO)(O.CH_2.O.CH_3)(OH)[1.2.4]$$

When the bisulphite compound of this is saponified with dilute acids, protocatechuic aldehyde is formed.

The homologues of methoxyvanillin are obtained by oxidising the higher homologues of hydroxyisoeugenol.

Acid or alcoholic derivatives of methoxyisoeugenol may also be oxidised by permanganate, or electrolytically. For instance, the sulphuric acid derivative gives protocatechuic aldehyde. The benzyl derivative gives benzyl methoxyvanillin, which, on boiling with dilute acids, is converted into benzyl protocatechuic aldehyde. This, on methylation, gives benzylvanillin, which can be converted into vanillin.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photography; Novel Application of Hydrogen Peroxide in ——. L. A. Ebert. Phot. Corr., 1903, **40**, 269; Chem.-Zeit., **27**, (44), Rep. 152.

By suffusing a negative with an ethereal solution of hydrogen peroxide, a milky deposit is obtained in relief, of good covering power and therefore suitable for intensification. Being soluble in water it can be partly or entirely washed off, and is consequently adapted for partial intensification or reduction. Bromide prints, suffused with a similar solution, and then exposed to the air for 24—30 hours, yield a brownish tone, approaching more and more to yellowish brown in proportion as the treatment is prolonged; but as the colour is not fast to light, the prints toned in this manner should then be treated with an energetic developer. This gives sepia to brick-red tones that are apparently permanent; and at the same time the image is slightly intensified. Metol-hydroquinone or rodinal seems the best developer to use. The prints can be reduced with dilute ferric chloride solution, which alters the tone, as does also treatment with ferrous sulphate.—C. S.

English Patent.

Photographic Prints [on Metals]; Production of —— C. Archer. New Southgate. Eng. Pat. 7853, April 14, 1903.

Aluminium, or other metal plates, are coated with a solution of gelatin, dried, and again coated with spirit varnish, collodion, &c. They are then ready to receive the sensitive emulsion.—T. F. B.

United States Patent.

Coloured Photographs; Process of Producing ——. A. A. Gurtner, Bern. U.S. Pat. 730,454, June 9, 1903.

A plate which has been stained yellow (with Aniline Orange) is exposed with its sensitised surface in contact with the sensitive face of an orthochromatic film or plate, and the two negatives are developed separately.

A print from the first negative on a "celloidin" film, and stained yellow to orange, is superposed on a blue print from the orthochromatic negative.—T. F. B.

French Patents.

Printing and Toning Compound; Combined ——. P. E. Schoenfelder, Newark, N.J., Assignor to M. Bauer, Montclair, N.J. U.S. Pat. 730,800, June 9, 1903.

See Eng. Pat. 28,284 of 1902; this Journal, 1903, 572. —T. F. B.

Emulsions; Photographic ——. Soc. Anon. Prod. F. Bayer et Cie. Fr. Pat. 326,468, Nov. 19, 1902.

Acetyl derivatives of cellulose, which are soluble in alcohol (see Fr. Pat. 317,007 of 1901; this Journal, 1902, 870), are claimed as emulsifying agents. 60 c.c. of alcohol are added to a solution of 1·5 grms. of nickel chloride and 3 grms. of magnesium chloride in 40 c.c. of water. This is added to 1 litre of a 2 per cent. alcoholic solution of acetyl cellulose, and the mixture is well shaken; the following solutions are then added successively, with constant shaking:—20 grms. of silver nitrate in 40 c.c. of water with 60 c.c. of alcohol; 10 grms. of citric acid in 40 c.c. of water and 60 c.c. of alcohol. When the whole has become homogeneous, it is applied to glass or paper in the usual manner. —T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitroglycerin Powders; Spontaneous Decomposition of ——. S Thomas. Fifth Internat. Congr. of Applied Chem., Berlin. Chem.-Zeit., 1903, **27**, [48], 589.

A case is recorded in which the accidental imbedding of the head of an iron nail in the mass caused the spontaneous decomposition of a nitroglycerin powder.—J. F. B.

Explosive "Prometheus." Mem. des Poudres et Salpêtres, 1901—1902, **11**, 39—46.

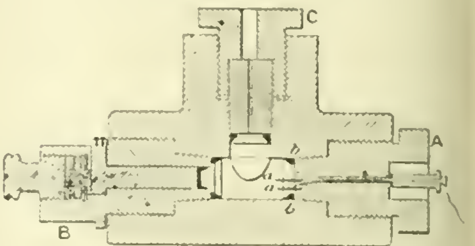
The explosive is composed of potassium chlorate, 67·6 parts; manganese dioxide, 16·9 parts; nitrobenzene, 10 parts; and heavy petroleum oil, 5·5 parts. The solid constituents are incorporated together, the liquids being added only at moment of use. Absorption was found to be very variable, and the explosive cannot therefore be considered of constant composition. Taking black powder as unity, the relative strength was found to be 1·73. The expansion effect was only one-half of that obtained with dynamite No. 1, while in a bore hole it was found to be incompletely detonated. The same defect was also brought out by detonating experiments in the open and by submitting the explosive to shock.—G. W. McD.

Safety Explosives: Experiments with ——. Beyling. Glückauf, 1903, **39**, 434; Chem.-Zeit., 1903, **27**, [45], Rep., 149.

The trials were made in the experimental gallery of the Westphalian Joint Stock Mining Co. to determine which explosives can be safely used in mixtures containing firedamp and coaldust; or rather to ascertain what weight of charge can be employed in each case without danger. The greatest risk in shot-firing arising from blown-out shots, the conditions leading to the production of such shots were imitated by using an iron mortar with a bore 22·6 ins. deep and 2·67 ins. in diameter, from which the charges were fired into an explosive mixture containing firedamp and coaldust. The charges were left unstemmed, and in each case a medium charge was employed at first, the weight being subsequently varied by 50 grms. at a time. The safety limits in the 17 explosives tested were as follows:—Wittenberg Wetterdynamit, Kohlenkarbonit and Karbonit I., up to 1,000 grms. (this was the maximum charge employed Karbonit II. up to 850 grms.; Phœnix I., 700 grm Ammoniumcarbonit, 550 grms.; safety gelatin dynamite I 500 grms.; Roburite I.A, 500 grms.; Dahmenite A, 400 grm Ammonium carbonite I., 350 grms.: gelatin dynamite, 2 grms.; Roburite I.c, 250 grms.; whilst Westfalite and K Rottweiler safety blasting powder both ignited the mixt in charges of less than 50 grms. Disruptive-power te made by the Trauzl leaden mortar method, showed that most cases these explosives are only ½—¾ as powerful ordinary gelatin dynamite.—C. S.

Erosion [in Guns]; Phenomena of ——. Vieille. M des Poudres et Salpêtres, 1901–2, **11**, 157—210.

Erosion is generally most marked at the commencem of the rifling. The portion of the chamber immediat preceding presents the appearance of a very fine netw of cracks, passing into a series of grooves (erosion prop



running parallel to the rifling. The origin of the cracks probably due to the action, on the steel, of the carb monoxide and carbon dioxide in the gases produced fr the explosion; whilst the grooving or true erosion, paral to the rifling, is considered to be due to gas leaks, at v high pressure and velocity, past the projectile, when it is minimum velocity, and is being subjected to greatest pr sure. The theory of gas vortices is decided against, s erosion does not occur either in a closed vessel or in part of the chamber nearest to the breech.

Explosion Vessel.—This consists of a steel vessel (figure) provided with three openings, fitted with steel plu A carries an electric igniter consisting of a fine iron wire, passing through a small primer of sporting powder. B connected with a pressure gauge to register the press developed in kilos. per sq. cm., while C is provided wit steel plug 22 mm. in diameter, and 40 mm. long, axia pierced with a canal 1 mm. in diameter, through wh the gases escape at the moment of explosion. The capac of the vessel found to be most serviceable was 17·8 c the charges of the explosives varying from 3·5 grms. 10 grms. Other vessels, of capacities of 75 c.c. and 340 c were also used, but were found to present disadvanta as compared with that of smaller capacity.

Measurement of Erosion.—The gas exit plug, of a wei of some 135 grms., is weighed before and after the exp sion, and the decrease in weight noted. This latter fig is converted into its equivalent volume in cubic millimet on the basis of a specific gravity of 7·8, and this figure taken as the basis of the amount of erosion.

Influence of the Diameter of the Gas Exit Canal

Powder.	Diameter of Canal.					
	4 mm.		2 mm.		1 mm.	
	Erosion.	Pressure.	Erosion.	Pressure.	Erosion.	Pr s
	Cb.mm.	Kilos.	Cb.mm.	Kilos.	Cb.mm.	K
Pure nitrocellulose .. .	0·2	1,214	6·9	2,039	25·5	2
Nitroglycerin, 50 per cent.; nitrocellulose 50 per cent. .	12·7	1,084	58·6	2,186	90·2	[illegible]

th the same weights of explosive, erosion rapidly reases as the diameter of the exit canal decreases; or active surface of a gas jet is inversely proportional to diameter.

Influence of Length of Gas Exit Canal.

owder.	Length of Canal. Diam. = 1 mm.					
	10 mm.		20 mm.		40 mm.	
	Erosion.	Pressure.	Erosion.	Pressure.	Erosion.	Pressure.
	Cb. mm	Kilos.	Cb. mm.	Kilos.	Cb. mm	Kilos.
nitro- ulose	11·4	2,343	13·8	2,282	24·7	2,224
glycerin, per cent; rocellulose, per cent. ..	39·9	2,380	57·3	2,185	90·2	2,542
te and oguanidine	11·92	2,504	..	..	30·0	2,375
te	26·6	2,607	..	..	64·2	2,500

ion increases with increasing length of canal. In each of experiments the explosives fall into the same order gards erosive power.

fluence of Volume of Gas passing through Gas Exit l at same Maximum Pressure.—This was determined plosion vessels of varying capacity, so adjusting the er charge as to give equal maximum pressures under tions of greatly varying gas volumes.

owder.	Capacity of Chamber.					
	343·7 c.c.		73·8 c.c.		17·8 c.c.	
	Erosion.	Erosion per grm. of Powder.	Erosion.	Erosion per grm. of Powder.	Erosion.	Erosion per grm. of Powder.
nitro- lose	386	5·5	107	7·3	22·6	6·4
....	738	10·2	..	..	64·2	18·0
lycerin, er cent.; cellulose, r cent. ...	1,014	14·7	322·2	21·5	83·3	24·9

ıal pressures, the smaller the charge the greater is rosion per grm. of explosive, and the smaller vessel us selected as best calculated to bring out differences ous explosives.

uence of Repetition of Gas Exits in same Plug.—on decreases with each successive use of the plug in ner which can be approximately calculated for any ılar experiment from the formula $E = \frac{e}{\sqrt{N}}$, where etermined erosion on first using the plug, and N = r of the experiment. Pressure, also, except in the f black powder, decreases with each successive use llowing figures give some of the results obtained :—

Powder.	Gas Exit Plug.	Erosion.		Pressure.
		Observed.	Calculated.	
trocellulose ..	1st use	193	193	2,224
	10th „	49	61	1,855
cerin, 50 per nitrocellu- per cent. ...	1st „	704	704	2,542
	5th „	338	315	1,628
owder........	1st „	312	312	1,839
	4th „	132	156	1,881

These experiments have a very direct bearing on erosion in guns after long use.

Influence of Pressure.—On firing *constant* charges in vessels of different capacity with the consequent result of production of different pressures, erosion was found to be inappreciable up to 100 kilos., to increase rapidly at 900 kilos. to 2,000 kilos., and to remain almost stationary at 2,000 kilos. to 4,000 kilos.

—	Pure Nitrocellulose.				Nitroglycerin, 50 per cent.; Nitrocellulose, 50 per cent			Cordite.	
Erosion...	0·3	5·9	25·5	30·6	40·6	84·5	85·7	64·2	64·5
Pressure..	100	906	2,253	4,128	879	2,509	3,867	2,500	3,710

Erosion of various Metals.—The following figures give some relative erosions in cubic millimetres: Platinum 59·1, copper 98·8, silver 230·8, zinc 101·8, aluminium 230·7, iron 68·2, cannon steel 84·5, bronze 279, brass 326.

Influence of the Nature of the Explosive on the extent of the Erosion.

Powder.	Pressure.	Erosion per Grm.	Strength.	Temp.
				°C.
Pure nitrocellulose	2,276	6·4	9,600	2,676
Nitroglycerin, 50 per cent.; nitrocellulose, 50 per cent. .	2,440	24·3	10,000	8,384
Cordite	2,500	18·1	10,000	..
Nitroglycerin, 34 per cent.; nitrocellulose, 63 per cent.; hydrocarbon, 3 per cent....	2,449	13·8	10,000	..
Black powder (75 per cent. potassium nitrate).........	2,167	2·2	3,000	2,910
Black powder (78 per cent. potassium nitrate).........	1,958	4·5	3,000	3,530
Blasting gelatin	2,458	31·4	10,000	3,545
Dynamite (75 per cent. nitroglycerin)	2,084	18·0	8,000	3,161
Nitromannite	2,361	23·6	10,000	3,429
Nitroguanidine	2,019	2·3	9,000	907

Diminution of Erosive Power.—The addition of nitroguanidine greatly diminishes the erosive power of explosives, as will be seen from the following table :—

Powder.	Pressure.	Erosion per Grm.
A. Pure nitrocellulose	2,277	6·4
A. 70 per cent.; nitroguanidine, 30 per cent.	2,407	5·45
A. 50 per cent.; nitroguanidine, 50 per cent.	2,124	3·44
B Cordite....................................	2,500	18·1
B. 70 per cent.; nitroguanidine, 30 per cent.	2,407	13·0
B. 50 per cent.; nitroguanidine, 50 per cent.	2,375	8·44
C. Nitroglycerin, 50 per cent.; nitrocellulose, 50 per cent.	2,466	24·3
C. 70 per cent.; nitroguanidine, 30 per cent.	2,796	14·2
C. 50 per cent.; nitroguanidine, 50 per cent.	2,435	7·8

—G. W. McD.

Explosion; Circumstances attending an ——, which occurred in a Press House of the Factory of the Lowwood Gunpowder Company at Lowwood, near Ulverston, Lancashire, on the 12th March 1903. By Major A. Cooper-Key, H.M. Inspector of Explosives.

This explosion occurred during the pressing of common blasting powder, about 15 cwt. of powder being involved. Two men were fatally injured. Major Cooper-Key is of opinion that the explosion must be regarded as an accident pure and simple, and that it may be attributed to the presence in the powder under pressure, of some foreign substance.—A. E. L.

Perchlorates and Chlorates in Refined Saltpetre; Determination of——. Mem. des Poudres et Salpêtres, 1901-2, 11, 63-67. XXIII., page 824.

English Patents.

Blasting Powder, Gunpowder and the like; Apparatus for Glazing ——. A. I. du Pont, Delaware, U.S.A. Eng. Pat. 7695, April 2, 1903.

The apparatus consists of a metallic drum, through which air can be passed, revolving in a steam-jacketed casing, connected by rotary joints with the steam supply.
—G. W. McD.

Blasting Powder, Gunpowder and the like; Method for Glazing ——. A. I. du Pont, Delaware, U.S.A. Eng. Pat. 7712, April 2, 1903.

Claim is made for the method of using the apparatus described in preceding abstract. After the moist powder is charged into the drum, steam is admitted to the jacket during rumbling, for the purpose of bringing the moisture promptly to the surface, the moisture being confined within the barrel until the grains are brought to the glazing point. Steam is then shut off, and the temperature allowed to fall. Sufficient aqueous vapour is thus condensed to collect the dust and cause it to adhere to the inner surface of the drum, leaving the powder grains free from dust. Glazing is then proceeded with by rotation of the drum, cold air being passed through to expel the moisture, the powder being left dry. By this method glazing is said to be accomplished in one-third of the time ordinarily employed, and the finest varieties of powders can be successfully treated.—G. W. McD.

Matches (Non-Poisonous); Manufacture of ——. J. Hueh, Silesia, Germany. Eng. Pat. 4009, Feb. 20, 1903.

Chloride of sulphur, either alone or with addition of sulphur, is allowed to react with amorphous phosphorus, the escaping chlorine being utilised again by passing it through molten sulphur. The resulting compound of sulphur and phosphorus, after being freed from chlorides, is a grey-brown non poisonous powder, which is used in the igniting composition for matches.—G. W. McD.

United States Patent.

Safety Explosives; Process of Manufacturing ——. A. McCracken, Dunedin, N.Z. U.S. Pat. 730,218, June 9, 1903.

Picric acid is dissolved in glycerin and then neutralised with ammonium carbonate. Infusorial earth and a solution of potassium nitrate are then added. The mixture is boiled with addition of a small quantity of sulphur, and, after drying, forms the finished explosive.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

United States Patent.

Saccharimeter. A. B. Lyons, Assignor to Nelson, Baker & Co, both of Detroit, Mich. U.S. Pat. 730,674, June 9, 1903.

A saccharimeter is claimed comprising a pair of adjacent vertical tubes on a common base, one of the tubes forming a receptacle for the solution to be tested, and the other a displacement receptacle for the gas, the latter tube being provided with two series of markings, one graduated to compensate for the gas absorbed by the solution, and the other being uniform in graduation for testing solutions saturated with gas.—J. F. B.

French Patent.

Photometers. L. B. Marks. Fr. Pat. 326,368, July 11, 1902.

See Eng. Pat. 14,688, 1902; this Journal, 1903, 761.
—T. F. B.

INORGANIC—QUALITATIVE.

Portland Cement; Detection of Adulterations in ——. W. Fresenius. Zeits. angew. Chem., 1903, **16**, [23], 539—540. Fifth Internat. Congress of Applied Chemistry, Berlin.

Portland cement is defined as a product obtained by firing to sintering a mixture of limestone and clay; the product is very finely ground after the firing, and has property of setting hard with water. It may contain 2 cent. of gypsum. Its composition should be:—Lime 59— silica 20—26, alumina and ferric oxide 7—14, magn 1—3, alkalis up to 3, sulphur trioxide up to 2 per c As many substances can be added which affect the perties of the cement without altering its percent composition, R. and W. Fresenius suggested the follow limiting values:—Minimum sp. gr., raw 3·00, ignited 3· maximum loss on ignition 3·4; alkalinity of aque solution of 0·5 grm., 7·2 c.c. of N 10 acid; permangat reduced by 1 grm., not more than 2·8 mgrms.; magne content, not more than 3 per cent. Now that blast-furn slag is used in the manufacture of cement, these limits longer hold, for a cement may be made from slag wh shall be quite normal in these respects. The permanga measures the sulphide-sulphur present, but if there much sulphur, some may escape as hydrogen sulp during the titration. This may be avoided by additio excess of permanganate and back titration, but the l must in that case be altered, for a normal cement so trea may require 6 mgrms. of permanganate. Instead permanganate, the author now recommends additio excess of arsenious acid in hydrochloric solution, w precipitates the sulphur as arsenic trisulphide, and titration; or two titrations with permanganate, one di the other after removing the sulphur as cadmium sulp Normal cement should not contain more than 0·15 cent. of sulphide-sulphur, while one made with admix of ground slag may contain 0·8 per cent. This li however, cannot be rigidly upheld in all cases. A fur criterion may be found in the centrifugal separation, examination by permanganate or arsenious acid, of constituents of the slag of different specific gravities.
—J. T.

Vinegar; Detection of Free Mineral Acids in —. D. Ganassini. Boll. Chim. Farm., **42**, 241— Chem. Centr., 1903, **1**, [23], 1278.

About 1 c.c. of the vinegar is treated with an e volume of a 20 per cent. solution of potassium thiocya and a drop of ammonium sulphide solution, and th drop of a 5 per cent. solution of ammonium molybdat allowed to fall into the liquid. In the presence of 4—5 parts per 1,000 of free mineral acid in the vin an intense violet coloration is immediately prod otherwise only a light brown colour appears. If, usually the case, a considerable amount of tartaric aci present, a crystalline precipitate of tartrate is produce adding the ammonium sulphide, and the liquid is colo light red by ammonium molybdate. In such a case, sulphide should be added instead of ammonium sulp after previously converting the tartaric acid into so tartrate by the addition of sodium acetate. The chara istic violet coloration in presence of mineral acids can be obtained as before.

Another test consists in saturating a small quantit the vinegar with antipyrine, filtering from the preci produced, and adding to the filtrate a drop of potas thiocyanate solution (Griggi's reaction). With pure vi the liquid is coloured yellow, or a slight turbidity is duced; but if mineral acids be present (even 4—5 per 1,000), a copious ruby-coloured precipitate is for (See also this Journal, 1902, 1246.)—A. S.

INORGANIC—QUANTITATIVE.

Pyrites; Determination of Sulphur in ——. M L Lemaire. Zeits. angew. Chem., 1903, **16**, [23], 5 512. (Report of a Committee of the Chemical So of Northern France to the Fifth Internat. Congr Applied Chemistry, Berlin.)

The Committee have examined particularly the dry cesses of Clark (sodium peroxide) and of Fresenius (carbonate and nitrate) and the wet process of L They recommend Lunge's method (oxidation with *regia*, repeated evaporation with hydrochloric removal of silica, precipitation of iron with ammon precipitation of the filtrate with barium chloride).

commend that the ferric hydroxide should be more oroughly washed than Lunge prescribes, however (till the ılk of the filtrate is 500 c.c.). Besides quickness and nplicity, the method has the advantage that sulphates, hich would be unavailable for the sulphuric acid process, iefly remain with the silica, and are thus not included in e determination.—J. T. D.

anganese; Precipitation of ——, from Acid Solutions, by Persulphates. H. Baubigny. Comptes rend., 1903, **136**, [22], 1325—1327.

ıe retarding action of sulphuric acid (this Journal, 1903, 1) does not depend on the absolute amount of acid esent, but on its concentration, so that an increase of lume, keeping the "acidity" (the concentration) the me, does not necessitate an increased amount of per- lphate, and dilution of a given solution with water ssens the amount of persulphate needed for complete ecipitation. If the acidity be not greater than 4 per nt. of H_2SO_4, and the volume be not more than 150— 0 c.c., the error from incomplete precipitation is negli- ble. As the acidity increases, the initial temperature of action rises, and the decomposition of the persulphuric d consequently becomes more rapid. Persulphuric acid much less stable than its salts, which no doubt accounts the increase in the amount of persulphate needed for mplete precipitation as the acidity increases.—J. T. D.

miridium; Qualitative and Quantitative Analysis of ——. Leidié and Quennessen. Comptes rend., 1903, **136**, [23], 1399—1401.

ıe following method depends on the reaction of sodium roxide on the platinum metals, and on the properties of double nitrites. (See this Journal, 1901, 45, and 1902, 9.)

Solution.—The osmiridium is broken up by Deville d Debray's method of fusion with zinc, solution of the ıc, and pulverising the skeleton remaining. Then grms. of the alloy are mixed with 40 grms. of sodium roxide, and gradually thrown into a nickel crucible ntaining 10 grms. of fused caustic soda, the mass being vays kept liquid. After half an hour, the fused mass is oled, powdered, and disseminated through a litre of water. e liquid is set aside in tall, narrow vessels, and, after tling, the clear liquid is decanted, the residue washed with lium hypochlorite solution, and the washings added to the st liquors. The liquid contains the osmium and ruthenium sodium osmate and ruthenate, and most of the iridium iridate.

Separation of Osmium and Ruthenium.—The liquid is osferred to a flask connected to a condensing apparatus ving three bulbs, which are two-thirds filled with 1:2 drochloric acid and plunged in iced water; a current of orine is then passed through, first cold, then (when bbles of oxygen commence to appear) heated to 70° C., no more volatile oxides come over (test with hydrogen phide paper), taking care that the liquid remains alkaline. smium and ruthenium are converted into volatile per- ides, OsO_4 and RuO_4, iridium into iridium chloride, Ir_2Cl_6, naining dissolved in the caustic soda solution). The liquid m the condensers, containing the osmium and ruthenium, now transferred to the flask of a similar apparatus, the st condenser containing 1 : 3 hydrochloric acid, the others per cent. caustic soda solution mixed with 2 per cent. alcohol; it is distilled at 70° C., a current of air being sed through. The ruthenium peroxide is converted o chloride, while the osmium peroxide is unaffected, l distils over. Any traces of ruthenic acid are caught the first receiver, the contents of which are, later, added the liquid in the flask and the distillation then continued. e osmium is in the distillate, the ruthenium in the flask.

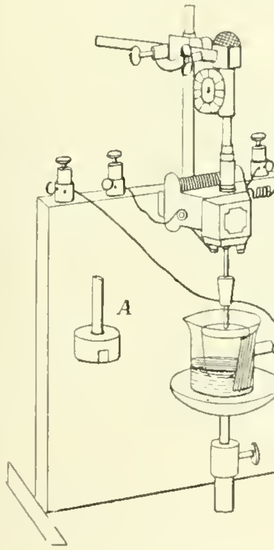
Separation of Iridium.—The residue in the first dis- ation flask is acidified with hydrochloric acid; the idue of the original fusion, insoluble in water, is solved in hydrochloric acid; and the two solutions are xed. The non-platinum metals are separated, and the lium is converted into double nitrite, as in Leidié's ıeral separation (this Journal, 1901, 45). When iridium ne remains in solution, it is converted into sodium chloro-iridate by hydrochloric acid, and the bulk of the sodium chloride present is removed by precipitation, by passing hydrochloric acid gas into the cold solution.

Determination of the Metals.—The osmium is precipitated from the alkaline solution by aluminium; the precipitate washed by decantation, first with water, then with 5 per cent. sulphuric acid, collected on a weighed asbestos filter, dried, ignited, and cooled in hydrogen, and weighed. The ruthenium solution is evaporated to expel excess of acid, taken up with water, the ruthenium precipitated by magnesium, washed and collected as above, ignited in hydrogen, cooled in carbon dioxide, and weighed. The iridium solution is similarly treated; but the aqueous solution is made up to 500 c.c., and 50—100 c.c. of this taken for the determination.

Specimens of osmiridium from various sources, separated from platinum ore, hardly ever contain anything but iridium, osmium, ruthenium, and iron.—J. T. D.

Metals; Use of a Rotating Cathode in the Electrolytic Determination of ——. F. A. Gooch and H. E. Medway. Chem. News, 1903, **87**, [2272], 284—286.

In the electrolytic determination of metals, the authors use a rotating cathode, in order to avoid the interfering action of hydrogen, and to obtain compact, adherent deposits. An ordinary platinum crucible of 20 c.c. capacity serves as cathode. It is fixed to the vertical shaft of a small electric motor, by pressing it over a rubber stopper, bored centrally and fitted tightly on the end of the shaft (see A, figure). A narrow strip of platinum is soldered to the shaft and then bent upward along the side of the stopper, thus placing the shaft in electrical contact with the inside of the crucible when the latter is pressed over the stopper. The shaft is constructed in two pieces, so that the cathode can be easily removed, and is joined by a piece of thick rubber tubing. The crucible is rotated at a speed of 600—800 revolutions per minute. A platinum plate is used as anode.



Determinations were made of copper (from copper sulphate solution acidified with nitric or, preferably, with sulphuric acid), of silver (from silver nitrate dissolved in potassium cyanide solution, acidulated with sulphuric acid, and then rendered strongly alkaline with ammonia), and of nickel (from nickel ammonium sulphate solution after addition of ammonia and a small amount of ammonium sulphate). In these tests the current density used, varied between 0·8 and 4 ampères, the amount of metal deposited between 0·0617 and 0·2550 grm., and the time between 8 and 35 minutes. The greatest error was −0·0005 grm. —A. S.

Metals; Quantitative Determination of ——, *by Electrolysis.* P. Denso. Zeits. f. Elektrochem., 1903, **9**, [23], 463—470.

From mixed sulphate solutions of copper with cadmium or nickel, the copper can be quantitatively separated, provided that the E.M.F. employed does not exceed 2 volts. The time required for the deposition can be reduced to about one half of that ordinarily required, by platinising the anode and by keeping the electrolyte well stirred. Platinum-gauze cathodes were employed by the author, and the necessary agitation of the electrolyte was accomplished by suspending the spiral anode from the hammer of an electric bell, suitably suspended, the gong being of course removed.

After the complete removal of the copper, the remaining metals are deposited selectively from the acid or nearly neutralised solution by suitably increasing the E.M.F. The author also describes how cadmium can be quantitatively deposited from a solution containing much zinc.
—J. S.

Nitrate Nitrogen in the presence of Organic Matter; Schlösing's Method for Determining ——. P. Liechti and E. Ritter. Zeits. anal. Chem., 1903, **42**, [4 and 5], 205—232.

This method, when performed as follows, was found to give accurate results in the determination of nitric nitrogen in manures, &c. The apparatus employed, consists of an evolution flask of about 100 c.c. capacity, closed by an india-rubber stopper, through which pass a delivery tube and the stem of a cylindrical funnel. India-rubber tubing with screw clips is preferred to glass taps, as being absolutely air-tight. The internal diameters of the end of the funnel and the delivery tube should be 2—3 mm. The gases evolved are collected in an upright tube, which is about 65 cm. in height and 15 mm. in diameter. The capillary tube at the top is provided with a length of india-rubber tubing and a screw clip. Mercury is used for filling the collecting tube. The ferrous chloride solution employed for the decomposition of the nitrates, contains as much ferrous chloride as corresponds to 200 grms. of iron and 40 c.c. of hydrochloric acid, dissolved in water up to 1 litre. 5 c.c. of this solution are used in each determination. The nitrate solution (containing about 25 mgrms. of nitrogen in 50 c.c.) is introduced into the evolution flask, boiled to expel all air from the apparatus, and then heated with the ferrous chloride solution. When the evolution of gas has ceased, the collecting tube is transferred to a basin filled with well-boiled water. The carbon dioxide in the gases is absorbed by a little air-free sodium hydroxide solution in a Hempel's pipette, and the remaining gas, consisting of pure nitric oxide, is then introduced into a measuring burette, the volume read off, and corrected for temperature and pressure. Instead of measuring the nitric oxide, the latter may be transferred to a flask (previously freed from air by filling it with steam), oxidised by the admission of oxygen to the flask, and the resulting nitric acid, titrated. Test experiments with solutions or extracts of potassium nitrate, soils, urine, &c., are described, and the results prove the accuracy of the method. Ammonium salts have no influence on the results.—W. P. S.

Perchlorates and Chlorates in Refined Saltpetre; Determination of ——. Mém. des Poudres et Salpêtres, 1901—1902, **11**, 63—67.

The limits permitted by the French artillery service are: chlorides, 0·01 per cent.; chlorates, 0·01 per cent.; perchlorates, 0·1 per cent. The following methods are used to determine that these limits are not exceeded:—

Perchlorates.—10 grms. of saltpetre are fused with 10 grms. of sodium carbonate for 15 minutes. The melt is dissolved in dilute nitric acid and made up to 250 c.c. To 50 c.c. of this solution sufficient standard silver nitrate solution is added to precipitate the chloride produced from the limit quantity of perchlorate, *plus* chlorides, previously determined. After filtration, the addition of silver nitrate and hydrochloric acid to separate quantities of the filtrate, determines whether the limit has been reached or exceeded.

Chlorates.—(1) Standard samples of saltpetre containing 0·0 per cent., 0·01 per cent., and 0·1 per cent. o potassium perchlorate are prepared and heaped up i conical form in a basin. Strong sulphuric acid is carefully added until it reaches to the top of the cone. The dept of the yellow colour produced, after an action of half minute, as observed against the background of the con is dependent on the percentage of chlorate present. Th sample under investigation is compared with the standards. (2) 10 grms. of saltpetre are dissolved i 50—60 c.c. of water. Sufficient silver nitrate is adde to precipitate the chlorides. The filtrate is then heated t 90° C., and a solution of lead nitrate, slightly acidifi with nitric acid, is added. Turbidity indicates presenc of chlorate, the amount being estimated by using standar solutions of saltpetre and chlorate, as in the previous test.
—G. W. McD.

ORGANIC—QUALITATIVE.

Wood-Pulp, Mechanical; Reagents for ——. C. Wurt Papier-Zeit., 1903, **28**, [46], 1608—1609.

The phloroglucinol-hydrochloric acid test for mechanic wood-pulp cannot be used with papers which are colour with Metanil Yellow, because the free mineral acid caus an intense violet coloration of the dyestuff. Dimeth *p*-phenylenediamine and the corresponding trimethyl a tetramethyl derivatives are most unstable compounds they yield unstable dyestuffs very readily under the actic of oxidising agents, and are very delicate tests for t presence of ozone in the air. These dyestuffs are p oxides; they are readily converted back into the origi bases by reducing agents and partially by alkalis. A peroxides, as well as free chlorine, bromine, and iodin produce a red coloration with the "dimethyl" reagen Hence, if paper contain free chlorine, a red reaction wi be obtained, even in the absence of mechanical wood-pul A similar coloration will be obtained if the paper conta manganese dioxide (for grey tones) or ferric hydrox (buff) in a soluble form; organic peroxides also give th coloration, but these are not likely to be found in pape The red coloration in presence of mechanical wood-p with the "dimethyl" reagent appears after one minu and dries to a deep orange, if a drop of water be th applied, the carmine-red reappears. If the paper conta Metanil Yellow a violet-red coloration is developed in ab 10 minutes; if the red spot be moistened with water t original Metanil Yellow colour is restored; with glaci acetic acid violet-red colorations may be produced, b disappear on the addition of water. If the paper conta free chlorine a different red coloration will be produc with the "dimethyl" reagent: on touching with ammon this red colour is discharged, and does not reappear subsequent acidification with glacial acetic acid. The r coloration due to wood, however, after it has been di charged by a drop of ammonia, is restored by glacial acet acid.—J. F. B.

Strychnine; Wenzell's and other Tests for ——. G. Guerin. J. Pharm. Chim., 1903, **17**, [12], 553.

Although Wenzell's reagent, a solution of 1 part potassium permanganate in 200 parts of sulphuric ac affords an extremely delicate test for the identification strychnine, its application is limited, since the results a vitiated by the presence of even a trace of other alkalo and of organic matter. Not only so, but tartar and citric acids and their salts, and thiocyanates (phocyanides), give a bluish-violet reaction with the r which is similar to, but less persistent than, the colour giv by strychnine. These bodies, however, give no su colour reaction with Mandolin and Kundrat's reage a solution of ½ to 1 grm. of ammonium vanadate 100 grms. of sulphuric acid, nor with Sonnenschein's te a solution of cerium oxide in sulphuric acid. Th cyanates give no reaction with the familiar bichroma and sulphuric acid test; citric and tartaric acids and th salts afford a permanent green colour, which cannot confused with the fugitive but intense violet-blue ti afforded by strychnine.—J. O. B.

ORGANIC—QUANTITATIVE.

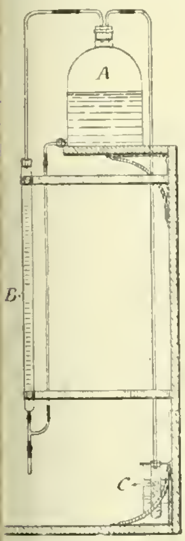
igo; The Best Method of Determining ——. Möhlau. ifth Internat. Congr. of Appl. Chem., Berlin. Zeits. ngew. Chem., 1903, **16**, [23], 547.

e methods at present in use were tested on pure indigo- e. The author concludes that extraction with aceto- huric acid is the most accurate and convenient method.
—E. F.

Dyestuffs, Nitro Compounds, &c.; Volumetric Process or the Determination of ——. E. Knecht. J. Soc. yers and Colourists, 1903, **19**, [6], 169—174.

e process depends on the quantitative reduction of azo npounds, &c. by acid solutions of titanous chloride (see Pat. 324,835 of 1902; this Journal, 1903, 628).

he author finds that a 1 per cent. solution of titanous oride is most convenient; it is prepared from the nmercial 20 per cent. solution, 50 c.c. of which are ed for a few minutes with 50 c.c. of concentrated rochloric acid, and the whole made up to 1 litre with water free from dissolved oxygen. The solution may be conveniently stored in the apparatus shown in the accompanying diagram. The reservoir A is connected on the one hand with a burette B, and on the other with a hydrogen generator C, so as to preserve the solution from oxidation.



The solution is standardised by means of ferric chloride or ferric sulphate; the method adopted by the author being as follows:—35 grms. of ferrous ammonium sulphate are dissolved in dilute sulphuric acid, and the solution is made up to 1 litre. 25 c.c. are now titrated with permanganate solution until the iron is completely oxidised, when the titanous chloride solution is run in until a drop of the solution, added to a drop of potassium thiocyanate (sulphocyanide) solution, gives no further red coloration. The on value" of the titanous chloride solution can then be ulated.

Determination of Azo Compounds.—Dyestuffs soluble in ite acids can be determined by direct titration, and they as their own indicator, being reduced to colourless ino compounds. It is found convenient to dissolve grm. of the dyestuff in 500 c.c. of water, and to acidify c.c. of this solution with 10 c.c. of concentrated hydro- oric acid. This process gave good results with the stuffs known as Crystal Scarlet, Orange II., and Cotton rlet.

yestuffs derived from benzidine, &c., which are pre- tated by mineral acids, are estimated by adding ess of titanous chloride solution (*e.g.*, 50 c.c. for grm.) to the boiling solution of the dyestuff, a gentle am of carbon dioxide being passed through the ution during the process. The mixture is cooled, and excess of titanous chloride determined by titration with dard iron-alum solution. Benzopurpurin 4 B and lliant Yellow gave good results in this way, as did nitro npounds, including nitrobenzene, picric acid, *p*-nitrani e, &c.

itrosodimethylaniline can be determined by the direct thod.

he author considers it probable that all other dyestuffs, ch can be reduced to colourless leuco compounds, may be determined by this method. Under certain conditions, indigotin disulphonic acid gave quantitative results by the direct method.—T. F. B.

Weighting of Silk; New Method for the Quantitative Determination of the ——. H. Zell. Zeits. f. Farben- u. Textil-Chem., 1903, [12], 239—241. (See A. Müller, this Journal, 1903, 622.)

1 to 2 grms. of the silk are treated with hot water and then with a 1·5 per cent. solution of hydrofluoric acid at 50°—60° C. in a copper vessel. It is then treated with 5 per cent. hydrochloric acid, rinsed, and boiled with a 2·5—3 per cent. soap solution to remove the sericin. It is then treated with hot solution of sodium carbonate of 1° B. and dried. It now represents pure fibroïn, containing only a small amount of irremovable ash, and is weighed as such. By rinsing, drying, and weighing before the soap-bath, the amount of sericin can also be determined, it being equal to the loss on further treatment. The method is inapplicable in its present form to most black and paste colours.
—E. F.

Wool-Fat Oleins; Examination of ——. J. Marcusson. Mitt. techn. Versuchsanst. zu Berlin, 1903, **21**, [1], 18—51.

Two samples examined had specific gravities of 0·9012 and 0·9275 at 15°/4° C. respectively, and gave the Hager-Salkowski and Liebermann reactions. The free acid, determined in the usual way by titration of an ether-alcoholic solution, amounted in one case to 50 per cent., and in the other to 40 per cent., expressed as oleic acid.

In determining the total acids, 3 grms. of the samples were heated for three hours in a sealed tube at 105° C. with 25 c.c. of 2 N-potassium hydroxide solution. The resulting soap solution was treated with calcium chloride, and the precipitated calcium salts extracted with acetone by Herbig's method (this Journal, 1896, 138). The insoluble residue was examined for rosin by Morawski's test, and in the one sample in which it was detected its amount (18 per cent.) was determined by Holde and the author's method (this Journal, 1902, 930). The fatty acids recovered after separation of the rosin amounted to 41 per cent., and had an iodine value of 46 and the molecular weight of 298. The fatty acids from the other sample (51 per cent.) had an iodine value of 42·5 and molecular weight of 299; whilst from a sample of known purity 41·5 per cent. of fatty acids were obtained, with iodine value 35·2, and molecular equivalent 276. The values 298 and 299 agree well with the molecular weight of 300·5 found by Lewkowitsch.

The unsaponifiable constituents left on evaporation of the acetone extracts were oily residues, free from ash, and giving Liebermann's reaction.—C. A. M.

Dégras; Determining the Specific Gravity of ——. A. Gawalowski. Wiener Allgem. Gerber-Zeit., 1903, [2]; Chem.-Zeit., 1903, **27**, [45], Rep. 145.

The author regards the Simand method as defective, since all the neutral fats, hydroxyfatty acids, and any non-drying fatty acids from the alkali- or lime-saponification, are grouped together as "dégras fat"; and because the use of petroleum spirit leaves a portion of the hydroxyfatty acids in the residue, so that the most important portion, the dégras-former, is left out of the weighings. He considers the specific gravity does not give any indication of the quality, unless the following determinations are made in addition to the percentage of water and ash: the actual density of the sample; that furnished by the Simand method, with the omission of petroleum spirit; and the density of the unsaponifiable matter. The author describes a method for determining the density with the pyknometer, and a practical method of utilising dégras, based on the increased proportion of the constituents insoluble in petroleum spirit (dégras former) obtained by exposing the leather soaked in dégras to the air for eight days.—C. S.

Sugar Analysis; Source of Error in Optical ——. F. G. Wiechmann. Zeits. Vereins deutsch. Zuckerind., 1903, [568], 498—509.

As is well known, when basic lead acetate solution is added as a clarifier to solutions of raw sugars, a precipitate is formed, and the volume occupied by this precipitate introduces an error into the value of the polarimeter reading. Two methods have been proposed for eliminating this error: (1) That of Scheibler, in which two separate normal weights of the sugar are dissolved in water and made up, in one case, to 100 c.c. and, in the other, to 200 c.c., the same volume of lead acetate solution being added to each solution. The true polarisation is then calculated from the values for the two solutions. This method, which assumes that the volume of the precipitated matter is independent of the dilution of the liquid, is found to give discordant results, especially when raw colonial sugars are treated. (2) Sachs' method, in which the influence of the precipitate is determined by washing it free from sugar, adding it to a 100 c.c. flask containing the half-normal weight of pure sugar, making the solution up to volume, filtering, and taking the polarimetric reading.

The author has made use of both these methods in the examination of various sugars, and he finds that the volumes of precipitate formed with sugars of different origin but giving approximately the same reading in the polarimeter, are widely different. For a number of raw cane sugars the volume of precipitate varied from 0·05 to 0·71 c.c., the specific gravities (determined in benzine) ranging from 1·65 to 4·38. The most voluminous precipitates are not always obtained with the sugars of lowest value.

The addition of a few drops of acetic acid to the sugar solution, after lead acetate, causes a difference in the polarisation value in only a few cases, and this difference was never greater than 0·1 division Ventzke.

The errors introduced into the polarimeter reading by different temperatures of working, are much smaller than the above, and in ordinary cases are always less than 0·1 division Ventzke.

The author suggests: (1) that the magnitude of the error introduced by the lead precipitate be determined under different circumstances and allowed for, or (2) that a reagent be sought which will clarify sugar solutions without causing any precipitate and without, of course, influencing the polarising power of the sugar.—T. H. P.

Malt; Determining the Starch-Liquefying Power of ——. C. J. Lintner and P. Sollied. Zeits. ges. Brauw., 1903. **26**, [21], 329—330.

Since the liquefactive power of malt does not always harmonise with the diastatic power, the result being delayed saccharification, the authors believe that the determination of the former quality will afford valuable information on the enzymatic properties of the substance, and they therefore recommend the following development of the method formerly proposed by Lintner (1886).

To prepare the malt extract, 25 grms. of malt are crushed, and digested with 500 c.c. of water, at the ordinary temperature, for six hours, with occasional shaking, the extract being then filtered clear. Ten grms. of good potato starch are placed in a 100 c.c. flask, which is filled up to the mark with water, the mixture well shaken up, and divided into 10 portions. Each portion of the mixture is treated with a different amount of the malt extract (0·1—1·0 c.c.), having previously been gelatinised by heating to 100° C., and allowed to cool to 65 C., and the liquids are then maintained at 65° C. for 15 minutes, whereupon they are again heated to 100° C. for 10 minutes to arrest enzymatic action. Satisfactory liquefaction of the starch is indicated by a gradual clarification of the liquid and the formation of a ring of froth, whilst in the contrary event the turbidity produced by the air bubbles is persistent.

The liquefying capacity is placed at 100, if 0·1 c.c. of an extract of 25 grms. of malt with 500 c.c. of water, under the conditions stated, liquefies 10 c.c. of a 10 per cent. starch-paste. With 0·2 c.c., the liquefying capacity is then $\frac{100}{2} = 50$, and so on. Normal kilned malts usually give the liquefactive value 40—75 on this scale; b that a considerable divergence from this normal valu can be exhibited in malts of normal saccharifying power i evidenced by the case of a kilned Bavarian malt whic gave the values 22 for the liquefactive power and 25 for th saccharifying power.—C. S.

Formaldehyde; Determination of ——, *in Air*. G. Romy and J. A. Voorthuis. Bull. Soc. Chim., 1903, **29**, [1 540—543.

Nessler's reagent rapidly absorbs formaldehyde and reduced in the cold according to the equation—

$$HgI_2,2KI + CH_2O + 3KOH =$$
$$Hg + CHO,OK + 2H_2O + 4KI.$$

On adding a solution of iodine, the precipitate is redissolve with consumption of iodine, and the titration of the residu iodine by thiosulphate solution, after acidifying with hydro chloric acid, gives the amount of formaldehyde absorbe Since a quantity of Nessler's reagent made with 271 mgrm of mercuric chloride is capable of absorbing 30·16 mgrm of formaldehyde, it follows that very small volumes of t reagent (5 c.c.) and apparatus of small capacity can be use for the determination of formaldehyde in air. Kyll's tub are convenient for the purpose, and only minute traces formaldehyde escape absorption in the first tube. Twenty two litres of air are sufficient for the determination, an quantities of formaldehyde as small as 0·02 mgrm. produc a distinctly visible reduction.—M. J. S.

Wood; Determination of Cellulose in ——, *and Valuatio of Sulphite Wood-Pulp*. Klason. Fifth Internat. Congr. Appl. Chem., Berlin. Chem.-Zeit., 1903, **27**, [48], 58

Under the name of cellulose the author denotes th carbohydrates which are not dissolved by heating f 24 hours at the boiling point of toluene, 108° C., wi solutions of calcium or magnesium bisulphite of a certa composition. The composition of such solutions shoul correspond with the formulæ $N/2\ CaO(SO_2)_2 + N/6\ SO$ or $N/2\ MgO(SO_2)_2 + N/6\ SO_2$. By such treatment oth carbohydrates in combination with the cellulose prop e.g., hydrocellulose, oxycellulose, and pentosans are d solved. Pure cellulose should give perfectly clear solutio in concentrated sulphuric acid which should only dark very gradually. In many celluloses, such as those fro birch and beech woods, the author has found an exces 0·2—0·3 per cent. of carbon over that corresponding w the formula $C_6H_{10}O_5$. He does not regard cellulose a chemical individual, but as a collective compound in which both hexose and pentose groups enter. Cellulose best dried for analysis in the desiccator over phosphor pentoxide at 60° C. For the determination of cellulose lignified fibres, Müller's method by alternate treatments wi bromine water and ammonia is preferable to Schultz method. In order to obtain perfectly pure cellulos however, the treatment must last for eight days, and t cellulose itself is attacked by the bromine; the auth estimates a correction of 3 per cent. to allow for this. rapid colorimetric method for the determination of cellulo is proposed. The procedure is as follows: 22 mgrms. of t sample, equivalent to 20 mgrms. of dry fibre, are dissolv with agitation in 20 c.c. of concentrated sulphuric acid. colour standard is prepared by making a solution in similar manner of a fibre, the cellulose content of which b been determined directly. The solution of the sample then adjusted by the addition of alcohol until it is identic in colour with the standard; the percentage of cellulose c then be calculated, and the results are said to be accurate 0·1 per cent.—J. F. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTE

Hydrogen Peroxide; Catalytic Decomposition of — J. H. Kastle and A. S. Loevenhart. Amer. Chem. 1903, **29**, [6], 563—588.

The authors conclude that, in many cases at least, t inhibition of the catalytic decomposition of hydrog peroxide by various metals is due to the formation of th ible, protective films over the surface of the metal, the ation of which is brought about by the action of the tor on the metal. The fact that many inhibitors en to be poisonous does not indicate any analogy en the finely-divided metals and the soluble ferments; rm "platinum poisons" is unwarranted. During the nposition of hydrogen peroxide by various catalysers, is no evidence of the formation of atomic oxygen. been found, however, that various catalysers act as en carriers in presence of hydrogen peroxide, and all ances which break down hydrogen peroxide, with the tion of catalase, also act as oxygen carriers and *ersâ*, and for any given catalyser the oxidation is pro- onal to the rate of catalytic decomposition. The rties of inducing oxidation by hydrogen peroxide and ecting its catalytic decomposition are correlated, and depend on the fact that the catalytic agent is capable acting or combining with the hydrogen peroxide to complex unstable holoxide derivatives as intermediate ucts. In presence of suitable reducing agents these ide derivatives may act as oxidising agents, or in the ce of reducing agents they may break up into molecu- xygen, water, and the original catalyser, or an oxidation uct thereof; very often both processes occur simul- usly.

talase has a tendency to combine with hydrogen xide to form a very unstable holoxide derivative, immediately decomposes with evolution of molecular en. Catalase may indeed be regarded as a reducing ance which under certain conditions can combine with spheric oxygen to form an oxydase.—J. F. B.

Colloidal" Silver. Hanriot. Comptes rend., 1903, **136**, [24], 1448—1449.

ARGOL (this Journal, 1903, 437), which the author ght analogous to Carey Lea's colloidal silver, is really ical with Paal's "colloidal silver prepared by means of r lysalbinate." The author has prepared colloidal silver arey Lea's method, but could not obtain a substance with than 89·3 per cent. of silver; it also contained iron, uric acid, and organic matter. This substance is quite rent from, and much more unstable than, collargol. both collargol and Carey Lea's substance evolve ogen when heated *in vacuo*, they are possibly complex ogenated derivatives of silver.—J. T. D.

curic Iodide; Form assumed by ——, on Deposition m Solution. D. Gerner. Comptes rend., 1903, **136**, 2], 1322—1324.

CURIC iodide, when deposited from its solutions in any large number of organic and inorganic solvents, her by evaporation of the solvent or by cooling the ated solution, always assumes the yellow form, though ed is the stable form at these low temperatures. The ions were all made at low temperatures, so as to avoid ossibility of conversion of the red into the yellow form igh change of temperature. (Compare this Journal, 180.)—J. T. D.

C *tallisation of Sparingly-soluble Substances.* A. de bulten. Comptes rend., 1903, **136**, [24], 1444— 46.

T method consists in forming the compound by double mposition in a hot and extremely dilute solution of the ting substances. For example, 10 grms. of crystallised im chloride are dissolved in 3 litres of water, to which c.c. of strong hydrochloric acid have been added; this d is heated on the water-bath, and 2 litres of water, aining 4 grms. of sulphuric acid, are dropped in at the of one or two drops per minute. There is no immediate ipitation, but after a day, minute crystals of barium nate begin to form on the bottom of the beaker, and ase for about a month, by which time 8—9 grms. can collected. The crystals are small (0·5 mm.), but ectly shaped, and slightly denser (4·499) than natural y-spar. Celestine and anglesite are formed in pre- y the same way. The author has also formed artificial tals of monetite, haidingerite, newberyite, scheelite, several others, as well as arsenate and phosphate of uth.—J. T. D.

Sulphuric Acid; Esterification of ——. A. Villiers. Comptes rend., 1903, **136**, [24], 1452—1453.

In 1878—1880 the author measured the extent to which esterification occurred in mixtures of alcohol, water, and sulphuric acid, and found that this reached a maximum and then retrogressed, the retrogression being more rapid the higher the temperature, but reaching the same limit at 44° and at 100° C. No retrogression could be measured at the ordinary temperature; but on now opening and testing the sealed flasks then prepared, the author finds that retrogression to the same limit has occurred, as the following table shows:—

Percentages of Initial Acid neutralised.

Mixture.	Maximum.	After 25 Years at Ordinary Temp.	After 221 Days at 44° C.	After 154 Hours at 100° C.
$H_2SO_4 + C_2H_6O$	29·5	22·2	22·2	22·7
$H_2SO_4 + C_2H_6O + \frac{1}{4}H_2O$	26·5	19·2	18·7	18·5
$H_2SO_4 + C_2H_6O + \frac{1}{2}H_2O$	24·2	16·5	16·8	16·9

With further dilution with water, all these rates were much lessened, so as to be practically impossible of measurement, save for high temperatures.—J. T. D.

Oxalic Acid; Speed and Nature of the Reaction of Bromine upon ——. T. W. Richards and W. N. Stull. Amer. Acad. Proc., 1902, **8**, [38], 321—237.

The authors confirm the statement of Wurtz, which was denied by Schönbein, that bromine oxidises free oxalic acid. The reaction is very slow at the ordinary temperature, and variation of the concentration of the acid between fairly wide limits does not greatly affect the velocity of the reaction. The latter is increased by diminishing the concentration of the hydrogen ions, *viz.*, by neutralisation or by addition of sodium acetate, but is reduced by the addition of strong acids. From the facts mentioned, it is probable that the reaction takes place between the bromine and the oxalate ions, according to the equation, $C_2O_4'' + Br_2 \rightleftarrows 2Br' + 2CO_2$. Hydrobromic acid has a retarding influence on the reaction, owing probably to the formation of the ion Br'_3, whereby the active mass of the bromine is reduced, this view being supported by the fact that hydrobromic acid also greatly reduces the bromine vapour-pressure of bromine water.—A. S.

Glycerol; Reaction of Phosphorus Trichloride on ——. P. Carré. Comptes rend., 1903, **136**, [24], 1456—1458.

The author's results differ from those of Lumière and Perrin (this Journal, 1901, 1232). He finds that phosphorus trichloride acts on glycerol as on glycol, giving phosphorous esters of glycerol and of monochlorhydrin—

$$2PCl_3 + 2C_3H_5(OH)_3 = 6HCl + P_2O_6(C_3H_5)_2,$$
$$PCl_3 + C_3H_5(OH)_3 = 2HCl + OH.P.O_2C_3H_5Cl,$$

both of which substances are then acted on by the water present, giving the compounds $P_2(OH)_4O_2C_3H_5OH$ and $P(OH)_2O.C_3H_5OHCl$, the calcium-derivatives of which the author has isolated. This reaction, it should be noted, leads to esters containing two molecules of phosphorous acid to one of polyhydric alcohol, while the direct action of the acid on the alcohol (this Journal, 1902, 65), yields compounds containing 1 molecule of each.—J. T. D.

Urea; Occurrence of ——, in Plants. M. Bamberger and A. Landsiedl. Monatsh. f. Chem., 1903, **24**, [3], 218—219.

The authors have found a considerable amount of urea in the spore dust of a ripe specimen of *Lycoperdon borista*, which was separated in colourless crystals from an alcoholic extract. Other constituents of urine were not detected, nor was chlorine present in more than traces. Other specimens of the same fungus were then examined, including one 12 years old, and in each case urea was found, amounting in one instance to 3·5 per cent. It was also detected in several ripe specimens of *Lycoperdon gemmatum*. Since the soil in which the fungus had grown contained no urea, the authors concluded that that substance was a normal constituent of the plants.—C. A. M.

Glucose; Mutarotation of ——, as influenced by Acids, Bases, and Salts. T. M. Lowry. Proc. Chem. Soc., 1903, **19**, [268], 156.

Both acids and bases have an accelerating effect on the mutarotation of glucose, whilst potassium chloride is without influence. If the mutarotation is conditioned by the presence in the glucose of an exceedingly minute quantity of basic impurity or a somewhat larger amount of acid impurity, a retardation should be produced when the base or acid is neutralised by adding hydrogen chloride or potassium hydroxide respectively. Careful quantitative experiments showed that this retardation does not occur, and the conclusion is drawn that although the mutarotation is accelerated by both acids and bases, its occurrence is independent of the presence of these impurities. Probably the water alone is sufficient to condition the change if enough impurity be present to render it an electrolyte.

Nicotine; Studies on ——. C. Kippenberger. Zeits. anal. Chem., 1903, **42**, [4 and 5], 232–276.

The work described in this paper is given under the following headings:—Roussin's crystals (produced by the action of iodine on nicotine in ether solution); the action of iodine on nicotine in chloroform and ether solutions, including theory and experimental work. The latter comprises determinations of the iodine introduced into the nicotine molecule by substitution of hydrogen. The preparation of various compounds of iodine and nicotine and their properties is also described.—W. P. S.

New Books.

Thirty-ninth Annual Report on Alkali, &c., Works. By the Chief Inspector (Alkali, &c. Works Regulation Acts, 1881 and 1892). Eyre and Spottiswoode. Price 10*d*.

Subject List of Works on Architecture and Building Construction in the Library of the Patent Office. [Pat. Office Library Series, No. 12; Bibliogr. Series, No. 9.] Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. Darling and Son, Ltd., 34—40, Bacon Street, E. 1903. Price 6*d*.

Quantitative Chemical Analysis by Electrolysis. Prof. Alexander Classen, Ph.D. Authorised Translation, Fourth English, from the Fourth German Edition Revised and enlarged by Bertram B. Boltwood, Ph.D. John Wiley and Sons, New York, U.S.A. 1903. Price $3. Chapman and Hall, Ltd., London.

8vo volume, containing 295 pages of subject-matter, with 93 illustrations, and indexes of authors and subjects. The sub-divisions of the text are as follows:—Part I., Section I.: I. Historical. II. Theory of Solution. III. Electrolysis. IV. Current-strength, Potential. V. Faraday's Law. VI. Ohm's Law. VII. Migration of Ions. VIII. Conductivity of Solutions. IX. Electrolysis. X. Electromotive Force. XI. Polarisation. Section II. XII. Electro-chemical Analysis. XIII. Determination of Electrical Magnitudes. XIV. Source of Current. XV. Regulating Current-strength and Potential. XVI. Accessory Apparatus. XVII. The Analytical Process. XVIII. Arrangement for Analysis. Part II. I. and II. Quantitative Determination of Metals, and of Nitric Acid in Nitrates. III. Determination of the Halogens. IV. Separation of Metals. V. Separation of the Halogens. Part III. I. Applied Examples of Electro-chemical Analysis, &c.

Chocolate and Confectionery Manufacture. Auguste Jacoutot. Maclaren and Sons, 37 and Shoe Lane, London, E.C. 1903. Price 21*s*.

8vo volume, containing alphabetical index of subje I. Chocolate and II. Confectionery; and text filling pages. There are numerous illustrations in the text apparatus and plant employed in these industries.

Trade Report.

I.—GENERAL.

Commercial Intelligence Committee.

Bd. of Trade Notice, June 17, 1903.

A meeting of the Board of Trade Advisory Comm on Commercial Intelligence was held on June 17, at offices of the Board in Richmond Terrace, Whitehall.

The principal business had relation to the new Rus "General" tariff and the proposed new "General" t for Austria-Hungary, and the best means of obtaining views of the commercial community with regard to effect of these tariffs on British trade. A sub-comm was appointed to communicate with the principal Cham of Commerce and other bodies on the subject, and it also decided to take the necessary steps to obtain the v of the commercial community in India and the Col with regard to these tariffs.

Chemicals and Medicines in Egypt.

U.S. Cons. Reps., No. 1,667, *June* 9, 1903.

The customs returns for the last few years show t the imports of chemicals into Egypt are rapidly increas The average total imports for the last five years amoun in value to 182,500 dols., while in 1901 they rose 329 985 dols. Although the annual returns for 1902 not yet published, the monthly returns for the period s that there has again been a large increase, especially d the autumn, owing to the cholera epidemic. The annu increasing demand for patent filters, disinfectants, r gerators, laundry materials, electrical apparatus, ph graphic materials, and medicines, gives the prospect o corresponding increase of the chemical trade. The princ chemicals imported into Egypt are sulphuric, nitric, hy chloric, and tartaric acids; borax, sal ammoniac, al sulphates of iron and magnesia, corrosive sublimate, s crystals, caustic soda, carbolic acid, and aniline colo According to the bulletin of the French Chamber Commerce, the following are the current prices, f Alexandria, of the principal articles: Borax, 15*l*. (73 d) per ton; sulphate of iron, 6*l*. (29·19 dols.) per t bicarbonate of soda, 7*l*. 6*s*. (35·52 dols.) per ton; and ammoniac, 42*l*. 10*s*. (206·82 dols.) per ton, supplied 100-kilos. (220-pound) barrels. England supplies most these products, as well as ammonium carbonate magnesium sulphate. England's supplies amount to ab one-half of the whole import into Egypt. In 1899 t were 92,800 dols., and in 1901 156,885 dols. Fra supplies most of the sulphuric, nitric, and hydrochl acids. The value of its exports in 1901 was 56,925 dols nearly double that of 1899. Belgium sends most of soda crystals, caustic soda, ammonia at 29 (for manufacture of ice), and lead acetate, as well as seve pharmaceutical and photographic requirements. Its in the trade in 1901 was 29,915 dols., which also doubled in the last two years. Germany's share in 1 was 27,710 dols.; in 1899 it was 20,405 dols. It practically the monopoly of aniline dyes. Connected w the chemical trade proper is that in medicines and phar ceutical articles. Under this heading, the total imp into Egypt in 1901 were valued at 146,085 dols., an incre of but 25,000 dols. in two years. In 1902 there was a la demand for anticholeric medicines and disinfectants.

All medicine, &c., should be accompanied with simple nstructions printed in the language of the country to which hey are sent. Directions for articles for use in Egypt hould be printed in Arabic, French, and English. Should ny difficulty be experienced in carrying out this advice, rrangements should be made with the agent in Egypt o supply the printed matter in the language and wording est understood by the people here. France exported ither medicines and pharmaceutical articles to the value of 0,080 dols. in 1899 and 54,015 dols. in 1901. England's xports for the same years amounted to 23,955 dols. and 4,325 dols., respectively. Germany suffered a decrease of 0 per cent. in its trade during the last two years, having llen from 26,015 dols. to 12,050 dols. Austria, its rival n many articles, has increased from 9,120 dols. to 17,006 dols. taly, the only other serious competitor, exports about 2,500 dols. worth of goods to Egypt annually, but with ttle variation.

Denmark; Trade of ——.

Foreign Office Annual Series, No. 2994.

The following table shows statistics of several of the most uportant articles of consumption manufactured in Denmark ad controlled by the State during 1902, with figures of revious years for comparison :—

ear.	Spirits (14·3 under proof).	Beer. Taxed. Amount of Spirit being over 2¼ per Cent. of Weight.	Beer. Untaxed. Amount of Spirit being under 2¼ per Cent. of Weight.	Beet Sugar.	Margarine.
	Galls.	Galls.	Galls	Cwts.	Cwts.
3	7, 76,290	16,021,717	26,637,457	544,709	163,128
95	7,018,616	17,785,991	27,629,779	887,932	155,049
97	7,117,019	20,601,368	29,936,758	966,877	190,942
00	7,035,949	21,948,157	32,671,922	1,009,454	325,309
01	7,339,628	23,103,488	32,126,258	1,155,457	369,931
02	7,502,968	20,470,665	33,063,625	776,460	385,234

emical Patents; What Should be the Protected Subject in ——.

Chem.-Zeit., 1903, **27**, [49], 622—623.

Fifth Internat. Congress of Appl. Chem., Berlin, 1903, *Sect. II.*

In the discussion on this matter at the International ngress of Applied Chemistry, at Berlin, E. Katz called ention to the great irregularity existing in the patent vs of different countries with reference to chemical tents, and advocated the general adoption of the German r, under which the process is the protected subject, ilst the protection accorded to the product is conditional its having been prepared by the patented process. The vantage to inventors consists in the stimulus given to cover new processes, whilst securing to the inventor of general process protection for the sub-varieties arising refrom.

Klöppel objected to the patenting of chemical products the ground that the first inventor frequently employs tional methods of preparation which prevent the hnical utilisation of the substance produced; and also ause this system would prevent the manufacture of logues or homologues except by the inventor or coverer of the first member of a series.

The Congress finally passed a resolution approving, in German patent law, the abolition of protection for the ducts alone of chemical processes, and the introduction the modification according protection to processes and ect products of same; and at the same time expressed esire that this latter modification should be adopted in countries where patents are granted.—C. S.

Scientific Instruments: U.S. Customs Decision.

aragraph 638 of the Tariff Act, provides for the ission free of duty of scientific and philosophical instruments and apparatus when imported for the *bonâ fide* use of any college or institution of learning and not for sale. Under this paragraph the Board of General Appraisers decided the following articles to be free of duty :—

Tintometers and glasses, porous plates, evaporating dishes, chloroform and ether.

Reagent bottles were decided to be subject to duty; also mortars, funnels and stopcocks, crucible tongs, straw rings, black varnish, glass tubing, and flint-glass bottles.

—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

Arsenic Manufacture in the West of England.

Chem. Trade J., June 20, 1903.

In his presidential address at the annual meeting of the South-Western Branch of the British Medical Association, at Launceston, Dr. W. F. Thompson referred to the manufacture of arsenic, which was carried on in the neighbourhood. In 1898, the output of arsenic was over 5,000 tons, valued at 67,000*l*. The bulk of this was manufactured in Devon and Cornwall, chiefly on the banks of the Tamar. At present the production was very small, owing to foreign competition. The work was carried on entirely above-ground, in sheds which were more or less open. Certain parts of the process required great care in order to prevent injury to the health of the workman.

Seeing that the fatal dose of arsenic was so small, it was astonishing to find that no case of death was known due to an overdose of the powder, or from its absorption into the system, through the skin, or by inhalation of the fumes, such as was to be found in lead and mercurial poisoning. The arsenical dust caused the millers and packers to suffer, unless great care was taken, from certain affections of the skin. Cough and bronchitis were common. Gastric troubles were occasionally met with, but nervous disorders were rare.

Graphite Production of the United States and Canada in 1902.

Bd. of Trade J., June 18, 1903.

According to an advance abstract of the annual report of the Geological Survey upon the production of graphite in the United States in 1902, published in the *Iron Age* (New York) of 28th May, the production of crystalline graphite in that country during 1902 amounted to 4,176,824 lbs., valued at 153,147 dols., as compared with 3,967,612 lb., valued at 135,914 dols. in 1901. The greater part of the product was derived from the mines at Ticonderoga, N.Y., although the mines at Chester Springs, Chester County, Pa., and at Stockdale, Clay County, Ala., contributed to the output.

The production of amorphous graphite in the United States during 1902 was 1,209 short tons (of 2,000 lbs.), valued at 19,764 dols., as compared with 809 short tons, valued at 31,800 dols. in 1901. The decline in unit value was due to the increased proportion of products of lower grades. Under this head are included the so-called "graphite anthracite" of Rhode Island, which is of a structure between scaly and granular, and contains, in selected samples, as much as 52 per cent. carbon, and the so-called "Baraga graphite" of Michigan, which in reality is a carbonaceous schist.

The imports of graphite into the United States during the year 1902 amounted to 18,201 long tons (of 2,240 lb.) valued at 1,168,551 dols. This product was all imported in unmanufactured form.

The manufacture of artificial graphite in the United States has assumed a very prominent position in recent years, the production in 1902 amounting to 2,358,828 lb., as compared with 2,500,000 lb. in 1901 and 860,750 lb. in 1900. The production of both the crystalline and amorphous variety has been steadily developed.

In the same report it is stated that graphite occurs in Canada both amorphous and crystalline, the former being found chiefly in Nova Scotia and New Brunswick, as graphitic shale or clay, and the latter in Ottawa and Argenteuil counties, Quebec, and in Lanark, Leeds and

Frontenac counties, Ontario. The most important of the amorphous deposits are near St. John's, New Brunswick, although others of less note occur in Kings and Westmoreland counties, New Brunswick, and at the Lochaber Mine, Nova Scotia. Amorphous deposits have also been found in Haliburton and Hastings counties, Ontario, and in Renfrew County, Brougham Township, is a very extensive deposit of this character, which carries also much crystalline graphite. The Ontario Graphite Company worked this last named deposit during 1902. The value of the output in Ontario during 1902 amounted to 17,868 dols. The production of graphite in Canada during 1902 amounted to 1,995 short tons (of 2,000 lb.), valued at 28,[illegible]00 dols., as compared with 2,005 short tons, valued at 38,7[illegible]0 dols., in 1901.

SODIUM CARBONATE; PRODUCTION OF ——

E. Solvay. Paper read before International Congress of Applied Chemistry, Berlin, June 1903.

The following table shows the progress of soda manufacture, both by the Leblanc and the Solvay processes, since 1850; also the decrease in average price during that period:—

Years.	Tota Production per Annum.	Amount made per Annum by		Average Price per Ton in Europe.
		Leblanc Process.	Solvay Process.	
	Tons.	Tons.	Tons.	Francs.
1850	150,000	150,000	0	700?
1863	300 000	300,000	0	450?
1864—1868	375,000	374,000	300	400?
1869 1873	450,000	417,000	2,600	280
1874—1878	525 000	495,000	30,000	280
1879—1883	675,000	545,000	136,000	170
1884—1888	800,000	435,000	365,000	120
1889—1893	1,023,000	390,000	633,000	115
1894—1898	1,250,000	265,000	985,000	110
1902	1,760,000	150,000	1,610,000	110

The first batch made by the Solvay process was sold in Belgium, in 1863, at 325 fr. per ton.

VIII.—GLASS, POTTERY, AND ENAMELS.

ELECTRIC LIGHT BULBS: U.S. CUSTOMS DECISION.

June 3, 1903.

Bulbs for incandescent electric lights were decided by the Board of General Appraisers to be dutiable at 45 per cent. *ad valorem*, under paragraph 112 of the Act, as "manufactures of glass not specially provided for," and not at 60 per cent. *ad valorem*, as "blown glasswares," under paragraph 100, as assessed by the Collector at Detroit, Michigan.—R. W. M.

IX.—BUILDING MATERIALS, Etc.

BRICK; PAVING ——: U.S. CUSTOMS DECISION.

June 6, 1903.

Paving brick made of scoria was decided by the Board of General Appraisers to be dutiable at 25 per cent. *ad valorem*, under paragraph 87 of the Act, as "brick other than fire-brick." The action of the Collector at San Juan, Porto Rico, who had assessed duty at 35 per cent. *ad valorem*, under paragraph 97, as "articles composed of mineral substances," was overruled.—R. W. M.

GROUND TALC: U.S. CUSTOMS DECISION.

The Treasury Department has issued instructions to disregard a decision of the United States Circuit Court of Appeals, wherein it was held that ground talc was properly dutiable at 20 per cent. *ad valorem* under section 6 of the Tariff Act as a "manufactured article unenumerated." The Department possesses information that ground talc and French chalk are, in fact, synonymous terms in commerce, and since French chalk is provided for by name, in paragraph 13, at a duty of 1 cent per pound, ground talc is ordered to be assessed at this rate, with the object of presenting this view of the question to the courts in a new case.—R. W. M.

X.—METALLURGY.

NICKEL AND PLATINUM TWEEZERS: U.S. CUSTOMS DECISION.

June 5, 1903.

Tweezers and forceps, made of nickel and platinum, were decided by the Board of General Appraisers to be free of duty as "apparatus composed of platinum for chemical uses," under paragraph 642 of the Tariff Act. The ground was taken that the law did not require that the articles should be wholly of platinum, but a manufacture in chief value of that material. Duty had been assessed at 45 pe cent. *ad valorem* as a "manufacture of metal" unde paragraph 193.—R. W. M.

GOLD PRODUCTION BY THE CYANIDE PROCESS.

The following are the tabulated results contained in th *Appendix* to Mr. Beilby's paper before the Internat Congress of Appl. Chem., Berlin, 1903 (see this Journa 1903, 766—767).

Transvaal.

	Oz.
1891	35,000
1892	175,000
1893	3[illegible]0,000
1894	600,000
1895	655,000
1896	770,000
1897	825,000
1898	950,000
1899	900,000
1900	8[illegible],000
	5,325,000

United States.

	Oz.
1895	75,000
1896	135,700
1897	190,000
1898	245,840
1899	428,400
1900	497,280
	1,572,220

New Zealand.

	Oz. Bullion. 20s. per Oz.	Tons treated. Approximate.
1893	38,160	28,096
1894	86,728	50,816
1895	68,354	64,076
1896	119,091	63,907
1897	263,076	110,161
1898	422,418	140,806
1899	496,900	165,635
1900	452 524	150,841
	1,947.251	771,3[illegible]

Mexico.

	Oz.
1895	4,053
1896	9,931
1897	10,207
1898	49,170
1899	48,832
1900	47,936
	170,129

India.

	Quantity of Tailings Treated.	Quantity of Extracted.
	Tons.	Standard Oz.
1894*	1,004	158
1895	18,065	3,177
1896	51,532	5,364
1897	132,871	18,798
1898	207,713	30,440
1899	283,619	35,776
1900	455,861	59,414
	1,150,665	153,127

* November and December.

Australia.

	Oz. Bullion.
1897	308,000
1898	398,074
1899	545,563
1900	683,899
	1,935,536

XI.—ELECTRO-CHEMISTRY, Etc.

ECTRICAL ACCUMULATORS; MANUFACTURE OF ——. DRAFT REGULATIONS UNDER THE FACTORY AND WORKSHOPS ACT, 1901.

Home Office, June 1903.

these regulations "lead process" means pasting, ca ng, lead burning, or any work involving contact with dr sorts of lead Any approval given by the Chief In ector of Factories in pursuance of these Regulations sh be given in writing, and may at any time be revoked by otice in writing signed by him.

Duties of Occupier.

) Every room in which casting, pasting, or lead bu ing is carried on shall contain at least 500 cb. ft. of ai space for each person employed therein, and in co puting this air space, no height above 14 ft. shall be aken into account. These rooms and that in which th plates are formed, shall be capable of through ventil- at by means of windows made to open.

) Each of the following processes shall be carried on such manner and under such conditions as to secure ef tual separation from one another and from any ot r process: (*a*) Manipulation of dry salts of lead; (*b* pasting; (c) formation, and lead burning necessarily ca cd on therewith; (*d*) melting down of old plates.

ovided that manipulation of dry salts of lead carried on as in regulation 5 (*b*) need not be separated from pa ng.

) The floors of the rooms in which manipulation of dr salts of lead or pasting is carried on shall be of cement or milar impervious material, and shall be kept constantly m t while work is being done. Means shall be provided fo washing the floors of these rooms with a hose pipe de .

) Every melting pot shall be covered with a hood an shaft so arranged as to remove the fumes and hot air fr the workrooms. Receptacles shall be provided for ho ing lead ashes and old plates.

) Manipulation of dry salts of lead in the mixing of th paste or other processes, shall not be done except (*a*) in n apparatus so closed, or so arranged with an exhaust dr ght, as to prevent the escape of dust into the work- ro ; or (*b*) at a bench provided with (1) efficient ex ust draught and air guide so arranged as to draw th dust away from the worker, and (2) a grating on which ea receptacle of this salt of lead in use at the time shall st l.

) The benches at which pasting is done shall be co red with sheet lead or other impervious material, and sh have raised edges.

(7) No women, young person, or child shall be employed in the manipulation of dry salts of lead or in pasting.

(8) (*a*) A duly qualified medical practitioner (in these regulations referred to as the "Appointed Surgeon") who may be the Certifying Surgeon, shall be appointed by the occupier, such appointment unless held by the Certifying Surgeon to be subject to the approval of the Chief Inspector of Factories. (*b*) Every person employed in a lead process shall be examined once a month by the Appointed Surgeon, who shall have power to suspend from employment in any lead process. (c) No person after such suspension shall be employed in a lead process without written sanction entered in the Health Register by the Appointed Surgeon. It shall be sufficient compliance with this regulation for a written certificate to be given by the Appointed Surgeon and attached to the Health Register, such certificate to be replaced by a proper entry in the Health Register at the Appointed Surgeon's next visit. (*d*) A Health Register in a form approved by the Chief Inspector of Factories shall be kept, and shall contain a list of all persons employed in lead processes. The Appointed Surgeon will enter in the Health Register the dates and results of his examination of the persons employed and particulars of any directions given by him. He shall on a prescribed form furnish to the Chief Inspector of Factories on the 1st day of January in each year a list of the persons suspended by him during the previous year, the cause and duration of such suspension, and the number of examinations made. The Health Register shall be produced at any time when required by H.M. Inspector of Factories or by the Certifying Surgeon or by the Appointed Surgeon.

(9) Overalls shall be provided for all persons employed in manipulating dry salts of lead or in pasting. The overalls shall be washed or renewed once every week.

(10) The occupier shall provide and maintain: (*a*) a cloakroom in which workers can deposit clothing put off during working hours. Separate and suitable arrangements shall be made for the storage of the overalls required in Regulation 9. (*b*) A dining room unless the factory is closed during meal hours.

(11) No person shall be allowed to introduce, keep, prepare or partake of any food, drink, or tobacco, in any room in which a lead process is carried on. Suitable provision shall be made for the deposit of food brought by the workers. This regulation shall not apply to any sanitary drink provided by the occupier and approved by the Appointed Surgeon.

(12) The occupier shall provide and maintain for the use of the persons employed in lead processes a lavatory, with soap, nail brushes, towels, and at least one lavatory basin for every five such persons. Each such basin shall be provided with a waste pipe, or the basins shall be placed on a trough fitted with a waste pipe. There shall be a constant supply of hot and cold water laid on to each basin. Or, in the place of basins the occupier shall provide and maintain troughs of enamel or similar smooth impervious material, in good repair, of a total length of 2 ft. for every five persons employed, fitted with waste pipes, and without plugs, with a sufficient supply of warm water constantly available. The lavatory shall be kept thoroughly cleansed and shall be supplied with a sufficient quantity of clean towels once every day.

(13) Before each meal and before the end of the day's work, at least ten minutes, in addition to the regular meal times, shall be allowed for washing to each person who has been employed in the manipulation of dry salts of lead or in pasting. Provided that if the lavatory accommodation specially reserved for such persons exceeds that required by Regulation 12, the time allowance may be proportionately reduced, and that if there be one basin or 2 ft. of trough for each such person this regulation shall not apply.

(14) Sufficient bath accommodation shall be provided for all persons engaged in the manipulation of dry salts of lead or in pasting, with hot and cold water laid on, and a sufficient supply of soap and towels. This rule shall not apply if, in consideration of the special circumstances of any particular case, the Chief Inspector of Factories

approves the use of local public baths when conveniently near, under the conditions (if any) named in such approval.

(15) The floors and benches of each workroom shall be thoroughly cleansed daily, at a time when no other work is being carried on in the room.

Duties of Persons Employed.

(16) All persons employed in lead processes shall present themselves at the appointed times for examination by the Appointed Surgeon as provided in Regulation 8. No person after suspension shall work in a lead process in any accumulator factory without written sanction entered in the Health Register by the Appointed Surgeon.

(17) Every person employed in the manipulation of dry salts of lead or in pasting shall wear the overalls provided under Regulation 9. The overalls, when not being worn, and clothing put off during working hours, shall be deposited in the places provided under Regulation 10.

(18) No person shall introduce, keep, prepare, or partake of any food, drink (other than any sanitary drink provided by the occupier and approved by the Appointed Surgeon), or tobacco in any room in which a lead process is carried on.

(19) No person employed in a lead process shall leave the premises or partake of meals without previously and carefully cleaning and washing the hands.

(20) Every person employed in the manipulation of dry salts of lead or in pasting shall take a bath at least once a week.

(21) No person shall in any way interfere, without the concurrence of the occupier or manager, with the means and appliances provided for the removal of the dust or fumes, and for the carrying out of these regulations.

XII.—FATS, OILS, Etc.

COCOA BUTTERINE: U.S. CUSTOMS DECISION.

June 15, 1903.

A FATTY material with a melting point of 87° to 90° Fahrenheit, produced from cocoanut oil by a process which eliminated the softer portion of the oil together with the free fatty acid, was decided by the Board of General Appraisers to be dutiable at $3\frac{1}{2}$ cents per lb. as "cocoa butterine" under paragraph 282 of the Tariff Act. The ground was taken that the article was, in fact, a substitute for cocoa butter, and was not "cocoanut oil" free of duty, under paragraph 626, but an article manufactured from it.
—R. W. M.

XIII. A.—PIGMENTS, PAINTS, Etc.

THE ADULTERATION AND MARKING OF WHITE LEAD.

Chem. Trade J., June 20, 1903.

A circular has been issued by the *White Lead Corroders' Trade Section* of the London Chamber of Commerce in regard to the desirability of making it compulsory to mark all packages, containing white and red lead admixtures, other than genuine, with the word "reduced."

The section has decided to approach the trade generally with a view to obtaining adhesions to a memorial to be presented to the President of the Board of Trade.

This memorial does not bind the trade to carry out the practice mentioned therein, but merely indicates that, in the general interests of the trade, it should be made compulsory that such admixtures should be marked "reduced."

The following is the text of the memorial:—

"That it having come to the knowledge of your petitioners that the practice of using incorrect terms for the marking of packages of white and red lead is prevalent in the trade, and is likely to lead to misrepresentation and fraud, we are of opinion that it is desirable—

(1) To discontinue the use of the term 'best' as a trade description for admixtures of white and red lead, other than genuine, on the ground that the same is a false and misleading description within the meaning of the Merchandise Marks Act.

(2) To brand or stencil all packages, wooden or iron, containing white and red lead admixtures, other than genuine, with the word 'reduced,' and

(3) To invoice all white and red lead admixtures, othe than genuine, as 'reduced white or red lead.'

"Your petitioners, believing the general adoption of th above throughout the trade would be beneficial, humbl request the Board of Trade to introduce a Bill into Par liament to render it compulsory."

All communications on the subject should be addresse to the Secretary, London Chamber of Commerce, 10, Eastcheap, London, E.C.

XIII. C.—INDIA-RUBBER, Etc.

RUBBER TRADE OF BRAZIL.

U.S. Cons. Rep., No. 1668, *June* 10, 1903.

The total shipments of rubber from Para from July 1 1902, to May 1, 1903, have been 26,010 tons, as agains 26,655 tons during the same period of the preceding season The shortage is due to the troubles in the Acre territory The crop, however, lacks but a few hundred tons o equaling that of last season, which was the largest eve known.

XVI.—SUGAR, STARCH, Etc.

SUGAR-BEET CULTIVATION.—EUROPEAN

U.S. Cons. Rep., No. 1676, *June* 19, 1903.

The following table, regarding European sugar-be cultivation for the season of 1903 as compared with that 1902, has been compiled and published by the Internation Sugar Statistical Association as the result of a gener inquiry made between the dates of April 29 and May 9:—

Country.	No. of Factories.	Area under Sugar-Beet Cultivation. (In Acres.)		Increase.	De-crease
		1903.	1902.		
				Per Cent.	Per Cent
Germany	385	1,018,282	1,060,902	..	4·
Austria - Hungary.	215	757,633	751,184	0·8	.
France........	299	553,998	598,315	..	5·8
Russia	277	1,395,801	1,476,106	.	5·5
Belgium	99	142,083	129,233	9·9	..
Holland	29	99,687	76,687	3·0	..
Sweden	17	70,997	59,596	19·1	..
Denmark	7	36,324	36,324	..	..

XVII.—BREWING, WINES, SPIRITS, Etc.

SPIRITS; USE AND EXPORT OF DUTY-FREE ——, IN LUXEMBURG.

Zeits. Spiritsind., 1903, **26**, [24], 258.

By an order dated April 24, 1903, denatured spir imported into Luxemburg from Germany cannot be export under bond. On entry it becomes liable to the transit du of 120 frs. per hectolitre of absolute alcohol.

The refund of the duty is granted if the official chem certifies that the alcohol content of the spirit by the alcoho ometer is not below 80 per cent. by weight or 85·5° Tr dl and that the spirit is completely denatured by the additi of 2·5 litres to every 100 litres of alcohol of a mixture 4 parts by volume of wood spirit and 1 part of pyridi bases to which has been added 50 grms. per litre of oil lavender or rosemary. The complete denaturation of t spirit may also be effected by the addition, to every 1 litres, of 1·25 litre of the general denaturing agent togeth with 0·25 litre of crystal violet solution and 2–20 litr of benzene. If analysis shows that denaturation is i sufficient the duty will only be refunded after the defic en has been made good at the expense of the owner. Perso who wish to have spirit denatured by the addition of eth or amylacetate for use in the collodion industries, may authorised to obtain the ether required for the purposes the industry from Germany and to receive exemption fro duty for the quantity of alcohol to be denatured for t purpose.—J. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Canadian Paper Industry.

Industrial Canada, May, 1903.

Through Bd. of Trade J., June 25, 1903.

ttention is drawn to the abundant natural resources Canada for paper-making; it is stated that in a short : the paper mills of Canada will be able to produce ut 1,300,000 lb. of paper every 24 hours. This total not only include news print, book paper, and ledger, l and writing paper, but the coarser grades of product vell, such as wrapping, felt, building and manilla papers. uring the three-quarters of a century that have elapsed e the birth of the paper-making industry in Canada s have sprung up in various sections of the country, there are at the present time about 40 in operation, cipally in Ontario and Quebec. The quality of their luct has of late years exhibited a remarkable improvet. As regards the finer grades of paper, such as book er, cover paper, note paper and the like, the same may said. It is not so long ago since the demand was rely for foreign-made goods. Indeed, Canadian mills e no attempt to capture the market. Now, through energy and perseverance of the manufacturers, exnt paper is turned out, which can well hold its own the imported article.

otwithstanding, imports steadily advance. In 1898 a e of 1,135,904 dols. was imported; in 1902, 1,945,786 ., the great bulk comprising papeteries, pads, printing r, and wall paper.

Paper Mills in British India.

Bd. of Trade J., June 18, 1903.

here are eight paper mills in operation in British a—three in the Bombay Presidency, four in Bengal. one at Lucknow. Of those in the Bombay Presidency, are private concerns. The capital invested, so far formation is obtainable, amounts to Rs. 73,20,000.

ost of the white and blue foolscap and much of the ing paper, notepaper, and envelopes used in the ernment offices is now obtained from the India mills. total quantity of paper made in 1902 was nearly 00,000 lb., and its reported value Rs. 64,38,319. The s employ 4,865 persons. The capital employed has trebled in 20 years, since 1883, and the production number of persons employed have increased about old. But in recent years there has been a depression he paper-making industry in Bengal, owing to the ortation in large quantities of cheap paper made from l pulp, which is of more attractive appearance, if less ble, than paper made from grass, gunnies, and rags in Bengal mills.

XX.—FINE CHEMICALS, Etc.

Ichthyol: U. S. Customs Decision.

June 10, 1903.

e ammonium salt of ichthyol was decided by the d of General Appraisers, to be dutiable at 25 per cent. *alorem* as a "chemical salt" under paragraph 3 of the ff Act, and not free of duty under paragraph 636, ing to various oils among which is included ichthyol.

—R. W. M.

S. l and Chloral Hydrate: U.S. Customs Decision.

e United States Circuit Court of Appeals recently ered a decision covering salol and chloral hydrate h is of great importance as affecting other medicinal arations and fine chemicals. These preparations con no alcohol as a component part, but in their preparation ol is sometimes used. The Tariff Act, in paragraph 67, sses a duty of 55 cents per pound on "medicinal pretions containing alcohol, or in the preparation of which hol is used." The United States Circuit Court decided this paragraph did not apply, because to hold to the rary opinion would result in imposing a different rate uty upon the same drug, according to whether alcohol was or was not used in its preparation. The higher court does not concur in this view, since Congress has distinctly discriminated between drugs or chemical preparations in which alcohol was used, and those in the preparation of which it was not used, and holds that this use of alcohol is the controlling feature in assessment of duty. When alcohol has been used, the medicinal preparation is dutiable at 55 cents per pound, under paragraph 67, and when it has not been used, at 25 per cent. *ad valorem*, under paragraph 68.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 13,331. Edgeworth. Method of moving or extracting matter in solution from liquid. June 15.
„ 13,379. James (Giglio and Zanche). Agglomerating compound for pulverulent matter. June 15.
„ 14,105. Loison. Centrifugal separators for dry materials of different densities. June 24.
„ 14,195. Abel (Siemens and Halske A.-G.). Separation of different liquids from each other, and of liquids from bodies suspended or dissolved therein. June 25.
„ 14,242. Appleyard and Cranfield. Lids or covers for crucibles and the like. June 27.

[C.S.] 15,881 (1902). Tolhurst and Skinner. Roller mill. July 1.
„ 17,566 (1902). McNeil and McNeil. Vacuum drying apparatus. July 1.
„ 20,241 (1902). Pryor (Soc. Anon. D'Escaut et Meuse). Receptacles for compressed gases or liquids to prevent explosion thereof. June 24.
„ 8602 (1903). Bogoiävlensky and Kroupovess. Distilling apparatus. July 1.
„ 9570 (1903). Lake (Patterson). Centrifugal separators. July 1.
„ 10,094 (1903). Moller. Apparatus for purifying liquids. June 24.
„ 10,124 (1903). Ekenberg. Concentrating and evaporating liquids. June 24.

II.—FUEL, GAS, AND LIGHT.

[A.] 13,466. Tohl. Freeing gases from carbon disulphide. June 16.
„ 13,476. Dowson. Gas generators. June 16.
„ 13,482. Hartridge. Manufacture of artificial fuel. June 16.
„ 13,540. Woods and Hamond. Incandescent mantles for gas lamps. June 17.
„ 13,633. Casse and Diguet. Apparatus for producing a stereo gas for lighting, heating, and power purposes.* June 18.
„ 13,648. Horn. Retorts for the manufacture of gas.* June 18.
„ 13,661. Smethurst. Apparatus for producing combustible gas. June 18.

[A.] 13,667. Mathieson. Application of forced draught to furnaces. June 18.

,, 13,748. Abel (Deutz). Production of heating gases free from hydrocarbons, from gas-containing fuel in gas producers.* June 19.

,, 13,763. Crossley and Rigby. Regulation of gas producers. June 20.

,, 13,764. Crossley and Rigby. Gas producers. June 20.

,, 13,918. Humfeldt and Tesch. Blast furnaces.* June 22.

,, 14,014. Cory. Artificial fuel. June 23.

,, 14,031. Helouis, Mauclaire, and Meyer. *See under* VII.

,, 14,098. Charles. Agglomeration of combustible materials.* June 24.

,, 14,145. Jouques and Leteneur. Powder or liquid to improve the combustion of fuel and to abate the smoke. June 25.

,, 14,305. Boult (Seydel). Cupola furnaces.* June 27.

[C.S.] 14,167 (1902). Crossley and Rigby. Apparatus for removing impurities from gases. July 1.

,, 15,498 (1902). Tonkin and Puplett. Gas producers. June 24.

,, 18,233 (1902). Leask. Construction of furnaces, and the supply and control of air to the same. July 1.

,, 2283 (1903). Gaze. Illuminating gas. July 1.

,, 6311 (1903). Glasgow. Water-gas generator. June 24.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 13,160. Ransford (Cassella). Manufacture of acetyl-diamidosalicylic acid, and of colouring matters therefrom. June 16.

,, 13,808. Newton (Bayer). Production of derivatives of the anthraquinone series. June 20.

,, 14,113. Imray (Soc. Chem. Ind. in Basle). Manufacture of new mono-azo-dyestuffs.* June 24.

[C.S.] 19,894 (1902). Imray (Meister, Lucius und Brüning). Manufacture of dialkylanthrachrysone ethers, their nitro- and amido-sulphonic acids. July 1.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 13,125. Shillito (Fischer). Cylinder printing machines for paper, fabrics, &c.* June 16.

,, 13,556. Reid. Apparatus for treating spun fibre. June 17.

,, 13,827. Imray (Meister, Lucius und Brüning). Production of white and coloured discharge in printed fabrics, and discharges therefor. June 20.

,, 13,928. Sunderland. Production of colour or other effects in textile fabrics. June 22.

,, 14,125. Dargues, Dargues, and Barker (J. W. Knowles and Co.). Apparatus for dyeing, mordanting, or washing fibrous materials. June 25.

,, 14,132. Leadrum. Scouring, milling, and dyeing of fabrics. June 25.

,, 14,196. Imray (Meister, Lucius und Brüning). Process of printing indigo. June 25.

,, 14,200. Rovira. Continuous bleaching apparatus. (Fr. Appl. Nov. 10, 1902.)* June 25.

[C.S.] 27,993 (1902). Dubrule, jun., and Dubrule. Wool scouring machines. June 24.

,, 3192 (1903). Clark (Kaun). Treating sheep's wool and other ceratinic fibre or fabrics. June 24.

[C.S.] 8167 (1903). Mudge. Manufacture of flax fi June 24.

,, 11,320 (1903). Boult (Stone). Depilatories removing hair from skin and hides. July 1.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 13,412. Grossmann's Cyanide Patents Synd. Grossmann. Manufacture of cyanides. June

,, 13,783. Plummer. Process of obtaining ammo and chlorine from ammonium chloride. June

,, 14,028. Ashcroft. *See under* XI.

,, 14,031. Helouis, Mauclaire, and Meyer. Manu ture of carbides of the alkali and alkaline ea metals. June 23.

,, 14,112. De Wilde. Manufacture of carbon diox and precipitated calcium sulphate from p phosphates. (Belgian Appl., March 5, 1903 June 24.

,, 14,194. De Wilde. Manufacture of dicalci phosphates, precipitated calcium sulphate, the regeneration of the hydrochloric or nitric a used therein.* June 25.

,, 14,213. Price. Apparatus for the separation oxygen and nitrogen from atmospheric June 27.

,, 14,303. Pictet. Apparatus for separating ga from their mixtures, especially oxygen nitrogen from atmospheric air. (Fr. Appl., J 28, 1902.)* June 27.

,, 14,342. Askenasy and Mugdan. Production separation of hydrochloric and sulphuric aci June 27.

[C.S.] 6051 (1902). Graham. Apparatus for break up, mixing, and condensing gases in acid ma facture, especially sulphuric acid. June 21.

,, 4820 (1903). Cummer. Calcining alumina phate. June 24.

,, 11,221 (1903). Lightfoot (Ges. f. Linde's maschinen A.-G.). Process and apparatus obtaining nitrogen from liquid air. July 1.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 13,354. Cox. Printing of earthenware and like. June 15.

,, 14,290. Rosenhain. Glass manufacture. June

[C.S.] 14,849 (1902). Franzek and Weigl. Manu ture of porcelain. July 1.

IX.—BUILDING MATERIALS, CLAYS, MORTA AND CEMENTS.

[A.] 13,616. Campbell. Manufacture of building blo &c. June 18.

,, 13,903. Lake (Chem.-Techn. Fabrik Dr. A. R. Brand and Co.). Process for colouring nat stones. June 22.

,, 13,916. Lake (Chem.-Techn. Fabrik Dr. Brand Co.). Process for rendering marble asep and for increasing its properties of electr insulation. June 22.

,, 14,236. Boothby. Renewable lining for cruc and melting-pot furnaces. June 27.

,, 14,366. Wirtz. Obtaining emery and like substan from slag. June 27.

[C.S.] 6132 (1902). Wise (Homan). Treatment materials containing silicates of alum June 24.

,, 17,618 (1902). Rubitschung. Manufacture artificial asphalt, stone, or the like. June 24.

,, 3483 (1903). Krüger and Denkelmann. Manu ture of firepoouf bricks or material. June 24

[C.S.] 8996 (1903). Maclay. Continuous burning Portland cement kilns. June 24.

„ 9835 (1903). Geissler. Manufacture of cement. June 24.

„ 10,206 (1903). Illemann. Fireproof building blocks and slabs. June 24.

X.—METALLURGY.

[A.] 13,454. Huntington and Heberlein. Treatment of sulphide ores or compounds preparatory to smelting. June 16.

„ 13,557. Callmann and Bormann. Liquid soldering composition.* June 17.

„ 13,750. Kington. Depositing gold.* June 20.

„ 13,762. Moore. Metallic alloy. June 20.

„ 13,780. Dove and Nicholson. Blast furnaces, steel converters, &c. June 20.

„ 13,877. Herreshoff. Ore roasting furnaces. (U.S. Application, Jan. 15, 1903.)* June 22.

„ 14,013. Cory. Treatment of ores. June 23.

„ 14,251. Elworthy and Swales. Methods of hardening or treating steel. June 27.

„ 14,361. Massenez. Manufacture of iron and steel from chromic pig-iron, &c. June 27.

C.S.] 17,322 (1902). Mercer and de Alzugaray. Apparatus for use in the extraction of precious metals from their ores. June 24.

„ 17,616 (1902). Meunicke. Treatment of stanniferous ores. June 24.

„ 26,279 (1902). Marks (Delprat). Extraction of zinc and other sulphides from their ores. June 24.

„ 8466 (1903). Huth. Soldering compound for cast-iron. July 1.

„ 9715 (1903). Sorensen. Method of soldering aluminium. July 1.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

A.] 13,931. Fielder and Gerard. Secondary batteries. June 22.

„ 14,021. Brandt. Galvanic batteries.* June 23.

„ 14,028. Ashcroft. Production of metals of the alkali group, and alkalies by electrolysis. June 23.

C.S.] 813 (1903). Csányi and von Bárczay. Electrical batteries. June 24.

„ 5892 (1903). Staedtefeld. Electric insulating material. June 24.

„ 10,194 (1903). Carrere. Electric furnaces. June 24.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

A.] 13,173. Thompson (Ges. zur Verwertung der Boleg'schen wasserlöslichen Mineralöle und Kohlenwasserstoffe). Processes for producing lubricants. June 16.

„ 13,747. Lewy. Manufacture of a wax-like composition. June 19.

C.S.] 2202 (1903). Sandberg. Manufacture of an odourless tallow-like product. June 24.

II.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

A.] 13,812. Armbruster and Morton. Processes of making pigments.* June 20.

„ 13,813. Armbruster and Morton. Composition of matter to be used for pigments.* June 20.

[A.] 13,837. Wegelin. Manufacture of soot or lampblack from tar and other carbonaceous substances.* June 22.

[C.S.] 11,112 (1903). Armbruster and Morton. Processes of making pigments. July 1.

„ 11,113 (1903). Armbruster and Morton. Compositions of matter to be used for pigments. July 1.

B.—Resins, Varnishes.

[A.] 13,825. Lake (Wardropper). Manufacture of linoleum, oil-cloth, &c. June 20.

[C.S.] 14,169 (1902). Peters and Shepherd. Compound oil for use in the manufacture of linoleum, &c. June 24.

„ 19,626 (1902). Fry. Production of substances constituting varnish, or for use in its manufacture. July 1.

C.—India-rubber, &c.

[A.] 13,431. Gray. Manufacture of rubber, gutta-percha, and similar goods. June 16.

„ 13,729. Foster and Dental Manufacturing Co. "Dental rubber" for use in manufacturing artificial dentures. June 20.

„ 14,011. Pensa. Manufacture of a substance similar to rubber. June 23.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 13,682. Hilbert. Manufacture of glue and gelatin from bones.* June 19.

[C.S.] 14,122 (1902). Reichelt, Helbing, and Nienaber. Manufacture of leather substitute. July 1.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 14,182. Miller, Huether, Hough, and McNeill. Process and apparatus for making sugar.* June 25.

[C.S.] 20,851 (1902). Schrader. Process for obtaining and utilising the organic acids contained in the residuary liquors of molasses. July 1.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 13,760. Dewar. Process of malting. June 20.

„ 14,033. Ramsay. Distillation and purification of alcoholic liquids. June 24.

[C.S.] 11,223 (1903). Lapp. Manufacture of beer free from alcohol. July 1.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 13,469. Bunyan. Food product (U.S. Application, June 19, 1902).* June 16.

„ 13,625. Stimpson. Cereal and like extracts for flavouring purposes. June 18.

„ 13,994. Thorp. Milk powders. June 23.

„ 13,995. Edmonds (Galbraith). Treatment of milk, cream, and butter. June 23.

„ 14,006. Alsop. Treatment of flour to purify it and increase its nutritive qualities. June 23.

„ 14,153. Noad. Process for treating flour. June 25.

B.—Sanitation; Water Purification.

[A.] 13,132. Stephens and Caeckland. Preparation for use as a disinfectant and preventive of incrustation in boilers. June 16.

[A.] 13,560. Hewes. Methods for treating sewage. June 17.

,, 14,258. Eichen. Process for the purification of sewage. June 27.

[C.S.] 11,789 (1902). Bez. Prevention of incrustation and corrosion in steam boilers and the like. July 1.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 13,323. Williams and Parkin. Production of non-inflammable celluloid. June 15.

[C.S.] 17,434 (1902). Grimshaw. Fireproofing of paper, cardboard, &c. June 24.

,, 23,174 (1902). Lebateux. Treated or coated papers. June 24.

XX.—FINE CHEMICALS, ALKALOIDS ESSENCES, AND EXTRACTS.

[A.] 13,889. Howorth (Knoll and Co.). Manufacture of certain new cotarnin salts. June 22.

,, 14,189. Chem. Fabr. Uerdingen Lienau and Co. and Naschold. Purification of pinene hydrochloride. June 25.

[C.S.] 14,034 (1902). Evans (Electrochemische Werke, G. m. b. H.). Preparation of oxalates from formates. July 1.

,, 18,340 (1902). Imray (Meister, Lucius und Brüning). Removal of albumin from bacterial and animal antitoxines and toxines. July 1.

,, 1664 (1903). Boehm (Fischer). Manufacture of c-c dialkylbarbituric acids. June 24.

,, 2054 (1903). Boehm (Fischer). Preparation of c-c-dialkylbarbituric acids. July 1.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 13,350. Burrell. Photographic plates. June 15.

,, 13,805. Reiner. Rapid photographic plates or films. June 20.

,, 13,920. Gros and Ostwold. Reproducing pictures &c., with the aid of catalysis.* June 22.

,, 14,073. Nusch (The Franklyn Tarsulet). Preparation of durable collodion emulsions for all colour rays of the spectrum, suitable for producing negatives for half tone in natural colours.*

,, 14,074. Nusch (The Franklyn Tarsulet). Colouring and sensitising emulsions, films, solutions, &c., to be used for the production of photographic pictures.* June 24.

[C.S.] 4962 (1903). Fritzsche. Roll films and processes for three-colour photography. June 24.

,, 7472 (1903). White and White. Photographic prints. July 1.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 13,457. Justice (International Smokeless Powder and Chemical Co.). Manufacture of smokeless powder.* June 16.

,, 13,531. Wetter (Westfälisch-Anhaltische Sprengstoff-A. G.). Explosives or blasting compositions. June 17.

XXIII.—GENERAL ANALYTICAL CHEMISTRY

[C.S.] 10,936 (1903). Köhler. Means for facilitating the reading of thermometers, burettes, and other graduated tubes. July 1.

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Notices.

ST. LOUIS EXHIBITION, 1904.

he invitation to British manufacturers to participate in St. Louis Exhibition next year, which has been issued the Royal Commission, with the endorsement of the ice of Wales as President, may perhaps be regarded by e as an appeal to the patriotism rather than to the ness instincts of British manufacturers, but it is to be ed that on the higher ground indicated it will not be red.

would be most regrettable if other nations made a er display than this country, for, as has been pointed out His Royal Highness, conclusions respecting the relative strial importance of various nations will certainly be vn from the respective exhibits, and thus, indirectly, if directly, the manufacturing interests of this country suffer unless they are adequately represented at Louis.

he Commission is seeking to encourage the adoption of principle of collective exhibits, and is offering important antages to those who co-operate on this basis. The nical industries lend themselves readily to such a hod of representative illustration, and it is satisfactory to n that already many important firms have signified their ingness to become exhibitors under those conditions.

order that adequate space may be secured, it is ssary that the Commission should at once receive full rmation as to the extent to which chemical manufacrs are prepared to support the action now being taken, those who have not responded to the appeal should do ithout loss of time. Full particulars can be obtained the Secretary of the Liberal Arts Committee at the e of the Royal Commission for the St. Louis Exhibition, , 47, Victoria Street, S.W.

ELOPMENT OF THE ST. LOUIS EXHIBITION.

a circular letter addressed to the press by Mr. Geo. arker, Commissioner in the United Kingdom for the Louis Exhibition, the following paragraphs occur:— that the Royal Commission on the St. Louis Exhibi is soliciting and receiving formal applications for space he various departments, it may not be amiss to give information about tariff duties, the facilities for ng exhibits through the Custom Houses, the rates of ht on the railways to and from the coast, the plans he admission of labourers, and some notice of the ress of the work of preparation.

duties will be levied upon exhibits except those sold lelivery after the close of the exhibition, in which case will pay the regular taxes fixed by law. Goods ded for exhibit may be shipped to any port, whence will be transported in bond to the exhibition grounds ade by law a bonded warehouse—in which the goods remain until their removal before March 1, 1905. If sold they will be returned to the country of origin gh the port of entrance. The Revenue officers, of h there will be more than 500 on the grounds, acting the division of exhibits, will exercise a close supern of foreign goods, collect duties upon those sold, rintend the packing in the original cases of those ned, and supervise reshipment in bonded cars to the er seaport. Personal supplies for the use of foreign nissioners in attendance at the exhibition, samples of handise for distribution, descriptive advertising matter, the portions of exhibits necessary for the juries of d, will be admitted free of duty.

r the purpose of facilitating the admission of foreign its, the Government of the United States and the ition have appointed Mr. I. P. Roosa, United States atch Agent, as their joint official representative. He eceive at the Port of New York exhibits consigned to will carry out the forms laid down by the Government he exhibition, afford whatever assistance may lie in ower, and have the exhibits placed in bonded cars for gh shipment to the exhibition grounds. All this will be done, both going and returning, without charge of any kind for the agent's services. The shipper will thus avoid the usual delay and also the ordinary brokerage and other fees. The exhibitor will, of course, pay the actual cost of cartage and transfer, which will in general be small. For the larger consignments inclusive rates from the British coast to St. Louis will no doubt be arranged.

The freight rates are simple. All communicating railways will carry exhibits in bond from the landing port to St. Louis at a single full rate, which will entitle the exhibitor, after the close of the exhibition, to the free return of his goods to the same port. It is scarcely necessary to explain that in America, as everywhere else, freight rates vary according to the class of goods. The Royal Commission will no doubt in due time make public its own arrangements for reduced ocean rates, and also announce any plans it may form for giving assistance in the matter of transportation charges on collective or other exhibits.

In order that foreign exhibitors may not be hampered by the provisions of the contract labour law and regulations, the Congress of the United States has passed a special Act providing for the admission of foreign labourers for the purpose of preparing, making, and caring for exhibits. When they arrive at any port, the Commissioner, or the Collector of Customs, will satisfy himself that such labourers are entitled to admission under the Act in question, and will issue a certificate to that effect to each one. This permit will be valid for three months after the close of the exhibition, and must be surrendered upon the return of the holder to his own country. The law, and the regulations under it, have been made very short and simple, in order that complications or difficulties may be avoided.

NEW SECTION AT SYDNEY, NEW SOUTH WALES.

The Council has granted the application of thirty members of the Society residing in New South Wales to be allowed to form a section, to be called the Sydney Section of the Society.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

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15th JULY 1903.

Abraham, Herbert, 13, West 89th Street, New York City, U.S.A., Chemist.
Armstrong, E. D., Climax Powder Works, Emporium, Pa., U.S.A., Chemist.
Brown, Frank C., P.O. Box 211, Framingham, Mass., U.S.A., Foreman.
Cook, James W., London and Provincial Dye Works, Hackney Wick, E., Dyer.
Grant, Henry C., c/o Grasselli Chemical Co., 63, Wall Street, New York City, U.S.A., Manager.
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Griswold, Geo. G., Globe Plant, A. S. & R. Co., Denver, Col., U.S.A., Assistant Superintendent.
Haigney, John J., 271, 58th Street, Brooklyn, N.Y., U.S.A., Manufacturing Chemist.
Hasting, J. J., c/o Benjamin Morce and Co., 241-259, Water Street, Brooklyn, N.Y., U.S.A., Chemist.
Humphrey, John, 17, Bloomsbury Square, London, W.C., Editor.
Johnstone, S. J., 15, Springfield Road, New Southgate, N., Research Chemist.

Kessler, R., jun., Brandt, Susquehanna Co., Pa., U.S.A., Chemical Manager.

Mooney, Geo. A., 2716, St. Catharine Street, Montreal, Canada, Chemical Merchant.

Nash, A. Douglas, Tiffany Furnaces, Corona, Staten Island, N.Y., U.S.A., Glass Manufacturer.

Oldham, E. W., St. Louis Portland Cement Co., St. Louis, Mo., U.S.A., Chemist.

Pearcy, A. C., 40, St. Kilda's Road, Stoke Newington, N., Director, Explosives Co.

Shuttleworth, Dr. E. B., 220, Sherbourne Street, Toronto, Canada, Professor of Chemistry.

Smith, F. M., 101, Sansome Street, San Francisco, Cal., U.S.A., President (Pacific Coast Borax Co.).

Stevens, T. R. B., 39, High Street, Battersea, S.W., Metallurgical Chemist.

Strayer, D. W., 112, Newman Avenue, Bayonne, N.J., U.S.A., Chemist.

Whitehouse, P. L., 44, Victoria Street, West Bromwich, Staffordshire, Oil Chemist.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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Cawley, Geo.; communications to 25, Victoria Street, Westminster, S.W.

Davis, W. A.; Journals to 8, Quenington Mansions, Rostrevor Road, Fulham, S.W.

Farrell, Frank, l/o Albert Bridge Road; 24, Primrose Mansions, Prince of Wales Road, London, S.W.

Fuller, H. C., l/o Worcester; 83, North Washington Street, Boston, Mass., U.S.A.

Gabbett, E. R.; communications to 64, Vanbrugh Road, Blackheath, S.E.

Gent, Percy W., l/o Summer Avenue; 792½, Ridge Street, Forest Hill, Newark, N.J., U.S.A.

Koechl, V., l/o Hudson Street; communications to P.O. Box 159, New York City, U.S.A.; Journals as before.

Lawson, Wm., l/o Alvarado; c/o Utah Sugar Co., Salt Lake City, Utah, U.S.A.; and retain Journals.

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Van Gilder, H. P.; Journals to 234, Bushkill Street, East, P.A., U.S.A.

Willard, Chas. T., l/o Worcester; 1, State Street, Scher tady, N.Y., U.S.A.

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Glatz, Jos.; l/o Riverside Chemical Works, Brooklyn, N., U.S.A.

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Bush, Baron W. de, of W. J. Bush and Co., Ash Gr Hackney, E. July 24.

PROCEEDINGS

OF THE

TWENTY-SECOND ANNUAL MEETING.

BRADFORD.

WEDNESDAY, JULY 15, 1903.

The Annual General Meeting of the Society was d in the public hall of the Municipal Technical Coll Bradford, on Wednesday, July 15th 1903, the Presid Mr. Ivan Levinstein, in the chair.

The PRESIDENT said that the Mayor of Brad Alderman David Wade, J.P., had been good enoug come there that day to extend an official welcome to Society.

The MAYOR said that he had very great pleasure performing the duty which he had been called upo fulfil. He was sure that the city of Bradford w welcome the members of the Society. The chem industries were an important part of the business of country, and involved also the development of techn education. He hoped that the Society would be favo with fine weather, so that they might enjoy their out engagements.

The PRESIDENT said it was most kind of the head of a important city like Bradford to come personally and an official welcome to their Society. Bradford had exte d its hospitality of late years to various bodies of a scien character. He believed it was about three years ago the British Association was in that town. Then the S tary Congress had had its meetings there only the before. Bradford stood in the front rank of municipa in the country; it possessed not only an extensive and fine system of waterworks and a number of other exce municipal undertakings, but it had also enjoyed, and still enjoying, notwithstanding the fluctuations of tra substantial prosperity. Its real prosperity was best trated by the fact that Bradford had the lowest percen of paupers of any place in Yorkshire, and one of lowest percentages for the whole of the kingdom. Bradford had done a great deal, and, in fact, had tak leading part in the matter of education. He had al forgotten to mention further that Bradford was one of first to introduce electric traction. He again thanke Mayor for his kindness in coming to formally open proceedings.

The SECRETARY read the minutes of the last A Meeting, which were adopted.

THE NEW COUNCIL.

The PRESIDENT said that only sufficient nominatio been received to fill the vacancies, and that consequ there was no need to ballot for the new Council, th of which the Secretary would read over.

he SECRETARY said the new Council would be formed ollows :—

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E. Bedford. | Thos. Fairley.

Honorary Treasurer:

Samuel Hall, East London Soapworks, Bow, E.

Honorary Foreign Secretary:

Dr. Ludwig Mond, F.R.S.

THE NEW PRESIDENT.

e PRESIDENT said he had great pleasure in announcing Sir William Ramsay, K.C.B., F.R.S., had been unani sly elected the President of the Society. The task of ducing Sir William was a very easy one. His name famous in every part of the world where chemistry and ics were taught, and his contributions to science were numerous to mention. It was not long ago that Sir iam was selected as one of a distinguished few men of rs and science on whom the King had conferred titular nction. He had lately been invited by the German eror to demonstrate some of his marvellous discoveries h marked an epoch in chemistry. He hoped Sir William say would be spared for many, many years, and that his iant career might be continued with advantage to the ent generation and to posterity.

r WILLIAM RAMSAY thanked the President for the very words he had said. His connection with technical istry was very small, but perhaps on that account he t be able to take the position of the outsider who saw . of the game. At any rate his chief business had with education, and there was no doubt that the best s of education and the study of technical chemistry closely associated. He came as one of the successors very illustrious line of Presidents, and he would avour to hand down the tradition of that presidential unimpaired.

e General Secretary read the Report of the Council.

REPORT OF THE COUNCIL.

The number of members on the register is now 3,950, as compared with 3,794 at the last annual meeting. During the year 380 new members have been elected, as compared with 340 last year; and the losses have been 224, as against 181.

There have been 44 deaths, as compared with 29 last year, viz. :—Sir F. A. Abel, Dr. C. M. Aikman, F. Baden Benger, G. Bischof, Geo. Booth, A. Crosbie, W. A. Curry, Kirkman Finlay, Major L. Flower, Wm. Foulis, G. T. France, Robt. Free, H. B. Fulton, Dr. J. H. Gladstone, Robt. Hasenclever, Z. J. Heys, Quintin Hogg, Prof. J. J. Hummel, Robt. Jackson, Dr. T. A. Lawson, J. G. Little, Jas. Mactear, F. Tremills Martin, Jas. Mason, Paul Mellors, Edw. Milner, Dr. Henry Morton, Jno. Moss, Edw. Ostlere, Andrew Pears, jun., Jos. Reddrop, W. A. Richards, E. W. T. Richmond, Robt. Ritchie, Jno. Robbins, G. H. Robertson, Dr. Edw. Schunck, W. Cross Sellar, W. Harry Stanger, Jas. Stevenson, C. M. Stillwell, G. W. H. Taylor, Thos. Ward, and Alf. Wertheimer.

The yearly volume of the Journal for 1902 numbered 1,570 pages, equal to 65·5 pages per issue, or, for comparison with the table in the last report, 131 pages per month, as against 107 in 1901.

During the past session 81 original papers, together with discussions, have appeared in the Journal, as compared with 110 in the previous session.

The attention of the Council has been drawn to the necessity for the adoption of a uniformly concise method of expression in the papers submitted, owing to the increasing difficulty of keeping the Journal within desired dimensions. The abstracts of Journal and Patent Literature are indispensable, and the space available for papers is therefore limited. In future Chairmen's addresses will not be published as a matter of course, but will be treated like all other communications brought before the Society.

The Honorary Treasurer will submit his financial statement, which appeared in the issue of the Journal for June 30th last.

In October last a communication was received from the Home Secretary, stating that His Majesty the King was pleased to receive graciously the resolution adopted at the Annual General Meeting at Liverpool.

In response to an appeal for funds from the National Physical Laboratory the Council has made a grant of 300*l*., in three annual instalments of 100*l*., from the funds of the Society, to assist the Laboratory in carrying on its work. Mr. R. Forbes Carpenter has been elected to succeed Mr. Geo. Beilby on the board of management.

A committee has been appointed to consider the question of improved means of transport of goods and raw materials in Great Britain, and to draft a series of questions to manufacturers. A circular has been issued and the replies are being collated with a view to taking public action.

The Finance Act of June, 1902, section 8, gave rise to a hope that it was the intention of H.M. Government to frame certain regulations for the use of alcohol free of duty for manufacturing purposes. The subject was considered of such importance that a joint committee of this Society and the Chemical Section of the London Chamber of Commerce was appointed to deal with the matter, and a series of questions were issued with the object of eliciting facts and statistics on the advantage to British trade likely to be derived from modified regulations. A letter was addressed to the Board of Inland Revenue in order to ascertain whether the proposed regulations would be of a general or specific character. To this letter a reply was received which appeared to indicate that no general regulations would be framed. The joint committee then issued a circular in which the opinion was expressed, (1) that the inability of chemical manufacturers to use alcohol free of duty seriously hampered the industries of the country; (2) that the Customs Consolidation Act, 1876, Appendix F, recognised that injustice might be done to the Revenue by the importation of substances in the manufacture of which alcohol had been used, although not remaining as such in the finished products, or capable of being reproduced therefrom; (3) that the industries of this country were diverted from their natural channel and the trade in chemicals with our colonies seriously threatened by countries able to work under more favourable fiscal conditions, and that steps should be taken to amend the regulations for the use of alcohol for manufacturing purposes; (4) that the Government were unlikely to consent to an inclusion in the Customs tariff of the substances referred to in the Customs Consolidation Act, 1876, for this would not only injure those industries which the Government appeared to desire to benefit, but would also destroy much of the home trade with the colonies. The replies to the circular made it evident that the duty on alcohol crippled industry, hampered research, and retarded progress. Alcohol should be duty-free to the manufacturer; he should be able to use it in a pure state, with permission to recover it. In short, free and cheap alcohol is absolutely necessary for industrial purposes. The following resolution, formulated by the Manchester Chamber of Commerce, was adopted at a meeting of the Associated Chambers of Commerce held on March 6th, Lord Avebury in the chair: — "That the provision of section 8 of the Finance Act, 1902, requiring the payment of duty on imported pure spirit for manufacturing purposes, at a rate equivalent to the difference between the Customs and Excise duty on spirit, adds about 50 per cent. to the original value of such spirit, and this addition places British manufacturers who use it in a position of serious disadvantage in relation to their continental competitors, who are able to purchase it entirely duty free, and that representations be made to the proper Government department with a view to the removal of this disadvantage."

In co-operation with the Royal Society and the Chemical Society this Society undertook the organisation of a representation of British Chemists at the fifth International Congress of Applied Chemistry recently held at Berlin. The President and about fifty members of the Society attended. In response to a notice published in the *Tageblatt*, a meeting of English members of the Congress was held on June 3rd, and was attended by 38 representatives of the following Societies: — Society of Chemical Industry, Chemical Society, Institute of Chemistry, Royal Society of Edinburgh, University of Glasgow, Society of Dyers and Colourists, Federated Institute of Brewing, and British Pharmaceutical Conference. Mr. Ivan Levinstein was elected chairman, and was unanimously deputed to invite the International Congress of Applied Chemistry to meet in London in 1906, the invitation to be given on behalf of the Society of Chemical Industry and other societies interested. At the close of the proceedings of the Congress this was done. Invitations to visit Rome, however, had been received on two previous occasions, and on the proposition being put to the vote, Rome was selected by a narrow majority.

In May, the Council acceded to the application of 30 members, residing in New South Wales, to form a "Sydney Section" of the Society.

The Chairman and Vice-Chairmen of the Canadian Section have been nominated to represent the Society at the Congress of Chambers of Commerce of the Empire to be held at Montreal on Aug. 17 next.

The Council feels it a subject for congratulation that the Patent Bill, referred to in the last report, has been passed into law. The efforts of the Chambers of Commerce, supported by the Society, to provide for the effective and *bona fide* working in this country of English patents held by foreigners have been successful, and the new Patent Act, which is retrospective in its action so far as clause 2 is concerned, is now in operation. The obligations on the part of foreign patentees to either work their patents in this country, or grant licenses to others, are clearly defined in the new Act, and the rules of procedure are clear and definite.

For some time past the Council has been of opinion that the position of the Society would justify the grant of a Charter of Incorporation, and that such recognition would add to the dignity of the Society, besides giving it a legal status. Accordingly a committee was appointed to take preliminary steps in the matter, and assurances of so encouraging a character have been received that the Council proposes to ask the members of the Society to authorise the presentation of a petition to the Privy Council.

The Committee appointed by the New York Section make arrangements for the meeting in 1904, to whi reference was made in the last report, has requested Pr Edward Hart, of Lafayette College, Easton, Pa., to subm to the members a tentative programme for the New Yo meeting.

The President drew attention to the reference in t report to the grant to the National Physical Laboratory, whi he said was on similar lines to the Physikalische Reich anstalt in Berlin, which had done so much useful work f the trade and industry of Germany. It had long been f that a similar institution ought to be established in th country, and the Government having at last been prevail upon to take the matter up, the National Physical Labor tory was opened last year. But whereas the Germ Government gave 200,000*l.* towards the building of t Berlin laboratory and an annual subsidy of 17,000*l.*, t British Government only contributed 13,000*l.*, and a subsi of 5,000*l.* a year for five years. In those circumst voluntary assistance was absolutely necessary, and when appeal was made for contributions the Council drew up the Society's funds to the extent of 300*l.*

Mr. Christopher Rawson moved the adoption of t Report, which he thought was an exceedingly satisfacto one.

Mr. Thorp Whitaker seconded the motion, which w agreed to.

The Treasurer's Report.

Mr. Samuel Hall, Honorary Treasurer to the Societ read his Annual Statement for 1903 (this Journal, June pp. 728—729). He said that, as intimated last year, the was one great difference between these accounts and the previous ones. Their 21st year had been rendered memo able by the Journal being published twice monthly, and the insertion of abstracts of French and American patents to date. These improvements were entirely due to t initiative of the President, Mr. Levinstein, and to his ener in carrying them out. There was hardly a country to wh the Journal was not sent, and in it the members had t world's best journal of the chemical industries. The of the Council's new arrangement with the publishers w that the Society paid them a subsidy and gave them t right to take all receipts from advertisements. From t cause the receipts appeared in the accounts some 4 less than in 1901. On the other hand, printing and pu lishing was considerably less.

Life members, having paid their composition fees we of course, exempt from ordinary subscriptions. Entran and composition fees amounting to 422*l.* were accordin not reckoned as part of the annual income, as, very proper they were always invested; and they had been able to a to these fees during the year sufficient savings to e them to invest 977*l.* in Great Western 5 per cent. Preferen Stock, and during this present year (1903) to invest 80 in Midland 2½ Guaranteed Preference Stock.

There had naturally been an increase in the editori expenses; these amounted to 261*l.* in excess of 1901; a 100*l.* for an assistant in the office. Sectional expenses a sundry printing were both less, while other items remain much the same.

The net result of the year 1902 was a balance to t good of 458*l.* 3*s.* 5*d.*, notwithstanding a donation of 10 to the National Physical Laboratory, which would co for two years more, and a payment of 258*l.* on account the Decennial Index, 1905. Together these items am to 816*l.* 3*s.* 5*d.*

In his remarks last year he had said, "it is difficult forecast the exact bearing of the expenses under the n arrangement, but I believe we shall still have a sub balance at the end of the year." That had been fulfil He could not, however, conceal from himself or from th that advertisements had not increased, as both the Coun and the publishers hoped. They had a good agreem with the publishers, but it might in fairness require so modification. The advertisements had hardly been de with as well as they might have been. They should be od medium for bringing, on the one hand, to the notice members and readers, materials, plant, &c.—things that ıst be constantly wanted in works; and, on the other hand, those who had things to sell, to bring their goods to the tice of users. The circulation was at least 4,500 fortghtly, and any who could see their way to advertising in Journal would be helping at the same time the general angement.

The **President** said he thought both the Report and Balance Sheet were satisfactory as they were increasing ir funds and also their membership.

Mr. C. **Wightman** moved a cordial vote of thanks to the asurer. They must congratulate themselves as a iety upon the fact that they had such a gentleman to fill position of Treasurer. He had had the honour of owing Mr. Hall's predecessor in that position for many ırs, and he could say nothing more in praise of the asurer than that he had proved himself a most worthy cessor of Mr. Rider Cook.

Mr. F. W. **Richardson**, City Analyst of Bradford, onded the motion, and it was agreed to.

Mr. **Hall**, in replying to the vote of thanks, said it was reat pleasure to him that his services were appreciated, l all he could say was that what he had done had been the sake of the Society. He had very great faith it, not only because it diffused useful information ongst its members, but also because wherever its ırnal and its influence went it propagated those liberal as for which he had worked all his life, and he thought t this general recognition of a common aim was of uable import, as it meant not only the amelioration of de jealousies, but also to some extent, of international erences.

PRESIDENT'S ADDRESS.

CENT LEGISLATION AND OTHER MATTERS AFFECTING OUR TRADES AND INDUSTRIES.

Since our last annual meeting several events have taken ce likely to affect in a greater or less degree the future elopment of our industries. Amongst these may be ed the passing of the Education Act, the enactment of Patent Bill, the clause of the Finance Act dealing with y-free alcohol, and we now hear of a contemplated rease in foreign tariffs. I propose in my address briefly discuss these topics and their bearing on our trade and nmerce.

Education.

I am addressing an audience chiefly consisting of scientific l professional men. I need not, therefore, labour the nt that superior education will substantially assist us in progress of our manufactures. This question has been fully thrashed out during the last 20 years that little be added with regard to it. Indeed, in my opinion, a exclusive importance has been attached to this special tor in industrial progress when comparing other nations h our own. My friend Professor Dewar, for example— l he does not by any means stand alone in such assertions stated, in the admirable address delivered in September t year in Belfast, that the present industrial position in rmany is entirely due to superior education. Now ıcation is one of the causes of German industrial progress, gree. There are, however, others which the Professor itted to record, and to some of which I referred in my lress of last year. I maintain that America and Germany uld not have obtained their eminent industrial position for their fiscal policy. Their prosperity could not have n created without the high tariffs which they have put against our traders, or without other legislative measures ich have benefited their trading community to a high gree. In the case of Germany, industrial progress has n helped, in addition to high tariffs, not only by the vantages of superior education, but by the unification of various German States after the Franco-German war, ich gave an internal free trade to the German nation, population of which is to-day almost half as large again that of the United Kingdom. The nationalisation and ension of her railways and canals, and other factors to which I referred last year, have again been contributory to her phenomenal progress.

In the case of America, she is self-contained, and in addition to her great natural resources she has internal free trade with a population of about 80 millions, and against outside invasion she has protected her manufactures by high tariffs. With regard to technical education, I do not believe that we are in any way behind her, except, perhaps, in metallurgy and mining. Personal investigation has convinced me that in the teaching and in the knowledge of some branches of science, especially of chemistry, some of our university colleges and some of our best technical schools compare very favourably with the best institutions of a similar character in America. That she is making strenuous efforts to improve her educational apparatus, and that the American nation is getting more and more convinced of the money value of scientific training, there is no doubt. Opinion is, however, just as with us, unfortunately divided as to whether the future technologist or commercial man should specialise at an early age, or whether he should begin his special studies at an age that will allow previously that thorough systematic training in general subjects and broad cultivation of the mind which in my view constitute the principal advantage of German education.

The industrial progress of a nation cannot depend alone on technical education. It must largely depend on other factors, such as the character of the people and the conditions under which they live and carry on their work; the natural resources of the country, its climatic conditions, and geographical position; and not the least, I maintain, on wise and sensible legislation. If this were not true, how could it come about that Austria, for example, in spite of her excellent schools and universities, her high standard of general education, which compares favourably with that of Germany, fails comparatively in the expansion of her internal and external trade? Why is Belgium, with a comparatively inferior standard of education, probably the foremost nation in Europe, as regards industry, in proportion to her population? Education is, however, a great factor in industrial progress and I want now to go into more details on this point.

The Education Act of 1902.

After a severe struggle, in which the question of education pure and simple was treated more or less as a side issue, the Education Bill has at last become law. That this Bill will be of value in the improvement of primary education is generally admitted, but under present conditions it is doubtful whether it will, in the immeditate future, advance secondary education, in which we so lamentably fail in this country. In the first instance the number of men appointed on the various education committees by county and borough councils, representing secondary education, is exceedingly small, and with a largely preponderating majority of representatives of primary education, less attention is likely to be paid to secondary education for some time to come. There is, however, another reason which may stand in the way of progress.

Secondary education, if we really mean to raise it to something like the German standard, will be very costly. Now the expenditure on primary education, under the new Bill, is bound by the provisions of this Act to absorb such large sums of the ratepayers' money that it is only natural that (taking into account their constitution) the education committees will be very reluctant to incur the additional expenditure required to make secondary education efficient. It is quite true that the Bill empowers education committees to raise all funds for secondary education from the rates; but it does not oblige them to spend a penny. It is only reasonable to expect that the majority of the committees which are elected by the ratepayers will have to exercise very great discretion in order not to forfeit the goodwill of their electors, and the majority of the ratepayers scarcely appreciate the great value and importance of secondary education.

The failure to carry out, without delay, a scheme for improving the higher education of the people in an efficient manner will largely take away the intended benefit of the Act.

Without improved secondary education the work of our technical schools and university colleges will be kept at a standstill. To erect magnificent technical schools and to found universities is putting the cart before the horse, unless we have a sufficient number of boys ready prepared to take real advantage of their teaching. Everybody knows that at present this is not the case. What appears to be immediately required is the equipment, in all important centres, of first-rate secondary schools of the German "Realgymnasium" type. In some cases existing school buildings might be adapted to the purpose, in other cases the erection of new buildings might be found necessary. Schools ought to be built in the least expensive style, without ornamental architecture, without costly laboratories, but staffed with the very best and most able teachers—men who have graduated with distinction at our universities. The remuneration of these men must naturally be high; but the school fees must be low, in order to give proper chances to able youths of moderate means. The leaving certificate of such a secondary school ought, as in Germany, to give the right of entrance without any further examination to our best technical schools and universities. If we carry out these, or similar proposals, then we shall be able simultaneously to raise to outsiders the standard of the present entrance examination of these institutions. Remember that we do not want to crowd our professions with incompetent men, of whom we have already far too many, but to select as far as possible the most able of our people and to give to them the very highest training. Our present system tends to pauperise the profession by turning out a large number of men inadequately prepared for their work and proportionately ill-paid. A stiff entrance examination will help to sift out capable and industrious youths from the ranks of indolence and mediocrity. The chemist or engineer, trained in this manner, will in the future occupy a higher social position than at present. Increased efficiency will not only raise the standing of chemists and engineers, but will undoubtedly also tend to raise their pecuniary remuneration.

Since this address was written Lord Rosebery has announced that a wealthy firm has promised to provide a very large sum of money for the erection of a "London Charlottenburg." Mr. Haldane, K.C., M.P., who is represented as the initiator of the scheme, declares that this school is to be only a pioneer, and that at least five more institutions of the Charlottenburg type should be founded in Great Britain. Now such munificence on the part of private firms cannot be too highly appreciated, and Mr. Haldane's enthusiasm deserves every respect. But I must seriously question Mr. Haldane's opinion that the erection of five or six Charlottenburg schools would very much improve our position as far as technical education is concerned. In my opinion his scheme is premature. I would ask Mr. Haldane, "From whence are suitably prepared students to come to take real advantage of the teaching provided in these future Charlottenburg schools?" The difficulty, let us remember, has hitherto not been to find funds for the erection of new technical high schools.

Those who have devoted a large part of their life to this question know full well that the already existing schools are starved, and will be for a generation to come, for want of properly prepared students.

We have in this country 20 universities and university colleges in which technological subjects are taught, and about 70 technical colleges and schools. The total number of day students, according to latest information, aged 15 years and upwards, taking complete day technological courses in these 90 British educational institutions is 3,873, or an average of 43 students for each institution. Of these 3,873 not 10 per cent., I am convinced, could pass the entrance examination of Charlottenburg. On the other hand, at nine technical high schools in Germany, in the year 1902, there were 15,142 day students, entering at the age of 18 years and upwards, of whom 12,422 have passed the extremely difficult matriculation examination of their secondary schools (Gymnasium or Ober-realschule). The average number of students for each German Technical High School is thus 1,718, compared with 43 in this country. Do these figures point to a scarcity of schools, or do they point to the want of a sufficient number of properly equipp students, ready to take advantage of them?

Consider the case of the new Municipal School Manchester, "the Manchester Charlottenburg." This m nificent school, excellently equipped (as I have emphasi before) for scientific research work in several branches technology, has 200 day students. Of these perhaps l than 20 are adequately prepared and possess suffici general knowledge to take full advantage of the splen opportunity that this school provides. Of the whole 2 students I doubt if 10 could pass the entrance examinati of the Technical High School at Charlottenburg.

The clamour for technical education as generally und stood appears to me in many respects unjustified, or least misleading.

What we really want is a large number of men w have enjoyed the highest scientific training. To att this end, the first condition is not by any means to erect additional number of technical high schools, but to ha a very large number of boys available who have b thoroughly trained in general knowledge and are ready benefit from the existing facilities for higher educati It is here that the "shoe really pinches." Establish system of high-class secondary education accessible to grades, give sufficient inducement for the boys to st long enough at school, and you will find that effic scientific and technical education will follow here just as did in Germany.

Do not misunderstand me; it is far from my mind belittle the munificence or the aims of the generous do to establish a great School of Technology in London, bu venture to suggest that in the provinces at least a m fruitful field would be found for the endowment w valuable exhibitions and scholarships of first-class second schools in addition to those already existing, than in t multiplication of technical schools.

The Department for Preparing, Bleaching, Dye Printing, Mercerising, and Finishing Textiles, together with the Manufacture of Paper in t Manchester Municipal School of Technology.

The completion of this department, which is lodged i building apart from the palatial School of Technolo marks a distinct progress in the teaching of these cr I do not mean that Manchester was the first city wh recognised that they could not successfully be taught the ordinary means and appliances available in labo tories; but to Manchester the credit is due of building a supporting an installation on the industrial scale principa for teaching the treatment of vegetable fibres in their vari phases; their bleaching, colouring, and finishing, and t manufacture and colouring of paper, which is more co plete in detail and more magnificent in scope than a similar institution either here or elsewhere. Germany the country in which this type of school (that at Crefel the most famous example) was first established, but it diff in many respects from the new Manchester school.

I remember well, about 15 years ago, when I first urg the necessity of establishing such a school in Manches that there was a considerable divergency of opinion to faced, both on the part of the staff of the old school and others prominently connected with the teaching of techn science. Now that the building is complete there is almost unanimous spirit of confidence in its future. N only are the most modern machines, appliances, and ap ratus known to the manufacturers of this country to found in our school, but recourse has also been had Germany and France and other foreign countries for latest improvements connected with the textile trade. C has also been taken that as any one of the present machi or appliances become obsolete their replacement by m modern ones can be secured, for most of the machinery driven by separate electro-motors. It is, however, my intention to trouble you with details as to the ar construction, machinery, or appliances of this great but merely to refer to its educational value and proba influence on the various staple industries in which Society is largely interested.

We in this country excel in the production of first-class rn and cloth, made from first-class raw material, and in louring these with fast colouring matters. Our spinners d weavers are acknowledged to be more proficient than ose of other countries, and our humid climate is particu- rly suited to the production of the finer counts of yarns. s a proof of the efficiency of British foremen dyers and inters and colour-mixers, we find Englishmen and otchmen in many foreign dye-houses. If you inquire Berlin or in Vienna, or other capitals of Europe, you ll hear it confirmed by ladies, who are good judges of ese wares, that in the shops English silks and English oths command higher prices than the home-made articles, d this not on account of superior design, colouring, or ish, but for their better durability and better wearing alities. It is, however, clear that this class of goods is ly designed for the well-to-do. In the last 25 years, wever, a demand has sprung up in every country for ds of another kind, and this demand has been increasing proportion to the increase of wealth and prosperity ongst the middle and especially amongst the working sses. The market requires in increasing quantities ods which, although made from inferior materials, must e the appearance and possess externally all the qualities goods made from expensive and costly ones.

The factory girl is no longer satisfied with a simple dress a strong, well-wearing wool dress dyed in one colour. She v turns out on holidays adorned in silks, velvets, and furs; bonnets are trimmed in the latest fashion in all possible igns. The silks are probably weighted 200 per cent., velvets are cotton, and the furs are imitation. Wearing lities in these days are secondary considerations. The ncipal demand is for goods which appear to be better n they really are. New shades, designs, or patterns ught out for the best fabrics are reproduced with light- g-like rapidity on inferior goods. Now, it is in the duction of this lower class of goods that, in my opinion, foreigner has got the pull over us, not so much in colour- fabrics, but principally in designing, treatment, and ermixing of fibres, weighting, &c. Every day greater nands are put on our manufacturers, dyers, printers, shers, and designers.

ndependently of the great advantages that the foreigner sesses through protective tariffs, there is more art uired, and the difficulties to overcome are much greater producing cheap imitations than in producing expen- e fabrics from costly materials. Mere experience or e of thumb is insufficient; both must be combined h a knowledge of the scientific principles underlying se arts. Now I am well aware that some of our ge dye-houses and paper works are excellently well naged institutions and, especially within recent years, ploy chemists. Their work will doubtless bear com- ison with the best that is produced in any other ntry; but at the same time it will be granted that, adly speaking, rule of thumb is yet the guiding principle many dyers, finishers, and kindred craftsmen. Again, he dyeing, printing, paper-making establishments, &c., in ch chemists are employed, the latter very rarely indeed ome managers of such works or take a leading part in r internal work. Most of them are chiefly employed in ing dye wares and drugs, and become in the course of e, to a greater or less degree, what may be called mere sting machines." The whole management and the real k of the factory is largely left to the practical man. y? you may ask in amazement. The reply is simple ugh. These chemists, when entering the works, have dequate knowledge of engineering, nor of the special nt and machinery used in the works. Many difficulties, ever, occur in practice, which are caused by a defect in plant and machinery, and the chemist without this cial knowledge is perfectly helpless to overcome them. s left to the practical man to get his employer out of the ldle, and consequently the chemist, instead of being the er, has often to play second fiddle to the practical n. On the other hand, there are a number of problems solution of which requires a knowledge both of the hanism of the plant and of chemistry, and where wledge of the one is of little avail without knowledge of the other. It is here that the knowledge of the practical man is entirely insufficient and where the usefulness of the chemist-engineer is apparent. Even chemists appointed in print, dye, or similar works purely for research should possess the necessary mechanical knowledge. A proper discrimination between what can and what cannot be employed in practice will save him time and labour, and his employer much fruitless expense. It is further of great advantage to be able to give the engineer of the works an indication in what manner the result of the research may be carried out on a large scale. It was with the idea in our minds to remove the defects in the existing training of the future colorist or tinctorial chemist destined to take a leading position that this school was established.

The Manchester tinctorial school expects every student before entering into the dye-house to take and pass in a two years' course of chemistry at the day school, unless he possesses an amount of chemical knowledge equivalent to that obtained during the two years' course in the school. I hope that this term will presently be extended to three years, for we want men to come to the dyeing school after a thorough scientific training. Here the young chemist will have an opportunity, previous to taking a position in the works, of making himself thoroughly acquainted with the actual machinery used in the largest and best equipped works for bleaching, dyeing, finishing, or mercerising yarns and fabrics, and also the making and colouring of various kinds of paper. Research is carried on and investigations are made on the properties of all vegetable fibres and materials in connection with the spinning and weaving school, with a view to solving problems that are actually met in the work of the mill. In this way an entirely different class of chemists and colourists will be trained up and introduced into our industries. The university graduate, entering an industrial concern as a research chemist, devoid of technical or practical knowledge, ignorant of the point of view of his employer, is frequently the cause of friction. His ideas are often unpractical and his experiments expensive. Not knowing the needs nor grasping the point of view of a manufacturer, he frequently proves anything but a success, and consequently there is a difficulty for such young men, although able and well educated, and possessing the foundations for a useful career, to find employment. But I venture to predict that an average intelligent young man leaving this school after a three years' study of chemistry and 12 months' course of practical work in addition, will very readily find remunerative employment. Further, I venture to say that there will be a great increase in the number of our manufacturers employing chemists of this type in their works.

Let me add that a student who has passed through this school will have a wide range of technical work open to him, for he will be fully qualified to take a position not only in dye, bleach, print, mercerising, or finishing works, but also in paper mills. In possessing a knowledge of the machinery used in these various processes he will have a great advantage over the practical man who has only experience of one kind of machine and special knowledge of only one trade. He should be able to suggest to his employers more modern machines, or new appliances, for the school possesses, as I have mentioned above, for every operation, that machine which a competent selection from those used in the best British and best continental works has proved by experience to be the best.

It may be of interest to know that the school authorities intend to undertake investigations for local manufacturers and merchants of problems relating to the colouring or finishing of goods and, in general, the solution of technical difficulties which may be met in their business. Such work must be of a character, let me add, which excludes it from being taken up successfully by the consulting chemist or by other institutions existing in the neighbourhood. Finally, let us remember (and I wish this to be clearly understood) that the young man leaving school is not supposed to be a proficient or experienced dyer or printer, &c. We recognise that you cannot acquire by a course at a school that knowledge of a trade which comes through years of practice. But he will have the fundamental technical knowledge which is imparted by a study of the mechanism of various branches of industry in conjunction with a thorough systematic chemical education. Such a man will at once make himself useful to his employer; in the course of time, with added experience, he may become invaluable. The department is under the competent directorship of Mr. J. Hübner.

Patent Law Amendment Act.

When addressing our members at Liverpool in 1902, I expressed the opinion that the Bill in the form then contemplated by the President of the Board of Trade would not become law. The Patent Amendment Bill which has come into force in the meantime differs, as I predicted, very substantially from the Bill before the House last year. If I now venture again to refer to it, as briefly as possible, my apology is twofold. In the first place, the effect of the Bill in some respects is scarcely understood and appreciated by many interested in this question. In the second place, to look back to the proceedings that were needed to force the hands of our legislators may be not altogether without interest, and possibly not uninstructive.

For more than 20 years our Society has been agitating for the reform of the Patent Law, and a large number of papers have been published in our Journal dealing with this question. It was in 1897 that the first practical step was taken by the Manchester Chamber of Commerce. A large and representative deputation called on the President of the Board of Trade and made clear to him the great injury inflicted on British industries owing to the ineffective character of section 22 of the Patents Designs and Trades Marks Act, which dealt with compulsory licences. In consequence of the very encouraging reception given to this deputation by the late Sir Courtenay Boyle, representing Mr. Ritchie, the Chamber decided that it was advisable for our firm to lodge a petition with the Board of Trade for the grant of a certain licence, as a test case for the special purpose of trying the efficiency of section 22. The hearing of the petition to the Board of Trade took the form of a trial in the law court; it extended over 11 days, and, although the compulsory licence was granted, the utter uselessness of this section for all practical purposes was abundantly proved. But the application served one good purpose. Mr. Ritchie resolved to appoint a departmental committee, under the chairmanship of Sir Edward Fry, for the purpose of inquiring into the "working" of patents (section 22). As soon as the resolution became known, the Manchester Chamber submitted to Mr. Ritchie, firstly, the desirability of nominating on the contemplated committee inventors and manufacturers interested in the Patent Law, and acquainted with the work and administration of the Patent Office; and also, secondly, the necessity of extending the scope of the inquiry. When, however, the list of members of the departmental committee was published, it became evident that attention had not been paid to these suggestions, for neither inventors nor manufacturers acquainted with the working of our patent laws were represented on the committee. Remonstrances as to the constitution of the committee and the too limited scope of the inquiry brought forth the reply "that the Board of Trade regrets to be unable to vary the terms of reference, or add to the numbers of the committee." Now, consider for a moment the consequence of appointing this departmental committee, on which neither the interests of inventors nor manufacturers were adequately represented. The report issued by the committee contained certain recommendations which Mr. Gerald Balfour, the successor of Mr. Ritchie at the Board of Trade, was, in the first instance, determined to carry out. Any obligation whatsoever on the part of foreign patentees, either themselves to work their English patents in this country, or to compel them to grant other persons licences to do so, was to be deleted from the statute book. The only obligation of foreign patentees to this country, according to the departmental report, was to supply the reasonable requirements of our markets with foreign-made goods. The position was, therefore, a very serious one; the report was out, and Mr. Gerald Balfour meant to carry its recommendations into effect. A conference was, therefore, convened by the Manchester Chamber on June 26, 1901, of all industrial Chambers of Commerce, and certain resolutions were subsequently passed condemning the recommendations of Sir Edward Fry's committee regarding the propos amendment of section 22. About three months later I h the honour of moving these resolutions at the autumn meeting of the Associated Chambers of Commerce of Gre Britain at Nottingham, and they were passed practical unanimously by about 200 representatives of the Associat Chambers.

Further delay occurred before these resolutions could made effective. The London Executive Committee of t Association was of opinion that it would be sufficient transmit these resolutions to the Board of Trade. It now certain that if such a course had been actually adopt they would have been shelved, and the recommendations the departmental committee, as they stood, would have be passed into law. The Manchester Chamber, on the oth hand, urged the necessity of introducing a deputation to t President of the Board, and at last the Executive Cou was moved to enquire whether the President would recei such a deputation.

The reply was to the effect that the President was fu alive to the importance of dealing with the subject patent law reform at the earliest possible date, and that did not think that to receive a deputation at the prese stage would serve any useful purpose. But, in the mea time, Manchester had secured the support of more than quarter of a million of working men, represented by th trades unions, of a considerable number of the largest ma facturing concerns in the country, and of practically ev interested Chamber of Commerce, of many power associations and societies, amongst these the Incorporat Law Society; and, finally, they had with them a la number of influential members of Parliament. When became known that such a representative deputati probably unique in its character, and representing so ma widely varied interests, was organised, Mr. Gerald Ba was moved to reconsider his decision, and finally resol to receive the deputation. To this deputation and to th who organised it, the fact is undoubtedly due that t President of the Board very substantially altered t departmental committee's recommendations regarding co- pulsory licences, and that a Bill has become law which now generally admitted to be sound and to be equita to British inventors as well as to British manufactur. Surely it should not have required so many years of c- stant agitation, and so much expenditure and labour on part of private individuals, to pass a Bill which is so m- festly just to our trade and commerce. It is, howev, lamentable to contemplate the millions of money wh this country has lost by the delay in amending the pat laws, and to reflect upon the enormous difference that would have made in the position of the chemical and all trades and other industries if the Bill of 1902 had co into force in 1883, when attention was first called to inefficiency of section 22, instead of twenty years later.

I need not take up your time with a repetition of wording of either the new or the old Act, both of which be found in full in our Journal; but let us consider fo moment the probable working in actual practice of the Act. An opinion has been expressed that the provi- of an appeal to the judicial committee, on account of great expense, seriously interferes with the advantage the Bill, and might make it almost abortive. I do share this opinion. An appeal to the judicial commi will be of very rare occurrence. According to the pr- dure laid down by the new Act, a petition for a licenc in the first instance, lodged with the Board of Trade. latter has to decide whether the petitioner has made a *prima facie* case or not. Its decision is practica equivalent to a verdict on the first hearing in the Courts, without the enormous expense and delay attac to this method of procedure. If the judgment is aga him, it stands to reason that the foreign patentee w prefer to make reasonable terms with the petitioner ra than risk the revocation of his patent. I go even fart than this. Since the law is now, at last, clearly d fin, even petitions to the Board of Trade will not be of freq occurrence, as friendly arrangements will be made betw the parties concerned in 90 cases out of 100 without re- ence to the Board This is the case in Germany, where requirements of the law are similar.

FOREIGN TARIFFS.

Probably no manufacturing town has received at various ıes harder blows from foreign tariffs than the one which tends its hospitality to our members to-day. If Bradford s survived the repeated onslaughts of foreign nations on trade, it is due to the ability of her manufacturers and the high intelligence of her merchants, and perhaps, o, in no less degree to the self reliant, thrifty, and enuous Yorkshire working man.

We are threatened to-day from almost all parts of the obe simultaneously with a great increase in the duties a number of articles which this country produces and on the export of which its prosperity largely depends. may be true, I grant, that the new increased tariffs not proposed in a hostile spirit towards this country particular. It is likely that in some instances they are posed merely to raise additional revenue, or perhaps found or to foster an industry that seems to require ditional protection before it can become firmly established. But whatever the motive or object may be of these called fighting tariffs, it is absolutely certain that as soon they are put into operation further serious injury will inflicted upon our trades and industries. I am quite are of the fact that some of the proposed higher rates subject to modification, as a result of negotiations for commercial treaties, and that any reductions of rates duty on any article which may be thus arranged ongst the fighting-tariff countries will also apply to the ne class of British goods. But, in many instances, this called "most-favoured-nation clause" will be of little ıctical value to us, as I will now show.

Many articles which we export to protected countries not articles which are exported in any perceptible ıntities by any of them. It may therefore be assumed t the goods in which we are far more interested than other country will not form the subject of negotiation ween the fighting-tariff countries.

et me give the new proposed Russian and Austrian ffs for higher counts of cotton yarn as illustration.

RUSSIA.	RUSSIA.
xisting tariff for single leached yarn:—For all ıts above 50's 1*l*. 13*s*. 7*d*. per .	New tariff for single unbleached yarn:—For counts from 60's to 80's inclusive, 5*l*. 5*s*. 1*d*. per cwt. For higher counts above 80's, 7*l*. 4*s*. 6*d*. per cwt.

AUSTRIA.	AUSTRIA.
xisting tariff for single unched yarn:—Above 50 to 60 ıts. 33·33 kronen per 100 s. (1 gold kr. about equal to lling). For all counts above 8·57 kr. per cwt.	New tariff for single unbleached yarns:—Above 50 to 70 counts, 38 kronen per 100 kilos. For all counts above 70, 43 kr. per cwt.

hese new duties of Russia and Austria are prohibitive. re is no "fighting" country (except Switzerland) ely interested in the export of high-count yarns. sequently the new tariff will become a fixture, and we l have to quietly submit to it, in spite of the most-ured-nation clause.

he closer general survey of the new scientific tariffs als the fact in a more pronounced way than is at first ırent, that, like their predecessors, the proposed higher es are excessive for more refined articles and goods, and paratively moderate for crude articles.

he result of this policy must clearly be that very soon shall only be in a position to export to tariff-ridden ıtries raw materials or goods in partly finished condi-, such as yarns and grey cloths. We shall be forced eave to our foreign competitors the task of converting ı into more highly refined or finished products—the ly profitable part of manufacturing.

here is involved in this state of things a very serious ques-, the consideration of which is of close and personal rest to the members of our Society. We cannot but erve that the very highest skill and technical knowledge required, not in the production of raw or intermediate lucts, such as, for example, yarns or grey cloth, but er in converting the latter into the more refined and rious articles of daily use. It is therefore reasonable to say that the efforts of tariff-ridden countries to close their markets to the import of more refined goods will have the effect of limiting in a still more marked degree the employment in our industries of highly trained men, educated in universities and technical schools. Is this not the very class of men upon whom we have lavished and are lavishing such vast sums of money, and from which this Society draws the majority of its members? Take, for instance, the manufacture of velveteens, or Manchester velvet, not because this affords us a particularly novel or startling example, but merely as a random illustration out of many similarly situated trades and industries. Velveteen was first produced on an industrial scale in Lancashire. In the raw state it constitutes a specially woven cotton cloth, which, by the successive operations of cutting, raising, preparing, dyeing (or printing), and finishing, may be converted into an article similar in appearance to real velvet. Now in this conversion dyestuffs, oils, pigments, heavy chemicals, finishing materials, and the many drugs used for mordanting, dyeing, and finishing are used, which are chiefly supplied by the home producers in the country where these goods are made. It is in these industries that highly trained technical assistance is particularly required. You will see, therefore, that an attempt at further restricting our export of these goods affects not only the employment of unskilled labour, but reduces the demand for highly trained artificers, craftsmen, designers, engineers, and chemists, who would otherwise be employed in these and collateral industries. The decline of the chemical, silk plush, carpet, &c., industries occurs to me as a further instance of the effect of increased foreign tariffs on the employment of highly skilled, technically trained men. The velvet case furnishes, however, another instructive illustration of the injurious effects of these tariffs on our trade. The crude velvet cloth may be exported to certain foreign countries on payment of a comparatively low duty, but even this duty is refunded if the cloth is refined in the respective country and exported, say, to our own or to other markets. Here we have a good example of the scientific tariff. The import duty on finished velvets is much higher, and is practically prohibitive. A premium is therefore directly placed on the employment of labour for work that requires the highest technical skill, since a rebate of the duty is granted on imported crude velveteens, which are subsequently refined and exported in the finished state. Once we supplied the markets of the world with this fabric. Now, Manchester velveteens are made in foreign countries in large quantities under the protection of high tariffs. Their manufacturers not only supply their own markets, but sell a considerable and increasing amount to our country and to our colonies. Germany's export of velveteen is steadily increasing, whilst ours is as steadily decreasing. It is the old story. The foreign manufacturer, urged by large profits in his home market to enlarged production, dumps the surplus upon this market at prices ruinous to our own makers.

The question may be fairly put here, Have these and allied trades declined on account of our alleged inferior technical education, or is their decline not principally due to the imposition of high tariffs? I think the best answer that can be given to this question is to briefly consider how these trades were established in America and elsewhere; and I have principally in mind Bradford goods—coat linings, velveteens, plushes, carpets, &c. In the first instance the foreigners imported our spindles and looms, they imported our spinners and weavers, and when the British machinery was put up by British hands, and the goods were ready to be bleached, dyed, printed, or finished, they imported our bleachers, dyers, printers, and finishers. Even this very day our foremen dyers, printers, and finishers are in demand in foreign parts. I was struck, on my recent visit to the United States, by the large number of British workmen, most of them in leading positions, employed in the largest American dye, print, and finishing works. In fact, in some of these works I found the whole staff British. When visiting the mills in New England, I heard almost as much Lancashire, Yorkshire, and Scotch dialect as one hears at home. In the few velveteen works I saw, either the proprietor was English or the principal dyers and finishers hailed from Lancashire. But what struck me still more was that they did not produce the articles which they took from this country to plant them in the United States in any superior quality. The men whom I met were more or less anxious to get technical information from the old country regarding their special trades. When submitting to me various samples of textile goods, the question was put, "Don't you think they are quite as good as they can be done in the old country?" They did not claim them to be superior to ours. The machinery and plant needed in these arts are now largely copied, and no doubt improved upon by the American makers, but much more with a view to turn out larger quantities than superior quality.

Now, I ask again, do these facts really point to superior technical education in these arts and industries, or is the enormous increase in the production of these goods by foreign rivals and formerly supplied by us not largely due to their high protective tariffs?

All kinds of foolish things are said to explain the success of the foreigners in underselling us in foreign and home markets in certain classes of coloured and finished products. Our water is not so well adapted for dyeing; the foreign dyestuffs are superior to our own on account of the better foreign technical education; our dyers are not capable of producing as good shades as theirs. Let us take these statements one by one. In the first place, the water found in Lancashire and Yorkshire is generally well adapted for the purpose of these industries, and it is ridiculous to attribute any defects to this source. The charge of inferiority in our dyestuffs can be dismissed at once. I am sorry to say that these are largely imported from abroad. Yet dyestuffs produced in this country are in every respect as good as the foreign products, and British dyestuffs are exported to foreign countries and compete successfully in foreign markets. If, however, our merchants occasionally contend that they can get certain goods better dyed and finished abroad, may the reason not be that the foreign producer, with lower wages, longer hours, and a higher profit secured by tariff, can devote more attention to the handling and finishing of the goods than we can afford?

Let us pass on to an illustration of quite another kind, which shows how the foreign tariffs are becoming more and more mischievous to our trade interests. During the last 10 years the production of electrolytic caustic soda and potash and bleach by the decomposition of brine and of potash salts, has been largely extended abroad. Germany is probably the largest producer of electrolytic alkali, but America is so rapidly increasing her output that before long she may head the list. Both countries were formerly our largest customers for caustic soda and for bleach. Both products are protected in these countries by high tariffs. These tariffs have reduced our exports to comparatively very small proportions, and as soon as their own production can meet the whole home demand these markets will be altogether closed to us.

But worse things are happening. Most of you are aware that in the electrolytic decomposition of salt much larger quantities of chlorine are obtained than of caustic alkali, and that whilst the demand for caustic alkali increases at a rapid rate, the demand for bleaching powder is almost stationary. The consequence is that Germany produces very much more chlorine or bleaching powder than she can place in her own market. By the nature of the process the German and American makers are forced to overproduce, and therefore export bleach, in order to supply the fast increasing home demand for caustic alkali. Her manufacturers realise a good profit in their home market, through the high tariff both on caustic alkali and on bleaching powder, and are thus in an exceptionally strong position. They are naturally able to export bleaching powder at a price which our manufacturers, not supported by a protected home market for either one article or the other, are unable to take. For a while an arrangement was in operation between our manufacturers and the German syndicate, not only as to the selling price of "bleach," but also as to the relative share of either party in our own and other markets. As the production of "bleach" increased in Germany, necessarily with the increased production of caustic, from year to year, this arrangement became untenable. The result was that the price of bleaching powder last year fell from 6*l.* 10*s.* per ton to 3*l.* 15*s.* The old price of 6*l.* 10*s.* pe ton left only a small margin to the British producer, whils at the present price he is a heavy loser. Indeed, German has it in her power to-day to ruin any British maker o bleaching powder who is solely dependent upon this articl Again, all such arrangements regarding selling price between foreign nations and ourselves have over an over proved to be impracticable, and more than once hav ended disastrously. Some wiseacre might suggest to u to stop the production of bleach in this country. Ou consumers, he may say, reap the benefit of the low price o bleach at which the foreigner is now supplying our ow and other markets to which we had hitherto sold this articl therefore we are not really losers. Bleach, however, is, a you know, an important subsidiary product in the manufacture of soda, and closing up the manufacture of bleach mean shutting up all our Leblanc alkali works. Many thousan workmen would not only be thrown out of employmen but millions invested in these works would be entirely los Moreover, if the foreigner succeeds in inflicting this enormous loss on our workpeople, investors, capitalists, and Imperial and local taxation, he would quickly enough lat on raise the price of bleach to our consumers, and thus afterwards inflict additional losses on our staple industries. I am however, somewhat surprised that our chlorine producer have not taken up the manufacture of chlorinated organ compounds such as monochlorobenzene and dichlorobenzene, mononitro- and dinitro-chlorobenzene, monochl and dichloro-aniline, &c. There is a large and increasin consumption of these products. I do not suggest that the substances would take up all or even more than a sma amount of the available chlorine, but their manufactu would mitigate in some slight degree the desperate positio of the chlorine industry.

With these facts before us we cannot be surprised many of our chemical industries are generally declinin If time allowed I could support these few illustratio by many others. Neither superior technical nor commercial education will enable us to scale the walls wh foreign nations are building higher and higher for th purpose of preventing us from selling our goods in the market.

In connection with the tariffs question, permit me t s a few words with regard to the slackness, on the part our Government, in making known to our traders at t earliest moment contemplated alterations of foreign tarif Every interested Continental trader was in a position ascertain about the end of January, by reference to t daily press, the increase or decrease in the tariffs of articl in which he was interested, proposed by Russia, Austr Germany, Switzerland, Portugal, and other countries. no such information was available in this country to o traders. An application made by the Manchester Chamb of Commerce to the Board of Trade in March, to furn the Chamber with information about the proposed n tariffs, elicited the reply "that the proposed tariffs are no in the hands of the translator, and will as soon as poss be officially published." The Russian tariff was only issu in May by the Board of Trade; whilst the complete Austr tariff, published in the *Neue Freie Presse* in January, h not, even to-day, been issued by the Board. The ex that these proposed tariffs are not final is scarcely to b Such official remissness is scarcely explicable, as it does r require a great amount of perspicacity to appreciate t importance to traders and exporters of knowing at t earliest date of any proposed changes in foreign tar Allow me to give you an illustration. A little while a I wanted to know about the Austrian tariff. I thoug the best thing to do was to go to the Austrian Consul Manchester. I wrote to him, asking him if he would me have a copy of the new Austrian Tariff. He wrote me in reply, stating that he did not know anything about I afterwards met him in the street, and he said, "Is th such a tariff proposed?" I replied, "It is not propos but it has already been passed by the Austrian Gov ment." I only want to give you an idea how serious it that our traders cannot get information of such an imp tant character at the same time that our foreign competit can get it.

Ministry of Commerce.

In spite of the efforts of a number of members of
urliament for the appointment of a Ministry of Commerce,
e have got no further. We do not require merely a
distribution of work amongst the various Government
epartments, as Government apparently thinks, but we
int a special Ministry of Commerce, with a Minister of
ceptional commercial ability and knowledge. Never was
ere a greater need for an able Minister of Commerce
an at the present time. The head of our commercial
fairs, who ought to have Cabinet rank, must be a man of
eat commercial knowledge, not merely theoretical, but
actical. That the outlook for our industrial expansion is
t bright will be generally admitted, taking into account
e ever-increasing production of articles by America,
ermany, and other countries, many of which were formerly
pplied by us, and in addition the proposed increased
riffs of foreign nations, against which we stand defenceless.
The momentous question is now before us, whether or
t a change in our fiscal policy is desirable. May this
estion not be rashly decided by phrases or catchwords;
t may the spirit of science, the search for truth, careful
quiry and investigation prevail, and guide the minds
those who have on their shoulders the very grave
sponsibility of shaping the future prosperity of this great
untry.

Sir **William Ramsay** said it was his duty to ask them
give a vote of thanks to the President for his most
mirable address. If he might be allowed to use a phrase
characterise that address he should name it an effort of
illiant common sense. The subjects which the President
d treated had been discussed with so much acumen, and
much perception of the real nature of the difficulties
ich oppressed them, and such a clear view of the remedies
ich were necessary, that no words of his were needed to
rease the importance of their verdict upon these subjects.
t if he might be allowed he should like to place before
m an analogy which he did not remember to have seen
ted before. It was the Prussians, he thought, who first
wed how a modern army should be organised. They
perimented with that army on Austria, and subsequently
France, with what success they all knew. They had at
rlin a council who arranged every particular of each
ssible campaign; the men were known who were to take
command, and from rank to rank the knowledge was
read as to what particular part each officer and each man
uld have to play in the campaign. The matter was not
t to chance. It was possible that in the earlier battles
h France some temporary successes might have been
ned by the French, but these successes would have
n only temporary, and in the long run the superior
anisation of the Germans was bound to win. Other
ions had copied Germany in regard to military tactics.
eat Britain and America stood alone in not adopting the
rman model of military preparations for possible invasion
possible war. All the other nations had adopted a policy
l organisation more or less resembling that of Germany.
appeared to him that an exactly similar policy was
ng pursued by Germany in the matter of industry.
would be curious if it had not occurred to the persons
o were responsible for the military organisation of
issia that a similar policy was applicable to com-
rce. It would be remarkable if, having succeeded so
l in their military organisation, no attempt was made
establish a similar commercial organisation; and we
uld not go wrong if we were to assume that there
s a council whose proceedings were kept quiet, but
ich took into consideration the statistics obtainable, and
far as possible legislated, or endeavoured to legislate,
n the basis of those statistics. Where fiscal duties
e found to be wanted such a council would put them
Where there was an advantage in taking them off
y would take them off. Where cheap transit was
sible they would let it be given, for the railways and
als were the property of the State. Was it to be
ected that any country could fight such a combination
hat without adopting, at all events, something of their
hods, or without studying those methods, and without combining together, if not to imitate them, at all events to thwart them? Russia was now copying Germany. The chief work of Russia now was to develop its home industries. It was looking out for foreign capital, and offering facilities for the foreigner to start commercial enterprises in Russia, and these were very heavily protected. These new enterprises would lead to an enormous production, and Russia would presently begin to export. Enterprises of this nature must go on. Was Great Britain to be the last to follow? They ought to take very serious counsel with themselves as to what policy should be pursued in the future. A study of the policies of foreign nations could not fail to impress them with the seriousness of the position. There was a military campaign against them, and they had to defend themselves. With these few words he had to ask them to give their very heartiest vote of thanks to the President for the extremely able and convincing way in which he had brought these problems to their notice.

Dr. **Boverton Redwood**, in seconding the vote of thanks, said he wished to say a few words in regard to the work which the President had done in the administration of the affairs of the Society during his tenure of office. During the whole history of the Society there had been an exceedingly happy blending of qualifications in those who had occupied the presidential chair. Without exception, every President had contributed notably in his own particular fashion to the advancement of those objects for which the Society was formed. It was not difficult to decide that the conspicuous feature of the work which the present President had done had been in regard to the change in the Journal from a monthly issue to a fortnightly one. This had been already alluded to in felicitous terms by the Honorary Treasurer, but he thought that the difficulties attendant upon this change, and the importance of the change, were hardly sufficiently realised. There were many who almost threatened opposition to the alteration so suggested in consequence of the great difficulties which they foresaw in carrying it into effect, and there were others who, though they did not threaten opposition, were very fearful of the result. It was high testimony to the foresight of the President that the change in question, initiated by him and largely carried out under his personal supervision, had been effected without any serious difficulty; and they must all admit now that the change had been an exceedingly wise one, and had had the effect of quickening the pulse of the whole Society, and not only quickening it, but making its beat more regular. The President had also done remarkably good work by personal intercourse in strengthening the fraternal relations existing between the different Sections of the Society. In making that statement he had specially in mind the numerically great and influential New York Section, of which they were all proud, and he was satisfied that they would agree with him in saying that the recent visit of the President to the United States, like the visit of King Edward VII. to France, had done much to remove possible sources of misunderstanding, and to cement the bonds of union in a way that would have an enduring effect. He was sure that there were no more loyal supporters of the Society than their American cousins, and he expressed confident anticipations of lavish hospitality on the occasion of the visit of the Society to America next year. It would have been seen from a notification in a recent issue of the Journal that the Government were most desirous that the industries of this country—and included in these industries, naturally, as occupying a very important position, were the chemical industries—should be adequately represented at the exhibition which was to be held in St. Louis next year; and a paragraph in the report of the Council referred to steps which the Council were proposing to take in connection with the incorporation of the Society. He ventured to think that there was some connection between these two subjects. Such a recognition as was implied in the granting of a Royal Charter was not lightly given. It would be necessary for the Society to establish its claim to that recognition. The Council told them that they were encouraged to hope that they would succeed, but he ventured to think that one way in which it would be possible for the

Society to strengthen to some extent its existing claims to recognition would be by helping to give effect to the desire of the Government that the chemical industries should be adequately represented at this St. Louis Exhibition. He was well aware that outlay for purposes of this kind must be advocated largely upon patriotic grounds, although he thought that there were also reasons for appealing to the business instincts of chemical manufacturers in connection with the question. But let them put it on patriotic grounds first, and on these grounds he should say that, as the Government had, by the appointment of a Royal Commission for this Exhibition and the appointment of the Prince of Wales as President of that Commission, practically assumed responsibility for the success of this country's participation in the Exhibition, there could be no better way of showing that the Society of Chemical Industry was entitled to the recognition which they wanted in the matter of the Charter than by falling in with the views of the Government. He might add that the Royal Commission were desirous of extending exceptional assistance and granting unusual facilities to those who were willing, under certain conditions, to take part in this Exhibition, so that the burden—if it must be called a burden—which the manufacturers would be called upon to bear in taking part would be a very small one in relation to the advantages—perhaps mainly indirect—which would attach to their participation. It seemed to him that it would be very unwise, especially in view of certain features of the situation as set forth in the President's address, that they should apparently accept as correct the estimate in which they were held, unfortunately, by continental nations, and particularly by Germany, as to their position among the chemical industries of the world, as they would seem to do by abstaining from making a representative exhibit upon this occasion. The rates of tariff were no greater for Great Britain than for Germany, and yet they knew that Germany was going to make a splendid demonstration of its chemical industries. Were they going to allow the Germans, and other nations—and, among these, nations with whom they did business—to form the conclusion, from a comparative abstention on the part of the British from showing at St. Louis, that the continental estimate of the British position in the chemical industries of the world was justified? He was glad to say that already the Royal Commission had received such promises of support from the leading chemical manufacturers as would prevent the occurrence of a state of things which would be positively disastrous. He did not wish them to take it that the entire and complete success of the exhibit of the British chemical industries at St. Louis was already assured, but enough had been done to demonstrate that at any rate Great Britain would have a creditable and representative exhibit, and further adhesions were being received daily, so that they had every reason to hope for the best. He thanked them for the opportunity of making these observations, and very cordially seconded the vote of thanks to the President.

The resolution was put, and carried unanimously, and the President briefly thanked the meeting for its vote.

Upon the motion of Mr. A. Gordon Salamon, seconded by Mr. Thomas Fox, Messrs. Miall, Wilkins, Randall, and Co. were elected auditors at a remuneration of 10*l*. 10*s*.

Place of Meeting, 1904.

The next business being the selection of the place of meeting for 1904, the President called upon Prof. E. Hart, of Easton, Pa.

Prof. Hart said that when the New York members learned that he was going to visit the old country they seemed to think that it would be well that he should come to Bradford, and assure them in person of the heartiness of the welcome that they were preparing. Whilst they would try not to exceed in warmth the proper temperature, they wished to so arrange matters that the Society should have a very good time, and be able to return to the old country safely and in sound condition. He wished to submit to them, for their information, and also for their amendment if need be, some particulars of the arrangements, which could still be altered if required. It was proposed that the members should be received, on landing in New York on the 16th of September, by a representat of the President of the United States, specially appoin for that purpose, along with the members of the recept committee. It was proposed to hold the meeting of Society in New York, to cover three days, and to h an excursion round the harbour, and visits to points interest, and banquets and receptions sufficient in quant to satisfy all. They would then be put on to train, which would be equipped with all the necess fittings, including dining cars, and would proceed Philadelphia, where a large and representative le committee would be in charge of a programme wh was to occupy one day. Then they would move on Washington, where three days would be spent, and events there included a reception by the President the United States. From Washington they would go Pittsburg, where they would spend not more than two da perhaps only one day. In Pittsburg, he thought he m fairly say, they would be allowed to see everything wh anyone would reasonably expect to see, and he believed would be possible for those of them who were interested metallurgy, with which Pittsburg was especially connect to see the Carnegie works. He had private assurance the effect that this would probably be allowed. Fr Pittsburg they would go on to St. Louis, where three d would be spent at the Exposition. At several point would probably be necessary to spend a short time aw from the train at the hotels, but at St. Louis, on account the probable congestion of the hotels, it was contempla to turn the train into a first-class hotel. After spend three days in St. Louis, they would move on for two day Chicago, passing therefrom on to Niagara Falls and Buff which were so nearly connected that they were practic one city, and where there was a large development of electrical industry. He could not say at the present t how much of this industry they would be permitted to because the manufacturers were, perhaps justly, a li careful about showing their places; but they had appoin a committee which would certainly be able to secure adm sion to all the places to which any committee could sec admission. From Buffalo they would move on to Bost and from Boston they would go back to New York, whole trip occupying three weeks. The New York Sect had carefully thought out the probable expense of the wh trip, and this had been estimated to be from 50*l*. to according to class of ocean travel. He was instructed say that the American members very much desired have as many lady visitors as possible, and, with this ob in view, special ladies' committees would be organ at the various towns to take charge of the ladies, see that they had a good time. It was not always teresting to ladies to visit chemical factories, soap wo and the like, and for that reason provision would be m for them in other ways. He had nothing further to except to assure them of the warmth of the welcome wh awaited them. It had been his lot to take part in vari arrangements for the entertainment of visitors, but had never experienced so spontaneous a desire to ext hospitality as upon this occasion.

Mr. Thomas Tyrer, in seconding the selection of N York as the place of meeting for 1904, said that the v best men that the Society could send would go to N York, because only the best could afford the necessary ti The New York Section might be sure of meeting thoroug representative men.

The resolution was carried unanimously.

Upon the motion of Dr. E. Divers, F.R.S., seconded Mr. Eustace Carey, a vote of thanks was accorded to Governors of the Municipal Technical College for the of the room for the meeting, and the proceedings closed.

Garden Party and Reception.

After the morning meeting the members lunched at Midland Hotel, on the invitation of the local commit In the afternoon an excursion took place to Appe Bridge, where the members were entertained at a gar party by Mr. and Mrs. W. E. Aykroyd. Fortunately weather kept fine, and the outing proved to be a pleasant one.

t eight o'clock in the evening, the members attended eception given by the Mayor of Bradford (Alderman id Wade) and Mrs. Wade, at the Town Hall, which tastefully decorated for the occasion. Selections nusic were given by Mr. F. P. Devine's band, with H. E. Cookson as vocalist.

ISITS TO WORKS AND PLACES OF LOCAL INTEREST.

SECOND DAY.—THURSDAY, JULY 16TH.

BRADFORD MUNICIPAL TECHNICAL COLLEGE.

his College, now a Municipal Institution, was erected by lic subscriptions, assisted by the generous help of the rshipful Company of Clothworkers. Provision is here e for the study of Chemistry, Dyeing, Engineering, tile subjects, and Art.

he building, on which the sum of nearly 40,000*l*. was it, was opened by T.R.H.'s the Prince and Princess Vales in June 1882, and the various departments were ied for instruction in the following year.

he present buildings having proved quite inadequate, s are now in course of preparation which will increase accommodation threefold.

he work of the College is divided into four departments, with a responsible head. In the department of mistry and Dyeing a three years' course is arranged, h also includes physics, engineering, and textile ects suitable for those taking up the study of the ical technology of dyeing Other subjects are taught, botany, biology, microscopy, bacteriology, &c.— nces which have a direct bearing on many of the lford industries; and in addition a two years' course arranged for pharmaceutical and medical students. e are also courses in conjunction with the Engineering artment for sanitary engineers, plumbers, and those ged in gas manufacture.

he Society of Dyers and Colourists (President, Mr. C. R. lley) has proved its interest in the advance of the local e and industry, by offering prizes for solutions of trade lems, scholarships for students, and in the provision depôt for sealed communications. The Bradford ile Society (President, Mr. W. E. B. Priestley, J.P.) also ts an important influence in the College. This Society nges for annual courses of lectures, the reading of rs, and discussion of matters relating to textile fabrics processes. Prizes are also offered for essays, research, and intercourse between past and present students of ollege is promoted.

VISIT TO FARNLEY HALL, NEAR OTLEY.

Leaders: MESSRS. F. W. RICHARDSON AND J. B. WILKINSON.

the kind invitation of Mr. F. H. Fawkes, J.P., a party out sixty members and their friends visited Farnley Hall. situated on a height overlooking the valley of the rfe, and the house is an interesting example of the of successive centuries. The visitors spent a most able afternoon in viewing the magnificent Turner ction at the Hall. T. M. W. Turner was a frequent at Farnley during the early years of the nineteenth ury. He did all his best early work for his friend er Fawkes, the then owner of the Farnley property, the house contains some 150 of his pictures and ings.

the entrance hall the collection of relics of Cromwell Fairfax excited much interest.

EENHOLME MILLS (MESSRS. WM. FISON AND CO.), BURLEY-IN-WHARFEDALE.

e operations conducted at these mills, founded in 1841, st of sorting, washing, drying, combing, preparing, ning, and weaving, the raw material being principally and mohair.

the mohair sorting rooms, the greatest care is taken revent the much-dreaded "anthrax." To this end sorter's board is provided with a wire covering, under h is an inverted cone, the open bottom of which leads into a large tube going all round the room, and delivering into a closed chamber in which revolves a powerful electric fan.

The sorted material passes on to the washhouse, out of the final bowl of which it emerges quite clean, when it is conveyed to the "dryhouse," where it is dried and oiled. Next in order comes the combing shed, where knots, dirt, and straws are extracted, and the long fibres issue as "sliver," while the short wool falls into a separate receptacle as "noils." Only the sliver is used at the Greenholme Mills, where, after preparing, it is spun and woven in the usual way.

A characteristic feature of these mills is the water power, which is provided by two 12-in. Hercules turbines and a 48-in. one. The water which drives them represents the full volume of the river Wharfe, and is led into a goit about a quarter of a mile long from a dam in the river. The fall is 21 ft. In case of low water, steam power is used to assist, and, if necessary, the two engines are sufficient to drive the whole place.

NEW LANE MILLS, LAISTERDYKE (MESSRS. W. AND J. WHITEHEAD, LTD.).

Leader: MR. F. HOOPER.

Wool-sorting, wool-combing, and worsted-spinning form the industries represented here, and they are exclusively confined to the treatment and manufacture of Australian wools. About 1,000 workpeople are employed.

In the wool-combing department, wool was seen in the bale, as received from Australia, and in the further processes of sorting, washing, carding, and combing.

In the spinning department, the processes of drawing, roving, spinning, twisting, and warping were shown. Merino and fine crossbred yarns in white, mixtures, and colours are the principal productions.

MESSRS. PRIESTLEYS, LTD., MANUFACTURERS AND MERCHANTS OF DRESS FABRICS.

Fully 1,000 hands are employed at these works, and 1,400 looms are engaged in making the latest style of ladies' dress fabrics, which, after being dyed and finished, are distributed, through the large warehouse of the firm in Vicar Lane, to all parts of the globe.

The visitors here saw the "yarns" woven into all kinds of fabrics, including silk-warp Henrietta and Melrose, silk and wool crêpe de chine, Eolienne, Venetian crêpe, all-wool Estamene, canvas cloth, voile, grenadine, mohair, alpaca, all-wool serge, rainproof fabric, &c., &c.

LUMB LANE MILLS (MESSRS. JAMES DRUMMOND AND SONS, LTD.).

Leader: MR. BUTLER WOOD.

These mills, devoted to the spinning and weaving of worsted, were founded by Mr. James Drummond about 1856. The property covers about eight acres, and gives regular employment to about 2,000 workers. There are about 50,000 spindles at work in the spinning department, producing yarn not only for the weaving department, but also for the trade of the district and for exportation to the Continent. In the weaving shed over 300 coating looms are in operation, more than half of these being devoted to the manufacture of high-class "fancies"—a speciality of the firm.

FIELD HEAD MILLS, BRADFORD (MESSRS. JOHN SMITH AND SONS, LTD.).

Leader: MR. W. LEACH.

This firm has for nearly 50 years carried on the business of worsted spinning, twisting, and warping, as well as the preliminary treatment of the wool fibre in washing, carding, and combing.

The greasy raw wool, containing 40 to 50 per cent. of grease and dirt, and about 4 per cent. of potash salts, is washed in two series of washing bowls, consisting of four bowls each, then carded by the large carding engines, which pull out and render parallel the fibres. After this it goes through two bowls of soap solution to remove oil and dirt, and is then combed, whereby the long and short wool fibres are automatically separated into top and noil respectively.

After being combed, the top is sent to be drawn and spun, and here two systems of spinning were seen, *viz.*, the continuous English, and the intermittent mule or French system, as well as numerous modifications of the former. The yarn when spun goes to the manufacturer to be used as weft in the making of piece goods. In making warps, the yarn is twisted, *viz.*, two or more threads of yarn are twisted together to form one compound thread.

The firm have two sets of washing bowls, 28 carding engines, 28 combing machines, and 55,600 spindles, 13,720 of which spindles are run on the mule system. The power for working the machinery is obtained from three engines of 650, 500, and 350 h.p. respectively. It has been estimated that the wool from nearly two million sheep is manipulated in these works per annum.

The process of dyeing wool in the top or ball was also shown, the fastest dyes only being used. The suds from the wash-bowls are treated by the Smith-Leach process, in which pure wool grease is extracted centrifugally, the water evaporated, condensed, and used again for washing. The potash is also recovered and used again for scouring.

BRICK LANE MILLS (MESSRS. PRIESTMAN).

The work of spinning and weaving is carried on by two separate companies in Brick Lane Mills.

Messrs. H. B. Priestman and Co. are engaged in spinning worsted yarns for export to the continent and for consumption by manufacturers in the Bradford district. The wool used, is grown in England, Australia, and New Zealand.

The H. B. Priestman Manufacturing Company, Ltd., is occupied in weaving various kinds of ladies' dress goods, coatings, and serges from worsted, cotton, and silk materials on plain and "Jacquard" looms.

MESSRS. ALFRED PRIESTMAN AND CO.

Established in 1851, this firm, engaged in the manufacture of fancy worsted suitings and trouserings, flannels, and fancy vestings, employs about 200 workpeople, and runs 89 looms. At the works the following processes were seen in operation by the visitors:—Winding yarn for warp and weft respectively, warping, pattern weaving in hand looms, warp dressing, cloth weaving in power looms, and finally, the scouring and finishing of the woven cloth.

MESSRS. SIR TITUS SALT, BART., SONS, AND CO., LTD., SALTAIRE.

Leader: Mr. G. W. SLATTER.

It is upwards of three-quarters of a century ago that, with three small mills in Bradford, Mr. Titus Salt laid the foundations of the business which has developed into the huge manufacturing concern of Sir Titus Salt, Bart., Sons, and Co., Ltd.

While alpaca, mohair, cashmere, camel hair, worsted, and silk yarns and goods are all produced with equal facility, the specialities of manufacture at Saltaire are alpaca and mohair, and this manufacture, very largely developed in recent years, is the staple business of the company. The operations begin with the raw material in the condition in which it leaves the back of the Alpaca or the Angora goat, and it is passed through all the various processes required to produce beautiful cloths, dyed, finished, and ready for use. The works are, furthermore, equipped for the manufacture of almost every description of textile fabrics for either ladies' or men's wear.

The works cover an area of 10½ acres, having a floor area of 29 acres, and find employment for over 3,000 people; 2,500 horse-power is required for the operation of the machinery, which comprises about 90,000 spindles and 700 looms, in addition to combing, dyeing, and other machinery.

The whole of the mills and combing sheds are ornate in design and entirely fireproof throughout.

In addition to the mills and dyeworks and surrounding lands, the town of Saltaire belongs to the company, by whose workpeople the houses are occupied.

The company own the gasworks which supply the tow and mills; the annual consumption of coal amounts t upwards of 20,000 tons for power and gas making. Th company are also owners of the beautiful Saltaire Park which is kept open for the free use and enjoyment of th public.

Before leaving the works, a vote of thanks to the firm wa proposed by Sir Wm. Ramsay, seconded by Prof. E. Divers

NEW CONDITIONING HOUSE, BRADFORD.

Leader: Mr. J. R. DENISON.

Some 12 years ago "the Corporate authorities" of Brad ford decided to establish a Conditioning House for th benefit of the wool and worsted trade of the district, and t make use of the powers granted by Act of Parliament i 1887, which enabled them to issue certificates under th Corporate seal and thus render them "official." A manage was appointed, and under his supervision an efficient equipped but small establishment was opened in Augu 1891. Goods were sent in, duly tested for the percentag of moisture, and certificates were given. The receive weights and the *corrected weights* were adjusted to th proper allowances for moisture.

As the business extended in volume so it increased variety of tests; testing machinery was ungrudgingly p in by the authorities, and every up-to-date appliance scientific value was made use of. Within five years "th Conditioning House" not only made its mark, but becam indispensable to the trade, more especially to the shippin merchants, whose customers abroad were accustomed t official certificates, and expected to have them with ea delivery of goods.

The Bradford City Council has now built large ne premises at a cost of about 40,000*l*. The available flo space is 15,630 yards, and will store, when full, about 6, bags and bales of wool, tops, yarns, &c. There are present 90 testing ovens at work, with room for mor whilst other machinery for testing yarns in counts, length twists, strengths, &c., is provided, as well as Governme machines for testing cloths and yarns for the army a navy, the police, &c.

The number of tests per day averages about 600, 180,000 in the year, and the gross weight of goods pass through the House annually is nearly 60 million pounds, an average value of between three and four million sterlin

A staff of 60 experienced men and youths is required attend to the various duties of this large establishmer The management has been from the first under the contr of Mr. Walter Townend and his son, Mr. Emile Townend

BRADFORD CORPORATION ELECTRICITY SUPPLY.

In 1883 the Bradford Corporation obtained a Provisio Order to erect and maintain electric lines and works, a to supply electricity within the borough of Bradford.

In 1892 a supply of current for private motive pow was commenced, and at the end of this year there we six motors connected to the mains, having an equivalent 26 h.p. At the end of 1902 there were 913 motors co nected to the mains, having an equivalent of 4,398 h This branch of the supply has been very much stimulat by the system of hiring out motors adopted by the Corpo tion in the year 1897.

In the year 1898 the Corporation tramways we inaugurated, and a supply of current for this purpose w given by the electricity department. During the year 19 the number of units sold for tramway traction purpo equalled 5,259,202.

The distributing network of mains has been increas from year to year until at the present time there are miles of distributing mains and 53 miles of tramway ma laid and in use.

Since the erection of the first generating station t more stations have been built, the total horse-power n installed being 11,500, whilst extensions have been plann and are now being carried out to accommodate a total 27,500 h.p.

The total capital expenditure at the end of 1902 w 429,768*l*., whilst the income from all sources was 70,917

N Loom Works (Messrs. George Hodgson, Ltd.).

Leader : Mr. E. Naylor.

he site of these works, containing an area of 4½ acres, is Frizinghall, in close proximity to the station, and w facilities of railway siding accommodation right on to th ground. The iron, coke, sand, &c., are brought in tr ks from the Midland Railway direct on to the level of th foundry stage, where the coke and iron are stored. I ediately adjoining the foundry are the pattern-rooms a the cleaning and fettling shop. Next to the latter is th store-room for unfinished castings, from which there a three doors opening into the boring, turning, and g ling shops respectively. In the exhibition room a n ber of looms of different descriptions in working order w seen.

ossley Hall (Messrs. Wm. North and Co., Ltd.).

Leader : Mr. E. T. Holdsworth.

ie Crossley Hall Dyeworks was built in 1889, with a g ud floorage of over three acres. Cotton warp and yarn dy ig, bleaching, sizing, and mercerising were seen here in l their branches, also winding from the warp to the pi ready for the weaver, and beaming warps for the lo .

l the various fancy colours and different kinds of bl s are dyed ; warp and hank mercerising is very nsively carried on, this establishment being among th irst to carry out the process on warps.

r. W. H. North and his son personally conducted the vi ors and explained the processes to them. Afternoon te was provided, and a vote of thanks was proposed by M E. Carey, seconded by Mr. A. H. Allen, to which M North replied.

Bowling Dyeworks (Messrs. Edward Ripley and Son, Ltd).

Leader : Mr. J. R. Denison.

is is said to be not only the largest, but the oldest es lished dyeworks, having been founded nearly a ce ry ago. It is divided into twelve departments, ea under separate management and each devoted to a li ct class of trade. To this departmental system may be o some extent, attributed the steady growth of the bu ess, for each department is placed under the close su vision of a specialist, who has the most approved m inery and material placed at his disposal. The scope of erations is a wide one, embracing practically anything th s manufactured in the way of fabrics. All kinds of dr goods, worsted coatings, mohair and alpaca goods, li ns for coat linings, and even flannels and silks, are be dealt with, and are finished in countless varieties of sh s. Specialities invented at Bowling Dyeworks are the " e" finish, which renders any fabric unspottable by ra and the "Riplene" finish—a recent invention designed to ke all-wool flannels unshrinkable.

provide the immense power required there is a battery of enty-five boilers consuming 200 tons of coal per day, wh over one million gallons of water are pumped from a gr depth daily.

ne idea of the capacity of the establishment may be ga red from the fact that the number of yards of cloth re d in one year exceeds 30,000,000. The workmen on th ooks exceed 2,000, in addition to a clerical staff of si and a large number of skilled mechanics. Perfectly q ped in every respect, the works are lighted by ele icity.

feature of special interest to the visitors was the be ifully fitted laboratories of the Research Department.

order to make a great effort to regain the silk dyeing an inishing trade, which is gradually becoming lost to En and, a new department has also been started, which is to ully equipped to deal with all classes of silk goods.

Messrs. Law, Russell, and Co., Ltd.

Leader : Mr. W. West.

the handsome warehouse of this firm, the visitors were sh the following goods, which represent the staple industry :—Worsted, woollen and cotton dress goods, linings, umbrella cloths, coatings, furnishing goods, and blankets. In these this firm now does a large home and colonial trade.

This excursion was marked as specially suitable for the lady visitors.

New Central Fire Station.

The new Central Fire Station was opened on October 28, 1902.

The engine-house accommodates five engines, and is placed in the centre of the principal front, and immediately behind each engine are the stables. The doors of the stables and the engine-house are constructed upon a patent automatic principle, so that upon pulling a cord they fly open, the horses are released and run to their posts, the harness becomes attached, and a turnout is made within a few seconds after the alarm.

The Annual Dinner.

The annual dinner was held at the Midland Hotel on Thursday, July 16th, and brought together a large and distinguished company, which included many ladies. The President (Mr. Ivan Levinstein) occupied the chair, and amongst those present were the Mayor and Mayoress of Bradford (Alderman and Mrs. David Wade), Sir William Ramsay, K.C.B., F.R.S. (president-elect), Prof. Edward Divers, F.R.S. (Emeritus Professor of Chemistry at the University of Tokio), Mr. Thomas Tyrer (past president of the society), Mr. Samuel Hall (hon. treasurer), Mr. Eustace Carey (vice-president), Prof. Edward Hart (delegate from the New York section), Mr. Walter F. Reid (chairman of the London section), Mr. W. E. B. Priestley (Bradford) Mr. J. E. Fawcett (Bradford), Principal N. Bodington (Yorkshire College), Mr. E. K. Gray (president of the Institute of Electrical Engineers), Mr. Thos. Fairley (president of the Society of Public Analysts), Prof. W. R. Lang (chairman of the Canadian section), Mr. B. C. Aston (New Zealand Department of Agriculture), Mr. J. Carter Bell (chairman of the Manchester section), Mr. J. E. Bedford (chairman of the Yorkshire section), Mr. F. Tate (chairman of the Liverpool section), Dr. J. T. Dunn (chairman of the Newcastle section), Mr. W. M. Gardner (hon. local organising secretary), and Mr. J. B. Moorhouse (hon. local treasurer).

The **President** proposed the toast of "The King," and said that, whereas last year they sent from their annual dinner a telegram to His Majesty to congratulate him upon his wonderful recovery from illness, they were now able to rejoice in the fact that His Majesty was permanently restored to health.

The **Mayor** proposed the toast of "The Society of Chemical Industry." He thought it was the most important toast of the evening. He rejoiced to have the Society in Bradford, because he thought the gatherings would prove of mutual benefit to the Society and to the city, especially to the latter. He understood that 21 years ago they had a membership of 300. The fact that this had now risen to 4,000 showed the progress that had been made. The President had spoken in his address about foreign competition. In his own opinion there was nothing to fear from foreign competition if they could find out ways and means to capture their own home trade. There was at home and at their own doors sufficient trade to find employment for everyone in this country. Bradford, as most of them would know, was not concerned largely in chemical industry, but it was a town which used a large quantity of chemicals. Bradford was a large textile community. It was often termed "Worstedopolis," dealing with the wool from the sheep's back up to textiles ready for wear. The progress of Bradford during the last 30 or 40 years had been remarkable. It used to be said that grass would grow in the streets of Bradford if they lost the American trade. They had practically lost that trade, but grass was not to be seen in the streets of Bradford that day. Personally he did not fear the competition of either America or of foreign countries. He believed that Bradford could hold its own against all competitors. He thought that his friend the

President was somewhat in favour of protection. Personally, he (the Mayor) was in favour of the open door. To his mind England had progressed marvellously during the 50 years of free trade. Where was poverty found to-day? If there were the trade to employ it, they could not get the workpeople necessary to run all the machinery in Bradford. If they captured this and the other market there was something still to capture, and that was the people to produce the output. In Bradford the population had increased to 280,000, and everyone was better fed and better clothed than was the case 50 years ago, and he did not think there was any dire distress at all. He had very great hopes of the future, notwithstanding all the protectionist ideas that were prevalent at the present day. As to the dyeing industry, he used to say a few years ago that he thought Germany and France could beat Bradford, but he was very glad to say that Bradford could beat either as to dyeing. It used to be said that all the brain power was in Germany; nothing of the kind was the case. There was plenty of it in England. There were some of the finest professors engaged in connection with the industry of chemistry. Still they welcomed all foreigners who had been the pioneers in the industry, though if they did not look very sharp England might take the first prize. The gathering around him was an influential and varied one, and he wished personally to welcome Prof. Hart from the United States, and give him a cordial greeting. Notwithstanding the high tariff of the States, he believed that if America, England, Canada, and our colonies marched together there would be no more Franco-Prussian wars. If the English-speaking race would only work shoulder to shoulder he thought they could set the tune to the rest of the world, and he did not see why they should not; why there should not be one common bond of union between all the English-speaking peoples to help forward not only their own progress, but that of mankind generally. There was a representative from Canada present, and also a representative from New Zealand. That showed that the Society was world-wide, and at any rate so far as it was concerned there was a chance of mutual working together, and helping forward the general well-being of the whole. In conclusion the Mayor said he was proud of the city in which he had grown up, and proud of its institutions and its industries, and he was pleased to say that, thanks to the development of technical education, the humblest boy could climb from the lowest rung of the ladder to the highest. As to the municipal life of Bradford, its activity was so well known that he need not refer to it. He had the utmost pleasure in submitting the toast.

The President responded to the toast, and said that the chief citizen of Bradford had spoken and given his dictum, and it was not for him to contradict him. He wished rather to say something in reference to the working of the Society. He could conscientiously say, after trying to make himself acquainted with the organisation and administration of the Society during his two years of presidency, that he left that chair with the conviction that no society had a better council than the Council of the Society of Chemical Industry. He also spoke in terms of the highest appreciation of the work of the Publication Committee, which had resulted in making their Journal the very best publication in the world for applied chemistry. He gave the greatest credit for the success of the Journal not only to the members of the Publication Committee, but also to their most esteemed and long-tried editor, Mr. Watson Smith, and to Mr. Cresswell, the sub-editor, and the whole staff. He congratulated the Society most heartily on the presence of ladies at that dinner, an innovation which had been so entirely successful that they could only wonder that it had not been tried years ago. He hoped that they would always have the privilege of the presence of ladies at future dinners of the Society. Finally he wished to say a few words of acknowledgment of the work done by the chairman and members of the local committee. Their most sincere thanks were due in the first instance to Mr. W. E. B. Priestley, the chairman of the local executive committee, and to Mr. J. B. Moorhouse, the hon. treasurer, and to Mr. W. M. Gardner, the hon. secretary. The work of making the arrangements for the annual meeting was always a heavy one, and it had been carried through by their friends Mr. Gardner d Mr. North. He had pleasure also in testifying to the v e and usefulness of the excellent handbook which had b n produced for the Society under the editorship of Me s Pearson and Spencer.

Mr. C. G. Cresswell informed the gathering that let expressing regret at their inability to attend the din had been received from Mr. J. H. Wicksteed (Presi t of the Institute of Mechanical Engineers), Mr. D d Howard (President of the Institute of Chemistry), James Dewar (President of the British Association), S. R. Atkins (President of the Pharmaceutical Socie), Prof. Tilden (President of the Chemical Society), Thorpe (Foreign Secretary of the Royal Society), Hawksley (President of the Institution of Civil Enginee Mr. Andrew Carnegie (President of the Iron and S Institute), Mr. Bennett H. Brough (Secretary of the I and Steel Institute), Dr. J. W. Swan (President of Faraday Society), Sir H. Trueman Wood (Secretary of Society of Arts), Sir Wm. Abney (President of the Ro Photographic Society), Sir Wm. Preece (President of Society of Arts), and Mr. Hennin Jennings (President the Institute of Mining and Metallurgy).

Sir William Ramsay, K.C.B., gave the toast of "App Science." After some humorous remarks on the consti tion of the toast list, Sir William went on to say that President had remarked, for the benefit of those who not members of the Society, that the Society was ra famed for its rapid method of publication. The Journ the Society was formerly a monthly one; now it w fortnightly; perhaps in another 24 years it would be a d one. Anyhow, rapid publication was what was aimed and he thought he should not be departing from tradition of the Society if he let out what was no longe secret, inasmuch as it had been published in the journ *Nature* which was appearing that evening. For some t two very distinguished young scientists of Cana Prof. Rutherford, of Montreal, and Mr. Soddy, who now working in his laboratory—had been investigating properties of those mysterious elements which had power of discharging an electroscope when they brought near it. They were all aware, no doubt, that property was first discovered for uranium by M. Becqu a well-known scientist of Paris, and not long afterw Mons. and Mdme. Curie discovered the wonderful ele radium. Messrs. Rutherford and Soddy discovered t thorium, an element not far removed from radium uranium, gave off what they called an emanation, or w we might call a gas — a substance which could be m from place to place; a substance which could be conden by cooling to a sufficiently low temperature, but n remarkable as a substance which discharged a cha electroscope, and also a substance which shone in the This they called an emanation. They pointed out radium gave out a similar emanation or gas continuou but any salt of radium—radium bromide or any o salt of radium—if allowed to stand for a while, accu lated a further quantity of gas, which could be rem by a pump or by washing it out with another This very curious substance lost its properties on stand If it were allowed to remain for four days it would found to have parted with half of its power to disch an electroscope, and it became, if looked at in the dark far as they could judge by the eye, only half as lumin and as time went on it lost its power to discharge electr and lost its luminosity until, after a month, ther nothing left. There appeared to be no residue as fa could be told. Mr. Soddy had done him the honou come and work in his laboratory, and as he himself some little experience in dealing with small quantiti gases, they had laid their heads together and had contr to examine the emanation or gas which was given off radium. He might tell those who might not be awa the fact that radium was very expensive, because it a very rare substance, and that 25*l*. would buy a v small quantity indeed, less than a grain. They mana to scrape together the needful and invested in as m radium as they could get; indeed, all there was in market at the moment; and having examined this gas d to their astonishment the other day that the emana- contained a quantity of helium, a light constituent of atmosphere. He did not wish to imply that the emana- was helium, for it was not. The gas was first passed ugh a tube cooled with liquid air in which the emana- stayed behind, being condensed at the low temperature, the other gas passed on through this cool tube, and, collected in the microscopic Plücker tube, what is l a vacuum tube, it showed undoubtedly the whole rum of helium. It was impossible to forecast what implied, but they must remember that the radium ide which they had obtained—prepared no doubt by same process which the Curies used; namely, the mposition of pitchblende, a uranium mineral, with pitation of barium by means of sulphuric acid, and it radium, and separation of radium from barium by ional crystallisation—that this radium obtained from blende could hardly be supposed to have retained the m through all these manifold operations; and it would that the helium must be generated from the radium, om the gas—the emanation—which the radium gave He was at present as much in the dark about it as ce, and merely chronicled the fact that there was ubtedly production of helium continuously from radium. s useless to speculate further upon such subjects. He ght it was better if one had ideas on a subject to re them and perfect them by further experiment before ging in vain conjectures. Therefore he would leave ubject at present and revert to the immediate subject toast, which was "Applied Science," and they would owledge that, although he had departed very far indeed it, they might hope that in the future this branch of ce, as well as others, might meet with its application. t would actually take place they could not forecast; ven now any rich man who did not mind possessing ury could furnish a very efficient illumination for an ary sized room which would be permanent, or, at all s, would last out his time—at any rate, some three and or four thousand years—for an expenditure of 500*l*. if he could get the radium. At a Scotch ng the bridegroom, as was customary at a wedding fast, rose to respond to the toast of the health of the . He was not used to public speaking, and, words g him, he contented himself with the response, "Well, s naething wrang with the woman"; and in proposing ast of "Applied Science" he should like to point the l of this story, and say that there was nothing wrong it; that it was in a state of absolute health, and in this ry, as well as in others, it was in a state of marvellous ty, and as each branch of Applied Science was ently capable of producing any number of other hes of Applied Science, as time went on they might t a somewhat numerous family.

. Walter F. Reid, in responding to the toast, said he nbered no meeting of the kind at which so important nouncement as that delivered by Sir William Ramsay een made. He thought they were to be congratulated is announcement. It was a subject for great con- ation that such an advancement had been made in owledge of one of the greatest branches of modern e. Sir William Ramsay said he had been in the on the subject; but if anyone had thrown light on n it was Sir William Ramsay. It was rather a difficult r to reply to the toast of "Applied Science," because or less all science was applied. It was a question of ale of application. For instance, one might say that air had no practical application; but at once, directly it vailable, it was used in the laboratory, especially for lation of new gases. The discovery of radium again d up large fields, and at the same time difficulties to who wished to follow this new branch of science. We pended upon applied science. The very dinner they ust eaten had been a matter of applied chemistry. vage who first produced fire was applying chemistry, e courage of the man must be admired; but there had one application after another for every new fact that The growth of their Society was less in proportion the growth of the applications of modern science. was no question that their Society had an enormous future before it. Every new fact that arose in chemistry had to be dealt with, and it was chiefly the members of their Society who applied the science in a way which made it available for the whole population. That was especially their function. A distinguished member of their Society, Sir William Crookes, referred, he thought in rather too pessimistic terms, to the time when their food supply would fail, and when the wheat lands would not supply sufficient for the human race. Four or five years ago the extraction of nitrogen from the atmosphere for the fertilisation of plants was talked about, and it was characterised as a dream. Now it was an accomplished thing. Means were being found to fix the nitrogen of the air, and it would be used to produce food products. Sir William Crookes made no allusion, he believed, to the sea. Quite recently he (the speaker) had a very interesting conversation with a good friend of his. Dr. Divers, who alluded to the great use made of the products of sea-weeds for food in Japan. These were made available for our use by chemical operations, rather crude in their nature, but that opened out an enormous field for chemical industry and applied science. It was a subject that had been ably dealt with by one of their old members, and there could be no doubt that there was an enormous store of food in the sea for the human race should their ordinary supply run short. He did not think they were altogether dependent upon the cargoes of wheat that came to our shores from certain countries. With regard to the future of British trade, he must say that he shared the thoroughly British and straightforward views of the Mayor of Bradford. He was not a pessimist at all, but at the same time we could not stay where we were. A month ago he had the pleasure of going over the important laboratory of Prof. Emil Fischer, of Berlin, and one thing struck him there as an old Berlin student, namely, the improved apparatus which they had there, as compared with what was at our disposal in this country; especially as regards the quantities of material for experiment. Unless there was an improvement here in this respect, we should fall behind. Our appliances were not altogether up-to-date. In that direction our technical institutions were alike. He did not think it was necessary or even advisable to found other institutions on the same lines. It might not lead to more applied science, although it might lead to a great deal more science being taught. But the supply of trained chemists was in excess of the demand. What they wanted was a chemist who could be taken from a technical institute, and put in charge of works and entrusted with the control of operations. The other point had been dealt with, and that was that, in connection with the technological institutions, the education of those who attended had not been sufficient for them to get the best fruit from the teaching which they received there. As to those applications of applied chemistry which came to us by accident, we had recently in connection with our Government factories at Woolwich a most disastrous explosion which resulted in the loss of many lives. Now it was a very curious thing that the substance which caused that explosion had been made for nearly a century, and had been used for a variety of purposes as a dye, and it was not thought it was an explosive. Accidentally, it was found to be an explosive. An ingenious Frenchman melted it and put it into shells, and then our Government made lyddite of it. There we had a case of applied science almost by accident. But, on the other hand, there were a great number of these applications which were found by very careful research, and he thought it would be to their advantage if they could keep in this country and give the very highest posts possible to men of science, who had shewn themselves capable of developing new ideas. They all knew what good Hofmann did to this country; when he left, he took with him not only his own knowledge, but also the aniline industries, and if we had given Hofmann 1,000,000*l*. to have stayed in Great Britain it would have paid us well. He had pleasure in responding to the toast.

Mr. Thos. Tyrer proposed "The Trade and Industries of the District." These told their own tale in the admirable handbook to which the President had referred. Edward III. had broad views and was a worthy predecessor of Edward VII. He took the wide view which seemed to be characteristic of British diplomacy, and he invited the Flemish to come over. They came. Whatever they taught us we to-day inherit. Later came Sir Robert Peel, whose battles would have to be fought over again on a wider area and with a larger issue and on broader facts. But again the result of that was that the three towns of Hamburg, Frankfort, and Lübeck again sent us their goods and their men. History would be repeated and it would be well for us in this controversy to be cautious and not to treat the subject of fiscal enquiry with scorn. The Mayor had remarked that with the open door we had benefited and that the grass had not grown upon the streets. This was not so much a controversy as a desire for facts, and one could not help seeing that the day had come when mere shibboleths and mere tradition counted for nothing. The scientific application of fact, the application of scientific methods were not confined to chemistry merely, but there was a scientific method in business, and there could be no more stimulating words than those which the President elected yesterday had given to them. There might be rivalry in the world, but let them meet one another as men of equal talent and ability. The trades and industries of that district had resulted largely from the applications of science. It might be true that there was more merchanting, for they had seen great packing-cases full of yarns to go abroad. It all went well to show that we must not be the producers of half products for any persons outside the United Kingdom. He was glad that the industries of the district were not decreasing. He was also glad to know that the capital of England was not decreasing, but its investments abroad were enormous. He considered himself honoured in having been asked to propose the toast of "The Trade and Industries of the District."

Mr. W. E. B. Priestley, J.P. (chairman of the local committee), responded to the toast, and said that the labours of the members of the Society of Chemical Industry were absolutely necessary to the existence and prosperity of the city of Bradford. The last time he crossed the Atlantic he had an experience of the weird and mysterious wonders of wireless telegraphy, and this had been to him a most wonderful illustration of the way in which science united the peoples of the world. He did not look upon the achievements of science, and of such men as those who were members of that Society, purely from the commercial point of view. Their work for the benefit of humanity had greater and nobler results than the enormous help which was given to commerce—greater results even than they themselves, probably, were aware of. See, for instance, how the application of electricity had made it possible to relieve the pressure of population in the towns, and to give opportunity of building up healthy men and women, and thereby building up the Empire. It was the research of scientific men that led to such important possibilities as these. Looking at the matter from the commercial point of view also, it would be absurd to suggest that the marvellous development of manufacture which had taken place in Bradford was entirely due to the perseverance and adaptability of the Yorkshireman. It had come very largely through the application of science to industry. He was glad to think that the greatest scientists in the world to-day were Englishmen; and he would venture to predict that when the Society visited New York next year it would find the Americans anxious to learn something from the Englishmen. In conclusion, he said that, in spite of all that was hinted to the contrary, he had not the slightest fear for the future of this country; and whilst men like Sir William Ramsay were continuing the noble work they were doing, he cared nothing for the competition or rivalry of the whole of the world.

Prof. Edward Hart proposed the toast of "The Yorkshire Section." Alluding to the importance of education, and the great extent to which the success of education depended on the quality of the student, he spoke in eulogistic terms of the cleanly appearance of the Bradford children, which, he said, had pleased him greatly. He had, in fact, during his visit been greatly pleased with the Englishman as a type, and he should be ungrateful if he did not make recognition of the cordiality of the recept which had been extended to him personally, both dur this visit and during his previous visit in 1895. In re ence to the visit of the Society to the United States n year, he wished to dismiss from their minds any undue f which those who intended to visit the States on that oc sion might have in regard to the consequences of the ta with which the American people had hedged themsel round. Having written to a friend, stating that he wa some positive assurances on the subject, he had receive reply a letter from Mr. Russell W. Moore, who was in Customs service and in the Appraiser's Office in New Y informing him that tourists from abroad were not bound the 100 dols. limit, but could bring in anything and eve thing which was necessary for their convenience and co fort during the voyage or during their stay in America. was added that trunks containing wearing apparel could left in bond in New York or placed in any storehouse of duty, and that, in regard to the examination of th baggage, the Collector of Customs would be requeste see that it was accomplished with all possible expedit and that Mr. Moore would give the matter his perso attention and endeavour to make the experience as li annoying as possible. The American committee, Prof. H went on to say, were sincerely desirous that each of members of the Society who came should be able to le all that was possible for himself upon the matters wh were of special interest to him, and, in order that this in tion might be carried out with success, he ventured to m the practical suggestion that each of them should indic either individually to him or through their headquart the matters in which they were particularly concern The American committee would then make arrangement to put each visitor into the hands of a suitable person would be able to give them all the information that possible. He suggested that this arrangement should acted upon with as little delay as possible, so that American committee should have ample time to carry wishes into effect. He had the greatest possible pleasure proposing the toast of "The Yorkshire Section," beca no one could have been treated in a more kindly way th the members of the Society had been treated by Yorkshire Section. He was sure they would agree w him that if the American welcome was any warmer th the Yorkshire welcome had been it would be very indeed.

Mr. J. E Bedford (Chairman of the Yorkshire Secti responded to the toast. What had been said had b very satisfactory to the local committee, as it showed the arrangements had been carried out in a way to sat the visitors. For some weeks, in fact for some mont the local committee had been working very industriou at the details, but for his own part he could claim very li individual credit because family affliction took him aw but he knew that the business was left in the hands capable organisers.

Mr. Walter M. Gardner, who was received w applause, said that, on behalf of the local committee, wished to thank those who had aided them so very heartil the arrangements—the Mayor, Mr. W. E. Aykroyd, Mr. H. Fawkes, and those gentlemen who had so kindly willingly thrown open their works. He was sure he speaking in this respect not only on behalf of the l committee but on behalf of the whole body of memb Then he thought that Bradford was to be congratulat the visit of the Society, and there was special gratificat on account of so important an announcement as they been privileged to hear from Sir William Ramsay. C tainly the Bradford meeting would be remembered, perh for all time, as the occasion on which the possibility, or probability, of the genesis of one element from another publicly announced.

The President said those present had heard from P Hart, of America, the generous arrangements which w being made for the reception in New York of members of Society of Chemical Industry. One of the greatest hono which would be conferred upon the members would be reception by the President of the United States. He thou it s only right that they should honour the toast of "The Pr dent of the United States." He called upon Prof. Hart to ply.

of. Hart, in responding, expressed his appreciation of th indly feeling which had actuated the toast. One of th rst things he had to learn at school was a list of the E ish kings. He did not think he could recite it now, bu e knew the name of the last sovereign and the present on and he had not forgotten Queen Elizabeth, of course. Th bond of brotherhood that existed among the English-sp ting peoples was a strong one. He sincerely hoped th t would go on growing stronger. Now how were they to e some practical expression to this feeling which he l all of them shared—and he was sure the feeling was g, at least in certain quarters, on the other side of the At itic, and there had been demonstration that it was in other parts of the world? He would suggest for o deration that one way to get together in anything at as to have common habits and common customs. e were two things which they might perhaps do. Why not they have a common coinage to begin with, and could not they have a community of postal arrange- s? Perhaps we could do it. There was now a Board of ternational Arbitration, and he hoped that was only a ning. There had not been much submitted to that a yet, but let them hope there might be. The first ational arbitration took place between England and nited States. He was not quite sure whether England he loser, but if so England paid the debt like a man. were ready to do the same thing, and he thought ica was ready to join with them as far as it was icable in all those things which they had in common, e trusted that the selfish arrangements of established ations would not interfere with the further union of e who were after all one people.

musical entertainment, both vocal and instrumental, rovided.

Appendix.

e following is the text of the letter to "Nature" to wh Sir Wm. Ramsay made reference in his speech. ommunication takes the form of a letter to the editor, headed "Gases Occluded by Radium Bromide":—

therford and Soddy (Phil. Mag., 1902, p. 582; 1903, 53 and 579) pointed out that the almost invariable ace of helium in minerals containing uranium indicated hat gas might be one of the ultimate products of the egration of the radio-elements. Rutherford, moreover, nined the mass of the projected particle which con- es the "A-ray" of radium (Phil. Mag., 1903, p. 177) approximately twice as great as that of the hydrogen an observation which points in the same direction. A-particles are readily absorbed by solids, and should ulate in the solid salts of radium and in the radio- minerals.

have been engaged for some months in examining ectrum of the "radio-active emanation" from radium, and during this work the opportunity presented itself of examining the gases occluded by 20 mgrms. of radium bromide which had been kept for some time in the solid state. These gases, which are continuously generated, have already been partially examined by their discoverer, Giesel, and by Bodlaender (Ber., 36, [2], 347; this Journal, 1903, 322), and found to consist mainly of hydrogen and some oxygen. We have found that after removing hydrogen and oxygen from the gas evolved from 20 mgrs. of radium bromide, the spectrum showed the presence of carbon dioxide. On freezing out the carbon dioxide, and with it a large proportion of the radium "emanation," the residue gave unmistakably the D_3 line of helium. This was confirmed by sealing off the tube and comparing its spectrum with that of a helium tube. The coincidence of the two lines may be taken to be at least 1-10th of the distance between D_1 and D_2, or say 0·5 of an Angström unit.

This observation, if confirmed, substantiates the theory already mentioned, and brings ordinary methods to bear on the changes occurring in radio-active bodies.

July 10.

William Ramsay.
Frederick Soddy.

P.S. (July 13).—We have repeated the experiment with 30 mgrs. of fresh radium bromide, kindly placed at our disposal by Prof. Rutherford, which had probably been kept for several months in the solid state. Entirely new apparatus was constructed for the purpose, and better precautions were taken to exclude from the spectrum tube carbon dioxide and the emanation. The spectrum was practically that of pure helium with the addition of two new lines. The lines identified are:—

Red	6677
Yellow (D_3)	5876
Green	5016
Green-blue	4932
Blue	4713
Violet	4472

The additional lines are one in the red and one in the green; these we have been unable to identify.

THIRD DAY.—Friday, July 17th.

The party left Bradford by special train at 9.10 a.m., arriving at Ripon about 10.20 a.m., where conveyances took the visitors to Studley Royal, and by walking through the lovely park a visit was made to Fountains Abbey.

The visitors were subsequently conveyed to Ripon, where luncheon was provided at the Unicorn Hotel; after luncheon a visit was made to Ripon Cathedral, and later on the party proceeded to Harrogate.

Here afternoon tea was provided at the Grand Hotel, the visitors returning to Bradford about 6.30 p.m.

In the evening, from 8 to 10 p.m., a Ladies' Musical Evening was held in the Midland Hotel, the day's entertainments being concluded by a Smoking Concert at 10 p.m.

Journal and Patent Literature.

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Patent Specifications may be obtained by post by remitting as follows:—

English.—8*d.* each, to the Comptroller of the Patent Office, C. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W

United States.—9*d.* each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3ᵉ).

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Gases; Method of and Apparatus for Separating ——, from a Liquefied Mixture thereof. The Linde British Refrigeration Co., Ltd., London. From C. Linde, Munich, Bavaria. Eng. Pat. 14,111, June 21, 1902.

See U.S. Pats. 727,650 and 728,173 of May 12, 1903; this Journal, 1903, 743. Compare also Eng. Pat. 12,528, June 28, 1895; this Journal, 1896, 528.—E. S.

Furnaces; Impts. in ——. J. M. Stratton, Paisley, Scotland. Eng. Pat. 15,043, July 5, 1902.

An air chamber with its sides sloping upwards, so as to form a constricted upper opening, is placed in the ash-pit centrally beneath the grate of the furnace, and air, either cold or preheated, or mixed with steam, is blown in. Another plan consists in arranging pivotally mounted or fixed baffle-plates longitudinally or transversally beneath the grate, these serving to deflect the air blown into the ash-pit to different parts of the fire.—L. F. G.

Furnaces; Impts. in Regenerative ——. A. G. Bloxam, London; from F. H. Treat, Pittsburg, Pa. Eng. Pat. 16,175, July 21, 1902.

A pit furnace has at each end a gas regenerator, and beyond that an air regenerator. At the right-hand end is a valve controlling the admission of the combustible gases into one of two passages, at the same time connecting the other passage to the chimney. At the left-hand end is a similar valve controlling the air supply. The combustible gases pass from the gas valve through one of the passages into the right-hand heated gas regenerator, and air passes from the air-valve through a flue below the furnace into the right-hand heated air regenerator. The heated gases mix and are burnt. The products of combustion pass partly down through the left-hand gas regenerator, heating it, and out to the chimney through the other passage controlled by the gas valve; and partly through the left-hand air regenerator, heating it, and out to the chimney through the other passage controlled by the air-valve.

On reversing the valves, the gases and air are sent through the heated left-hand regenerators, and the products of combustion pass through and heat the right-hand regenerators.—L. F. G.

Furnaces or Apparatus for Roasting, Calcining, and the like. G. W. Johnson, London. From Verein Chemischer Fabriken in Mannheim, Mannheim. Eng. Pat. 16,207, July 21, 1902.

See U.S. Pat. 726,911 of 1903; this Journal, 1903, 690.
—T. F. B.

Aëration of Liquids; Method for the more Efficient and more Economical ——. A. P. Swan, Dundalk, Ireland. Eng. Pat. 16,363, July 23, 1902.

The liquid to be aërated is contained in a cylindrical vessel, in which it is subjected to a circular movement by mechanical or other means, the air being forced by pressure through a "finely-divided plate" and wire gauze into the liquid near the bottom of the vessel. In consequence of the movement of the liquid, and the diminished buoy of the air due to its "finely-divided state," the air rem submerged for a prolonged period instead of rising stra upwards to the surface of the liquid.—R. A.

Condensers for Distillation and for other Heat Tr ferring Purposes; Apparatus for use as ——. C Cribb, London. Eng. Pat. 17,131, Aug. 2, 1902.

Simple condensers, which may be employed also as elements of compound condensers, are formed of two tu arranged one within the other, and forming an annu condensing space between them. The condensing spac enlarged at the top, and diminishes in sectional area do wards, so that, when used for condensing vapours, space is greatest where there is most vapour, and l where condensed liquid predominates. By making ends of different sizes, they may be adapted for re condensation and for ordinary distillation respectiv The condenser may be wholly enclosed in a water-ja and the inner tube also supplied with cooling water, part of it may be evaporative, and another part may cooled by air. Wires, ridges, or baffles may be provid to cause the vapours to follow a spiral course through condensing space.—R. A.

Compressed Gases or Liquids; Receptacles for —— to Prevent Explosion thereof. H. A. Pryor, Lon From the Soc. Anon. d'Escaut et Meuse, Paris. E Pat. 20,241, Sept. 16, 1902.

See Fr. Pat. 324,350 of 1902; this Journal, 1903, 618.
—T. F.

Crushing and Pulverizing Machines; Impts. in ——. C. E. Hall, Sheffield. Eng. Pat. 2702, Feb. 5, 1903.

In roller crushing machines, such as are described in Pat. 2549 of 1881, the elliptic spring arrangement exerting the required yielding pressure on the rollers is replaced by one or more hydraulic cylinders, acting thro pressure plates and tension bars, which are made justable to enable the distance between the rollers to regulated.

The patentee also describes and claims a crus machine comprising two concentric main rollers, an number of smaller rollers mounted in the annular sp between the main rollers. Springs or hydraulic cylin are employed to press some of the small rollers towards outer (or working) surface of the inner main roller, the other small rollers towards the inner (or work surface of the outer main roller.—R. A.

United States Patents.

Furnace; Muffle Roasting ——. F. Meyer, New Yo. U.S. Pat. 731,114, June 16, 1903.

The furnace consists of a number of vertical chamb each made up of a series of superposed hearths dischar from one to the other. The hearths have rotary st mounted on a vertical shaft, and are heated by a furn common to the series, the flues extending below the l hearths of the series and above the roofs of these hea An intermediate heating furnace, common to two row series of hearths, may also be provided. The st umn is provided with blades, the inner ends of which of angular cross-section and fit within corresponding ular orifices in the column, to which the blades are tly secured by a through bolt.—R. A.

trifugal Separator [Oil, &c., from Steam]. T. S. atterson, Flushing, N. Y. U.S. Pat. 731,215, June 16, 903.

: drum of the separator is carried by a steam-driven ine, and encloses a chamber constructed to receive the aust-steam from the turbine and to heat the contents of drum. Blades are utilised to eject the steam from the nber, and lubricating ducts are provided to conduct the rated materials to the bearings of the machine.—R. A.

Distilling Apparatus. W. E. Lummas, Lynn, Mass.
U.S. Pat. 731,799, June 23, 1903.

Eng. Pat. 25,967 of 1902; this Journal, 1903, 202.
T. F. B.

s; Method of Extinguishing ——. A. H. van Riper d P. F. Guthrie, Nutley, N.J. U.S. Pat. 732,143, une 30, 1903.

: method consists in applying to the fire a freshly pre- d solution of sodium hyposulphite (thiosulphate). This be obtained by interposing between the water-tap and hose a reservoir containing crystals of sodium hypo- hite, which dissolve in the running water so as to give a tion of sodium hyposulphite of about 1·75° B.—A. G. L.

Column for Column Stills. E. Guillaume, Paris.
U.S. Pat. 732,548, June 30, 1903.

column is provided with fixed inclined plates curved nwards at their lower edges, and extending into the mn so that they compel the ascending vapour to take gzag course, each inclined plate being combined with a e or less vertical plate, which is arranged so that a er having a narrow opening at its bottom is formed een it and the inclined plate. (See also Fr. Pats. 850 and 321,871, and Eng. Pat. 5794 of 1902; this nal, 1903, 136, 313, and 223).—R. A.

French Patent.

mes and Gases, &c.; Apparatus for Removing ——.
W. Lynes. Fr. Pat. 327,012, Dec. 4, 1902.

Eng. Pats. 14,615 and 22,852 of 1902; this Journal, , 484 and 544 respectively.—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Alcohol as Fuel in Oil Engines. C. W. Weiss.
Eng. and Mining J., 1903, **75**, [25], 938.

author states that the results of some experiments e to substitute cheap alcohol for oil as fuel in standard ngines were entirely satisfactory. A mixture of four s by volume of Cuban alcohol with two parts of water loped 4 h.p. for one hour. The specific gravity of the hol was 0·794 and that of the mixture 0·9. It is stated this application of alcohol will be of considerable ortance in the matter of producing power cheaply in a, in Brazil, and other South American countries and he Philippines, where alcohol is cheaper and more ily obtainable than oil.—A. S.

hur Compounds in Coal-Gas and their Removal by ippig and Trachmann's Process. F. Frank. J. für asbeleucht., 1903, **46**, [25], 488—491.

process of Pippig and Trachmann for the removal of hur compounds from gas is based upon the fact that on bisulphide combines with aniline, in the presence of ll quantities of sulphur as contact substance, to form hocarbanilide, in accordance with the equation :—

$$CS_2 + 2C_6H_5NH_2 = CS(NHC_6H_5)_2 + H_2S.$$

he hydrogen sulphide formed can be eliminated by wn methods.

In applying this reaction to the purification of gas, the most suitable solvent is anthracene oil, containing a determined proportion of high-boiling tar bases. To this is added 5 per cent. of aniline, about 0·2 per cent. of sulphur, and about 5 per cent. of benzol, the latter being added to prevent the removal by the mixture of the benzene existing in the gas. The mixture may be used in a standard washer, or other suitable apparatus of that character, and, as it dissolves 15 per cent. of naphthalene, it affords a means of combining, in one apparatus, the purification of the gas from sulphur, with Bueb's process for the extraction of naphthalene.

The sulphocarbanilide, being but slightly soluble, separates out during the operation as a finely crystalline deposit, which may be filtered off.

The author's experiments show that the process removes about six-sevenths of the sulphur present in the gas. All the carbon bisulphide is removed, and the thiophene is retained by the solution. The nature of the remaining one-seventh is unknown; but that it does not consist of mercaptan or condensable bodies is proved by the fact that strong sulphuric acid does not retain it. Phenylhydrazine removes about one-half of it.—H. B.

Methane Homologues in Coal Gas; Occurrence and Determination of ——. E. Graefe. XXIII., page 885.

Complex Cyanides; New Method of Analysis of —— *[Determination of Ferrocyanides in Spent Gas Purifiers].* M. Dittrich and C. Hassel. XXIII., page 883.

Carbides and Acetylene-Acetylides; Preparation of —— *by the Action of Acetylene Gas on the Alkali and Alkaline Earth Metal Hydrides.* H. Moissan. VII., page 865.

English Patents.

Coking Ovens; Impts. in ——. G. Wolters, Dortmund, Germany. Eng. Pat. 9087, April 22, 1903.

In a coking oven with regenerators operated alternately for heating the air of combustion, the claim is for the combination of means for supplying gas and air to alternate flues in the furnace walls, and for conveying the products of combustion through the neighbouring flues to the regenerator actually in operation; also means, on the regenerators being reversed, for supplying gas to the neighbouring flues, and passing the products of combustion from the same through the flues that in the preceding operation were supplied with fresh gas.—C. S.

Coking Ovens; Impts. in ——. C. Wilke, Dortmund, Germany. Eng. Pat. 9401, April 25, 1903.

In a coking oven with vertically disposed heating flues and gas-distributing channels or jets underneath, the combination is claimed of a series of channels, leading through the vaults below the furnace to the gas channels or jets, the lower ends of these vault channels being provided with a peep hole, and a cleaning implement that can be passed into the jet above. The lower ends of the vault channels are closed with a cap through which the cleaning implement is passed, and in which the peep-hole is situated.—C. S.

Wood, Peat, or the like; Treatment of Comminuted ——, *to Prepare it for Consolidation.* A. Classen, Aix-la-Chapelle. Eng. Pat. 17,299, Aug. 6, 1902.

See Fr. Pat. 326,722 of 1902; this Journal, 1903, 620.
—T. F. B.

Fuel; Impts. in Burning Liquid —— *in Steam Boilers.* J. Weir, Cathcart, N.B. Eng. Pat. 15,917, July 17, 1902.

The liquid fuel is fed into the furnace in a direction opposite to the escaping products of combustion, the heat from these serving to vaporise the liquid fuel.—L. F. G.

Combustible for Explosion Motors; Liquid ——. F. de Mare, Brussels. Eng. Pat. 3626, Feb. 16, 1903. Under Internat. Conv., Aug. 11, 1902.

To increase the calorific power of alcohol (preferably amyl alcohol) for use as a fuel in motors, it is mixed with nitrobenzene, the proportions being varied in accordance with the effect obtainable in the motor used.—C. S.

Vapour-Burning Apparatus; Impts. in ——. A. Kitson, London. Eng. Pat. 13,785, June 17, 1902.

A thermostatic device which allows oil to pass to the vaporiser only when the latter has become sufficiently heated, and which cuts off the supply of oil when it has cooled down. The device consists of a hollow brass tube, inside of which is an iron rod, screwed into a plug at one end of the brass tube. The other end of the brass tube is provided with a stuffing-box, the gland of which contains two passages, arranged to be connected respectively to the oil reservoir and to the vaporiser. The end of the iron rod acts as a valve, the gland forming the seat, and cuts off connection between the two passages; connection only being established when the brass tube has by expansion moved away from the valve end of the iron rod. The brass tube is provided with holes, air circulating through these serving to keep the iron rod cool; it is not exposed to the direct heat of the vaporiser, so that it is heated more slowly and becomes cool faster than the vaporiser. (See also Eng. Pat. 23,458 of 1902; this Journal 1903, 289.)—L. F. G.

Explosive Gases [Acetylene and Oxygen], Apparatus for Use in the Production and Supply of ——. J. Y. Johnson, London. From the Cie. Française de l'Acétylène dissous, Paris. Eng. Pat. 14,057, June 20, 1902.

The explosive mixture of gases, as, for example, acetylene and oxygen, is produced in a nozzle-piece consisting of an outer tube, into which the oxygen is led, and a concentric inner tube, conveying the combustible gas, the latter tube having a longitudinal series of holes or a very thin slot. The mixture thus becomes richer in combustible gas as the outlet of the nozzle is approached, and the effects of back-firing are minimised. An arresting chamber, filled with brick or porous ceramic material, is connected to the inner tube, so that the combustible gas, if explosive by itself, will be unaffected by a back-fire in the nozzle.—H. B.

Blast Furnace Gases; Rough Cleaning of ——. B. H. Thwaite, London. Eng. Pat. 14,771, July 2, 1902.

The gases are passed through a vessel in which a disc or discs are rotating at high velocity, and by centrifugal action the gases are driven against the sides of the vessel, down which a mixture of tar and water flows. The heavier particles of suspended matter are thus removed.—H. B.

Gas Producers; Impts. in ——, *and in Apparatus Connected therewith.* W. T. Tonkin and S. Puplett, London. Eng. Pat. 15,498, July 11, 1902.

The 25 claims relate to a producer for use with bituminous coal, in which the products distilled from the fuel in a vertical charging-retort at the top of the generating chamber are brought into contact with hot chequer work to produce fixed gases, and the hot producer gases are led through a heat-interchanger and through a water scrubber, so as to heat the air blast and saturate it with water vapour. The producer is provided either with curved pokers, resting in the water seal and moving in a curved path up into the fuel in the generator, or with a vertical poking device, moved up from below and partly revolved and moved from side to side by means of mechanism. The rod, carrying the charging bell, which extends down into the retort to form a poker, passes through a spherical stuffing-box, which allows angular movement in all directions.—H. B.

[Coal] Gas; Condensing Apparatus for Use in the Manufacture of ——. S. B. Clapham, Keighley. Eng. Pat. 16,668, July 28, 1902.

A series of condensing towers is so arranged that the hot gas enters the towers at the top and leaves them at the foot, whilst the cooling water flows up through them and leaves them at the top. By means of suitable valves, order in which the towers come into use may be var, and the flow of gas and water may be controlled.—H. B.

Water-Gas Generating Apparatus; Impts. in ——. A. G. Glasgow, London. Eng. Pat. 6311, March 18, 19

A dust-collecting chamber is placed at the end of outlet-conduit from the top of the generator, and a bra leads from the conduit to the carburetter or other connec vessel, the arrangement being such that the dust-la gases travel towards the dust collector, and by reason its greater momentum the dust passes on into the collec, whilst the gases turn into the branch leading to the c nected vessel. The flow of gas from the top or bottom the generator is controlled by means of a reversing va in a valve chamber, in which the conduits from the top bottom of the generator and that leading to the connec vessel, meet The reversal of the valve also causes reve of the cock supplying steam to the top or bottom of generator.—H. B.

Gases; Method of and Apparatus for Cleansing W and other ——. E. Kratochvil, Kraluv Dvur, Bohe Eng. Pat. 6387, March 19, 1903.

The gases to be cleaned are passed through a casing which rotates a horizontal shaft provided with di Streams of water impinge on the faces of the discs, and dispersed by centrifugal force. The discs may be provi with projecting pins to assist in distributing the water. —H.

Gas Producers; Impts. in ——. O. Lindemann, Lon Eng. Pat. 9504, April 27, 1903.

The gas producer has a charging hopper which is extension of the fuel chamber, a vertical grate, and a exit lower than the middle of the height of, and on opposite site to, the grate. The products of combus and distillation formed in the upper layers are thus obli to pass through the lower layers of fuel. The grate be in two portions, a flue opposite to the upper port conveying the products of combustion down into the of combustion at the lower grate.—H. B.

Electrodes for Electric Arc Lamps; Manufacture of —. A. Blondel, Paris. Eng. Pat. 6060, March 16, 19 Under Internat. Conv., April 8, 1902.

See U.S. Pat. 714,277: this Journal, 1903, 19. The cen core of alkaline salts there described may be dispensed w —H.

Mantles for Incandescent Gas and other Lamps, *Method of Making Same.* M. J. Schwartz, Berlin. Pat. 6845, March 24, 1903.

The strengthened head of the mantle is provided with t or tongues projecting downwards over the otherwise wea portion, so as to extend the line of connection between mantle and strengthening fabric.—H. B.

United States Patents.

Fuel; Artificial ——, *and Process of Making Sa.* E. C. May, Chicago, Ill. U.S. Pat. 732,574, June , 1903.

The fuel is made from garbage, which, after it has crushed, is treated with a disinfecting material (cal chloride), dried, then mixed with a saponaceous subst (made from crude petroleum and potassium protoxide), finally mixed with a binding agent (coal-tar), the resul product being pressed into briquettes.—R. A.

Coke Oven and Gas Producer. J. A. Potter, Pittsburg, U.S. Pat. 731,950, June 23, 1903.

A continuous coke oven, of vertical stack form, is prov round its lower portion with regenerative flues having inlets, and round its middle portion with a combus chamber, having air-inlets. At the top it has a gas off and a pusher for forcing the charge downwards, whil the bottom it has a movable blade arranged to shear off discharge successive portions of the charge.—H. B.

Producer Gas; Process of Making ——. F. W. latthiessen, Lasalle, Ill. U.S. Pat. 730,941, June 16, 1903.

he volatile parts of the fuel are separated from the non-olatile by distillation in the upper part of the producer by leans of heat reflected upon the fuel, the volatile portion eing there oxidised as a first step in the operation. The on-volatile portion falls to the lower part of the producer ıd is there burnt. (For the apparatus, see U.S. Pat. 23,224; this Journal, 1903, 486.)—H. B.

Gas; Method of Treating ——. O. N. Guldlin, Fort Wayne, Ind. U.S. Pat. 731,412, June 16, 1903.

order to remove tar, ammoniacal liquor, &c., from coal-ıs, without reducing its illuminating power, the gas is oled at a regulated temperature above 90° F., thereby moving part of the suspended tar; the remaining tar is ecipitated by dry mechanical impact; and then the gas is oled and the ammonia is extracted.—H. B.

as-Manufacturing Apparatus. G. Cothrau, Summitville, Ind., Assignor to the Crude Oil Gas Co., Chicago. U.S. Pat. 731,434, June 23, 1903.

he apparatus comprises a furnace, an air-heating coil and retort within the furnace, a carburetter into which the t air from the coil is discharged under pressure, a drain pe from the carburetter, and a fan-shaped trough on to ıich the discharge from the drain falls and is sprayed to the retort.—H. B.

lcium Carbide; Process of Preparing ——. E. F. Price, Assignor to Union Carbide Co., Niagara Falls. U.S, Pat. 731,070, June 16, 1903.

all carbide is powdered and mixed with powdered tuminous coal. The whole is heated to drive off volatile atter, and the coherent residue is crushed into pieces of itable size.—F. H. L.

etylene Gas; Process of Generating ——. G. J. Atkins, Tottenham. U.S. Pat. 731,652, June 23, 1903.

e Eng. Pat. 22,425 of 1899; this Journal, 1901, 31.
T. F. B.

French Patents.

Combustible; Artificial ——. International Fuel Co. Fr. Pat. 527,164, Sept. 24, 1902.

e U.S. Pats. 711,166 and 711,167; this Journal, 1902, 23.—H. B.

Electrodes; Manufacture of Arc Lamp ——. A. Edelmann. Fr. Pat. 327,155, Dec. 9, 1902.

the carbon electrodes there are added, for the purpose increasing the illuminating power, vitreous substances tained by fusing metallic compounds with suitable fluxes, ch as water-glass, boric acid, &c., and then pulverising mass.—H. B.

Electrodes; Manufacture of Arc Lamp ——. A. Edelmann. Fr. Pat. 327,156, Dec. 9, 1902.

the powdered carbon are added the double compounds of ron with the alkalis and alkaline earths, such as borona-calcite, boracite, stassfurtite, &c., either alone or mixed th metallic oxides.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

as Liquor; Determination of Thiocyanates (Sulphocyanides) in ——. Linder. VII., page 863.

Ammoniacal Liquors; Constitution of ——. Linder. VII., page 864.

United States Patent.

Petroleum; Apparatus for Continuous Distillation of ——. W. D. Perkins, Oil City, Pa. Assignor to G. B. Aten, F. M. Thompson, J. H. Aten, L. B. Wade, T. A. McIntosh and J. M. Kerr, Wellsville, Ohio. U.S. Pat. 731,943, June 23, 1903.

The combinations include a vaporiser; a receiver for the unvaporised product; condensers, maintained at nearly constant temperature, arranged in series, and fitted with pipe coils; receivers, connected with the condensers, for heavy unvaporised products; a steam superheater, connected by a pipe with two of the condensers; a steam pipe with injectors arranged in the pipes conveying the unvaporised products; a gas burner placed underneath each heater; a float and valve in the latter, for regulating the escape of oil; means for feeding oil to one of the heaters, and for conveying the unvaporised products to the various heaters in succession, and to the vaporiser.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo; Improved Method of Determining ——, *by Means of Hydrosulphite.* A. Binz and A. Kufferath. XXIII., page 885.

English Patents.

Aromatic Compounds, and Colouring Matters therefrom; Manufacture of New ——. R. B. Ransford. From L. Cassella and Co., Frankfurt a/M. Eng. Pat. 16,823, July 29, 1902.

See Fr. Pat. 323,202; this Journal, 1903, 491. Compare also U.S. Pat. 723,154; this Journal, 1903, 490.—E. F.

Sulphur Dyes for Dyeing Cotton Directly; Manufacture of ——. G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine. Eng. Pat. 16,932, July 30, 1902.

See Fr. Pat. 323,490 of 1902; this Journal, 1903, 491.
—T. F. B.

Nitroso-oxy Compounds or Quinone Chlorimides and Aromatic Amines; Manufacture of Condensation Products from ——, *of Leucoindophenols therefrom, and of Sulphurised [Sulphide] Dyestuffs derived from the said Condensation Products and Leucoindophenols.* O. Imray. From The Society of Chemical Industry, Basle. Eng. Pat. 7025, March 26, 1903.

Coloured products, characterised by the fact that on reduction they yield entirely or mainly leucoindophenols, are obtained by condensing aromatic amines, with a free para-position, with nitrosophenols or quinone-chlorimides of the benzene or naphthalene series. Primary, secondary, or tertiary alkylated or alphylated amines may be used, the amine being able to combine with more than one molecule of nitrosohydroxy compound if it contains several free para-positions. The reduction to leucoindophenols may be performed in either acid or alkaline solution with the usual reagents. The condensation products, or their reduction products, are converted into blue to black sulphide dyestuffs by the action of sulphur and sodium sulphide, as described in Eng. Pats. 9968, 1902; 5385, 1900; and 9969, 1902 (this Journal, 1900, 530, and 1902, 1024), or according to Fr. Pat. 284,387. Compare also U.S. Pat. 727,387; this Journal, 1903, 693.—E. F.

United States Patents.

Indoxyl; Process of Making ——. P. E. Oberreit, Assignor to The Badische Anilin und Soda Fabrik, both of Ludwigshafen-on-Rhine. U.S. Pat. 731,385, June 16, 1903.

Indoxylic acid and indoxyl are prepared by heating, *in vacuo*, phenylglycin-*o*-carboxylic acid with caustic alkali, "in presence of water, until the desired condensation has been effected."—T. F. B.

Azo Dye; Bluish-Violet ——. A. Israel and O. Dressel, Assignors to Farbenfabriken of Elberfeld Co., N.Y. U.S. Pat. 731,460, June 23, 1903.

A new azo dyestuff is obtained from chloro-*p*-phenylenediamine and 1:8-dihydroxynaphthalene-3:6-disulphonic acid, containing the chlorine atom in meta-position to the azo-group. It dyes wool from acid baths in bluish-violet shades, fast to light.—E. F.

Sulphur Dye (Green), and Process of Making same ——. E. Culmann, Assignor to Schoellkopf, Hartford, and Hanna Co., Buffalo, N.Y. U.S. Pat. 731,669, June 23, 1903.

A green dyestuff is obtained by boiling a melt of the hydrochloride of aminoazobenzene and *p*-aminophenol with sodium sulphide and sulphur. Green dyestuffs are also obtained by boiling a melt of the hydrochloride of aminoazobenzene with sodium sulphide and sulphur with or without a copper salt. The dyestuff obtained in the latter case is almost insoluble in sodium carbonate solution, but soluble in sodium sulphide solution and in concentrated sulphuric acid.—E. F.

Mono-azo-dyestuff, (Yellow) [Azo-Dyestuffs], and Process of making same. W. Dollfus and R. Hagenbach, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a M. U.S. Pat. 731,670, June 23, 1903.

Diazotised *o*-amino-*p*-sulphobenzoic acid is combined with phenylmethylpyrazolone, forming a yellow dyestuff, easily soluble in hot water, and specially suitable for preparing yellow insoluble colour lakes, fast to water, acid, lime, and light.—E. F.

Sulphur Dye; Blue ——, *and Process of Making same.* I. Levinstein and H. Levinstein, Assignors to Levinstein, Ltd., all of Manchester. U.S. Pat. 732,090, June 30, 1903.

See Eng. Pat. 12,229 of 1902; this Journal, 1903, 490.
—T. F. B.

[*Electrolytically*] *Oxidising Organic Compounds.* M. Moest, Assignor to The Farbwerke vormals Meister, Lucius und Brüning. U.S. Pat. 729,502, May 26, 1902. XI. A., page 872.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

English Patents.

Mercerisation of Cotton or other Yarns; Apparatus to be Employed in connection with the ——. Lang Bridge, Ltd., and W. E. Wood, both of Accrington. Eng. Pat. 13,982, June 20, 1902.

The apparatus consists essentially of a frame which carries a lower roller of fixed position, and above this a shaft on which is hung a framework in which two or more smaller rollers work; these latter are flanged to prevent the yarn from slipping off.

The hanks can be put in the machine by bringing the smaller rollers below their shaft, and then, by bringing them above the shaft, the hanks are put in tension.

A screw arrangement is provided to adjust the upper rollers for different lengths of hank. A catch and slot are provided to keep the upper framework in position.

A perforated pipe, for spraying the yarn whilst in motion, and a tank beneath the apparatus, are also provided.—T. F. B.

Oils; Impts. in the Manufacture of —— [*Mordants*]. E. Meusel. Eng. Pat. 7410, March 31, 1903. XII., page 874.

Colour Effects on Woven Fabrics; Process of Obtainin by Embossing and Subsequent Printing, Certain —— Calico Printers' Association, Ltd., and J. Nuttall, both Manchester. Eng. Pat. 16,438, July 24, 1902.

The desired design is embossed on the fabric, which is th printed lightly in an ordinary calico-printing machine, that the embossed portions are printed. The fabric finally fixed and finished, so that the embossing is remove leaving only the design in colour.—T. F. B.

Sulphurised Dyestuffs for Printing Fabrics. O. Imra London. From Farbwerke vormals Meister, Lucius un Brüning, Hoechst a Main. Eng. Pat. 16,897, July 3 1902.

With the object of preventing the attacking of the roller in printing machines, by sulphur or free sulphides in cru sulphurised dyestuffs, the following methods are used:—

When the proportion of sulphur is small, a solution sodium xanthate, or any other thiocarbonate, is added the alkaline printing mixture.

With larger amounts of sulphur, the crude dyestuff mixed with a bisulphite (or sulphurous acid and an alkal which converts the sulphur into thiosulphate.—T. F. B.

Dyed Textile Materials; Apparatus for Oxidising —— C. E. Wild, Lansdowne, Pa. Eng. Pat. 7562, April 1903.

See U.S. Pat. 726,207 of 1903; this Journal, 1903, 624.
—T. F. B.

Fireproofing of Textile Fabrics; The ——. H. Gri shaw, Manchester. Eng. Pat. 16,372, July 16, 1903.

Animal or vegetable fibres, or fabrics composed of the are rendered incombustible by immersion in solutions "inorganic" ammonium salts.—T. F. B.

United States Patent.

Waterproofing and Rot-proofing Fabrics; Method of — J. Williams, Assignor to The Oriental Waterproofi Syndicate, Ltd., both of Hackney Wick. U.S. P 731,002, June 16, 1903.

See Eng. Pat. 19,013 of 1901; this Journal, 1902, 1132.
—T. F. B.

French Patents.

Fulling and Dyeing of Woollen Fabrics. A. Elosegui Fr. Pat. 327,065, Dec. 6, 1902.

See Eng. Pat. 371 of 1903; this Journal, 1903, 416.
—T. F. B.

Dyeing Woollen Fabrics in the Fulling Trough. A. Elosegui. Fr. Pat. 327,066, Dec. 6, 1902.

See Eng. Pat. 369 of 1903; this Journal, 1903, 491.
—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Alkali, &c., Works; Thirty-ninth Annual Report on — by the Chief Inspector, Feb. 21, 1903.

The inspector considers that the advances made chemical technology in recent years have brought abc conditions, provision for which is not completely made the Alkali, &c., Works Regulation (Amending) Act of 1 Damage is sustained by crops and vegetation general from escape of acid gases, in some districts, as in Widn for instance, from chemical works, subject to control, a from the tall chimneys of metallurgical works, the ope tions of which are exempt from inspection under t Alkali Acts, and it is not always easy to apportion the blan This consideration is not, however, one to cause a slackening of vigilance over acid escapes from chim connected with the Chance-Claus process, which esca have occasioned serious remonstrance during the past ye

Experiments made with "Weldon mud," as a cont material in Claus kilns, show that it offers only slig advantages over iron oxide similarly used. The investi tions initiated in the preceding year into the reactions t take place in these kilns have been continued in Scotla pecially to determine the working conditions most favour- ie for maximum decomposition of hydrogen sulphide, ith the highest yield of sulphur in the free state. These nditions proved to be: 1. That the working temperature ould not fall below 400° F.; a higher temperature results oxidation of the sulphur formed to sulphurous acid, pecially if excess of air be present. 2. The air supply the reacting mixture should not exceed 3½ to 4 times at of the hydrogen sulphide present. 3. The rate of flow the reacting mixture should not much exceed ¾ cb. ft. r minute per square foot superficies. An investigation llows as to the "Theoretical temperature attained in Claus ns by products of reaction."

An elaborate paper, by the chief inspector and Mr. Linder, the "Examination of Methods employed in estimating the tal Acidity of Gases escaping from the Chamber Process Manufacture of Sulphuric Acid, with Suggestions arising m the Study of the Interaction of Nitrous and Sulphur- s Acids, or their Salts, in Aqueous Solution," included, th tabular matter, in the present report, has already peared in this Journal, 1902, 1490—1507.

As regards the chamber process for the manufacture of lphuric acid, no striking modifications of existing methods ve occurred. The "tangential" system of chamber rking, with cylindrical instead of rectangular chambers, roduced in Germany, and meeting with some extension the Continent and in America, has not yet been intro- ced here. On the Continent, atomised water is coming o use instead of steam, for supplying the water vapour cessary for the chamber reactions. In concentrating or tifying sulphuric acid, the stepped beaker system is not gely favoured. The old glass retort system is preferred many cases; and when absolutely clear acid is not a cessity, iron pots are often used. The Kessler process pears to be gaining ground and giving satisfaction, but not applicable in all cases. The processes and apparatus cribed in Eng. Pats. 20,142 and 20,143 of 1901 (this rnal, 1902, 1183), for increasing the absorption power of iven vitriol plant, have been used for a considerable time different sets of chambers, and have shown an increase 20 per cent. of pyrites burnt, with considerable reduc- n in the nitre consumption. In District No. 4, the al inspector thinks it probable that great changes are pending in the construction of vitriol chambers in the ection of reduction in size. In Scotland, the Herreshoff ner (see this Journal, 1903, 747) for pyrites smalls has n introduced, and is stated, notwithstanding initial ficulties, to have effected a distinct improvement as ards the escape of noxious gases.

actors for Use in Ascertaining the Speed of Acid ses saturated with Water Vapour.—Owing to the ead of the Kessler system of sulphuric acid concentra- , attention has of late been specially directed to this ject. The anemometer and methods of calculating ults, as described in Fletcher's pamphlet in 1876, relate currents of heated *permanent gases* passing to the irator through a flue of known sectional area in a en time, and when applied to mixed gases and water our, as drawn at the temperature of the water in the irating vessel from heated apparatus, containing, perhaps, ersaturated steam, the calculations do not accurately ly. Mr. Linder has now revised the formulæ given in tcher's pamphlet so as to meet the cases in question. calculations are given, and are illustrated by experi- ntal data.

he manufacture of sulphuric acid by the "contact" cess has been successfully introduced in Scotland. ites burners of the ordinary type are employed, the hot es from which pass up a tower filled with pyrites cinder, re a portion of the sulphurous acid present is con- ted into sulphuric anhydride. The latter is absorbed sulphuric acid, and the residual gases are brought into tact with platinum, whereby a further conversion takes e. The remaining gases are permitted to escape. So the results, as regards the acidity of the escaping gases, e much to be desired.

etermination of the SO_3 Equivalent of Gases evolved he Manufacture of Superphosphate Manures.— Dr. eck has again taken up this subject, already dealt with in the Report for 1901 (see this Journal, 1902, 1135-7 and 1413). There are certain drawbacks to the test there described, which are completely overcome simply by addition of calcium chloride to the standard caustic alkali solution, when (without use of alcohol, or of phenolphthalein as indicator, involving boiling of the solution on its reaching the neutralisation point), the test may be made in the cold, with methyl orange as sole indicator, with accuracy, rapidity, and certainty. Detailed examples are given of the results obtained by the former and present tests. The explanation is that when calcium chloride is added to the sodium hydroxide or carbonate solution used in neutralising the gases, the calcium silico-fluoride formed is decomposed as quickly and completely in the cold as the very sparingly soluble sodium salt is at the higher temperature; and that, "being easily soluble, while giving a totally insoluble fluoride, the solution continues permanently acid to methyl orange from the beginning to the end, when the decomposition to calcium fluoride is complete." There may then be a brief period during which the solution developes a terra cotta shade of colour (due to traces of dissolved silica), which is removed by addition of two or three more drops of the alkali solution, and then the yellow neutral tint becomes permanent.

Chemical manure works have been busily engaged during the year. The following table shows the amount, in tons, of manure materials imported during the indicated years:—

—	1902.	1901.	1900.
Guano	9,000	13,000	30,000
Mineral phosphates	365,000	354,910	353,400
Nitrate of soda	105,000	107,600	135,000

The manufacture of superphosphates at the present time is almost entirely dependent on imported material. The Cambridgeshire coprolites, at their maximum output in 1876, yielded 258,150 tons, valued at 625,000*l.*, the corresponding figures for 1901 being 79 tons, in value 136*l.* The exports of sulphate of ammonia amounted in 1902 to 162,750 tons, the home consumption being 63,750 tons. The corresponding figures in 1901 were 150,000 tons and 68,009 tons; but it is believed that the home consumption for 1902 is understated, and probably should not be lower than for the preceding year.

In the Widnes and Runcorn District, two Mond gas installations, with ammonia recovery apparatus, are in course of erection, and are expected to gasify about 1500 tons of slack per week, which will materially increase the production of ammonium salts in the district. The following table shows the amount of sulphate of ammonia produced in the United Kingdom:—

—	1902.	1901.	1900.
Gas works	150,055	142,703	142,419
Iron works	18,801	16,353	16,959
Shale works	36,931	40,011	37,267
Coke oven works	15,352	12,255	10,393
Producer gas and carbonising works (bone and coal)	8,177	5,891	6,688
	229,316	217,213	213,726

Determination of Thiocyanates (Sulphocyanides) in Gas Liquor.—The methods hitherto followed having proved unsatisfactory, a modified method has been devised, and worked out by Mr. Linder, which appears to meet all requirements. To the previously boiled liquor, ferric chloride is added in slight excess (in case a ferrocyanide is present, which rarely happens), and after filtering off the Prussian blue, sulphurous acid in excess is added to the filtrate, followed by copper sulphate. After standing in the cold, the precipitate of cuprous thiocyanate is separated, washed, and oxidised by nitric acid, and after boiling a slight excess of sodium carbonate is added, followed by acetic acid and potassium iodide. Then, after diluting the solution, the iodine set free is titrated with thiosulphate.

Constitution of Ammoniacal Liquors.—In a table of analyses of ammoniacal liquors, in part of which this improved method of estimating the thiocyanate present is used, there is a column under the head "Distribution of sulphur" for polysulphide and other forms, by difference, in which all the percentages have the minus sign prefixed, and, in some cases, this minus percentage is considerable. This means that the sum of the sulphur returned as sulphate, thiocyanate, thiosulphate, and sulphide, exceeds the total sulphur found by bromine oxidation and precipitation as barium sulphate. This is readily explicable on the supposition that part of the sulphur is present as *sulphite*, causing the figure for thiosulphate to largely exceed its proper value, by reason of the fact that the factor of conversion of N/10 iodine into sulphur for thiosulphate is four times as great as that for sulphite. In the special case of a coke oven liquor, the analysis of which is included in the table cited, and in which the minus difference figure reaches 18·29 per cent., by the application of Richardson and Ackroyd's joint iodine and acidimetric method, clear evidence has been obtained that sulphite was present. On the other hand, when the percentage in the "difference" column of the table is positive, this is taken as evidence of the presence of a polysulphide, which cannot co-exist with a sulphite, the former being at once completely converted into a mixture of thiosulphate and sulphide by an excess of the latter, as has been already shown in the previous report. The analyst can only at present, in the case of liquors shown by appearance of the negative sign, to contain both sulphite and thiosulphate, arrive at a united figure for both by a differential method. But when polysulphide is present, and the absence of sulphite may consequently be inferred, the figure for thiosulphate may be reached directly by iodine titration.

Complaints that have been made in the neighbourhood of Torquay of injury from noxious gases, supposed to have emanated from a sulphate of ammonia plant, have been found to owe their origin to a peculiar condition of the water in Torbay, occurring about once in every two or three years, and spoken of locally as the "sea being sick." This condition is traced to the presence of a vast quantity of decomposing micro-organisms, which give off a sewage-like stench. It was clearly shown that this local condition of the sea, and not the tar works, was the source of the smell complained of.

In tar works, two cases of fatalities in cleaning stills have occurred in the year covered by the report, involving in each case the loss of two lives. It is again urged that, in cleaning stills, complete physical disconnection should be made from other stills, the mere turning of a tap being "quite an insufficient safeguard against accident."

There has been continued depression in the Cheshire districts in the salt industry. The United States took the lead as salt producers in 1897, and in 1900 they produced 23 per cent. of the world's supply, Great Britain's production being only 16·6 per cent. The escape of hydrochloric acid gas in salt works averages only about one-fourth of the escape legally permissible.

The use of rotary cylindrical kilns in cement works is becoming more general; but the industry is still depressed, and several works have remained inactive. Complaint has been made of the emission of black smoke where dry powdered coal is used, leading to the trial of oil for fuel at one works, "but the fumes emitted have a distinct and characteristic odour which is noticeable." A fatality occurred at a factory on the Medway on the 27th November, by which three lives were lost from poisoning by carbon monoxide. Attention is called to the necessity of keeping at hand a cylinder of compressed oxygen, with means for its administration, at all places where poisoning by carbon monoxide or other gases is likely to occur. The workmen have a plan of restoration which has been locally used for years, consisting in placing the sufferer on the ground with his face over a freshly dug hole; an operation which should be "strictly forbidden."

The experimental plant started at Neath for working Picard's process of treating complex zinc ores, and described in the Report for the preceding year (this Journal, 1902, 1137) has been in operation during the whole of the yea and is stated to have met with considerable success. Th trade in white arsenious acid has been so greatly depresse that several arsenic works have discontinued operation and the Devon Great Consols mine is to be abandoned an the plant removed. Previous to 1901, the world's suppl of arsenic and its compounds was derived almost entirel from Cornwall and Devon, and from Freiburg in German No prosecutions have been instituted in the year. Tl report contains 193 pages, of which 24 pages are given t Scotland.—E. S.

Sodium Thiosulphate; Action of Hydrogen Peroxi on ——. R. Willstatter. Ber., 1903, 36, [9], 1831-1833.

When one molecular proportion of hydrogen peroxide added to a solution of sodium thiosulphate, the liqui becomes alkaline, but addition of another molecule caus the liquid to become neutral towards phenolphthalei The reaction is supposed to take place in two phases:—

(*a*) $3Na_2S_2O_4 + 4H_2O_2 = 2Na_2S_3O_6 + 2NaOH + 3H_2O$;
(*b*) $Na_2S_2O_3 + 2NaOH + 4H_2O_2 = 2Na_2SO_4 + 5H_2O$.

When hydrogen peroxide is slowly added to a well-coole concentrated solution of sodium thiosulphate, the sodiu sulphate formed completely deposits, and by further co centration of the solution in a vacuum, crystals of sodiu trithionate, $Na_2S_3O_6$, $3H_2O$, are obtained.—J. McC.

Chromates of Polyvalent Metals. O. Mayer. Ber., 190 36, [9], 1740—1743.

Silver bichromate is formed as a dark crystalline powde resembling iodine, or in lustrous amethyst-coloured plate on mixing hot solutions of chromic acid and silver nitrat For analysis the bichromate was dissolved in dilut ammonia, the excess of ammonia boiled off, and the silve precipitated as chloride. The clear liquid was decante the silver chloride digested with water containing hydr chloric acid, transferred to a filter, and washed wi alcohol. The filtrate was boiled down with hydrochlor acid and alcohol, the residue calcined and weighed a chromic oxide.

Barium bichromate is formed on mixing hot concentrate solutions of chromic acid and barium chloride. The pr cipitated crystals were washed with glacial acetic aci For analysis the salt was dissolved in hot concentrat sulphuric acid, the barium sulphate precipitated by addin water, filtered off and calcined.

Both silver bichromate and barium bichromate ar decomposed by water in the cold, into monochromate an chromic acid.

Lead bichromate is formed as a reddish-brown, crystalli powder on boiling lead acetate and chromic acid with co centrated nitric acid under a reflux condenser. Fo analysis the salt was boiled with concentrated sulphur acid till a white precipitate was produced, the formation which was completed by the addition of water and alcoho After settling, the lead sulphate was filtered through Gooch crucible, washed with alcohol, and dried. Th filtrate was evaporated to dryness, and the chromic sulpha calcined, and weighed as chromic oxide.—T. F. G.

Manganese Salts: Mode of Oxidation of ——, *in Ac Solutions by Alkali Persulphates.* H. Baubign Comptes rend., 1903, 136, [26], 1662—1664.

The fact that (this Journal, 1903, 823) the amount manganese remaining in solution after treatment with pe sulphate increases with the acidity of the solution explained by reference to the behaviour of solutions potassium permanganate and manganous salts when mixe There the precipitation of manganese peroxide may be n only retarded, but prevented by increasing the acidit sufficiently; but in any case the liquid (when the pe manganate is not in excess) shows a reddish-yellow ti due to manganic salt. The action of the persulphate, the in the hot solution is to form manganic salt, either direct or as the result of the action of permanganate, first forme on the remaining manganous salt; and this decompos with formation of peroxide and manganous salt, the latt

ing again oxidised, and the cycle of reactions repeated l no manganous salt remains. The higher the acidity greater the proportion of manganic salt remaining decomposed. In the acid mixture of permanganate and nganous salt, even with manganous salt in excess, the ecipitate formed is always MnO_2, showing within the nts of errors of determination no deficiency of oxygen.
—J. T. D.

rbides and Acetylene-Acetylides; Preparation of ——, by the Action of Acetylene Gas on the Alkali- and Alkali-Earth Metal Hydrides. H. Moissan. Comptes rend. 1903, **136**, [25], 1522—1525.

HEN the hydride of potassium, rubidium, cæsium, or cium is maintained at 100° C. in an atmosphere of tylene gas, reaction occurs, expressed by the equation, $_2H_2 + 2M'H = C_2M'_2.C_2H_2 + 2H_2$. The rapidity of the ction is greatly influenced by the physical condition of hydride, which should be a snowy mass of felted ute crystals. With sodium hydride the reaction occurs, is incomplete even after many hours. The acetylene-tylides produced in this reaction are identical with se formed by the reaction of acetylene on the metal-moniums (this Journal, 1899, 180). Their most ortant character is their dissociation when heated *in uo*, when acetylene gas is evolved, and carbide of the tal remains. The present reaction affords a means of ming these metallic carbides at comparatively low peratures from the hydrides.

Neither ethylene nor methane reacts on these metallic drides at 100° C.—J. T. D.

tric Oxide; Reduction of —— by Alkaline Pyrogallol. C. Oppenheimer. Ber., 1903, **36**, [9], 1744—1748.

RE nitric oxide was prepared by the action of dilute ic acid on copper filings, absorbing the gas in ferrous phate solution, heating this solution, and collecting the over mercury.

Paper balls, soaked in a concentrated solution of alkaline ogallol, were introduced into the pure nitric oxide con-ed in a eudiometer over mercury. The gas was rapidly orbed, equilibrium being established after 24 hours. out 60 per cent. of the gas was absorbed, the residue sisting of nearly pure nitrous oxide. The quantity of ous oxide formed is less than that required by the ation $2NO = N_2O + O$, and hence it seems that alka-pyrogallol not only reduces nitric oxide to nitrous oxide, dissolves part of the nitric oxide as such, forming ites. The presence of nitrous acid could be detected in solution by means of *m*-phenylenediamine paper, and iodide-starch paper.—L. F. G.

dine and Sulphur; Mixtures of ——. R. Boulouch. Comptes rend. 1903, **136**, [25], 1577—1578.

PHUR and iodine, when melted together, form neither pounds nor solid solutions. They form a eutectic, posed of 54·3 per cent. of sulphur and 45·7 per cent. dine, which melts sharply at 65·5° C.—J. T. D.

Phosphorus; Solubility of ——. C. Stich. Pharm. Zeit., **48**, 343.

SPHORUS dissolves very slowly in most of its solvents, frequent agitation for weeks is required before satura-is effected. The author has determined its solubility he following liquids, the weights given being those of phorus in 100 grms. of saturated solution:—Almond 1·25; oleic acid, 1·06; liquid paraffin, 1·45; water, 03; acetic acid, 96 per cent., 0·105.—J. O. B.

ulphuric Acid; New Method for the Determination of ——. F. Raschig. XXIII., page 883.

Nitric Acid; Volumetric Determination of ——. Débourdeaux. XXIII., page 883.

li Bicarbonates and Carbonates; Behaviour of Phe-lphthalein in Presence of ——. Giraud. XXIII., ge 883.

Complex Cyanides; New Method of Analysis of ——. M. Dittrich and C. Hassel. XXIII., page 883.

Nitroprussides; Volumetric Determination of ——, and of Soluble Cadmium Salts. Fonzes-Diacon and Carquet. XXIII., page 883.

English Patents.

Iron Alloys; Electrical Production of ——, with the Simultaneous Production of Alkaline Oxides and Alkaline Earths. G. Gill. Eng. Pat. 12,702, June 3, 1902. XI. B., page 872.

Ammonia; Obtaining ——, from Towns' Refuse or other Nitrogenous Organic Matter by Means of Waste Heat from Refuse Destructor Furnaces. W. Naylor, Preston. Eng. Pat. 17,650, Aug. 12, 1902.

THE refuse, powdered, and if not already alkaline, mixed with lime or the like, is passed by a conveyer through a gas-tight chamber, into which air, heated by the hot flue gases leaving the destructor furnace, is forced. The ammoniacal gases are led away for collection by usual means. The dried refuse is charged into the furnace for complete combustion.—E. S.

Silicates of Alumina; Treatment of Materials containing ——. [Preparation of Silicon and Alumina]. W. L. Wise, London. From C. H. Homan, Christiania, Norway. Eng. Pat. 6132, March 12, 1902.

SEE U.S. Pat. 732,410, following these.—A. G. L.

Electrolytic Processes [Electrolysis of Alkali Chlorides], and Apparatus therefor. L. Gurwitsch. Eng. Pat. 16,358, July 23, 1902. XI. A., page 872.

Gases, Vapours and the like; Process and Apparatus for Treatment of ——, by Electric Spark Discharges. J. Schlutius. Eng. Pat. 2199, Jan. 29, 1903. XI. A., page 872.

Ammonium Formate and Ammonia; Process for Manufacture of ——. J. Schlutius, Karow i. Mecklenburg, Germany. Eng. Pat. 2200, Jan. 29, 1903.

A MIXTURE of hydrogen, nitrogen, and carbon monoxide, such as is obtained in Dowson gas, or in a mixture of water-gas and nitrogen, is submitted to the action of non-luminous electrical discharges in the presence of steam and spongy platinum. If the chamber be not cooled, ammonium formate is produced as follows:—

$$2N + 3H_2 + 2CO + 2H_2O = 2HCO_2(NH_4).$$

If the chamber be kept below 80° C., ammonia is formed.
—W. G. M.

United States Patents.

Sulphuric Anhydride; Apparatus for Making ——. C. Daub, Antwerp, Assignor to J. C. Deuther, Detroit. U.S. Pat. 731,758, June 23, 1903.

SEE Eng. Pat. 9536 of 1902; this Journal, 1902, 1138.
—T. F. B.

Metallic Oxides; Apparatus for Making ——. M. Jacobi, Assignor to O. G. Boehm, both of Philadelphia, Pa. U.S. Pat. 731,055, June 16, 1903.

ROWS of covered pots containing the metal and acid to be used in the process of oxidation, are arranged within a casing provided with draught openings, and having a bed of sand at the bottom, in which a serpentine or zigzag heating pipe is embedded. Means are provided for supplying a regulated amount of cool air within the casing.
—E. S.

Sodium Oxide; Process of Making ——. A. Bischler, Basle, Switzerland, Assignor to the firm of Basle Chemical Works. U.S. Pat. 731,746, June 23, 1903.

A MIXTURE of sodium and sodium peroxide, with addition of a small percentage of caustic alkali, is heated to above 400 C., a vacuum being maintained towards the end of the operation.—E. S.

Brine [used in Manufacture of Starch from Indian Corn]; Process of Purifying ——. T. T. Gaff, Barnstable, Mass., and J. F. Gent, Mount Clemens, Mich. U.S. Pat. 731,105, June 16, 1903.

The brine used in separating the starchy particles from the germs of Indian corn is purified by maintaining it in constant circulation from and back into the bath, with successive separation of the germs and of the starchy and glutinous matters. See U.S. Pat. 707,059, Aug. 12, 1902; this Journal, 1902, 1149.—E. S.

Brine [used in Manufacture of Starch from Indian Corn]; Apparatus for Purifying ——. T. T. Gaff, Barnstable, Mass. and J. F. Gent, Mount Clemens, Mich. U.S. Pat. 731,106, June 16, 1903.

The apparatus used in conducting the process described in the preceding abstract includes a brine-bath with a pipe circuit, interposed in which near the overflow of the bath is a reel to segregate the germs, and between the reel and the pump by which the brine is circulated, is a settling device for removal of the residual starchy and glutinous matter, with means for conveying the latter to a filter press.—E. S.

Silicon and Aluminium; Manufacture of ——, *from Silicates of Alumina.* C. H. Homan, Christiania, Norway. U. S. Pat. 732,410, June 20, 1903.

The clay or other substance containing silicates of alumina is mixed with a reducing agent, such as metallic aluminium, in such proportion that the whole of the silica and basic impurities may be reduced. The mixture is heated to a high temperature, in an electric furnace or otherwise, and the resulting products are tapped off separately. See Eng. Pat. 6132; preceding these.—A. G. L.

Generator for Gases [Manufacture of Oxygen]. F. B. Felt and C. E. Felt, Chicago, Assignors to the Oxygen Light and Fuel Co., Delaware. U.S. Pat. 725,060, April 14, 1903.

The invention consists of a vertical chamber, in the lower end of which are suspended vertical tubes open at both ends. Into the lower ends of these tubes, jets project, through which different reagents may be alternately discharged. The apparatus is particularly useful for treating a manganate of soda solution alternately with air under pressure, and with steam, for the purpose of obtaining oxygen.—R. A.

French Patents.

Sulphuric Acid; Manufacture of ——, *by the Contact Process.* Soc. Anon. La Métallurgie Nouvelle. Fr. Pat. 326,850, Dec. 1, 1902.

A mixture of heated air with purified sulphur dioxide obtained as described in the next abstract, is passed through a series of chambers charged with platinised asbestos, arranged on shelves projecting from alternately opposite sides, each chamber being surrounded by a space, through which, by suitably arranged inlets, a regulated cooling air current may be caused to pass. The air thus heated is conveyed away to be utilised for mixing with sulphur dioxide. The speed of the reacting gases passing through the contact chambers is so regulated as to obtain uniformity of reaction in each successive chamber.—E. S.

Sulphuric Acid; Manufacture of ——, *by the Contact Process.* Soc. Anon. La Métallurgie Nouvelle. Fr. Pat. 326,851, Dec. 1, 1902.

In order to obtain sulphur dioxide free from arsenic and other impurities, and so fitted for the production of sulphuric acid by the contact process, the gases from the sulphur burners are passed into an apparatus of "quadruple effect," in which they are partially cooled, and filtered; thence they traverse a cooling tank to a tower in which they are washed free from sulphuric anhydride by a flow of sulphuric acid from a rose, and then pass into a chamber in which they are exposed to pulverised water that has been previously used in washing the weak exit gases. The sulphurous acid solution thus formed is led back to the cooling tank already mentioned, and then to the extractor, or "quadruple effect" apparatus, in which, under the joint action of the hot burner gases, and of agitation with ai previously heated as described in the preceding abstrac the sulphur dioxide gas is liberated in admixture with ai and the hot mixture is conveyed to the contact apparatus. —E. S.

Sodium Sulphide; Manufacture of Concentrated —— *Immediately Applicable in Manufactures.* J. Weisber Fr. Pat. 326,805, Nov. 28, 1902.

Sodium sulphide solution, when sufficiently concentrat for running into moulds, is, under the present inventio cast in plates or pieces of such dimensions as may readily utilised in industry. The plates or pieces ma immediately on cooling, be packed in wooden cask capable of being well closed.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Quartz-glass. Heraeus. Fifth Internat. Congress Applied Chemistry, Berlin. Zeits. angew. Chem., 190 **16**, [25], 594.

Brazilian quartz is used in the manufacture of glass, bein cheap and of excellent quality. Large lumps cannot melted and worked up immediately, as they splinter 570°. At 1,700° the crystalline quartz becomes vitreou Before heating, apparatus made of quartz must be carefull cleaned, the merest trace of dust or moisture causin devitrification of the surface at a temperature as low 300° C. The coefficient of expansion of quartz-glass exceedingly small, it is therefore not affected by changes temperature. It has not yet been found possible construct high temperature thermometers of quartz-glass. —L. F. G

Glass; Valuation of ——, *and Impts. in the Manufactu of* ——. F. Mylius. Fifth Internat. Congress of A plied Chemistry, Berlin. Zeits. angew. Chem., 190 **16**, [25], 592.

Glass for chemical purposes should be strong, colourles homogeneous, and not easily attacked by chemicals. Th tensile strength of glass cannot be materially increase but absence of colour and homogeneity are very perfectl attained. The resistance against chemical action depen on the reagents employed. Caustic soda attacks all glas even quartz, to an approximately equal extent. Dilu acids are without action, but boiling concentrated sulphur acid attacks glass strongly, as does metaphosphoric acid high temperatures. Of saline solutions, those which a hydrolysed and thus contain free alkali, attack glass. Th best test is the action of water on the glass; the alkali d solved out can be estimated by titration or by conductivit measurements. Quartz is not attacked by water. Surfa hardening does not improve the qualities of glass.

Ordinary green bottle glass seems to offer great resis ance to the action of chemical reagents.—L. F. G.

Porcelain; Influence of Kiln Temperature on the Pr perties of ——. Fifth Internat. Congress of Appli Chemistry, Berlin, 1903. G. Vogt. Chem.-Zeit, 1903, 27 [49], 606.

In view of the fact that the coefficient of expansion of porcelain, unlike that of hard porcelain, diminishes as th temperature increases, it is necessary, in judging porcelai to be acquainted with the kiln temperature as well with the composition of the mass. In investigating th influence of temperature on the properties of the porcel the author found that one and the same body will furni different products when coated with different glazes a fired at different temperatures, the alteration dependi solely on the modification of the coefficient of expansi resulting from a difference of as little as 100° C. in th kiln temperature. The conclusion formed is that, f producing porcelain, it is sufficient to add enough kaol to render the mass plastic, and the requisite amount quartz and flux to impart transparency. The properties the porcelain can then be modified by controlling the ki temperature, excessive heat being avoided since all bodi rich in fluxes tend to exhibit a uniform coefficient expansion as the temperature rises.—C. S.

English Patent.

urnaces [for the Manufacture of Glass]. C. Leistner, London. Eng. Pat. 13,114, June 9, 1902.

E furnace is heated by means of liquid fuel, which is ected by a compressed-air blast through a burner unted on trunnions, the flame being directed on to the face of the mass to be liquefied. Both air and oil may previously heated by waste heat from the furnace, the after leaving the compressor, passing through a receiver ated below the furnace and heated by it, whilst the oil ses through a pipe around which the burnt gases from furnace play. An additional air supply is provided, ch is blown into the furnace by means of fans so as to ure complete combustion. It may be made to cool the ners supplying the mixed oil and air, and may also be -heated by waste heat from the furnace.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

English Patents.

lding Materials; Processes for Colouring ——, such as ime, Mortar, Bricks, and Artificial Stone. W. chnithess, Zurich, Switzerland. Eng. Pat. 7836, April , 1902.

RTAR, lime, &c., may be coloured by adding, during the ing, lakes of colouring matters with lime or other line-earth hydroxides. A moulded brick may also be n a superficial colouring by first impregnating it with a tion of an alkaline-earth salt and then with an alkaline tion of the colouring matter. If a solution of a metallic , *e.g.*, manganese, iron, zinc, and lead salts, is used, the ks require steaming in order to develop the colour. lime itself may be coloured by adding the colouring erial to the water used for slaking. Bricks may also be regnated with solutions of organic bodies, *e.g.*, indigo, h in a reduced state are colourless, and then exposed e action of the air, when the colour is developed.

etallic salts which interact with lime to give insoluble ipitates, *e.g.*, ferrous chloride, may also be used to stain ks, as may also such salts, *e.g.*, ferrous chloride, mic salts, which on heating and exposure to air mpose with formation of a coloured oxide.—A. G. L.

ks or Artificial Stone Articles or Blocks, or the ke; Manufacture of ——, and Apparatus therefor. Kœniger, Cologne, Germany. Eng. Pat. 15,437, uly 10, 1902.

-grade sandy or dusty ores, ore residues, blast-furnace , iron and copper pyrites residues, and similar materials nixed in a drum by means of mixing blades with deter d quantities of lime, magnesia or magnesite, and borax, lry mixture then being mixed with calculated quantities lphuric acid, or sulphuric anhydride, and water. The is then moulded into bricks, allowed to dry for about ays, and burnt.—A. G. L.

R actory Material; Manufacture of ——. H. A. D. ollins, Glynneath. Eng. Pat. 16,215, July 21, 1902.

P erised silica or siliceous matter is mixed with one or compounds of sodium and calcium, the mixture ded to the desired shape and burnt at a temperature of 2,)° to 4,000° F., so as to produce a compound silicate of m and calcium acting as a binding agent. For bricks, good results are obtained by using a mixture of 99 per by weight of pulverised quartz, flint, or sea-sand, with cent. of caustic soda and 8 per cent. of milk of lime; t for crucibles and the like, a mixture of 93 per cent. uartz, &c., 5 per cent. of sodium silicate (of, say, 14 Tw.), and 2 per cent. of calcium chloride is preferred. —A. G. L.

B ding Materials; Manufacture of Artificial ——. J. B. Mills, London. From A. Seigle, Lyons, France. g. Pat. 17,580, Aug. 11, 1902.

C mine, calcined at a comparatively low temperature, is xed with about 3 or 4 parts of slaked lime, and the whole mixed with sand containing at least 50 per cent. of silica, in the proportion of 90 per cent. of sand to 10 per cent. of calamine and lime. After moistening, so as to obtain a sufficiently plastic mass, the paste is moulded as usual, transferred to autoclaves, and exposed to the action of steam at a pressure of 8 to 10 kilos. for 8 to 12 hours. The bricks, &c., which are ready for use immediately after their removal from the autoclaves, consist of a stable hydrated silicate of zinc and calcium.

The calcined calamine may be replaced by a mixture of zinc oxide with an alkali silicate, and the slaking of the lime may be deferred until it has been mixed with the calamine, or even with sand.—A. G. L.

Asphalt Stone; Manufacture of Artificial ——, and the like. C. Rubitschung, Frankfurt a Main, Germany. Eng. Pat. 17,618, Aug. 11, 1902.

The powdered stony material is heated to about 200° to 300° C., and intimately mixed with thin tar, freed from water, and heated to a temperature of 150° C., till a non-staining mortar, dry to the touch, is produced. This is rapidly cooled and prevented from caking together, for instance, by causing it to fall from a considerable height through cold air on to one or more slaking sieves. The loose material obtained is fused and pressed into blocks, &c., just before use.

In a modification of the process, a quantity (10 per cent. or less) of tar insufficient for the necessary binding is added as above, and a few per cent. of a pulverised binding agent, such as pitch or asphalt-mastic, added in the cold. During the reheating this binding agent melts and assists the binding action of the tar. Or, instead of adding the binding agent in the form of a powder in the cold, it may be added in the liquid form, whilst hot, during the reheating *in situ*. Sawdust may also be mixed with it.—A. G. L.

Stone, Artificial, or other Refractory Material; Manufacture of ——. A. G. Salamon, London, and P. Williams, Rochester. Eng. Pat. 18,829, Aug. 27, 1902.

In the manufacture of uralite, a refractory material, made from asbestos, with or without the use of a filling material, by treatment with sodium silicate and sodium bicarbonate, the sodium mono-carbonate left in the material after washing is removed by soaking it in a solution containing about 15 per cent. of calcium chloride, drying at a temperature of about 80° C., and repeating these operations, finally removing the sodium chloride formed, together with any excess of calcium chloride left, by prolonged washing with water. The duration of the soaking in the calcium chloride solution depends on the thickness of the sheet—*e.g.*, one $\frac{1}{64}$-inch thick would require two hours' soaking.—A. G. L.

Bricks or Artificial Stone; Manufacture of ——. J. S. Rigby, Liverpool. Eng. Pat. 20,534, Sept. 20, 1902.

Prior to being mixed with sand, the lime used for the bricks, &c., is hydrated by means of a current of moist air. This may be done by causing the lime to fall down a series of inclined shelves in a tower, the shelves being moved up and down, and a current of moist air being passed up the tower; or else the floors of the tower may be level and provided with openings in one part, through which the lime is caused to fall by means of revolving rakes, from which the moistened air may be injected into the lime. The lime may first of all be broken up in any mill, and, if desired, bolted.

In preparing the mixture, the hydrated lime and sand are fed from two large hoppers, beneath which are placed two smaller hoppers, each in connection with a weighing machine. When the requisite quantities of lime and sand have been weighed out, they are discharged from the smaller hoppers into a mixer, which is in the form of a double conveyor, whereby an intimate mixture is obtained. —A. G. L.

Fireproof Bricks or Material; Manufacture of ——. F. Krüger and J. Denkelmann, both of Berlin. Eng. Pat. 3483, Feb. 13, 1903.

Fireproof artificial stone, bricks, blocks, &c., are made by adding to a liquid mass of silicate of sodium or potassium, heated to from 20° to 100° C., a mixture of finely-ground waste of specular gypsum or other unburnt calcium sulphate with one-tenth its weight of finely-ground asbestos, soapstone, or other material consisting essentially of magnesium silicate, after which the homogeneous mass is pressed into moulds, heated to a red heat, and kept at this temperature for some time, until it becomes hard.—A. G. L.

Bricks or Blocks or other Cementitious Products, or Artificial Stone; Process of Making ——. H. J. Haddan, London. From A. O. Crozier, Wilmington, Del. Eng. Pat. 6849, March 24, 1903.

See U.S. Pat. 723,281; this Journal, 1903, 497.—A. G. L.

Portland Cement, White; A Process for Making ——, for Interior and Exterior Decoration. W. H. Martin, London. Eng. Pat. 12,762, June 4, 1902.

To one part of kaolin or China clay, as free as possible from iron, three to five parts of pure white chalk are added, and then gypsum (sulphate of lime) or chloride of magnesia is added to the extent of 2 to 5 per cent. of the total weight. The ingredients may be mixed dry or with water to a slurry; and the burning is effected as usual for Portland cement.—A. G. L.

Lime Kilns and Cement Kilns; Regenerator for Employment in ——, for Utilising the Heat of Escaping Gases to Heat the Injected Air. P. Lauer, Nancy, France. Eng. Pat. 15,153, July 7, 1902.

See Fr. Pat. 322,776 of 1902; this Journal, 1903, 367.
—T. F. B.

Portland Cement: Improved Method of Manufacturing ——. B. H. Thwaite, London. Eng. Pat. 16,066, July 19, 1902.

The calculated quantity of pulverised lime, previously heated to a high temperature, is placed in a mixing vessel, which is preferably mounted on trunnions so as to be capable of rotation in a vertical plane. The slag from a blast-furnace is next run into the mixing vessel, the lid of which is then put on, and the whole revolved so as to mix the lime and slag intimately. This mixing may, however, also be effected by means of rotating paddles. The product is powdered as usual for Portland cement. The mixing vessel may itself be heated by a gas jet or otherwise.
—A. G. L.

Portland Cement Kilns; Continuous Burning ——. W. W. Maclay, Glen Falls, New York. Eng. Pat. 8996, April 21, 1903.

See U.S. Pat. 725,975 of 1903; this Journal, 1903, 630.
—T. F. B.

Cement; Process for the Manufacture of ——. G. Geissler, sen., and G. Geissler, jun., both of Graz, Austria. Eng. Pat. 9835, April 30, 1903.

Oxygen of as pure a quality as possible is substituted for air during the burning of the cement, which is granulated by letting it flow into water whilst still in the liquid condition. The high temperature (2,500° to 3,000° C.) obtained enables the duration of the burning to be very considerably shortened, whilst, owing to the absence of the nitrogen of the air, much smaller kilns than usual are employed, and the air-blast apparatus is dispensed with.
—A. G. L.

United States Patent.

Stone, Artificial; Process of Manufacturing ——. W. Owen, Woking, England. U.S. Pat. 731,608, June 23, 1903.

Eighty-five per cent. of sand of a fineness of 40 to 50 meshes is mixed with 15 per cent. of lime of a fineness of 75 meshes, in the dry state, in such a way "that each grain of sand is coated with the finer particles of lime." The product is then treated with enough steam at a low pressure to slake the lime, and, after cooling, the whole is subjected to a high pressure, so as to form it into a compact mass, which is dried, and then saturated with moisture at the same time that it is exposed to the action of carbon dioxide, the admission of moisture being gradually stopped until the mass is in a hardened state.—A. G. L.

French Patent.

*Cement; Manufacture of ——, and Apparatus for t
same.* R. F. Wentz. Fr. Pat. 326,948, Dec. 2, 1902.

See U.S. Pats. 714,842 and 714,843; this Journal, 190
30.—A. G. L.

X.—METALLURGY.

Nickel Steels; Theory of ——. C. E. Guillaume.
Comptes rend., 1903, **136**, [26], 1638—1641.

Nickel steels are reversible or irreversible according
the proportion of nickel which they contain; but a clo
examination of their behaviour as to contraction or dilatatic
on cooling from a high temperature shows that both class
behave in an analogous way, the irreversible steels bei
distinguished by exhibiting a thermic hysteresis, which tl
author regards as a secondary phenomenon. Iron, c
cooling, passes at 890° C. from the γ to the β state, a
at 755° C. from the β to the α or magnetic state: tl
addition of nickel (which itself undergoes but one tran
formation, becoming magnetic at 340° C.) lowers the
transformation temperatures at different rates, so that f
a certain percentage of nickel the transformation from tl
γ to the α state appears to be effected directly. Quanti
tive measurements of the dilatation of nickel steels are
accord with this theory, and show that the anomalies
reversible alloys are different from, and of different orig
from, those exhibited as the result of mechanical deform
tion. Reversible nickel steels, then, are to be looked
as reciprocal solutions of nickel and iron, tending to
definite state of equilibrium determined by the proportio
of α- and γ-iron at each temperature.—J. T. D.

Silver Ores; Cyaniding of ——, by Percolation. A.
Griffiths and [illegible]. W. Oldfield. Inst. Mining and Metal
Paper read June 18, 1903. 7 pp.

About 30,000 tons of low-grade silver ores have bee
successfully treated by cyanide percolation under tl
management of the authors at the Palmarejo Min
Mexico. The ore is of the "sulphide" class, the sil
occurring chiefly as argentite (Ag_2S), but with a litt
stephanite, and occasionally embolite. These are acco
panied by iron sulphides (chiefly), with a little galen
blende, and chalcopyrite, the gangue-stuff being quart
calcite, black oxides of manganese, clay, and iron oxide
The ore also contains about 1 dol. to 2 dols. of gold It
crushed wet in a stamp mill, passed over Wilfley tabl
into four masonry settling-tanks, each of 350 tons capacit
The slimes carried over are treated separately. The cyani
plant consists of 12 vats (10 of steel and 2 of wood), ea
30 ft. in diameter and 4 ft. 6 in. deep, over the filters, a
of a capacity of 110 tons each. The solutions drain in
cement sumps, whence they are passed to elevated tank
from which they flow over the zinc extractors, and a
thence conducted to the "strong" and "weak" tanks, a
finally back to the 12 treatment tanks. The strength
the weak solution ranges from 0·25 to 0·7 per cent., th
of the strong from 0·7 to 1·25 per cent., and from 1 ton
3 tons of solution are used per ton of ore. The amount
cyanide and of zinc consumed has gradually been reduc
from 6 lb. to 4 lb., and from 1½ lb. to 1 lb. respectivel
In practice about 25 tons of weak solution (0·30 per cent
are introduced from the bottom, and allowed to soak f
six hours. Then from 30 to 35 tons of similar solution a
added. This in turn is displaced, after 36 hours from tl
commencement, by about 60 tons of "strong" solu
added from the top, with intervals of from three to
hours for soaking. Then 160—180 tons of weak solut
are added, and finally the ore is washed well. Solutio
are titrated before and after passing the ore.

In an account of working two typical tanks, it is show
that, in one case, with an ore assaying 1·24 dols. gold, a
14·21 oz. silver, there was an extraction, after eight day
of 51·9 per cent. of the silver, and 91·9 per cent. of tl
gold. In the other case, with an ore assaying 2·48 do
gold, and 13·38 oz. silver there was an extraction in ni
days of 55·21 per cent. of the silver, and 95·98 per cent.
the gold. The cyanide solutions before passing the zi
extractors assay on an average:—Weak solution = 0·

Au, 2 oz. Ag; strong solution = 1·00 dols. Au, oz. Ag. Afterwards they assay a trace of gold and 0·02 to 0·08 oz. of silver.

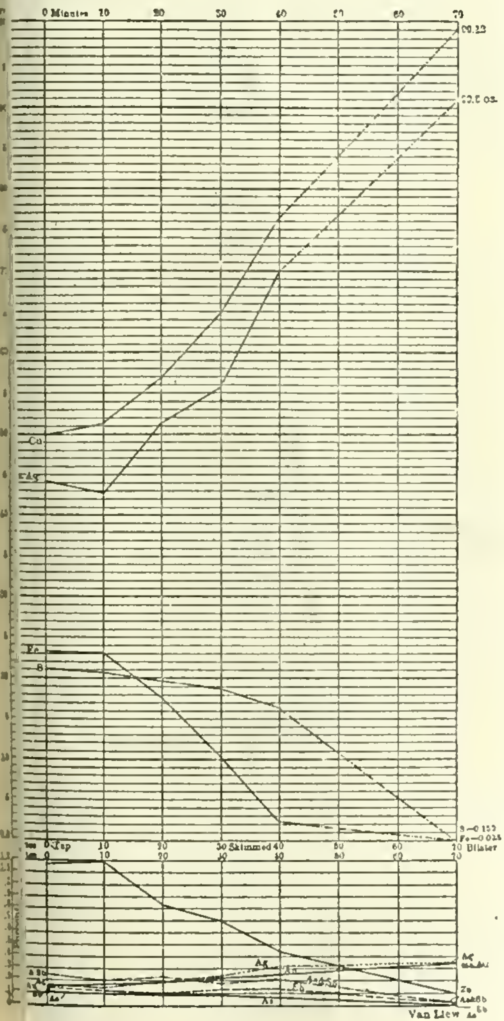
e following table gives the working cost :—Potassium de, 4 lb. at 65 cents, 2·60 Mexican dollars; zinc, b. at 25·5 cents, 0·28; lime, 0.03; filling and sluicing .19; wages, 0·185; sampling, assaying, &c., 0·175; tenance, filters, &c., 0·015; management, 0·15; nent of precipitates, 0·055; total, 3·68 Mexican s; or, say, 5*s.* 10*d.* per ton of 2,000 lb.

m the results obtained, the authors conclude that the ss is economically applicable to certain low grade ores; that fine-crushing and classification are sary; that a larger volume of weaker solution is rable to a small volume of stronger solution; and that ugh oxygenation of the mass is necessary, whilst e treatment would appear to be the best practice.

—W. G. M.

er Matte; Relative Elimination of Impurities in semerising ——. W. R. van Liew. Eng. and Mining 1903, **75,** [26], 967.

ler to determine the relative rate at which the different ities in copper matte are eliminated during the process onverter-blow, a converter in which one charge had y been "blown" was selected, and at intervals of 10 es, a sample of the matte was withdrawn and analysed. e end of 40 minutes' actual blowing, the matte was rted into "white metal," and from this point the ng was continued till "blister copper" was produced.



The results obtained are shown in the following table and in the accompanying curve diagram, in which the abscissæ represent the time in minutes and the ordinates the amounts of the different elements.

Time.	Cupola-Tap.	10 min.	20 min.	30 min.	40 min. Last Skim.	70 min. Blister-Copper.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Copper........	49·72	50·20	56·88	64·60	76·37	99·120
Iron..........	23·31	23·15	17·85	10·59	2·40	0·038
Sulphur	21·28	20·95	19·74	18·83	16·30	0·159
Zinc..........	1·19	1·20	0·84	0·70	0·45	0·090
Arsenic.......	0·11	0·09	0·08	0·08	0·08	0·0012
Antimony.....	0·14	0·12	0·10	0·13	0·13	0·006
	oz.	oz.	oz.	oz.	oz.	oz.
Silver.........	44·20	42·90	51·40	55·80	70·00	20·800
Gold..........	0·16	0·14	0·20	0·24	0·32	0·350

The figures relating to iron and sulphur show that up to the skimming point (40 minutes' blowing), the heat required to carry on the operations within the converter is produced by the oxidation of the iron to ferrous oxide and the combination of the ferrous oxide with the silica of the lining; whilst afterwards it is chiefly the burning of the sulphur which furnishes the necessary heat.—A. S.

Furnaces; Adobe [*Sun-dried Bricks*] *and other Cheap and Makeshift* ——. H. F. Collins. Inst. Mining and Metall. Paper read June 18, 1903. 16 pp.

The raw material of adobe is a loamy clay, mixed with sand or surface loam if too stiff. If too sandy the bricks are friable. Small stones may be present; and chopped straw should be added in the proportion of, say, one two-bushel sackful to a cubic yard of clay, to render the bricks more capable of being handled. Almost any mud will yield adobe, but pure clay shrinks too much in drying. In Mexico, silver-lead ores are smelted in adobe blast-furnaces, and an account is given of these (*cf.* Chism, in the Trans. Amer. Inst. Min. Eng., **15**). Hearths of the material have also been used (*cf.* A. L. Collins "On the Ghorband Lead Mines," Trans. Fed. Inst. Min. Eng., **6,** [3], 449). In Mexican adobe blast-furnaces charcoal is used as fuel; but reverberatory furnaces for use with brushwood may also be built of adobe, and an account is given of the roasting-reverberatories and cupellation furnaces (*vaso*) employed in Mexico (*cf.* W. L. Austin, in the Trans. Amer. Inst. Min. Eng., **12,** 185, and **13,** 41).—W. G. M.

Silicic Acid; Determination of ——, *in Presence of Tungstic Acid* [*Determination of Tungsten in Steel*]. C. Friedheim. XXIII., page 883.

Vanadium; Determination of ——, *in Alloys.* P. Nicolardot. XXIII., page 884.

Iron in Blast-Furnace Working; Losses of ——. B. Osann. Stahl und Eisen, 1902, 1035.

In smelting iron ores, iron is lost, firstly, by projection of unreduced ore as dust in the gases, and, secondly, as ferrous oxide scorified in the slag. The apparent amount of these losses may be diminished by the iron contained in the coke-ash and the limestone flux, which is not taken into account in making up the charges. The total loss thus incurred may vary from nothing up to 5 per cent. and more in the most unfavourable cases. With unroasted oolitic (minette) ores the average may be taken as 3 per cent. Other ores giving rise to much dust in the gases, are calcined spathic iron and burnt pyrites residues.

The amount of dust in the cubic metre of waste gas varies between 5 grms. and 20 grms., and the proportion of iron contained between 12 per cent. and 45 per cent.

With a consumption of 110 coke per 100 of metal smelted, the former containing 7 per cent. of ash with 7 per cent to 11 per cent. of ferrous oxide, this source of loss is completely covered, and such an amount of iron is found in the ash of Westphalian coke.

Aluminium; Heating by ——, and its Applications. H. Bertin. Mém. de la Soc. des Ing. Civils de France, 1902, 218—249.

The principle of heating by aluminium, to which the name of "alumino-thermy" has been given by H. Goldschmidt, the originator of the process, is based upon the reduction of a metallic oxide or sulphide by heating it with powdered aluminium. Once started, the reaction is accompanied by development of heat, not merely sufficient to propagate combustion throughout the entire mass of the mixture without external aid, but also ample for smelting ores and for other metallurgical processes requiring heat. For certain applications magnesium can be employed preferably to aluminium in the mixture.

The practical advantages realised in the process of generating heat by the reducing action of aluminium or magnesium are threefold:—

Firstly, the metals and alloys so prepared are free from impurities, notably from carbon, which is not an ingredient of the reagent mixture. Even from aluminium, though itself one of the readiest metals to alloy, it is remarkable that they are almost free

Secondly, the choice of suitable oxides gives the means of obtaining, without cumbersome apparatus, the highest temperatures as yet possible to be attained even electrically. Sulphides yield the low temperatures desirable for certain processes.

Thirdly, the heat developed by the reaction can at pleasure be determined beforehand with exactitude, and throughout the widest range; it depends solely upon the nature and quantity of the ingredients composing the reagent mixture, which has been named by Goldschmidt "thermit." The temperature also can be regulated, depending as it does upon the heat developed and upon the mass through which the heat is disseminated.

The practical details of this mode of heating are described, and also its industrial application to a variety of mechanical and metallurgical operations.

A table is given of the heat developed and absorbed in smelting by this means the oxides of iron, manganese, chromium, and tungsten, and examples are adduced of the preparation of manganese and of chromium, as well as of various alloys produced direct by this process.

The concluding section of the paper points out how simply carbide of calcium can be prepared by the aluminothermic process instead of by electric current.

English Patents.

Iron Ores for Blast Furnaces; Process of Treating Fine ——. A. D. Elbers, Hoboken, N.J., U.S.A. Eng. Pat. 8591, April 15, 1903. Under Internat. Conv., May 9, 1902.

See U.S. Pat. 708,331, Sept. 2, 1902; this Journal, 1902, 1400.—E. S.

Manganese Steel; Toughening ——. R. A. Hadfield, Sheffield. Eng. Pat. 5604, March 6, 1902.

The manganese steel is very slowly heated to from 750° C. to 800° C., and is then heated as quickly as possible to the temperature at which it is to be plunged into cold water, which varies according to the quality of the steel from 940° to 1125°; but is preferably from 980° to 1050° for castings, and for forged manganese steel from 940° to 1000° C. The proportion of "hardening carbon" in the steel diminishes as the temperature for quenching is raised, so that with the higher temperature, the steel is tougher and less hard. Reference is made to Eng. Pat. 11,833, May 30, 1896; this Journal, 1897, 544. Compare also Eng. Pat. 7778, April 2, 1902; this Journal, 1903, 557.—E. S.

Ores; Concentration of ——. H. H. Lake, London. From A. Froment, Traversella, Italy. Eng. Pat. 12,778, June 4, 1902.

The finely-powdered metalliferous ore is mixed with water, and a suitable oil is added. A gas is then liberated in the mixture, as, for instance, by addition of a carbonate and an acid, when the bubbles carry the metal sulphides to the surface, from which they may be collected.—E. S.

Zinc Refuse or Dross of Galvanising Works; Separa of Pieces or Fragments of Iron and Steel from the — and Apparatus therefor. G. A. Dick, London. Pat. 13,614, June 16, 1902.

The dross is melted at a higher temperature than th which it was formed in the galvanising process, a filtered through a heated filter pot or crucible contai fire-resisting filtering material, which may be constru in various forms, in one of which the pot is divided two compartments communicating at the bottom, o which is charged with fragments of firebrick, coke, o like, through which the molten dross passes. The may be further, or as an independent process, cleared pieces of iron and steel, by being caused to flow in a me state on to the surface of a revolving copper drum, w which a number of permanent or electro-magnets are fi the dross falling from the surface into a gutter w conducts it to the ingot moulds or the like.—E. S.

Metal Plates, Wires, or the like; Manufacture of pound ——. A. J. Boult, London. From H. Wael and M. Dünkelsbühler, both of Nuremburg. Eng. 13,669, June 16, 1902.

See Fr. Pats. 322,159 and 322,160 of 1902; this Jo 1903, 303.—T. F. B.

Fumes; Collection and Treatment of Certain — R. W. Western, London. Eng. Pat. 16,723, July 1902.

The fumes of sulphide ores from blast furnaces are br into contact with ammonium sulphate solution, with tion. The solution thus obtained is treated for separ of the metals present, and especially for obtaining th as hydroxide, by the methods described in U.S. 715,771 of Dec. 16, 1902; and in Eng. Pat. 26,16 Dec. 21, 1901; this Journal, 1903, 97 and 96. Co also Fr. Pat. 324,062, Aug. 6, 1902; this Journal, 499.—E. S.

United States Patents.

Manganese Steel; Toughening ——. R. A. Ha Sheffield, England. U. S. Pat. 731,450, June 23, 1

See Eng. Pat. 5604, March 6, 1902; above, and com Eng. Pat. 7778, April 2, 1902; this Journal, 1903, —E

Gold and Silver; Extracting —— from Slimes. Terry, jun., Assignor to J. O. Treanor, both of Mexico. U.S. Pat. 731,631, June 23, 1903.

The slimes are sprayed with water into an elevate partially filled with cyanide solution containing an ox agent, and "made dense," as by sodium chloride. tank has a hopper-shaped bottom, opening into a pipe leading to another similar tank on a lower lev discharging the settled slimes. The second tank is similarly connected to another, or to others. Side op at different levels in the side of each tank allow of d off the clear liquor, and passing it on to the top of th tank, and so on, until the enriched solution is drawn precipitation.—E. S.

Precious Metals; Sulphuric Acid Process of Extr —— from Solutions. G. A. Bahn, Austin, Tex. Pat. 731,839, June 23, 1903.

Cyanide solutions of the precious metals are aci with sulphuric acid, and zinc, in sheets or otherw immersed in them. The precipitate thus produ collected and treated for its contents of the precious —

Alkali Metals; Manufacture of ——. H. Specket O. H. Weber, Assignors to the firm of Chemisch Griesheim Elektron, Frankfort-on-the-Main. 730,979, June 16, 1903.

See Fr. Pat. 320,815, April 15, 1902; and Eng. Pat March 27, 1902; this Journal, 1903, 148 and 36 compare U.S. Pat. 710,193, 1902; this Journal, 190 —

D agnetic Separation. E. Gates, Chevy Chase, Md., signor to T. J. Mayer, Washington, D.C. U.S. Pat. 1,042, June 16, 1903.

A xture containing diamagnetic substances is fed into a rel vely intense part of a magnetic field, which is rapidly mo d in a direction opposite to that of the feed, the descent of e material being obstructed by a current of liquid, to en e the material to be collected in separate portions, ac ding to the diamagnetic susceptibility.—E. S.

D agnetic Metal; Separating ——, from Sand. E. Gates, evy Chase, Md., Assignor to T. J. Mayer, Washington, C. U.S. Pat. 731,043, June 16, 1903.

T eparate particles of such diamagnetic metals as gold, o er, "or the like," from other diamagnetic material, such as nd, with which they are associated, a rough preliminary se gation is first effected, and with the enriched portion, m etic particles are mingled so as to enmesh or entangle th old, &c. The mixture is concentrated, and the con- ce ate is passed through a directing magnetic field, and th through a magnetic field of such graduated force as to ca the particles to assume "frond-like" forms, such angements contributing to a disentanglement of the di agnetic particles, which are then collected apart.—E. S.

D agnetic Separation. E. Gates, Chevy Chase, Md., signor to T. J. Mayer, Washington, D.C. U.S. Pat. 1,044, June 16, 1903.

A xture of diamagnetic material of different degrees of di agnetic susceptibility, is fed into the intenser part of a ma etic field, in which it is continued until the particles of gr er susceptibility have moved into a less intense part of h eld; the "magneto motive force" is then intensified n action on the particles to be separated, "by causing th eld to move in a succession of wave-like impulses in a i ion opposed to the feed of the mixture through the fie '—E. S.

M ls; Apparatus for Extracting ——, from Ores. O. A. is, Eldorado Canyon, Nev. U.S. Pat. 731,169, June 16, 03.

ore passes into a hopper having an inclined bottom, an discharge opening, at a point adjacent to which a pip communicating with a vat containing a chemical so on, discharges such solution through its perforated up section, upon the ore, as the latter passes by gravity do a chute leading from the hopper into a precipitating bo in which means for passing a current of electricity are pr led. The mixture of ore and chemical solution passes thr gh the precipitating box into a filtering tank.—E. S.

Zi ; Process of Obtaining ——. E. H. Hopkins, London. U.S. Pat. 731,184, June 16, 1903.

SE Eng. Pat. 12,859, June 5, 1902; this Journal, 1903, 70 and compare Eng. Pat. 22,554, Dec. 11, 1900; and U. Pat. 708,044, Sept. 2, 1902; this Journal, 1902, 54 and 14 —E. S.

Or or Tailings; Process of Leaching ——, with Solu- ns of Alkaline Cyanides. C. W. Merril, Alameda, . U.S. Pat. 731,590, June 23, 1903.

Or or tailings containing reducing agents are treated wi an alkali or alkaline-earth hypochlorite to oxidise the and, subsequently, with a corresponding cyanide.
—E. S.

Fu ace; Melting ——. W. J. Brown, Assignor to N. Paxson Company, Philadelphia, Pa.: T. R. Brown, ministrator to said W J. Brown, deceased. U.S. Pat. ,991, June 23, 1903.

Th urnace is spherical, supported on trunnions for tilting, an made in two flanged halves for clamping together. A me ng pot within is solely supported by a projecting fla bearing upon the lower half of the furnace, an outlet spo for the molten metal being provided on one side. The co ustion chamber extends under the entire body of the po ommunicating with an opening in the casing, in front of ich an oil burner is mounted There are flues at the side of the melting-pot, and there is an opening in the furnace at the top for the escape of products of combustion.
—E. S.

French Patents.

Steel; Manufacture of ——. L. V. Pratis. Fr. Pat. 326,998, Dec. 4, 1902.

See Eng. Pat. 6728 of 1902; this Journal, 1903, 31.
—T. F. B.

Zinc Sulphide and other Sulphides; Process for Extracting ——, from their Ores. G. C. Marks. Fr. Pat. 326,866, Dec. 1, 1902.

Sulphides, such as those of zinc, lead, or silver, are separated from their ores by immersing these, in a finely-divided state, in a hot, but not boiling, solution of sodium sulphate, with or without sulphuric acid, and skimming off the sulphides which rise to the surface. Compare U.S. Pat. 718,554, Jan. 13, 1903; and Eng. Pat. 28,925, Dec. 31, 1902; this Journal, 1903, 147 and 423.—E. S.

Zinc Sulphide and other Sulphides; Process for Extracting ——, from their Ores. G. C. Marks. Fr. Pat. 326,867, Dec. 1, 1902.

Ores containing a sulphide of zinc, lead, or silver, are finely powdered and immersed in a bath containing solution of a nitrate of sodium, potassium, or of zinc, with nitric acid. The sulphides which rise to the surface are skimmed off.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Accumulator Factories; Dangers to Health in ——. O. Wagener. XXIV., *page* 889.

Silver; Electrolytic Determination of Small Quantities of ——, in presence of Large Quantities of Lead. Arth. and Nicolas. XXIII., *page* 884.

English Patents.

Insulating Compositions; Water, Acid, and Fireproof ——, and Method of Making the Same. J. A. Heany, Philadelphia, Pa. Eng. Pat. 17,745, Aug. 12, 1902. Under Internat. Conv. Nov. 11, 1901.

One pint or 15 oz. of linseed oil are heated to boiling, and an intimate mixture of 1 oz. of litharge and 1 oz. of red lead is added, the whole being boiled and stirred for about one hour, after which, if desired, copal gum in the proportion of ½ oz. to 1 lb. of the mixture is added, and the whole again boiled until it becomes thick and black. The mixture, which on cooling becomes hard and gumlike, is applied hot to the surfaces to be insulated, and is especially useful for asbestos insulated wires or metallic surfaces.

See also Fr. Pats. 322,448 and 322,449; this Journal, 1903, 370.—A. G. L.

Insulating Metallic Surfaces or Wires and Method of Preparing Asbestos for Insulating Metallic Surfaces or Wires. J. A. Heany, Philadelphia, Pa. Eng. Pat. 17,746, Aug. 12, 1902. Under Internat. Conv., Nov. 9, 1901.

Two compositions are used in the process, the first consisting of fish glue or gelatinous or albuminous substances, and enough water to make a thin solution which is combined with lime, either wholly or partly slaked so as to give a doughy consistency; the second solution consists of 2 oz. of ammonium sulphate, 1 oz. of boric acid, 1 oz. of sodium sulphate, 1 oz. of ammonium chloride, and 1 oz. of sodium chloride dissolved in 25 oz. of water. The compositions of these solutions may be varied if desired.

One of the two compositions is applied to the metallic wire or surface, and asbestos, first treated with the second solution, is dried, picked into a flaky or fibrous form and twisted under pressure upon the sticky surface. The asbestos covering is then coated with a paste formed by mixing the two compositions and again pressed down on the wire, &c.

Before applying the composition, the metallic surface may first be immersed in a bath of zinc chloride. In this case the whole is heated after the insulating material has been applied, so as to volatilise chlorine and leave metallic zinc adhering firmly to both the wire and the asbestos.
—A. G. L.

Batteries; Electrical ——. H. Csanyi and G. von Bárczay, Felso Dobsza, Hungary. Eng. Pat. 813, Jan. 13, 1903.

The cathode (carbon) is immersed in nitric acid and the anode (zinc) in an alcohol solution containing pernitrate of mercury and potassium cyanide, the depolariser being separated from the solvent by means of a diaphragm.
—W. G. M.

Electric Batteries. S. Yai, Tokio. Eng. Pat 8964, April 21, 1903.

The battery, which may be used either as a primary or a secondary cell, consists of an outer casing of zinc or lead plate forming the positive element, and provided with an interior cylinder, preferably formed of blotting or similar paper, and filled with a mixture of manganese oxide and graphite powder, in the centre of which is fixed a carbon or graphite rod. The space between the two cylinders is filled with oxide of zinc, and the cover of the vessel has an inlet through which a solution of caustic potash is poured in. A threefold power as compared with other lead oxide accumulators is claimed for it when used as a secondary battery.—G. H. R.

Electric Spark Discharges; Process and Apparatus for Treatment of Gases, Vapours, and the like by ——. J. Schlutius, Karow-i-Mecklenburg, Germany. Eng. Pat. 2199, Jan. 29, 1903.

The gases to be treated are blown through a spark gap of special shape. A wire connected to one terminal of an induction coil is wound in a spiral around an insulating drum, placed at a short distance from a metal strip, parallel to its axis, and connected with the other terminal. When the drum with the spiral is rotated sufficiently rapidly, a band of sparks passes between the drum and the strip from end to end. The gases to be sparked are so directed through nozzles placed side by side that they pass through the band of sparks. Or the gases may pass through a metallic nozzle, which, itself forms one pole, whilst the other is a slightly concave disc, which may also form a collector for the gases. In this case the sparks form a cone between the point and the disc. Or, again, the one pole may be hollow and bent at the delivery end, which is surrounded with an insulating block, except at the orifice. The other pole is a metallic funnel through which the gases, after treatment, are sucked away. The nozzle is rapidly rotated and forms a ring of sparks between itself and the funnel.—W. G. M.

Ammonium Formate and Ammonia; [Electrical] Process for the Manufacture of ——. J. Schlutius. Eng. Pat. 2200, Jan. 29, 1903. VII., page 865.

Electrolytic Processes [Electrolysis of Alkali Chlorides], and Apparatus therefor. L. Gurwitsch, St. Petersburg, Russia. Eng. Pat. 16,358, July 23, 1902.

In order to reduce the amount of mercury to be handled in processes, such as the electrolysis of alkali chlorides, in which amalgam is formed, advantage is taken of the fact that mercury containing even a minute proportion of amalgam will wet metallic iron surfaces. In order to facilitate the action to the uttermost, the cathode surfaces of the plates are grooved with narrow flutings, less than $\frac{1}{100}$th of an inch in width, so that surface tension may be compensated by capillarity. Several of these iron sheets are suspended in the electrolytic tanks; only the end plates are connected to the terminals of the generator, the intermediate plates being insulated and forming bipolar electrodes, with the grooved surfaces on the cathode side. The anode side is coated with manganese dioxide or lead. At the top a mercury pump delivers mercury into a distributor, which forces the metal in spurts on to the grooved surface of the iron, through nozzles about 25 to 30 mm. apart. The bottom of each iron plate is curved into trough shape on the fluted side, the trough sloping slightly from one to the other, so that the amalgamated mercury is ca and delivered into another trough provided with a r distributor which conveys the amalgam into a sui receptacle outside.—W. G. M.

Liquids [Water, &c.]; Apparatus for [Electrolytica Purifying ——. O. M. R. Moller. Eng. Pat. 10 May 4, 1903. XVIII. B., page 878.

United States Patents.

Electrodes; Method of Producing ——, *for El Accumulators.* E. W. Jungner, Stockholm. U.S. 731,308, June 16, 1903.

See Eng. Pat. 1684, 1902; this Journal, 1902, 1082.
—G. H.

Electrode. W. R. Chipman, New York. U.S. P 732,047, June 30, 1903.

Electrodes for use in the purification of liquid electrolysis are claimed, consisting of nickel, and a stance which acts as a producer of oxyhydrates an binder; of Straits tin and nickel; or of aluminium, n and Straits tin.—W. G. M.

[Electrolytically] Oxidising Organic Compounds. Moest, Assignor to the Farbwerke vorm. Meister, L und Brüning, both of Hochst a M. U.S. Pat. 72 May 26, 1903.

The claim covers the electrolytic oxidation of or compounds in acid solution by means of cerium comp A very small quantity of cerium salt is necessary, cerous salt formed is immediately oxidised by the el current to the ceric state. A 2 per cent. solution of c sulphate is sufficient. By this means, anthracene is ox to anthraquinone, naphthalene to naphthoquinone (ph acid being also formed in small quantity), phenanthr phenanthraquinone, &c.—T. F. B.

Electrolytes; Method of Applying Heat to ——. Burgess and C. Hambuechen, Madison, Wis. U.S. 732,616, June 30, 1903.

One or other of the electrodes is heated by being inc in a separate electric circuit, which may be direct or nating. In electrolytes, practically non-conduct ordinary temperatures, electrodes of aluminium an are specified, of which the latter is separately heated special circuit.—W. G. M.

French Patents.

Electrolytic Cell fitted with Aluminium Electro Grisson & Co. Fr. Pat. 326,974, Dec. 3, 1902

See U.S. Pat. 719,791, 1903; this Journal, 1903, 304
—T.

Reduction of Compounds by Electric Heating [El Furnace]; Process and Apparatus for the ——. Acheson. Fr. Pat. 327,189, Dec. 9, 1902.

See U.S. Pats. 718,891 and 718,892 of 1903; this Jo 1903, 217.—T. F. B.

(*B.*)—ELECTRO-METALLURGY.

English Patents.

Iron Alloys [Ferro-Silicon and Ferro-Manga Electrical Production of ——, *with the Simult Production of Alkaline Oxides and Alkaline* G. Gin, Paris. Eng. Pat. 12,702, June 3, 1902.

The sulphate of the oxide it is desired to prepare is with silicic acid, or manganese dioxide, in the prese carbon, in an electric or other suitable oven, so as to a reaction of the following form:

$$SiO_2 + SO_4M + C = SiO_3M + SO_2 + CO, \text{ or}$$
$$MnO_2 + SO_4M + 2C = MnO, MO + SO_2 + 2CO$$

en it is desired to obtain ferro-manganese and a e alkaline oxide, the sulphide is substituted for the te so as to obtain the following reaction:

$$9MnO_2 + 2M_2S = 3Mn_3O_4 + 2M_2O + 2SO_2.$$

reduction of the silicate or double mangano-alkaline with or without the addition of oxide of iron, or of ic iron, is carried out in a closed electric oven nicating with a dust chamber, in which the sublimed s are condensed, the product being "dosed with sufficient quantities" to reduce the metal to sformed into iron alloys, and insufficient to reduce burise the alkaline oxide or earth it is desired to r. The metal produced is run out at regular intervals e oxide is recovered in the form of scoria, or sublimed ts. See also Fr. Pat. 316,772, 1901, and U.S. 12,295, 1902; this Journal, 1902, 1541; Fr. Pat. 8, 1902, and Eng. Pat. 964, 1903; this Journal, 1903, G. H. R.

o-plating; Apparatus for Use in ——. A. J. A. G. hal, Birmingham. Eng. Pat. 16,824, July 29, 1902.

ectrolyte is drawn from the top of the tank by means omp, and delivered again at the bottom through a r of orifices in a pipe laid horizontally along the f the vat; a vertical pipe is connected to the supply utside the tank, to steady the supply through the res. The bath is heated, if necessary, either by a pipe within, or by steam-jacketing the pipe supplying ctrolyte to the feeding-orifices.—W. G. M.

; Electro-plating of ——, and Apparatus Employed ein [Silver-plating]. (Miss) J. Schiele, Brussels. . Pat. 5693, March 11, 1903.

rocess consists in deoxidising the surface of the s by exposing them to a temperature of about 800° 0° C. in a closed chamber of a furnace (heated), and then slowly cooling them with the exclusion by introducing them directly into a chamber with a ing platform, adjoining the heating one, from which it rated by a sliding door. They are then placed in a g bath of about 20 per cent. of hydrochloric acid and cent. of nitric acid in about 55 per cent. of water, or her suitable bath may be employed. The surfaces terwards cleaned with a wire brush in a solution of nd hydrochloric acid (preferably 15 to 20 grms. of 500 grms. of acid). The silver-plating is effected bly in accordance with Eng. Pat. 9438, 1902, (this l, 1902, 917), after which the articles are re-heated, f necessary, subjected to pressure while hot. See ts. 320,154, 320,696, and 324,832, 1902; this Journal, 7, 148 and 635.—G. H. R.

es; Electric ——. J. M. Carrere. New Brighton, N.Y., U.S.A. Eng. Pat. 10,194, May 5, 1903.

volving cylinder set at any desired angle, or ntal, is fitted with non-rotating cap ends, provided pertures at one end for the introduction of the charge, the other for the removal of the furnace products, th axial electrodes. The furnace may be lined with e separated from the (steel) furnace walls by a of asbestos. The graphite may be brought into with the electrodes and so be heated by the current required temperature even up to incandescence. ectrodes themselves may be caused to form an arc desired position within the cylinder.—W. G. M.

French Patents.

-plating of Metals; Special ——, called "Argento-kel." H. Bourel. Fr. Pat. 326,890, Dec. 2, 1902.

ticles are first nickel-plated by any ordinary process, a bath of 3,000 litres, and containing "80 per cent. ual, and 20 per cent. of double sulphate of nickel," and s. of boric acid per 100 kilos. of sulphate of nickel. rst operation should last an hour, and then by means commutator, the current which has hitherto been d on the rods supporting the nickel anodes, is turned sh rods supporting platinum anodes. The second operation should last a quarter of an hour, and both it and the first one should take place without removing the articles from the bath.—G. H. R.

Metals; Method of accelerating the Deposition of ——, in Electrolytic Operations. C. Evesque. Fr. Pat. 327,054, Dec. 5, 1902.

The anode and the cathode are placed between the arms of a magnet or solenoid so as to produce a magnetic field, the action of which, when suitably directed, is said to induce the metal molecules to attach themselves rapidly to the mould it is desired to cover. In the apparatus described, the electrolytic tank has a false bottom, between which and the real bottom is placed an electro-magnet, the polar pieces of which are formed by plates crossing the false bottom, and rising to the middle of the electrolyte. The joints between the polar pieces and the false bottom are rendered impervious by a coating of gutta-percha, or similar substance. A greater or lesser number of electro-magnets can be used according to the requirements of the case. Where solenoids are employed, the polar pieces are replaced by twists of the conducting wire.—G. H. R.

XII.—FATS, FATTY OILS, & SOAP.

Fatty Acids; Formation of Hydrocarbons in the Distillation of ——. F. Kassler. Chem. Rev. Fett- u. Harz-Ind., 1903, **10**, [7], 151—154.

The formation of unsaponifiable substances during the distillation of fatty acids is shown to be mainly due to the presence of neutral fat, as the other factors (overheating, &c.) can be readily avoided. The author's experiments on the subject have been continued for a year under comparable conditions. Fatty acids from tallow, palm oil, and bone fat were used as raw material. They contained from 2·2 to 10·4 per cent. of neutral fat, and in each case had been obtained by saponification with magnesia in autoclaves, the after-saponification of neutral fat that takes place in sulphuric acid saponification having been avoided. Charges of 1,400 kilos. were distilled in cast-iron retorts, steam at 300° C. and under a reduced pressure of 0·3 atmos. being used. Samples of the distillates were taken every hour, and the proportion of unsaponifiable matter determined. The results showed that hydrocarbons began to be formed when the neutral fat in the retort became concentrated to 12 to 15 per cent., except in the case of the bone-fat fatty acids, the distillates from which contained hydrocarbons almost from the first. The author attributes this exception to the nature of bone-fat, which, as he points out, frequently itself contains hydrocarbons in the crude state. As soon as the distillates contained hydrocarbons, the process was stopped, and the residue in the retort treated with sulphuric acid, washed, and again distilled. On the average the amount of neutral fat in the residues was reduced by the treatment with acid from 15·2 to 2·6 per cent. On distillation of the black mass thus obtained, the same results were found, hydrocarbons appearing in the distillate as soon as the amount of neutral fat in the retort reached 13 to 15 per cent. The author's general conclusion is that fatty acids containing more than a small proportion of neutral fat should be treated with sulphuric acid before distillation or after fractional distillation as described above.—C. A. M.

Fats, Oils, and Esters; Enzymic Decomposition of ——. K. Braun and E. C. Behrendt. Ber., 1903, **36**, [9], 1900—1911.

In continuation of their work on this subject (this Journal, 1903, 639) the authors have made comparative experiments as to the action of the enzymes in castor-oil seed and jequirity seed on lanolin, carnaüba wax, and lower esters of organic acids. On treating 10 grms. of lanolin with 25 c.c. of water and 2·5 grms. of finely-powdered castor-oil seeds at 40° C., the total acid liberated after 96 hours corresponded to 3·65 c.c. of N/10 alkali; whilst in parallel experiments with jequirity seed the free acid corresponded to 11·15 c.c. after 96 hours, and, after neutralisation of the acid first liberated, to 3·9 c.c. of alkali after 120 hours. Similar experiments with carnaüba wax showed that here, too, the jequirity seed had a stronger decomposing effect than the castor-oil seed. These results show that neutralisation of the acid first formed has not the same stimulating effect on the jequirity enzyme (abrin) when acting on lanolin or carnaüba wax as in the case of castor oil. The action of the enzyme of castor-oil seeds, however, is checked in all cases by neutralisation of the free acid. Only a moderate degree of warmth is required to promote the decomposition. Experiments with simple esters of the aliphatic and aromatic series gave analogous results, with the exception that in the case of ethyl benzoate the decomposition effected by the castor-oil seeds was greater than that effected by jequirity seed. It was proved that light had no appreciable influence on the decomposition in either case. Slight quantities of mercury, copper, and iron salts checked the enzymic decomposition, as was also the case with alcohol. On the other hand, magnesium salts, alkali-metal salts, and tungstic compounds had no influence on the results. Experiments made with mixtures of equal quantities of castor-oil and jequirity seeds gave the curious result that the free acid had an injurious effect, whilst the small amounts of acid liberated after neutralisation of the free acid soon disappeared again.

The experiments with emulsin were repeated, the pure enzyme being used this time. It was found that it effected only a very slight decomposition of fats, and that the action was not increased by the presence of free acid. Less acid was liberated from castor oil by the action of crushed bitter almonds than by the pure emulsin, which the authors attribute to the emulsin in the almonds being used up in the decomposition of the amygdalin. When castor oil was treated with amygdalin no decomposition was observed, as was also the case when a mixture of equal parts of pure amygdalin and emulsin was used. In like manner it was found that the myrosin from black mustard seed and gold lac (*Cheirantus Cheiri*) had a fairly energetic action on castor oil, but that when potassium myronate was also present no decomposition occurred. The myrosin of gold lac comes about midway between emulsin and ricin as regards its activity. The buds showed greater enzymic activity than the stalks or leaves, whence the authors conclude that the myrosin in gold lac is concentrated in the buds.—C. A. M.

Chinese Wood [Tung] Oil; Poisonous Properties of ——. J. Hertkorn. Chem.-Zeit., 1903, **27**, [50], 635.

Numerous patents have been taken out for the use of this oil in cosmetic and similar preparations, the fact that it produces severe ulcers when brought in contact with the skin being apparently lost sight of. The author describes several instances of the oil causing severe wounds to the workmen and others who have carelessly handled it, and considers that its use in cosmetic preparations should be strictly prohibited. Moreover, in his opinion, all wood oils that have been imperfectly refined, yield slimy deposits with penetrating odour, and ought to be excluded from commerce. Candle-nut oil has similar toxic effects on the skin though only to a slight extent. It is an open question whether the poisonous properties of these oils must be attributed solely to substances in the slimy deposit, or whether the fatty acids also play a part.—C. A. M.

Soaps, Hydrocarbons and Cresols; Separation of ——. O. Schmatolla. XXIII., page 885.

English Patents.

Tallow-like Product; Manufacture of an Odourless ——. G. Sandberg, Moscow. Eng. Pat. 2202, Jan. 29, 1903.

See Fr. Pat. 317,540 of 1902; this Journal, 1902, 1103.
—C. A. M.

Oils; Manufacture of [Chemically Modified] ——. E. Meusel, Liegnitz, Germany. Eng. Pat. 7410, March 31, 1903.

A manufacturing process is based on the bacterial oxidation of oils or fats, in the presence of a nitrate or nitrite. The mixture containing the oil, nitrate and nutrient salts, is treated with a cultivation of, *e.g.*, cheese bacteria, and kept thoroughly aerated during the oxidation. Oils thus treated undergo partial decomposition, together with partial oxidation of the glycerin and unsaturated fatty acids. The modified products are well suited for manufacture of dégras, and as substitutes for she mordants for dyestuffs, &c. For the preparatio of lacquers they are dissolved in sodium carbonate solu and after the addition of a suitable dyestuff, *e.g.*, alizarin precipitated by means of alum or calcium salts.—C. A.

French Patent.

Fats and Waxes; Separation of Liquid Constituent of ——. H. Breda. Fr. Pat. 327,064, Dec. 6, 1902

The crude fat is treated with acetone, the solution s rated from the insoluble residue, and the liquid constit in solution precipitated by the addition of water.—C. A.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Complex Cyanides [Prussian Blue]; New Method fo Analysis of ——. M. Dittrich and C. Hassel. XX page 883.

English Patents.

Lead in the Form of Powder. G. T. Hyde, Lon From the Union Lead and Oil Co., New York. Pat. 19,981A, Sept. 12, 1902.

See Fr. Pat. 325,471; this Journal, 1903, 702.—F. H.

Pigments [Mixtures of Zinc Hydroxide and Ba Sulphate]; Processes of Making ——. W. J. A bruster and J. Morton, St. Louis, Miss., U.S.A. Pat. 3768, Feb. 17, 1903.

See U.S. Pat. 721,235; this Journal, 1903, 562.—F. H

United States Patent.

Pigments [Zinc and Barium]. W. J. Armbruster, Louis, Mo. U.S. Pats. 731,152 and 731,153, Jun 1903.

The first specification describes a pigment made by mi a zinc solution (which may be sulphate) with the hydro and then with the carbonate of an alkali metal, and fi with a soluble salt of barium. The second descr pigment consisting of zinc carbonate, barium sulp and barium carbonate, with or without a certain propo of zinc sulphide, made by mixing together solutions of sulphate, sodium carbonate, and a salt of barium, which be the sulphide. Compare previous U.S. and Eng. P this Journal, 1903, 218, 307, 562, and 807.—F. H. L.

French Patent.

Zinc White and Similar Pigments; Manufacture of ——. A. Salgues. Fr. Pat. 326,962, Dec. 3, 1902.

The metallic vapours which are evolved when zinc ores treated in an electric furnace according to the pro described in Fr. Pat. 310,100, April 19, 1901, are all to burn and are then collected in chambers. If the o pure, the product is a simple zinc oxide, but if the m contains lead, the product is a mixture of zinc and oxides, the latter constituent giving it a better covering drying power when used as a pigment. The process claimed to exhibit advantages over similar methods the ore is treated chemically, because the fume is less taminated with products of combustion, and is there capable of condensation in smaller receptacles.—F. H. L

(*B.*)—RESINS, VARNISHES.

Rimu Resin. T. H. Easterfield and B. C. Aston. Chem. Soc., 1903, **19**, [269], 190—191.

Rimu (*Dacridium cupressinum*; natural order, *Conifer* is one of the most valuable of the New Zealand timber the cracks or shakes in the heart wood being always partially or completely filled by a hard pink with a distinctly crystalline fracture.

e chief constituent (75 per cent.) of the resin, a alline acid, for which the name *rimuic acid* is proposed, at 192°—193°, distils with very slight decomposition 6—300° C. under 21 mm. pressure, and is optically e. It is easily soluble in alcohol or ether, and ves sparingly in water or light petroleum. Its formula $H_{18}(OH)CCOH$. The barium compound is the most cteristic of the salts; it crystallises in well-defined e plates having the composition $Ba(C_{16}H_{19}O_3)_2,14H_2O$. alkali salts are very soluble and do not separate from on in the presence of excess of alkali. Rimuic acid is rotatory, having $[\alpha]_D - 159°$ in a 10 per cent. alcoholic on; it yields benzoyl and acetyl derivatives. Like of the acids from the pine resins, it yields no esters treated with alcohol and hydrochloric acid.

Improvements in Manufacture of —— [*Shellac stitute*]. E. Meusel. Eng. Pat. 7410, March 31, 3. XII., page 874.

eum and the like; Processes for Making ——, *with uble Layers of Material.* L. W. Seeser, Delmenhorst, many. Eng. Pat. 15,889, July 16, 1902.

Fr. Pat. 325,129; this Journal, 1903, 641; also Eng. 15,890 and 15,891, 1902.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

r and Gutta-Percha, &c.; Chemistry of ——. Harries. Ber., 1903, **36**, [9], 1937—1941. Compare Journal, 1901, 1123, and 1902, 1404.

substance "nitrosite C," $2(C_{10}H_{15}N_3O_7)$, furnished by rubber (*loc. cit.*) is also readily obtained by similar from Mozambique rubber (*Mohorro*), from the r Guayrule-rubber (Mexican), and from the latex of *lphia Hendelotii* (this sample had been kept liquid dition of ammonia).

v gutta-percha also appears to give the same nitrosite, gh the analytical results are not in absolute agree- and the molecular weight appears to be low. After l purification by acetone (Ramsay's method), however, eld is almost theoretical.

ata likewise gives a substance which closely resembles site C" in chemical behaviour.

lnical Application.—A commercial rubber mixture oing sulphur, zinc sulphide, and mercuric sulphide, vulcanised, was analysed by ordinary methods, in se with considerable difficulty.

5 grms. were then placed with 150 c.c. of benzene ient to dissolve the sulphur) in a closed vessel for lays at the ordinary temperature.

ous acid gas (N_2O_3) dried over phosphorus pent- was then thrice passed through the swollen mass, ime for a period of two days. The resulting yellow r was transferred to a tared filter and washed with e till free from sulphur, the amount left in the vessel found negligible. When dried *in vacuo* till of constant , the residue amounted to 6·25 grms., of which grms. were dissolved out by acetone. This amount ted as nitrosite of the formula $C_{10}H_{15}N_3O_7$ indicated grms. of hydrocarbon $C_{10}H_{16}$ or 27·9 per cent. of in the original mixture. The zinc sulphide which en converted into sulphate, and the unaltered mercuric le were then estimated. The following shows the rative results:—

——	Nitrosite Method.	Technical Method.
	Per Cent.	Per Cent.
....	27·90	28·57
lphide............	41·61	40·07
ic sulphide.......	24·23	23·70
r...................	Difference	7·33
....		0·33

—R. L. J.

-Rubber; Action of Light on ——. C. O. Weber. India-Rubber J., 1903, **25**, [13], 639.

ction of light upon india-rubber, whether vulcanised ulcanised, is an oxidising action, accelerated by the actinic influence of the sun's rays. Thin films of Para rubber, both crude and worked on hot rollers, vulcanised and unvulcanised, were exposed to the action of light for 50 days, the acetone extract being determined at intervals. The figures obtained tend to confirm the author's opinion that unvulcanised rubber is more liable to oxidation than vulcanised, owing to its "lower state of saturation."

The longer rubber is worked or "broken down" on hot rollers, the greater is the amount of the acetone extract. With very excessive working, the extract is gummy, and not resinous as in the case of truly oxidised rubber, and the author considers the increase consists of products of depolymerisation of the india-rubber molecule itself.

Rubber overworked on the masticator oxidises very rapidly indeed, yielding, after 50 days' exposure, 38·7 per cent. of extract against 5·7 per cent. when properly worked.

Experiments made to ascertain the effect of the degree of vulcanisation on the rate of oxidation show that the rubber tends to oxidise faster the lower the degree of vulcanisation.
—J. K. B.

English Patent.

Rubber Boots or Shoes and such like; Vulcanising ——. A. Cockburn, Edinburgh. Eng. Pat. 17,637, Aug. 12, 1902.

The articles are vulcanised without the use of moulds by subjecting them to the combined action of air or gas under pressure greater than that of the atmosphere and at a high temperature within a closed chamber.—F. H. L.

French Patent.

India-Rubber; Machines for the Vulcanisation of ——. E. Frankenberg. Fr. Pat. 327,019, Dec. 5, 1902.

See also Eng. Pat. 24,573 of 1902; this Journal, 1903, 809.

The trough of the machine is fitted with a cover, and the whole machine enclosed in a cage, part of which is made of material permeable to air, and which is connected to a shaft.—J. K. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Chromed Hide Powder Question; Contribution to the ——. J. Paessler and W. Appelius. XXIII., page 886.

Leather; Elasticity of ——. C. Bach. Zeits. des Ver. deutscher Ing., 1902, 985. Proc. Inst. Civ. Eng., **151**, [1], 58.

This paper contains the record of experiments undertaken with the view of obtaining information as to the elasticity of leather taken from different parts of the hide. The hide having been cut into three strips was first stretched by the manufacturers in the same way as leather intended for belts. These strips were afterwards cut into narrower pieces for the experiments. In the loading by successive additions of weight, the load at each step was applied several times, until the permanent set and the elastic extension ceased to alter. The results are contained in a number of tables and diagrams. The stress per square inch and the stretch coefficient are given for (*a*) the whole belt, (*b*) the head side, and (c) the tail side. The stretch coefficient varies from about $\frac{1}{2300}$ to about $\frac{1}{6000}$ per kilo. per sq. cm. ($\frac{1}{32700}$ to $\frac{1}{85320}$ per lb. per sq. in.). When the hides had been stretched at the manufacturers, the resulting permanent elongation had varied from 19 per cent. to 27 per cent. The maximum stress to which the belts were subjected in the detailed tests was about 47 kilos. per sq. cm. (668 lb. per sq. in.), and the permanent set with this did not much exceed $\frac{1}{2}$ per cent. The leather from the back of the animal proved to have the greatest uniformity from head to tail, so far as its elastic properties are concerned, while generally the material from the tail end had a greater stretch coefficient than that towards the head. The piece from the middle of the back exhibited the greatest extension per unit stress, the portions from the belly of the animal the smallest: the elasticity thus increases from the belly part of the skin towards the back; and this result agrees precisely with the value which, in practice, is placed on the leather from the back.

ENGLISH PATENT.

Leather; Method of Making ——. G. C. Dymond, London. From W. Macmillan, Palmerston, North, New Zealand. Eng. Pat. 19,661, Sept. 8, 1902.

Hides are unhaired, fleshed, bated, shaved, cleaned, and treated with a bran drench for 3—4 days, are then handled in sumach liquor (2 lb. of sumach per hide) for four days, then handled in a salt and alum bath (alum, 6 lb., salt, 4 lb., per hide), for three days, and then, whilst still damp, dressed with neats-foot oil (½ pint per hide). They are then dried out, damped, staked, shaved, set out, given a medium stuffing with tallow and fish-oil dubbin, hung-up, dried, sleaked off, cleaned and grained.—R. L. J.

FRENCH PATENTS.

Leather; Manufacture of Artificial ——. G. S. and C. Falkenstein. Addition dated Dec. 2, 1902, to Fr. Pat. 308,044, Feb. 12, 1901.

See U.S. Pat. 714,791, Dec. 2, 1902; this Journal, 1903, 37 (the corresponding modification of U.S. Pat. 667,770, Feb. 12, 1901; this Journal, 1901, 731), and Eng. Pat. 26,596, Dec. 1902; this Journal, 1903, 373.—R. L. J.

Tannage; Rapid ——. E. Roy. Fr. Pat. 326,799, Nov. 28, 1902.

Ferrocyanides or ferricyanides, or the corresponding free acids, are employed to counteract the effects produced by placing hides in very strong liquors (such as drawing of the grain, &c.)

For this purpose the acid (1 part in 10,000 or less) or equivalent amount of salt, is either used in a preliminary bath, or added direct to the strong tan-liquor. It is claimed that heavy hides may be thus tanned in a few days, and light skins in a few hours.—R. L. J.

XV.—MANURES, Etc.

Superphosphate Manures; Determination of the SO_3 Equivalent of Gases evolved in the Manufacture of ——. Affleck. VII., page 863.

UNITED STATES PATENT.

Fertilisers; Process of Producing ——. A. K. Jarecki, Sandusky, Ohio. U.S. Pat. 731,461, June 23, 1903.

A basic phosphate is mixed with sulphuric acid. Alcoholic or syrupy beet sugar residues are then added together with nitrogenous organic refuse, and the whole allowed to stand until the heat of reaction drives off the moisture, leaving a granular product.—E. F.

FRENCH PATENT.

Manure; Process of Manufacturing ——, by means of Apatite or other Phosphatic Mineral; Dicalcium-hydrogen Phosphate for employment as ——. W. Palmaer. Fr. Pat. 326,917, Dec. 2, 1902.

See U.S. Pat. 707,886, Aug. 26, 1902; this Journal, 1902, 1189.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar: Rapid Method for the Determination of ——. T. B. Wood and R. H. Berry. XXIII., page 886.

Starch Syrups; Examination of ——. A. Rossing. XXIII., page 886.

Stachyose. C. Tanret. XXIV., page 888.

Sugars; Alkylation of ——. T. Purdie and J. C. Irvine. XXIV., page 888.

ENGLISH PATENT.

Syrups or Similar Fluids; Evaporation for Concentra or Condensation of ——. F. Meyer, London. F J. W. Meyer and J. W. Arbuckle, both of Trini Eng. Pat., Apr. 22, 1903.

The apparatus consists of a series of cylindrical evap ting vessels having steam drums in their lower porti through which pass a number of vertical tubes which thus heated externally. Each vessel is fitted with a volving sprinkling arm or sparger through which the liq to be concentrated is delivered; the liquor falls on to steam drum and passes through the heated tubes to a s below, which is connected with the sprinkler of the vessel and so on throughout the series. The vap evolved from the liquor in each vessel are conducted to steam-drums of each succeeding vessel and employed heating the tubes.—J. F. B.

UNITED STATES PATENTS.

Brine [used in Manufacture of Starch from Indian Cor Process and Apparatus for Purifying ——. T. T. and J. F. Gent. U.S. Pats. 731,105 and 731,106, Jun 1903. VII., page 866.

Cornstalks, Sugar-cane, &c.; Process of Manufactu Products from ——. V. Drewsen, New York. Pat. 731,290, June 16, 1903.

The cornstalks, sugar-cane, or analogous pithy st either whole or slit and divided into pieces, are cooke a disintegrating solution, such as one of caustic sod sufficient strength and for a sufficient time to disinteg the pith only. The pith is then separated from the sh which are cooked in a disintegrating solution, such as ca soda solution, of sufficient strength and for a sufficient to disintegrate the shells into fibres.—T. H. P.

FRENCH PATENT.

Sugar Solutions and other Liquids; Defecation of ——. J. Delavierre. Fr. Pat. 326,975, Dec. 3, 1902.

Claim is made for the defecation of sugar and o solutions by means of an electric current in presence freshly-precipitated oxide of iron or oxide of zinc, with without an alkaline earth, an aluminate or alumin manganate.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, E

Ferments: Action of Abietic Acid on ——. J. Effro Comptes rend., 1903, **136**, [25], 1556—1557.

Lactic or butyric ferments, beer-yeast, &c., can be cultivated singly in worts from grain or molasses, to wh 1 per 1000 of abietic acid has been added, without the exerting any influence; but if a mixture of ferment present, the abietic acid favours the development of present in the greater quantity, and suppresses the oth Colophony, if free from volatile constituents, may be instead of abietic acid. In the practical application this in molasses distilleries or breweries, sterilisation acidification of musts is superseded, the amount of y needed is reduced and the yield of alcohol increa Colophony promises to be widely useful in the fermenta industries as a preservative against infection.—J. T. D.

Wild Yeasts; Sources of Infection by ——. F. Sch Woch. f. Brau., 1903, **20**, 27], 313—316.

The author enumerates sources of wild yeast infec giving instances of specific cases which he has met in the course of his experience. Hansen has shown dangerous is the neighbourhood of orchards to a bre working with open coolers; in such cases warm fermenta and complete attenuations are likely to do good. In cer cases the cause may be traced to infected water o the unfavourable situation of the wort coolers ent surrounded by buildings. Again, the infection is quently introduced and circulated by carelessness in dea with the returned empty casks containing residue stale beer; these residues, strongly infected, may be

ı the floor and carried by the feet to all parts of the
ıilding. Another very frequent cause of infection lies in
le presence of soft, porous places in the wood of the
rmentation vessels, especially at the bottom and round
e bung holes and in the bung plugs. In such places the
equer has become destroyed and the wood is saturated to
considerable depth with colonies of wild yeasts in active
owth, of which only the surface is affected by scrubbing
ıd disinfectants; re-lacquering of such perished parts
fords only a short relief, unless the wood is thoroughly
raped away down to the hard grain. Lastly the bottles
ay not be properly cleaned or, more frequently, cracks
ay exist in the rubber portions of the patent stoppers,
hich may be full of infecting organisms. All bottling
ould preferably be done at the brewery, direct from the
ger vat, without loss of carbon dioxide, and if trouble be
obable, customers should be served frequently and with
ıall quantities at a time.—J. F. B.

'alt; Peculiar Deterioration of ——, by Storing. Woch. für Brau., 1903, **20**, [25], 299.

ANY of the barleys grown in 1901 were not satisfactory
ving to heavy rains. They malted normally. The
rleys consisted of 15 per cent. steely, 10 to 15 per cent.
lf steely, and 65 to 70 per cent. mellow corns. It was,
wever, found that the malt when kept for more than
ur months in closed silos lost its quality. A pneumatic
ılt made in June 1902, and which gave satisfactory
sults in the brewery, had lost its quality in the following
tober. Again, a similar barley malted in December
ve good results up to March and April, but from
ne to July many complaints were made to the maltster.
—J. L. B.

er Wort; Caramelisation of ——. G. Barth. Zeits. ges. Brauwesen, 1903, **26**, [22], 349—351.

FERRING to the work of Prior (this Journal, 1903, 566),
author records his own experiments in the caramelisa-
n of beer wort. In all cases where the wort was heated
der a pressure exceeding two atmospheres, there resulted
lisagreeable, bitter flavour. Below three atmospheres, the
oth of colour was not increased by more than an inappre-
ble extent, but beyond this limit the change was consi-
rable. The percentage of acid is largely increased in
amelisation, and Prior's discovery of large percentages
glucose in the wort is presumably due to the hydrolysis
dextrin by the acid. The increase in the proportion of
oric-reducing sugar may be explained by the fact that
xtrose possesses this property in a higher degree than
original maltose, the abundance of furfural, probably,
ıtributing to the same end. A diminution in the amount
sugar as caramelisation proceeds is indicated by the
luced final attenuation, the actual attenuation in the
ginal wort being 63·45—64·25, whilst in the same wort,
er boiling an hour under a pressure of three atmospheres,
attenuation only reached 50·3—51·8.—C. S.

Veissbier"; "Boiling" Fermentations in Berlin ——. F. Schönfeld. Woch. f. Brau., 1903, **20**, [26], 301—303.

OILING" fermentations are practically unknown in
tom fermentation breweries; they may occur in top
mentation beers, and are mostly met with in the fermen-
on of Berlin "Weissbier," which is prepared by the top-
mentation of unboiled wheat-malt worts. The pheno-
uon of "boiling" fermentation is observed only in the
t stages when the "Kräusen," or yeasty head, ought to
gin to appear; instead of this, however, the wort shows no
ce of foam, but large bubbles of gas are given off with a
sing sound. Later the fermentation apparently takes
normal course. The finished beer is, however, pro-
ndly modified, and when poured out it evolves a few
ge bubbles of gas, and then remains perfectly flat,
ereas good "Weissbier" should have an extraordinarily
npact "head." Many causes may contribute to the
duction of boiling fermentations, such for instance as
e of yeast, especially yeast of the Saaz type, deficiency
hops or the use of old hops deficient in α-hop resin.
chief cause, however, is the deficiency of albumoses
other only slightly degraded albuminoids in the wort,
owing to excessive activity of the proteolytic enzymes. Such activity is more liable to occur owing to the fact that the worts are not boiled. The fault most often lies with the malt, and perfect dryness during storage must be ensured. The most important point is the germination of the malt, the growth of which should be as short and at as low a temperature as possible, and not in any degree forced. This is illustrated by a practical case in which a new parcel of wheat malt gave "boiling" fermentations when treated under the same conditions as the old parcel which had been satisfactory. Analysis of the two malts showed that the new parcel of malt had been forced during growth; the proportions of ready formed sugars, extractive matters, and albuminoids soluble in cold water were all considerably higher in the bad malt than in the good one, showing excessive degradation of the proteids of the grain.—J. F. B.

Yeast; Determination of Activity of ——, for Bakers' Purposes. J. Metzler. XVIII. A., below.

English Patent.

Fractional Distillation, Condensation, and Rectification of Liquids, particularly Mash; Method and Apparatus for ——, for obtaining Extra Fine Spirit direct from the Mash. V. Slavicek, Vienna. Eng. Pat. 27,063, Dec. 8, 1902.

Strong rectified spirit is obtained directly from the mash by the combination of a continuous still with a rectifying plant. The mash is delivered to the top of the distilling column, and flows down from plate to plate until it emerges free from alcohol at the bottom, the alcoholic vapours passing on to a condenser and rectifying column, where they are separated into their three component parts.

—J. F. B.

French Patent.

Non-Intoxicating Beverage, and Process of making same. Wahl and Henius. Fr. Pat. 326,943, Dec. 2, 1902.

See Eng. Pat. 26,588 of 1902; this Journal, 1903, 223.

—T. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Yeast; Determination of Activity of ——, for Bakers' Purposes. J. Metzler. Amer. Brew. Rev., **16**, [6], 300 and [7], 348; through Zeits. Spiritusind, 1903, **26**, [26], 277.

For the valuation of bakers' yeast, it is customary to determine the fermentative power by Hayduck's method, but the fermentative power does not always correspond with the dough-raising power of the yeast. The author, therefore, proposes the following direct method, remarking that, if the operations are all performed as rapidly as possible, the results are very concordant, and correspond closely with the behaviour of the yeast in the bakehouse.

One hundred grms. of flour are placed in a thermostat at 30° C. for some time, and then mixed by a silver spoon in a porcelain dish with 80 grms. of distilled water at 30° C., to which 2 grms. of the yeast have been added. The dough is then rolled on a small board, sprinkled with flour, to a length of about 6 ins.; in this operation it takes up a further 3—5 grms. of flour. The roll of dough is then placed in a paper cylinder $4\frac{1}{2}$ in. in length and $1\frac{3}{4}$ in. in diameter, which must be filled to the point of overflowing. The whole is placed in a glass-measuring cylinder of 500 c.c., care being taken that the paper cylinder, the capacity of which must be 9·15 cb. in., accommodates itself to the width of the glass cylinder. The height of the dough at the beginning of the operation is taken as the zero point for the determination. The cylinder is then placed in the thermostat at 30° C., and the increase of the volume of the dough is noted every half-hour, the final reading being taken after two hours. The doubling of the volume of the dough is taken as a raising power of 100.—J. F. B.

Karaka Fruit; Note on the ——. T. H. Easterfield and B. C. Aston. Proc. Chem. Soc., 1903, **19**, [269], 191.

The kernel of the fruit of the Karaka tree (*Corynocarpus laevigata*: natural order, *Anacardiaceæ*), is a staple article of food amongst the Maoris and Morioris. In its raw state it is bitter and very poisonous, but when baked, and subsequently soaked in water, its toxic properties disappear. Examination of the kernels show that they contain 15 per cent. of a harmless, non-drying oil, and that the aqueous extract of the nut contains mannitol, mannose, and dextrose. When the extract is distilled it yields a considerable quantity of hydrocyanic acid. From the aqueous extract, Skey obtained a bitter glucoside, karakin, which the authors find to be highly nitrogenous and, when pure, melting at 122° C. It is most readily obtained from an alcoholic extract of the kernel by removing the alcohol under diminished pressure and recrystallising the residue from warm water.

Karakin, which has the formula $C_{15}H_{24}O_{15}N_3$, crystallises in leaflets and, like amygdalin, is only slightly toxic when removed from the enzymes with which it is associated. A second glucoside, *corynocarpin*, can be obtained in small quantity by evaporating the aqueous extract at a temperature below 50°, and extracting with ether. As this glucoside cannot be detected in the freshly prepared extract, and as the karakin disappears during the evaporation, it is probable that the second glucoside is a product of the partial hydrolysis of karakin. Corynocarpin crystallises in fine needles, melts at 140° C., and is less soluble in hot alcohol than karakin.

Sulphite Poisoning; Chronic ——. H. Kionka and L. Ebstein. Zeits. fur Hygiene, 1902, **12**, 123.

So-called "preserving salts" are sold to wholesale butchers, consisting of impure sodium sulphites mixed with varying quantities of sodium sulphate, with directions to add from 1—2 grms. to each kilo. of meat, and stating that this amount would not be injurious. The authors, as the result of various experiments with dogs, came to the conclusion that meat thus treated gave distinct evidences of poisonous action, and the German Government, in October 1898, issued a notice, warning feeble and delicate persons against partaking of salt meats which had been cured with substances containing sulphurous acid compounds. Since then additional facts have been published, and the authors undertook a searching investigation into this subject, their results confirming their first conclusions.

English Patents.

Cereals and Leguminous Substances for Feeding Horses, Cattle, and other Animals; Process for Rendering —— more Digestible. J. H. Mullins, Preswylfa, near Cardiff. Eng. Pat. 21,416, Oct. 2, 1902.

The crushed material is moistened with a saline solution (*e.g.*, a 26 per cent. solution of sodium chloride) with a boiling point higher than that of water, then heated to a temperature sufficient to soften the husk and gelatinise the starch, and finally dried and flaked.—C. A. M.

Milk and Cream Separators; Centrifugal ——. A. J. Boult, London. From the Ramesohl and Schmidt Akt. Gesell., Oelde, Westphalia. Eng. Pat. 3,192, Feb. 10, 1903.

The machine consists of a drum, having a settling chamber for dirt, from which the milk passes up into the separating chamber, through several distributing pipes arranged parallel to the axis or spindle of the drum. These pipes are closed on all sides except towards the centre of the drum, where they are perforated, so that the milk enters the separating chamber towards the centre.—J. F. B.

Sterilising Apparatus for Organic Liquids [Milk]. M. Seiffert, Leipzig, Germany. Eng. Pat. 9242, April 23, 1903.

Claim is made for a process of sterilising organic liquids by means of ultra-violet rays such as those emitted by sparks from high-tension alternating currents. In practice, the liquid is made to circulate in as thin layers as possible through a series of vessels with apertures to admit t rays, provided, if required, with dispersive lenses of quart or the like. Small lumps or balls of quartz, fluorspa rock crystal, &c., incapable of absorbing ultra-violet ray may also be placed in the vessels. The special advantag claimed for the process is that no heat is required, that liquids, such as milk, can be sterilised without bein chemically altered.—C. A. M.

Concentrating and Evaporating Liquids [Milk, &c.] Method of, and Apparatus for ——. M. Ekenberg Stockholm. Eng. Pat. 10,124, May 4, 1903.

The concentration or evaporation is effected in vacuum under ordinary atmospheric pressure, by causing the liqui to flow in constant circulation over the free surface, an especially the end walls, of a heated rotary body mounte in the liquid receptacle. The dry residue produced by th evaporation is removed from the rotary body by a scrape and falls into a delivery chamber. (See also U.S. Pa 711,719, and Eng. Pat. 23,770 of 1902; this Journal, 190 1548, and 1903, 158.)—R. A.

United States Patent.

Milk Product and Process of Making same. J. W. Dowle St. Louis. U.S. Pat. 730,888, June 16, 1903.

A small quantity of "acid calcium phosphate," is added t "waste milk," the mixture is filtered, and the filtra concentrated and added to the residue on the filter. further quantity of "acid calcium phosphate" is now adde (30 lb. to 160 lb. of the "waste milk") and the mixtu dried. It can be used as a baking powder.—T. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Oxygen; Detection of Dissolved ——, *in Water.* A. Kaiser. XXIII., page 882.

Ammonia; Obtaining ——, *from Town's Refuse or oth Nitrogenous Organic Matter by means of Waste He from Refuse Destructor Furnaces.* W. Naylor. En Pat. 17,650, Aug. 12, 1902. VII., page 865.

English Patent.

Liquids [Water, &c.] Apparatus for Purifying. O. M. Moller, Copenhagen. Eng. Pat. 10,094, May 4, 1903.

The purification of the water or other liquid is effected the action of ozone and other gases generated electrolyticall within the purifying tank. The electrodes are made perforated plates built up one above the other, an insulated from the tank, the plates being also separated insulation into two groups which are connected by pol pieces to the source of electricity. Means are provided f passing the water through the electrodes, and for reversin the flow to cleanse the apparatus, the cleansing action bein facilitated by "reciprocating the electrodes within the tank. Perforated diaphragms mounted above the electrodes a spaced apart to form compartments, in which broke material, such as quartz, glass, sand, &c., is placed t retard the passage of the water through the tank, and t ensure the thorough commingling of the water with t generated gases.—R. A.

(*C.*)—DISINFECTANTS.

Antiseptic [Trioxymethylene]; Solid Soluble ——. Koehler, Lyons-Monplaisir. U.S. Pat. 731,578, June 2 1903.

See Fr. Pat. 325,391 of 1902; this Journal, 1903, 708. —T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Sizing; Use of Sodium Bisulphate in ——. Würster. Fifth Internat. Cong. Appl. Chem., Berl 1903. Papier-Zeit., 1903, **28**, [54], 1896—1897.

It is now generally recognised that the sizing of paper effected by the precipitation of free rosin and not aluminium resinate. In accordance with this view t thor formerly advocated the use of sulphuric acid in ice of aluminium sulphate for decomposing the rosin ip. Sulphuric acid is, however, a dangerous substance add to paper pulp, and if no aluminium salt be used, the ing effect is liable to fail owing to the clotting together the precipitated rosin. With aluminium salts, the atinous precipitate which is simultaneously produced ists the fine division of the rosin. Sodium bisulphate sesses the advantages without the disadvantages of phuric acid. It is cheaper than an equivalent quantity sulphuric acid, and one part of bisulphate can do the rk of 3 parts of aluminium sulphate. For papers which ve to be sized with a minimum proportion of rosin 5 to 3·5 per cent.), the author recommends that one f of the aluminium sulphate be replaced by an equivalent ntity of sodium bisulphate.

But in cases where a larger proportion (5 to 6 per cent.) rosin is permissible, the whole of the aluminium sulphate y be replaced by sodium bisulphate, and since the rosin precipitated is cheaper than the paper itself, its use as a ding and loading material may be extended. If the sence of traces of iron in the bisulphate be objection- e, the iron should be precipitated by potassium ferro- nide. In order to avoid corrosion of the beater knives, bisulphate should be added shortly before the beater is harged, or else it should be added to the pulp in the ing chest.—J. F. B.

English Patents.

t Moss Fibre or Paper ; Treatment of Waste Liquors om Manufacture of ——. W. M. Collander, London. ng. Pat. 15,633, July 14, 1902.

waste liquors washed out of peat moss fibre which has boiled or otherwise treated with alkali, are treated an acid whereby hydrocarbons or gummy substances precipitated. The precipitate is separated from the or which is then sufficiently pure to be discharged into ream. The dried or partially dried precipitate is treated istillation, sublimation, or other means to recover useful lucts. If desirable, the precipitate may be re-dissolved neans of an alkali before subsequent treatment.

—J. F. B.

ulose Films and Threads ; Manufacture of Colourless ——. W. P. Thompson, London, from Vereinigte unstseidefabriken A.-G., Frankfort-on-Maine. Eng. Pat. ,503, Aug. 8, 1902.

Fr. Pat. 323,474 of 1902 ; this Journal, 1903, 508.

—T. F. B.

ulose ; Manufacture of Filaments from —— [Viscose]. H. Stearn, London. Eng. Pat. 7023, March 26, 1903. nder Internat. Conv., April 3, 1902.

U.S. Pat. 716,778 ; this Journal, 1903, 92.—J. F. B.

er [Coated] ; Treatment of ——. L. Lebateux. rst Addition, dated Dec. 10, 1902, to Fr. Pat. 316,777, ov. 28, 1901.

he original specification the use of a composition uining zinc white and oil was claimed for coating r for "art" printing. The present addition provides he employment of barium sulphate, with or without white, also for the addition of a siccative or an anti- tive to the fatty compositions, according to the purpose hich the paper is required.—J. F. B.

French Patents.

per Material ; A New ——. J. Ferrand. Fr. Pat. 327,046, Dec. 5, 1902.

T fibrous bark of a forest tree very abundant in odia, Tonquin, and Indo-China, called "Quaicé" or e Wood" is claimed as a new paper-making material. fibres of this bark are interlaced and crossed after the ner of a cloth and have only a slight, scaly covering of y matter. The bark is steeped in water for about a , chopped and milled to remove the scaly matter ; the uct is then washed in a rag-engine and converted into —J. F. B.

Paper-Pulp from Gorse ; Manufacture of ——. G. P. Horteloup. Fr. Pat. 327,136, Dec. 9, 1902.

Common gorse or furze is employed for the manufacture of paper-pulp by boiling the green plants with dilute caustic soda solution under pressure. The mass is then washed, acidified, and bleached.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Chloroform ; The Function of Alcohol in the Preservation of ——. Adrian. J. Pharm. Chim., **18**, [1], 5—9.

Although the use of alcohol as a preservative of chloroform has long been known, and its efficacy established, the precise nature of its action has not been determined. The decomposition of chloroform by the action of light, when unprotected by the addition of alcohol, may be represented by the equation—

$$4CHCl_3 + 6O = 4COCl_2 + 2H_2O + 4Cl$$

and

$$2COCl_2 + 2H_2O = 2CO_2 + 4HCl.$$

It is to the presence of carbon oxychloride that the ill effects of impure chloroform are due.

It is found that the presence of alcohol does not, strictly speaking, prevent this decomposition ; but it retards it, and fixes the nascent chlorine, forming, instead of free hydrochloric acid and the toxic carbon oxychloride, other chlorine derivatives which are harmless to the animal organism.

The first phase of this reaction is that of free chlorine on alcohol, as represented by—

$$C_2H_5OH + 2Cl = CHO.CH_3 + 2HCl.$$

The acetic aldehyde thus formed has a great affinity for chlorine, giving acetals more or less chlorinated until finally, by successive stages, trichloraldehyde $CCl_3.CHO$ is formed. The hydrochloric acid set free during these reactions combines also with the alcohol, forming esters, if the latter be in excess ; if not, it is found as free acid. It is found that in 24 months pure chloroform will liberate 0·034 per cent. of free chlorine ; and from 0·015 to 0·011 per cent. in six months. Therefore, the addition of one part of alcohol in 1,000 of chloroform is sufficient to ensure preservation. Sulphur and oil of sweet almonds, which have also been employed for preserving chloroform, doubtless act in a similar manner by fixing the nascent chlorine as it is generated.—J. O. B.

Odoriferous Compounds ; Influence of the External Medium on the Formation and Evolution of ——, in Plants. E. Charabot and A. Hébert. Comptes rend., 1903, **136**, [26], 1678—1680.

Formation of Terpenic Compounds.—Peppermint was manured with various inorganic salts. Ammonium chloride produced the greatest effect in regard both to the weight of the crop and the yield of essential oil. Potassium and sodium chlorides had but little influence. Sulphates, especially those of manganese, potassium, and ammonium, as also sodium nitrate and disodium phosphate, favoured the production of odoriferous compounds.

Evolution of Terpenic Compounds.—The addition of inorganic salts accelerates the diminution of the proportion of water in the plant ; it also favours the esterification of the menthol. There is a clearly shown relation between the diminution of the proportion of water and the esterification, not only of the menthol, but also of the volatile acids in the plant. Thus, the chlorophyllian function, by provoking transpiration (which determines the proportion of water removed), favours esterification.—J. T. D.

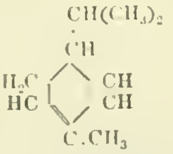
Siberian Fir (Abies sibirica) ; Essential Oil of the ——. J. Schindelmeiser. Farmazeft, 1903, **11**, 473. Chem.-Zeit., 1903, **27**, [53], Rep., 161.

The essential oil of *Abies sibirica*, obtained by distillation of the needles and twigs of the tree, occurs in commerce as a thick, somewhat resinous liquid of pleasant aromatic odour. According to Hirschsohn (Pharm. Zeits. f. Russl., 1892, 593), it contains 36 per cent. of the acetic ester of *l*-borneol, together with *l*-pinene, and probably also the acetic ester of terpineol. The specimen examined by the author had the sp. gr. 0·929, and the optical rotation $[\alpha]_{D}^{20^\circ} = -43^\circ 35'$. The oil began to boil at 160° C., and the temperature then rose continuously to 270 C., but decomposition took place, acetic acid being formed. The oil was therefore distilled at the atmospheric pressure up to 190° C., and the residue distilled under diminished pressure (20 mm.), the fraction coming over between 90° and 140° C. being collected. The fraction boiling at 160°—190 C., at atmospheric pressure, had an optical rotation of $[\alpha]_{D}^{20^\circ} = -53^\circ 18'$. After purification by distilling it with metallic sodium, it boiled at 160°—165 C., and had the optical rotation, $[\alpha]_{D}^{20^\circ} = -60^\circ 45'$ (see this Journal, 1903, 647). On cooling the fraction which distilled at 90°—140° C. at 20 mm. pressure, crystals separated. These melted at 30° C., and had the optical rotation, $[\alpha]_{D}^{18^\circ} = -43^\circ 63'$; they were identified as the acetic ester of borneol. The yield was 50 per cent. of the oil taken. The liquid portion of the fraction contained a terpineol-like substance. In view of its content of the acetic ester of *l*-borneol, the essential oil of *Abies sibirica* might be useful as a raw material for the manufacture of camphor.—A. S.

Phellandrene. F. W. Semmler. Ber., 1903, **36**, [9], 1749—1756.

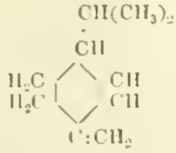
Crude phellandrene obtained from oil of eucalyptus was oxidised by treatment with a neutral solution of permanganate (quantity equivalent to 4 atoms of oxygen) at a low temperature. The residual cymene and cineol were distilled off by steam, the whole of the phellandrene having been converted into a mixture of two acids. These acids were separated by treatment of the neutralised solution with copper acetate. The precipitate, when decomposed by sulphuric acid and extracted with ether, yielded the lactone $C_8H_{12}O_4$ of *α-hydroxy-β-isopropyl-glutaric, acid* $C_8H_{14}O_5$, which on oxidation with lead peroxide in presence of acid yielded *l-isopropyl-succinic acid.* From the filtrate from the copper precipitate the second acid was isolated, which also showed a tendency to form a lactone; this acid was identified as *α_1-hydroxy-β_1-isopropyl-adipic acid*, $C_9H_{16}O_5$, which yielded on oxidation with lead peroxide *l-α-isopropyl-glutaric acid.* Since a neutral solution of permanganate showed no tendency even on warming to convert one of these hydroxy-acids into the other, it is concluded that the two acids must be derived from two different phellandrenes. The phellandrene corresponding with the hydroxy-isopropyl glutaric acid would have the constitutional formula I. of a normal terpene, whilst that corresponding with the hydroxy-isopropyl-adipic acid would have the formula II. of a pseudo terpene:—

I.



Normal phellandrene.

II.



Pseudo-phellandrene.

Eucalyptus oil contains a preponderating proportion of the normal phellandrene. In conformity with the above formulæ, the two double bonds in each being attached to contiguous carbon atoms; both phellandrenes yield the same dihydro-phellandrene when reduced by sodium in presence of amyl alcohol (see this Journal, 1903, 658).

Both phellandrenes yield dibromides; the dibromide from normal phellandrene is converted by alcoholic potash into cymene, whilst the dibromide of pseudo phellandrene yields a derivative in which the bromine atom in the nucleus is replaced by an ethoxyl group, the bromine in the side chain being retained.

The two phellandrenes must yield different nitrites, which, however, have not yet been separated.—J. F. B.

Alkaloids; Precipitation of some ——, by Uranium Nitrate. Reaction of Morphine. J. Aloy. XXIII., page 881.

Chinese Wood [Tung] Oil; Poisonous Properties of —— J. Hertkorn. XII., page 874.

English Patents.

Acetyl-Salicylic Acid and Esters thereof; Manufactur of ——. R. E. Ellis, London, from Soc. Chim. des Usine du Rhône, ancien. Gilliard, Monnet et Cartier, Lyons France. Eng. Pat. 14,699, July 1, 1902.

Acetyl salicylic acid, or any of its esters, is prepared b heating salicylic acid or its esters with sodium (or potassium acetate and an aromatic sulpho-chloride (*e.g.*, toluen sulpho-chloride).

The esters of acetyl salicylic acid are also prepared b heating salicylic esters with acetic anhydride; or by heatin acetyl salicylic acid with an alcohol and a mineral acid.
—T. F. B.

Ureides of Dialkylacetic Acids; Process for the Prepara tion of ——. F. Boehm, London. From E. Fische Berlin. Eng. Pat. 1914, Jan. 27, 1903.

When di-alkyl malonic acid is heated with urea an phosphorus oxychloride or "thio-oxychloride," carbo dioxide and water are eliminated and the ureide of dialkyl acetic acid (dialkylacetylurea) is formed. This does n apply to dimethylmalonic acid, which forms dimeth barbituric acid when condensed with urea.

The ureide of dialkylacetic acid is also prepared b condensing urea and dialkylmalonic acid with fumin sulphuric acid, and decomposing the ureide-dialkylmaloni acid, $R_2:C.(COOH).(CO.NH.CO.NH_2)$, thus produced b heat, into carbon dioxide and the ureide of dialkylacet acid $R_2:CH.CO.NH.CO.NH_2$.—T. F. B.

Carbon Compounds having the General Formula $C_{10}H_{16}O$ Process of Obtaining ——. K. C. Wideen and the Carbo Hydrate Chemical Co., both of New York. Eng. Pa 9340, April 24, 1903.

Ethylene gas is prepared by the treatment of acetylen with a reducing agent such as ammonio-chromous sulpha or in any other manner. The ethylene is then passed ov or through a heated mass of *p*-bromo-isopropylbenzen $C_6H_4BrCH(CH_3)_2$, and then immediately over heate metallic sodium. The product from this action is a hydr carbon $C_{10}H_{14}$, which, when brought into intimate conta with superheated steam, is converted into the compou $C_{10}H_{16}O$.—J. F. B.

United States Patents.

Aldehyde; Sulpho-acid of Aromatic ——, and Process Making same. A. Steiner, Assignor to the Chemic Works, formerly Sandoz, both of Basle. U. S. P 731,139, June 16, 1903.

Methylbenzene sulphonic acids are oxidised in presen of "anhydrous sulphuric acid."

m-Methyl-benzaldehyde disulphonic acid sodium sal when crystallised from 80 per cent. methyl alcohol, form transparent white needles, or tablets, which contai besides water of crystallisation, combined methyl alcoh The substance is easily soluble in water, and yields, wi phenyl hydrazine, a soluble yellow hydrazone. (See al Fr. Pat. 320,621, 1902; this Journal 1903, 44.)—T. F. B.

Carbon Compounds; Process of Obtaining ——. K. Wideen, Brooklyn, Assignor to the Carbon Hydra Chemical Co., New York. U. S. Pat. 732,480, June 3 1903.

See Eng. Pat. 9340, 1903, above.—T. F. B.

French Patent.

Pseudoionone; Hydrolysed ——, and its Homologues o their Conversion into Cyclic Ketones. Soc. Ch Naef & Co. Fr. Pat. 326,982, Dec. 3. 1902.

By adding concentrated sulphuric or phosphoric a gradually, with constant stirring, to cooled pseudo-iono open chain compounds are formed, derived from pseu ionone by the addition of one molecule of water. T resulting "hydrolysed pseudo-ionone" boils at 176

78° C. (under 9 mm. pressure), and has a sp. gr. of 0·96 : 15° C.

The methyl derivative (obtained from methyl pseudo-ionone) has a sp. gr. of 0·956 at 20° C., and boils at about)0° C., under 13·5 mm. pressure.

These compounds closely resemble, in properties, seudo-ionone and its homologues.

By the further action of acids on these substances, and β-ionone and its homologues are obtained.

When the hydrolysed pseudo-ionone is heated with ncentrated phosphoric or formic acid, and the product eated with water and distilled with steam, α-ionone is rmed.

When 75 per cent. sulphuric acid is used, β-ionone is oduced.

Hydrolysed methylpseudo-ionones behave similarly.

The α- and β-methyl-ionones, derived from hydrolysed ethyl pseudo-ionone of sp. gr. 0·950 (from methyl seudo-ionone of sp. gr. 0·896) have sp. grs. of 0·931—·932 and 0·939—0·941 (at 20° C.) respectively; and iling points of 138°—143° C. (14 mm.) and 143°—150° 5 mm.).

The methyl ionones (α- and β) derived from methyl-seudo-ionone of sp. gr. 0·912, have sp. grs. of 0·933—·936 and 0·939—0·943 (at 20°) and boiling points 134°—138° (13 mm.) and 132°—140° C. (11 mm.) spectively.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

atent Image; Action of Thiosulphate on the ——, and on Development. Lüppo-Cramer. Phot. Korr., 1903, **40**, 279. Chem.-Zeit., 1903, **27**, [53], Rep., 168.

he action of thiosulphate in the developer is not always rallel to its action on the latent image. The author has eviously shown that a preliminary treatment of the latent age with thiosulphate has an accelerating influence on e action of the iron developer (this Journal, 1902, 138). e presence of traces of thiosulphate in the iron developer s a similar accelerating influence, but in organic velopers thiosulphate in general has no effect, or has a tarding influence, or leads to the production of "fog." is different behaviour of thiosulphate is partly due to the e of sulphite with the organic developers.

A latent image, which has been subjected to a pre-inary treatment with thiosulphate and then well washed, developed much more rapidly and better by pyrogallol, techol (pyrocatechin), quinol (hydroquinone), and (to a sser degree) metol, when these are used without sulphite, an an image which has not been so treated. The addition thiosulphate to the developer, however, strongly reduces e action of catechol and quinol developers, but accelerates a very slight extent the action of pyrogallol and metol; e effect in these cases is the same whether sulphite is ed or not. A large addition of thiosulphate to the metol veloper greatly diminishes its effect.—A. S.

lver Image bleached by Mercuric Chloride; Chemical Reactions in the Blackening, by Thiosulphates, of the ——. E. Valenta. Phot. Korr., 1903, **40**, 302. Chem.-Zeit., 1903, **27**, [53], Rep., 168.

a mixture of silver chloride and mercurous chloride tained by precipitating a mixture of equivalent quantities silver nitrate and mercurous nitrate with hydrochloric id, be treated with sodium thiosulphate solution and then mediately filtered off, the dark-coloured precipitate nsists of a mixture of silver chloride and metallic rcury. With a concentrated solution of thiosulphate, by allowing the thiosulphate to act for a longer period, e silver chloride is completely dissolved, and only tallic mercury is left. If the thiosulphate be allowed to t for too long a time, the black precipitate of mercury ntains very small quantities of silver sulphide. The actions which occur may be represented by the equations:

$_2Hg_2Cl_4 + Na_2S_2O_3 = Hg + HgS_2O_3 + 2NaCl + 2AgCl$;

d $2\,AgCl + 3\,Na_2S_2O_3 = Ag_2S_2O_3 . 2\,Na_2S_2O_3 + 2\,NaCl$.

In practice, therefore, the intensification of the negative is satisfactory only when very dilute solutions of thiosulphate are used, and when these are allowed to act for only a short time.

By the action of the double thiosulphate of gold and sodium on the image bleached with mercuric chloride, gold, mercury, and silver chloride are formed in variable quantities. The intensification is very satisfactory, but the method is too costly for ordinary use.

If freshly-precipitated mercurous chloride be treated with freshly-precipitated silver bromide dissolved in sodium thiosulphate solution, it is immediately blackened, the dark product consisting of metallic mercury, silver, and silver bromide. If a mixture of mercurous chloride and silver chloride, corresponding to the formula $AgHgCl_2$, be treated with a solution of the double thiosulphate of silver and sodium, the dark-coloured product formed, contains variable amounts of silver chloride. If silver chloride or bromide be reduced to metallic silver by treatment with a developer, subsequent intensification with the double thiosulphate of silver and sodium is very satisfactory. The double thiosulphate of lead and sodium can also be satisfactorily used for blackening the bleached image. If a mixture of silver chloride and mercurous chloride, corresponding to the formula $AgHgCl_2$, be treated with an excess of a solution of the double thiosulphate of lead and sodium, it is first intensely blackened, then becomes whitish, and finally is again blackened. The dark-coloured product contains mercury, sulphides, and varying amounts of lead thiosulphate and silver chloride.—A. S.

Silver and Sodium Thiosulphates; Double Salts of ——. J. Gädicke. Fifth Internat. Congress of Applied Chemistry, Berlin. Zeits. angew. Chem., 1903, **16**, [25], 608.

The composition of the double salts depends on the salt of silver used to prepare them. A number of double salts containing 1 mol. of $Ag_2S_2O_3$, 1, 2, 4, 6, 9 mols. of $Na_2S_2O_3$, and 2, 5, 6, 32 mols. of water were obtained. The silver salts employed were the nitrate, chloride, bromide, and iodide. The advantages of acid fixing-baths in photography and in the washing of printing-out papers are deduced from the results obtained.—L. F. G.

United States Patents.

Photographic Plates, Papers, &c.; Solution for Use in the Production of ——. M. Jolles and L. Lilienfeld, both of Vienna. U.S. Pat. 732,189, June 30, 1902.

See Eng. Pat. 11,053 of 1897; this Journal, 1898, 794.
—T. F. B.

Amido-oxybenzyl Sulphonic Acid [Photographic Developer]. F. Fischer and H. Guntrum, Elberfeld, Germany, Assignors to the Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 729,054, May 26, 1903.

m-Nitro-*o*-hydroxy[3:6]benzylchloride is treated with a sulphite in aqueous solution, and the resulting nitro-hydroxybenzyl sulphonic acid is reduced to the amino compound. This latter is a whitish compound, stable in air, with difficulty soluble in cold water, readily in hot water, and insoluble in alcohol, ether, and acetone. It forms salts with the alkalis, and is especially suitable as a photographic developer.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives; Twenty-Seventh Annual Report of H.M. Inspectors of ——, for the year 1902.

The only modification of the law made during the past year has been the order amending the order relative to the packing of explosives of the 4th class (chlorate mixtures). The condition and management of the various factories and magazines throughout the kingdom were found satisfactory, but, as regards stores and registered premises, the administration of the Explosives Act by local authorities still leaves much to be desired. The total number of factories under continuing certificate or license is 150, and four new licenses have been confirmed during the year. The number of deaths (13) from fire or explosion during the manufacture of explosives is above the average (6·5) for the decade. Under "Government Accidents" is recorded the explosion of a charge of Cordite M.D. in one of the mixing houses at Waltham Abbey. The machine was probably being started at the time, but the cause of the explosion cannot be determined with certainty. Dr. Dupré reports on the chemical work done during the year. Four hundred and six samples of licensed explosives and materials used in their manufacture were examined, and of these 36 were rejected. Among the special work done, some experiments were made on the sensitiveness of nitroglycerin to direct percussion, or to a glancing blow. Contrary to what might have been anticipated, it is more difficult to explode a thin film than a layer of moderate thickness, such, for example, as that formed by a small drop. It was found quite impossible to explode nitroglycerin on sheet lead of 1 inch thickness placed on stone, by iron or steel implements, either by a direct or glancing blow. Another investigation of considerable interest had for its object the influence exerted by small quantities of potassium perchlorate present in the saltpetre used in the manufacture of ordinary gunpowder. Six samples of gunpowder were prepared, the amount of perchlorate in the saltpetre of these samples varying from 0·048 per cent. to 1·21 per cent. The samples were directly compared with another gunpowder, absolutely free from perchlorate, in regard to the following particulars: Chemical stability; temperature of ignition; sensitiveness to direct percussion (*a*) by a falling weight, (*b*) by firing at the powder contained in a 1 lb. canister with an Enfield, Martini-Henry, and a ·303 rifle, using service ammunition; sensitiveness to glancing blows on wood and stone by means of implements of iron, wood, and hide. In the case of the stone, the temperature of the stone was gradually raised until the gunpowder placed on it took fire. With the exception of a slight depression in the temperature of ignition, amounting to 5·6° C. in the case of the powder with 1·21 per cent. of perchlorate (the igniting point of the pure powder was 327° C.), no difference whatever could be discovered between the gunpowder absolutely free from perchlorate and those containing it. The investigation left no doubt whatever that the presence of small quantities of perchlorate in the saltpetre does not in any way injuriously affect the powder, and that it is certainly not necessary to limit the permissible proportion of perchlorate to below 1 per cent. Captain Desborough, the officer in charge of the Home Office Testing Station, reports that during the past year 23 explosives were submitted to the official test, and in 12 cases the tests were successful, thus adding eight new explosives to the permitted list, and enabling four explosives previously on the list to be issued in a modified form. The amount of foreign blasting explosives imported in 1902, as compared with 1901, was as follows:—

—	1902.	1901.
	Lb.	Lb.
Containing nitroglycerin	1,839,277	1,173,950
Not containing nitroglycerin	12,000	142,800
Detonators	13,152,000 and 20 cases.	13,666,570 and 65 cases.

—A. E. L.

Explosives; Powdered Aluminium for ——. Eng. and Mining J., 1903, **75**, [26], 965.

It is stated that a mixture of powdered aluminium and ammonium nitrate has recently been introduced as an explosive, under the name of "ammonal." This explosive is said to be one of the safest known; it is not subject to spontaneous decomposition, is not exploded by shock or friction, burns reluctantly, and is not affected by frost or moisture. It is fired with the usual detonator, and the gases produced are stated to be harmless. By varying the proportion of powdered aluminium, the strength of the explosion can be increased or decreased.—A. S.

French Patent.

Matches; Inflammable Composition for ——. (Che Fabrik Griesheim-Elektron. Fr. Pat. 327,107, Dec. 1902.

See U.S. Pat. 727,758 of 1903; this Journal, 1903, 710. —T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

Lead Dioxide; Employment of ——, *in Analysis.* St. Bogdan. Bull. Soc. Chim., 1903, **29**, [12], 594—59

An aqueous solution of sulphuretted hydrogen or of sulphide is decomposed in the cold by lead dioxide, wi formation of lead sulphide. Alcoholic solutions may freed from traces of hydrogen sulphide by digesting three hours with excess of lead dioxide. The autl makes use of this reaction for the removal of the exc of ammonium sulphide, which is present in solution af precipitation as sulphides, of the metals which are n precipitated by hydrogen sulphide in acid solution. adding powdered lead dioxide to the solution, the ammoni sulphide is decomposed, ammonia being formed, and le sulphide and sulphur precipitated. The reaction tak place in the cold, but it is desirable to heat on the wat bath for a few minutes. The precipitate does not ret any salts of alkaline earths which may be present, a the solution, after filtering, is ready, without any additi of ammonia, for testing for the metals of the next gro (calcium, barium, and strontium).—A. S.

Nickel and Cobalt; Detection of ——, *in Mixtures co taining both Metals.* F. W. Dootson. Proc. Cambrid Phil. Soc., 1903, **12**, 125—126.

By suitably modifying the method of Rosenheim a Huldschinsky (this Journal, 1901, 840) for the quantitat determination of nickel and cobalt, the author has devis a simple and rapid qualitative test. The sulphides of two metals separated in the usual manner are dissol in a small amount of hydrochloric acid and a few dr of nitric acid, the solution diluted, treated with ether, a a dilute solution of potassium or ammonium thiocyan (sulphocyanide) added gradually, till the ethereal la acquires a distinct colour. The mixture is vigorou shaken after each addition of thiocyanate solution. double thiocyanate of nickel and potassium or ammoni is easily soluble in ether; the cobalt compound is m less soluble, except in presence of methyl alcohol. nickel alone be present, the ethereal layer is coloured p rose to blood red, according to the concentration of solution; if nickel be absent and cobalt present, the e is colored blue, and the coloration becomes considera darker after the addition of some methyl alcohol. If b metals are present, the nickel reaction is observed at fi and then on cautious addition of methyl alcohol, presence of cobalt is indicated by the formation, af standing, of an intense blue colour at the zone of cont of the ethereal and aqueous layers.—A. S.

Oxygen; Detection of dissolved —— *in Water.* A. Kti Chem.-Zeit., 1903, **27**, [52], 663.

0·5 grm. of pure ferrous sulphate is dissolved in a sm quantity of boiled water acidulated with sulphuric a This solution is introduced by means of a pipette int litre flask filled with the water to be examined; an exc of caustic potash solution is then added, the flask stoppe and shaken. If the water be rich in oxygen, the prec remaining in suspension immediately becomes of a yel colour, ferric hydroxide being formed. If little oxygen present, only a greenish precipitate of ferrous hydrox is formed, and with water free from oxygen, the prec remains of a greenish-white colour. Small quant nitrates or nitrites present do not interfere with the action.—L. F. G.

INORGANIC—QUANTITATIVE.

henolphthalein ; Behaviour of ——, in presence of Alkali Bicarbonates and Carbonates. Giraud. Bull. Soc. Chim., 1903, **29**, [12], 594.

HE author describes experiments the results of which ow that phenolphthalein is coloured red by alkali rbonates, but not by the corresponding bicarbonates.

—A. S.

lphuric Acid ; New Method for the Determination of ——. F. Raschig. Zeits. angew. Chem., 1903, **16**, [26], 617—619.

HE author wished to determine sulphuric acid in a cold lution, and found that Wolf Müller's method of ecipitation with benzidine hydrochloride in excess, ve excellent results if some slight modifications were troduced. 18·5 grms. of benzidine are warmed with 0 c.c. of N/10 hydrochloric acid and 1 litre of water till is dissolved, the solution is then filtered and diluted 10 litres. 100 c.c. of this solution are theoretically nivalent to 0·098 grm. of sulphuric acid, but in practice 0 c.c. are taken to precipitate 0·1 grm. of sulphuric id as insoluble benzidine sulphate. The solution to be alysed, is treated with the benzidine solution in the cold, e mixture stirred, and, after five minutes, the precipitate benzidine sulphate filtered off with the pump, and shed with water. Filter and precipitate are then placed an Erlenmeyer flask, shaken up with 50 c.c. of water, drop of phenolphthaleïn solution added, and titration ected with N/10 sodium hydroxide solution. As soon the red colour only disappears slowly, the flask and ntents are heated to 50° C., and the titration completed that temperature. To make sure that the reaction completed, the flask is heated to boiling, and the titration necessary continued. The duration of a complete deternation is 15 minutes. Some analytical results are given. e method is inapplicable if ferric salts be present. ganic substances, such as starch, also prevent the nplete precipitation of the benzidine sulphate.

—L. F. G.

tric Acid ; Volumetric Determination of ——. Débourdeaux. Comptes rend., 1903, **136**, [26], 1668—1669.

E process is based on the following facts, which have n worked out experimentally:—1. Oxalic acid may be iled with sulphuric acid of a strength of 20 c.c. of conntrated acid per 100 c.c., without decomposition. 2. Nitric d hardly reacts on such a solution, but does so rapidly l regularly in presence of manganous sulphate. 3. The ction in presence of manganous sulphate, if there be re than 20 c.c. of concentrated sulphuric acid per) c.c., is represented by—

$$3(H_2C_2O_4.2H_2O) + 2KNO_3 + H_2SO_4 =$$
$$10H_2O + K_2SO_4 + 6CO_2 + 2NO,$$

l, if less than that concentration of sulphuric acid, by—

$$4(H_2C_2O_4.2H_2O) + 2KNO_4 + H_2SO_4 =$$
$$13H_2O + K_2SO_4 + 8CO_2 + N_2O.$$

The concentration, both of manganese sulphate and sulphuric acid, has some influence on the progress of reaction, the best results being given when 4—6 grms. nanganous sulphate and 11—14 c.c. of strong sulphuric l are present in 100 c.c. of the liquid. 5. The mixture uld be heated (if as much as 150—200 c.c., over a ne, if about 50 c.c., better in a water-bath) gradually 4° C. 6. It is safer (though if the heating be carefully l gradually done not indispensable) to connect the omposition-flask with a reflux condenser.

A weighed quantity of oxalic acid, or a known volume a titrated solution, is used, and the amount remaining lecomposed is determined by titration with potassium manganate. In presence of substances which reduce manganate, the oxalic acid is precipitated as calcium ilate, and determined in the washed precipitate either vimetrically or by permanganate.

anadium salts act similarly to manganese salts, though powerfully and less regularly.—J. T. D.

Silicic Acid : Determination of ——. in presence of Tungstic Acid. C. Friedheim. Fifth Internat. Congress of Applied Chemistry, Berlin. Zeits. angew. Chem., 1903, **16**, [25], 590—591.

The mixture containing both acids, is distilled in a current of dry hydrochloric acid gas, tungsten volatilising as the chloride, and silica remaining behind. The method is applicable to the determination of tungsten in steel.

—L. F. G.

Nitroprussides and Soluble Cadmium Salts : Volumetric Determination of Alkali ——. Fouzes-Diacon and Carquet. Bull. Soc. Chim., 1903, **29**, [13], 636—638.

A solution of cadmium nitrate (8—10 grms. per litre) is titrated with sodium sulphide solution, using a few drops of sodium nitroprusside solution as indicator. To the solution of a known amount of the nitroprusside to be determined, a known volume (in excess) of the cadmium solution is added ; the precipitate of cadmium nitroprusside is filtered off and washed, and the excess of cadmium in the filtrate and washings is determined. Or, the washed precipitate may be dissolved in dilute ammonia, and titrated with sodium sulphide. The violet nitroprusside reaction appears only after the whole of the cadmium is converted into sulphide. These two methods of titration give exactly concordant results. Cyanides and ferro- or ferricyanides, if present, must be removed, the former by passing carbon dioxide through the boiling solution till hydrocyanic acid ceases to be evolved—the latter by precipitating with zinc sulphate and filtering off.—J. T. D.

Cyanides ; New Method of Analysis of Complex ——. M. Dittrich and C. Hassel. Ber. 1902, **36**, [9], 1929—1932.

The cyanides are decomposed by ammonium persulphate in slightly acid solution. Of potassium ferrocyanide, for example, about 0·5 grm. is dissolved in 50 c.c. of water containing 5 drops of dilute sulphuric acid (1 : 10) ; 30 c.c. of filtered 10 per cent. solution of ammonium persulphate are added, the beaker is covered with a clock-glass and heated on the water bath till the turbid liquid has become clear again (ferricyanide is first formed, and is then decomposed with precipitation of basic ferric sulphates, which dissolve in the sulphuric acid gradually formed by the decomposition of the persulphate). To the liquid, 10 c.c. of strong hydrochloric acid are added, and the heating continued for some minutes (if a blue coloration indicates a little undecomposed ferrocyanide, a few drops of persulphate solution are added to destroy it.) The iron is now precipitated by ammonia ; if the persulphate be free from fixed alkalis, the potassium can be determined in the filtrate. Accurate results are obtained both with ferro- and ferricyanides. In the case of Prussian blue, the substance is decomposed by heating with caustic soda solution, the ferric hydroxide filtered off and washed, 30 or 40 c.c. of ammonium persulphate solution are added to the filtrate, which is then acidified, heated, and the iron precipitated as above. In this case both of the iron precipitates are contaminated by fixed alkali, and must be redissolved and reprecipitated. The method is suitable for determining ferrocyanides in spent gas-purifiers ; it has the advantage over Donath's method (this Journal, 1899, 519) that the long boiling with a strong alkaline liquid, which leads to the contamination of the iron precipitate with silica and alumina from the glass or porcelain vessels, is avoided. Other complex cyanides can similarly be decomposed by persulphate.—J. T. D.

Potassium ; Determination of —— by means of Perchloric Acid. H. Precht. Fifth Internat. Congress of Applied Chemistry, Berlin. Zeits. angew. Chem., 1903, **16**, [25], 589—590.

The advantages of this method are : (1) An excess of barium chloride may safely be used to precipitate any sulphuric acid present in the solution, whereas when precipitating potassium with platinic chloride an excess has to be avoided, as barium platinic chloride is only soluble with difficulty in alcohol. (2) The solution containing excess of perchloric acid can be readily concentrated, whilst with the platinic chloride method the concentration has to be effected very carefully. (3) The slightly greater solubility of potassium perchlorate in alcohol, as compared with potassium platinic chloride, can be diminished by adding free perchloric acid to the wash alcohol. (4) The platinic chloride method often affects the health of the analyst, the perchloric acid method does not.—L. F. G.

Gold from Platinum ; Separation of ——. R. Willstätter. Ber., 1903, **36**, [9], 1830.

Gold chloride is soluble in ether, whereas platinum chloride is insoluble, and a quantitative separation can thus be effected.—J. McC.

Silver ; Electrolytic Determination of Small Quantities of ——, in presence of large Quantities of Lead. Arth and Nicolas. Bull. Soc. Chim., 1903, **29**, [13], 633—636.

If certain conditions of E.M.F., acidity, and temperature be observed, minute quantities of silver can be deposited from solutions containing 20,000 — 100,000 times as much lead, completely and without contamination by lead. The maximum E.M.F. permissible is 1·1 volt, and this should be the maximum voltage of the generator, so that there is no possibility, through changes in the resistances of parts of the circuit, of the E.M.F. of the electrolytic cell rising above this. The solution should contain at least 1 per cent. of free nitric acid, and a few c.c. of alcohol, and should be kept at 55°—60° C. The duration of the electrolysis is about 7 hours. The authors have thus separated accurately quantities of 1—5 mgrms. of silver from 100 grms. of lead.—J. T. D.

Arsenic ; Separation of ——, from other Elements. C. Friedheim. Fifth Internat. Congress of Applied Chemistry, Berlin. Zeits. angew. Chem., 1903, **16**, [25], 591.

The ferruginous substance is distilled in a Bunsen retort with fuming hydrochloric acid and potassium iodide. Only arsenic volatilises (even antimony remains behind), and is determined in the distillate in the usual way.—L. F. G.

Vanadium ; Determination of ——, in Alloys. P. Nicolardot. Comptes rend., 1903, **136**, [25], 1518—1551.

The author's proposal to separate vanadium from vanadium steels and similar alloys by precipitation as basic ferric vanadate (this Journal, 1901, 1242), has not been found practicable, the slight solubility of ammonium vanadate not permitting the vanadium to be removed in that form from the precipitate. He finds, however, that when a vanadium steel is dissolved in acid without access of air, the whole of the vanadium is left in the metallic state in the residue, and bases on this fact the following method :—

Alloys readily attacked by Hydrochloric Acid.—Dissolve, in a flask fitted with a cork and a Bunsen valve, 1 grm. of the alloy in 5 c.c. of hydrochloric acid of sp. gr. 1·17 (or in a solution of 5 grms. of potassio-cupric chloride) ; two to three hours at a gentle heat will be required. Filter, wash thoroughly, dry the residue, calcine in a tared platinum crucible, drive off any silica by a few drops of hydrofluoric acid, and heat at 350° C. to constant weight. At this temperature, the vanadium exists as vanadic anhydride ; if heated more strongly, this loses oxygen. The weighed residue must be tested for iron by dissolving in dilute sulphuric acid, and treating with hydrog sulphide and a few drops of ammonia ; if (which is seld the case) any ferrous sulphide be formed, it is filtered and either the iron is determined in the precipitate, or ammonium thiovanadate in the filtrate is evaporated, a decomposed by heating at 350° C. till of constant weight

Alloys not readily attacked by Hydrochloric Acid. Dissolve in nitric acid. Separate any copper electroly ally from the nitric acid solution. Evaporate the remaini solution to dryness, redissolve in a little dilute sulphuric ac pass hydrogen sulphide in, and, whilst the gas is passi add just enough ammonia to precipitate the iron a alumina. Filter rapidly (with the precautions usual w sulphides), and evaporate the filtrate to dryness and h at 350° C. till of constant weight. Weigh the vana anhydride.—J. T. D.

SO_3-Equivalent of Gases evolved in the Manufact of Superphosphate Manures ; Determination of — Affleck. VII., page 863.

ORGANIC—QUALITATIVE.

Alkaloids ; Precipitation of some ——, by Uran Nitrate Reaction of Morphine. J. Aloy. Bull. S Chim. 1903, **29**, [12], 610—611.

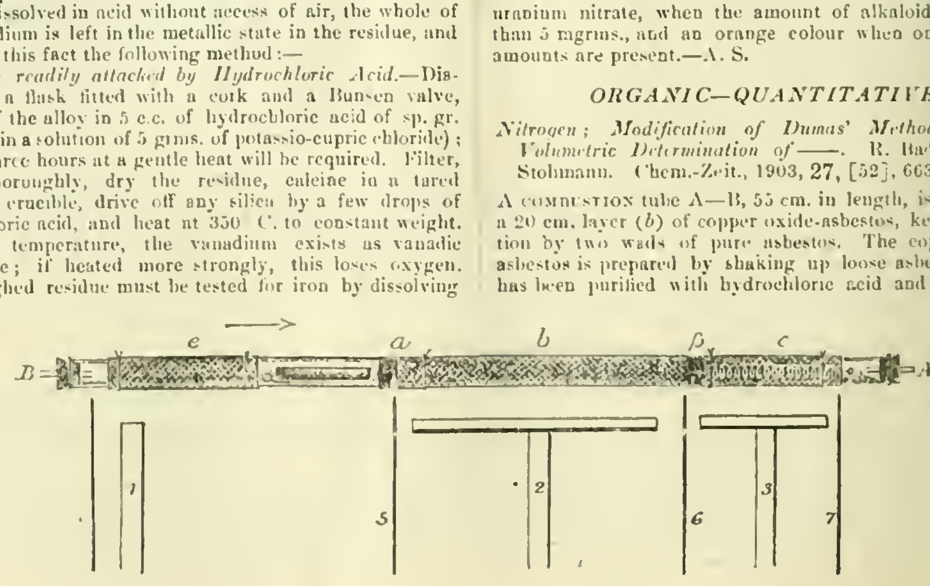
A dilute solution of uranium nitrate gives, with f ammonia and with most alkaloids, a precipitate of insoluble uranate, which on igniting is converted into oxide, U_3O_8. The uranium nitrate solution is with action on salts and on organic matter. Of the ba examined by the author, the following gave insolu uranates, *viz.*: pyridine, narcotine, papaverine, codei thebaine, narceine, quinine, cinchonine, cinchonidine, stry nine, brucine, cocaine, pelletierine, aconitine, atropine, a cicutine. Caffeine, theobromine, and asparagine did give precipitates. Morphine gave a characteristic col reaction with the reagent. A 5 per cent. solution uranium nitrate is most suitable ; it is exactly neutrali with ammonia till a precipitate just begins to form, an then added drop by drop to the solution of the alkaloid, long as a precipitate is formed. This test allows of detection of $\frac{1}{10}$ mgrm. of the alkaloids examined. uranates of the alkaloids have a more or less intense yell colour, are insoluble in water and alcohol, and have prop ties similar to those of the alkali uranates. They corr pond to the general formula : $2X.U_2O_8H_2 + H_2O$; analysis shows a deficiency in nitrogen, which deficiency increased by washing. By treating the uranates with alkali bicarbonate, the alkaloids are regenerated.

Reaction of Morphine.—Morphine and its salts give characteristic red coloration with a dilute solution f uranium nitrate, when the amount of alkaloid is grea than 5 mgrms., and an orange colour when only smal amounts are present.—A. S.

ORGANIC—QUANTITATIVE.

Nitrogen ; Modification of Dumas' Method for Volumetric Determination of ——. R. Bader and Stohmann. Chem.-Zeit., 1903, **27**, [52], 663.

A combustion tube A—B, 55 cm. in length, is filled w a 20 cm. layer (*b*) of copper oxide-asbestos, kept in p tion by two wads of pure asbestos. The copper ox asbestos is prepared by shaking up loose asbestos, wh has been purified with hydrochloric acid and water



its weight of freshly-precipitated moist copper oxide water, filtering off, and igniting the mass. c is a duced copper spiral, 10 cm. in length, and the combustion e is surrounded by coils of brass wire gauze at , and e, to prevent excessive heating. The coil e is e, and during the process of combustion is moved dually towards the porcelain boat, so as to heat this up ly. The substance to be analysed is placed in a celain boat, covered with a layer of fine copper oxide, burnt in a current of carbon dioxide in the usual . To regenerate the copper oxide-asbestos, the tube eated, and a current of oxygen passed through.

—L. F. G.

hane Homologues in Oil-gas; Occurrence and Determination of ——. E. Graefe. J. für Gasbeleucht., 903, **46**, [27], 524—528.

rdinary coal-gas, no member of the paraffin series, other methane, is present in appreciable proportion, and the rogen and methane may be determined in the usual way explosion. Oil-gas, however, does contain higher bers of the series than methane, and the explosion od in this case must not be used until the hydrogen been removed. This is best effected by partial comion by means of palladium black. The author modifies pel's directions by first filling the palladium tube with on dioxide, then burning and absorbing the hydrogen h a pipette, containing caustic potash, in front of the), washing back the gas residue into the measuring tte with 5—10 c.c. of carbon dioxide, and finally removing carbon dioxide before noting the volume. Operating is way, none of the gas is lost, and no nitrogen is duced. The residual gas may now be examined by osion. The paraffin hydrocarbons present, other than ane, may be taken to be ethane, the author's experis showing that no higher members are present in eciable amount.

England and America, where carburetted water-gas is to a greater or less extent, the above method of sis is of importance.

number of analyses of oil-gas are quoted showing from per cent. of ethane and 45·9 per cent. of methane in a le of 4·5 Hefner candle-power (with a consumption of tres per hour) to 12·6 per cent. of ethane and per cent. of methane in a sample of 16·2 Hefner e-power.

determining the oxygen in such gases, alkaline pyrol is preferable to phosphorus, the latter giving results are too low.—H. B.

hocyanides in Gas Liquor; Determination of ——. Linder. VII., page 863.

o; Improved Method of Determining ——, *by Hydrophite.* A. Binz and A. Kufferath. Färber-Zeit., 1903, , [13], 225—226.

uthors find that in estimating indigo by the usual od with hydrosulphite (Bernthsen, Ber., **13**, 2277) they results differing by 2 per cent.

same has been observed by Wengerin and Vorländer Journal, 1902, 991), who improved the process by ating and allowing for the free oxygen in the solution .

authors ascribe this irregularity to the presence of the coal-gas, which oxidises part of the hydrosulphite e reduced indigo sulphonic acid.

her better results are obtained by replacing the coaly hydrogen. (Tiemann and Preusse, Zeits. anal. ., **19**, 272.)

authors conclude that the titration takes place best cuo, and recommend the following method:—The on of hydrosulphite flows through a three-way tap burette furnished with a capillary jet, which passes gh an india-rubber cork into a 180 c.c. distillation o as to reach just below the neck. A capillary tube, mission of hydrogen, passes through the same cork aches to the bottom of the flask. To the side tube flask is connected an exhaust pump with manometer. ydrosulphite in the burette is kept under a current of gen. The burette is washed with hydrosulphite, care being taken to prevent any of the solution from entering the capillary jet.

100 c.c. of the solution to be titrated are placed in the flask, a stream of hydrogen is passed through, and the flask is exhausted by means of the pump. As soon as all the oxygen is removed, the solution is titrated.

The flask must be shaken during titration, otherwise the hydrosulphite partly decomposes. (Bernthsen, Annalen, 1881, **202**, 161.)

From a series of estimations the authors find that they obtain very concordant results if hydrogen is pumped through for five minutes, and the flask exhausted to 14 mm.

The authors observe that if the indigo to be analysed is sulphonated at 45° C., or at a still lower temperature, one obtains a blue solution which requires more hydrosulphite to decolorise it than the same amount of indigo sulphonated at 55° C. This is owing to the formation of different sulphonic acids.—A. B. S.

Soaps, Hydrocarbons and Cresols; Separation of ——. O. Schmatolla. Chem.-Zeit., 1903, **27**, [50], 634.

As it is impossible to effect a complete separation of hydrocarbons and cresols from soap by means of distillation, the author has devised the following simple method. A definite proportion of the soap solution is decomposed with dilute sulphuric acid, and petroleum spirit added in about the same amount as the volume of the separating mixture of cresol and fatty acids. An aliquot portion of the petroleum spirit layer, containing a known quantity of the cresol and fatty acids, is then evaporated to dryness in the water oven, the residue diluted with alcohol, the fatty acids in the solution titrated in the usual way, and the amount of cresol determined by difference. Any considerable error in the amount of cresol thus determined is only possible when hydrocarbons are also present in small proportion in the aqueous soap solution. They may be quantitatively determined in the following manner:—A definite amount of the soap solution is mixed with exactly the same volume of a 15 per cent. solution of potassium hydroxide, and shaken two or three times with successive portions of petroleum spirit in the proportion of 1½ part to each part of soap solution. The united extracts are washed once with 3 per per cent. potassium hydroxide solution and evaporated at a low temperature, the residue of hydrocarbons weighed, and the weight deducted from the amount of cresol previously found. For the determination of total alkali a weighed quantity of the original soap solution is titrated with normal acid, methyl orange being used as indicator.

A quantitative separation of the cresol from the fatty acids can be made by repeatedly shaking the mixture of the two with potassium hydroxide solution (5 to 10 per cent.), containing sodium chloride, a little petroleum spirit and ether being added to facilitate the separation of the soap. The fatty acids can thus be obtained free from cresol and without any material alteration.—C. A. M.

India-Rubber; Valuation of ——. Schneider. Gummi-Zeit., 1903, **17**, [40], 874.

The author dissolves not more than 5 grms. of the washed rubber in 300 c.c. chloroform in the usual manner, heats to about 60° C. on the water-bath, and adds chloroform at the same temperature, drop by drop, with constant stirring. At first the liquid becomes slightly turbid, finally a copious precipitation takes place.

The precipitated rubber, designated by the author as α-caoutchouc, is filtered through silk gauze, separated from the filter, dried in a current of hydrogen and weighed. To the filtrate is added more alcohol, which at first becomes strongly milky, and after the addition of a considerable volume of alcohol a further precipitation of a rubber-like mass takes place, which is treated like the first precipitate and is called β-caoutchouc. The filtrate from this precipitate is distilled on the water-bath and the residue extracted repeatedly with boiling absolute alcohol. The insoluble residue is called γ-caoutchouc. The three fractions are of the same empirical formula, $C_{10}H_{16}$, but they differ considerably in their physical properties. The first fraction yields a firm and strong rubber, the second a markedly softer one, sticky, and not so strong, whilst the third fraction is still poorer in quality.—J. K. B.

India-Rubber and Gutta-Percha, &c.; Chemistry of ——. C. Harries. XIII. C., page 875.

Chromed-Hide Powder Question; Contribution to the ——. J. Paessler and W. Appelius. Collegium, 1903, [61]. 152, [62], 153—160, 63], 161—168, and [64], 169—175. (See also this Journal, 1903, 482—484.)

In view of the diverse opinions which exist as to the advantage or otherwise of using chromed-hide powder in the analysis of tanning materials, the authors have investigated the effect of adding to a given liquor known quantities of certain materials known to be present or likely to be present in tan-liquors, and then testing the same by means of the ordinary and chromed powder respectively.

Schweitzer (Collegium, 1903, pp. 48 *et seq.*) has shown that the extent to which the powder is chromed materially affects its absorptive power. The present authors bring further evidence, (1) of the specific action of certain tan-liquor constituents (dextrin, grape-sugar, cane-sugar, gallic acid, and lactic acid); (2) of the non-keeping qualities of chromed-powder; (3) of its irregular absorptive power as compared with ordinary powder, and conclude strongly against the use of chromed-powder. A liquor prepared from a perfectly clear quebracho-extract was used for the experiments, and analyses were made both by the official method of the International Association of Leather Trades Chemists (I.A.L.T.C.), *i.e.*, with ordinary hide-powder and bell-filter, and by the method of the American Association of Official Agricultural Chemists (A.O.A.C.), in which the liquor to be analysed is shaken with moist chromed-hide-powder.

The following scheme shows the main results of the long series of analytical figures obtained. In any mixtures the tannins and non-tannins could be calculated from the original solutions and the variations from the theoretical amounts of tannin per 50 c.c. (always as nearly as possible 0·2000 grm.) are here given in mgrms. to illustrate the greater divergence in the A.O.A.C. method.

Mixtures of Quebracho Tannin with various Substances. Variation from theoretical Weight of Tannin per 50 c.c. (0·2000 grm.), in mgrms.

Added Substance.	I.A.L.T.C. Method.	A.O.A.C. Method.
(1) Dextrin, 5 mixtures	−0·5 to +5·0	−14·5 to −8·8
(2) Grape-sugar, 5 mixtures.	−0·5 to +2·0	− 8·1 to +8·9
(3) Cane sugar, 5 mixtures.	−3·0 to +1·0	− 5·8 to +2·0
(4) Gallic acid, 8 mixtures.	66·4 − 79·7 per cent. absorbed.	44·2 − 50·5 per cent. absorbed.
(5) Lactic acid, 5 mixtures.	Dissolves hide powder and gives low results.	Dissolves hide powder and gives low results.

Lactic acid may be evaporated and weighed safely if the proportion of soluble non-volatile substance is large, but as the percentage of lactic acid increases so it loses weight by chemical change. It dissolves ordinary hide powder more readily than chromed powder, and both powders are dissolved somewhat in proportion to the amount of lactic acid.—R. L. J.

Sugar; Rapid Method for the Determination of ——. T. B. Wood and R. A. Berry. Proc. Cambridge Phil. Soc., 1903, **12**, 97—98.

The authors have devised the following method for use where a polarimetric determination is not possible. The saccharine solution is clarified by means of basic lead acetate, the cane sugar present inverted by treatment with dilute acid, the solution neutralised and diluted till it contains from 0·5 to 1·0 per cent. of reducing sugar. 10 c.c. of the sugar solution are now added to 50 c.c. of a boiling copper solution (23·5 grms. of copper sulphate, 250 grms. of potassium carbonate and 100 grms. of potassium bicarbonate per litre) and the mixture boiled for 10 minutes. The cuprous oxide precipitated is filtered off into a Gooch crucible, washed with boiling water, and transferred t flask filled with carbon dioxide. It is then shaken vigoro for a few moments with 25 c.c. of 2½ per cent. solutio ferric sulphate in 25 per cent. sulphuric acid, whereby cuprous oxide dissolves, reducing an equivalent amou ferric sulphate to the ferrous salt. The latter is titr with a solution of potassium permanganate of such stren that 1 c.c. is equivalent to 0·01 grm. of copper.—A. S.

Starch Syrups; Examination of ——. A. Rössing. Z öffentl. Chem., 9, 133—142. Chem. Centr., 1903, **1**, [ ]. 1378.

The author states that Honig's method for the separatio dextrin and dextrose (this Journal, 1902, 1100) is ope objection. Honig states that in a 1 per cent. solutio dextrose treated with half its volume of barium hydro solution and then with alcohol, the dextrose remains u tered. The author finds, however, that under these ditions the reducing power of the dextrose is diminis With pure dextrose, this diminution amounts to 11·7 cent. after 24 hours. To attain a constant value for diminished reducing power in alcoholic solution, an alkal of at least 0·6 grm. of barium hydroxide per 100 c.c. is ne sary. If the solution be acidified, the alcohol evapor in the course of 24 hours, and the liquid inverted by he it for one hour on the water bath with $\frac{1}{10}$th of its volu hydrochloric acid of sp. gr. 1·124, a further decrease in reducing power is caused, corresponding on the ave to 79·5 per cent. of dextrose. A similar diminution of reducing power of dextrose is caused by barium hydr in solutions free from alcohol.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOT

Dichroism; Spontaneous ——, of Liquids conta Solids in Suspension. G. Meslin. Comptes rend., 1 **136**, [26], 1641—1643.

Some of the mixtures exhibiting dichroism in the mag field, such as potassium chlorate in amyl alcohol, shew phenomenon in a very high degree, so that a cell of s mixture acts as a very efficient polariser, when used in junction with a Nicol's analyser, shewing, for exampl coloured designs of a selenite slide. This property pe for a while after the magnetic field is removed, and be reproduced by the action of very weak fields, su those of bar magnets at a considerable distance. Such tures may exhibit dichroism spontaneously, owing to different action on a beam of light of the lamellæ o suspended solid, according as they lie under the acti gravity in horizontal or vertical planes; in the first positive, in the second negative dichroism will occur i solid be more refractive than the liquid, while the sign dichroism will change with the order of the refr powers. The magnetic field, by altering the proporti horizontal to vertical lamellæ, may alter this dichr either by increasing or diminishing its intensity, c changing its sign. This last appearance is especially fested by boric acid suspended in turpentine. Those tures which exhibit spontaneous dichroism are also active in the magnetic field, and conversely.—J. T. D.

Unknown Element; Presence of ——, in a Spring of British Columbia. Annual Report of the Minist Mines (British Columbia) for the year ending De 1902, 27.

The solid residue of a spring water from the Kootenay trict, British Columbia, when examined in the spectro gave three lines at the blue end of the spectrum, whic not correspond to the lines given by any of the know ments. The wave lengths of the lines given by the ch of the element at the heat of the ordinary Bunsen were calculated as 4,327, 4,404 and 4,490, the first two strong lines and the last rather weak. The water only tains a minute trace of the supposed new element.—A

Peroxides. S. Tanatar. Ber., 1903, **36**, [9 , 1893—

In a previous paper (see this Journal, 1900, 281 author suggested that the difference between the so- "true peroxides" and the "pseudo-peroxides" is pro constitutional, but might be explained on thermo- mical grounds. The formation of hydrogen peroxide n water and oxygen requires the provision of 23 calories when, under certain conditions, the "pseudo-peroxides" decomposed with evolution of oxygen, whilst "true oxides" yield hydrogen peroxide, it is probably because required energy is not available in the former case to luce hydrogen peroxide. If this be so it should be sible, by curtailing the liberation of energy in the tion, to cause the "true peroxides" to behave as eudo-peroxides."

arium peroxide and all "true peroxides" may be rded as metallic salts of hydrogen peroxide, liable to ble decomposition like other salts. If barium peroxide lecomposed by hydrochloric acid, hydrogen peroxide is ree; but if an acid be used, the heat of neutralisation of ch with baryta is considerably less than that of hydro- ric acid, no hydrogen peroxide should be formed and gen should be liberated. Such is indeed proved to be case with phenol, no hydrogen peroxide being produced, would probably occur with all acids the heat of neutralis- n of which with one equivalent of baryta is less than lories.

milarly a salt capable of reacting with double decom- tion with barium peroxide will, if the heat of reaction of ombined acid with barium peroxide be less than the heat rmation of the salt from acid and base, liberate oxygen ad of hydrogen peroxide. A suitable salt is aluminium ride, which reacts with barium peroxide, with production arium chloride and liberation of oxygen; in this case, ever, a little hydrogen peroxide is produced, owing to ydrolysis of the aluminium chloride and the consequent ence of free hydrochloric acid in the solution.—J. F. B.

rogen *Peroxide of Crystallisation.* R. Willstätter. Ber., 1903, 36, [9], 1828—1829.

n ammonium sulphate is dissolved in 30 per cent. ogen peroxide solution and the solution is placed over uric acid, transparent tabular crystals of $(NH_4)_2SO_4$, separate. The crystals possess the odour of ozone decompose in the air; they keep well in closed ls.

hen sodium sulphate separates from a similar solution, rystals have the composition, Na_2SO_4, H_2O, $\frac{1}{2}H_2O_2$. rystals are octahedral; they possess no smell and are stable in the air.

m, aluminium sulphate, borax and sodium acetate eparate with hydrogen peroxide of crystallisation.

—J. McC.

m Nitroprusside; Toxicity of——. Fonzes-Diacon Carquet. Bull. Soc. Chim., 1903, 29, [13], 638—

nistered to a rabbit, either by the mouth or lermically, sodium nitroprusside was found to be fatal ses of 0·25 grm. per kilo. weight of the animal. ming it to be equally toxic to human beings, 8 grms. would be the fatal dose for an average man. ocyanic acid is found in the stomach of a rabbit ned by nitroprusside, and is no doubt formed by a atative decomposition, for none of the acids found in ody decompose nitroprussides, nor do alkalis nor ides, whilst the lactic ferment, or beer yeast, cultivated edium containing nitroprusside, liberates hydrocyanic —J. T. D.

valent Lead: New Derivatives of——. A. Colson. Comptes rend., 1903, 136, [26], 1664—1666.

the acetate (this Journal, 1903, 577), lead propionate pionic acid, acted on by chlorine, gives a tetrapro- e. The same mode of preparation yields lead tetra- yrate. The corresponding normal butyric derivative, er, is not produced in a similar way, but can be ed by long-continued boiling of the tetracetate with of normal butyric acid. Similar treatment (the being however carried out *in vacuo*) has yielded a earate and tetrapalmitate. All these substances are posed by water—

$$(PbR_4 + 2H_2O = PbO_2 + 4HR)$$

with absorption of heat; but calorific observations during the progress of the reaction indicate that there is first solution, with absorption of heat, and then decomposition, with evolution of a quantity of heat less than that first absorbed.—J. T. D.

Gold Chloride; Compounds of ——, with Pyridine. M. François. Comptes rend., 1903, 136, [25], 1557—1559.

Pyridine chloraurate, C_5H_5 NHCl . $AuCl_3$, is only stable in presence of hydrochloric acid and auric chloride. When heated with excess of water, the yellow colour pales considerably, and on cooling, microscopic crystals of C_5H_5N. $AuCl_3$ deposit. When excess of dry pyridine is poured on dry auric chloride, a compound $(C_5H_5N)_2$ $AuCl_3$ is formed. This, when heated, readily loses pyridine and is converted into the more stable C_5H_5N . $AuCl_3$. This last substance seems to be analogous to the platinopyridyl-ammonium chloride produced from pyridine chloroplatinate in Anderson's reaction.—J. T. D.

Silicamide and Silicimide. E. Vigouroux and Hugot. Comptes rend., 1903, 136, [26], 1670—1672.

Ammonia gas is very gradually brought into contact with silicon tetrachloride cooled to − 50° C. When reaction is complete, liquid ammonia is added; and the apparatus is so arranged that the liquid can be drained off from the solid and distilled back upon it, these operations being repeated till the solid is thoroughly washed. The white amorphous powder obtained, which is stable only below 0° C., is *silicamide*, formed as indicated by the equation $SiCl_4 + 8NH_3 = Si(NH_2)_4 + 4NH_4Cl$. With water, it yields silica and ammonia. Heated above 0° C. (to 120°, or 100° *in vacuo*), it yields *silicimide*:—$Si(NH_2)_4 = Si(NH)_2 + 2NH_3$, which is stable even at the temperature of softening glass. The authors state that former investigators have worked at too high temperatures, and with solvents which did not allow of the complete removal of the ammonium chloride formed, and consequently have not been able to isolate the pure compounds. (Compare Joannis, this Journal, 1903, 49.)

—J. T. D.

Phosphorus; Organic Base containing ——. P. Lemoult. Comptes rend., 1903, 136, [26], 1666—1668.

Phosphorus pentachloride reacts violently on aniline, but the whole of its chlorine is not displaced, the final product being $PCl(NHC_6H_5)_4$, obtained by Gilpin, and called by him chlorophosphotetranilide. The author finds that this substance is really the hydrochloride of the base $(C_6H_5NH)_3 : P : NC_6H_5$, *trianilidophenylphosphimide*. He has prepared this base (colourless needles, m.p. 232° C.) by treating the hydrochloride with alcoholic potash, and has also obtained the sulphate, nitrate, and chloroplatinate.—J. T. D.

Peroxides in the Chemistry of Living Cells; Part played by ——. VI. A. Bach and R. Chodat. Ber., 1903, 36, [9], 1756—1761.

At first sight there would appear to be an antagonism between the peroxydases and catalase, the former being able to "activify" hydrogen peroxide, whilst the latter decomposes it most energetically with evolution of inert oxygen. It must be borne in mind, however, that oxidations in living cells are brought about by the combined action of peroxydases and oxygenases (see this Journal, 1903, 384) and that the latter are peroxides of organic radicles.

The catalase employed by the authors was prepared from *Sterigmatocystis nigra*, in which fungus it is very abundant; the preparations were exceptionally pure and free from all other enzymes and reducing substances. In order to study the action of catalase on organic peroxides, ethyl-hydrogen peroxide $C_2H_5O . OH$ was prepared by the method of von Baeyer and Villiger; it was free from hydrogen peroxide. Catalase was found to be absolutely without action upon this substituted peroxide, and it is therefore concluded that catalase is inert towards the oxygenases of living cells. In another experiment it was proved that catalase had no influence upon the oxidation of pyrogallol by a mixture of oxygenase and peroxydase (see *loc. cit.*). Further, catalase had no inhibitive influence upon the oxidising action of a mixture of peroxydase and hydrogen peroxide. Only that portion of the hydrogen peroxide which is not required for the purpose of oxidation by the peroxydase is decomposed by the catalase. At the same time, the activity of the catalase is not affected by the presence of peroxydase.

The authors have repeated, with their pure catalase, the experiments of Pozzi-Escot (see this Journal, 1903, 812) which led the latter to conclude that catalase belongs to the class of reducing enzymes. They have found, however, that pure catalase has no reducing action upon sulphur and that Pozzi-Escot's conclusions were based upon results obtained with impure preparations.—J. F. B.

Stachyose. C. Tanret. Comptes rend., 1903, **136**, [25], 1569—1571.

Planta and Schulze in 1890 extracted from the Japanese *Stachys tuberifera* a sugar which they called stachyose, and which they regarded as a triose from the partial examination of the products of its hydrolysis. The author finds that it is in reality a tetrose, and is in all respects, chemically and physically, identical with the manneotetrose obtained by him from manna. (This Journal, 1902, 1033.) —J. T. D.

Primary Alcohols; Preparation of ——, from the Corresponding Acids. L. Bouveault and G. Blanc. Comptes rend., 1903, **136**, [26], 1676—1678.

The methods of Würtz and Friedel for obtaining primary alcohols (reduction of aldehyde and of acid chloride or anhydride respectively) are very laborious and give but poor yields. The other methods known are those of Guerbet (this Journal, 1902, 984) and of Grignard and Tissier (this Journal, 1902, 286), the latter depending on the use of organo-magnesium compounds. The authors, struck with the energy with which these compounds react on esters, and remembering that the lactones of the gluconic acids (really esters) are easily reduced to polyhydric alcohols, have endeavoured, successfully, to reduce esters by sodium. One molecular weight of ester is dissolved in 3—4 times its weight of absolute alcohol, and gradually poured on 6 atomic-weights of sodium in a flask under a reflux condenser, so as to keep up a rapid ebullition. The boiling is kept up for several hours by a chloride of calcium bath, then the whole is allowed to cool, water added to hydrolyse any undecomposed ester, and first the ethyl alcohol and afterwards the prepared alcohol distilled off in a current of steam. The authors have in this way prepared primary octyl alcohol from methyl caprylate, and are extend the application of the method.—J. T. D.

Nitric and Nitrous Esters; Preparation of ——. L. Bouveault and A. Wahl. Comptes rend., 1903, **136**, [25], 1563—1565.

The ordinary methods of preparing nitric esters (by means of concentrated nitric and sulphuric acids, cold, or dilute nitric acid hot) fail with the higher alcohols; but if alcohol be dropped gradually into 3 parts of the strongest nitric acid ("Franchimont's real nitric acid"), and the temperature be kept between 0° and 5° C., the yield of nitric ester is almost quantitative for primary alcohols up to decyl and myristyl alcohols. With secondary alcohols, no nitrate is formed, but the ketone corresponding to the alcohol, while tertiary alcohols undergo very complex decompositions not yet investigated. Nitrous esters are obtained from all alcohols by passing a current of nitrosyl chloride in excess into an ice-cooled equimolecular mixture of the alcohol and pyridine, both thoroughly dry. The nitrites from the primary alcohols boil at temperatures very different from the boiling-points of the alcohols, and are thus easily purified; but the difference is less with the secondary and insignificant with the tertiary derivatives.—J. T. D.

Di-iodophenol; A New ——. P. Brenans. Bull. Soc. Chim., 1903, **29**, [12], 603—607.

The author has already prepared the 1.2.4, 1.2.6, 1.3.6, and 1.3.5 di-iodophenols, $C_6H_3(OH)I_2$ (this Journal, 1903, 233). He has now prepared the 1·3·4 derivative. The mono-iodine derivative of *p*-nitraniline, $C_6H_3(NH_2)(NO_2)I$ [1.4.2] was diazotised, and the diazo compound converted into di-iodonitrobenzene, $C_6H_3(NO_2)I_2$ [1.3.4], by means of potassium iodide. This compound was reduced to corresponding di-iodo-aniline, and the diazo sulphate the latter base converted into the 1.3.4 di-iodophe $C_6H_4(OH)I_2$, by heating with water.

1.3.4-*Di-iodonitrobenzene* $C_6H_3(NO_2)I_2$ crystallises fr a mixture of alcohol and ether in yellow prisms, melting 112·5° C. It is identical with the compound prepared Kœrner and Wender by the action of fuming nitric acid 1.2 di-iodobenzene.

1.3.4-*Di-iodo-aniline*, $C_6H_3(NH_2)I_2$, crystallises fro mixture of 1 part of benzene, and 2 parts of light petrole spirit in yellow spangles or prisms, melting at 74·5 It is easily soluble in benzene, ether, acetic acid and alcoh less soluble in light petroleum spirit and weak alcohol. is slightly volatile with steam and is not altered by l exposure to air and light.

1·3·4 *Di-iodophenol*, $C_6H_3(OH)I_2$, crystallises f water in long, silky needles, melting at 83° C. It is rea soluble in the usual organic solvents except ligroin (pe- leum spirit). It is slightly volatile with steam. The et acetyl, benzyl, and benzoyl ethers were prepared.—A. S.

Sodium; Action of Hydrogen on ——. A. Holt, Proc. Chem. Soc., 1903, **19**, [269], 137.

Pieces of sodium free from oil were placed in a ni boat and heated in a combustion tube through which a s current of pure dry hydrogen was passing. An ordi small combustion furnace without top tiles was emplo and it was arranged so that, whilst the lower part of tube was strongly heated, the upper portion was kept a lower temperature in order that the hydride might conde on it. The hydride thus obtained consisted of colou matted crystals, a hairy deposit not unlike cotton wool, a white powder deposited next to the glass. The h material was formed on and above the powder in fro the boat, whilst the crystals projected from the surfac the tube at either side of the boat.

The ratio of sodium to hydrogen showed that the hy had the composition NaH, as already stated by Moissa

It is instantly decomposed by water, forming sod hydroxide and hydrogen, this result also occurring in after a few minutes.

Sugars; Alkylation of ——. T. Purdie and J. C. Ir Proc. Chem. Soc., 1903, **19**, [269], 192—193.

The method of alkylating hydroxyl groups by mean dry silver oxide and alkyl iodides does not appear dir applicable to aldoses or ketoses, and leads to oxidation subsequent changes of some complexity; but α-met glucoside and cane sugar can be methylated by m of this reaction. α-Methylglucoside, when methylate methyl-alcoholic solution, yields a mixture of m glucose ethers. The main constituent, trimethyl-α-me glucoside, which can be isolated by fractional distilla is a viscid syrup; it boils at 167°—170° under 17 pressure, exhibits dextrorotation, and has no actio Fehling's solution.

Complete methylation of trimethyl-α-methylglucosi readily effected with silver oxide in methyl iodide solu and under these conditions tetramethyl-α-methylgluc is obtained as a comparatively mobile liquid, boilin 144°—145° C. under 17 mm. pressure; it is dextrorota and has no action on Fehling's solution. Tetrame glucose, which is produced by hydrolysing the t methylated glucoside with dilute hydrochloric acid, d without decomposition at 182°—185° C. under 20 mm. sure. It solidifies slowly and crystallises from light p leum in tufts of radiating needles, melting at 81°—8 It behaves like an aldose, reducing warm Fehling's sol giving tetramethylgluconic acid on oxidation, and rea with phenylhydrazine in molecular proportion to form oil, which is apparently a hydrazone. Tetramethyl cose is dextro-rotatory, but does not exhibit any no multi-rotation.

The production from α-methylglucoside of a tetram gluconic acid, capable of forming a lactone, proves clusively that the oxygen of the ring in the formu the alkylglucosides is coupled with the γ, and not the β-carbon atom.

A pentamethylated glucose, isomeric with the tetramethyl-ethylglucoside already mentioned, is produced when a ation of tetramethyl-glucose in methyl iodide is treated h silver oxide; it boils at 124°—127° under 8 mm. ssure, crystallises in slender prisms melting at 42°— C., and is lævorotatory.

Methylfructoside behaves like the corresponding gluco-, and, when completely methylated, yields tetramethyl-thylfructoside.

'ane sugar, on methylation, yields a neutral oil, which no action on Fehling's solution until it is hydrolysed. products of hydrolysis are the above-mentioned cry-line tetramethyl-glucose and an uncrystallisable syrup, ch is probably the corresponding methylated lævulose.

umulator Factories; Dangers to Health in ——.), Wagener. Deutsche Vierteljahrsschr. für öffentl. esundheitspfl., 1902, 529.

is shown that in many countries of Europe, notably in tzerland, Austria, and Germany, legislation has been lered necessary to protect the workpeople from the re effects of lead-poisoning. A general outline is n of the processes of manufacture, based upon the ntions of Planté, Faure, Volkmar, and others, and a f account follows of the nature of the illnesses found to chiefly prevalent in certain factories inspected by the ior, together with an estimate of the number of days in year lost owing to illness before and after various ervative measures were introduced. The process of ing the lead plates or gratings is described, and illustra-s are given of the appliances employed in the different ations. The character of the deleterious vapours ved is discussed, and it is shown that if proper pre-ions are taken no evil effects need be produced. Plenty esh air and abundant means of ventilation are here of utmost importance. While some have doubted the ibility of absorbing lead through the pores of the skin uantities sufficient to be injurious to health, it is shown a marked diminution in the number of cases of lead-has taken place where change of clothing and frequent are made compulsory. In the various operations of g and framing together the lead plates and the soldering e joints, risks arise of lead-poisoning, and the presence senious acid is here a source of danger, especially when ogen gas is used, owing to impurities in the zinc and uric acid. The mouth, which is exposed more than other part of the body to danger arising from inhalation ad vapours and lead dust, should be frequently rinsed with pure water, and in some factories all the work-le have to wash and take baths at stated periods.

The Technical High School for London.

Standard, July 20, 1903.

the meeting of the County Council held on July 21st, cial Report was presented from the Joint Committee ie General Purposes Committee and the Technical ation Board regarding the proposal contained in Lord bery's letter to the Chairman of the Council for the sion in London of further opportunities for advanced ological teaching and research. Having examined tter in detail, and referred to a previous Report of the iical Education Board bearing on the same subject, Joint Committee recommended the following for ion:—

hat the Council expresses its high appreciation of the tant proposal contained in Lord Rosebery's letter, ould cordially welcome the establishment of further ion in London for advanced technological teaching esearch. That the Council, in response to the request ned in Lord Rosebery's letter, places on record its n that, when the land, buildings, and equipment for oposed additional technological teaching and research rovided to a value of not less than 500,000*l.*, the cil will be well advised to contribute, out of the moneys lly placed at its disposal under the Local Taxation oms and Excise) Act of 1890, a sum not exceeding *l.* per annum towards such part of the work as vithin the statutory definition of technical education, subject to the following conditions:—(i.) That a scheme be prepared, to the satisfaction of the Council, for the constitution of the governing body and the adequate representation of the Council thereon. (ii.) That financial arrangements, adequate to the whole maintenance of the proposed work, are made to the satisfaction of the Council. (iii.) That, in view of the national scope and utility of the proposed work, substantial contributions towards maintenance be made from funds of a national character. (iv.) That due provision be made in the scheme to prevent overlapping and secure co-ordination of the work already carried on by the university colleges, polytechnics, and other science and technological institutions; and the proper connection of the whole with the University. (v.) That a sufficient number of scholarships, including free places, be placed at the disposal of the Council. (vi.) That it be considered whether other counties and boroughs should not be invited to contribute towards the maintenance, receiving in return the right to send their picked scholars for instruction under the proposed scheme."

The recommendation was adopted.

Radium and Helium.

Times, July 20, 1903.

A paper bearing in a remarkable way on the connection between these two elements, which is now exciting so much interest, has been received for publication by the Royal Society from Sir W. and Lady Huggins. Prompted, in fact, by theoretical ideas, they attacked the problem of the spectroscopic analysis of the light emitted directly by a radium salt at ordinary temperatures. Preliminary visual observation seemed to show traces of bright lines in a continuous spectrum. Preparations were accordingly made for photographic record by means of a small quartz spectroscope constructed some years ago for use on very faint celestial objects. After several trials, a spectrum, consisting of eight definite bright lines in the ultra-violet, entirely different from the spark spectrum of radium, and some faint lines together with a very faint continuous spectrum, was obtained by 72 hours' exposure to the glow. The lines were of some breadth, on account of the wide slit that had to be employed in order to admit sufficient light; but it was found possible to measure their wave lengths within an error of 2 in the fourth figure. On a comparison of this spectrum, so different in type from an ordinary phosphorescent spectrum, with the recorded measurements for helium, it appeared at once that four, and perhaps five, of the eight lines agreed with lines of helium within the uncertainty of the measurements. Another line, that of highest refrangibility, agrees with a line in the spark spectrum of radium itself, which, however, has not been recorded by other observers; the two other lines, the lowest, have not yet been traced.

Trade Report.

I.—GENERAL.

Thermometers: U.S. Customs Decision.

The Board has decided that thermometers of glass, cut, bevelled, painted, or frosted, are not dutiable at 60 per cent. *ad val.*, under paragraph 100 of the Tariff Act, unless such cutting, bevelling, or frosting is substantial and of such character as to amount to an ornament or decoration. In any other case duty is to be assessed at 45 per cent. *ad val.* as "manufactures of glass," under paragraph 112.

—R. W. M.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Industry of Roumania.

U.S. Cons. Reps., No. 1683, *July* 3, 1903.

The production of petroleum in Roumania is steadily increasing. It has grown from 56,000 tons in 1893 to 310,000 tons in 1902. Three companies practically control the entire industry, *viz.*, the Steaua, the International

Petroleum Company, and the Telega Oil Company, the first participating with 45 per cent. and the two others with 10 per cent. each of the total production.

The export of petroleum and its products also shows a large increase. From 1901 to 1902 this increase was nearly 32 per cent., as the following table will show:—

Description.	1901.	1902.
	Tons.	Tons.
Crude oil and refuse............	30,800	23,100
Kerosene	15,500	32,300
Gasoline	8,300	16,300
Total	54,600	71,700

Kerosene and gasoline go principally to Germany, Great Britain, Norway, Bulgaria, and France, while the greater part of the expert of crude oil is taken by Austro-Hungarian refineries.

In 1899 the Roumanian importations of crude oil into Austria-Hungary amounted, in round numbers, to 16,000 tons. They reached almost 20,000 tons in 1900, and since that time have remained stationary.

The high prices commanded by gasoline in 1901 greatly favoured Roumania's export of that article. When, after a year of intense activity, the quotations receded, and the market finally experienced a general collapse, recourse was had, in the fall of 1902, to the creation of a cartel. This organisation fixed the price of gasoline at 8 frs. per quintal (1·54 dols. per 220 lb. or 15·40 dols. per long ton), and has since maintained it at that figure.

The consumption of liquid fuel has increased in Roumania from 433 tons in 1890 to 40,000 tons in 1902. The experiments made with this fuel by State experts have given the most satisfactory results, and its general adoption by the Government for railway and marine purposes is reported to be assured.

X.—*METALLURGY.*

TUNGSTEN ORE: U.S. CUSTOMS DECISION.

The United States Circuit Court of Appeals has decided that tungsten ore is free of duty as a "crude mineral" under paragraph 614 of the Tariff Act.

This decision reverses the action both of the Board of General Appraisers and the United States Circuit Court, who had held that such merchandise was dutiable at 20 per cent. *ad valorem* as a "metallic mineral substance in a crude state," under paragraph 183.

As no further proceedings will be directed in this case by the Treasury Department, the above decision is final.

—R. W. M.

XII.—*FATS, OILS, Etc.*

CORN [MAIZE] OIL IN THE UNITED STATES.

Foreign Office Annual Series, No. 3001.

Considerable interest has been manifested recently in the development of a maize oil manufacturing industry. As an article of commerce, maize oil has become of so great value that many millers are investigating the process of manufacture, and establishing plants for its manufacture and production with their milling business.

The oil is pressed from the germ of the maize when meal, grist, &c., are made. This portion of the seed was practically lost until the present processes of extracting oil were applied. In its preparation the germ is ground and pressed in much the same way that flax and cotton seed are prepared in the manufacture of linseed and cotton seed oil. In removing the germ the corn is first steamed when it passes to degermination.

There is no secret in the process of maize oil manufacture, although each manufacturer endeavours to keep certain parts of this process secret, much in the same way that certain processes in the manufacture of flour are kept secret. The machinery for the extraction of the germ is patented, but the process cannot be said to be a secret in any sense of the word.

It is said that the annual output of maize oil in the United States is about 160,000 barrels, and of this amount about 150,000 barrels are manufactured by the Glucose Ma facturing Company. About 25 per cent. of this compa s output is used in the home market, the principal c sumers being white lead and putty manufacturers, p t manufacturers, and soap makers, and it is also extensi y used by the manufacturers of prepared paints, although of them will admit it. Its use in the foreign markets is d to be principally among the manufacturers of soft s , and it is said to make a superior quality of soap.

The oil is also employed as an adulterant for table l. It is easily purified, forming a light, amber colou l, perfectly transparent liquid, without rancidity, and hav g a pleasant taste. It is also used for lubricating purp s and may even be used as a lamp oil.

XIII. C.—*INDIA-RUBBER, Etc.*

GERMAN RULES FOR VULCANISING BY CARBON BISULPHIDE.

India-rubber Journal, *July* 6, 1903.

The following rules were decreed by the German Fe Council in March 1902, as regards the erection d management of premises in which rubber is vulcanised means of carbon bisulphide or chloride of sulphur, came into force in July 1902:—

1. The floors of such rooms as are used for the vulca ing of india-rubber goods by means of carbon bisulp shall not be lower than the surrounding ground. The ro shall have windows opening into the outer air, and lower halves shall be capable of being opened and rende possible sufficient renewal of air.

The rooms shall be ventilated by fans mechanic driven. With the approval of the higher authorities mission to dispense with mechanical draught may be allo , provided that in other ways effective change of ai secured. With the approval of the higher authorities sp ventilating arrangements can be dispensed with if fumes of carbon bisulphide are removed immediately the point where they are produced, by means of a powe draught, and by this means purity of the air be secured.

2. The vulcanising rooms shall not be used as a dwell , or for sleeping in, or for preparing food in, or as a stor drying room, nor shall other processes than those of canising be carried on in them. No persons, except th engaged in vulcanising processes, shall be allowed in rooms.

There shall be at least 20 cubic metres (700 cb. ft.) of space allowed for each person employed therein.

3. Only such quantities of carbon bisulphide shall brought into the vulcanising rooms as shall serve for the d supply. Further quantities shall be stored in a spe place separate from the workrooms. Vessels to hold vulcanising liquid shall be strongly made, and when fi and not in use they shall be well covered.

4. Vulcanising or drying rooms shall be warmed only steam or hot-water pipes.

The lighting of these rooms shall only be by mean protected incandescent electric lamps. Exceptions from p graphs 1 and 2 may be allowed by the higher authorities

5. Machines intended for vulcanising long sheets of shall be covered over (*e.g.*, with a glass casing), so prevent as far as possible the entrance of carbon bisulp fumes into the workrooms, and from the casing the shall be drawn away effectually by means of a fan (ve lator) mechanically driven. Entrance to the space whic enclosed shall only be allowed in case of defects in working.

In cases where a covering of the machine is practicable for technical reasons, the authorities can suitable means of protection are used (especially when machine is placed in an open hall, and provided that person works at the machine for more than two day week), allow of exception to the above arrangements.

6. Vulcanising of other articles (not mentioned in), unless carried out in the open air, shall be done in cove in boxes (digesters, glass covers), into which the wo need only introduce his hands, and so arranged as to the fumes away from the face of the worker.

he air must be drawn away from the box by means of ffective draught.

Rule 6 shall apply in vulcanising both the outside and le of india-rubber goods. In vulcanising the inside no ker shall be allowed to suck the fluid through with mouth.

The goods after their immersion in the vulcanising , shall not lie open in the room, but shall either be ed under a ventilated cover, or at once be carried to drying chamber.

e drying chamber or drying rooms, in which the goods exposed to artificial heat immediately after vulcanising, be so arranged that actual entrance into them for the ing in or withdrawal of the vulcanised goods shall not necessary. No person shall be allowed to enter the ng chamber while work is going on. The higher orities can permit of exceptions to this rule in the case e drying of long rolls if other sufficient safeguards are n.

When vulcanisation is effected by means of chloride of ur, the vessels or chambers used for generating this be so arranged that escape of the fumes is prevented.

person shall enter the vulcanising chamber until the the chamber has been completely changed; the cham- hall not be used for purposes other than vulcanising.

. Employment in vulcanising with carbon bisulphide or her work exposing the workers to the vapour of carbon phide shall not be allowed without a break for more two hours, and in no case for more than four hours in lay; after two hours a pause of at least one hour must lowed before resumption.

person under eighteen years of age shall be employed ch work.

. The occupier shall provide all workers employed as l in paragraph 10 with proper and sufficient overalls. itable notices and supervision he shall see that when use the overalls are kept in their proper place.

Separate washing accommodation and dressing-rooms ch sex shall be provided, distinct from the workrooms, l persons employed as stated in paragraph 10.

ater, soap, and towels, and arrangements for keeping lothes put off before the commencement of work, be provided in sufficient amount.

The occupier shall appoint a duly qualified medical tioner (whose name shall be sent to the inspector of ies) to watch the condition of health of those exposed effects of carbon bisulphide. He shall examine the ers once every month, with a view to the detection of oms of poisoning by carbon bisulphide.

direction of the medical practitioner, workers ng signs of carbon bisulphide poisoning shall be sus- d from work, and those who appear peculiarly tible shall be suspended permanently from work in sses mentioned in paragraph 10.

The occupier shall keep a book, or appoint some responsible for its keeping, of the changes in the s employed in the processes mentioned in paragraph d as to their state of health.

XIV.—*TANNING, LEATHER, GLUE, SIZE, Etc.*

TANNING MATERIALS; EXPORT OF ——, FROM CORSICA, IN 1902.

Foreign Office Annual Series, No. 3010.

lic acid, to the amount of 3,808 tons, was exported Corsica to the United Kingdom during 1902; the s for tanning extract, obtained from the wood of the chestnut (25° B., containing 31–33 per cent. of), totalled 5,985 tons, of which 2,710 tons came to nited Kingdom.

XV.—*MANURES, Etc.*

HOMAS PHOSPHATES: OUTPUT OF ——, IN THE ODESSA DISTRICT.

Foreign Office Annual Series, No. 2997.

I. Consul-General at Odessa, reporting on agriculture t district during the year 1902, remarks that the output of Thomas phosphates is rapidly increasing. The price varies from 35 to 37 c. per pood (*2s. 4d.* to *2s. 5½d.* per cwt.), and it competes successfully with Russian superphosphates. It is also being exported to Italy from Sartana and Mariupol.

XVI.—*SUGAR, STARCH, Etc.*

SUGAR PRODUCTION OF RUSSIA; ESTIMATED ——.

Foreign Office Annual Series, No. 2997.

H.M. Consul at Kieff reports that the official returns give the actual yielding area under beetroot in 1902 as being 524,869 dessiatines (1,443,390 acres), against 507,143 dessiatines (1,394,643 acres) in 1901.

The yield of beetroot expected from the above area is given as 545,270,270 poods (8,794,682 tons) of roots, or an increase when compared with the yield of 1901 of 38,693,050 poods (624,082 tons). The average yield per acre would therefore be about 121¾ cwts. as against 117⅙ cwts. in 1901.

The quantity of sugar expected to be produced from the above yield of roots, with 278 factories in operation, is given as 65,507,973 poods (1,056,580 tons), or 6,240,297 poods (100,650 tons) more than the production of 1901. If to this be added the balance of the "inviolable" reserve of 2,481,536 poods (40,025 tons), and the "voluntary" reserve of 4,462,910 poods (71,982 tons), it thus appears that there will be 72,452,419 poods (1,168,587 tons) of sugar available.

In comparing the yield of sugar from the beetroot it will be found that 8·33 tons of roots were required to produce 1 ton of sugar, as against 8·55 tons in 1901.

GERMAN SUGAR IN ENGLAND.

U.S. Cons. Reps., No. 1677, *June* 20, 1903.

There has been a decided decrease during the last few months in the quantity of beet-sugar exported from Germany to England, the loss amounting for the first quarter of 1903 to almost 63,000 long tons in raw sugar alone. England has, it is true, a considerable stock from 1902; but another reason for the decrease is that larger quantities of cane sugar have been imported from the English colonies. Cane sugar is also being bought from Cuba, a thing which has not been done for 25 years.

XVII.—*BREWING, WINES, SPIRITS, Etc.*

SPIRITS, BEER, BEET SUGAR, AND MARGARINE; STATE-CONTROLLED MANUFACTURE OF ——, IN SWEDEN.

Foreign Office Annual Series, No. 2994.

In his recent report to the Foreign Office, His Majesty's Consul at Copenhagen gives the following table, showing statistics of several of the most important articles of consumption manufactured in Denmark and controlled by the State during 1902:—

Year.	Spirits (14·3 under Proof).	Beer.		Beet Sugar.	Margarine.
		Taxed Amount of Spirit being over 2¼ per Cent. of Weight.	Untaxed. Amount of Spirit being under 2¼ per Cent. of Weight.		
	Gallons.	Gallons.	Gallons.	Cwts.	Cwts.
1893	7,176,290	16,021,717	26,637,457	544,709	163,128
1894	6,894,557	17,025,180	27,304,544	748,193	167,793
1895	7,018,616	17,785,091	27,629,779	887,992	155,049
1896	7,389,639	19,589,674	28,725,196	883,036	161,688
1897	7,117,019	20,601,368	29,936,758	966,877	190,942
1898	6,973,355	21,141,532	30,177,762	712,713	237,705
1899	7,142,365	22,451,655	32,392,913	796,677	279,825
1900	7,035,949	21,948,157	32,671,922	1,009,454	325,309
1901	7,339,628	23,103,488	32,126,258	1,155,457	369,931
1902	7,508,968	20,470,665	33,063,625	776,460	385,234

XVIII. A.—FOODS.

ADULTERATED FOOD PRODUCTS, DRUGS, AND LIQUORS: U.S. CUSTOMS INSTRUCTIONS.

The Secretary of the Treasury has recently issued instructions to customs officers regarding the sampling of importations of foods, drugs and liquors supposed to be adulterated. Under the provisions of the law which became operative on July 1, the Secretary of Agriculture, whenever he has reason to believe that articles are imported from foreign countries, which by reason of adulteration are dangerous to health or which are forbidden to be sold or are restricted in sale in the countries of manufacture or exportation, or which are falsely labelled regarding place of manufacture or contents, can request the Secretary of the Treasury for samples from original packages of such articles for inspection and analysis.

Upon receiving such requests the following rules will be observed by customs officers :—

(1) Samples of solid food products not less than 2 lb. each, samples of liquids not less than 1 quart each, and samples of drugs to be designated at the time, will be forwarded to the Department of Agriculture of Washington.

(2) The cost of such samples will be paid to the importer.

(3) A detailed description of the articles and shipment is to be furnished the Secretary of Agriculture.

(4) The liquidation of the entry sampled as above, is to be suspended pending the examination of the merchandise.

(5) Articles declared to be adulterated are to be exported, and in default of exportation, destroyed by the Customs authorities.

(6) The owner, importer, or consignee of such samples shall be notified to appear within two days and be given an opportunity to submit written testimony as to the harmless nature of the article imported, which shall be forwarded to the Secretary of Agriculture.

(7) Information regarding the character and labelling of these classes of goods will be furnished to the Collector of Customs by the Secretary of Agriculture.

(8) A strict observance of the legal provisions regarding marking all such products with the name of the country of origin and quantity of contents will be required, and entry will be refused of all such articles bearing names or marks calculated to induce the public to believe that they are manufactured in the United States.—R. W. M.

XVIII. C.—DISINFECTANTS.

INSECT ERADICATOR WANTED AT SEVILLE, SPAIN.

Foreign Office Annual Series, No. 2992.

The Vice-Consul reports that a means of eradicating *Orobanche speciosa*, which is known at Seville as "Jopo," will be beneficial and profitable. The same remarks apply regarding a small insect that, during the last two years, has infested the orange trees, burying itself in the peel of the orange, and making the fruit practically worthless.

XIX.—PAPER, PASTEBOARD, Etc.

WOOD-PULP: SWEDISH ——.

Foreign Office Annual Series, No. 3011.

The prices quoted for chemical wood-pulp, especially sulphite pulp, were perhaps the lowest on record, largely owing to the influence of considerably increased production and accumulated stocks. About the end of the year, however, most of the factories were able to dispose of their goods, of which considerable quantities went even to the United States, and this unusual business with a rival country cheered exporters with the hopes of future improvement.

The following table shows the amount of Swedish sulphite pulp produced for export during the years 1898—1902 (calculated dry) :—

	Tons.
1898	74,800
1899	89,900
1900	127,700
1901	140,500
1902	168,000
Average, five years	120,180

The production of sulphate pulp increased but little prices have been as bad as for sulphite. Its chances selling appear less than those of other kinds. The pri for sulphite and sulphate pulps of well-known bra have varied during 1902 between 7*l*. 4*s*. 5*d*. and 6*l*. 2*s*. in a Swedish port. In some instances even lower pri were accepted.

Prices for mechanical wood-pulp were good at first orders brisk, production being limited on account of severe drought that prevailed during the previous y Later, however, the unsatisfactory state of the paper marl and considerable imports brought from Canada to Europ markets, sent prices down. The badness of the mar is attributed partly to "caisse" sales made by speculat and partly to increased production caused by a plenti supply of water in the fjords, as also to the enlargement old and the starting of some new factories.

Under these circumstances prices fell quite exceptiona low.

Dry mechanical wood-pulp, which at the beginning the year was quoted at about 4*l*. 14*s*. 5*d*., afterwards fell 3*l*. 12*s*. 2*d*., or even less, and for wet mechanical wood-p from 2*l*. 4*s*. 5*d*. to 1*l*. 11*s*. 1*d*. f.o.b. in a Swedish port.

XX.—FINE CHEMICALS, Etc.

ESSENCE OF ROSE IN BULGARIA.

Foreign Office Annual Series, No. 3002.

The steadily increasing prosperity of the attar of r industry is shown by the fact that since 1895 the a under cultivation has nearly doubled, having reached figure of 13,700 acres.

Last year's crop was expected to be one of the larg on record, but a week of scorching winds during harv time is calculated to have reduced the yield by some 25 cent. The damage done to the quality of the roses shown by the fact that 360 lb. of flowers were required produce 1 oz. of attar—or twice the usual quantity. T yield totalled about 75,000 oz., as compared with 135, oz. in 1900.

Some 13,000 native stills were employed on last ye crop, which is estimated at 25,000,000 lb. of rose flowe which were sold at the low price of a fraction over $\frac{1}{2}$*d*. per

Modern stills cannot at present be worked at such profit as the native variety, as the output does not co the outlay on the former, whereas the latter are in t hands of small distillers who supply their own labour a fuel, and are able to undersell their modern rivals by 25 30 per cent.

Prices for last year's yield ruled low, namely, betw 15*s*. 6*d*. and 17*s*. 9*d*. per oz. Consequently growers a exporters have held back some 10,000 ozs. The l prices of the last four years are accounted for partly the competition of cheap synthetic and artificial oils, a partly by the practice of sophistication, which, it is to hoped, the stringent measures expected to be adopted the Government will succeed in checking. For the pre lence of adulteration, however, consumers are larg themselves to blame, and it should be noted that buy can always obtain the pure article if they choose to p for it.

CAMPHOR IN JAPAN.

Foreign Office Annual Series, No. 3009.

The value of the camphor exported in 1902 amounted 347,577*l*., as against 398,632*l*. in 1901. The United Stat United Kingdom, Germany, British India and Hong-Ko are the chief consumers.

Japanese journals point out the imperative necessity devising some means for bringing the camphor business Japan proper under the same monopoly as that of Formo This would put an end, so they assert, to the suicidal poli of underselling, which is at present proving so disastrous the business both in Japan and Formosa. The demand camphor is a steady one, and with the great activity d played in Europe and America in the making of cellul ware, for which a large quantity of camphor is required, t rket is capable of considerable expansion. At present, h the supply of grown-up trees in Formosa almost xhaustible, there is no ground for fear that demand nnot be met with supply, but nevertheless attention is eady being turned to the Floridan method of manufturing camphor with the leaves of the trees, or even with young trees themselves.

XXII.—EXPLOSIVES, MATCHES, Etc.

DYNAMITE AND POWDER; TAX ON ——, IN MEXICO.

U.S. Cons. Rep., No. 1687, *July* 2, 1903.

he following is the text of a decree relating to the nufacture of smokeless powder and dynamite in Mexico.

rt. 1. The Executive is empowered, in accordance with contract entered into by the Department of Fomento n the Compañia Nacional de Dinamita y Explosivos, S.A., establish an internal consumption tax on all kinds of amite and industrial explosives imported from abroad manufactured in the Republic, said tax to be payable n and as the Executive may determine.

rt. 2. The basis for the creation of said interior conption tax will be as follows:—

. Dynamite and industrial explosives, entered through custom-houses of the Republic, will pay 210 dols. 50 dols. gold) per ton of 1,000 kilos. (2,204 lb.) gross ght.

I. Exemption from said tax may be allowed in the case common gunpowder, black gunpowder for mines, and powder for fireworks or for hunting purposes, in the position of which the only ingredients used are sulphur, on, and the nitrates of soda and potash, and not nitroerin, chlorate of potash, or other chemical explosive.

I. The Compañia Nacional Mexicana de Dinamita y losivos, S.A., will pay the internal consumption tax on products which it may manufacture, in the form and ect to the conditions provided by the contract which it e with the Department of Fomento on August 12, 1901.

Patent List.

B.—In these lists, [A.] means "Application for Patent," and], "Complete Specification Accepted."

ere a Complete Specification accompanies an Application, an isk is affixed. The dates given are (i) in the case of Applica- for Patents, the dates of application, and (ii) in the case of plete Specifications Accepted, those of the Official Journals ich acceptances of the Complete Specifications are advertised. mplete Specifications thus advertised as accepted are open to ction at the Patent Office immediately, and to opposition n two months of the said dates.

—PLANT, APPARATUS, AND MACHINERY.

.] 14,578. Imray (National Manufacturing and Supply Co.) Mixing and agitating machines. June 30.

14,829. Loreau. Filtering medium. July 3.

15,108. Haas (Haas and Haas). Drying apparatus. July 8.

15,278. Mann. Apparatus for drawing liquids from tanks or containers. July 10.

[.] 19,862 (1902). Fisher. Contrivance for the ventilation of unhealthful mills, works, and factories. July 8.

8907 (1903). White. Condensing apparatus. July 15.

10,431 (1903). Brookes (Bradley). Centrifugal mill or grinding apparatus. July 15.

[C.S.] 10,831 (1903). Knight. Manufacture of filtering mediums. July 8.

„ 11,547 (1903). Johnson (Fulton). Means acted on by changes of temperature for indicating such changes or for regulating temperatures or obtaining movements for other purposes. July 15.

II.—FUEL, GAS, AND LIGHT.

[A.] 14,552. Boult (Köneman). Furnaces.* June 30.

„ 14,559. Korff. Illuminating bodies. June 30.

„ 14,593. Ramsay. Coke ovens.* June 30.

„ 14,844. Wilton. Treatment of gases produced in the destructive distillation of coal or other carbonaceous material, for the purification thereof and the recovery of by-products. July 3.

„ 14,893. Paul. Gas producers. July 4.

„ 15,060. Imray (Burgemeister). Gas washers. July 7.

„ 15,147. Johnson (Deutsche Continental Gas-ges. and Bueb). Manufacture of gas. July 8.

[C.S.] 7613 (1902). Daniels and Daniels. Gas producers. July 8.

„ 12,461 (1902). Elworthy and Williamson. Manufacture of gas, consisting chiefly of methane, for illuminating, &c. July 8.

„ 14,893 (1902). Fielding. Gas producers. July 8.

„ 15,257 (1902). Hendunen. Treatment of peat. July 8.

„ 17,802 (1902). Thwaite. Method of utilising liquid fuel for generating heat for steam raising or furnace heating. July 15.

„ 17,406 (1902). Blondel. Electrodes for arc lamps. July 15.

„ 18,649 (1902). Boult (Cie. Fabr. Compteurs et Matériel d'Usines à Gaz). Apparatus for treating gases with liquids, for purifying gases or other purposes. July 15.

„ 19,719 (1902). Bessey. Manufacture of peat fuel, peat charcoal, and fibrous peat. July 15.

„ 20,839 (1902). Schlickeysen. Manufacture of peat fuel. July 8.

„ 25,575 (1902). Key. Manufacture of coke and recovery of by-products. July 8.

„ 12,528 (1903). Milne. Treatment of peat immediately prior to compressing. July 8.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 14,849. Schwab and H. Greene and Sons, Ltd. *See under* VII.

[C.S.] 18,728 (1902). MacAlpine and Alcohol Syndicate. Ltd. Refining mineral or petroleum oils. July 15.

„ 12,518 (1903). Haddan (Edson). Evaporating apparatus for separating naphtha or other readily volatile matter from oil or other liquid. July 15.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 14,676. Johnson (Badische Anilin und Soda Fabrik). Manufacture of phenylglycin-*o*-carboxylic acid nitrile and intermediate products relating thereto. July 1.

„ 14,768. Ellis (Chem. Werke vorm. Sandoz). Manufacture of azo dyestuffs and intermediate products. July 2.

[C.S.] 19,341 (1902). Read Holliday and Sons, Dean and Turner. Manufacture of intermediate products and colouring matters. July 15.

" 19,440 (1902). Johnson (Badische Anilin und Soda Fabrik). Manufacture of blue colouring matters containing sulphur. July 15.

" 19,551 (1902). Read, Holliday, and Sons, Dean and Turner. Production of dyestuffs containing sulphur. July 15.

" 20,000 (1902). Johnson (Badische Anilin und Soda Fabrik). Manufacture of colouring matters suitable for dyeing wool. July 8.

" 20,375 (1902). Abel (Act.-Ges. für. Anilinfabr.). Manufacture of poly-azo dyestuffs. July 15.

" 20,577 (1902). Imray (Meister, Lucius und Brüning). Manufacture of amidophenol derivatives and of azo dyestuffs therefrom. July 8.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 14,472. Burdick and Pervilhac. Colouring, decorating, or printing textile and other fabrics, paper, &c. June 29.

" 14,483. Lilienfeld. Producing glossy silk-like effects in printing. June 29.

" 14,625. Livesey. Rollers for opening, scouring, or stretching fabrics. July 1.

" 14,626. Livesey. Hawking machines for indigo dye vats. July 1.

" 14,840. Imray (Peterhauser and Rechberg). Improving the fastness of indigo-dyed woollen goods to wear. July 1.

" 15,068. Perkin and Whipp Bros. and Todd, Ltd. Treatment of raw cotton and flax, and cotton and linen goods to reduce the inflammability thereof. July 7.

" 15,207. Hussong. Apparatus employed in dyeing yarns. July 9.

" 15,358. Grime. Dyeing cotton cloth. July 11.

[C.S.] 17,023 (1902). Bonnard. Warp sizing machines. July 8.

" 17,465 (1902). Lugo. Extracting foreign matters from vegetable fibre. July 8.

" 26,928 (1902). Holland (Bennett). Apparatus for printing and colouring relief or raised ornamentations on fabrics. July 8.

" 5324 (1903). Schirp. Apparatus for treating textile materials with liquids. July 8.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 17,759 (1902). Kay and Kay Bros., Ltd. Staining paper for ornamental or advertising purposes. July 8.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 14,613. Swinburne. Treatment of iron chloride. July 1.

" 14,743. Johnson (Badische Anilin und Soda Fabrik). Manufacture of contact bodies and their use in the manufacture of sulphuric anhydride. July 2.

" 14,849. Schwab and H. Greene and Sons, Ltd. Manufacture of ammonium sulphate from ammonia liquor. July 3.

" 15,212. Heibling. *See under* XI.

[C.S.] 17,609 (1902). Johnson (Badische Anilin un Soda Fabrik). Manufacture of sodium oxid July 8.

" 17,760 (1902). Ellison. Apparatus for conce trating sulphuric acid. July 15.

" 18,947 (1902). Conroy, Shores, and United Alka Co., Ltd. Manufacture of sodium hypochlorit July 8.

" 20,915 (1902). Johnson. Badische Anilin un Soda Fabrik). Means for revivifying conta substances employed in the manufacture sulphuric anhydride and sulphuric acid. July 1

" 6933 (1903.) Descamps. Process for producin hydrosulphites of metals. July 15.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 14,448. Murphy. Bricks.* June 29.

" 14,522. Peddle. Fireproofing wood. June 30.

" 14,534. Alzugaray. Manufacture of fireclay ma terial. June 30.

" 14,660. Curry. Manufacture of refactory brick July 1.

" 14,832. Armstrong. Kilns and other furnace July 3.

[C.S.] 16,926 (1902). Lake (General Electric Co.). Pr cess of renovating foundry sand. July 8.

" 17,579 (1902. Mills (Seigle). Artificial buildin materials. July 8.

" 24,094 (1902). Perry. Cement compositio July 8.

" 4876 (1903). Oates. Composition for formin joints for earthenware, fireclay, stoneware, an other glazed goods. July 8.

" 7850 (1903). Pratt. Brick kilns. July 8.

" 12,256 (1903). Vaughan. Continuous kilns fo burning bricks and other clay goods, also lime and cements. July 15.

" 12,584 (1903). Mack. Manufacture of a con position from calcined gypsum. July 15.

X.—METALLURGY.

[A.] 14,398. Worsey and Hoal. Extraction of gol from gold ores. June 29.

" 14,615. Alzugaray. Iron and steel making July 1.

" 14,731. Willis (Shields). *See under* XI.

" 14,795. Arthur and Hodder. Crucible scrap an forge furnace. July 3.

" 14,910. Hermann. Process for gilding surface July 4.

" 14,950. Berend (Kueppers). Tinning and solderin flux. July 6.

" 14,951. Berend (Kueppers). Solder. July 6.

" 15,032. Spencer. Manufacture of steel. July 7.

" 15,188. Rouse and Cohn. Method of hardening lump of iron sand or concentrated podwer iro ore for transport and for reduction in furnace July 9.

" 15,420. Kaiser. *See under* XI.

[C.S.] 15,272 (1902). Miller. Elimination of sulphu from sulphide ores. July 8.

" 17,617 (1902). Mennicke. Recovery of coppe from residual products. July 15.

" 20.496 (1902). Wirtz. Recovery of tin and zin from tinned and galvanised scrap metal. July 15

[S.] 5902 (1903). Johnson (Chem. Fabr. Griesheim-Elektron). Treatment of chrome iron stone for separating the iron and obtaining the chromium compounds. July 15.

, 7897 (1903). Elspass. Pulverising mills for the treatment of ores, &c. July 8.

, 12,644 (1903). Spooner (Magnetic Ore Separating Co.). Separation of zinc blende from the ores with which it is associated. July 15.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[.] 14,541. Schauli and Loewenstein. Galvanic dry cells. June 30.

14,654. Jone. Regenerative voltaic cells. July 1.

14,655. Jone. Converting energy of fuel into electric energy. July 1.

14,656. Jone. Heating voltaic cells and restoring the battery products to the original state. July 1.

14,731. Willis (Shields). Electrolytic separation of copper and nickel from mattes or ores. July 2.

14,963. Willis (Sjosted). Electric furnace. July 6.

15,037. Edison. Nickel plated articles or sheets. July 7.

15,212. Heibling. Manufacture of soda and caustic potash, chlorine, and hydrochloric acid by electrolysis of aqueous solutions. July 9.

15,317. Collis, Collis, and Head, Apparatus for the electro-deposition of metals. July 10.

15,420. Kaiser. Electrolytic production of zinc. July 11.*

[S.] 16,984 (1902). Gouin. Electrodes for secondary batteries. July 8.

28,353 (1902). Wetter (Elektriz. Act.-Ges. vorm. Schuckert and Co.). Electrolysing processes and appliances. July 8.

4234 (1903). Piqueur. Electric batteries. July 8.

8389 (1903). R. Trüb and Co. Accumulators. (Int. Appl., April 19, 1902.) July 8.

X.—FATS, FATTY OILS, WAXES, AND SOAP.

[ ] 14,461. Schilling and Kremer. Apparatus for the recovery of fats, &c.* June 29.

14,518. Lewiak. Apparatus for bleaching and condensing vegetable oil.* June 30.

14,907. Müller. Treatment of cocoanut butter. July 4.

14,937. Perrett. Oil extractor. July 6.

15,071. Osmond. Soap or cleansing compositions. July 7.

15,236. Piffard. Manufacture of artificial wax. July 10.

[S.] 15,586 (1902). Perrelet. Process for saponifying fatty substances. July 15.

26,929 (1902). Traine. Process for preventing oil from becoming turbid or gelatinous when heated. July 8.

3973 (1903). Dreymann. Manufacture of soaps. July 8.

7519 (1903). Haddan (Edson). Rendering or reducing tanks for use in treating fish waste or other oil or grease yielding material. July 8.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 14,385. Bollé (Hirschfeld). Manufacture of paints and pigments. June 29.

„ 14,866. Fletcher. Indelible ink pencil. July 4.

„ 15,119. Brown. Preparation for distempering purposes. July 8.

B.—Resins, Varnishes.

[A.] 14,554. Terrisse. Treatment of gums and resins and preparation of varnishes. June 30.

„ 14,987. Blume. Manufacture of a varnish substitute from rosin oil. July 6.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 14,547. Smith. Coating of leather.* June 30.

[C.S.] 22,251 (1902). Finkler. Extraction of albumen from substances. July 15.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 15,274. Whiteman (Synd. Exploitation Brevet Illavati). Extraction of the crystallisable sugar contained in saccharine liquids obtained from beetroot or sugar cane.* July 10.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 14,755. Calmaut. Process for ageing wines and spirits. July 2.

[C.S.] 12,040 (1903). Lapp. Manufacture of a thick mash of malt meal. July 15.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 15,248. Ashworth. Production of foodstuffs. July 10.

[C.S.] 12,867 (1903). Marks (Pfaff). Preservation of eggs. July 15.

B.—Sanitation; Water Purification.

[A.] 14,752. Thresh. Apparatus for treating liquids, especially effluents from sewage works. July 2.

„ 14,857. Firth and Walker. Sterilising potable waters. July 4.

„ 14,897. Rawlins and Douglas. Separation or treatment of town refuse. July 4.

„ 14,905. Jeffcock and Yardley. Treatment of clinkers from refuse destructors and like substances. July 4.

„ 15,425. Duyk. Process for sterilizing and purifying potable and residuary waters (Belgian Appl., July 11, 1902.* July 11.

XIX.—PAPER, PASTEBOARD, Etc.

[C.S.] 12,674 (1903). Hawke. Blotting paper. July 15.

„ 12,675 (1903). Hawke. Blotting papers and their manufacture. July 15.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 14,430. Newton (Bayer). Production of the monoformyl derivative of 1-3-dimethyl-4-5-diamido-2-6-dioxypyrimidine. June 29.

„ 14,758. Bouveault and Blanc. Manufacture of alcohols and their derivatives applicable for perfumes, and of primary alcohols generally. July 2.

„ 14,961. Newton (Bayer). Manufacture of new pharmaceutical compounds. July 6.

„ 15,401. Johnson (Kalle and Co.). Production of a new serum for curative purposes. July 11.

[C.S.] 18,215 (1902). Lang. Oxidising processes and the manufacture of aldehydes, ketones, and quinones. July 15.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[C.S.] 19,137 (1902). Edwards. Manufacture of flex films, &c., for photographic purposes. July 1

„ 4961 (1903). Fritzsche. Roll films. July 8.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 14,825, Lake (Dynamit-A. G. vorm. A. Nobel Co.). Explosives. July 3.

„ 14,827. Johnson (Soc. Anon. Poudres et Dy mites). Manufacture of explosives. July 3.

„ 15,208. Johnson (Chem. Fabr. Griesheim Elektro Manufacture of matches. July 9.

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I.—PLANT, APPARATUS AND MACHINERY.

English Patents.

Heat; Apparatus for Transmitting ——, from one Fluid to another Fluid, such as Evaporators, Water Heaters, Condensers, and the like. J. Andrews, Cathcart, N.B. Eng. Pat. 15,056, July 7, 1902.

The invention consists mainly in the applicatio injector or injectors for circulating water or other he fluid through the circuit of a heat-transferring appa so that a more rapid circulation of the fluid is effe and consequently a greater amount of heat is transf per unit of surface in a given time. Various arrange of apparatus are described and claimed.—R. A.

ler Mill for Crushing and Grinding Cement Clinker, Ore, and the like. P. W. Tolhurst and H. Skinner, Northfleet, Kent. Eng. Pat. 15,881, July 16, 1902.

order to prevent the material from being nipped or lged between the rolls so as to stop their rotation, a d shield plate is mounted between the upper halves of rolls, so that it extends downwards between them to hin a short distance of the nip, and is held close to one the rolls, the material being fed between the plate and other roll.—R. A.

cuum Drying Apparatus [Cocoa Beans, Granular aterials, &c.] J. McNeil and C. McNeil, Govan, N.B. ng. Pat. 17,566, Aug. 11, 1902.

e apparatus comprises a horizontal drum having hollow journals or trunnions rotating in fixed bearings, one of trunnions opening into the interior of the drum and ng connected to a vacuum-producing apparatus. The m is encircled by a steam jacket connected to a drain et, and blades, paddles, or their equivalents are arranged hin the drum for the purpose of agitating the material. ead of, or in addition to, the steam jacket, an internal cal steam coil, or a range of straight piping, may be loyed.—R.A.

tilling Apparatus. N. Bogoiävlensky and M. Krou- vess, St. Petersburg. Eng. Pat. 8602, April 15, 1903.

distilling apparatus of the kind in which trays and id seals are employed for the ascending vapours, the s and caps for forming the liquid seals are arranged so the caps are immersed at all places to a uniform depth he liquid flowing over the trays, with the object of uring a uniform rising of the vapours through the ids at all points of the trays. The trays and caps be inclined in the direction of the flow of the liquid, the trays may be arranged in the form of a zigzag nnel, the spaces between the sections of which are red by single caps, or in the form of a spiral channel red by a single spiral channel or cap.—R. A.

ent Composition [for Blow Holes in Castings, &c.]; ew or Improved. W. Perry, Ansonia, Conn. Eng. Pat. ,094, Nov. 4, 1902.

composition, which is to be used chiefly for stopping low-holes and cracks in castings, as well as for making s, consists substantially of 50 to 90 parts of powdered 8 to 35 parts of plaster of Paris, 2 to 15 parts of rin or gum arabic, 5 to 25 parts of ground glass, and 5 parts of a sodium or potassium salt. The two latter edients may be altogether omitted for certain purposes, ecially good cement having the composition: Charcoal , 75 parts; quick-setting plaster of Paris, 19 parts; ng dextrin, 6 parts. The charcoal iron preferably used ains 0·25 per cent. of silicon, 0·05 per cent. of sulphur, per cent. of phosphorus, 0·40 per cent. of manganese, per cent. of carbon, and 96 per cent. of iron; but qualities of hard iron, light gray in colour, may also sed.—A. G. L.

rifugal Separators [Oil, &c.]. H. H. Lake, London. om T. S. Patterson, New York. Eng. Pat. 9570, ril 28, 1903.

U.S. Pat. 731,215; this Journal, 1903, 859.—R. A.

United States Patents.

position of Matter used for Protecting the Walls of torts, &c. T. J. Carlton, Iola, Kans. U.S. Pat. 2,707, July 7, 1903.

composition is made of plumbago, 25 lb.; burnt er of fireclay, 10 lb.; saltpetre, 1 lb.; and "cobalt," ; with 15 galls. of water.—E. S.

ids from Solids; Apparatus for Separating ——. Duncan and R. R. Sherriff, both of Glasgow. U.S. t. 732,720, July 7, 1903.

Eng. Pat. 26,667 of 1901; this Journal, 1902, 458.
—T. F. B.

Extracting Apparatus. E. Heimann, Brunswick. U.S. Pat. 733,200, July 7, 1902.

See Fr. Pat. 324,202 of 1902; this Journal, 1903, 618.
—T. F. B.

French Patents.

Float; Regulating —— for Milk of Lime or other Liquids. G. Blériot. Fr. Pat. 327,252, Dec. 11, 1902.

The liquid enters a hermetically sealed vessel through an inlet pipe, furnished with a cock. Through a stuffing-box at the top of the vessel passes an air pipe. A float carrying a valve-seat is lifted by the incoming liquid, and at a certain level closes the air outlet. The liquid continues to rise, compressing the air enclosed in the vessel, till its pressure equals the pressure of the incoming liquid. The cock admitting the liquid is then shut, and the definite quantity of liquid contained in the vessel let out by a draw-off cock. The pressure of the imprisoned air first forces out the liquid, the float falls, opens the air inlet, and allows the liquid to flow out freely. When the vessel is empty, the draw-off cock is closed and fresh liquid admitted. The quantity of liquid contained by the vessel is regulated by sliding the air pipe up or down in its stuffing-box, and fixing it in place by a screw.—L. F. G.

Combustible Liquids; Storage Vessels for ——. F. Spiller, R. Steffek, and Mrs. M. Retschun. Fr. Pat. 327,613, Dec. 23, 1902.

The vessel containing the combustible liquid is surrounded by a second vessel, the space between them being filled with some inert gas, as nitrogen, under pressure. The draw-off cock of the vessel is provided with a back-pressure valve to prevent a flame or spark reaching the contents of the vessel.—L. F. G.

Liquids; Continuous Apparatus for the Concentration of ——, and for Single and Multiple Distillations. A. Waché and E. Locoge. Second addition, dated Dec. 24, 1902, to Fr. Pat. 283,758 of Dec. 10, 1898.

The liquid is heated in an open vessel over a fire; into it dip two vertical tubes connected to a separator, the latter being in communication with a condenser. The first vertical tube carries an air valve at its lower end, and is of conical shape, expanding in cross-section the higher it rises from the liquid. The other tube is merely a return pipe, dipping either into a small auxiliary vessel which can overflow into the first vessel, or directly into that vessel. When the open vessel is heated, and a vacuum produced in the condenser, the hot liquid rises in both tubes. In the conical tube rapid evaporation takes places, and liquid and vapour, and any solids separating out, are carried over into the separator. From here the solids and any liquid return to the vessel by the second tube, while the vapour passes on to the condenser. Air can be admitted through the air valve to facilitate the evaporation. Two or more of these concentrators can be arranged in series, the vapour escaping from one serving to heat the liquid in the other.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

Lignite and Coal; Method of Distinguishing between ——. E. Donath and H. Ditz. XXIII., page 927.

Gases; Fractional Combustion of ——, by Means of Palladium-Asbestos [Determination of Hydrogen in Presence of Methane]. O. Brunck. XXIII., page 925.

Calcium Carbide; Valuation of Commercial ——. V. Recchi. XXIII., page 925.

English Patents.

Coke Ovens; Impts. in ——. H. Poetter, Dortmund. Eng. Pat. 16,807, July 29, 1902.

The heating gas is conducted through two mains lying along both sides or crowns of the groups of ovens, through nozzle pipes into bottom ports, which are beneath the coking chambers. Divisions in these ports direct the gas

and force it to pass alternately to the back and front, and finally under the side walls, where it is mixed with air, which may be preheated, burnt, and passed through vertical heating flues in the walls, and thence to the uptake.
—L. F. G.

Coke: Manufacture of ——, Construction of Coke Ovens, and Recovery of By-Products. J. T. Key, Fencehouses, Durham. Eng. Pat. 25,575, Nov. 21, 1902.

A false bottom of serrated firebrick blocks is laid on the floor of the coke oven, so as to form channels for the outlet of the gases and by-products. Beneath this are placed pipes connected to an exhauster or chimney, and so arranged that the gases from all parts of the oven pass downwards through the coal. In forming the false bottom, a solid portion is placed all round the inside of the wall of the oven, extending to 12 ins. inside. It serves to keep the downward draught through the centre of the coal. Air from a channel flue placed around the outside of the oven wall is admitted through apertures in the wall placed at a suitable height above the bottom of the oven; by this means an equal mixture and supply of air is assured. A fourway cast iron pipe is placed on the front of the oven, the back pipe extending into the centre of the oven, and the right hand branch serving to lead away the hot gases. The other two branches are for cleaning out purposes.

When the coal is sufficiently carbonised, air under pressure is forced into the oven through the pipe leading away the gases, freeing the coke from sulphur and deleterious gases, and escaping through an opening in the top of the oven. When all the coke has been drawn out, air under pressure is blown in to clean out the flues and the false bottom.—L. F. G.

Fuel; Method of Distributing Water on an Incandescent Bed of ——, in Minute Particles. A. G. Ingalls, Montreal, Canada. Eng. Pat. 19,651, Sept. 8, 1902.

See Fr. Pat. 325,674 of 1902; this Journal, 1903, 736.
—T. F. B.

Gas Producers; Impts. in ——. J. S. and F. L. Daniels, Stroud. Eng. Pat. 7613, March 29, 1902.

The tarry vapours distilling from the top of the bituminous fuel are led down a side passage to a hollow perforated conduit at the grate of the producer, whence they pass up along with steam through the incandescent fuel. The grate consists of the hollow conduit, provided on its exterior with fixed bars, and of inclined pivoted fire-bars alternating with the fixed bars and adapted to be rocked to loosen the clinker.—H. B.

Gas Producers; Impts. in ——. J. Fielding, Gloucester. Eng. Pat. 14,893, July 4, 1902.

The hopper of the producer is open, so as to allow the free introduction at all times of the fuel and of pokers. To prevent the escape of gas and vapours from the hopper, an annular space is provided round the lower end of the same and is in connection with a pipe into which the gas and vapours are drawn by means of a fan or steam jet. Simultaneously some air is drawn in through the hopper. The gaseous mixture is led down a pipe into the body of fuel. The usual air supply is also delivered beneath the fuel.
—H. B.

Gas, consisting chiefly of Methane or Marsh Gas; Manufacture of ——, for Illuminating, Heating, and Power Purposes, and Apparatus therefor. H. S. Elworthy and E. H. Williamson, London. Eng. Pat. 12,461, May 31, 1902.

Water gas, obtained by any of the usual methods, is mixed with hydrogen in sufficient quantity to convert the carbon present as carbon monoxide and carbon dioxide into methane, and to convert the oxygen into water, and the gaseous mixture is passed over metallic nickel at a suitable temperature, whereupon the following reactions occur: (1) $CO + 3H_2 = CH_4 + H_2O$. (2) $CO_2 + 4H_2 = CH_4 + 2H_2O$. The nickel acts as a catalytic agent. The reactions may be effected in two stages, a temperature of 250° C. being suitable for attacking the carbon mono e, and 350° C. for the dioxide.

The 26 claims relate to modifications in the proces to the production of the hydrogen required from metallic and steam, to the production of metallic nickel in suit form, and various forms and combinations of plant.
—H.]

Gas; Illuminating —— [Air Gas]. W. H. Gaze, S parton, Australia. Eng. Pat. 2283, Jan. 30, 1903.

This is a variety of air-gas in which the air is carbure with a mixture of 3 parts of benzene, 3 parts of gaso and 1 of methylated ether; or with 3 parts of benz 5 parts of gasoline (light petroleum spirit), 1 part of e and 1 part of naphthenes. The latter are said to be spec economical in some conditions.—F. H. L.

Gases; Apparatus for Removing Impurities from — W. J. Crossley and T. Rigby, Manchester. Eng. 14,167. June 23, 1902.

The gas from a producer, blast furnace, or the lik cleansed by causing it to ascend through one or vertical towers, which are partially filled with coke or o solid filtering material, and "containing a horizontal forated plate or plates, through which the gases are pa and are caused to bubble through a layer or layers of flo water, carried by the perforated plate or plates." water may afterwards be run to waste, cooled, and afresh, or treated for the recovery of the impurities colle
—F. H.

Gas: Treatment of ——, for Obtaining Cyanogen C pounds therefrom. C. C. Carpenter and J. M. Somer both of London. Eng. Pat. 8166, April 8, 1903.

Cyanogen compounds are removed from gas, in the of magnesium thiocyanate (sulphocyanide), by passin gas through a solution "approximating the compositi a sulphide of magnesium," contained in a scrubber.

This solution is prepared by passing sulphured hydrogen, or gases containing it, through a suspen in water, of 9 parts of magnesia and 1 part of sulphur.
—T. F.

United States Patents.

Coke; Process of Removing Silica from ——. C. M. Niagara Falls. U.S. Pat. 733,389, July 14, 1903.

The coke is heated with a metallic fluoride, such as th sodium, with or without a suitable binding material, the silicon has been driven off as silicon fluoride.—F. H

Gas-Purifier. E. F. Lloyd, Detroit, Mich. U.S. Pat. 732,756, July 7, 1903.

A combination of two gas purifiers arranged side by with an intermediate space and a system of pipes and va so arranged that the vessels can be worked in the ma desired.—F. H. L.

Ammonia; Obtaining ——, from Ammonia-contai Gases [Fuel Gases]. H. H. Dow. U.S. Pat. 733 July 14, 1903. VII., page 908.

French Patents.

Coke Ovens. Soc. Franz Brunck. Fr. Pat. 327,1 Dec. 18, 1902.

See Eng. Pat. 28,363 of 1902; this Journal, 1903, 3
—T. F.

Peat; Apparatus for the Carbonisation of ——. Marcotty and A. Karlson. Fr. Pat. 327,591, Sept 1902.

A hydraulic press is arranged inside a furnace, a peat is submitted to a pressure of 300 atmospheres d the process of carbonisation, which takes place at a temperature. Full details are given of the means emp for recharging the press with peat, and of the carri for bringing up the peat and carrying away the fin product.—L. F. G.

A hol ; *Means for Rendering* (*Burning*) ——, *luminous thout the Use of Incandescent Mantles.* A. Ruch. . Pat. 327,292, Dec. 13, 1902.

F y acids, such as oleïc acid, or their ammonium salts, ar dissolved in the alcohol. The ammonium salts also co r the flame.—L. F. G.

I andescent Lighting] *Burner ; Bunsen* —— *for Gas der Pressure with a Distributor placed inside the rner Tube.* R. Steilberg. Fr. Pat. 327,423, Dec. 17, 02.

IN DE the tube of a Bunsen burner is fixed a hollow m llic cone, with its apex downwards. The stream of ai nd gas flowing round this cone, produces a diminution of essure where the space between the distributor and the bu er tube becomes constricted, setting up eddies and pr ucing an intimate mixture of gas and air. This mi ure, when used to heat an incandescent mantle, gives an ntensity of illumination of more than 1,500 Hefner ca les.—L. F. G.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

French Patent.

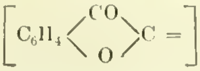
N *htha and the Products of its Distillation ; Process for eodorising* ——. E. Lenders. Fr. Pat. 327,630, Dec. 23, 02.

S Eng. Pat. 28,516 of 1902 ; this Journal, 1903, 547.
—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

ndigo ; Theory of the Reduction of ——. A. Binz. Zeits. f. Elektrochem., 1903, 9, [30], 599—600.

O adding sodium hydroxide solution to a solution of in c carmine (sodium salt of indigo-disulphonic acid) th olution turns green, and finally yellow. If alcohol be th added, a dark green precipitate is obtained, which co ins 2 mols. of sodium hydroxide to one of indigo ca ine. The author considers that indigo itself probably fo s an analogous addition-product in the dye vat. He th s that this assumption is supported by the facts that th ubstance—



is luble in alkali, and that indigo-dicarbonic acid forms a ra-sodium salt. From this point of view, the reduction of ndigo to indigo-white means deoxidation, and not an ad tion of hydrogen, and it takes place according to the eq tion—

$$C\;{}_{10}N_2O_2 . 2NaOH + Zn = C_{16}H_{10}Na_2N_2O_2 + ZnO + H_2O$$

T hypothesis agrees with the fact that indigo cannot be re ced electrolytically except with a zinc anode in presence of lkali, or when zinc is deposited on the cathode under th same conditions.—E. F.

C triphenylmethane Dyestuffs [*Triphenylmethane Dye- ffs*], *The Chromogen of* ——, *Diphenylquinomethane.* . Bistrzycki and C. Herbst. Ber., 1903, 36, [10], 33—2339.

T DIPHENYLQUINOMETHANE $(C_6H_5)_2:C:C_6H_4:O$ is obta d by heating *p*-methoxytriphenylchloromethane (from *p* thoxytriphenylcarbinol and hydrochloric acid) to from 1 —200° C., according to the equation—

$$C\;O.C_6H_4.CCl:(C_6H_5)_2 = CH_3Cl + O:C_6H_4:C:(C_6H_5)_2.$$

It ay be looked upon as the chromogen of aurin, which is s *p*-*p*-dihydroxy derivative. Though its aqueous-alcoholic solution is intensely yellow, it does not dye textile fibres, doubtless owing to the fact that it contains no salt-forming groups. It readily unites with nascent hydrogen, and, under the influence of alkalis and acids, with water, forming *p*-oxytriphenylmethane and *p*-oxytriphenylcarbinol respectively.—E. F.

Anthraquinone ; Condensation of ——, *with Phenols.* W. Scharwin and Kusnezof. Ber. 1903, 36, [10], 2020—2025.

Both phenol and resorcinol can be condensed with anthraquinone according to the equations—

$$C_{14}H_8O_2 + 2C_6H_5.OH = C_{26}H_{16}O(OH)_2 + H_2O$$
$$C_{14}H_8O_2 + 2C_6H_4(OH)_2 = C_{26}H_{14}O_2(OH)_2 + 2H_2O$$

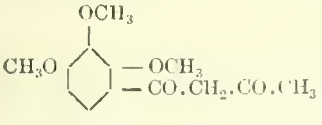
Phenolanthraquinone is analogous to phenolphthalein, but its solution in aqueous alkalis is colourless.

Resorcinol-anthraquinone is analogous to fluorescein. Its solutions show a greenish fluorescence. With bromine it forms a product which is not of uniform composition. Alcohol extracts from this a portion containing less than 4 atoms of bromine, the dilute alcoholic solution of which is pink, with green fluorescence, aqueous solutions of its salts being red without fluorescence. Resorcinol-anthraquinone and the bromination product here described are very weak dyestuffs. The latter dyes animal fibres dull pink shades, and unites with basic mordants, forming a red alumina lake and a violet-red chrome lake.—E. F.

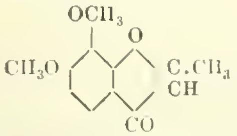
3.4-*Dihydroxy*-β-*methylchromone.* M. Blumberg and St. v. Kostanecki. Ber., 1903, 36, [10], 2191—2193.

3.4-Dihydroxy-β-methylchromone can be obtained by the methylation of gallacetophenone-trimethyl ether with dimethyl sulphate and alkali. It is an oil which distils at 174° C. under a pressure of 19 mm.

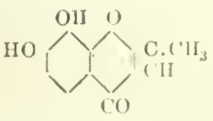
When sodium (0·7 grm.) is added to a solution of 2 grms. of gallacetophenone-trimethyl ether in 7 grms. of ethyl acetate, a yellow solid is formed. When this is poured into dilute acetic acid an oil is obtained which solidifies on standing. The substance produced, is 2.3.4-*trimethoxybenzoylacetone*—



it crystallises from dilute alcohol in white leaflets, and melts at 65° C.; its alcoholic solution gives a red coloration with ferric chloride. When boiled with concentrated hydriodic acid a second ring is formed—



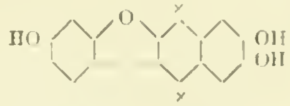
and further action of the reducing agent causes a removal of the methoxy groups, so that 3.4-*dihydroxy-β-methylchromone*—



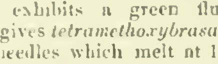
is formed. It crystallises from hot water in long needles containing $\frac{1}{2}H_2O$, which is lost at 100° C.; the anhydrous compound melts at 243° C. It is soluble in sodium hydroxide solution with a yellow colour; its alcoholic solution gives a green coloration with ferric chloride, and it dissolves in concentrated sulphuric acid with a greenish-yellow colour. Its *diacetyl* derivative melts at 120° C. On methylation, it gives a dimethoxy compound which crystallises with 1 mol. of water and melts at 102° C.—J. McC.

Brasilin; A Transformation Product of the Mother-substance of ——. St. v. Kostanecki and L. Lloyd. Ber., 1903, **36**, [10], 2193—2199.

When the oxidation product of brasilintrimethyl ether is warmed with concentrated hydriodic acid, a crystalline substance is formed. In order to stop the reduction, the mixture is poured into a solution of sodium bisulphite and the solid is then recrystallised from dilute alcohol. The substance, which is *tetrahydroxybrasane* (3.6′.7′ [1′ or 4′]-*tetrahydroxyphenylenenaphthylene oxide*)—



(OH in either position is marked ×), is difficult to prepare quite pure; but on acetylation it gives the *tetra-acetyl derivative*, which can be easily isolated. It melts at 208°—209° C.; in sulphuric acid it gives an orange-coloured solution, which exhibits a green fluorescence. Tetrahydroxybrasane gives *tetramethoxybrasane* on methylation; it forms white needles which melt at 158° C. By careful reduction of tetrahydroxybrasane with hydriodic acid, *trihydroxybrasane* (3 . 6′ . 7′ - trihydroxyphenylenenaphthylene oxide) is formed. It crystallises from benzene in white leaflets, which melt at 244°—246° C. By reduction of the trihydroxy compound with zinc dust, *brasane* (β, β-phenylenenaphthylene oxide)—

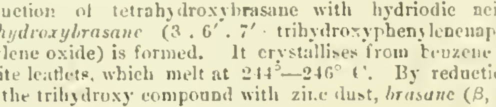


is formed. It is also obtained from the tetrahydroxy derivative, but the yield is not so good. It crystallises from alcohol in plates which melt at 202° C. Its alcoholic solution shows a greenish-blue fluorescence. In cold sulphuric acid it gives a colourless solution which becomes blue and then reddish on warming.

Other possible formulæ for brasane are discussed, and it is shown that the one here given is the most probable one.
—J. McC.

Brasilin; Coloured Transformation Products of ——. St. v. Kostanecki and L. Lloyd. Ber., 1903, **36**, [10], 2199—2201.

When 3.6′.7′.1′ (or 4′) tetra-acetoxybrasane (see preceding abstract) is oxidised in acetic acid solution with chromic acid, yellow needles of 3.6′.7′-*triacetoxybrasanequinone*—



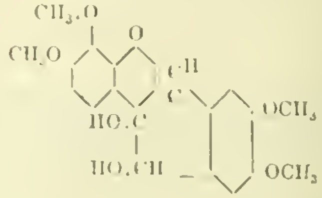
are formed. It melts at 281° C., and dissolves in sulphuric acid to a green solution. When treated with zinc dust, acetic anhydride, and sodium acetate, it first takes up two atoms of hydrogen, then gives 3.1′.4′.6′.7′-*penta-acetoxybrasane*, which crystallises from acetic acid in needles which melt at 268° C.

When 1′ (or 4′) - hydroxy - 3.6′.7′ - trimethoxybrasane (see preceding abstract) is oxidised with chromic acid, 3.6′.7′-*trimethoxybrasanequinone* ($C_{19}H_{14}O_6$) is formed. By simultaneous reduction and acetylation it is converted into 3.6′.7′-*trimethoxy*-1′.4′-*diacetoxybrasane*, which forms white needles, and melts at 254°—255° C.

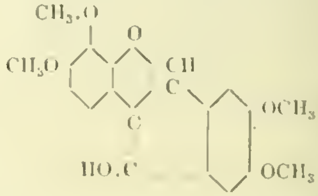
It can be hydrolysed easily, but the product very readily oxidises to the quinone. Dimethyl sulphate acts on the hydrolysed product to give 3.1′.4′.6′.7′ *pentamethoxybrasane*, which crystallises from a mixture of acetic acid and alcohol in white prisms, and melts at 167° C.—J. McC.

Hæmatoxylin; Naphthalene from Transformation Products of ——. St. v. Kostanecki and A. Rost. Ber., 1903, **36**, [10], 2202—2206.

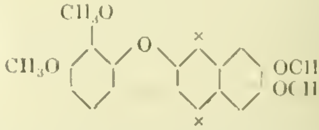
Tetramethylhæmatoxylin can be obtained by dissolving 50 grms. of hæmatoxylin in a little hot alcohol and adding quickly 120 grms. of dimethyl sulphate and 90 grms 40 per cent. sodium hydroxide solution. The mixt when cold, is poured into water and filtered. On stand for 12 hours, the tetramethylhæmatoxylin separates. crystallises from dilute alcohol in white prisms which at 142° C. When oxidised with chromic acid, it g 3.4.2′.3′-*tetramethoxyrufindandiol*—



which is identical with the substance described by Gilb and Perkin (this Journal, 1899, 133) as tetramet hæmatoxylone. When this -diol is boiled with ac anhydride and sodium acetate an acetyl derivative obtained which on saponification gives 3.4.2′.3′-*t methoxyrufindenol*—

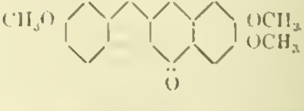


When the -diol is suspended in a little alcohol, th dissolved in concentrated sulphuric acid, and precipita by water, a compound is obtained which has the same co position as the -enol, but different properties. It has be recognised as 1′ (or 4′)-*hydroxy*-3.4.6′.7′-*tetrametho brasane*—



(with OH in either position marked ×). It crystall from benzene in leaflets which melt at 218° C., a dissolve in concentrated sulphuric acid with a red colo Its acetyl derivative melts at 196° C. On methylation gives *pentamethoxybrasane*, which melts at 174° C., a dissolves in concentrated sulphuric acid with a red colou

When the hydroxytetramethoxybrasane is oxidised acetic acid solution with chromic acid, red, needle sha crystals of 3.4.6′.7′-*tetramethoxybrasanequinone*



are formed. It melts at 264° C., and dissolves in conce trated sulphuric acid with an olive green colour. I reduction and simultaneous acetylation it gives 3.4.6′.7 *tetramethoxy*-1′.4′-*diacetoxybrasane*, which crystallises small, white needles, and melts at 234° C.

The hydroxytetramethoxybrasane and the brasan quinone, when distilled with zinc dust, give naphthalene.
—J. McC.

Brasilin and Haematoxylin. J. Herzig and J. Pollak. Ber., 1903, **36**, [10], 2319—2322.

By the action of alkali on dinitrotetramethylhaematoxylon a product is obtained which is partially soluble in alka The insoluble part is a mixture of 6-nitrohomoveratrol a

4. 4′.5-tetramethoxy-2.2′-dinitrodibenzyl. The portion so ble in alkali, is 2-carboxy-5.6-dimethoxy-phenylglycollic ac

ie dinitro- as well as the mononitro-derivatives dissolve in lute alkali with a reddish-violet colour. In the case of th linitro- compound, the colour disappears on dilution wi much water and returns on the addition of more alkali. Tl original substance is precipitated either from the co ired or colourless solution on addition of acid. On wa ing the solution in dilute alkali, the colour changes to ye wish-brown, and the decomposition in this case does not gi rise to any substance insoluble in alkali. It has been pr ed that *p*-methoxysalicylic acid is one of the products of ie decomposition.

trotrimethylbrasilone gives an oxime, $C_{19}H_{20}N_2O_9$, with hy oxylamine. The oxime forms yellowish crystals which m at 159°—162° C. It is soluble in dilute alkali solution, an on treatment with hydrochloric acid in alcoholic so ion the original substance is regenerated.—J. McC.

D stion; Influence of some Coal-Tar Dyestuffs on ——. A. J. Winogradow. XVIII. A., page 922.

Iydrocarbons; Synthesis of ——. A. Werner and F. Zilkens. XXIV., page 929.

English Patents.

D kyl-anthrachrysone Ethers, their Nitro- and Amido- phonic Acids; Process for the Manufacture of ——. Imray, London. From Farbwerke vorm. Meister, ıcius und Brüning, Hoechst-a/Main. Eng. Pat. 19,894, pt. 11, 1902.

S Fr. Pat. 324,349 of 1902; this Journal, 1903, 549. —T. F. B.

A lophenol Derivatives and Azo-Dyestuffs therefrom; anufacture of ——. O. Imray, London. From eister, Lucius und Brüning, Höchst-a/Main, Germany. ıg. Pat. 20,577, Sept. 20, 1902.

A NOPHENOLBENZYLETHERS are formed by the reduction of itrophenolbenzylethers (from nitrophenols and benzyl cl ride or chlorobenzylchloride), with iron filings and salt so ion. These compounds, when diazotised and coupled wi β-naphthol on the fibre, yield red azo-dyestuffs distinguished for shade and fastness. These dyestuffs may al be used for the production of lakes. In this case the β- phthol solution is mixed with a substratum such as bl *fixe.*—E. F.

uring Matters [Azo-Dyestuffs] suitable for Dyeing ool; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, ıdwigshafen-a/Rh., Germany. Eng. Pat. 20,000, Sept. , 1902.

T diazo compounds of sulpho-acids of aromatic amines o ie benzene or naphthalene series or their substitution pr ucts, or of sulpho-acids of 1.8-aminonaphthol are cc led with 1.8-naphthylenediamine. Valuable dyestuffs of rious shades are thus produced, dyeing very evenly on w . If treated on the fibre with a chromate they are ch ged and become very fast against milling and fulling. B eatment with nitrous acid on the fibre, these dyestuffs ar onverted into the corresponding azimides, which are al valuable dyestuffs; and are altered by treatment with a omate in a similar manner to the original dyestuffs. —E. F.

French Patents.

D azo Dyestuffs; Production of ——. Soc. Anon. Prod. Bayer & Cie. Second addition, dated Dec. 13, 1902, Fr. Pat. 323,808, Aug. 18, 1902.

S Eng. Pat. 18,569 of 1902; this Journal, 1903, 359. —T. F. B.

Indigos [Indigo Dyestuffs] derived from Benzene and Naphthalene, and Intermediate Products; Preparation of ——. C. and H. Dreyfus. Addition, dated Dec. 19, 1902, to Fr. Pat. 326,168, Nov. 8, 1902 (this Journal, 1903, 791).

The processes described in the main patent are extended to include various mixed thioureas, containing both benzene and naphthalene nuclei, and the isatin derivatives and indigo dyestuffs formed from the same.—E. F.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mercerised Cotton; Increased Capacity for Dyeing of ——, and its Causes. W. Schaposchnikoff and W. Minajeff. Zeits. für Farben- und Textil Chemie, 1903, **2**, [13], 257—260.

The quantity of indigo in a given piece of cloth was determined by extracting pieces 100 sq. cm. in area, with 96 per cent. acetic acid in Hönig's extraction apparatus.

It was found that mercerised cotton fixes about 29 per cent. more dye than non-mercerised, and that the darker colour of the former is primarily due to the larger amount of dye so fixed.

From the results of another series of experiments the following conclusions are drawn:—(1) Mercerised cotton in all cases retains more indigo than non-mercerised, the relative quantities being about 130 to 100. (2) The absolute increase in the quantity of indigo retained for each successive dipping is greater for the mercerised cotton. The relative difference between the quantity retained by mercerised and non-mercerised cotton increases with the number of dippings. Table III. shows this, the differences being expressed in tenths of mgrms.

Absolute and Relative Differences on Dyeing.

Number of experiments.	3	4-3	5-4	6 5	11	12-11	13 12
Absolute difference for non-mercerised cotton	26	30	12	124	68	43	43
Relative difference between both.........	14	20	21	61	24	30	38
Absolute difference for mercerised cotton.....	40	36	13	164	92	49	53
Number of experiments.	7	8-7	9-8	10 9	14	15-14	16 15

Whilst the mercerised cotton is dyed a clear deep-blue colour, the non-mercerised possesses a turbid grayish blue colour.

Another series of experiments made on fabrics mercerised without stretching, gave similar results.

Calico mercerised without stretching, always possessed the deepest colour, with a characteristic metallic sheen.

On comparing the depths of colour produced with the different fabrics, it was found that for equal intensities, non-mercerised cotton required at least 40 per cent. more indigo than mercerised.—L. F. G.

Azo Colour Reserves for Indigo Printing (with Steaming). E. Colli. Bull. de la Soc. Ind. de Mulhouse, 1903, **73**, 210—213.

The β-naphthol ordinarily used as a phenolic component is replaced by 3-phenanthrol, the anilide of aceto-acetic acid and methylphenylpyrazolone.

The fabric is prepared:—

I. By treatment with β-naphthol and glucose, printing with 3-phenanthrol and overprinting with Azophone Orange MN, Azophone Pink A, and α-diazonaphthalene, with addition of sulphur and aluminium sulphate; or

II. By printing with β-naphthol on goods prepared, either with methylphenylpyrazolone and glucose, or with the anilide of aceto-acetic acid and glucose, and then overprinting with the same diazo compounds as in the first example.

In either case a mixture containing indigo and caustic soda is then padded on, the goods being finally steamed washed, and soaped.

The results are said to be good, and the colours satisfactorily fast to washing and to light. Phenanthrol gives redder shades than β-naphthol, whilst aceto-acetanilide and methylphenylpyrazolone give more yellow shades than the latter.—E. F.

Azo Colour Reserves for Indigo Printing (with Steaming); Report on Colli's Process for Producing ——. R. Bruckmann. Bull. de la Soc. Ind. de Mulhouse, 1903, **73**, 214—215. (See preceding abstract.)

The experiments were repeated satisfactorily. The sodium sulphide formed on steaming, influences certain azo colours, turning the compound formed from β-naphthol and Azophon Orange MN, for instance, to a deeper shade, though it has no action on the azo compounds formed from α-diazonaphthalene. The aluminium sulphate which is added, only incompletely destroys the sodium sulphide formed. Sulphur alone forms a quite efficient reserve under indigo, but the formation of insoluble azo colours on the fibre by means of 3-phenanthrol and of aceto-acetanilide is new.—E. F.

Turkey-Red; Note on Schlieper's Theory of the Formation of ——, and on the Method of Dyeing the same employed by Schlieper and Baum. J. Persoz. Bull. de la Soc. Ind. de Mulhouse, 1903, **73**.

If fabrics mordanted with alumina be dyed in a boiling bath containing alizarin and a corresponding amount of lime, bright red shades are obtained. If then rinsed with cold water and dried, the shade changes to a dull yellowish brown. It is this dull brown substance which combines with fatty acids to give brilliant fast red shades, such as Turkey-red. The original bright red fibre, as taken directly from the bath, does not combine with fatty acids, and the colour is at this stage not fast to soap. If the dull brown fibre be steamed or boiled with distilled water, the shade changes to a bright red, which will not react with fatty acids, and is also not fast. The author explains this by the assumption that the brown substance, which is unsaturated, and can therefore combine with fatty acids, undergoes an internal condensation to form the saturated bright red compound which has lost this property.

Turkey-red oil is not very stable, and loses the property of dissolving in water. Schlieper and Baum employ acid sodium ricinoleate instead, which they make by saponifying castor oil with caustic soda lye, and neutralising half the combined soda with hydrochloric acid. The required substance rises to the top as an oily layer, congealing to a semicrystalline mass, readily soluble in water. They employ, as alumina-mordant, sodium aluminate, made by dissolving hydrated alumina in excess of soda lye, and neutralising the excess of caustic soda with hydrochloric acid. The white goods are padded with this, dried, treated with hot moist air, allowed to stand, washed, and twice treated in a warm lime bath to convert the sodium aluminate completely into calcium aluminate.

The fabric is then rinsed, and dyed at 87° C. in very large vats, which are replenished continuously with water, containing 1½ grms. of 10 per cent. alizarin, and 6 c.c. of lime water per litre. The same vat is used for an indefinitely long time, the amount of lime and alizarin being carefully controlled and corrected as required. After dyeing, the goods are cooled, pressed, impregnated with the fatty mordant (in aqueous solution), dried, steamed, and soaped. Finally, they are re-soaped with addition of a small amount of tin-salt. If the dyebath were heated to a higher temperature than 90° C., the "saturated" red substance would be formed, and would not combine with the ricinoleic acid.—E. F.

Silk; Determination of the Weighting Agents in Loaded ——. C. Ris. XXIII., page 928.

English Patents.

Flax Fibre; Manufacture or Production of ——. B. C. Mudge, Snow's Falls, Maine. Eng. Pat. 8167, April 8, 1903.

In order to disintegrate and remove the shives in flax waste, the fibre is washed, after a preliminary combing, with a dilute solution of soap and sodium carbonate 70° C., immersed for about two hours in a solution sodium carbonate (one part) and caustic soda (two pa of 3° Tw., at a temperature under 80° C., washed with wa bleached with a solution of 5° Tw., of bleaching pow (three parts), magnesium sulphate (two parts), and sodi carbonate (one part), washed, "soured" with a solutio acetic (or sulphuric or hydrochloric) acid, washed, trea with a dilute alkali solution, and finally washed.—T. F.

Wool-Scouring Machines. P. Dubrule, junr., and Dubrule, both of Tourcoing, France. Eng. Pat. 27,9 Dec. 18, 1902.

The wool is fed through an inlet channel on to a perfora circular rotating platform, where it is treated with scouring liquid, and finally removed.

Various devices for facilitating the process are describ —T. F. B

Sheep's Wool and Other Ceratinic Fibre or Fabrics C taining such Fibre; Treating ——. A. M. Cl, London. From A. Kaon, Passaic, N.J. Eng. Pat. 3 Feb. 13, 1903.

Wool is prepared for treatment with alkaline liquids (alkaline dye baths, &c.) by subjecting it to the action formaldehyde, solution or gas, "in order to enable subsequent use of hotter and more concentrated soluti of alkali than have hitherto been used."

The material may be first treated with formaldehyde, then with the alkaline solution, without removing formaldehyde; or slightly alkaline solutions of formal hyde may be employed, and higher temperatures used; the alkaline formaldehyde solution may be first used dil, and then the action may be increased by further addit of alkali.—T. F. B.

Yarn; Machines for Sizing ——, and like Machi. F. ter Weele, St. Dié, France. Eng. Pat. 770, Jan. 1903. Under Internat. Conv., Oct. 9, 1902.

The claims cover the use of rotating bearings, driven gearing, and in which are mounted the shafts of the dry drums, size-cylinders, warp rollers, &c., so as to cause various drums to revolve by friction, and thus easing tension of the yarn as it passes over the drum.—T. F. B

Molasses; Process for Obtaining and Utilising Mordants] the Organic Acids contained in the Resid Liquors of ——. H. Schraeder. Eng. Pat. 20, Sept. 24, 1902. XVI., page 920.

Cotton; Method of and Means for Pressing, Dyeing, Washing ——. J. E. and H. Cock, Linthwaite, Yo. Eng. Pat. 15,537, July 12, 1902.

A combined machine for pressing, dyeing, and wash cotton, consisting of a cistern fitted with a perforated f bottom to hold the cotton, above which is a perforated p for pressing the cotton, worked by a screw and capabl being swung on a pivot to allow access to the cistern. F and exit pipes and an exhaust pump are also provided. —T. F. I

Dyeing, Bleaching, Washing, and Otherwise Trea Textile Materials with Liquids; Apparatus for — P. Schirp, Barmen, Germany. Eng. Pat. 5324, Marc 1903.

See Addition, dated Aug. 26, 1902, to Fr. Pat. 314,27 1901; this Journal, 1903, 551.—T. F. B.

Chemicking, Souring, Bleaching, Dyeing, Mercerisi Washing, or Similarly Treating Textile Fabrics in Open State; Machines for ——. C. L. Jackson E. W. Hunt, Bolton. Eng. Pat. 7872, April 6, 1903.

The improvements claimed, consist in combining with batch rollers and the self-adjusting drum of the appara described in Eng. Pat. 5409 of 1900 (this Journal, 1 120), an arrangement of spurt pipes and a squeezing spreading roller for the purpose of distributing bleach a other liquors on the tissue under treatment, and of thus e uring its rapid and complete saturation by these as the ti e passes from one batch roller to the other.—E. B.

ico Printing or Printing Repetitions of Designs on 'ontinuous Webs of Fabric or other Materials; Multi-lour Machines for ——, The Printing Arts Co., Ltd., '. Black, and F. H. Mowbray, London. Eng. Pat. 7,174, Aug. 2, 1902.

rAL cylinders, each bearing in relief a part of the design e reproduced, after being inked or supplied with colour ie usual manner, are employed to print upon inter-iate indiarubber- or composition-coated rollers, from h the colours are transferred to a main collecting and ting cylinder and thence to the tissue to be printed. ral collecting cylinders may be used, to each of which or more colours are transferred.—E. B.

ting Textile Fabrics, Linoleum, Floorcloth, Table aize, Wall-Papers, or the like; Machinery for ——. ulse and Co., Ltd., and E. Adams and W. A. M. 'allwork, Salford. Eng. Pat. 8399, April 11, 1903.

T enable the printing cylinders in a calico-printing hine to be adjusted in position, both in relation to one her and also to the bowl of the machine, the frame-s of the machine are provided near their edges with ılar T-shaped grooves to which the brackets that y the mandrels of the printing cylinders are secured in djustable manner.—E. B.

United States Patent.

Stock, and Method of Preparing same. B. C. udge, Lynn, Mass., Assigner to Linen Manufacturing ., Boston. U.S. Pat. 732,103, June 30, 1902.

Eng. Pat. 8167 of 1903, in preceding Eng. Pats.
—T. F. B.

French Patents.

eads and Tissues [from Paper Pulp, &c.]; Manu-cture of ——. C. Kellner. Fr. Pat. 327,176, Dec. 1, 02.

HITE cellulose, soda cellulose, rag pulp, asbestos, ine-made wood pulp, and similar short-fibred fibrous ers, are, if necessary, moistened with water, and spread pasty condition upon the sieve of a paper-making ine. When it has attained a suitable consistency, the of fibres thus produced is divided into narrow strips ibons, either while it is still upon the machine or after-s, by means of endless bands, revolving discs, currents mpressed air, or other means. The ribbons obtained hen spun, either singly or two or three together, into ds suitable for weaving into tissues.

th the process of manufacture and the apparatus oyed are claimed.—E. B.

ring Wool with Volatile Solvents; Apparatus for ——. Rouselle. Addition, dated Dec. 2, 1902, to Fr. Pat. 0,492, May 21, 1900.

A ORDING to the present supplement, the inner, perforated, y drum carrying the wool to be treated is mounted a perforated, hollow axis, which allows it to be heated within (with hot air), instead of from without, as rto. Other improvements relate to the disposition of at the top and bottom, instead of at the sides, of the outer drum which encloses the rotary drum, to facili-he filling and emptying of the latter; the addition to pparatus of a supplementary battery of condenser ; and the employment of water jets outside the main nser and condenser tubes, as an alternative to the oyment of water sprays inside these, to effect the nsation of the solvent used.—E. B.

ing, Scouring, and Bleaching Wool; Process of ——. A. S. Bœuf. Fr. Pat. 327,070, Dec. 6, 1902.

alkali salts of the compounds resulting from the nent with concentrated sulphuric acid of castor oil, acid, &c., are employed, with or without alkalis, such imonium carbonate, and turpentine, in either fresh or salt (sea) water, and at the ordinary temperature, to effect the washing, scouring, or bleaching of wool and similar animal fibres.—E. B.

Dyeing Machines; Apparatus for Introducing Dyestuffs and Mordants into Closed ——. L. Détré. Fr. Pat. 326,806, Dec. 2, 1902.

To avoid the loss of time caused by the interruption of the dyeing operation for the purpose of introducing dye or mordant liquors into dyeing apparatus, such as is described in Fr. Pat. 272,925, air, steam, or other gas, under pressure, is employed, or, preferably, the difference existing between the pressures in the two liquor-receiving vessels, is utilised to force the required dye or mordant liquor, from a receptacle which is closed for the time being, into that vessel in which is the lesser pressure.—E. B.

Dyeing of Textiles in Skeins, Machine for Mechanical ——. E. Dittmar. Second addition, dated Dec. 20, 1902, to Fr. Pat. 315,658, Nov. 6, 1901 (this Journal, 1902, 547).

Mechanical arrangements are introduced which cause the framework carrying the skeins to oscillate along a vertical semicircle.—E. F.

Block Shades on Wool; Process for Obtaining Fast ——. Soc. Anon. Prod. F. Bayer et Cie. Second addition, dated Dec. 13, 1902, to Fr. Pat. 323,809, Aug. 18, 1902.

See Eng. Pat. 18,139 of 1902; this Journal, 1903, 416.
—T. F. B.

Aniline Black; Process of Dyeing and Printing in —— F. Cleff. Fr. Pat. 327,529, Dec. 20, 1902.

See Eng. Pat. 28,142 of 1902; this Journal, 1903, 416.
—T. F. B.

Printing Tissues with Oil Mixtures; Impts. in ——. A. Boyeux. Fr. Pat. 327,223, Dec, 11, 1902.

Tissues printed with mixtures of colour-lakes with oils, such as linseed oil, are passed, when the latter have become dried, through baths of petroleum, alcohol, soap, or other compound capable of dissolving fatty matters, to remove the excess of oil and, with it, the halo around the printed parts and the unpleasant smell commonly present in oil-printed tissues.—E. B.

Silk Effects; Imitation ——, *by Simultaneous Embossing and Printing.* Soc. Cotonnière H. Geliot. Fr. Pat. 327,448, Dec. 17, 1902.

In ordinary textile printing not more than 15 lines can be printed per centimetre. By using a fatty printing mixture and embossing at the same time, as many as 200 lines per centimetre can be printed on animal or vegetable fabrics, giving the appearance of silk fabrics with fluorescent, iridescent, shot, or watered effects. The fabric is passed between an engraved metallic roller and another one made of paper. The metallic roller is connected with a colour-holder and a system of gelatin rollers which distribute the colour uniformly over the raised parts of the metal. The fabric is thus, in this case, printed where it is compressed. Or two paper rollers may be employed, one of which applies colour to the engraved parts of the metallic roller, whilst the fabric passes between the latter and the other paper roller. In this case the compressed parts are left uncoloured, whilst the embossed portions are printed. Glassy, metallic, or other coloured powders may be mixed with the printing paste, or may be sprinkled as a dry powder on to the print, whilst the latter is still moist, producing effects not hitherto employed.—E. F.

Multicoloured Effects on Fabrics; Production of Speckled ——, *by Printing.* M. Haase. Fr. Pat. 327,606, Dec. 23, 1902.

The fabric is printed in any required design with a mixture of caustic alkali, a thickening agent, such as British gum and glycerin. It is then passed into a bath, such as stannous chloride solution, which deposits basic mordants on the printed portions, and arrests the further action of the caustic alkali. Salts of zinc or aluminium may also be used. The fabric is then rinsed and passed through a suitable dye-bath. The most suitable dyestuffs are the mordant-dyeing alizarin colours, and the substantive diamine colours. In some cases the metallic salt can be applied first, and the alkaline mixture subsequently printed on. The effects produced resemble the speckled designs obtained by means of multicoloured threads.—E. F.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Skins or Partly-prepared Leather: Process for Dyeing ——. C. Dreher, Freiberg. Eng. Pat. 5211, March 5, 1903.

Fast colours are produced on skins, &c. which have been previously freed from grease, by successive treatments with mordant dyestuff solutions and solutions of titanium salts (preferably the lactate or salt of another carboxylic acid) at temperatures not exceeding 40—60° C. (See also this Journal, 1903, 294.)—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Thiosulphuric Acid; Conditions of Production and Stability of ——. J. Aloy. Comptes rend., 1903, **137**, [1], 51—53.

Thiosulphuric acid can be produced rapidly by saturating 95 per cent. alcohol, containing sulphur in suspension, with gaseous sulphur dioxide. Solutions of thiosulphuric acid in alcohol are far more stable than aqueous solutions; the presence of normal salts also increases the stability of the acid. The presence of acids and the direct rays of the sun hasten the decomposition. The decomposition of thiosulphuric acid appears to be regulated by the proportion of sulphurous acid existing in the solution; if sulphurous acid be developed in the solution by the action of hydrochloric acid upon a sulphite, the deposition of sulphur is much slower than if the sulphurous acid be removed as soon as it is formed by passing a current of carbon dioxide through the liquid.—J. F. B.

Calcium Sulphate; The Second Anhydrous Modification of ——. P. Rohland. Zeits. anorg. Chem., **35**, 194—200; Chem. Centr., 1903, **2**, [1], 7.

The modifications of hydrated and anhydrous calcium sulphate known at the present time are:—(1) the di-hydrate, $CaSO_4.2H_2O$; (2) the hemihydrate, $CaSO_4.\frac{1}{2}H_2O$ obtained when the di-hydrate is heated to 107° C.; (3) the first anhydrous modification (so-called overburnt plaster of Paris) formed by heating to 130° C.; (4) the second anhydrous modification (so called hydraulic or flooring plaster of Paris) obtained by heating to 525° C.; (5) a third anhydrous modification obtained by igniting in the blow-pipe flame, but which usually contains decomposition products; and (6) natural anhydrite. The hemihydrate and the second anhydrous modification, possess hydraulic and hardening (setting) properties, as also does the first anhydrous modification in presence of positive catalysers (see this Journal, 1900, 1111; 1902, 1233). The author has previously (Zeits. Baumaterialkunde, 6, 19) examined the hemihydrate with regard to its behaviour towards catalysers, and he has now subjected the second anhydrous modification (hydraulic or flooring plaster of Paris) to a similar investigation. It was found that the velocity of hydration is influenced to a degree depending upon the concentration and nature of the catalyser. Ammonium chloride, magnesium chloride, aluminium chloride, and potassium bichromate have a retarding influence. The direction of the influence may change with an alteration of temperature. The causes of the catalytic action appear to be connected with the influence of the catalyser on the solubility of the anhydrous calcium sulphate; an increase of solubility is accompanied by an acceleration of the velocity of hydration. It may be accepted that solution takes place before hydration, and that, subsequently, the crystalline di-hydrate separates.—A. S.

*Sulphates; Processes of Hydration and Hardening (Settin
of some* ——. P. Rohland. Zeits. anorg. Chem., 3
201—204; Chem. Centr., 1903, **2**, [1], 8.

Many processes of hydration include the phenomenon
hardening, the substance being converted into a form near
insoluble in water. In the case of metallic sulphates,
connection may be observed between the processes
hydration and hardening. By the aid of Gibbs' phase rul
it can be shown that only those sulphates fulfil the requisi
conditions, in the solutions of which four or more phas
can be present simultaneously, in equilibrium:—*viz.*, h
drated salt, anhydrous salt, solution, and vapour. Tl
definite transition points are not far removed from o
another, and only below these can the processes of hydr
tion and hardening (setting) of the sulphates occur. Tl
processes can be accelerated or retarded by catalysers, b
the latter have not the same influence on different co
pounds (see preceding abstract). In the case of calciu
sulphate, the hemihydrate decomposes spontaneously in
the di-hydrate and the anhydrous salt, and in the cas
other sulphates similar reactions can occur. The transit
points can be attained by heating to a definite temperatu
or two sulphates may be mixed under such conditions th
by their union, water is separated. For example:—

$$Na_2SO_4.10H_2O + CuSO_4.5H_2O \overset{21^\circ C.}{\rightleftarrows}$$
$$Na_2SO_4.CuSO_4.2H_2O \text{ (Krohnite) } + 13H_2O.$$

At a higher temperature decomposition mostly takes pla
The transition points can also be attained by exposure
the air, if the vapour pressure is higher than the avera
atmospheric pressure, provided the air has otherwise
action on the substance.—A. S.

Ferric Sulphate and Sulphuric Acid; Compound of —
A. Recoura. Comptes rend., 1903, **137**, [2], 118—12

The author has previously shown (Comptes rend., 18
114, 477; 1893, **116**, 1367: this Journal, 1892, 60
1896, 565) that green chromium sulphate combines read
with sulphuric acid, forming chromosulphuric acids co
taining 1 mol. of chromium sulphate with 1, 2, or 3 mo
of sulphuric acid. He now finds that ferric sulphate al
combines readily with sulphuric acid, but whatever t
amount of sulphuric acid used, the compound obtain
which the author names ferrisulphuric acid, always co
tains 1 mol. of ferric sulphate to 1 mol. of sulphuric ac
If concentrated sulphuric acid be added to a solution of fer
sulphate, the liquid becomes decolorised after some ti
(varying with the amount of acid used), and ferrisulphu
acid is deposited in the form of a white powder, whi
after being drained on a porous plate, washed with aceto
and exposed to a dry atmosphere, has the compositi
represented by the formula, $Fe_2(SO_4)_3.H_2SO_4.8H_2O$. Fe
sulphuric acid dissolves readily in water, but is immediat
decomposed into its components, ferric sulphate and s
phuric acid, thus differing somewhat from the analog
chromosulphuric acid, $Cr_2(SO_4)_3.H_2SO_4.Aq.$, which, wh
dissolved in water, behaves at first as a complex diba
acid, although it, too, is gradually decomposed, vio
chromium sulphate and free sulphuric acid being formed.
—A. S

Ammonium Persulphate; Action of ——, *on Metal
Oxides.* A. Seyewetz and P. Trawitz. Comptes ren
1903, **137**, [2], 130.

By the action of ammonium persulphate on metallic pr
oxides, ammonia is produced, together with the persulph
of the metal, or the sesquioxide or peroxide of the me
may be formed. This last reaction may be used for t
preparation of precipitated lead peroxide.

By the action of ammonium persulphate on sesquioxi
or peroxides, either a portion of the ammonia is oxidis
with liberation of nitrogen, and the sulphate of the me
produced; or the sulphate of the metal is formed and
oxygen of a portion of the persulphate is liberated;
finally, as in the case of the hydroxides of manganese a
chromium, complete peroxidation of the metal is effecte
—A. S

Z c *Potassium and Zinc Sodium Cyanides.* W. J. Sharood. J. Amer. Chem. Soc., 1903, **25,** [6], 570—596.

Z c cyanide is dissolved by a dilute solution of potassium c nide as the very stable double cyanide $K_2Zn(CN)_4$, w ch readily crystallises out on evaporating the solution. S ium cyanide yields the double compound $Na_2Zn(CN)_4$ in lilute solutions, but on concentration crystals of the c pound $NaZn(CN)_3$ are produced, which are partially d omposed by water with production of basic zinc c nide.

otassium zinc cyanide in solution is apparently decomp ed in slight degree on treatment with potassium b roxide, thus: $K_2Zn(CN)_4 + 2KOH = ZnO + 4KCN$ $+ H_2O$. This would explain the increase in the solvent a on of a double cyanide solution on gold when caustic a li is added. The reaction expressed in the equation $K_2Zn(CN)_4 + 2KOH = Zn(OH)_2 + 4KCN$ is contrary to a he observed facts.

hen zinc oxide is treated with excess of N/10 potassium c nide, complete solution occurs; when zinc oxide is p ent in excess, the following reactions take place:— ($4KCN + ZnO + H_2O = K_2Zn(CN)_4 + 2KOH$; (2) $OH + ZnO = K_2ZnO_2, 8KOH + H_2O$. The zincate i is solution is partially decomposed, with the precipitati of zinc oxide, on boiling the liquid. Analogous r tions take place when sodium cyanide is used.

nc cyanide is dissolved by dilute solutions of potassium h oxide, yielding potassium zinc cyanide and potassium z ate. The solution is permanent when less than 1 mol. of inc cyanide is taken to 2 of potassium hydroxide; w the proportion is as 1 : 1, a precipitate of zinc oxide s separates out. With addition of zinc cyanide after e ibrium has been established by the separation of the o e, the reaction may be represented by the equation $2 H + 2Zn(CN)_2 = K_2Zn(CN)_4 + ZnO + H_2O$. With s m hydroxide somewhat less than the corresponding a nt of zinc cyanide is dissolved. In these reactions, pr ably the salts $Na_2Zn(CN)_4$ and Na_2ZnO_2, or the corre- p ding potassium compounds, are intermediate compounds.

—C. A. M.

C on *Monoxide; Action of Ozone, Hydrogen Peroxide,* *, on* ——. W. A. Jones. Amer. Chem. J., 1903, **30,**], 43—50.

oxidising action of ozone on carbon monoxide varies w the temperature and the concentration. The perce ge of ozone formed by moist phosphorus was found to e 0·0021, and this amount had very little action on he carbon monoxide, whilst an ozoniser yielded a ga containing 3·78 per cent. of ozone, which had a co derable oxidising action at ordinary temperatures, and sti more so at 250° C. At the latter temperature moist ph horus also had a slight action. Hydrogen peroxide di ot cause any oxidation when a 2·424 per cent. solution wa employed, nor did solutions containing 53, 57, and 63 r cent. Electrolytic oxygen was also found to have no tion on the carbon monoxide.—W. P. S.

M *llic Oxides; Reducibility of* ——, *by Hydrogen and* *rbon Monoxide.* J. W. Fay and A. F. Seeker. J. er. Chem. Soc., 1903, **25,** [6], 641—647.

oxides of silver and gold are reduced by hydrogen at mperatures far below 0 C., whilst with carbon mo xide, the minimum temperature of reduction is still low . In general, reduction is effected much more rapidly an efficiently by carbon monoxide than by hydrogen. Th following reduction temperatures were observed in ex iments in which the oxides were treated for six ho with carbon monoxide:—Silver oxide, 0 C.; gold oxi , 0° C.; mercurous oxide, 0° C.; yellow mercuric oxi , 0° C.; and red mercuric oxide, 95° C. An analogous dif ence in the reduction temperatures of the two mercuric oxi s was also observed in the case of hydrogen.

—C. A. M.

ulphuric Acid; Titration of ——, *with Benzidine* *lydrochloride.* W. J. Müller. XXIII., page 925.

Tartars; Gasometric Method for the Valuation of Commercial ——, *and for the Determination of Potash.* De Saporta. XXIII., page 928.

Chloride of Lime; Analysis of ——. D. de Pæpe. XXIII., page 926.

Alkali Sulphides; Electrolysis of ——. A. Brochet and G. Ranson. XI. A., page 916.

Silicates; Simplification of the Analysis of ——, *by the Use of Formic Acid.* A. Leclère. XXIII., page 926.

English Patents.

Sulphuric Acid; Apparatus for Breaking Up, Mixing, and Condensing Gases in the Manufacture of Acids, especially ——. J. G. Graham, Arklow, Ireland. Eng. Pat. 6051, March 12, 1902.

The main purpose of the invention is stated to be to substitute for the ordinary sulphuric acid chambers, a series of flues, passages, or columns, provided with a number of "contact" or "obstruction" pieces, placed crosswise to the flow of gases, to break, mix, assimilate, or condense them, as may be required. Such pieces may be angular, semi-circular, or channel-shaped. Such "contact" columns are also provided to ordinary apparatus, in combination with the burners, nitre chambers, Glover and Gay Lussac towers and chambers, to improve the output of acid.

—E. S.

Sodium Oxide; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 17,609, Aug. 11, 1902.

See Fr. Pat. 323,793 of 1902; this Journal, 1903, 195.

—T. F. B.

Sodium Hypochlorite: Manufacture of ——. J. T. Conroy, J. H. Shores, and The United Alkali Co., Ltd., all of Liverpool. Eng. Pat. 18,947, Aug. 28, 1902

The removal, or partial removal, of the water of crystallisation from sodium hypochlorite, is effected by subjecting it to a current of air or of a suitable gas, previously dried, in a partial vacuum or otherwise, in a vessel which may contain sulphuric acid or other desiccating substance. The dried air may be at the ordinary temperature, or it may be heated. Reference is made to Eng. Pat. 25,925, Dec. 8, 1898; this Journal, 1899, 1019.—E. S.

Alumina Sulphate or like Material; Calcining ——. A. E Cummer, Cleveland, Ohio, U.S.A. Eng. Pat. 4820, March 2, 1903.

The apparatus for "calcining" [drying] aluminium sulphate or the like, consists of a pair of similar drying chambers. The aluminium sulphate is supplied to one of the dryers in small pieces, and in its passage through the same is subjected to a tumbling movement at an angle to the length of the dryer. The temperature is caused to increase from about 180° F. at the entrance, to about 210° F. at the exit end, where the material is hoisted by an elevator into a cooling bin. The cooled material is then screened, the coarser particles being led between rollers to be cracked or broken, and is then passed into the second dryer, to be circulated as before, but with a temperature at the entrance of 210°, rising at the exit end to about 300° F. (Compare Eng. Pat. 15,153, July 25, 1901; this Journal, 1902, 52.)—E. S.

Gas; Treatment of ——, *for obtaining Cyanogen Compounds therefrom.* C. C. Carpenter and J. M. Somerville. Eng. Pat. 8166, April 8, 1903. II., page 900.

Nitrogen from Liquid Air: Process and Apparatus for Obtaining ——. T. B. Lightfoot, London. From Gesell. für Linde's Eismaschinen, Munich. Eng. Pat. 11,221, May 16, 1903.

Gas rich in nitrogen, obtained by the rectification of liquid air, is conducted through an upward extension of the rectifying column, through which pure liquid nitrogen trickles down. The requisite liquid nitrogen is obtained by condensing some of the vapour, rich in nitrogen, issuing from the top of the column on metal surfaces cooled by evaporating under reduced pressure the liquid, rich in oxygen, previously obtained; or by compressing a portion of the nitrogen after its issue from the interchanger, cooling it in an interchanger by the gases and liquefying it by the evaporation of liquid rich in oxygen boiling at atmospheric pressure.

For the former method, the apparatus consists of a rectifying column above a vaporiser vessel, an interchanger apparatus terminating in a coil within the vessel, from which coil a pipe passes to about the middle of the rectifying column, and a pipe passing from the vessel to a coil in the upper part of the rectifying column, connected through the interchanger with a vacuum pump. For the second method, the interchanger is provided with two passages, one terminating in a coil in the vaporiser vessel, and the other in a coil in an auxiliary vaporiser vessel, between which vessels there is a means of communication; pipes connect the coils with about the middle of the rectifying column, and the interchanger apparatus communicates through a compressor with the outlet for the nitrogen, and terminates in a coil in one of the vaporiser vessels, which coil communicates with the top of the rectifying column. See also U.S. Pats. 727,650 and 728,173; this Journal, 1903, 743.—W. C. H.

United States Patents.

Condensers for Nitric or other Acids. W. Bate, Hayle, and F. G. Orme, London. U.S. Pat. 733,452, July 14, 1903.

See Eng. Pat. 25,790 of 1902; this Journal, 1903, 212.
—T. F. B.

Ammonia; Obtaining ——, from Ammonia-containing Gases. H. H. Dow, Midland, Mich. U.S. Pat. 733,465, July 14, 1903.

The gases are brought into intimate contact with a hot solution of a hydrochloride of an alkaline earth, such as calcium chloride, calcium hydroxide (or the like) is added, and the ammonia is blown out by a relatively cool gas. The ammonia is, in some cases, mixed with carbon dioxide, and the mixture is brought into contact with a solution containing the hydrochloride of an alkaline earth, or with "hot bitter-water obtained from natural brine." In the case of absorbing the ammonia from fuel gases, these are brought at once into contact with hot bitter-water from brine, in order that the more volatile of the tarry gases may be expelled; and the ammonia is driven out, after addition of calcium hydroxide, by a gas so cool as not to expel the less volatile tarry gases.—E. S.

Calcium Peroxide Hydrate; Process of Manufacturing ——. G. F. Jaubert, Paris. U.S. Pat. 733,047, July 7, 1903.

Milk of lime is agitated with solution of hydrate of sodium dioxide, and the calcium peroxide hydrate formed is separated, washed, and dried. Compare U.S. Pat. 729,767, June 2, 1903; this Journal, 1903, 796.—E. S.

Litharge; Process of Making ——. J. W. Bailey, Assignor to Union Lead and Oil Co., Jersey City. U.S. Pat. 733,896, July 14, 1903.

Lead is melted on the hearth of a suitable furnace and subjected to an oxidising flame produced by hydrocarbon fuel atomised by means of a jet of steam.—F. H. L.

Zinc Sulphide from Copper Slag; Process of Obtaining ——. F. Brünjes, Langelsheim, Germany. U.S. Pat. 733,000, July 7, 1903.

See Eng. Pat. 16,272 of 1902; this Journal, 1902, 1286.
—T. F. B.

Bromine; Process of Manufacturing ——. H. H. Dow, Midland, Mich. U.S. Pat. 733,466, July 14, 1903.

In manufacturing bromine from brines containing bromides, air laden with bromine and chlorine is brought into contact with a solution containing an "artificial bromide" in excess, by which the chlorine is absorbed with formati of chloride. The liquid is then transferred to the "natu brine purifier." Compare U.S. Pat. 714,160, Nov. 1902; this Journal, 1903, 26.—E. S.

Bromides; Process of Manufacturing ——, from Bromi containing Solutions. H. H. Dow, Midland, Mich. U Pat. 733,467, July 14, 1903.

Air is brought into contact with sodium chloride (or t like) solution containing free bromine, and the bromi charged air is led through solution of ammonium bromi to which ammonia, or ammonia-containing material, added, the solution being then further used in absorbi bromine from air containing the same. According to t last claim, the process of manufacturing a bromide fr bromine-containing solutions, consists in "oxidising t solution, then blowing out, purifying, and absorbing t bromine in a suitable ammonia-containing materia Compare the preceding abstract.—E. S.

Metal Sulphates; Obtaining ——, from Mattes. O. Meu, Cologne, Germany. U.S. Pat. 733,590, July 14, 1903

The ore is fused, and after removal of the gangue, matte is disintegrated, and mixed with iron pyrites and w alkali sulphide and coal. The mixture is heated "in absence of air," then allowed to crumble by exposure to and is washed, dried, and oxidised; the resulting mas then lixiviated. Compare Eng. Pat. 7463, March 27, 19 and addition to Fr. Pat. 295,879, March 21, 1902; t Journal, 1903, 212 and 93; also Eng. Pat. 23,664, 18 this Journal, 1900, 901.—E. S.

Phosphorus; Apparatus for Making ——. R. K. Dunc, Assignor to Gen. Chemical Co. U.S. Pat. 733,017, Jul, 1903.

Phosphorus; [Electrical] Process of Making ——. R. Duncan, Washington, Pa., Assignor to General Chem Co., New York, N.Y. U.S. Pat. 733,316, July 7, 190

Phosphatic material, after, in some cases, a prelimi heating by a hydrogen burner, is subjected to the dec posing action of an electric current, and the phosphides produced are placed in a chamber from which air is placed by hydrogen. Water is then admitted, wher hydrogen phosphide is set free, which, after being dri "dissociated," either by the action of heat, or by elec sparking, producing phosphorus.—E. S.

French Patents.

Alkali Metal Oxides; Obtaining ——. A. Foelsing Fr. Pat. 327,642, Dec. 23, 1902.

The metal of an alkali is melted in a covered iron cruc, and at about 250° C. a molecular proportion of a perox of the same metal is gradually added, to obtain the w oxide.—E. S.

Combinations [of Titanium Lactate] resistant to Boi Water; Manufacture of ——, from Titanic Acid Sulphuric (or Hydrochloric) and Lactic Acids. C. her. Fr. Pat. 327,528, Dec. 20, 1902.

Titanic acid is dissolved by aid of heat in an e molecular part of sulphuric acid (or two molecular par of hydrochloric acid) and with one or two molecular part of lactic acid. Or to one molecule of titanic acid, half t proportions of sulphuric or hydrochloric acid may be ta with three molecules of lactic acid. In either case, mixture is neutralised by an alkali or alkali carbo or by a hydrated alkaline earth or carbonate if hy chloric acid is used. Compare supplement to Fr. 311,094, May 23, 1901; Eng. Pats. 22,629, Nov. 9, 23,188, Nov. 21, 1901; and 14,921, July 4, 1902; Journal, 1902, 1533, 988, 988, and 1245, respectively.—

Phosphates; Process for Enriching Poor ——, Simultaneous Production of Precipitated Calcium phate. P. de Wilde. Fr. Pat. 327,669, Dec. 24, 1 XV., page 919.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

celain ; *Manufacture of* ——, C. J. A. Franzek and . X. Weigl. Both of Charlottenbrunn, Silesia. Eng. at. 14,849, July 3, 1902.

S Fr. Pat. 323,081, July 16, 1902 ; this Journal, 1903, 4 —W. C. H.

ts for Earthenware, Fireclay, Stoneware, and other lazed Goods ; New or Improved Composition for orming ——. W. Oates, Halifax. Eng. Pat. 4876 arch 3, 1903.

ixture of 60 parts of sulphur, 35 parts of fireclay, and 5 arts of red lead, is gradually heated, with continuous ing, to a temperature of 250° F., and applied hot to articles requiring jointing, by means of moulds.

—A. G. L.

French Patent.

melling in the Cold ; Process of ——. F. Boas and Co. Fr. Pat. 327,689, Dec. 24, 1902.

icles of any material are coated with a solution of -lac in alcohol, in order to fill up the pores of the ace, and then with a mixture of colophony, zinc white, benthine and india-rubber solution, to form a bed for enamel proper, which consists of a mixture of colophony, a-rubber solution, wax, and benzene, and this is coated, n dry, with a mixture of alcohol, gum-lac, and resin, to a glaze. Articles so treated are said to be protected heat, cold, rain, dryness, &c.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

ates ; Contribution to the Knowledge of ——. E. Jordis d E. H. Kanter. Zeits. anorg. Chem., **35**, 82—92, 148— 3, 336—343. Chem. Centr., 1903, **1**, [26], 1400 ; **2**,], 12, [3], 182.

li Silicates.—Determinations of the conductivity on ually adding ammonia to a solution containing 0·15 cent. of silica, indicate the existence of the compounds $_4)HSiO_3$ and $(NH_4)_2SiO_3$, and possibly also $_4)_3HSiO_4$.

lkaline Earth Silicates.—The only compound which, o the present, has been accurately examined, is the m silicate, $BaSiO_3.6H_2O$ or $BaH_2SiO_4.5H_2O$. If c acid solution, containing more than 23 per cent. of r, be introduced into excess of a boiling saturated tion of calcium, strontium, or barium hydroxide, meta-tes of the type $BaSiO_3.H_2O$ (or, perhaps, acid ortho-tes of the type BaH_2SiO_4) are produced. The barium pound forms a crystalline powder, the strontium comp d forms ill-defined crystals, and the calcium compound norphous. A silicate containing more than 1 mol. of line earth to 1 mol. of silica could not be obtained. eover, if 2 mols. of a hydrated alkaline earth be ed in a Fletcher's furnace with 1 mol. of silica, and product extracted with water, the first extract contains eponderating proportion of free alkaline earth.

ction of Solutions of Hydrated Alkaline Earth on ic Acid Solutions containing less than 23 *per cent. of ter.*—A solution of silicic acid containing less than per cent. of water yields, with barium hydroxide, a pound having the composition $3BaO.4SiO_2.4{\cdot}6H_2O$. ries of similar compounds has been prepared. Using same silicic acid solution, the compounds obtained with turated and with a dilute solution of barium hydroxide, ectively, are different ; also the compounds obtained with um hydroxide solutions and with strontium hydroxide tions of equivalent concentration are of a different acter. The barium compounds contain about 10 per ., and the strontium compounds 15 per cent. of water.

ecomposition of Alkaline Earth Silicates by Water.— trary to the view generally held, the alkaline earth ates, $X.SiO_3$ or $X.H_2SiO_4$, are fairly soluble in water, in solution, electrolytic dissociation and, at the same time, hydrolysis takes place. It has been usually accepted that the silicic acid formed is dissolved in the colloidal condition, but the authors find that it separates and passes into the sediment which settles to the bottom. The absolute solubility of the alkaline earth silicates decreases with each successive treatment with water, whilst the proportion of alkaline earth extracted becomes continuously larger, and that of silicic acid continuously smaller. The compounds described above, prepared from dehydrated silicic acid, *e.g.*, $3BaO.4SiO_2.4{\cdot}6H_2O$, behave in a similar manner to the metasilicates when lixiviated with hot water, that is, the compounds extracted are of a different composition from the original silicates. In the case of the barium compound mentioned, after continued treatment with hot water, a gelatinous body was separated from the solution, by means of alcohol, having a composition corresponding approximately to the formula $BaSiO_3.H_2O$. Thus, with these compounds also, the proportion of silicic acid continuously decreases and that of alkaline earth increases in the solution. A number of the different compounds prepared are described in the original.—A. S.

English Patents.

Building Materials ; Improved Artificial ——. B. J. B. Mills, London. From A. Seigle, Lyons, France. Eng. Pat. 17,579, Aug. 11, 1902.

Chips or shavings of rough iron are formed into blocks, and the latter are evenly oxidised, for example, by placing them in water acidulated with nitric acid. The metallic mass is then placed in a mould, into which a damp and plastic mixture has first been introduced. This mixture should consist principally of lime and very silicious sand, together with some ferrous oxide or "oxide of chrome iron," *e.g.*, ·90 per cent. of sand, 7 per cent. of lime, and 3 per cent. of ferrous oxide or "oxide of chrome iron." The mould is then filled under pressure with the mixture, the articles removed and submitted for 10 to 12 hours to the action of steam under a pressure of 8 to 10 kilos., after which they are ready for use.

To render the articles impermeable, some percentages of a mixture containing oxides or silicates of lead, potassium or sodium, and boric acid or borates, may be added to the mass before moistening. After the articles have been steamed, they are then slowly heated to a cherry-red heat, by which they are vitrified.—A. G. L.

Brick Kilns ; Impts. in ——. J. W. D. Pratt, Oldbury. Eng. Pat. 7850, April 4, 1903.

Arches are provided at frequent intervals over a central flue running down the middle of the kiln floor, which is plain, the bricks to be dried forming the ducts to the openings between these arches for the passage and exit of the exhaust gases. The shafts leading from the "steam" flues are also separated from the firing holes, and the "steam" flues are built inside the main brickwork.

—A. G. L.

United States Patent.

Cement. T. B. Joseph, Salt Lake City, Utah. U.S. Pat. 732,640, June 30, 1903.

The cement contains calcined calcium sulphate with water, arsenic acid, barium peroxide, and ammonium chloride, to which petroleum oil may be added. Or, the cement may contain only calcined calcium sulphate, with water and arsenic acid, with or without ammonium chloride.—E. S.

French Patent.

Stone ; Manufacture of Very Refractory ——. J. Horak. Addition, dated Dec. 23, 1902, to Fr. Pat. 314,559, Sept. 28, 1901.

A supplementary patent referring to the hardening under pressure, in steam boilers, of a mixture of powdered sandy or quartz-containing minerals, with hydraulic lime, or of the lime mixed with one or more of the following,—clay, or oxides of iron, aluminium, magnesium, barium or strontium, or their compounds. See Eng. Pat. 19,283, 1901 ; this Journal, 1902, 1078.—W. C. H.

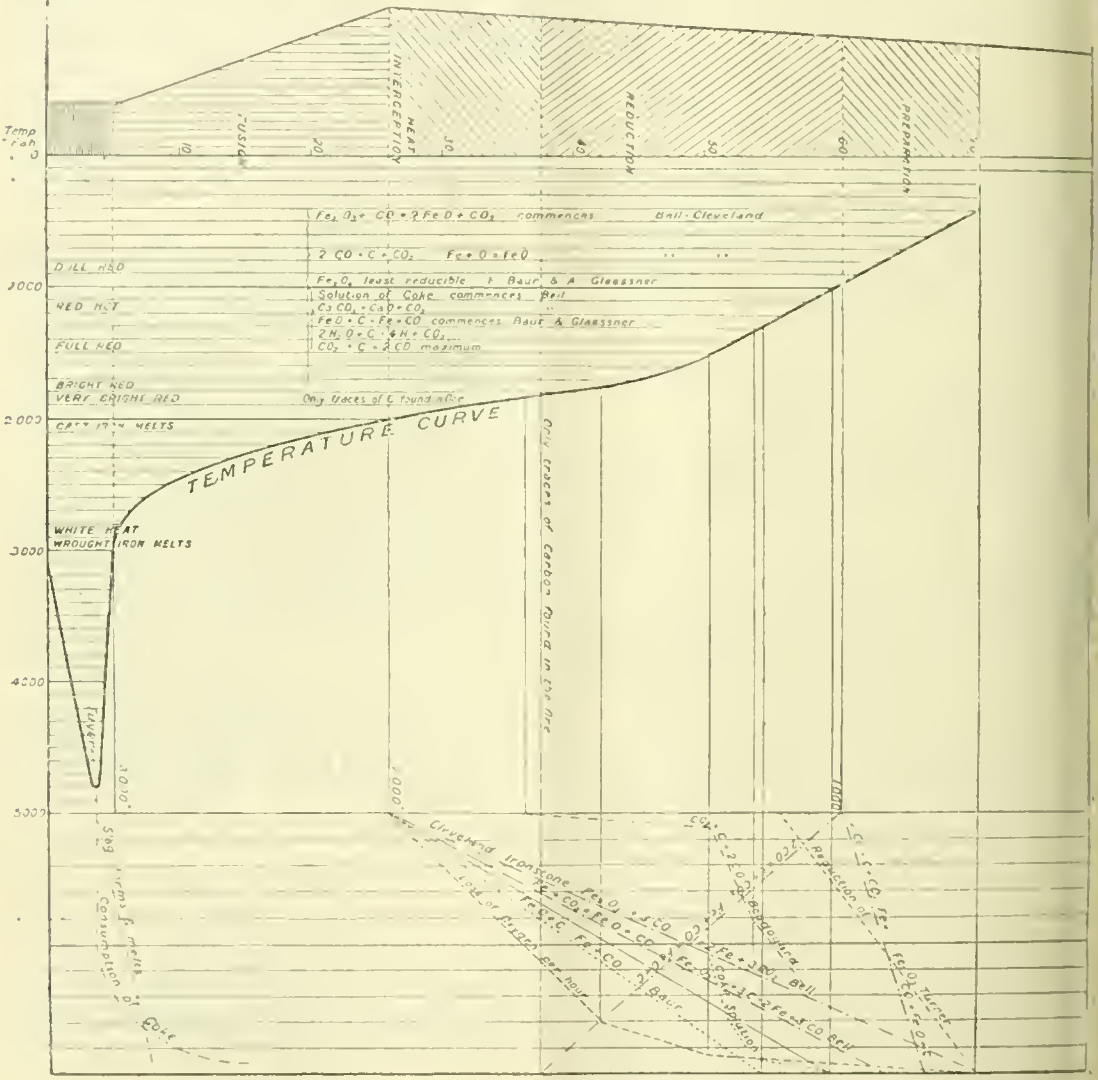
Stone; Process of Making Artificial ——. W. Black and H. S. Richards. Fr. Pat. 327,629, Dec. 23, 1902.

SEE U.S. Pat. 716,371 of 1902; this Journal, 1903, 145.
—T. F. B.

X.—METALLURGY.

Blast Furnaces; Temperature Reaction in the ——. H. Allen. Engineer, 1903, **96**, [2482], 84.

THE accompanying diagram was constructed chiefly from results obtained with Cleveland ore smelted with coke fuel and limestone flux, but it will apply, to a great extent, to any blast furnace, since any change in the proportions of the furnace, the quantity and pressure of the blast, temperature of the blast or the height of the furnace w have no very considerable effect upon the curve shov the temperature in the different zones, other than extenc or reducing the height to which it attains. In general increase in the height would have the effect of raising temperature curve rather than of reducing the tempera at the top of the furnace. By a double row of tuyère greater volume of blast would be admitted, but, owing the rapid reduction of temperature, the curve in the of fusion would not be greatly affected, unless the differe in the height of the two rows of tuyères were considera Most of the slag is formed in the neighbourhood of tuyères, as the slag-forming constituents are more or widely separated during the descent of the furnace charge, the lime for fluxing being generally in pieces of considerable size, which do not come into intimate contact with the silica, &c., until the hottest part of the furnace is reached.



Rate of Chemical Action at Temperatures given

Sir L. Bell has shown that some varieties of coke are more readily acted upon than others with regard to "solution by carbonic acid gas" and the author points out that this will explain why, in some instances, increasing the volume and pressure of the blast has not resulted in economy and increased output of iron, "through a more active solut of coke by the carbon dioxide." The diagram also affo an explanation of the effect, on the quality of the iron allowing the stock to fall too low, whilst the temperatu in the heat interception and fusion zones will rem constant, the volume of the zones of preparation reduction will be considerably curtailed, and consequen a higher proportion of the oxide of iron will be reduced solid carbon instead of by carbon monoxide.—A. S.

C bon Monoxide ; Action of ——, on Iron and Oxide of on. G. Charpy. Comptes rend., 1903, **137**, [2], 0—122.

A on of Carbon Monoxide on Metallic Iron.—The au or confirms the view of Margueritte that the action is e of cementation. Metallic iron was heated in a slow cu ent of carefully purified carbon monoxide, then the in ase in weight of the metal, and the amount of carbon di de formed were determined, and also, by combustion of e metal, the amount of carbon absorbed by the iron. A ve 750° C. the deposition of carbon on the surface of th iron is practically nil. The following results were ob ned :—

pera- ire.	Duration of Heating.	Carbon fixed by the Iron, as shown by Increase of Weight of the Metal.	Combustion of the Metal.	Weight of Carbon Dioxide produced.
C.	Hours.			
560	8	0·10	0·09	Deposit of carbon.
60	8	0·22	0·17	"
715	8	0·26	0·28	"
825	3	0·56	0·57	0·60
25	2	0·69	0·72	0·60
35	2	0·41	0·41	0·49
25	2½	0·60	0·58	0·58
50	2	0·44	0·47	0·44
85	2	0·53	0·53	0·58
125	2	0·46	0·50	0·47
175	2	0·47	0·47	0·51
185	2	0 53	0·53	0·47
190	2	0·30	0·36	0·33

e figures show that the speed of cementation does not e bly increase at temperatures above 900° C. ; this is ac however, owing to saturation being attained, as the au or has previously shown that by sufficiently prolonged co act of iron with carbon monoxide, a separation of gr hite in the metal occurs. If, instead of heating in a cu ent of the gas, the iron be heated in presence of a li ed quantity of carbon monoxide, the carburisation stops w the proportion of carbon dioxide formed, attains a ce in value.

tion of Carbon Monoxide on Oxide of Iron.—On be ng ferric oxide in a current of carbon monoxide, it is re ced to metallic iron, more or less carburised, at all te eratures between 200° and 1200° C., the reduction be more rapid at the higher temperatures. At 280° C. th reduction is complete in 27 hours. Above 1100° C., if e oxide of iron is in contact with porcelain, a fused fe us silicate is produced, which is reduced only with gr difficulty, but if the iron be heated in a crucible of m esia, the reduction to metallic iron is complete.—A. S.

N el Steels ; Consequences of the Theory of the ——. E. Guillaume. Comptes rend., 1903, **137**, [1], —46. (See also this Journal, 1903, 868.)

T theory by which the anomalies of the nickel steels are ex ined by the transformation of the iron from the *α* co ition to the *γ* condition, or *vice versa*. leads to further de lopments. The abnormal course of the variation of th modulus of elasticity at ordinary temperatures is ex ined by the fact that the transformation of the iron fr the *β* to the *γ* state takes place with a considerable c ge of volume. The changes in volume of nickel steel u r the influence of the magnetic field may be as much as times greater than those of iron. It therefore follows th the actual state of the iron, isolated or dissolved in ni el, depends not only on the temperature and pressure, bu also on the magnetic field, which thus becomes a third ad e factor in the expression of the phase law applied to st s. Alloys other than nickel steels do not appear to po ess analogous properties. Iron very sparsely distr ted is not sensibly magnetic apart from the solvent m l, and the iron in steels rich in nickel will be magnetic or u-magnetic simultaneously with the nickel, *i.e.*, it will as ne the temperature of transformation corresponding to th nickel.

If this be correct the reversible anomalies are the necessary result of the dissemination of the iron in a solvent of a magnetic metal which has a temperature of transformation lower than that of iron, and nickel is the only metal fulfilling the conditions.—J. F. B.

Sulpho-Telluride [Gold] Ores ; Cyaniding ——. P. Argall. Eng. and Mining J., 1903, **76**, [2], 53.

The author compares the Diehl process for the treatment of sulpho-telluride ores by means of fine grinding and subsequent treatment with potassium cyanide and cyanogen bromide (this Journal, 1902, 1029) with the ordinary process of roasting followed by cyaniding. Knutsen has stated that the comparative cost of treatment per ton of ore is 8·9659 dols. (37*s.* 4·295*d.*) by the roasting process, and 7·8606 dols. (32*s.* 9·03*d.*) by the Diehl process, and that the return of gold is 0·88 dol. (3*s.* 8*d.*) per ton more by the latter process. The author points out, however, that according to Knutsen's figures, the capacity of the roasting plant appears to be only about 60 per cent. of that of the Diehl plant, yet the cost of supervision, engine driving, &c., is about 50 per cent. greater for the smaller plant. Again, by the roasting process the whole of the yield is in the form of bullion, whilst by the Diehl process about 42 per cent. of the bullion content of the ore is left in the form of high-grade concentrates which can neither be handled nor roasted without loss of value; the additional smelting charge for extracting the values from the concentrate is apparently not included in Knutsen's figures. In this comparison also the roasting plant has not been credited with flue dust or "sweeps." According to the author a comparison of the Diehl process with the roasting process in the case of the sulpho-telluride ores of Cripple Creek, Colorado, would work out as follows :—

Diehl Process.—Cyanogen bromide and royalty, 1 dol. (4*s.* 2*d.*); fine grinding, 0·5 dol. (2*s.* 1*d.*); filter-press work and agitation, 1·25 dols. (5*s.* 2½*d.*); total cost, 2·75 dols. (11*s.* 5½*d.*) per ton.

Roasting Process.—Roasting, 0·5 dol. (2*s.* 1*d.*); tank-work, 0·25 dol. (1*s.* 0½*d.*) ; total cost, 0·75 dol. (3*s.* 1½*d.*) per ton.

There is thus a difference of 2 dols. (8*s.* 4*d.*) in favour of the roasting process, and assuming the consumption of cyanide to be the same in each case, the author states that it is evident that the total cost of cyanogen bromide, grinding the ore from 30-mesh size to 200-mesh size, filter-press work, and concentration would have to be less than 1 dol. (4*s.* 2*d.*) per ton before the Diehl process could compete successfully with the roasting process in the treatment of Cripple Creek sulpho-telluride ores.—A. S.

Lead Bullion ; Refining ——. F. L. Piddington. J. Chem., Metall., and Mining Soc. of S. Africa. 1903, **3**, [13], 207—210.

The Parkes process, as applied by the Smelting Co. of Australia, is carried out in six stages, the amount refined being about 200 tons weekly.

(1) *Softening the Base-bullion.*—To remove copper, antimony, &c. This is effected in a double set of 15-ton furnaces, water-jacketted, with 2-in water space, for 3 ins. above and 6—9 ins. below the charge-level. The furnace is built into an iron pan. The bullion contains 2—3 per cent. of impurities. The bars are melted slowly to remove as much copper as possible ; the copper dross is drained free of lead, and sent back to the blast-furnace, either direct or after liquating. The copper removed, the temperature is raised, and a tin and arsenic skimming is removed : the temperature is then again raised, and the antimony collects in oily drops ; when these have accumulated to a depth of ½ in., lime, ashes, or fine coal are stirred in, and the thickened dross is skimmed. The operation is repeated again and again, with stirring, until the dross is yellow and breaks with the long grain of pure litharge. The antimony dross is used for the production of hard lead.

(2) *Removal of precious Metals by Means of Zinc.*—The kettle used is of cast-iron or steel and carries 12—13 tons. The lead run from the softening furnace into the kettles throws up dross which is removed. The lead is heated to the melting-point of zinc, the zinc is added, the whole

cooled, and the zinc removed, the operation being repeated once, or, it may be twice. The crusts are kept separate. Where the gold is first abstracted with as little silver as possible, the amount of zinc added first is calculated on the gold contents. 1 lb. of zinc will remove 1·5 oz. of gold when the total amount of gold in the kettle is 300 oz.; 1·0 oz. when the total amount is 200 oz.; 0·79 oz. when it is 150 oz.; 0·59 oz. when it is 100 oz., and 0·45 oz. when the total amount is 60 oz.

With regard to silver zincing, the following general results were obtained with 11-ton charges:—1 lb. of zinc removed 5·6 oz. of silver when the total amount of silver in the kettle was 1,450 oz.; 4·1 when it was 1,200 oz; 3·8 oz. when it was 930 oz.; 3·5 oz. when it was 755 oz.; 3·4 oz. when it was 616 oz.; and 2·6 oz. when the total amount was 460 oz. of silver. Or, extracting gold and silver together:—

Total contents of Kettle.		1 lb. of Zinc takes out	
Gold.	Silver.	Gold.	Silver.
Oz.	Oz.	Oz.	Oz.
494	3,110	0·59	3·60
443	1,883	0·64	2·89
330	2,417	0·45	3·34
204	1,638	0·36	2·86
143	1,330	0·28	2·65
128	1,320	0·23	2·54

The richer the bullion, the greater is the extracting power of the zinc, and with very rich bullion it suffices to use 250 lb. for the first addition; the second addition averaged 127 lb.; and the third 57 lb.; but, in 112 out of 237 charges, no third addition was necessary.

(3) *Refining the Lead.*—The lead is treated with dry steam delivered through a $\frac{3}{4}$ in. pipe to the bottom of the vessel, the lead being hot enough to burn the zinc. 4 hrs. were usually enough for heating and 3—4 hrs. for steaming. The average life of the refining kettle is 60 charges, and steel kettles are preferred to those of cast-iron. Zincing kettles have a longer life.

(4) *Liquation of Zinc Crusts.*—The furnace slopes $\frac{3}{4}$ in. per foot from bridge to flue and from sides to centre. The liquated lead rarely contains more than a few ounces of silver per ton.

(5) *Retorting the Liquated Alloy.*—A Du Faur tilting-furnace is used with Battersea retorts, carrying 560 lb. each. These are charged hot, and have an average life of 30 charges. The condenser is of one-eighth inch iron formed into a cylinder 12 in. in diameter, open at one end, and lined with a mixture of lime, clay, and cement. It has three holes, two on the top, one (the vent-hole) at the furnace end, and one at the other end, and a tap-hole on the bottom for condensed zinc. The bullion left after distillation is expelled; the zinc is used again; the zinc powder is sieved and then used in the blast-furnace or as a precipitant in cyanide work; the dross is worked up; and the slag is sent to the blast-furnace. The zinc recovered is about 60 per cent. of that used originally. The retort dross consists of lead-zinc-copper alloy with carbon, and if much copper is left in the original bullion before zincing it passes into the dross, and carries much gold and silver with it. The dross may contain more of these precious metals than the retort bullion itself (*e.g.*, in one case the assay of the dross showed 800 oz. of gold and 3,000 oz. of silver per ton).

(6) *Cupellation of the Retort Bullion.*—The gold and silver are concentrated up to 50—60 per cent. in a water-jacketted cupel, and then transferred to the finishing cupel. A sulphuric acid parting plant is used.—W. G. M.

Alloys suitable for Bearing Purposes; A Study of ——. G. H. Clamer. J. Franklin Inst., 1903, 156, 49—77.

The author's researches are in continuation of those of Dudley (this Journal, 1892, 440) and Job (*ibid.*, 1902, 974).

After pointing out the uncertainty which still exists as to the composition of the alloy best suited for journal brasses, and the multiplicity of formulæ which have been recommended, the author proceeds to a general discussion f the essential characteristics of such alloys suitable, m especially, for railway journal bearings. A successful be ing alloy must consist of at least two structural constitue *viz.*, a hard constituent to support the load, and a s constituent to act as a plastic support for the harder gra If the bearings were always in perfect adjustment to journal, a hard unyielding alloy would give the best resu since, generally speaking, the harder the alloy the lower coefficient of friction; but, owing to the imperfection the surfaces which have to be dealt with in practice, it found that a hard unyielding alloy, which cannot mo itself to the irregularities on the journal, causes a conc tration of pressure upon a few high spots, with the re that rapid heating and abrasion occur, leading to hot bo and rapid wear and tear. On the other hand, soft me bearings are apt to cause unduly rapid wear of the journ though whether this is due to the imbedding of grit in bearing surface, with consequent formation of the lap, to the fact that the metal itself has a dragging nature, t author is not prepared to say. Excessive collar wear journals is, however, undoubtedly caused by the lead lin of brasses lapping out the fillets.

Of the white metal alloys, the cheapest which can used is composed of lead and antimony. These met alloy in all proportions, but the mixture which alone is f from segregation is the eutectic mixture composed, appro mately, of 87 per cent. of lead and 13 per cent. of antimo This mixture has been adopted by the Pennsylvania R. for lining-up brasses. Alloys containing less than 13 cent. of antimony consist of dendrites of pure lead i bedded in a matrix of eutectic; with more than 13 cent. of antimony, free crystals of the latter appear. W increasing antimony the alloys become more brittle, un with above 25 per cent., they are unsafe for use. Char considers that the alloys containing between 15 and 25 cent. of antimony are the best constituted for bearings, t free antimony forming the necessary hard constitue embedded in the plastic eutectic; but the author points that the alloys containing free lead also possess the necessa structure of a hard constituent (the eutectic) imbedded the more plastic lead, and that although the friction of su alloys is higher than that of alloys containing excess antimony, the wear is much less. Experiments prove th lead is the best wear-resisting metal known, and that wi increasing antimony, and increasing hardness and brittlene the wear becomes more marked, owing to the breaking of the harder particles. The addition to tin of the lea antimony alloy imparts rigidity and hardness, withc increasing brittleness, and is desirable when high pressur have to be carried, though it increases the cost. Babb metal, composed of tin (89·1), antimony (7·4), and copp (3·7), which is still regarded as the standard of excellenc is the most expensive of all white metals, and in t majority of cases might be replaced by cheaper alloy The addition of lead in small proportion to this al renders it superior in every way.

Passing now to the bronzes composed of copper, tin, a lead, the author has confirmed and extended the work Dudley. For this purpose he has used a testing machi designed by Prof. Carpenter, of Cornell University, co sisting of a journal, $3\frac{3}{4}$ ins. in diameter, revolving on large cast iron wheel, which takes the weight and preve heating of the journal bearings. The test-bearing is 3 long by $\frac{1}{2}$ inch wide, and can be weighed on a chemic balance. It is held in contact with the journal by mea a ball and socket joint, connected with a weighted lever, t pressure being applied by means of a powerful spring, a a weight sliding along a graduated arm attached to the le gives the friction in pounds. A thermometer indicates t temperature of the test-bearing. In each test the jour made 100,000 revolutions, at a speed of 525 per minute, a the wear of the journal was determined by weighing it be and after the test. The method of lubrication was t same in all tests, and consisted in keeping waste saturat with Galena oil, in contact with the underside of t journal. Each of the alloys made and tested was subje to chemical analysis and microscopic examination. T results obtained, confirm the conclusions reached by Dudl

, that the rate of wear diminishes with the decrease of and with the increase of lead. Dudley's "Ex. B" alloy, posed of copper 78 per cent., tin 7 per cent., and lead per cent., was believed to represent the limit of diminu- of tin and increase of lead possible in practice without ation of the lead occurring in the mould. But in view of marked diminution in the rate of wear produced by each ease in the percentage of lead up to 15, it seemed highly rable to endeavour to make alloys containing still more . It was then discovered that whilst a certain amount n was necessary to prevent liquation of the lead, and to give the alloy sufficient compressive strength, a ter amount was very detrimental. Alloys containing r cent. of tin and 30 per cent. of lead were produced out difficulty; but if the tin exceeded 6 to 6½ per cent., ings containing 30 per cent. of lead could not be ined: and if the tin exceeded 7 per cent., not more 20 per cent. of lead could be introduced, except on a l scale and by the use of chill moulds. This the or explains as probably due to the fact that these 's are constituted of dendrites of copper freezing at c 1,800° F., a eutectic made up of alternate laminæ of lloy $SnCu_3$ and copper, freezing at about 930° F., and lead melting more than 300° F. below the eutectic; that when the amount of eutectic is increased to such xtent as to keep a large bulk of the alloy for a long liquid in the mould, time is given for the lead to te to the bottom; whilst in the presence of only a l proportion of eutectic, solidification takes place lly, forming the copper-tin network which envelops upholds the still liquid lead. This is proved by the that such castings may be withdrawn from the sand still red-hot and yet show no sweating of the still d lead. However, the presence of certain impurities, sting at too high a temperature, may still cause slight gation, even when adhering to the proper proportion of and as casting in iron moulds is quite impracticable any patterns, it was sought to find some metal which, ded to the mixture, would cause more rapid solidifica- of the castings. This result was obtained by the ion of from ½ to 1 per cent. of nickel. The alloy y adopted was composed of copper 64 per cent., tin 5 per , lead 30 per cent., and nickel 1 per cent., and is known Plastic Bronze." Nearly four million pounds of it been successfully made during the past three years, stings weighing from a fraction of a pound to over lb. It is handled as readily in the foundry as any of ommon alloys; castings are sharp and clean, and are y machined. Nickel was purposely not added in ng the test-bearings used for the experiments recorded table, as it was thought desirable to have no metal ut throughout the series other than copper, tin, and The results prove that the reduction of tin and the ion of lead, whilst increasing the friction and, to some t, the rise of temperature, enormously reduce the f wear.

—	Copper.	Tin.	Lead.	Friction.	Temp. above Room.	Wear in Grms.
				Lb.	F.	
1	85·76	14·90	..	13	50	0·2800
2	90·67	9·45	..	13	51	0·1708
3	95·01	4·95	..	16	52	0·0776
4	90·82	4·62	4·82	14	53	0·0542
5	85·12	4·64	10·64	18¼	56	0·0380
6	81·27	5·17	14·14	18⅓	58	0·0327
7	75[illegible]	5[illegible]	20[illegible]	18½	58	0·0[illegible]77
8	68·71	5·24	26·67	18	58	0·0204
9	64·34	4·70	31·22	18	64	0·0130

—L. A.

Bronzes and Bearing Metals; Analysis of ——. E. Walters and O. J. Affelder. XXIII., page 927.

ınium; Solubility of ——, *in Nitric Acid.* R. Woy. ts. öffentl. Chem., **9**, 158—161. Chem. Centr., 1903, [2], 93.

Co rary to the statements in text-books, &c., that alu ıium is acted upon only slightly or not at all by nitric acid, the author finds that commercial aluminium is rapidly dissolved by nitric acid, with formation of ammonia.—A. S.

Cyanide Solutions; Assaying —— [*Determination of Gold and Silver*]. Mining and Scientif. Press (Cal.). XXIII., page 927.

English Patents.

Sulphur; Elimination of ——, *from Sulphide Ores.* E. H. Miller, London. Eng. Pat. 15,272, July 8, 1902.

The powdered ore is mixed with carbon and with sodium sulphide, "or other suitable sulphide," and the mixture is heated to incipient redness with limited access of air for a short time; after which, the roasting is continued with free admission of air. After partial cooling, the charge is mixed with sodium nitrate, or other suitable nitrate, and is heated to complete the oxidation.—E. S.

Precious Metals from their Ores: Apparatus for Use in the Extraction of ——. W. A. Mercer, London, and J. B. de Alzugaray, Shortlands, Kent. Eng. Pat. 17,322, Aug. 6, 1902.

The apparatus is especially intended for use in the process of treating ores for their precious metals, consisting in blowing a halogen, such as bromine, mixed with oxygen or oxygenated gases through a mixture of the ore with a cyanide solution. The present invention relates to means for employing mechanical agitation, to keep the ore in suspension in the liquid whilst the chemical, whether gaseous or liquid, is being forced in. The closed vessel is provided with fixed internal blades, a rotary hollow spindle with ball bearings and with blades or beaters set at an angle, and carrying at the back perforated lead pipes, with means for raising, lowering, and rotating the spindle, and there are steadying and supporting adjuncts. See U.S. Pat. 701,002, May 27, 1902 and Eng. Pat. 15,541, July 31, 1901; this Journal, 1902, 863 and 1140; also U.S. Pat. 724,076, March 21, 1903; this Journal, 1903, 558.—E. S.

Tin; Treatment of Stanniferous Ores to Facilitate the Extraction of ——, *and the Accompanying Metals.* H. Mennicke, Höchst a M., Germany. Eng. Pat. 17,616, Aug. 11, 1902.

Oxide tin ores, or sulphide ores after roasting, are crushed, moistened with water, and introduced into fused sodium bisulphate, heated to about 300° C., and towards the end of the operation, to about 425° C. A small proportion of sodium nitrate is preferably added. The mass is stirred for half an hour or less, and is then chilled with water, and lixiviated. The solution contains the silver, bismuth, tungsten, and copper originally present in the ore, as sulphates. Lead sulphate is washed out from the residue, which then forms a pure oxidised tin ore, from which the metal may be obtained by smelting.—E. S.

Zinc and other Sulphides; Extraction of ——, *from their Ores.* G. C. Marks, London. From G. D. Delprat, Broken Hill, New South Wales. Eng. Pat. 26,272, Nov. 28, 1902.

Ores containing zinc sulphide, or other sulphides, are added, in fine powder, to a bath of salt cake (sodium bisulphate) dissolved in water, of sp. gr. 1·4 approximately, which is kept hot, but not boiling. The sulphides which rise to the surface are skimmed off from time to time.

—E. S.

Pulverizing Mills for the Treatment of [Gold] Ores and the like. J. H. Elspass, Los Angeles, California. Eng. Pat. 7897, April 6, 1903.

The mortar of the mill is mounted to rotate on a number of bevelled rollers set at an inclination to the horizontal. The pulverizing rollers are also mounted at an inclination in vertically-movable journal-boxes mounted in inner and outer posts forming the frame, and work in conjunction with an annular steel die set in the bed of the mortar, the pressure on these rollers being adjustable by means of a pressure-screw acting through a crosshead and springs on the journal-boxes. The mortar is formed with an inclined annular ledge outside the die, and is provided with a screen outside the ledge, a plough supported over the ledge being arranged to throw the upper layer of pulverized material outwardly against the screen and also inwardly over the mortar face. The material which passes through the screen falls over an inclined amalgamating plate into a trough at the base.—R. A.

Cast Iron; Soldering Compound for ——. G. Huth, London. Eng. Pat. 8466, April 14, 1903.

The soldering compound is composed of a finely-divided metal, as iron or copper, either superficially oxidised, or coated with an "oxygen compound," mixed with a flux, such as borax, and paraffin oil or the like.—E. S.

Aluminium; Soldering ——. C. Sorensen, Slagelse, Denmark. Eng. Pat. 9715, April 29, 1903.

Potassium chloride is applied to the cleansed surface of the aluminium, which is then heated from below to about 600° C., whilst the saline coating is heated to about 900° C., thus binding both. After partial cooling, tin is applied, when the aluminium is soldered to the metal concerned at a temperature of 328° C.—E. S.

Foundry Sand; Process of Renovating ——. H. H. Lake, London. From General Electric Co., Schenectady, N.Y. Eng. Pat. 16,926, July 30, 1902.

"Spent" or used foundry sand is renovated by washing it with water, the sand being at the same time stirred, whereby the foreign objectionable matter is rubbed and washed away, about 90 per cent. of the total amount of sand used being recovered. The sand is then more or less dried, mixed with silica or the like to give it the requisite fineness, and then mixed with unburnt clay and molasses, water, or other binding agents.—A. G. L.

Cement Composition [for Blow-holes in Castings]; New or Improved ——. W. Perry. Eng. Pat. 24,094, Nov. 4, 1902. I., page 899.

United States Patents.

Metallurgical Furnace. M. P. Boss, San Francisco, Cal., Assignor to the Hydrocarbon Smelting Company, West Virginia. U.S. Pat. 732,263, June 30, 1903.

An elevated hopper delivers the ore or material to be treated into an inclined calcining chamber, communicating at its base with an oppositely inclined hearth, delivering on to a horizontal hearth; above which an oxidising atmosphere is maintained, whilst above the inclined hearth is a reducing atmosphere. The furnace is intended to be fed with hydrocarbon fuel, which is introduced longitudinally and transversely in the inclined hearth chamber, and transversely of the lower chamber, the exit flue from which leads from the point of connection of the two chambers. Many other features are claimed. Compare U.S. Pat. 708,116, Sept. 2, 1902; this Journal, 1902, 1400.—E. S.

Metallurgical Furnace. M. P. Boss, San Francisco, Cal., Assignor to the Hydrocarbon Smelting Company, West Virginia. U.S. Pat. 732,264, June 30, 1903.

The furnace comprises connected calcining, reducing, and oxidising chambers, with means for producing the required atmospheres in them, an air-heating chamber being situated partially over and partially under the two latter chambers, connected by a vertical flue, and open to the atmosphere at one end, means for impelling air into the oxidising chamber being provided. Series of hydrocarbon burners are suitably arranged for the purposes indicated.—E. S.

Metallurgical Furnace. M. P. Boss, San Francisco, Cal., Assignor to the Hydrocarbon Smelting Company, West Virginia. U.S. Pat. 732,265, June 30, 1903.

The main features of the furnace are similar to those described in the two preceding patents. Means are claimed whereby gaseous flames may be freely developed where required, either oxidising or reducing in character, without actual contact with the material in the chambers.—E. S.

Metallurgical Furnace. M. P. Boss, San Francisco, C Assignor to the Hydrocarbon Smelting Company, W Virginia. U.S. Pat. 732,266, June 30, 1903.

The calcining, reducing, and oxidising chambers arranged and heated substantially as in the former paten The oxidising chamber is provided with a hearth lon than the chamber, and extending into the reduci chamber, covered with a bed of fusible material, wh will chemically combine with the partially reduced me or ore body discharged on it, on which fusible material i floating bridge serving to divide the chamber at the surf of the molten metal into two parts; one part forming a sl basin, and the other, a refining basin, both having de sufficient to allow vertical fining of the metal from its pu of ingress into the chamber to its point of egress.—E. S.

Metallurgical Furnace. M. P. Boss, San Francisco, C Assignor to the Hydrocarbon Smelting Company, W Virginia. U.S. Pat. 732,267, June 30, 1903.

A chamber in which a reducing atmosphere is maintai has an arched top, and is provided with a conical hear connected with a second chamber for oxidation, havin basin-shaped hearth, on which a supplemental body material, adapted to react with the substance under tre ment, receives an air blast through its body. Means free development of flame in the upper part of the oxid ing chamber are provided, and these flames do not co into contact with the material under treatment.—E. S.

Metallurgical Furnace. M. P. Boss, San Francisco, C Assignor to the Hydrocarbon Smelting Company, W Virginia. U.S. Pat. 732,268, June 30, 1903.

The furnace includes a calcining and a reducing cham having inclined hearths, with heating means, a tank ha a floating slag-ring into which the metal from the redu chamber passes, and an oxidising chamber provided wi removable hearth on to which the metal flows from tank. Below this hearth is a series of tuyères ha couplings projecting below the bottom of the hearth, an removable device for feeding them with air. The pass way between the tank, or fining portion of the hearth, the movable portion of the same, is provided with an open to the outside of the furnace.—E. S.

Metallurgical Furnace. M. P. Boss, San Francisco, Assignor to the Hydrocarbon Smelting Company, W Virginia. U.S. Pat. 732,269, June 30, 1903.

In this form of furnace, besides calcining and reduc chambers, a removable oxidising hearth is mounted o trackway, with means for continuously tilting both, c sisting of a pair of discs on which they are mounted, h opposing surfaces arranged at an angle to the plane of horizon, which discs can be rotated relatively to one anot —E.

Ores [of the Precious Metals]; Process of Leaching — G. E. Thede, Havilah, Cal. U.S. Pat. 732,605, June 1903.

The ore is treated with a cyanide solution contai hydrogen peroxide and an oxide reducible by such oxide; or such an oxide may be first mixed with the which is then leached by the cyanide solution contai hydrogen peroxide, or instead of hydrogen perox another oxide capable of reacting with the oxide m with the ore.—E. S.

Gold-Extracting Process. T. B. Joseph, Mercur, Ut U.S. Pat. 732,639, June 30, 1903.

Ores containing precious metals are leached by aqueous solution of potassium cyanide, containing brom calcium hydroxide, barium peroxide, and carbon diox the pulp being agitated by forcing in compressed air the carbon dioxide may be forced in with the lat Alternatively, the ore may be treated with potass eyanide solution containing barium bromide and perox Compare U.S. Pats. 718,633, Jan. 20, and 728,397, May 1903; this Journal, 1903, 214 and 747.—E. S.

tal-Leaching Process. T. B. Joseph, Salt Lake City, Utah. U.S. Pat. 732,641, June 30, 1903.

M ALS are extracted from their ores by subjecting the la r to the action of an aqueous solution of sulphuric ac sodium chloride, nitric acid, potassium permanganate, an sodium thiosulphate; or the sodium chloride and th sulphate may, severally or jointly, be omitted.—E. S.

old; Process of Extracting ——, from Ores. H. R. C sel, New York, N.Y. U.S. Pat. 732,708, July 7, 1903.

A lkaline solution in which bromine has been collected, is cidulated to set bromine free, and is then used in le ing the ore; to the resulting liquor a bromate and an cid are added, and from the sub-divided solution the br ine is vaporised, and collected in solution of an al i hydroxide for re-use as described. From the liquor th freed from bromine, the gold is then precipitated. C pare U.S. Pats. 694,349 and 694,350, March 4, 1902; th Journal, 1902, 485 and 486.—E. S.

G ; Apparatus for Extracting ——, from Ores. H. R. C el, New York, N.Y. U.S. Pat. 732,709, July 7, 1903.

T apparatus for conducting the process described in the r ding patent (see the above abstract) comprises an ore-ve l, having at its top an inclosed solution-distributor, o unicating on one side with an "alkaline bromine- ion" tank, and on the other side with an acid tank; a a o receive the liquor; a communicating tank; a a ising tower in connection with an air-blast; a gold- r itating tank; and a bromine recovery tower, in which b romine vapours from the vaporising tower are ab bed by caustic soda solution, for use, after acidulating, a ating fresh portions of ore. Other accessory vessels an onnections are described.—E. S.

M llurgical Processes; Apparatus for Use in —— yaniding Gold and Silver Ores]. F. H. Officer, H. Officer, J. H. Burfeind, and J. W. Neill, Salt Lake y, Utah. U.S. Pat. 733,739, July 14, 1903.

In closed tank in which the ore-pulp is treated with a y le solution (in the case of gold and silver ores) has a o l bottom, into or near the apex of which a pipe a g centrally from above into the tank, leads compressed r gas. From the apex there is a discharge opening n ipe leading to a filter-press, the flow being aided by o ressed air or gas, which is also passed upwards from he ex within the tank. From the top of the tank a p asses, the downward continuation of which reaches ar the bottom of an absorption tank, containing a ca alkali solution, means for delivering which into the re g tank are provided, as well as for circulation thr ghout of compressed air or gases. Compare U.S. Pat 05,698, July 29, 1902; this Journal, 1902, 1141.

—E. S.

r us Metals; Process of Extracting ——, from their s. J. W. Maxwell and J. W. Sawyer, Louisville, K U.S. Pat. 733,859, July 14, 1903.

The owdered ore is treated "with heat, sodium chloride, xy , nascent chlorine," and with a current of chlorine gas volatilise the non-metals, and carry them, as chlorides r erwise, to be condensed; the chlorine is then passed a pid current under pressure, at a temperature commen g at about 360° F., and slowly rising to about 755° F., t ch the current is maintained for from one to three u The base-metal chlorides, and some silver chloride, l ised, are collected, and the excess of the chlorine s stored. A mixture of hot hydrogen and superhea steam is then passed through the still heated ore r hort time, to remove chlorine, &c.; mercury vapour is t passed under pressure to amalgamate "floured" ld The ore thus prepared is washed by chlorine water, be y chlorides of precious and other metals not previou removed (except silver chloride) are dissolved. The lution, filtered from the pulp, is treated with sodium sulp le to recover the dissolved metals as sulphides. The silv chloride retained by the pulp is dissolved out of it by lution of sodium thiosulphate, from which solution the silver is precipitated as sulphide. The pulp is then treated with a stated proportion of mercury, the gold being recovered from the resulting amalgam in the usual way.

—E. S.

Aluminium; Soldering of ——. H. Lange, Vesterås, Sweden. U.S. Pat. 733,662, July 14, 1903.

The cleansed aluminium surfaces are heated and covered with a layer of molten zinc, and then with molten aluminium-zinc alloy; the surfaces are then held in contact whilst being subjected to sufficient heat to melt the alloy.—E. S.

French Patent.

Steel and Malleable Iron; Process for Manufacturing ——. J. A. Hunter. Fr. Pat. 327,566, Dec. 22, 1902.

See U.S. Pat. 719,117 of 1903; this Journal, 1903, 214.

—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Lead Anodes; Irregularities in the Use of ——, in Sodium Carbonate Solution. K. Elbs and E. Stohr. Zeits. Elektrochem., 1903, 9, [26], 531.

In the reduction of aromatic nitro-compounds in alkaline solution (preparation of azo- and hydrazo-compounds, benzidines, &c.), in which sodium acetate is added to the cathode liquid, and the lead anode is immersed in saturated solution of sodium carbonate, a high current-concentration is necessary, and hence, to prevent too great rise of temperature, a low bath resistance. Frequently the resistance in the anode-cell rises in a very irregular way: this arises either from chloride in the sodium carbonate solution or from insufficiency of sodium carbonate. In the former case the anode becomes coated with a badly conducting crust of lead peroxide, chloride, and carbonate, instead of the normal coating of peroxide; in the latter, the peroxide coating drops off, and the plate becomes a soluble anode, behaving in the manner described by Isenburg (this Journal, 1903, 559). The sodium carbonate must therefore be free from chloride, and at least so much anode-liquid must be used as shall allow 15 c.c. of cold saturated sodium carbonate solution per ampère-hour.—J. T. D.

Lead Carbonate and Chromate; Anode-Potential during the Formation of ——. G. Just. Zeits. Elektrochem., 1903, 9, [27], 547—549.

Isenburg (this Journal, 1903, 559), in his work on the formation of white lead with lead electrodes, found that the potential of the anode rose, at first gradually, and then more rapidly, from 0·4 to 3·0 volts. The author finds, on varying the proportions of sodium carbonate and chlorate, that with low sodium carbonate concentration, the anode-potential is and remains that of a lead plate in a solution containing lead ions (0·192 volt), but as the sodium carbonate concentration increases, the anode-potential more and more rapidly rises from that initial value, the cell-E.M.F. rises, and the anode ultimately becomes covered with, and has the potential of, lead peroxide. With sodium chromate the results are similar, but exhibited in a still higher degree. In pure sodium chlorate solution (1·5 per cent.), however, the anode-potential is found to increase rapidly with the current density; and the author attributes the above-described behaviour of solutions containing much sodium carbonate to the gradual lessening of the effective surface of the anode, and hence the gradual increase of the current density, by the deposition on the anode of an adherent carbonate precipitate. This goes on till the anode-potential has risen to that of peroxide, and peroxide accordingly begins to form; at first concurrently with the solution of lead, afterwards exclusively. Experiments with copper have shown that it, too, becomes polarised at high current-densities; when that is the case, cupro-ions as well as cupri-ions go into solution.—J. T. D.

Solutions; Electrolysis of Aqueous ——. C. Frenzel. Zeits. f. Elektrochem., 1903, 9, [24], 487—496.

These experiments, made with solutions of alkalis, are in extension of others previously made to determine the nature of ammonia solutions. The position of the notch in the anode curves and the effect of the previous treatment of the electrode are discussed.—W. G. M.

Alkali Sulphides; Electrolysis of ——. A. Brochet and G. Ranson. Zeits. f. Elektrochem., 1903, 9, [25], 509—511.

Durkee and others have found that in the electrolysis of sulphides, sulphates are produced. In dilute solutions this is so, but with concentrated solutions at 50°—60° C., sulphur is deposited at the anode and hydroxide and hydrogen are formed at the cathode. The sulphur dissolves in the solution, to which a yellow colour is thus imparted, but forms hydrogen sulphide with the cathode hydrogen. There is thus a reversible equation—

$$Na_2S + 2H_2O \rightleftarrows 2NaOH + H_2 + S,$$

which, however, is not effective in the sense from right to left when a diaphragm is used. In an experiment with a solution containing 514 grms. of sodium sulphide and 8 grms. of sodium thiosulphate per litre, working with a current density of 0·07 amp. per sq. cm. of anode or cathode surface and an initial temperature of 68·5° C., using no diaphragm, the temperature gradually rose to 74° C. in three hours, and the P.D. fell from 2 to 1·86 volts. At the end of this time there was an opposing E.M.F. of 0·2 volt on breaking the circuit, the quantity of sulphide was reduced to 476 grms. per litre, whilst the quantity of thiosulphate was unchanged; no trace of sulphate was found. With a lower current-density the reduction was greater. When diaphragms were used and a dilute solution, sulphur was separated and converted into sulphurous acid. Hydrogen sulphide was evolved, but to a smaller extent as the solution employed was richer in sulphide. With a solution containing 500—600 grms. of sodium sulphide per litre, a current-density of 5—6 amp. per sq. dcm. required a P.D. of 1·2—2·2 volts, but as the decomposition of the sulphide requires only a low voltage, the P.D. necessary depends mainly on the resistance of the diaphragm and the distance between the electrodes. Platinum, carbon, lead, iron, or nickel could be used as anode, unless chlorides were added, in which case iron and nickel formed sulphides and could not be used. Copper acts as a soluble anode whether chlorides are present or not. In all experiments tried the anode-potential was lower when sulphur dissolved, and higher when it was deposited or oxidised. When a concentrated sulphide solution is used and the sulphur is passing into solution, there is found to be a critical point at which the needles of the ammeter and voltmeter begin to oscillate regularly, but in opposite directions; this is due to the deposition of sulphur from the immediate neighbourhood of the anode, with consequent reduction in the sulphide concentration, and therefore in the ability to dissolve sulphur. The resistance therefore increases, the P.D. increases, and the current-intensity is diminished. Less sulphur is then deposited and it can dissolve more rapidly than it precipitates, so that the volume of current increases again, and the cycle recommences. This phenomenon is more clearly observable with than without diaphragms. Alkali sulphide solutions always give either sulphur or sulphur oxidation products, which finally yield sulphuric acid, according to the concentration at the anode. —W. G. M.

Antimony; Electrolytic Determination of ——, *and Separation from Tin.* A. Fischer. XXIII., page 926.

English Patent.

Electrolysing Processes and Appliances [Manufacture of Oxides of Chlorine]. J. Wetter, London. From the Elektrizitäts Akt.-Ges., vormals Schuckert and Co., Nürnberg, Germany. Eng. Pat. 28,353, Dec. 23, 1902.

See Fr. Pat. 326,598 of 1902; this Journal, 1903, 796. —T. F. B.

United States Patents.

Electrolytic Apparatus. L. Gurwitsch, Kiew, Russia. U.S. Pat. 733,643, July 14, 1903.

See Eng. Pat. 16,358 of 1902; this Journal, 1903, 872. —T. F. B.

Battery; Secondary ——. W. Gardiner, Chicago, I
Assignor to North-Western Storage Battery Co., I
U.S. Pat. 732,842, July 7, 1903.

An outer tray with hermetically sealed lid forms o
electrode, the other is a smaller perforated tray with wi
gauze bottom placed within, but insulated from the fi
named, the conductor passing through the latter, but insula
from it. Active material is placed on the inner tray
reticulated material on the bottom of the outer ves
The active material on the inner tray may be in the fo
of a relatively hard porous tablet. The electrolyte m
be caustic alkali and zinc oxide.—W. G. M.

Electrolytes: Method of Preparing ——. W. Gardi
Chicago, Ill., Assignor to North-Western Storage Batt
Co., Ill. U.S. Pat. 732,843, July 7, 1903.

An excess deposit of a metal is accumulated upon
electrode by repeatedly charging a cell containing
solution an oxide of the metal and caustic alkali, repleni
ing the oxide in the solution between successive charg
and then, when sufficient metal has been deposited,
plenishing the cell with a solution of pure caustic al
solution.—W. G. M.

Active Material [Urea Sulphate] for [Plates of] Elec
Accumulators. A. L. Rosenthal, London. Administra
of S. A. Rosenthal. U.S. Pat. 733,918, July 14, 1903

See Eng. Pat. 12,700 of 1902; this Journal, 1903, 803. —T. F. I

Chlorates and Perchlorates; Electrolytic Manufact
of ——. P. Lederlin, Chedde, France. U.S. I
732,753, July 7, 1903.

See Eng. Pat. 14,387 of 1902; this Journal, 1902, 128 —T. F. I

Phosphorus; Apparatus for Making ——. R. K. Dun
Pottstown, Pa., Assignor to General Chemical Co.,
York, N.Y. U.S. Pat. 733,017, July 7, 1903.

The apparatus consists of an electric furnace adapted
intensely heating phosphatic material for production
phosphides; a chamber in which the phosphides
decomposed by water; a storage tank for the hydro
phosphide evolved, communicating with a drying cham
and a heating chamber, in which the phosphide is dec
posed, connected to a receiver for the products of
decomposition.—E. S.

Phosphorus: [Electrical] Process of Making ——. 1
Duncan, Assignor to General Chemical Co. U.S.
733,316, July 7, 1903. VII., page 908.

French Patents.

Electricity; Non-conductors of ——, *rendered Conduct*
and Impt. of Bad Conductors of ——. G. Pommer
and H. Wien. Fr. Pat. 327,541, Dec. 20, 1902.

The material to be treated is impregnated with antim
trichloride or with zinc chloride.—W. G. M.

Ozonising; System of ——. F. A. Chadefaux. Fr.
327,291, Dec. 12, 1902.

An electrical generator of the Holtz type is enclosed
case through which air is blown by means of a bel
which may be actuated by an eccentric attached to
pulley that drives the glass disc of the generator.
outlet pipe for the ozonised air is a gauze tray conta
cotton wool saturated with ether or other volatile m
capable of lessening the irritant effect of the ozone.
—W. G.

(B.)—ELECTRO-METALLURGY.

nide Silver-baths [*Silver-plating*]; *Decompositions curring in* ——. E. Jordis and W. Stramer. Zeits. f. lektrochem., 1903, 9, [28], 572—575.

BON dioxide attacks a bath in use to a greater extent one standing idle, but the amount of cyanide decom d is in excess of that which would correspond to the on dioxide entering into the reaction. The amount of decomposition is less in the winter than in spring and umn, probably owing to the influence of temperature. s containing chloride (formed by dissolving silver ride in the double cyanide) are more readily decom d, and therefore require more frequent regeneration plain cyanide baths do. This disadvantage is accom ed by the advantages that the resistance of the chloride is only two-thirds that of the pure cyanide bath, and the electrolyte can be attacked without harm by tively large currents, when it contains a larger pro iou of carbonate. The presence of oxalic acid, reducing tances, and other bodies in old baths gives an indication e cause of the decomposition of the cyanide otherwise by carbon dioxide. It is commonly stated that an old r bath works better than a new bath, and potassium ate and ammonia are sometimes added to a new bath— e latter is heated—to "age" it. But this is unnecessary, w bath gives good deposits if the materials are pure and ammeter and voltmeter are used during deposition.

—W. G. M.

United States Patents.

Iron: Electrolytically Coating —— with Zinc. Goldberg, Moscow. U.S. Pat. 733,028, July 7, 1903.

Eng. Pat. 7923 of 1902; this Journal, 1903, 426.

—T. F. B.

Furnace; Electric ——. P. L. T. Héroult, La Praz, France. U.S. Pat. 733,040, July 7, 1903.

See Eng. Pat. 3912 of 1902; this Journal, 1903, 217.

—T. F. B.

Metals and Metal Compounds; Process of Smelting [*Electrically*] ——. G. Egly, Charlottenburg, Germany. U.S. Pat. 733,578, July 14, 1903.

The process is conducted in an electric furnace, in which the lower, horizontal carbon electrode, at the base of the furnace, is covered by a scoria containing magnesia and other substances, so constituted as to be a conductor, and to remain solid at the temperature at which the smelting of nickel, wrought iron waste, or other metals or metal compounds can be effected.—E. S.

XII.—FATS, FATTY OILS, AND SOAP.

Beeswax, Portuguese; Characteristics of ——. H. Mastbaum. Zeits. angew. Chem., 1903, 16, [27], 647—653.

A considerable amount of beeswax is imported to Lisbon from Portuguese colonies, chiefly Angola, whilst the main supply of imported wax is obtained from Hamburg. The wax produced in Portugal is formed mainly in cylindrical cork hives, known as *Cortiços*, which yield annually about "700 tons of honey and 1,100 tons of wax." After removal of the honey, the wax is melted, strained, and poured into moulds, which give blocks of 30 to 35 kilos., known as *Gamellas*. The export trade is mainly in the hands of the Germans, and samples of each consignment are analysed by the export firms before being bought. Since 1900 the author has examined a large number of samples of the wax from different districts in Portugal, and gives the following results of the analysis of 17 samples of undoubted purity:—

——	Specific Gravity at 100°/15° C.	Melting Point.	Solidification Point (Shukoff).	Acid Value.	Saponification Value.	Ester Value.	Ratio.	Iodine Value.	Buchner's Value.
		° C.	° C.						
n	0·8152	64·5	62·8	18·35	91·28	72·85	3·96	10·1	2·05
mum	0·8191	65·5	63·4	20·53	95·91	77·78	4·30	14·0	3·70
mum	0·8126	64·0	61·9	16·71	88·54	70·49	3·61	6·7	1·10

he acid, saponification, and ester values are somewhat r than in the case of most European varieties of wax. s has led to the wax being sometimes suspected of teration with ceresin, but the author shows that in such s Weinwurm's method (this Journal, 1897, 939) affords lusive evidence of their purity.

he variation in the iodine values is greater than recorded different chemists for French, English, or German wax. general, a high iodine value is accompanied by a low nification and ester value, which agrees with the fact beeswax contains hydrocarbons capable of absorbing ne. Buchner's acid value is somewhat lower than the age.

he colour of Portuguese beeswax varies from light ow to reddish-yellow according to the flora of the rict whence it was derived.—C. A. M.

tle Wax; Analytical Constants and Composition of ——. W. F. Smith and F. B. Wade. J. Amer. Chem. oc., 1903, 25, [6], 629—632.

; fat examined was extracted with petroleum spirit from berries of *Myrica cerifera*. It had the following acteristics:—Specific gravity at 22° (15·5° C.), 0·9806; ific gravity at 99° (15·5° C.), 0·878; melting point, C.; solidification point, 45° C.; saponification value, ; iodine value (Hübl), 3·9; Reichert-Meissl value, ; acid value, 30·7; and refractive index at 80° C., 363.

ure palmitin was separated by crystallising the fat four es from petroleum spirit, but no stearin was found, a lt that was confirmed by crystallising the fatty acids from a saturated solution of stearic acid by Hehner and Mitchell's method. Oleic acid and volatile acids were not found, and the fat was judged to consist mainly of palmitin with some lower glyceride and a small amount of free acid.—C. A. M.

French Patents.

Oil from Oleaginous Grains and Residues; Process and Apparatus for Extracting ——, *and for the Recovery of the Solvent.* Soc. Urbain, Lefèvre and Tissier, and J. Deiss. Fr. Pat. 327,373, Dec. 16, 1902.

The material is mechanically mixed with the solvent in a closed vessel, and the resulting solution passed through a filter-press and then into a still. The condensed solvent falls into a vessel communicating with the mixing receptacle, whence it again passes through the filter-press, and so on continuously until the material is exhausted.

—C. A. M.

Fatty Matters; Process of Extracting ——, *in which the Volatile Solvent is Completely Recovered and Risk of Fire Obviated.* L. E. Barbe. Fr. Pat. 327,561, Dec. 22, 1902.

The process of cleansing previously claimed (Fr. Pat. 321,542; this Journal, 1903, 794) is adapted to the separation of fatty matters. The material is subjected *in vacuo* to the simultaneous action of radiant heat and of air or an inert gas, so as to effect rapid solution of the fat and subsequently distillation of the volatile solvent. The processes of solution, separation, distillation, and condensation are carried out continuously in closed apparatus.

—C. A. M.

Oils and Fats, and in particular Cocoanut Oil; Neutralisation of ——. Soc. Anon. des Savonneries de la Méditerranée. Fr. Pat. 327,581, Dec. 23, 1902.

THE oil is neutralised with lime, and the resulting calcium soap rendered easily separable by passing a current of air through the mixture.—C. A. M.

Soaps, "Transparent Glycerin"; Manufacture of ——. A. Rueb. Fr. Pat. 327,293, Dec. 13, 1902.

FATTY acids are treated in a closed vessel at 70°—80 C., with the requisite proportion of an alcoholic solution of caustic soda, and the soap cooled. Sugar syrup may also be used as an ingredient, after being previously heated to the right temperature.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

ENGLISH PATENTS.

Pigments; Processes for Making ——. Pigments; Compositions of Matter to be used for ——, and Process of Making same. W. J. Armbruster and J. Morton, St. Louis, Mo., U.S.A. Eng. Pats. 11,112 and 11,113, May 15, 1903.

SEE U.S. Pats. 731,152 and 731,153; this Journal, 1903, 874.—F. H. L.

UNITED STATES PATENTS.

Lithophone [Lithopone] and Glauber Salt; Process of Making ——. W. D. Gilman, Baltimore, Md. U.S. Pat. 732,732, July 7, 1903.

A SOLUTION of nitre cake is mixed with an excess of zinc, and "a proper proportion of solution of barium sulphate" is added, lithopone being precipitated, and sodium sulphate being left in solution. According to the second claim, the mixture of nitre cake and zinc is treated with steam till the free acid is neutralised, then the iron, alumina, &c., are thrown down by suitable reagents, and finally the lithopone is precipitated by means of barium sulphide solution.

—F. H. L.

Pigments; Manufacture of Material for Use in the Production of ——. L. Wirtz, London. U.S. Pat. 733,308, July 7, 1903.

SEE Eng. Pat. 1465 of 1902: this Journal, 1903, 705.

—T. F. B.

Pigments; Process of Making ——. W. J. Armbruster, St. Louis, Mo. U.S. Pat. 733,612, July 11, 1903.

SEE Eng. Pat. 6521, 1903; this Journal, 1903, 807.

—F. H. L.

Water-Paint and Method of Producing same. S. S. and and B. Ruston, Syracuse, N.Y. U.S. Pats. 732,894, 732,895, and 732,896, July 7, 1903.

A COMPOSITION consisting of milk albuminoids, oily, fatty, or resinous substances, lime, aluminium or zinc hydroxide, and calcium sulphate. The process of making the paints consists in :—"Emulsifying the oily or fatty substances, mixing with skimmed milk, adding an acid to precipitate the milk and resin, separating it from the whey, then washing the curd compound, then drying and pulverising, then mixing with the lime compound obtained by slaking the lime with a solution of aluminium or zinc sulphate and mineral matter in a finely divided state."—F. H. L.

(*B.*)—RESINS, VARNISHES.

ENGLISH PATENT.

Varnish; Production of Substances Constituting ——, or for Use in its Manufacture. G. Fry, Berwick-on-Tweed. Eng. Pat. 19,626, Sept. 8, 1902.

A SUBSTITUTE for the oil or resin base of an oil or spirit varnish is prepared by the action of nitric acid upon some substance like natural turpentine, followed by the decomposition of the nitro compound. The material actua operated upon may be one of the varieties of the oleo-re turpentine, *e.g.*, Venice turpentine, or Canada balsam solution of colophony in oil (spirit) of turpentine; a mixt of colophony with linseed oil, or linseed oil itself; product in the last case being practically a boiled oil. prolonging the time, or the temperature of nitrificati varnishes of quicker drying power and of colours rang from the normal yellow to an orange, red, or brown, a of greater viscidity than usual, may be manufactured.

—F. H. L.

UNITED STATES PATENTS.

Varnish and Method of Compounding. D. Brazel Brunswick, Ga. U.S. Pat. 732,514, June 30, 1903.

LINSEED oil ($3\frac{1}{2}$ pints) is boiled for three minutes, mel resin (1 quart) is then added, and the mixture boiled two minutes; white Japan drier (3 pints) is added, boiling is continued for three minutes. After standing two minutes, beeswax (1 gill) dissolved in alcohol ($\frac{1}{3}$ g and turpentine (1 gill) are stirred in, and finally, when mixture has cooled, a volatile petroleum product (1 gill added.—R. L. J.

FRENCH PATENTS.

Varnish and Varnish Colours; Manufacture of ——, *their Applications.* J. H. W. Stringfellow and F. Mainetty. Fr. Pat. 327,261, Dec. 12, 1902.

SEE Eng. Pat. 26,852 of 1902; this Journal, 1903, 705.

—T. F. B

Linoleum; Manufacture of ——. A. Kronstein. Fr. 1 327,340, Dec. 15, 1902.

WOOD oil, with or without some resin and other drying is used as the basis of the composition for linoleum "lincrusta." It is preferable to make some addition of or resin to the wood oil, because if the latter is employ alone, the temperature of working must not be permit to exceed 220° C., whereas with a suitable diluent mass may be rendered insoluble at 300° C. The finis material is said to resist alkalis better than usual.

—F. H. L

(*C.*)—INDIA-RUBBER.

Rubber and Rubber-Yielding Plants from the E. Afr Protectorate. Bull. of the Imp. Inst., Suppl. to Boa of Trade J., 1903, [2], 68—70.

A SPECIMEN of a vine from the Nandi Forest has be identified as the *Landolphia Watsoniana*, Vogtherr, t from Takaunga as *Landolphia Petersiana*, Dyer, a another from the same district as *Landolphia Kirkii*, Dy whilst an euphorbiaceous plant from Takaunga proves be the *Manihot Glaziovii*, Muell-Arg., a native of Braz

The "Mbungu" rubber from E. and W. Africa is usua stated to be from the *Landolphia florida*, whereas the pl from Takaunga known by this name is really the *Landolp. Petersiana*.

Three samples of rubber were submitted to chemi examination with the following results :—

—	Moisture.	Resin.	Caoutchouc.	Dirt.	Ash (and Dirt
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pe Cen
1. Rubber from Nandi (*Landolphia Watsoniana*).	12·9	11·9	67·2	8·0	1·
2. Rubber from Nandi (botanical source not given).	20·8	9·4	61·9	7·6	1·
3. Rubber from Takaunga (botanical source not given).	5·7	5·0	84·2	5·1	4·

The specimen from Takaunga is described as a good ha red rubber and is valued at 2*s.* 6*d.* to 2*s.* 7*d.* per lb., warehouse in London, and those from Nandi, which a rather softer, would fetch from 2*s.* 3*d.* to 2*s.* 4*d.* per lb.

—J. K. B.

ıbber from Mombasa, E. African Protectorate. Bull. of the Imp. Inst., Suppl. to the Board of Trade J., 1903, [2], 70.

SAMPLE of rubber stated to have been obtained from a eper which grows in the Wadruma Forest, Muele Hill, imton, has been examined.

On analysis the sample gave 87·7 per cent. of caoutchouc, 2 per cent. of moisture, 4·2 per cent. of resin, and 9 per cent. of dirt. Classified as a good, hard, red rubber, rth 2*s.* 6*d.* to 2*s.* 7*d.* per lb. *ex* warehouse in London. —J. K. B.

English Patent.

dia-rubber and Leather; Method and Means for Uniting ——. H. Sefton-Jones, London. From Koch and Palm, Elberfeld, Germany. Eng. Pat. 18,673, Aug. 25, 1902.

IE leather surface (freed from grease) is scored or ighened if so desired, and then impregnated with a ıtion of rubber in benzene (2—5 per cent.), and succese coats of the solution are applied until a film of rubber built up on the leather surface. To this prepared surface bber or similarly treated leather may be joined in the ıal manner.

Leather, coated in this manner, is also claimed as a comrcial product.—R. L. J.

French Patent.

ment for Leather, Rubber, and the like. C. A. Persson. Fr. Pat. 327,633, Dec. 23, 1902. XIV., see below.

IV.—TANNING; LEATHER, GLUE, SIZE.

ather; Theory of the Formation of ——. W. Fabrion. Zeits. angew. Chem., 1903, **16**, [28], 665—680; [29], 697—704.

TER reviewing previous work, the author discusses the bject under the headings:—(A) Animal or oil tanning;) Vegetable or bark tanning; (C) Mineral tanning. The nclusions drawn are:—Oil-tanned leather may be defined a salt in which the partially oxidised hide fibre plays e part of base, and an unsaturated, partially oxidised ty acid, that of acid. Vegetable-tanned leather may be garded as a salt in which the partially oxidised hide fibre ıys the part of base, and the partially oxidised tannic acid, ıt of acid. Mineral-tanned leather is a salt-like compound which the hide primarily plays the part of acid, chemically mbining with an oxide of the general formula M_2O_3. It o, however, acts as a base, in that it takes up a certain ıount of acid. As a general conclusion it may be stated at tanning is a chemical process, the leather being a salt, which the hide may play the part of base or of acid. If e tanning is to be satisfactory, the hide fibre must suffer idation in the process, otherwise an imperfect leather, ıich is not waterproof, is obtained.—A. S.

English Patents.

epilatories for Removing Hair from Skin and Hides; Manufacture of ——. A. J. Boult, London. From A. H. Stone, Boston, Mass. Eng. Pat. 11,320, May 18, 1903.

E U.S. Pat. 732,323 of 1902; see following U.S. Pats. —T. F. B.

ather Belting and the like; Method and Apparatus for Manufacturing Artificial ——. O. B. Reichelt, M. A. Helbing, and G. R. G. Nienaber, all of New Jersey, U.S.A. Eng. Pat. 14,122, June 21, 1902.

ANDS or ropes of cotton, hemp, flax, &c., are impregnated ıth a mixture of stearin-pitch (500 parts), acid-free resin 0 parts), and "kautschukin" (820 parts), then treated ı the outside with an insulating material composed of irit (60 parts), lamp-black, and kautschukin (20 parts), ıd finished on the flat side with a mixture of spirit parts), ochre (1 part), and kautschukin (1 part), and on ıe edges with spirit (2 parts), shellac (2 parts), and ıutschukin (1 part). To prepare kautschukin or rubber substitute, resin-oil is heated with sulphuric acid, the acid is removed by aqueous alkali, and the product is then extracted with hot water. This hot extract is treated with sulphuric acid, and the resulting precipitate is dried and mixed with colza-oil and graphite.

That portion of the resin oil which resists the action of sulphuric acid is mixed with acid-free resin and ozokerite forming the stearin-pitch.

The process is applied either to the completed band or rope, or to the individual strands forming them.

Mechanical details of a suitable plant are given.—R. L. J.

India-rubber and Leather; Method and Means for Uniting ——. H. Sefton-Jones. From Koch and Palm. Eng. Pat. 18,673, Aug. 25, 1902. XIII. (. above.

United States Patents.

Depilatory, and Process of Manufacture. A. H. Stone Boston, Mass. U.S. Pat. 732,323, June 30, 1903.

QUICKLIME is slaked with a solution of sodium sulphide and then heated to a temperature still higher than that resulting from the slaking action.—R. L. J.

Tanning Apparatus. C. P. Kerans, Danvers, Mass. U.S. Pat. 732,562, June 30, 1903.

MECHANICAL details are given of a tanning vat in which a trihedrally-shaped frame carries the hides or skins, and rocks upon a journal attached to the floor of the vat. —R. L. J.

French Patents.

Rapid Tannage. J. Ackermann. Fr. Pat. 327,231, Nov. 18, 1902.

THE skins, after the usual preparation, are tanned in liquors composed of valonia (30 parts), quebracho (16 parts), myrobalans (49 parts), pine extract (1·5 parts), and formaldehyde (0·5 parts), of 12 successively increased degrees of strength—*i.e.*, 4°, 7°, 10°, 13°, 16°, 20°, 24°, 27°, 30°, 33°, 36°, and 40°). The skins remain in each liquor for about a day, and are then treated with the next, the process being further assisted by (1) keeping each successive liquor at a slightly higher temperature (range, 4° C. to 10° C. with increments of 2°—3°), and (2) passing into each liquor an electric current, earthed to the ground, of gradually increasing voltage (range, 50 volts to 300 volts, with increments of 20—30 volts).

The liquors are strengthened and heated in a separate copper vessel.—R. L. J.

Cement for Leather, Rubber, and the like. C. A. Persson. Fr. Pat. 327,638, Dec. 23, 1902.

200 or 300 grms. of gutta-percha are dissolved in 100 grms of carbon bisulphide, and 65 to 125 grms. of mastic are dissolved in 100 grms. of ether, 5 to 8 parts of the former solution being mixed with 1 part of the latter. After admixture, the liquids are boiled togther, a process which is said to be of capital importance. F. H. L.

Glue and Gelatin; Process of Making ——. Rheinische Patent-Leim und Gelatine-Ind., Ges. mit beschr. H., and R. Arens. Fr. Pat. 327,234, Dec. 8, 1902.

SEE U.S. Pat. 721,852 of 1903; this Journal, 1903, 429 —T. F. B.

XV.—MANURES, Etc.

French Patent.

Phosphates: Process for Enriching Poor ——, with Simultaneous Production of Precipitated Calcium Sulphate. P. de Wilde. Fr. Pat. 327,869, Dec. 24, 1902.

CALCIUM phosphate of little commercial value, owing to the proportion of calcium carbonate contained in it, is treated with dilute acetic or formic acid, which dissolves only the carbonate. The solution is precipitated by sulphuric acid, and the calcium sulphate is separated. The acetic or formic acid thus regenerated is used as before, to act upon fresh portions of the phosphate, which may be in

the raw or calcined state. The wash waters are collected apart, to be neutralised by milk of lime and concentrated, when they are added to the solution of calcium acetate or formate before the latter is treated with sulphuric acid.
—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Determination; Aid to the Fehling Process for ——. S. A. Vasey. XXIII., page 928.

English Patents.

Stirring Devices, especially for Mixers for Sugar Massecuite. H. Winter, Charlottenburg, Germany. Eng. Pat. 21,102, Sept. 27, 1902.

Connected with the main shaft of the mixer are four or more vertically arranged arms, between two of which is situated a stirring drum mounted on a secondary shaft. Two or more of such drums may be provided in long mixers, arranged alternately in such a way that when one drum is above the main shaft, the next drum is below it. The stirring drums are fitted with flat, spiral, ribbed or pivoted blades and are rotated on their secondary shafts by the resistance of the fluid to the motion imparted by the main shaft.—J. F. B.

Molasses; Process for Obtaining and Utilising [as Mordants] the Organic Acids contained in the Residuary Liquors of ——. H. Schrader, Honningen-on-Rhine, Germany. Eng. Pat. 20,851, Sept. 24, 1902.

The residuary liquors (vinasse) resulting from the extraction of sugar from molasses are concentrated to a sp. gr. of about 1·4; they are then treated in the warm state with sulphuric acid sufficient in quantity to combine with the alkali present. Potassium sulphate crystallises out on cooling and is removed, a further quantity of the salt being deposited by standing in open vats. The excess of sulphuric acid is then removed by treatment with barium carbonate; the liquor is filtered and treated with a decolorising agent. The use of the organic acids of the vinasse, obtained as above, is claimed, for mordanting wool, the wool being treated with "a combination of metallic mordants and the organic acids of the vinasse."—J. F. B.

French Patents.

Sugar; Refining of ——. P. A. E. Caille. Fr. Pat. 327,289, Dec. 17, 1902.

Crystallised white sugar of suitable grain is mixed with water or a dilute solution of sugar, in a vertical mixer of small diameter with special arms, at a low temperature, until it becomes a fluid pasty mass. The mass is then discharged into special moulds which are arranged in series in a recipient with a perforated bottom. The syrup drains away through the false bottom and the purification is completed by placing the recipients in a centrifugal machine. The blocks of sugar are then removed from the moulds and dried.—J. F. B.

Saccharine Liquid from Beetroot and Sugar Cane or *Molasses; Production of Syrup from Boiled Roots and Purification of* ——. Raison sociale A. Martens and Co. Fr. Pat. 327,631, Dec. 23, 1902.

Chopped beetroots are treated with lime and oxidising agents such as hydrogen peroxide, barium or calcium peroxide, during or after boiling with water or steam. The juice obtained is then saturated with carbon dioxide or other acid capable of precipitating the lime. Molasses are treated with hydrofluosilicic or hydrofluoric acid or salts of these acids, to produce with the alkalis of the molasses double salts or fluosilicates. The liquor is then treated with lime, baryta or strontia in combination with a saturation process by carbon or sulphur dioxide or with bark extracts containing tannic or gallic acid in presence of alkaline earths. The purification may be completed by nascent hydrogen or with a peroxide and a precipitating acid. (Compare Hlavati's Eng Pat. 21,985 of 1901; this Journal, 1902, 1462.)—J. F. B.

Saccharine Juices; Purification of ——, *before converti them into Crystallised Sugar or Alcohol.* J. J. Hignet Second Addition, dated Dec. 24, 1902, to Fr. Pat. 230,3 May 27, 1893.

In treating saccharine liquids in a centrifugal filter, difficulty arising from the oxidation of the organic matt by the rush of air is overcome by closing in the centrifu machine and performing the operation in presence of atmosphere of steam or in a high vacuum.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Lactase. E. Bourquelot and H. Hérissey. Comptes ren 1903, **137**, [1], 56–59.

In previous work the authors have shown that the prope possessed by emulsin from sweet almonds of hydrolys milk sugar is not possessed by certain emulsins of ot origins, and concluded that this property does not belong emulsin itself but to a separate enzyme, lactase, wh sometimes accompanies it. This view is further confirm by the present series of experiments, by which it is sho that the kernels of certain Rosaceæ, such as bitter almon peach, apricot and apple, contain both emulsin and lacta macerations of the leaves of the cherry laurel and liqu obtained from *Aspergillus* and *Polyporus sulphureus* cont emulsin without lactase, whilst kephir grains contain lact without emulsin.—J. F. B.

Bacterium; An Oxidising ——, *and its Action on Alcol and Glycerin.* R. Sozerac. Comptes rend., 1903, **13** 90—92.

In studying a wine vinegar the author observed that reduced Fehling's solution strongly in the cold, althou the vinegar vat did not contain the sorbose bacterium, wh is capable of converting the glycerin of the wine i dihydroxyacetone which possesses that property.

From this vat cultures were isolated of a bacteri differing widely in form from *Mycoderma aceti* and t sorbose bacterium.

This bacterium is fairly large and the cells occur sing or in pairs, sometimes in the shape of a V. It grows b in yeast decoction containing 2 per cent. of glycerin, a the most favourable temperature is 28°—30° C. It does grow in meat bouillon nor does it form colonies on potato glycerin-agar is a favourable solid medium.

Existing in a vinegar vat in full activity, this bacterium in a certain sense an acetifying bacterium. Its action ethyl alcohol, however, is relatively feeble, since it produ only 0·85 grm. of acetic acid from 2 grms. of alcohol add to yeast decoction.

In this way it is distinguished from the true acetifyi bacteria such as *Mycoderma aceti* and the sorbose bacteriu and the author prefers to class it among the oxidis bacteria rather than the vinegar bacteria. This bacteriu resembles the sorbose bacterium in its action upon t polyhydric alcohols; it converts glycerin readily into hydroxyacetone and also yields bodies which redu Fehling's solution in the cold by its action upon ery ritol and sorbitol.—J. F. B.

Yeast; Some Constituents of ——. O. Hinsberg and Roos. Zeits. physiol. Chem., **38**, 1—15. Chem. Cent 1903, **1**, [26], 1428.

By two successive extractions of bottom fermentation be yeast (7 kilos., equivalent to 1 kilo. of dry substanc with 8—9 and 6—8 litres of alcohol, the author obtain 2·3—2·8 per cent. (of the dry substance) of "yeast fat which has been previously prepared by Löw and Nage The yeast fat was saponified, and three acids were isolated —(*a*) A saturated fatty acid, $C_{15}H_{30}O_2$, small, colourle glistening plates, m. pt., 56° C.; soluble in alcohol a ether, slightly soluble in acetic acid, methyl ether, a petroleum spirit, very slightly soluble in water; it form insoluble calcium and barium salts; (*b*) an unsaturat acid, $C_{12}H_{22}O_2$ (?) separated from (*a*) by means of t solubility of its lead salt; it absorbs bromine, and exposure to air acquires a characteristic odour; (*c*) an aci $C_{18}H_{34}O_2$ (?) separated from (*a*) by means of the solubili s lead salt, and from (*b*) by fractional distillation; a colourless oil, boiling at 210°—220° C. under 12 mm. ure, and appears to be identical with oleic acid.

om the alkaline residue after saponification, *yeast-sterol*, $C_{26}H_{44}O + H_2O$, was obtained by extraction with; it crystallises in small colourless plates from alcohol nelts at 159° C.; is lævo-rotatory and gives the usual sterol reactions.

e mother liquor from the yeast cholesterol contains a quantity of an essential oil, which in a concentrated tion has an odour resembling that of hyacinths, and dilute condition, that of yeast; it is volatile with .—A. S.

ey; The Carbohydrates of ——, and their Transfor- tions during Germination [Malting]. L. Lindet. mptes rend., 1903, **137**, [1], 73—75.

LES of barley at different stages of germination during ng were extracted with water containing a little mer- sulphate. This substance precipitates the nitrogenous rs, especially enzymes, and prevents their action upon arbohydrates during the extraction. The filtered cts were then treated with excess of baryta, which was quently removed by means of sulphuric acid; the ons were then concentrated and fractionally pre- ted by alcohol. The baryta precipitate is liable to down with it a little *lævosin* which is present in green ; the amount of this substance present, however, ishes during germination, and it is not found in fully nated malt.

ms.—By fractional precipitation with alcohol, two were separated. The gum which was precipitated as lævorotatory; this gum appears to be identical with livan's *β-amylan* ($[\alpha]_D = -146°$); it has no cupric ing properties. On hydrolysis it yielded a mixture of ing sugars ($[\alpha]_D = +53°$ to $+59°$); this mixture does ppear to contain glucose but a mixture of pentoses. more soluble gum corresponded with *a-galactan*, cted by Muntz from lucerne seeds ($[\alpha]^D = +84{\cdot}6°$). d a cupric reducing power of 30—35 and yielded ose and probably lævulose on hydrolysis. These are not attacked by diastase nor fermentable by yeast. gums are present in the raw grain; the quantity lactan increases during germination, whilst that of n remains practically constant. The author concludes o dextrin is present in either barley or malt.

ars.—Treatment of the alcoholic filtrates by inversion ferent temperatures led to the conclusion that no se is present in germinating barley, and this, coupled the absence of dextrin, proves that no internal rification takes place. The cane sugar increased germination in the ratio of 1:3. The quantity of ug sugar in raw grain is very small. During nation invert sugar is produced, the amount of reducing sugar increasing simultaneously with that of sugar. The rotatory power of the reducing sugars ally decreases; probably the glucose and lævulose ilised by the plant for different purposes, the glucose part in the respiration and the lævulose in the tion of cellulosic tissue; the consumption of lævulose ns towards the end of the germination.

rch.—The starch granules are attacked from the sur- determinations of their volume showed that they shed in size during germination.—J. F. B.

y; Influence of Low Temperatures on Steeped ——. emens. Zeits. Spiritusind., 1903, **26**, [29], 312.

y sometimes happen in the winter that the barley in eping cistern becomes completely embedded in ice in parts, with the result that the germinating power e seriously impaired.

author has studied the effect of low temperatures on erminating power of steeped barley. Barley was d for 17 hours, then immersed in a freezing mixture 20° C. until frozen, and then thawed after various s. The original barley had a germinating power of r cent., but after it had been frozen for half an hour awed in 1¼ hours, the germinative capacity had fallen per cent., whilst some which had been frozen for four hours and thawed in half an hour only germinated to the extent of 6 per cent.

In a second series of experiments the barley was frozen for half an hour at a temperature of −1° to −1·5° C., and the original germinating power of 94 per cent. was reduced to 68 per cent. When the temperature was lowered to −16° to −17° C. for a similar length of time only 5 per cent. of the corns were capable of germinating.—J. F. B.

Beers; Observations on the Chemical Analysis of ——. [Part I.] A. R. Ling. Brewers' Journ., 1903, **39**, [457], 426—428.

The author's scheme for the analytical examination of beers includes, in addition to the usual determinations of gravity, alcohol, and acidity, determinations of the cupric reducing power and optical rotation, expressed in terms of "apparent" maltose and dextrin, of the beer-solids calculated to 100 parts of original wort-solids, together with the percentage of extract fermented, the ash, and occasionally the nitrogenous matter. Statistics such as these, especially in conjunction with analyses of the malt and any other brewing materials used in making the beer and records of their origin and treatment, constitute a most valuable aid to the brewer in controlling the quality of the beer and expressing it in chemical terms. The value of the ratio of "apparent" maltose to dextrin is of special importance. Several examples are given in the paper of analyses of typical beers, with remarks on their age, stability, and suitability for bottling in connection with the analytical results. Analytical data side by side with practical data in this direction are of great importance, and it is desirable that such analyses should be made of the same beer at various stages of conditioning in cask, and after remaining on the forcing tray for definite periods. —J. F. B.

Wines; Differentiation of "Mistelle" from other ——, by the Proportion of Acids Soluble in Ether. C. Blarez. XXIII., page 928.

English Patents.

Beer free from Alcohol; Manufacture of ——. V. Lapp, Leipzig, Germany. Eng. Pat. 11,223, May 16, 1903.

Beer wort is treated with air or oxygen and then cooled to a temperature of 0° C.; yeast is then added to the wort, which is still maintained at 0°C., and allowed to remain in it until, by a process of diffusion, an exchange of the constituents of the wort and yeast has taken place without fermentative activity. This contact of the yeast with the wort is allowed to last for about 36 hours; the yeast is then separated from the liquor, which is subsequently clarified by double filtration and gassed.—J. F. B.

Linseed Liqueur; Production of ——. W. Tschappe, Vienna. Eng. Pat. 17,659, Aug. 12, 1902.

Five hundred grms. of best linseed are placed in six litres of boiling water, to which are added 5—10 grms. of "reduced blue juniper berries," and the whole is boiled for an hour. The mixture is filtered and the residue is twice extracted with boiling water; the filtrates are boiled down to a bulk of about four litres, 500 grms. of sugar are added, and the liquor is cooled. It is finally mixed with an equal volume of pure alcohol and half a litre of concentrated acetic ether. —J. F. B.

United States Patents.

Beer; Process of Converting Wort into ——. O. Selg and C. Guntrum, Brooklyn. U.S. Pat. 733,284, July 7, 1903.

The wort is run into a vessel and charged with yeast; when the main fermentation is nearly completed and the greater part of the yeast has been precipitated into a yeast pocket, the precipitated yeast is removed and the fermentation is completed with the vessel open. The beer is then clarified by cooling the upper strata, the precipitates are removed from the yeast-pocket, and the pocket is charged with a "concentrated fermentative and yeast"; the vessel is closed and the yeast-pocket is cooled during the ensuing fermentation. (Compare previous patents; this Journal, 1902, 492.)—J. F. B.

Distillers' Wash; Process of Treating ——. C. G. Sudré and C. V. Thierry, Paris. U.S. Pat. 732,234, June 30, 1903.

The spent wash of distilleries is concentrated to a syrupy or plastic state and the concentrated wash is subjected in the form of a moving thin sheet to a temperature of 200—250°C. with exclusion of air, the evolved gases are separated, and a moving thin sheet of the pulverulent residue is then subjected to a temperature of 500—600 C. with exclusion of air, the gases evolved being separated.—J. F. B.

French Patents.

[*Ether*] *Spirits; Apparatus for the Continuous Rectification of* ——. E. A. Barbet. Fr. Pat. 296,750, 1900. XX., page 923.

Spirits; Apparatus for Distilling ——. F. Meyer. Fr. Pat. 327,272, Dec. 12, 1902.

The liquor to be distilled is fed into the top of a column in which are situated a number of plates inclined downwards, and fixed alternately to opposite sides of the column. The liquid flows over the plates downwards in a zig-zag course and steam is introduced at the bottom. The apparatus is free from all perforations, valves, and complicated mechanism.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A*.)—FOODS.

Cheese; Relation of Carbon Dioxide to Proteolysis in the Ripening of Cheddar ——. L. L. Van Slyke and E. B. Hart. Amer. Chem. J., 1903, **30**, [1], 1—24.

To ascertain the extent to which carbon dioxide is formed in American cheddar cheese during the process of ripening, and also to learn the nature of the chemical changes that give rise to the production of this gas, experiments were made with two cheeses. One was quite normal, whilst the other was made from milk containing chloroform, and kept under antiseptic conditions. In the normal cheese, carbon dioxide was given off continually, decreasing in quantity after 20 weeks, but still being formed at the end of 32 weeks. The total amount produced was 15·099 grms., equal to 0·5 per cent. of the fresh cheese. Only 0·205 grm. was given off by the chloroformed cheese, practically none being found after three weeks. The following end-products were formed by the proteolysis of the normal cheese:—Tyrosine, hydroxyphenylethylamine, arginine (traces), histidine, lysine, guanidine, putrescine (traces), and ammonia. The same compounds, excepting hydroxyphenylethylamine, guanidine, putrescine, and ammonia, were found in the chloroformed cheese. In the case of the latter cheese, the carbon dioxide evidently came from that present in the milk, but the carbon dioxide yielded by the normal cheese was due to the decomposition of lactose by lactic acid organisms, a small amount also being derived from the original milk, and to the respiration of living organisms in the cheese. The gas produced after the first few weeks apparently came from reactions taking place in some of the amino compounds. Deep-seated proteolysis can take place to a certain limit without formation of carbon dioxide. The only active agents present in the chloroformed cheese were lactic acid, lactase, and rennet-pepsin. These, under the conditions of the experiments, were unable to form ammonia or secondary amino compounds with production of carbon dioxide. As the presence of chloroform could not account for this inaction, the results suggest that, in the normal cheese, some agent must have been present which was not present in the chloroformed cheese, and that this extra factor was of a biological character.—W. P. S.

Digestion; Influence of some Coal-Tar Dyestuffs on ——. A. J. Winogradow. Zeits. Untersuch. Nahr.- u. Genussmittel, 1903, **6**, [13], 589—592.

The author has examined the influence of 25 aniline dyestuffs on the digestion of egg albumin by gastric juice. The results of the experiments, which are arranged in a table, show that the twelve dyestuffs: Safranine, Pon RR, Azofuchsine G, Orange II, Cœrulein S, Phloxine Iodo-eosine, Chrysaniline (Phosphine), Magdala Azoflavin, Benzopurpurin, and Cerise, even when 1 mgrm. is present (equivalent to 0·1—0·01 per cent. of digesting liquid), almost entirely prevent the digestio egg albumin by pepsin. The thirteen dyestuffs: Quin Yellow, Methylene Green, Acid Green, "Iodine Gre, Azo Acid Yellow C, Yellow T, Naphthol Yellow, An Green, Primuline, Auramine O, Aniline Orange (Me Orange), Martius Yellow, and Metanil Yellow, distin weaken the digestive power of pepsin, but to a sm extent than the twelve dyestuffs previously mentioned.

—A.

United States Patent.

Food Product, and Process of Producing same. A Dunham, New York, Assignor to the Casein Comp of America, New Jersey. U.S. Pat. 732,929, Jul 1903.

A substitute for eggs is prepared by mixing with n casein, from which the whey has been removed, desic milk and sodium bicarbonate until the ingredients thoroughly incorporated; egg-albumin and sodium chl are then added to the mixture, and the whole is incorpo and dried.—J. F. B.

(*B*.)—SANITATION.

English Patents.

Furnaces [*for Burning Towns' Refuse*]; *Impts. relatin* ——, *and the Supply and Control of Air to the same.* N. Leask, Manchester. Eng. Pat. 18,233, Aug. 19, 1

An air duct extends along the bottom of the front of furnace, and supplies air under pressure to a cel furnace front, the air passing along two passages up side of the clinkering or furnace doorway, over its top down the other side, into the ashpit. Part of the air l these passages through slits, and gains access to the clin ing doorways. The furnace front consists of a numb units, each comprising a clinkering doorway, and commu cating by a chamber with the ashpit.—L. F. G.

Ventilation of Unhealthful Works, Mills, and Ma tories; Contrivance for the ——. T. Fisher, Llar Eng. Pat. 19,862, Sept. 11, 1902.

A main steam pipe is formed with branches provided th a number of jets or nozzles, which discharge into c neys, flues, shafts, &c., to increase the current of The pipe system is provided with regulating valves with means for drawing off condensed water.—R. A.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Paper, Cardboard, and Articles made therefrom; proofing ——. H. Grimshaw, Manchester. Eng. at. 17,434, Aug. 8, 1902.

Paper, cardboard, or the like is treated during or manufacture with a solution of an inorganic salt of am nium such as ammonium chloride, sulphate or phosph in such a way that the salt, being retained in the fin product, renders the latter incombustible or non-inflam mable.—J. F. B.

Papers; Impts. in Treated or Coated ——. L. Leba Paris. Eng. Pat. 23,174, Aug. 23, 1902. Under Int Conv., Nov. 28, 1901.

Paper is treated or coated either wholly or in parts (re designs) with a mixture of zinc white and a fatty Only the lighter forms of zinc oxide known under the of "snow white" are suitable, and the proportion employed is very much smaller than in the case of a p A suitable mixture is pure zinc oxide 750 parts, with li oil 250 parts. Siccatives or anti-siccatives such as va may be added if desired. The treated surface will either printer's ink or ordinary ink, and "reserve" de may be developed by rubbing with a metal style. (See this Journal, 1903, 879.)—J. F. B.

UNITED STATES PATENT.

loid or Pyroxylin Compound, and Process of Making e. E. Zuhl, Berlin. U.S. Pat. 733,110, July 7, 1902.

Eng. Pat. 4383 of 1902; this Journal, 1902, 719.
—T. F. B.

FRENCH PATENT.

eads and Tissues [from Paper Pulp, &c.]; Manufac- e of ——. C. Kellner. Fr. Pat. 327,176, Dec. 1, 02. V., page 905.

in Compound [for Paper Manufacture] and its Manu- ture. Casein Company of America. Fr. Pat. 7,675, Dec. 24, 1902.

Eng. Pat. 28,257 of 1902; this Journal, 1903, 569.
—T. F. B.

X.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

mia Cirrhosa; Alkaloids of ——. J. O. Schlotterbeck l H. C. Watkins. J. Amer. Chem. Soc., 1903, **25**, [6], 5—601.

following alkaloids were separated from this plant:— Protopine, $C_{20}H_{19}NO_5$, melting at 204°—205° C.; β-homochelidonine, $C_{21}H_{23}NO_5$ (m. pt. 159 C.); adlumine, $C_{39}H_{39}NO_{12}$ or $C_{39}H_{41}NO_{12}$ (m. pt. 187°— C.); (4) adlumidine, $C_{30}H_{29}NO_9$ (m. pt. 234° C.); (5) an unnamed alkaloid melting at 176°—177° C. e organic acids present included citric and tartaric .—C. A. M.

weed and Erigeron; Essential Oils of ——. L. F. bler and G. R. Pancoast. Amer. J. Pharm., **75**, 216— . Chem. Centr., 1903, **1**, [26], 1413.

so-called fire-weed oil from *Erechthitis hieraeifolia* dom met with in trade and is difficult to obtain pure, e plants are mostly collected by unskilled persons, t the term fire-weed is extended to six different s. Todd, in 1887, stated that pure fire-weed oil has gr. of 0·845—0·855, and an optical rotation of – 4° 4°. Some years later F. B. Power found the sp. gr. ·5° C. to be 0·838 and the optical rotation – 2° 2°. The two samples examined by the authors had pecific gravities, 0·8422 and 0·8244 and the optical ons, + 1·32° and + 2·12°; the first oil was soluble equal volume of alcohol, but the other was insoluble t solvent.

geron oil is frequently sold as fire-weed oil. This oil, pure, has a sp. gr. of 0·850—0·870 and an optical on of + 52°; it is soluble in an equal volume of l and it rapidly resinifies. Commercial erigeron oil sp. gr. of 0·8549—0·8963; optical rotation, from ·48° to + 84·28° and b. pt., from 172° to 178° C.
—A. S.

e; Action of Bromine on ——, *in presence of Water.* Genvresse and P. Faivre. Comptes rend., 1903, ', [2], 130—131.

RDING to Tilden, pinene will absorb four atoms of ne, whilst Wallach has only been able to obtain a nide. The authors have allowed bromine to act pinene in presence of water, care being taken to it the temperature rising. On steam-distilling the cts of the reaction, there were obtained:—(1) A less liquid, lighter than water, consisting mainly of red pinene; (2) a yellow oil, heavier than water, which cymene was isolated; and (3) a liquid which llised on cooling. The residue consisted of a brown, s mass. The crystals, after being re-crystallised from ether, melted at 167°—168° C. They are composed saturated compound, identical with the pinene nide, $C_{10}H_{16}Br_2$, obtained by Wallach by a different d.—A. S.

rs; Gasometric Method for the Valuation of Com- cial ——, *and for the Determination of Potash.* De orta. XXIII., page 928.

Liquid Storax; Detection of Adulteration of ——, *with Rosin.* C. Ahrens and P. Hett. XXIII., page 928.

ENGLISH PATENTS.

Oxalates from Formates; Process for the Preparation of ——. W. E. Evans, London. From Electrochemische Werke, G.m.b. H., Bitterfeld, Germany. Eng. Pat. 14,034, June 20, 1902.

See Fr. Pat. 322,534 of 1902; this Journal, 1903, 378.
—T. F. B.

Antitoxins and Toxins; Removal of Albumin from Bacterial and Animal ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 18,340, Aug. 20, 1902.

Antitoxins and toxins of bacterial or animal origin are freed from albumin by digesting the latter by means of a suitable proteolytic ferment. For instance, diphtheria serum is diluted and precipitated with ammonium sulphate. The precipitate is dissolved in water and digested with precipitated pancreatin in presence of toluene at a suitable temperature. The liquid is filtered and precipitated with ammonium sulphate; the precipitate is dissolved in water and submitted to dialysis in the presence of phenol, which is subsequently removed.—J. F. B.

CC-Dialkyl Barbituric Acids; Manufacture of ——. F. Boehm, London. From Emil Fischer, Berlin. Eng. Pat. 1664, Jan. 23, 1903.

CC-Dialkyl derivatives of barbituric acid are obtained from dialkylmalonic esters and urea by the action of metallic alcoholates.

The process is represented by the equation—

$$R_2.C(COOC_2H_5)_2 + (NH_2)_2CO =$$
$$R_2.C : (CONH)_2 : CO + 2C_2H_5OH,$$

where R is an alkyl radicle.

For the preparation of di-ethyl barbituric acid, 32 parts of sodium are dissolved in 600 parts of absolute alcohol; 100 parts of diethyl-malonic ethyl ester and 40 parts of urea are added and the mixture is heated in the autoclave for 4—5 hours. Crystals of sodium diethyl-barbiturate are separated and decomposed by hydrochloric acid. These derivatives have hypnotic properties.—J. F. B.

CC-Dialkyl Barbituric Acids; Method of Preparing ——. F. Boehm, London. From E. Fischer, Berlin. Eng. Pat. 2054, Jan. 28, 1903.

In the process described in the preceding specification and abstract, acyl derivatives of urea, such as acetylurea, may be employed instead of urea itself; the barbituric acid derivatives so obtained are the same as when urea is employed.—J. F. B.

FRENCH PATENT.

[Ether] Spirits; Apparatus for the Continuous Rectification of ——. E. A. Barbet. Eleventh Addition, dated Dec. 11, 1902, to Fr. Pat. 296,750, Feb. 1, 1900.

The simplified apparatus described in the tenth addition (this Journal, 1903, 815) can be employed for the manufacture of sulphuric ether. The ether is obtained as a "head" product, whilst alcohol at 96 per cent. strength is returned to the etherifying vessel for further treatment. The vapours are freed from sulphurous acid by passing through a solution of caustic soda.—J. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

ENGLISH PATENT.

Pigment Process of Photography. R. Krayn, Berlin. Eng. Pat. 13,093, June 9, 1902.

A film of gelatin mixed with pigment is applied to a thin sheet (0·05—0·25 mm.) of mica or celluloid, previously coated with rubber, wax, or other suitable substance, to facilitate transfer.

The "pigment foil" thus produced is placed with the mica face to the negative, thus obtaining a reversed positive which is applied to paper, &c., and only requires thus a single transfer.—T. F. B.

French Patent.

Paper or the like for Photographic Purposes; Chemical Compound for Preparing ——. M. Bauer. Fr. Pat. 327,706, Dec. 26, 1902.

See Eng. Pat. 28,281 of 1902; this Journal, 1903, 572.
—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrocellulose Powders; New Stability Test for ——. A. P. Sy. J. Amer. Chem. Soc., 1903, **25**, [6], 549—570.

After describing the various stability tests, none of which are regarded as entirely satisfactory, the author gives an account of a new test which he terms *The Elastic Limit of Powder Resistance to Heat.* This is based on the facts (illustrated in the paper by curves and tabulated results), that there is a relationship between temperature and decomposition, and that a bad powder decomposes more rapidly than a good one at a given temperature. Preliminary experiments showed that at 80° C. the decomposition of a powder was very slow, which was also the case at 100° C., although at the latter temperature there was a marked difference in the behaviour of good and bad powders. Hence 115° C. was adopted as the most suitable temperature, and the exposures made during the daytime for periods of eight hours. During the first day a good powder loses little but its moisture and volatile constituents, whilst subsequently it loses less than 1 per cent. a day up to the sixth or in some cases the tenth day, after which the daily loss gradually increases to a maximum, which is not usually reached before the eighth day, and then slowly diminishes. In the case of a bad powder more than the moisture and volatile substances are lost on the first day; the daily loss exceeds 1 per cent. before the sixth day, and the maximum daily loss is reached before the eighth day. Good powders lose less than a total of 10 per cent in six days (of eight hours each), whilst the total loss is considerably greater in the case of bad powders. After prolonged heating the total loss is approximately the same whether the powders be good or bad. As a rule, powders retain their shape after heating, though some, usually bad, are fused and soft while hot.

The proportion of nitrogen decreases with the increase in the total loss. Thus, samples containing 12·37 to 12·60 per cent. of nitrogen yielded residues containing 4·31 to 4·91 per cent. of nitrogen, with a total loss of 55 to 56 per cent. On the other hand, "acetone insoluble" nitrocellulose increases with the amount of total loss. The decomposition is slightly affected by the size of the grain of the powder, but not sufficiently to be considered in distinguishing between good and bad powders.

The following method of applying the test was used by the author:—From 1 to 4 grms. of the whole powder were heated on a watch-glass placed in an oven maintained at exactly 115° C. In the earlier experiments an air bath with a thermostat was employed, but subsequently this was replaced by a double-walled copper oven, with the bottom of the inner wall made slightly V-shaped to prevent bumping. The boiling mixture placed between the walls consisted of a mixture of commercial xylene and toluene in the right proportion to keep the temperature within the oven at 115 C. A reflux condenser and thermometer were fixed to the top of the oven. With this arrangement the temperature was found to vary less than ± 0·5 C. After eight hours the watch-glass and powder were cooled in an exsiccator and weighed, and the process repeated daily for six days or less.

The advantages claimed for the new test over the old methods of testing the stability are:—(1) The powder is tested in its natural condition. (2) All the products of decomposition are taken into account; whilst in the old tests only acid products are shown, and in the Will test only nitrogen. (3) The decomposition of all nitro-compounds present is shown, as well as the effect of the decomposition on the powder itself. (4) It affords an indication the effect of small quantities of added substances or forei matters on the stability. (5) It is simple and not subj to the variations of the old tests.—C. A. M.

English Patents.

Detonators; Impts. in ——. F. Hess, Vienna. Eng. 1 13,845. June 18, 1902.

The detonator is tightly enclosed in a suitable cap capsule, thereby causing its explosion to become unifo and sudden. This makes the explosive upon which i placed explode with the greatest possible intensity. (also Eng. Pat. 3238 of 1902, this Journal 1902, 562.)
—L. F. G

Caps, Detonators, or Friction Composition in Cartrid Tubes, Primers, Fuzes, and the like; Means for venting the Accidental Ignition of ——*, from reach the Explosive Charges thereof.* H. W. W. Bark Blackheath, Kent. Eng. Pat. 20,467, Sept. 19, 1902.

The detonating device is so constructed that, if the cap accidentally struck, the gases pass to the atmosphere or cooling chambers, and not to the main exploding char On being struck in the normal manner of firing, howe the cap is carried forward, closing the atmospheric c and opening that leading to the main charge.
—G. W. McD

United States Patents.

Powder; Method of Glazing ——. A. I. du P Wilmington, Del. U.S. Pat. 733,711, July 14, 1903.

See Eng. Pat. 7712 of 1903; this Journal, 1903, 822.
—T F. B

Powder; Apparatus for Glazing ——. A. I. du Po Wilmington, Del. U.S. Pat. 733,712, July 14, 1903.

See Eng. Pat. 7695 of 1903; this Journal, 1903, 822.
—T. F.

French Patents.

Explosive; A New ——. J. Luciani. First addit dated Dec. 22, 1902, to Fr. Pat. 326,037, Oct. 31, 190

Nitrocotton, containing a high percentage of nitro and insoluble in nitroglycerin, is mixed with ammon perchlorate powders. The effect of the explosive can increased by wrapping it in perforated sheets of alumin or magnesium, or by the addition of these metals in form of powder. The composition of such an explosiv 70 per cent. of ammonium perchlorate, about 12 per ce of nitrocotton, and 18 per cent. of aluminum or magnes (See also this Journal, 1903, 760.)—L. F. G.

Explosive; Manufacture of a Safety ——. C. Fra Fr. Pat. 327,721, Dec. 26, 1902.

Picric acid is dissolved in glycerin heated to 100° C., mixture neutralised with ammonium carbonate, and fusorial earth added. Any moisture is removed heating. A hot solution of potassium nitrate in wat then added, and the heating of the mixture continued at a temperature of 115° C. the mass is nearly dry. small quantity of sulphur may then be added. The m is dried in the sun, and the explosive then formed powder or grains, or compressed into various forms.
—L. F.

Erratum.

This Journal, 1903, 821, col. 2. Second Table, un Temperatures, *for* "8,384" *read* "3,381."

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

English Patent.

Thermometers, Burettes, and other Graduated Tu Means for Facilitating the Reading of ——. Köhler, Leipzig. Eng. Pat. 10,936, May 13, 1903.

A V-shaped frame, sliding over the graduated instrum carries an eye-piece and swinging mirror, or a sigh arrangement (of two horizontal wires viewed transver and an electric glow lamp.—F. H. L.

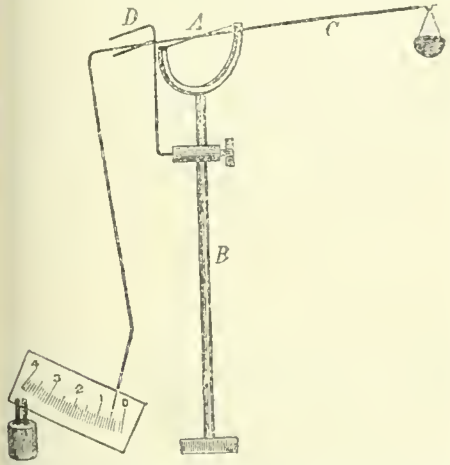
INORGANIC—QUANTITATIVE.

p-itrophenol as Indicator. A. Goldberg and K. Nauma. Zeits. angew. Chem., 1903, **16**, [27], 644—647.

Sgel (this Journal, 1900, 1040) recommended the use of -nitrophenol as a substitute for methyl orange in al limetry, but did not state what quantity of the indicator w necessary. The authors find that if too small a pr ortion of *p*-nitrophenol be used, the amount of normal ac required by a solution of sodium carbonate is invably less than when methyl orange is employed. For in nce, with 0·2 c.c. of a 0·1 per cent. solution of p rophenol, 25 c.c. of sodium carbonate solution required 5 to 6 c.c. of N/2 sulphuric acid, as against 7·8 c.c., w methyl orange as indicator. If, however, 1 to 4 c.c. of e same solution of *p*-nitrophenol were used, the amount of ulphuric acid used was 7·95 c.c., agreeing fairly well w the methyl orange results.—C. A. M.

avimetric Analyses with very small Quantities of ubstance. W. Nernst and E. H. Riesenfeld. Ber., 1903, 6, [10], 2086—2093.

authors use a delicate torsion balance, shown in the a mpanying figure. The beam is a capillary glass tube astened by water-glass to a quartz fibre A stretched b een the arms of the support. The beam is bent at t angles as shown, and the finely drawn out end travels ront of a divided scale, its positions being read off by escope at a little distance. The amplitude of swing is ted by the brass fork D. The little scale pan is of platinum foil, and with the attached wires (welded to weighs 20 mgrms.; it is counterpoised by a platinum r attached by water-glass to the other half of the beam. whole is contained in a glass case provided with lling screws, by the regulation of which the pointer can djusted to the zero of the scale. The balance is calited by cutting five weights out of thin platinum wire, as rly as possible a mgrm. each, and reading the detions produced by them separately and in combination; aggregate weight of the five being accurately determined an ordinary balance, it is a matter of calculation only to k out the deflection in scale divisions per mgrm. The sitiveness of the balance remains unchanged for long ods; but the zero point is apt to vary, and should refore be verified before and after each weighing. The lc-pan itself serves as a crucible, or a crucible of thin tinum foil may be placed upon it. With this apparatus authors have effected such determinations as that of bon dioxide in calc-spar, moisture and loss by ignition minerals, atomic weight determinations in fractionating earths, by weighing oxide and sulphate, &c. All these be done with considerable accuracy, and with great idity, owing to the small quantities of material operated —J. T. D.



Gases; Fractional Combustion of ——, by means of Palladium Asbestos. O. Brunck. Zeits. angew. Chem., 1903, **16**, [29], 695—697.

Charitschkow has stated (J. russ. phys. chem. Ges., 1902, **34**, 461 and 710) that Winkler's method for the determination of hydrogen in presence of methane by combustion by means of palladium-asbestos is useless, as a considerable proportion of the methane is oxidised at the same time as the hydrogen. This statement being opposed to the author's experience, he made a series of experiments to test its accuracy, and he concludes that the unsatisfactory results obtained by Charitschkow were due to the fact that Winkler's directions were not followed. A complete combustion of the hydrogen can be effected without the smallest quantity of methane being oxidised, if the following conditions, practically identical with those laid down by Winkler, be observed. (1) Not more than 25 c.c. of the gaseous mixture should be employed. (2) The oxygen required for the combustion must only be supplied in the form of air. Only in the rare cases where the gaseous mixture is very greatly diluted with nitrogen is the use of pure oxygen permissible. (3) The capillary tube containing the palladium-asbestos must only be very gently heated. (4) The test must be so carried out, that the asbestos fibre faintly glows only at the inlet end of the capillary tube. —A. S.

Calcium Carbide; Valuation of Commercial ——. V. Recchi. Gaz. chim. ital., **33**, [1], 153—155. Chem. Centr., 1903, **1**, [26], 1438.

The author's apparatus consists essentially of two Mariotte's bottles A and B joined by a piece of rubber tubing. The bottle A which is provided with a Mohr's clip, has a mark on its neck. The holder for the calcium carbide consists of a glass tube about 10 cm. long, closed at its upper end by means of a rubber stopper, through which passes a glass rod, bent at its lower end into the form of a hook which carries the cylindrical metal receptacle for the carbide. The bottle B is filled with water saturated with sodium chloride or acetylene, and is then raised till the water fills the bottle A up to the mark. The latter is then raised, the clip opened, and the carbide receptacle brought gradually into contact with the water. When the reaction is complete, the apparatus is allowed to cool, the bottle B raised till the level of water in the two bottles is the same, the clip closed, and the bottle filled up to the neck with water from a graduated cylinder, the quantity required being a measure of the gas evolved from the carbide. The author claims that by his method larger quantities of calcium carbide (15 grms. or more) can be used than ordinarily, and thus the difficulty of obtaining a good average sample is to some extent overcome.—A. S.

Sulphuric Acid; Titration of —— with Benzidine Hydrochloride. W. J. Müller. Zeits. angew. Chem., 1903, **16**, [27], 653—655.

Referring to Raschig's modification (this Journal, 1903, 883) the author asserts that his original method is capable of accurately determining 0·00003 grm. of sulphuric acid, whilst but little time is required for the separation of disturbing substances and the precipitation from a hot solution. As regards titration of the precipitate, he points out that in addition to the loss of time, there may be a considerable loss (0·1 to 0·2 per cent. at 25° C.), through washing the precipitate, which, as in the case of wines, frequently contains colouring matters mechanically carried down. A series of tabulated figures are given to show that good results are obtained by the original method in the cold, when dilute solutions of benzidine hydrochloride are used. A difference of about 1 per cent. from theory in some of the experiments is attributed to the presence of carbon dioxide in the water. About 200 c.c. of water are required for washing the precipitate in Raschig's modification to obtain good results, which even then may deviate from theory by as much as 1 mgrm. The general conclusion is that the modified method may be employed when there are no disturbing substances to be removed, but that otherwise the original method is preferable on account of its greater accuracy.—C. A. M.

Chloride of Lime; Analysis of ——. D. de Paepe. Bull. Acad. roy. Belgique, **17**, 92—99. Chem. Centr., 1903, **1**, [26], 1434.

For the determination of the available chlorine in chloride of lime, Pénot's method is the best. Titration with thiosulphate solution, after addition of potassium iodide, always gives results which are too high. By Bunsen's method, the chlorine present as chlorate is returned as available chlorine.

For the determination of the total chlorine, 7·1 grms. of this sample are dissolved in 1 litre of water, and to 50 c.c. of the solution, the amount of arsenious acid solution necessary (according to a previous determination) to combine with the available chlorine is added. The solution is then rendered faintly acid with nitric acid, neutralised with calcium carbonate, and the chlorine determined volumetrically by Mohr's method.

The chlorine present as chlorate is determined by treating a further 50 c.c. of the solution with arsenious acid as before, then adding 10 c.c. of a solution containing 50 grms. of ferrous sulphate and 50 grms. of sulphuric acid per litre, boiling for five minutes, and titrating with N/10 potassium permanganate solution. Each c.c. of permanganate solution used, represents 0·05917 mgrm. of chlorine in the form of chlorate.—A. S.

Silicates; Simplification of the Analysis of ——, by the use of Formic Acid. A. Leclère. Comptes rend., 1903, **137**, [1], 50—51.

After fusion with any of the bases which are usually employed for making the silicate capable of being attacked by acids, the material is treated with a suitable quantity of boiling water, and formic acid is immediately added in quantity sufficient to give a liquid containing about 5 per cent. of free formic acid: this liquid is maintained at a temperature of 100° C. for two days. The silica and titanic acid are completely precipitated without passing through the gelatinous state and can be easily filtered off. The filtered liquid is neutralised by a dilute solution of ammonia and again brought to the boiling point. This causes the complete precipitation of the iron and aluminium without any contamination other than the base which was employed in great excess to render the silicate capable of being attacked; filtration is easy. The precipitation of iron as formate has long been known, and the author has established, by experiments with potash alum, that the precipitation of aluminium under these conditions can be effected with great accuracy. By combining the above method of employing formic acid with the lead oxide method previously described by the author (this Journal, 1898, 71), all the constituents of a silicate can be accurately determined.—J. F. B.

Manganese and Iron; New Method of Separating ——. M. Dittrich. Ber., 1903, **36**, [10], 2330—2333.

The solution is acidified with sulphuric acid, warmed, and crystallised sodium sulphite, or sulphurous acid added, till the solution is colourless, and a further addition of the reducing agent produces no change of colour. The solution now contains iron only in the ferrous state. A solution of 4 grms. of pure potassium cyanide and 1 grm. of sodium sulphite in a little water, is now added, and the liquid heated for a short while. As soon as the precipitate has become of a lighter colour, an aqueous solution of 1—2 grms. of sodium hydroxide is added, then 20—30 c.c. of a 3 per cent. solution of hydrogen peroxide, and the mixture diluted with hot water. After 15 minutes, the hydrated manganese peroxide is filtered off, washed, and dissolved on the filter in a mixture of warm nitric or sulphuric acid with hydrogen peroxide. From the solution thus obtained, the manganese is precipitated with ammonia and hydrogen peroxide, filtered off, and weighed as manganese protosesquioxide, Mn_3O_4.

The filtrate is concentrated, and warmed with 40—50 c.c. of a 10 per cent. solution of ammonium persulphate, to destroy the complex cyanides. 15 c.c. of concentrated hydrochloric acid are then added, and the iron precipitated by ammonia solution.—L. F. G.

Antimony; Electrolytic Determination of ——, and Separa tion from Tin. A. Fischer. Ber., 1903, **36**, [1 2348—2356.

Like Hollard (this Journal, 1903, 512) the author us potassium cyanide to prevent the formation and solve action of polysulphides ($Na_2S_4 + 3KCN = 3KCNS + Na_2S$ but he finds sodium sulphydrate yields irregular ar inaccurate results, and uses instead sodium sulphid To the solution, contained in a platinum basin with ma surface, 30 per cent. potassium cyanide solution is added r it is decolorised; electrolysis is begun with the liquid 60°—70° C., a current of 1—1·2 amp. at 1·5—1·7 volts, a the cyanide solution is slowly dropped in so as to keep t liquid colourless. The deposition of 0·2—0·4 grm. antimony will require 3 or 4 hours, and 20—30 c.c. of t cyanide solution will be needed. The electrolysis may l carried out at the ordinary temperature, in 5—6 hour with a current of 0·45—0·8 amp. at 1·7—1·8 volts. the higher temperature the platinum anode is slight attacked, but no platinum is deposited on the cathode.

For the separation of antimony from tin, Classen method (60°—70° C., 1—1·5 amp., 2—3 hours), giv accurate results with trivalent antimony, but with penta valent antimony, though the deposited metal is free fro tin, the results are always too low, no doubt through t solvent action of polysulphides. The addition of potassiu cyanide enables accurate results to be obtained with eith trivalent or pentavalent antimony; but it also renders t co-precipitation of tin more likely, if the experiment conditions are not adhered to. The temperature must n rise above 30° C., nor the potential difference between t electrodes above 1·1 volt. About 7 hours are require the completion of the precipitation is recognised by addin 10 c.c. of sodium sulphide solution, and observing wheth after half an hour any deposit of antimony is visible on t newly-wetted portions of the cathode. During the proces 10—15 c.c. of the cyanide solution will be require Before beginning electrolysis, a concentrated solution 3—5 grms. of pure sodium hydroxide (from sodium; fr from alumina) must be added to the liquid; this is t check the hydrolytic formation of sodium sulphydrat which favours precipitation of tin.—J. T. D.

Mercury; Gravimetric and Volumetric Methods of Dete mining ——. F. M. Litterscheid. Arch. Pharm., 190 **241**, [4], 306—312.

If to mercuric chloride solution there be added excess potassium bichromate solution, followed by excess ammonia (or excess of ammonia followed by chromate bichromate solution), a lemon-yellow precipitate form which becomes dense and granular on shaking, and leav a solution absolutely free from mercury. This precipitat which has been obtained by different methods by Hirz and by Hensgen, has the formula $(NHg_2)_2CrO_4 2H_2O$; gives off no water at 100° C., no ammonia when warme with caustic potash solution, and on heating it decompos explosively, leaving a residue of chromium sesquioxide.

This precipitate is formed as stated, from a weighe amount of the substance in which mercury is to l determined, the solution well shaken and allowed to stan for six hours, the precipitate collected on a tared filter an dried at 100° C. till constant in weight; the results ar within 0·2—0·3 per cent. of those calculated. The pr cipitate may also be ignited and the chromium sesquioxid weighed, but the results are less satisfactory.

Volumetrically, the mercury solution is treated wit excess of standard potassium bichromate solution, an 10 per cent. ammonia solution gradually added to distin alkaline reaction; the liquid is well shaken for 10 minute and allowed to stand for at least six hours. It is then filtere through a dry filter (the first portions being thrown away and the excess of bichromate determined in an aliqu portion by acidifying with sulphuric acid, adding potassiu iodide, and titrating with thiosulphate.

The process is interfered with if large quantities ammonium or sodium salts be present.—J. T. D.

Cy ide Solutions [*Determination of Gold and Silver*] : *saying* ——. Mining and Scientif. Press (Cal.), ril 11, 1903. Chem. Metall. and Mining Soc. of S. rica, 1903, **3**, [13], 222.

Ch STY's method for the assay of cyanide solutions, is follows. From 3 to 10 assay tons of the solution are bo l, acidified until they give a strong acid reaction with lit s paper, and boiled for 2—3 minutes to expel hydrocy c acid. 20 c.c. of a solution containing 1 grm. of co er sulphate are then added from a pipette. When th mixture boils, the copper is precipitated by means of slight excess of an alkali sulphide, and boiling is co nued until hydrogen sulphide is no longer evolved. Th precipitate is rinsed on to an 11-cm. filter, and the is then folded up with its contents, placed on a 2½-in. ier and dried and burnt in front of a muffle. About 20 ms. of granulated lead and a little borax glass are ad l and the whole is scorified down to 8—9 grms., and is tracted and cupelled. Care must be taken in preci ting with sulphide that the solution is not made ine again. Half-litre agate-ware saucepans are recom ed for boiling and precipitating, although they are not lived. The results are as accurate as those obtained y other method.—W. G. M.

B zes and Bearing Metals; Analysis of ——. H. E. alters and O. I. Affelder. J. Amer. Chem. Soc., 1903, , [6], 632—636.

zes.—1 grm. (or 0·5 grm. when the lead exceeds er cent.) is dissolved in 10 c.c. of warm nitric acid gr. 1·42) in a covered beaker, and the solution diluted 40 c.c. of hot water, boiled for five minutes, and filtered, he insoluble matter washed with dilute (2 per cent.) acid, ignited, and weighed as tin dioxide. The e is treated with 25 c.c. of ammonia, heated to the g point, mixed with 5 grms. of ammonium persulphate, oiled for 5—10 minutes, after which it is acidified sulphuric acid, and the precipitated lead peroxide ted, washed with hot water, and returned on the filter to the beaker. It is now disintegrated in 600—700 c.c. ter, to which are subsequently added about 3 grms. of sium iodide and some starch solution. After the has dissolved, 10 c.c. of dilute hydrochloric acid) are added, and the liquid titrated with N/20 sodium lphate solution. The number of c.c. used, multiplied e factor 0·5175, gives the percentage of lead.

e filtrate from the lead peroxide is diluted to 500 c.c., l, and after the addition of 50 c.c. of a 20 per cent. on of sodium thiosulphate, again boiled for 5 minutes, filtered, and the precipitate washed, ignited, and ied as cupric oxide.

e filtrate from this precipitate is oxidised by means of acid and potassium chlorate, and concentrated to 300 c.c. Iron and aluminium are then determined e usual methods, and manganese in the filtrate from by adding ammonia to alkaline reaction, boiling, then g ammonium persulphate, boiling for five minutes, ug the precipitate with hot water, and weighing it, ignition, as manganese protosesquioxide, Mn_3O_4.

nmonium phosphate is added to the filtrate from the anese, and the liquid boiled, nearly neutralised with chloric acid, again boiled for five minutes, and the pitated phosphate collected, washed with hot water, and dried and weighed as zinc and ammonium phosphate, H_4PO_4, or ignited in a Gooch's crucible and weighed ic pyrophosphate, $Zn_2P_2O_7$.

y nickel in the filtrate is precipitated as sulphide, and d and weighed as nickel oxide, NiO. When only a amount of manganese is present, the following method be used on a fresh portion of the sample: 0·2 grm. is ved in 10 c.c. of warm nitric acid (sp. gr. 1·20), and expulsion of all nitrous vapours the solution is mixed 15 c.c. of silver nitrate solution (1·33 grms. per litre) bout 0·5 grm. of ammonium persulphate, heated to e the manganese to permanganic acid, cooled, diluted) c.c., and titrated with standard sodium arsenite or gen peroxide solution.

Determination of Phosphorus.—1 grm. of the sample is dissolved in 5 c.c. of fuming nitric acid, the solution evaporated to remove the bulk of free acid, then mixed with 10 c.c. of hydrochloric acid, and evaporated to dryness. The residue is dissolved in dilute hydrochloric acid, and lead, tin, and copper precipitated from the boiling solution by means of metallic zinc. The filtrate and washings are boiled for a few minutes with some iron solution (free from phosphorus) and 10 c.c. of nitric acid (sp. gr. 1·42), then treated with ammonia solution and filtered to separate most of the zinc. The precipitate is dissolved in hot nitric acid (sp. gr. 1·20), and the phosphorus precipitated with ammonium molybdate solution, and determined in the usual manner.

Bearing Metals.—Samples containing much tin and little lead are analysed as described above. If, however, much lead be present together with antimony, Hopkins' method of separating the latter is recommended: 0·5 grm. of the sample and 0·25 grm. of pure tin are boiled down to a paste in a covered beaker with 20 c.c. of nitric acid (sp. gr. 1·33), 40 c.c. of hot water added, and the precipitate filtered off, washed with 2 per cent. nitric acid, ignited, and the tin and antimony weighed as oxides. The filtrate is rendered strongly alkaline with caustic potash, and the lead oxidised by means of 10 grms. of ammonium persulphate. The analysis is then completed as in the case of bronzes.

For the determination of antimony, 1 grm. of the sample and 1 grm. of potassium iodide are gently boiled for an hour with 80 c.c. of hydrochloric acid (sp. gr. 1·10), and the insoluble matter collected, washed with dilute hydrochloric acid, then with water, and once with alcohol, dried at 100° C., and weighed as metallic antimony. This is calculated to antimony oxide, Sb_2O_4, and deducted from the weight of the mixed oxides. The amount of tin is found by difference, a deduction being made for that added at the beginning. Arsenic is determined in a fresh portion by one of the distillation methods, whilst bismuth, if present, is precipitated simultaneously with the copper sulphide.

The paper concludes with test analyses of bronze and other alloys.—C. A. M.

ORGANIC—QUALITATIVE.

Lignite and Coal; Method of Distinguishing between ——. E. Donath and H. Ditz. Oesterr.-Zeits. f. Berg- u. Hüttenw., **51**, 310—314. Chem. Centr., 1903, **2**, [2], 147.

LIGNITE and coal are frequently distinguished by their behaviour towards boiling caustic potash solution; coal is not affected, but lignite colours the alkali solution more or less intensely brown. Muck has stated, however, that all lignites do not give this coloration. The authors have examined the portion of the lignite extracted by alkali. The lignite was repeatedly boiled with caustic potash solution, the dissolved matter precipitated with hydrochloric acid, washed with water, and air-dried; the yield was about 5 per cent. The substance obtained contains nitrogen, is easily soluble in solutions of ammonia and sodium carbonate, partly soluble in solutions of sodium acetate and sodium sulphide, and slightly in 96 per cent. alcohol. If the lignite be first exhausted with alcohol and ether, then the substance extracted by alkali is free from nitrogen. When heated, the substance extracted by alkali decomposes at a relatively low temperature, with formation of acid vapours. The residue is very stable, and is partly soluble in 96 per cent. alcohol. The authors conclude that the substance extracted by alkali consists of two portions: (1) a compound of an acid character, insoluble in alcohol, which is dissolved by the alkali in the form of a salt, and is again separated by treatment with acid; and (2) an ester- or lactone-like compound which is decomposed by the alkali; the acid produced is dissolved, but is separated by addition of acid, and is soluble in strong alcohol. The residue remaining after the lignite has been exhausted with alcohol and ether, and repeatedly digested with hot caustic potash solution, is violently acted upon by nitric acid of sp. gr. 1·055. The residue left after this treatment contains a considerable proportion of nitrogen; it dissolves to a considerable extent in alcohol, and the insoluble portion is almost free from nitrogen.

The authors find that boiling with nitric acid of sp. gr. 1·055 affords a good means of distinguishing between lignite and coal, the former being strongly attacked, whilst the latter is unaffected. In mixtures, 10 per cent. of bituminous coal or 5 per cent. of lignite can easily be detected. It is stated that a lignite which, owing to a fire in the mine, had been exposed to a high temperature, greatly resembled ordinary coal in appearance, and behaved like the latter towards caustic potash and nitric acid.

—A. S.

Wines; Differentiation of "Mistelle" from other ——, by the Proportion of Acids soluble in Ether. C. Blarez. Comptes rend., 1903, **137**, [1], 64—65.

For the differentiation of "mistelle" wines, *i.e.*, wines manufactured by the addition of alcohol to unfermented grape juice, from true wines, the author proposes to determine the proportions of acids soluble in ether.

"Mistelle" wines, being made generally from very ripe grapes, the acid soluble in ether consists of small quantities of malic acid, whereas fermented wines contain in addition succinic acid as a product of fermentation.

The process is as follows:—25 c.c. of wine are concentrated on the water-bath to a volume of 10 c.c. The wine is then exhausted five times with 25 c.c. of ether each time. The combined ethereal extracts are evaporated, and the residue is dissolved in a little distilled water and titrated with decinormal soda in presence of phenolphthalein. According to this method three samples of "mistelle" wines showed from 0·215 to 0·333 grm. of acid soluble in ether per litre, whilst five samples of fermented wines showed from 0·820 to 1·100 grm. per litre.—J. F. B.

Liquid Storax: Detection of Adulteration of ——, with Rosin. C. Ahrens and P. Hett. Zeits. angew. Chem., 1903, **16**, [16], 384.

The authors find that storax adulterated with rosin yields to light petroleum spirit from 55·1 to 63·7 per cent. of extract; this has an acid value between 116·3 and 120·9, and a saponification value (cold method) between 171·6 and 177·6. Specimens of pure storax of both recent and older importation gave a light petroleum spirit extract of 37·6 to 47·6 per cent., with an acid value ranging from 37·6 to 47·6, and a saponification value (cold) of 194·6 to 198·4. Adulteration with rosin is more readily detected by this method of separating and treating the light petroleum spirit extract than by determining the saponification constants of the original drug, as recommended by Dieterich.

—J. O. B.

ORGANIC—QUANTITATIVE.

Silk: Determination of the Weighting Agents in Loaded ——. C. Ris. Zeits. für Farben- u. Textil-Chem., 1903, **2**, [13], 261.

The author confirms the results of A. Müller (this Journal, 1903, 622), and states that hydrofluoric acid removes the whole of the weighting agents in silk, without injuring the fibre in any way. His results were checked by determining the ash of the fibres thus treated, which never exceeded 0·3 per cent. Vessels of lead or gutta-percha, or glass beakers covered with paraffin, were employed for the reaction; for experiments on a large scale, wooden vessels free from metals are suitable.

— L. F. G.

Sugar Determination; Aid to the Fehling Process for ——. S. A. Vasey. Lancet, **164**, 1737. Pharm. J., 1903, **71**, [3378], 78.

The author adds a quantity of precipitated calcium carbonate or barium sulphate to the Fehling solution before titrating with sugar solution. The cuprous oxide separated, settles with the calcium carbonate or barium sulphate, leaving the supernatant liquid clear, so that the exact point of transition from blue to colourless can be easily observed.—A. S.

Tartars; Gasometric Method for the Valuation of C mercial ——, and for the Determination of Potash. Saporta. J. Pharm. Chim., 1903, **94**, [2], 61—65.

The valuation of commercial tartars by titration is quently rendered difficult owing to the colour of the san On the other hand, the sparing solubility of cream of ta makes the direct gasometric determination, by its ac upon bicarbonates, in the cold, in the calcimeter, in venient. This difficulty of solubility is surmounted boiling the tartar with a solution of boric acid in whic is readily soluble, and, provided an excess of boric over the quantity required for the production of the do salt be avoided, the mixture behaves towards bicarbon exactly as if the tartar alone were present. 25 grms. of powdered tartar are mixed with 5 grms. of boric acid, boiled for at least five minutes with about 500 c.c. of wa the solution is then cooled and made up to 1 litre. 20 of this solution are placed in the calcimeter and treated 0·4—0·6 grm. of crystallised potassium bicarbonate, volume of gas evolved being measured. Calculations be avoided by comparing the results with the volume of given off by 20 c.c. of a solution of pure tartaric aci 10 grms. per litre under the same conditions.

Determination of Potassium Salts.—When a non potassium salt, dissolved in a saturated solution of crea tartar, is treated with an excess of sodium bitartrate, dissolved in a saturated solution of tartar, the whole of potassium in the normal salt is deposited after standin about 12 hours, in the form of potassium bitartrate. precipitate is filtered off and washed with a satur solution of tartar, it is then dissolved by boiling wi suitable quantity of boric acid solution and treated bicarbonate in the calcimeter. The results may be chec by acidimetric titrations of a portion of the solution be and after the precipitation of the potash.—J. F. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTE

Polonium, and the Inductive Property of Ra F. Giesel. Ber., 1903, **36**, [10], 2368—2370.

Marckwald found that metallic bismuth, kept for s time in solution of polonium-bismuth chloride, acquires property of emitting α-rays, and attributes this to a of polonium precipitated on the bismuth. The aut however, in repeating Marckwald's work, could get precipitate on the bismuth, and concluded that the emis of α-rays was induced in the bismuth itself. He now fi that bismuth, similarly dipped in a 1 per cent. solutio radium bromide, acidified with hydrochloric acid, sh after one or two days intense α-radiation, but no β-ra tion, though every trace of radium salt was removed fr the bismuth. The platinum metals behave like bis though in a lower degree. A peculiarity of this ind radiative power is that it does not (as far as has yet observed) diminish with time. The small quantitie bismuth and of platinum metals dissolved, in these ex ments, were precipitated with hydrogen sulphide, and sulphides were found to emit β-rays; it is pos however, that this is due to co-precipitated or adh radium salt.—J. T. D.

Colloidal Silver. M. Hanriot. Comptes rend., 19 **137**, [2], 122—124.

In continuation of his previous work (this Journal, 437, 827) the author has now examined the colloidal s (silicargol) obtained by Küspert's method (this Jou 1902, 1301; 1903, 49). He concludes from the resu his experiments that (1) the different varieties of coll silver are distinct chemical individuals, differing in properties and in composition; (2) the albuminoid m in collargol, the oxide of iron in Cary Lea's modifica and the silica in silicargol are not impurities, but integral parts of the molecules, and cannot be sepa without destroying the colloidal silver; (3) all the lications give off carbon dioxide and hydrogen when hea *in vacuo*, and have a greater reducing power than the s they contain.—A. S.

sium ; The Burning of ——. A. C. Christomanos. Ber., 1903, **36**, [10], 2076—2082.

ning magnesium ribbon touches a glass plate, marble, , or iron foil, or any cold substance, grey to black surrounded by a ring of white magnesium oxide, med. A quantity of this grey powder was produced glass plate, and scraped off. A larger quantity duced by burning broad magnesium ribbon than narrow ribbon. The powder consisted of 78 per of magnesium oxide, and 22 per cent. of finely l metallic magnesium. If it be mixed with water, evolved, and hydrogen given off. More hydrogen lved from this powder than from an equivalent y of the finest commercial magnesium powder. The roduct of the action of water on it, is white magnesium ide, $Mg(OH)_2$.—L. F. G.

dracids ; Esterification of the ——. A. Villiers. Comptes rend., 1903, **137**, [1], 53—55.

nixture of hydracid and alcohol, which has reached ilibrium corresponding to a certain temperature, be d to lower temperatures, profound modifications In the case of sulphuric acid, the final equilibrium ble and independent of change of temperature; this is due to the stability of the hydrates of sulphuric But with the hydracids a new equilibrium tends to blished under the influence of a lower temperature. inary ether were not a product of the reaction, the quilibrium would probably be the same as if the cation had been conducted at the lower temperature, to the partial re-combination of the elements of the ated hydrates of the hydracids. But ordinary ether uced at the higher temperature in greater proportion at corresponding with the lower temperature. The is the liberation of a greater quantity of water, and oportion of ester tends to decrease not merely to the orresponding to the lower temperature, but to a still limit corresponding with a more highly hydrated mixture. Successive variations of the ordinary temre of the room may bring about a distinct lowering limit of esterification; exact determinations are g, owing to the extreme slowness of the reaction n ethyl alcohol and hydrochloric acid at the ordinary ature. Butyl alcohol and hydrochloric acid react xtraordinary slowness, and the limit is probably at the ordinary temperature than at 100° C. With ner monohydric alcohols the velocity generally decreases as the molecular weight increases. The esterification col and glycerol by hydrochloric acid is far more han that of ethyl alcohol, if account be taken of the at the limit is lower. This limit appears to be l at the ordinary temperature; it is lower than at , but the same as at 44° C.—J. F. B.

drocarbons ; Synthesis of ——. A. Werner and . Zilkens. Ber., 1903, **36**, [10], 2116—2118.

ynthesis depends on the reaction between organo- sium compounds (*e.g.*, phenylmagnesium bromide) yl sulphates, according to the following scheme :—

$$R.Mg.X + (C_nH_{2n+1})_2\,SO_4 =$$
$$R.C_nH_{2n+1} + X.Mg.SO_4.C_nH_{2n+1}.$$

ene was synthesised by the action of dimethyl e on phenylmagnesium bromide (from bromoe and magnesium) in ethereal solution. 31 per f the bromobenzene used was converted into toluene. ll quantity (about 6 per cent.) of diphenyl was also .

ubstituting *p*-bromotoluene for bromobenzene in the ction, a 74 per cent. yield of *p*-xylene was obtained. small amount of *p*-ditolyl was also produced.

—T. F. B.

New Books.

CYANID-PROZESSE ZUR GOLDGEWINNUNG. Nach einschlägigen Quellen bearbeitet von MANUEL VON USLAR, unter Mitwirkung von Dr. GEORG ERLWEIN, Vorstand der elektrochemischen Abteilung der Siemens und Halske A.-G., Berlin. Wilhelm Knapp's Verlag, Halle-a-S. 1903. Price M. 4.

8vo volume containing 93 pages of subject-matter, and four sheets of tables and engravings, with 30 illustrations in the text. The subjects treated of are as follows :—INTRODUCTION. Older and Newer Cyanide Processes. I. The MacArthur-Forrest and Siemens and Halske Process. II. Industrial Examples and Costs. III. Chemistry of the Process. IV. Modifications of the Cyanide Process.

BACTERIA IN MILK AND ITS PRODUCTS. Designed for the Use of Students in Dairying and for all others concerned in the handling of Milk, Butter, and Cheese. By H. W. CONN, Ph.D., Professor of Biology, Wesleyan University, &c. Rebman, Limited, 129, Shaftesbury Avenue, London, W.C. 1903. Price 6*s*.

CONTAINS 290 pages of subject-matter, with 43 illustrations, and a bibliographic list of works on the subjects under consideration. The work concludes with an alphabetical index. The subjects specifically dealt with are as follows :—I. The Nature of Bacteria. II. Sources of Bacteria in Milk. III. Types of Milk Bacteria. IV. Growth of Bacteria in Milk. V. Milk Bacteria and Health VI. How shall the Consumer of Milk Products be protected? VII. Bacteria in Butter. VIII. Bacteria in Cheese. IX. Bacteriological Analysis of Milk.

A SHORT MANUAL OF ANALYTICAL CHEMISTRY, Qualitative and Quantitative—Inorganic and Organic. Following the Course of Instruction given in the Laboratories of the SOUTH LONDON SCHOOL OF PHARMACY. By JOHN MUTER, Ph.D., F.R.S.E., &c. 9th Edition. Simpkin, Marshall, Hamilton, Kent, and Co., Ltd., London. 1903. Price 6*s*.

DEMY 8vo volume containing 230 pages of subject-matter, with 56 illustrations and an alphabetical index. The main subjects treated of are as follows :—Part I. QUALITATIVE ANALYSIS. I. Processes employed by Practical Chemists. II. Detection of Metals. III. Detection and Separation of Acid Radicals. IV. Qualitative Analysis, as applied to the Detection of Unknown Salts. V. Qualitative Detection of Alkaloids and Certain Organic Bodies used in Medicine, with a General Sketch of Toxicological Procedure.—Part II. QUANTITATIVE ANALYSIS. VI. Weighing, Measuring, and Specific Gravity. VII. Volumetric Quantitative Analysis. VIII. Gravimetric Quantitative Analysis of Metals and Acids. IX. Ultimate Organic Analysis. X. Special Processes for the Analysis of Water, Air, and Food. XI. Special Processes for the Analysis of Drugs, Urine, and Urinary Calculi. XII. Analysis of Gases, Polarisation and Spectrum Analysis, &c.

AGRICULTURE AND AGRICULTURAL INSTRUCTION IN GERMANY. Foreign Office Miscellaneous Series, No. 591. Price 4*d*.

ACCOUNT of the progress of agricultural instruction, with details of organisation, professorial staff equipment, and curricula of the various high schools, and of the Agricultural and Brewing Academy at Weihenstephan.

Details regarding secondary and elementary agricultural instruction.

Account of the practical application of agricultural science, including the theory of artificial manures.

General description, with statistics, of agricultural produce and industries.

Causes of agricultural depression, and proposed remedies.

Trade Report.

I.—GENERAL.

AUSTRIA-HUNGARY: PROPOSED NEW GENERAL CUSTOMS TARIFF.

Bd. of Trade J., July 16, 1903

(See this Journal, Feb. 28, 1903, 235—247.)

The Board of Trade has now published, in the form of a Parliamentary Paper, a translation of the Tariff, with comparison, as far as possible, of the rates of Customs duty contained therein, with the rates at present in force on imports into Austria-Hungary from the United Kingdom.

In publishing this translation the Board directs attention to the following points:—

1. The tariff is, as yet, only in draft form. It has still to receive the sanction of the Legislatures of Austria and Hungary before any portion of it can be put into force.

2. So far as regards goods on which the rates of Austro-Hungarian import duties are "conventional," *i.e.*, are fixed by existing commercial treaties between Austria-Hungary and other Powers, no alteration of the present rates can be made until those treaties expire, unless special arrangements are made with the Powers concerned.

3. The tariff has been prepared by the Austro-Hungarian Government in view of the approaching termination of commercial treaties at present existing between Austria-Hungary and other Powers, and the proposed new duties, besides being subject to modification by the Legislatures at Vienna and Pesth, are liable to further modification as the result of negotiations for fresh commercial treaties. Any reductions of the proposed rates of duty that may be made on any articles will apply to similar British goods imported into Austria-Hungary by virtue of the "most-favoured-nation" stipulation of the treaty of 1876 between Great Britain and the Dual Empire.

The return in question (reference number, Cd. 1672) may be procured from Messrs. Eyre and Spottiswoode, East Harding Street, London, E.C., at a price of 9*d.* per copy.

EXPORTS OF ITALY IN 1902.

Foreign Office Annual Series, No. 3020.

A considerable increase, viz., 1,509,680*l*., took place during the year in the export of raw materials, and this notwithstanding an almost general lowering of prices as compared to 1901:—

Exports.

Articles.	1902.	Increase compared with 1901.
	£	£
Tartar	492,624	133,461
Iron ore	136,084	53,588
Zinc	505,532	93,452
Sulphur	1,789,656	141,608
Marble	297,492	43,784
Olive oil	398,200	166,752
Volatile oils	400,708	91,668
Acids	195,292	13,168

THE TRANSVAAL TARIFF.

Reuter's Telegram from Pretoria, July 18.

The Customs Union Tariff has been promulgated as the tariff to be enforced in the Transvaal as from the 20th inst.

NEW INDUSTRIAL MOVEMENT.

Pall Mall Gazette, July 24, 1903.

The feeling that Great Britain is behind its principal competitors in the acquisition of scientific knowledge and the application of improved methods to the organisation of industry, gave rise to a discussion at a meeting of members of Parliament held recently under the presidency of Mr. Haldane. Members from both sides of the House were present, and it was agreed that means should be taken for
directing the attention of the country and Parliame
this matter and finding a remedy. A preliminary
mittee was formed, consisting, among others, of Mr. As
Mr. Beckett, Mr. Cripps, Colonel Denny, Mr. Duke,
Guest, Mr. Haldane, Mr. Fletcher Moulton, Mr. W.
and Mr. Austin Taylor. It is the intention of the
mittee to place themselves in communication with
Chambers of Commerce and leading members of the
ness community with a view to early and effective a
Mr. Ivor Guest, 22, Arlington Street, has consented t
as secretary for the present.

III.—TAR PRODUCTS, PETROLEUM, E

SOFT AND LIQUID PARAFFIN: U.S. CUSTOMS DECIS

June 1903.

Soft paraffin, composed of a mixture of paraffin oil
ceresin, and paraffin oil, were assessed for duty unde
proviso to paragraph 626 providing for a counterv
duty on petroleum products imported from countries
ing a duty on such products from the United States.
importers claimed free entry for both under paragrapl
of the free list, which provides for paraffin without li
tion. Following decisions of the United States C
Court and the United States Circuit Court of Appeal
Board (June 30th) held both articles to be free of du
claimed.—R. W. M.

NITRONAPHTHALENE: U.S. CUSTOMS DECISION.

July 1903.

This article was assessed for duty at 20 per cen
valorem, as a "preparation of coal tar not a colour or
under paragraph 15 of the Tariff Act of 1897, and
claimed by the importer to be free of duty as "naphtha
under paragraph 524. The Board (July 3rd) sustain
assessment of duty upon the ground that naphthalen
nitronaphthalene were two distinct bodies, both chem
and commercially.—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

SALT LIQUOR [BITTTERN]: U.S. CUSTOMS DECIS

July 1903.

A strong solution of common salt, sodium sulphat
potassium sulphate was assessed for duty at 24 cen
gallon under paragraph 301 of the Tariff Act of 18
an "artificial mineral water." The evidence showed th
article is obtained in Japan from the drying out of co
salt hung in coarse bags, and consists of the drip
This process is conducted in summer, and about 1
gallon of liquor is obtained from a hundred-pound
salt. The liquor is used exclusively in preparing bea
on account of the magnesium salts present. The
expressed the opinion that the article was properly
duty as a "crude mineral" under paragraph 614
Tariff Act of 1897.—R. W. M.

SULPHURIC ACID MANUFACTURE; PRESENT CONDI OF THE ——.

G. Lunge. Fifth Internat. Congress of Appl. Ch Berlin. Zeits. angew. Chem., 1903, **16**, [29], 689–

Great Britain still holds the lead in the manufact
sulphuric acid. In 1900, 992,400 tons were produce
pyrites and about 100,000 tons from sulphur and spe
purifying material. Twenty years earlier, 771,77
were produced from pyrites and about 100,000 ton
other sources. In the United States, in 1900, 8
tons of acid were manufactured from pyrites and su
and about 75,000 tons from blende, &c. The prod
has doubled in 10 years. In Germany, according to
clever, 279,356 tons were produced in 1882, and 6
tons in 1898, and in 1901 the author estimates that 8
tons were manufactured. After the above-men
countries follow France, where, in 1899, 492,000 tons

ictured; Italy and Austria, with about 200,000 tons Belgium, with 164,000 tons; Russia, with 125,000 and Japan, with about 50,000 tons.—A. S.

A nic; Production of ——, in North America.

Zeits. angew. Chem., 1903, **16**, [29], 708.

A nical ores have been discovered at various places in ited States, but only the deposit at Everett, Washing- te, has acquired commercial importance. In the first f working (1901), 300 short tons were produced, and 2, 1,353 short tons. The imports of metallic arsenic, arsenic, and arsenic sulphide into the United States own in the following table:—

Year.	Quantity, in Lb.	Value, in Dols.
1898	8,686,681	370,347
1899	9,040,871	386,791
1900	5,765,559	265,500
1901	6,989,668	316,525
1902	8,110,898	280,055

e 1899, Canada has been a producer of arsenic, the t increasing from 52 metric tons of white arsenic in 275 tons in 1900, 630 tons in 1901, and 726 tons 2. The whole of the arsenic produced in Canada in t two years was obtained from the arsenical gold the Delore mine in Hastings County, Ontario. The t, when ready for the market, contains from 99·6 to cent. of arsenic trioxide, and is mostly shipped to ork. The price of white arsenic in New York the past year varied between 3·34 cents per lb. in y and 2·94 cents in December, the average monthly or the whole year being 3·16 cents. For "red " the price was 7·03 cents in January and 6·88 n December, the monthly average being 6·86 cents.

T total production of the world of arsenic oxide and sulphide for 1901 is given in the Washington as 7,794 metric tons, or 17,182,524 lb., of a value of dols., the production of Turkey being taken as l with the figures for 1900. In 1900 the total ion was 8,128 metric tons, or 17,918,989 lb., of a f 735,491 dols.—A. S.

Nitrate of Soda.

ntgomery and Co.'s half-yearly Report, July 1903.

season just closed will be remembered as one in every available ton of nitrate of soda in Europe een absorbed for consumption. Not only have s in the ports reached vanishing point, but those rior towns are in the same state: while consumers istrial qualities have probably not a month's supply their control. This state of things has been at without any material alteration of values, ng during the past few weeks, and may probably ribed to the following reasons:—(*a*) The poor the cereal crops on the Continent, requiring the application of nitrogenous stimulant in February arch; (*b*) the starved state of the land owing to ative abstention from the use of nitrate caused by gh prices in the spring of 1902, and to the un- ty as to the sugar outlook; and (*c*) to the steady ry moderate price always current throughout the ason.

VIII.—GLASS, POTTERY, Etc.

Glass Industry of Germany.

U.S. Cons. Reps., No. 1692, *July* 9, 1903.

annual production of glass in Germany at present is in the accompanying table.

German glass industry comprises to-day 400 factories, give employment to 35,000 workmen. The necessary aterials—such as wood, potash, and sand—have been drawn from home sources. It is only in recent years, however, that Germany has taken up the manufacture of the finer qualities of glass, which thus far have been marketed at home, very little finding its way into foreign countries. Since 1870 the imports from Italy, Austria, England, and Belgium, the great glass-producing countries of Europe, have been rapidly decreasing, and Germany now exports to these nations large quantities of the coarser glass manufactures. It is doubtful, however, whether Germany will ever be able to compete with Belgium in mirrors or with Venice in fancy-coloured decorations.

Variety.	Quantity.	Value.
Glass:—	Tons.	Dollars.
Hollow	133,272	[illegible]
Green	58,835	7,052,970
Blown plate	13,774	2,448,830
Window	78,487	4,165,476
Rolled plate	39,547	[illegible]
Glass beads, &c.	991	180,166
Total	324,906	27,420,170

The raw material—white quartz sand—is found in Germany in many places in large quantities. The purest sands are found in the neighbourhood of Aix la Chapelle, in Silesia, and in the whole range of the Erzgebirge, which separates Saxony from Bohemia. The factories, for the most part, have been built close to the sand beds. The chemical factories of the Empire furnish all the other necessities of the industry.

In 1900 the Empire imported 13,119 tons of glass and articles manufactured from glass, valued at 2,500,000 dols. The exports amounted to 136,811 tons, valued at 10,000,000 dols. A few years ago six of the largest German glass factories formed a trust, with head offices in Cologne. The German tariff on foreign-made glass has enabled this ring to acquire such a monopoly of the sale of glass and glassware in Germany that it can sell to the home purchaser at higher prices than are demanded for the same articles abroad.

IX.—BUILDING MATERIALS, Etc.

Ground Mica: U.S. Customs Decision.

July 1903.

This article was assessed for duty as a "ground mineral substance" at 35 per cent. *ad valorem* under paragraph 97 of the Tariff Act of 1897, and was claimed by the importer to be properly dutiable at 20 per cent. *ad valorem* under section 6, as a "manufactured article unenumerated." The Board decided that neither the assessment nor the claim was correct, and overruled the protest, at the same time expressing the view that the article was in fact a "frosting," and dutiable at 30 per cent. *ad valorem* under paragraph 58.

German Method of Drying Wood.

U.S. Cons. Reps., No. 1694, *July* 11, 1903.

It is a mistake to suppose that wood which has been for some length of time in a drying room, exposed to a temperature of from 50° to 60° C. (122° to 140° F.), is dry and fit for use, and will not shrink, split, or bend.

Wood which has been floated in rafts or otherwise gives a more reliable material than that which has been carried by cart or rail to the sawmill and workshop. While the wood is lying in the water its sap and salts are diffused out. This diffusion process will progress more slowly at the ordinary temperature of river water—*i.e.*, at from 12° to 18° C. (52° to 65° F.)—than it would at a higher temperature, but the length of time rafts in Germany usually spend on their journey down rivers is entirely sufficient for this process to take place, even at an unfavourable temperature.

The drying process, as practised in Germany, is as follows:—The boards are loaded on a small cart, leaving small spaces between them by placing narrow strips in position. The cart is then pushed into the first drying room. The size of these rooms is usually from 20 to

30 metres (66·45 to 84·25 ft.) long, with breadth and height to correspond. The temperature is kept between 50° and 60° C. (122° and 140° F.). Steam pipes, placed on one side and underneath the flooring, supply the necessary heat, fresh air being admitted from one side by openings which can be wholly or partially closed by means of slides. Ventilators are also employed. The air, after becoming saturated with moisture, is then forced out at the other side of the room. After having been thus prepared, the wood goes into a water bath, where it is kept for about a fortnight.

It is better to have the first drying process followed by a second one in another drying room, which is heated by means of a stove extending its whole breadth, provided with fuel, usually coke, from the outside. On being withdrawn, after about 12 or 18 hours, the wood is quite dry and in perfect condition for use.

Wood which has gone through the lixiviation process makes very useful timber, and it is less liable than non-floated wood to be attacked by micro-organisms, the reason for this being that the lixiviated wood consists almost exclusively of cellulose and lignose, on neither of which do mould nor bacteria thrive. Such timber will require but a slight saturation with an antiseptic solution to become safe from putrefaction and destruction through fungi.

Portland Cement in Germany.

U.S. Cons. Rep., No. 1691, *July* 8, 1903.

The cement manufacture is one of the industries in Germany in which production is excessive. There were in operation at the end of 1899, 261 cement factories, and their number has increased since then.

During 1901 there was consumed in Germany 14,600,000 barrels of cement, while the collective productive capacity of all their factories was 29,000,000 barrels per annum. There must have been in 1901 a surplus of from 10,000,000 to 12,000,000 barrels, of which there was exported 506,652 tons, leaving a large excess, which broke down the market, reduced profits, and brought on a crisis in the industry from which it has not yet recovered.

From 1890 to 1900 all kinds of construction which use cement were active in Germany, and the consumption was enormous and increasing. Millions of barrels were used in the construction of the Kaiser Wilhelm and the Ems canals, and in improvements in the Rhine, Weser, and other rivers. It was expected that the Midland Canal would also be authorised, and the cement factories made preparations to meet that additional demand, so that the postponement of the project was among the causes of the overproduction of that period. The situation led to a new effort to unite the several groups, into which the cement makers were divided, into one combination, which could restrict the output, and restore prices to a profitable basis. The effort proved futile, and the result was war between the competing factories.

The year 1902 brought no relief. The supply of cement everywhere exceeded the demand. Building operations slackened, while labour and fuel—two of the two principal factors in cement production—maintained their values. The only outlet for the surplus was through exports, and these increased from 497,780 metric tons* in 1898 to 528,676 tons in 1899, 543,991 tons in 1900, and 641,520 tons in 1902. Of this export the United States took 197,174 tons in 1900, 108,596 tons in 1901, and 216,726 tons in 1902. The Netherlands took 66,837 tons; British South Africa, 36,720 tons; Great Britain, 33,534 tons; and Brazil, 18,209 tons.

Under the present tariff, cement is free of duty when imported into Germany, and there was a small influx of 51,947 tons in 1902, from points in Belgium, Denmark, France, Austria, and Switzerland, where there were factories near the frontier. To shut out this slight competition the new German tariff imposes a duty of 50 pfennigs (about 12 cents) per 100 kilos. ($1.20 per metric ton) on cement, as against $4.01 per ton duty assessed by Russia, $2.38 in Austria and Switzerland, $1.42 in Sweden, $1.76 in the United States.

Only those factories which are well placed for obtai raw material and handling their product are able to any substantial profit; many establishments are work at a loss. Early in the present year there was a mee in Berlin of cement manufacturers from all parts of Empire, which appointed a commission to consider report upon a plan for the organisation of the e industry under a cartel, or syndicate, which should co output and manage the market. Thus far the commis has not reported, and its silence is taken to show that differences between local syndicates and individual facto have again been found irreconcilable, and that no gen basis of combination can be reached.

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* 1 metric ton = 2,205 lb.

X.—*METALLURGY.*

Phosphor-Bronze Articles: German Customs Decision.

Bd. of Trade J., July 16, 1903.

Metal plates, about $5\frac{1}{2}$ inches long, $1\frac{1}{4}$ inches wide, $\frac{1}{100}$ inch thick, grooved lengthwise, and serving as cellu cleaning apparatus, are dutiable according to the na of the material employed, and according to their exte character, as "rough goods of phosphor-bronze," at the of 30 marks per 100 kilos. (15*s.* 3*d.* per cwt.).

Output of Bismuth Ore and Antimony in United States.

Bd. of Trade J., July 23, 1903.

According to the advance sheets of "Mineral Resou of the United States," published by the United St Geological Survey, the production of bismuth ore in United States during 1902 amounted to 37·5 short (of 2,000 lb.), as compared with a marketed output 318·6 short tons in 1901. The entire production du 1902 was obtained from the Ballard Mine, Colorado, none of the output was sold during that year.

The production of antimony in the last two years wa follows:—

——	1901.	1902
	Tons of 2,000 lb.	Tons 2,000
From hard lead	2,235	2,901
„ domestic ores	50	..
„ foreign ores	353	657
Total produced	2,638	3,561

Note.—The imports of the metal into the United States amou in 1902 to 2,694 tons, as compared with 1,837 tons in 1901.

Although many deposits of the mineral occur in Western States, the production of metal from dom ore has never reached an important position, the la quantity produced in one year being but 295 short ton 1895 in an estimated total production of 4,000 ton metal from all sources. Since 1895 the productio antimony from domestic ores has declined, until there practically none so produced in 1902 as compared wit short tons in 1901.

Manganese Industry of the Caucasus.

Mon. des Intérêts Matériels, June 11; *through Bd. of Trade J., July* 23, 1903.

A conference was recently held at St. Petersbur consider measures for ameliorating the condition of manganese industry in the Caucasus.

The accompanying table shows the production in, exportation from, the Caucasus of manganese, during of the last eight years.

The exportation of manganese from Brazil rose about 100,000 poods in 1894 to 7,500,000 poods in 190

Year.	Production.	Export.
	Poods.	Poods.
1895	7,208,649	10,106,870
1896	9,706,288	8,807,645
1897	12,131,807	10,899,736
1898	16,259,204	14.610,945
1899	34,052,432	24,058,581
1900	40,363.486	25,605,626
1901	22,569,035	20,730,000
1902	24,943,315	27,499,000

Pood = 36 lb. avoirdupois.

has been suggested that, rather than export the mineral at reduced price, the question of utilising the raw product ussia itself should be considered, with a view to trans- ing it on the spot, and opening up a trade in the aed product.

ıe necessity of some immediate action is evidenced by act that owing to the crisis through which the metal- cal industry in the south is passing, more than 50 per of the existing coke furnaces are shut down, and less 50 per cent. of the productive capacity of the blast ıces is utilised.

. Zeidler, the director of the Société de Kertch, recom- ls the erection of blast furnaces at Poti or Batoum, to where the mineral is found, and urges, on account ıe geographical position of the Kertch works, the ment of the import duties on foreign fuel necessary in manufacture for export.

ıe special commission appointed to examine the ques- have also presented a report on the possibilities of the uction, for export, of ferro-manganese in Russia, onstrating that, unless the mineral industry of the asus receives special advantages through export ties and reduced transport rates, Russian ferro-man- se cannot compete successfully on foreign markets.

ıe granting of such benefits to the Caucasian industry is, however, opposed by the representatives of the ganese industry of the Nicopol district; albeit the uction there only amounts to 4,000,000 poods.

e request for reduced transport rates has been refused quite recently, the authorities at St. Petersburg ex- ing their opinion that such reduction would only it foreign buyers by causing a drop in the price of the ral, this being the result of the reduction which was in 1899.

view of the many conflicting interests, the conference ed to leave the Government to settle a course of action, itting at the same time all the considerations set forth g the debate.

e progress which has already been made in the produc- and sale of spiegel and ferro-manganese in Russia is uced by the following statistics:—

—	Production.		Sale.	
	1901.	First Six Months of 1902.	1901.	First Six Months of 1902.
	Poods.	Poods.	Poods.	Poods.
l (12 to 14 cent.)	807,000	559,000	478,000	76,000
l (18 to 20 cent.)	1,492,000	861,000	611,000	303,000
manganese	899,000	744,000	593,000	387,000

stocks of the mineral accumulated at Tchiatour, our, Poti, and Batoum amount to between 30 and 40 n poods, or nearly one year's shipments.

showing the result of neglect in the mining and g of the manganese of the Caucasus, which is stated the best quality in the world, it is pointed out that the lian product is obtaining a higher price on the London et.

XII.—FATS, OILS, Etc.

VEGETABLE WAX TRADE OF HAMBURG.

Foreign Office Annual Series, No. 2998.

Carnauba vegetable wax was in considerable demand during the greater part of last year, the importations reaching 11,560 cwts., as against 7,644 cwts. in 1901. The use of this product by German industries appears to be developing from year to year, and the Hamburg market for Carnauba wax has now become of greater importance than that of the United Kingdom.

The prices of Japan vegetable wax reached a quite exceptionally high figure last year, importations being limited in extent.

TOILET SOAPS AT WUCHOW (CHINA).

Foreign Office Annual Series, No. 3006.

The Chinese are beginning to use soap for shaving, and there might be a sale for a cheap scented shaving soap, preferably coloured and packed in tins.

British soap of a well-known brand sells at 1*s.* per box of three cakes, but being packed in plain cardboard boxes and but slightly perfumed, it is not so much in demand as the cheaper and highly scented French and German varieties, which come out in ornamental covers, and sell well at from 6*d.* to 1*s.* per box.

JATROPHA NUTS: U.S. CUSTOMS DECISIONS.

July 1903.

The fruit of the candle tree (*aleurites triloba*), of the family of castor oil plants, designated also as Jatropha nuts, were assessed for duty at 25 cents per bushel as "oil seeds," under paragraph 254 of the Tariff Act of 1897. The importers claimed them to be free of duty under paragraph 548 as "nuts which are drugs and not edible." The evidence showed that an oil is obtained from them known as bankul or candle-nut oil, which is a mild cathartic similar to castor oil in its action. The Board found them to be unfit for food in any sense, and sustained the contention of the importer.

—R. W. M.

XIII. C.—INDIA-RUBBER, Etc.

VULCANITE TUBES AND SOFT INDIA-RUBBER PIPING FOR INSULATING PURPOSES: GERMAN CUSTOMS DECISION.

Bd. of Trade J., July 16, 1903.

The method of distinguishing between these two classes of goods is to be as follows:—The tube is held in both hands and bent sharply to an angle of 90 degrees; if it then breaks, it is to be considered as vulcanite, and is free of duty; but if it merely becomes indented, it is to be treated as soft india-rubber, and is to be dutiable at the rate of 40 marks per 100 kilos. (1*l.* 0*s.* 4*d.* per cwt.).

XIV.—TANNING; LEATHER; GLUE, Etc.

FRANCE—CORSICA: TANNING EXTRACT FROM SWEET CHESTNUT WOOD.

Foreign Office Annual Series, No. 3010.

The British Vice-Consul at Bastia refers to the rapidly extending utilisation of tanning extract from the wood of the sweet chestnut tree for the tanning of sole leather. Large quantities are produced in France, but the Corsican wood appears to be particularly rich in tannin.

Corsican extract, concentrated to 25° B., contains from 31 to 33 per cent. of tannin, as against about 28 per cent. in French extracts. The colour is also good.

Three large factories are in full work, and a fourth is in course of construction, all in the vicinity of Bastia. Makers are closely studying the requirements of British tanners with a view to supplying an article exactly suited to their needs.

XV.—MANURES, Etc.

Fertilisers and Feeding Stuffs Act, 1893.

Times, July 31, 1903.

The President of the Board of Agriculture has appointed a departmental committee to inquire into the working in Great Britain of the Fertilisers and Feeding Stuffs Act, 1893, the various methods in which it has been administered, and the results which have attended its operation; and to report whether any, and, if so, what further measures can with advantage be taken for the better protection of vendors and purchasers of the articles to which the Act applies.

The Committee is constituted as follows, viz.:—The Right Hon. Lord Burghclere (chairman); Dr. Thomas E. Thorpe, C.B., F.R.S., Principal Chemist of the Government Laboratory; Mr. Archie K. Loyd, K.C., M.P.; Dr. Andrew Peebles Aitken; Mr. James William Clark, Legal Adviser to the Board of Agriculture; Mr. Thomas Elborough, Mr. Alexander M. Gordon, Mr. Isaac Pearson, and Mr. John W. Spear, M.P. Mr. R. H. Hooker, of the Board of Agriculture, will act as secretary to the committee.

XIX.—PAPER, PASTEBOARD, Etc.

Celluloid Balls: U.S. Customs Decision.

June 1903.

Following previous decisions the Board decided, June 26, that various forms of hollow celluloid balls used as toys and in table games were dutiable at 35 per cent. *ad valorem* under paragraph 418 of the Tariff Act of 1897, as "toys," and not at 65 cents per pound and 25 per cent. *ad valorem* as "articles composed of pyroxylin" under paragraph 17.

—R. W. M.

XX.—FINE CHEMICALS, Etc.

Mexican Linaloe.

U.S. Cons. Rep., No. 1695, *July* 13, 1903.

Mexican linaloe (*Amyris linaloe*) is a large tree, the wood of which is soft, and of a light yellow colour. The bark exudes a resin called "xochiopal." The wood has a very pleasant odour, which is compared to that of a mixture of essence of lemon and essence of jasmine, and upon distillation yields from 6 to 9 per cent. of a very light yellow essence. This tree abounds in the southern parts of the States of Puebla and Guerrero. Indeed, it is reported to grow in the tropical portion of the Pacific slope of Mexico at the same altitude as in its habitat in Puebla and Guerrero. A good deal of the essence comes to the city of Puebla, and is worth 75 dols. Mexican silver (28·78 dols. gold) per arroba (4·263 galls.), or about 6·50 dols. (2·45 dols. gold) per kilo. (2·2 pounds). The process of distillation is careful, but very primitive and inexpensive. "Trozos," or sticks of the linaloe about the length and thickness of medium-size cord wood, were supplied to the labourers, each of whom has his little pen or enclosure contiguous to the still. These labourers reduced the sticks to small thin chips, and these chips, without further process, were placed in the "alembique," or still. The linaloe essence is the article exported. It comes to this city in 5-gall. kerosene oil cans and, in a crude way, in bottles. The major part goes to Hamburg, and some to Havre, and now and then a shipment goes to New York. It is largely in demand as the base of perfumes.

Perfumery at Wuchow, China.

Foreign Office Annual Series, No. 3006.

There is a large variety of foreign scents on sale in the Wuchow shops; they are chiefly of French and German manufacture, selling at 1*s.* to 1*s.* 6*d.* the bottle; here again the article is recommended by the shape and quality of the bottle.

The South African Chemical and Drug Trade.

Pharm. J., July 18, 1903.

The United Kingdom annually imports drugs, chemicals, and medicinal preparations at the rate of 4*s.* per head of its population of 40,500,000. South Africa, whose industr history is still in its earliest stages, imports similar m chandise to the extent of 12*s.* per head of its white popu tion of 1,000,000. The importance, therefore, of Sou Africa as a market for chemicals, drugs, and allied produ is obvious, and it is equally obvious that with the gradu resumption of mining and other industries in wh chemicals play an important part—to say nothing, the present, of the numerous new industries which being established, and will eventually constitute the coun one of the great industrial areas of the earth—the dem for these goods will expand in a rapidly increasing ratio.

The following table gives a list of the articles impor into Cape Colony, Natal, Delagoa Bay.

Article.	1898.	1901.	1902.
	£	£	£
Acetic acid	589	597	7
Acids, unenumerated	219	81	..
Apothecaryware	8,568	62,565	89,7
Chemicals and drugs	428,747	312,726	140,0
Cyanide of potassium	124,112	300	..
Medical preparations	..	55,210	60,0
Nitric acid	68	..	..
Quicksilver	5,658	305	7
Sheep dip	62,361	82,311	5,6
Sulphur, flowers of	5,399	5,969	..
Sulphuric acid	177	286	3
Total	636,178	520,380	597,8

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," a [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application asterisk is affixed. The dates given are (i) in the case of Appli tions for Patents, the dates of application, and (ii) in the case Complete Specifications Accepted, those of the Official Journ in which acceptances of the Complete Specifications are advertis

Complete Specifications thus advertised as accepted are ope inspection at the Patent Office immediately, and to opposit within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY

[A.] 16,724. Pokorny and others. Process for cool liquids. July 30.

,, 16,725. Pokorny and others. A mixing conden July 30.

,, 16,797. Bollé (Herrmann and Funke). Substit for cotton cleaning-waste.* July 31.

[C.S.] 15,828 (1902). Macfarlane. Centrifugal machi for separating fluids of different densit July 22.

,, 16,889 (1902). Elliott. Apparatus for purify fumes and gases. July 29.

,, 20,401 (1902). Scott. Evaporating appara Aug. 6.

,, 20,480 (1902). Jenkins. Melting apparatus f easily fusible substances. July 22.

,, 27,807 (1902). Baker. Making up or pack solid or semi-solid chemicals in small def quantities. Aug. 6.

,, 28,395 (1902). Passburg. Process and appar for drying aqueous and alcoholic solution *vacuo.* July 29.

,, 12,560 (1903). Flower. Apparatus for introduc dry substances into casks. July 29.

S.] 13,034 (1903). Theisen. Separating solid or liquid particles from gases and vapours. Aug. 6.

II.—FUEL, GAS, AND LIGHT.

.] 15,645. Kent. Process for making gas. July 15.

, 15,651. Dempster and Sons, Ltd., and Broadhead. Regenerator furnaces. July 15.

, 15,673. Adams. Extracting gas for lighting, heating, &c. July 15.

. 15,797. Bennis. Manufacture of gas. July 17.

, 15,966. Fielding. Gas producer. July 20.

16,018. Armstrong, Whitworth, and Co., and Orde. Apparatus for burning liquid fuel. July 20.

16,130. Lines. Plant for making and using hydrocarburetted air. July 21.

16.164. Duff. Gas producers.* July 22.

16,243. Duff. Superheating apparatus for gas producers.* July 23.

16,263. George. Gas producers.* July 23.

16,409. Ravinson. Unbreakable incandescent mantle. July 25.

16,497. Woodall and Duckham. Manufacture of gas. July 27.

16,659. Badger. Burning of liquid fuel. July 29.

16,766. Mucke and Krueger. Process and apparatus for burning off incandescent mantles. July 30.

16,797. Turnbull. Drying peat for the production of charcoal for use in manufacture of iron and steel. July 31.

16,908. Lake (Petit and Co.). Manufacture of briquettes for fuel. Aug. 1.

.] 16,461 (1902). Tcherniac. *See under* VII.

18,083 (1902). British Thomson-Houston Co. (Steinmetz). Means for changing the colour of artificial light. July 29.

18,501 (1902). Clarkson and others. Oil-fuel burners. July 29.

18,892 (1902). Crossley and Rigby. Gas producers. July 29.

20,004 (1902). Terrell. Manufacture of incandescent mantles. July 22.

21,587 (1902). Ledermüller. Apparatus for carbonising peat. July 29.

9605 (1903). Pallenberg. Coking ovens or furnaces. Aug. 6.

10,551 (1903). De le Croix. Gas burners, and purifiers for use therewith. July 22.

11,820 (1903). Desgraz. Furnace for gas generators, producer-gas plant, and refuse consumers. July 29.

12,182 (1903). Horn. Manufacture of water-gas or mixed gas, and apparatus therefor. July 22.

13,466 (1903). Töhl. Freeing of gases from carbon disulphide. July 22.

14,098 (1903). Charles. Agglomeration of combustible materials. Aug. 6.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

16,005. Otto-Hilgenstock Coke Oven Co., Ltd. (Dr. C. Otto and Co.). Recovery of by-products in processes of destructive distillation. July 20.

16,349. Cress. Chemical composition of the series of phenols, by-products, and processes for making same.* July 24.

[A.] 16,641. Catchpole and Catchpole. Process for the purification of naphthalene and anthracene.* July 29.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 15,515. Abel (Act.-Ges. für Anilinfabr.). Manufacture of yellow sulphurised colouring matters. July 13.

„ 16,299. Imray (Fab. de Prod. Chim. de Thann et de Mulhouse). Manufacture of orthotoluene sulphonic acid. July 23.

„ 16,330. Read Holliday and Sons, Turner, and Whittaker. Preparing and dyeing colours for wool and silk fast to milling. July 24.

„ 16,581. Newton (Fried. Bayer and Co.). Manufacture of new azo colouring matters and of new intermediate products for their production. July 28.

„ 16,898. Read Holliday and Sons, Turner, and Whittaker. Manufacture and dyeing of colours for wool and silk fast to milling. Aug. 1.

[C.S.] 16,138 (1902). Urquhart (Chem. Fabr. Weiler-ter Meer). Manufacture of dyestuffs dyeing cotton directly. July 22.

„ 18,096 (1902). Johnson (Badische Anilin und Soda Fabrik). Manufacture of halogenised indigo and analogues and homologues of indigo. July 22.

„ 13,035 (1903). Imray (Soc. Chem. Ind., Basle). Manufacture of a black sulphurised dyestuff. July 22.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 15,448. Burns. Apparatus for scouring and washing skins, wool, &c.* July 13.

„ 15,802. Mitchell, Mitchell, and Mitchell. Milling or fulling and scouring machines. July 17.

„ 16,549. Cleff. Apparatus for dyeing, bleaching, mordanting, washing, or drying cloth.* July 28.

[C.S.] 15,219 (1902). Eck. Means for producing a silk-like gloss on woven fabrics. July 22.

„ 19,319 (1902). Goddard. Method of and apparatus for dyeing warps for weaving. Aug. 6.

„ 22,235 (1902). Hahn. Machine for mercerising yarn in the form of skeins. Aug. 6.

„ 9532 (1903). Muller. Indigo dyeing. Aug. 6.

„ 9683 (1903). Cipollina. Apparatus for mercerising cotton yarns. Aug. 6.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 16,691. Walton. Colouring lincrusta, and apparatus therefor.* July 29.

„ 16,693. Walton. Process of colouring lincrusta, and apparatus therefor.* July 29.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 15,178. Rhodin and Rybery. Production of soluble potassium salts from felspar (orthoclase) and similar native silicates. July 13.

„ 16,298. Claude. Manufacture of oxygen by means of liquid air. July 23.

„ 16,485. Hebebrand. Method of decreasing the percentage of sulphocyanic compounds in gas phosphate. July 27.

[C.S.] 16,461 (1902). Tcherniac. Process for extracting valuable products from the spent lime of gas works. July 22.

„ 16,615 (1902). Lévy and Helbronner. Separation of gases from their mixtures, especially oxygen and nitrogen from air, and apparatus therefor. Aug. 6.

„ 21,017 (1902). Feld. Production of hydrocyanic acid. Aug. 6.

„ 8833 (1903). Johnson (Chem. Fabr. Griesheim Elektron). *See under* XI.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 15,854. Imray (St. Louis Plate Glass Co.). Method of making plate glass.* July 17.

„ 16,070. Blank and Friedberg. Glass composition for use in sharpening knives.* July 21.

„ 16,075. Mayer. Process for producing coloured glazed surface on metallic copper.* July 21.

„ 16,883. Reed. Methods and apparatus for enamelling.* Aug. 1.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 16,125. Sandwith and Rayner. Lubricating substances for use in the manufacture of bricks, tiles, and pottery. July 21.

„ 16,521. Bousfield (Jansson). Treatment of wood for preventing its distortion. July 27.

„ 16,595. Watson. Flexible material to be used as a damp-course in building or where damp has to be excluded. July 28.

„ 16,658. Rayner. Lubricant for use in manufacture of clay goods. July 29.

[C.S.] 16,665 (1902). Newton, Soar, Dickenson, and Goad. Compositions for and manufacture of imitation marble and stone. July 29.

„ 16,854 (1902). Gonnella. Colouring in the mass of plastic material composed of plaster, &c., with applications. Aug. 6.

„ 18,953 (1902). Passow. Process for producing cement. July 29.

„ 20,592 (1902). Baxter. Fireproofing of combustible materials. Aug. 6.

„ 14,522 (1903). Peddle. Process of fireproofing wood. Aug. 6.

X.—METALLURGY.

[A.] 15,561. Fris and British and West African Agency and Trading Co. Treatment of earths containing gold or other precious metals or gems. July 14.

„ 15,849. Tomellini. Method for soldering aluminium. July 17.

„ 15,855. Nodon and Davy. Soldering composition. July 17.

„ 15,924. Wilfley Ore Concentrator Syndicate, Ltd. (Wilfley). Method of and means for concentrating ores.* July 18.

„ 15,925. Wilfley Ore Concentrator Syndicate, Ltd. (Wilfley). Method of and means for concentrating ores.* July 18.

„ 16,285. Sulman and Picard. Separation of minerals from ores. July 23.

„ 16,365. Sulman and Picard. Separation of minerals from ores. July 24.

„ 16,377. Brandenburg and Weyland. Process for the extraction of tin from the dross, slag, and waste thereof.* July 24.

„ 16,453. Rübel. Alloys.* July 25.

„ 16,533. Nortcliffe. Annealing process. July 28.

[A.] 16,839. Goyder and Laughton. Process and ap ratus for separating minerals and extracti some of them as concentrates.* July 31.

„ 16,853. Auer von Welsbach. Manufacture metallic alloys having pyrophoric action, their application to the purposes of ignition illumination. July 31.

[C.S.] 16,774 (1902). Davies Bros. and Co., Ltd., Davies. Apparatus for use in galvanising sh metal. July 22.

„ 22,294 (1902). Jensen (Goldschmidt and Mat sius). Process of manufacturing homogene metal alloys. Aug. 6.

„ 23,046 (1902). Rd. Thomas and Co., Ltd., others. Apparatus for pickling and swilling i and steel plates and sheets to be afterw coated. Aug. 6.

„ 23,756 (1902). Howorth (Trollhättans Elektr Kraft-aktiebolag). Distillation of zinc and o volatile metals from material containing the sa Aug. 6.

„ 7838 (1903). Helbig. Process for manufactu substitute for lycopodium powder for foundry Aug. 6.

„ 10,659 (1903). Loewenthal and Lippert. Pro to smelt sand-like or dusty ores. Aug. 6.

„ 14,565 (1903). Boss. Metallurgical furna Aug. 6.

XI.—ELECTRO-CHEMISTRY AND ELECTRO METALLURGY.

[A.] 15,600. Gladstone. Voltaic batteries. (U.S. Ap Dec. 17, 1902.)* July 14.

„ 15,700. Imray (Meister, Lucius und Brün Reducing organic substances in an electrol bath. July 15.

„ 16,191. Cowper-Coles and Co., and Cowper-Co Deposition of metals or metallic compou July 22.

[C.S.] 16,341 (1902). Viertel and Siemens Bros. and Prevention of formation of deleterious vapour electric discharges in air. July 29.

„ 8833 (1903). Johnson (Chem. Fabr. Griesh Elektron). Electrolytic preparation of per ganates of alkaline earth and other heavy me and the obtainment of by-products in the pro July 22.

XII.—FATS, FATTY OILS, WAXES, AND SOA

[A.] 15,457. Macalpine. Appliance for use in refi oils. July 13.

„ 15,635. Morfit and Hurst. Refining and puri linseed oil. July 15.

„ 16,658. Rayner. *See under* IX.

„ 16,825. Westaway. Method of and apparatu granulating and solidifying fat. July 31.

[C.S.] 12,035 (1903). Haddan (Edson). Separatio grease and oily matter from raw fish, &c. Jul

XIII.—PIGMENTS, PAINTS; RESINS, VARNISH INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 15,493. Johnson (Badische Anilin und Soda Fa Manufacture of colouring matter lakes. Jul

„ 15,742. Montgomery. Manufacture of white (U.S. Appl., July 19, 1902.)* July 16.

„ 16,010. Restiaux. Paint. July 20.

.S.] 15,793 (1902). Geary. Ink for tissue copying by dry process up to twelve hours of writing without letterpress. July 22.

,, 20,413 (1902). Jamieson and Nicholson. Manufacture of paints and colours. July 29.

,, 12,645 (1903). Stempel. Protective composition, and method of applying it. July 29.

, 13,812 (1903). Armbruster and Morton. Processes of making pigments. July 29.

, 13,813 (1903). Armbruster and Morton. Pigments, and process of making them. Aug. 6.

C.—India-rubber, &c.

.] 16,143. Scammell and Muskett. Gutta-percha substitutes. July 22.

IV.—TANNING, LEATHER, GLUE, AND SIZE.

.] 15,895. Smith and McLaurin, Ltd., and McLaurin. Manufacture of a substitute for leather. July 18.

, 16,480. Dörner. Treating bones, skins, and the like to extract grease and produce glue. July 27.

S.] 13,682 (1903). Hilbert. Manufacture of glue and gelatin from bones. July 29.

XVI.—SUGAR, STARCH, GUM, Etc.

.] 16,750. Harrison (Hla ati and Co.). Manufacture of sugar. July 30.

S.] 9868 (1902). Cross and Traquair. Manufacture of soluble starch. Aug. 6.

21,146 (1902). Wetter (Weinrich). Purification and preservation of raw sugar. July 22.

23,779 (1902). McGlashan. Manufacture of sugar. Aug. 6.

XVII.—BREWING, WINES, SPIRITS, Etc.

.] 15,935. Kubessa. Brewing process.* July 18.

16,631. Pope. Filter for filtering cider and other fermentable liquids. July 29.

16,697. Squire, Squire, and Squire. Manufacture of yeast for bakers' use. July 30.

[S.] 10,929 (1903). Guillaume. Distillation and rectification of alcohols, and apparatus therefor. July 29.

11,038 (1903). Von Rougemont. Automatic cooling apparatus for use in fermenting operations. July 29.

11,756 (1903). Ball. Process and apparatus for drying malt extract, &c. July 22.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

.] 15,606. Thompson (A.-G. f. Chemische Industrie). Nutritive substance. July 14.

15,770. Ling and Jones. Manufacture of an alimentary extract. July 16.

15,993. Briant and Light. Food for cattle. July 19.

16,020. Schouten, Bertie - Smith, and Spencer. Preserving milk, cream, and other fluids. July 20.

16,302. Ramage. Manufacture of food products. July 23.

16,433. Kinley and Walker. Preservatives for animal food and other putrescible products. July 25.

16,472. Leetham. Apparatus for treating finely divided materials, such as flour, with a gaseous agent. July 27.

[A.] 16,473. Leetham and Woodsmith. Conditioning, sterilising, and similarly treating grain products by ozone. July 27.

,, 16,676. Binder. Food prepared from milk, and process for its production. July 29.

[C.S.] 18,137 (1902). Lake (Soc. Fran. Conservation des Beurres). Refining and preserving butter. July 22.

,, 21,294 (1902). Sandmann and Eichelbaum. Preservation of fruit juices. Aug. 6.

B.—Sanitation; Water Purification.

[A.] 15,555. Hunter. Treatment of distillery effluents or other polluting liquids, sewage or other putrescible material. July 14.

,, 15,986. Zörner. Separating solid materials from waste water. July 20.

,, 16,028. Corbett. Precipitation tanks. July 20.

,, 16,468. Adams and Adams. Settling tanks and filters. July 27.

,, 16,494. Peters. Biological purification of liquids with continuous operation, and plant used therefor. July 27.

,, 16,851. Dibdin. Sedimentation tanks for sewage treatment. July 31.

[C.S.] 16,965 (1902). Reisert. Method of purifying water. July 22.

,, 21,297 (1902). Crosfield and Markel. Treating sewage and manufacturing refuse liquor containing organic matter. Aug. 6.

,, 22,389 (1902). Maignen. Water-purifying apparatus. Aug. 6.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 15,531. Jackson. Manufacture of paper. July 14.

,, 15,696. Thompson (Eisenmann and Bendix). Rendering collodion wool soluble in alcohol.* July 15.

,, 16,422. Staines. Manufacture of paper. July 25.

,, 16,588. Thiele. Manufacture of artificial silk. July 28.

,, 16,604. Stearn and Topham. Manufacture of threads from viscose. July 28.

,, 16,605. Stearn and Topham. Apparatus for pumping and controlling the passage of liquids or semi-liquids, such as solutions of cellulose, in the manufacture of filaments. July 28.

[C.S.] 16,568 (1902). De Montessus de Ballore. Manufacture of paper pulp. Aug. 6.

,, 20,660 (1902). Little, Walker, and Mork. Manufacture of cellulose esters. Aug. 6.

,, 28,423 (1902). Hawke. Manufacture of copying paper. July 22.

,, 359 (1903). Jorreto. Paper. July 29.

,, 8646 (1903). Hawke. Manufacture of copying papers. Aug. 6.

,, 8983 (1903). Justice (U.S. Fibre Stopper Co.). Process of treating pulp stock. Aug. 6.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 15,765. Schuftan. Production of combinations of phenol-formaldehyde insoluble in water. July 16.

,, 15,782. Imray (Meister, Lucius und Brüning). Manufacture of a therapeutical compound. July 16.

,, 16,684. Imray (Ritsert). Manufacture of alkyl esters of 3 : 4-diamidobenzoic acid. July 29.

[C.S.] 17,695 (1902). Marckwald. Halogenising of organic substances, and apparatus therefor. July 22.

„ 19,178 (1902). Imray (Meister, Lucius und Brüning). Process for oxidising organic compounds. July 22.

„ 13,263 (1903). Ambrose. Medicinal compound. July 22.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 15,735. Collings. Obtaining photographic prints and reproductions in printing inks. July 16.

[C.S.] 16,071 (1902). Ludwig. Process for developing photographic plates and films in open daylight. July 29.

[C.S.] 12,513 (1903). Selle. Dyeing photographic pla Aug. 6.

„ 13,920 (1903). Gros and Ostwald. Reproduc pictures with the aid of catalysis. Aug. 6.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 16,182. Hargreaves. Explosives. July 22.

„ 16,517. Ransford (Talbot). Explosive compou and manufacture thereof. July 27.

[C.S.] 13,457 (1903). Justice (International Smoke Powder and Chemical Co.). Manufacture smokeless powder. July 22.

XXIII.—GENERAL ANALYTICAL CHEMISTR

[A.] 16,034. Funke. Apparatus for use in the anal of soil or matter containing lime. July 20.

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Members who contemplate attending the next General M ting, in New York, are requested to communicate with th General Secretary as soon as possible, in order that su ible travelling arrangements may be made.

THE NATIONAL PHYSICAL LABORATORY.

EPORT BY THE DIRECTOR ON THE WORK IN THE GINEERING AND PHYSICS DEPARTMENTS DURING THE HALF-YEAR ENDED JUNE 30, 1903.

(See also this Journal, 1903, 714.)

the Engineering Laboratory, further progress has b made with the experiments on wind-pressure, and the re lts obtained will be published shortly. Drawings have b prepared and some preliminary tests made for the r arch into the constants of steam.

the Thermometry division, Dr. Harker has completed hi comparison between the air thermometer, the platinum th mometer, and the thermojunctions for temperatures be een 0° C. and about 1,050° C. He has also constructed an subjected to stringent tests, a set of platinum thermo- m rs for the British Association. A research on the sp fic heat of iron at high temperatures (700° C. to 1, 0° C.) has also been nearly completed.

the Electricity division, Mr. F. E. Smith has calibrated so 10 or 12 standard mercury resistance tubes, and these gi results which only differ among themselves by a few pa in 100,000. On the assumption that the absolute va e of the wire standards in the Laboratory is known, the le h of the column of mercury, 1 sq. mm. in section, ha ng a resistance of 10^9 C.G.S. units is found to be almost ex ly 106·29 cm. Investigations are also being carried ou n some of the anomalies of the Clark cell; and on the ch ges in insulating strength of various dielectrics, used in m rs, transformers, &c., due to continued heating.

the Metallurgical division, the solidifying points and co ng curves of a series of 15 pure iron carbon alloys ha been determined, platinum platinum-iridium and pl num platinum-rhodium thermojunctions being used. Th alloys were prepared in the form of ingots weighing ab t 4 lb. each, which were satisfactorily homogeneous in co osition. The percentages of sulphur and silicon did no ncrease during the time needed for melting. The ra of carbon was from 0·15 to 3·55 per cent., and the ra of temperature from 1,502° C. to 1,111° C. The all s will also be examined by means of the apparatus for tal g cooling curves by the differential method.

addition to the research work, a number of tests of ins uments, materials, &c., have been made during the ha year.

COMMUNICATIONS.

thors of communications read before the Society, or an f its Local Sections, are requested to take notice that un Rule 43 of the Bye-laws the Society has the right of pri ty of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

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Bailey, Dr. T. L., l/o Liverpool; Gas Street, Runcorn.

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Hunt, Bertram, l/o San Francisco; Tres Amigos Mine, Puntarenas, Costa Rica (*viâ* New Orleans and Port Limon).

Johnson, Edmond, E., l/o Forest Gate; Corsden, Harold Wood, Essex.

Johnston, W. G., l/o Port Dundas; Anchor Chemical Works, Provanmill, Glasgow.

Jones, Chas. H., Spain; retain Journals.

McEwen, D. C., l/o Greenock; c/o British and Korean Corporation, Ltd., Gwendoline, Korea.

Mensching, Dr. C., l/o Manchester; 3, Geismar-Chaussée, Göttingen, Germany.

Pringsheim, Dr. H. H., l/o Syracuse; Boylston Hal Harvard University, Cambridge, Mass., U.S.A.

Ruddock, F. G.; Journals to Egypt Street Chambers Warrington.

"Science Abstracts," l/o 82; c/o Institute of Electrical Engineers, 92, Victoria Street, Westminster, S.W.

Shuler, D. P., l/o Sudbury, Canada; Mine La Motte, Mo., U.S.A.

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Sturrock, Capt. G. C.; Journals to Indian Cordite Factory, Aruvinkad, Nilgirio, India.

Takamine, Dr. J., l/o Amsterdam Avenue; 613, West 142nd Street, New York City, U.S.A.

Woodrow, Jno., l/o Broxburn, N.B.; 12, Park Road, Hull.

Journal and Patent Literature.

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United States.—9*d.* each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3e).

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Regulating Temperatures; Means acted upon by Changes of Temperature for Indicating such Changes or for —— [Heating Buildings, &c.], or Obtaining Movements for other Purposes. J. Y. Johnson, London. From W. M. Fulton, Knoxville, Tennessee. Eng. Pat. 11,547, May 20, 1903.

Two expansive agents, such as dry air and a mixture of air and benzene, having different coefficients of expansion, are contained in two expansible and collapsible vessels separated by a rigid partition wall. The end walls of the vessels opposite to the partition are made adjustable, to enable the capacity to be regulated, but are capable of being fixed in position, so that variations in temperature cause a displacement of the partition, the movement of which is employed to actuate a pointer, or to control the supply valve of a heating agent, &c.—R. A.

Boilers and the like; Prevention of Incrustation and Corrosion in Steam ——. P. Bez, Léran, France. Eng. Pat. 14,789, July 2, 1902.

A disencrustant consisting of four parts of barium chloride and one part of tannin, with or without the addition of mucilaginous substances (which may be present when the mixture is prepared from tan-yard by-products). Such mucilaginous substances are said to assist the suspension of insoluble substances.—T. F. B.

United States Patents.

Pyrometer. M. Arndt, Aix la-Chapelle, Germany. U.S. Pat. 734,393, July 21, 1903.

See Eng. Pat. 11,052, May 29, 1901; this Journal, 1901, 788.—E. S.

Vacuum Pan. N. Gerber, Zürich, Switzerland. U.S. Pat. 734,228, July 21, 1903.

The pan consists of a cylindrical evaporating vessel, which may be heated. A revolving shaft is provided, carrying stirrer blades; also a circularly channelled deflecting disc on the shaft near to the upper edges of the internal channel walls, in which the agitator works.
—J. F. B.

French Patents.

Flask for Holding Ethyl Chloride and other Volatil Liquids. M. Thilo. Fr. Pat. 328,431, Jan. 12, 1903.

The capillary exit of the flask is at the side of a meta cap closing the latter. A lever, after the manner of a ordinary siphon, allows the exit tube to be opened an closed.—W. P. S.

Drier: Continuous Working [Centrifugal Machine] —— fo Separating the Solid and Fluid Constituents of Liquids Especially Wort from Brewers' Grains. M. Guttu and R. Baeger. Fr. Pat. 327,785, April 15, 1903.

See Eng. Pat. 693, Jan. 10, 1903; this Journal, 1903, 485
—T. F. B.

Distillation; Separation by ——, of Materials havin Different Boiling Points. Oesterreichischer Verein Chem. und Met. Produktion, Germany. Fr. Pat. 328,27 Jan. 5, 1903.

See Eng. Pat. 26,695, 1902; this Journal, 1903, 355.
—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Gas: Purification of —— from Sulphur. H. Lest Greville. J. of Gas Lighting, 1903, **83**, 291—295.

There is at present only one practicable method fo removing the "sulphur compounds other than sulphurette hydrogen" from coal-gas, to a substantial extent, namel treatment with 'sulphided lime.' The best results a attained when special sulphide vessels are provided fo this treatment, and the main purification is effected befor hand in the purifiers, from which the gas should is perfectly free from carbon dioxide and with only a ve small proportion, if any, of sulphuretted hydrogen. I preparing the 'sulphided lime,' gas from the third or fourt purifier, containing no carbon dioxide and showing a fair large proportion of sulphuretted hydrogen, should b passed continuously into fresh lime until the gas issuin from the vessel contains a distinctly measurable proportio of sulphuretted hydrogen; this being absorbed by a fin check-vessel. It is important to maintain a high tem perature during the operation, for which reason th process should not be interrupted; the sulphiding shoul be carried out during the summer; the vessel shoul e protected from draughts; and the inflowing gas should ontain as much sulphuretted hydrogen as possible. A urifier of about 28 ft. by 36 ft., charged with six 10-in. ers of lime, will take up about 5 tons of sulphuretted ydrogen, and will absorb while in action, at least 3 tons f carbon bisulphide. Two such vessels should suffice for a ear's working on a daily output of about 3,000,000 cb. ft. f gas, and should reduce the sulphur from 25—30 grains own to 10—12 grains per 100 cb. ft. The reaction etween carbon bisulphide and sulphided lime is slow in omparison with that between the ordinary impurities and me and ferric oxide; hence the necessity for a relatively rge area in the sulphide vessel, to admit of a low velocity f gas.—H. B.

Fuel; Determination of Arsenic in ——. T. E. Thorpe. XXIII., page 964.

ctive Oxygen. VIII. Autoxidation of Cerous Salts and Indirect Autoxidation. C. Engler. XXIV., page 969.

English Patents.

riquettes; Manufacture of ——. W. F. Collins, Glynneath, South Wales. Eng. Pat. 15,958, July 17, 1902.

ULVERISED coal or other carbonaceous material is mixed ith "a compound of calcium," *e.g.*, calcium chloride, and e heated mass is incorporated with a solution of sodium licate of about 140° Tw. which has been liquefied by heat. he mixture is then compressed into blocks.—H. B.

oal Briquettes; Manufacture of ——. A. Waddell, Pittsburg, U.S.A. Eng. Pat. 9505, April 27, 1903. Under Internat. Conv., May 17, 1902.

OAL briquettes are manufactured by mixing fine coal with me or other suitable alkaline substance, feeding the ixture continuously through a heated retort to partially oke it and expel the volatile matters, and then compressing e product into blocks.—H. B.

eat Fuel, Peat-Charcoal, and Fibrous Peat; [*Electrical*] *Manufacture of* ——. J. B. Bessey, London. Eng. Pat. 19,719, Sept. 9, 1902.

REEN turf is firmly filled into receptacles, electrodes are serted, and the mass is electrolysed with an alternating curent of high amperage and low voltage. The heat generated auses the disintegration of the peat. The disintegrated eat is then kneaded, passed through a teasing apparatus, nd then formed. To obtain a uniform product from ifferent kinds of peat, certain salts, carbonates, carbon, hydrocarboniferous" or other mineral ingredients are dmixed before moulding. Charcoal is obtained from the aterial by further heating it with an electric current.

For treatment of peat-moss and fibrous peat, a current of w amperage and high voltage is employed, the result eing the shredding of the mass without destroying its fibre.

From stone-turf a product resembling "ebony" in appearnce, is obtained. Brown and red turfs produce a hard, orny substance.—L. F. G.

iquid Fuel; Method of Utilising ——, *for Generating Heat for Steam Raising and Furnace Heating.* B. H. Thwaite, London. Eng. Pat. 17,302, Aug. 6, 1902.

ART of the heated gases from the chimney of the furnace re mixed with the liquid fuel, which is atomised by supereated steam or compressed air, and fed into the furnace. he flue gases having a temperature of 500° to 750° F., the quid fuel is immediately gasified; at the same time it is iluted by the products of combustion, which have the ffect of making the burning of the mixture much less local r intense. The air required for combustion may be introuced along with the steam used for atomising the liquid uel. A chimney valve may also be provided, so that the ases can only escape into the atmosphere when a certain ressure has been established in the combustion chamber nd flues.—L. F. G.

Water-Gas or Mixed Gas; Manufacture of ——, *and Apparatus therefor.* G. Horn, Braunschweig. Eng. Pat. 12,182, May 28, 1903.

STEAM and coke-dust, coal-dust, or other solid or liquid carbonaceous material, are heated separately in externally-heated chambers, and are then brought into contact with each other. In the apparatus described, coal- or coke-dust is fed continuously in a thin cloud down a vertical retort; and in a downward extension of the latter, which serves as a decomposing chamber, it meets with steam which has been superheated by passing at low velocity between heated plates situated in the walls of the chamber. The water-gas produced, then passes through a mass of heated coke, whereby any excess of steam is decomposed. The retort, decomposing chamber, and coke chamber are all heated externally.—H. B.

Gases; Apparatus for Treating —— *with Liquids, for Purifying Gases and for other Purposes.* A. J. Boult, London. From La Cie. pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, Paris. Eng. Pat. 18,649, Aug. 25, 1902.

A ROTARY cylindrical drum is divided longitudinally by radial partitions into a number of compartments, through which the gas to be treated and the liquid employed, are passed in opposite directions. The compartments are filled with shavings, coke, or other suitable material which, when wetted by the liquid during the rotation of the drum, will offer a large surface to the gas. The gas and liquid pass through each of the longitudinal compartments in turn before leaving the apparatus.—H. B.

Gases; Freeing of —— *from Carbon Bisulphide.* A. Töhl, Hoenningen-on-the-Rhine, Germany. Eng. Pat. 13,466, June 16, 1903.

COAL-GAS, either before or after purification in the usual ways, is scrubbed with the oily distillate obtained by the dry distillation of vinasse (the liquid which remains when the sugar has been removed from beet-sugar molasses). This oil has the property of absorbing large quantities of carbon bisulphide. The oil may be revivified after use by heating it either with or without the simultaneous introduction of steam.—H. B.

Spent Lime of Gas-Works; Process for Extracting Valuable Products from ——. J. Tcherniac, Freiberg, Germany. Eng. Pat. 16,461, July 24, 1902.

THE spent lime is leached with water, the solution is evaporated to dryness, and the residue is kept for some time at 100°—110° C. to convert the soluble calcium thiosulphate into calcium sulphite and sulphur, which remain insoluble when the calcium sulphocyanide (thiocyanate) is subsequently extracted with cold water. The residue may be treated with an alkali or alkaline salt, which will react with the calcium sulphite and sulphur to produce an alkali thiosulphate.

By conducting the evaporation at a low temperature, as in a vacuum, the calcium thiosulphate is not decomposed, but may be crystallised while the sulphocyanide remains in solution.—H. B.

Incandescent Mantles; Manufacture of ——. T. Terrell, London. Eng. Pat. 20,004, Sept. 12, 1902.

To facilitate the manufacture of mantles from artificial silk and the like, the impregnated thread is treated with a solution of paraffin in benzene in order to waterproof it, and, after knitting, the fabric, in tubular form, is wound like a flat bandage on to a drum, and the whole is subjected to the action of steam. The tissue thus loses its elasticity, and the tubular form given it upon the drum retains its diameter.—H. B.

[*Acetylene*] *Gas Burners, and Purifiers for use therewith.* X. de le Croix, Brussels. Eng. Pat. 10,551, May 8, 1903.

THE acetylene gas is purified, immediately before its combustion, in a small chamber charged with purifying and drying substances, and attached on one hand to the gas supply cock, and on the other to the burner or burners. —H. B.

Electrodes for Electric Arc Lamps. A. Blondel, Paris. Eng. Pat. 17,406, Aug. 7, 1902.

The electrodes, composed of carbon with or without mineral substances, are provided with several cores or wicks, of which the aggregate cross-section is from one-fifth to one-half of the total section of the electrodes. The wicks are composed of an agglomerant, with or without carbon, and with "a proportion of mineral substances amounting to from 40 per cent. to 100 per cent. of the total mass of the wicks." The mineral subtances consist of compounds of calcium, strontium, &c., containing at least 5 per cent. of "exciting salts, such as potassium borate or silicate." The electrode may have a protecting envelope of compressed carbon.—H. B.

United States Patents.

Coal Bricks [Briquettes], particularly from Bituminous Brown Coal; Manufacturing ——. J. M. Schwartz, Eiken, Switzerland. U.S. Pat. 734,002, July 21, 1903.

A mixture of four parts of comminuted brown-coal waste and 1 part of "waste from glue-works" is moulded into bricks under high pressure.—H. B.

Gas Producer. J. W. Seaver and T. R. Morgan, Cleveland, Ohio. U.S. Pat. 734,472, July 21, 1903.

At the bottom of the producer is a rotating ash-hopper, from the lower part of which is suspended an ash-supporting plate which rotates with the hopper. A fixed blast pipe, projecting up through the plate, carries arms for pushing the ashes out through the space between the plate and the lower edge of the hopper. A stationary sealing pan surrounds the hopper and receives the ashes.—H. B.

Hydrocarbons; Process of Treating [Gasifying] Mineral Liquid ——. C. Horobostel, New York. U.S. Pat. 734,710, July 28, 1903.

A combustible gaseous mixture is obtained by forcing air through a mixture of fuller's earth and kieselguhr which has been saturated with mineral liquid hydrocarbons.

—T. F. B.

French Patents.

Coke; Manufacture of ——, and of Coke of Better Quality. A. Custodis, Germany. First Addition, dated Jan. 7, 1903, to Fr. Pat. 305,879, Dec. 1, 1900.

Coal dust is mixed with iron ore and rammed into moulds to form solid cakes, which, on being carbonised, generate such an amount of heat as to cause the iron to melt, and thus to diffuse evenly throughout the coke.—L. F. G.

Peat Briquettes; Manufacture of ——. C. F. Schlickeysen. Fr. Pat. 327,873, Dec. 29, 1902.

To prevent cracking of peat briquettes during drying, the peat is mixed with coarse sand, blast-furnace slag, anthracite, coke dust, sawdust, peat dust, &c.; the briquettes are then formed, and allowed to dry. It is necessary to impart to the grains of the materials thus employed, a polished surface, by either submitting them to strong pressure, or by steeping them in some fatty combustible liquid.

—L. F. G.

Binding Material; New —— of General Application [Fuel Briquettes]. J. Gascon and C. Vernay. Fr. Pat. 328,225, Jan. 7, 1903.

1—3 per cent. of pine-, fir-, or larch-resin is mixed with the charcoal or other material, and stirred in a heated mixer till the resin melts. The product is then pressed into blocks.

—L. F. G.

Binding Material; New ——, especially suitable for Coals. G. Charles. Fr. Pat. 328,341, Jan. 7, 1903.

Linseed or some other gummy substance is boiled with 15—20 times its weight of water for 35—45 minutes. An amount of rye-flour, barley, or starch equivalent to 8—12 per cent. of the water originally employed, dissolved in 2½ times its weight of water, is then added, and the mixtu boiled for another 15 to 20 minutes, with constant stirrio A quantity of tar, usually equal to the amount of the wat originally taken, is next added, and the boiling continue for 35 to 45 minutes with continual stirring. The viscou liquid thus obtained, is poured, while still warm, on the coa

A quantity of resin, amounting to 50 to 100 per cent. o the original weight of water, may also be added, an boiling continued for another 15—20 minutes.—L. F. G.

Blast Furnace Gases; Process for the Purification of —— P. Würth. Fr. Pat. 327,741, Dec. 26, 1902.

The gas to be purified is led up through a cylindrical towe containing a concentric cylindrical screen of wire gauz down which water flows. Horizontal baffle-plates, withi and outside the wire-gauze cylinder, cause the gas to pas repeatedly in zigzag fashion through the gauze. Th dirt-laden water collects in a tank at the foot of the towe The wire gauze, instead of being cylindrical in form, ma be a plane vertical screen, with approximately horizonta baffle-plates arranged alternately on each side, and extendin to the wall of the tower.—H. B.

Mantles; Self-Lighting Incandescence ——. T. Peters Fr. Pat. 328,344, Jan. 7, 1903.

See Eng. Pat. 609 of 1903; this Journal, 1903, 111.—H. B

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

English Patents.

Oils; Refining Mineral or Petroleum ——. T. Macalpine Chiswick, and the Alcohol Syndicate, London. Eng. Pat 18,728, Aug. 26, 1902.

A vessel having a tapered bottom, at the upper part o which is a perforated shelf and at the lower part a draw-of cock, is filled with some granular material, such as sand o broken coke. A solution of sodium chloride and sodium carbonate is run in, and allowed to remain in the vessel for about five minutes, when it is drawn off. The crude miner oil is then run in, and left in contact with the contents o the vessel for 1 to 10 hours, air being continually blown i to oxidise the impurities. The oil is then drawn off, an air again blown into it; or the impurities oxidised with solution of sodium or potassium permanganate or manganate, the oil being constantly agitated. Instead of the granular material, the vessel may be filled with smal crystals of sodium chloride and carbonate, and thes moistened with water before running in the oil. The impurities in the oil are further oxidised during distillatio by adding a compound which gives off oxygen within the range of the temperature of distillation, such as a spec manganese compound. Thick oils are diluted with petroleum spirit before treatment. The process is preferabl worked at a temperature of 60° F., although it is muc accelerated by heating up to 150° F.—L. F. G.

Naphtha or other readily Volatile Matter from Oil or other Liquid: Evaporating Apparatus for Separatin ——. E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat 12,518, June 2, 1903.

See U.S. Pat. 723,849, 1903; this Journal, 1903, 561.

—T. F. B.

French Patent.

Petroleum or other Hydrocarbons; Process of Refining Distilling, and Purifying ——, and their Distillates an Residues. L. von May, Austria. Fr. Pat. 328,416, Jan. 10, 1903.

See Eng. Pats. 11,217 of 1902 and 951 of 1903; this Journal, 1903, 734 and 790.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo-Reduction; Theory of ——. F. Haber. Zeits. f. Eletrochem., 1903, 9, [31], 607—608.

The article is largely polemical in answer to Binz (this Journal, 1903, 901). The author points out that indigo is reduced in alkaline solution not only by zinc, but also by ferrous hydroxide, sodium hydrosulphite and fermenting starch and sugars, and that these latter reactions cannot possibly be interpreted as a direct transference of hydroxyl groups from an indigo-sodium hydroxide complex to a metal, but are easily explained on the assumption of an ordinary ion-reaction.—E. F.

Indigo; Determination of —— in Substance and on the Fibres. R. Möhlau and M. R. Zimmermann. XXIII., page 967.

β-Hydroxynaphthoïc Monosulphonic Acids L and S; Determination of the Constitutions of —— by means of the Sulphite Reaction. H. Bucherer. Zeits. f. Farben- u. Textil-Chem., 1903, 2, [10], 193—199.

The isomeric monosulphonic acids of 2.3-hydroxynaphthaene carboxylic acid, m. pt. 216° C., were submitted to the sulphite reaction discovered by the author (Zeits. f. Farben- u. Textil-Chem., 1902, 1, 477), 1 molecular proportion of each being heated:—(1) Under an inverted condenser, with 8—9 molecular proportions of sodium sulphite; (2) at about 125° C., with 1 molecular proportion of ammonium sulphite and 4—5 molecular proportions of ammonia; (3) under an inverted condenser, with 6 molecular proportions of sodium bisulphite, in the presence of 2—3 molecular proportions of aniline.

Thus treated, the isomeride (L), which is characterised (α) by its lesser solubility in water and dilute sulphuric acid, (β) by giving a sparingly soluble acid sodium salt, crystallising in colourless plates or pale yellow needles, and (γ) by giving when combined with diazotised *p*-nitraniline an azo dyestuff of bluish red shade, yields by process (1) 2.6-naphthol sulphonic acid, by (2) 2.6-naphthylamine sulphonic acid, and by (3) 2.6-phenylnaphthylamine sulphonic acid.

Similarly, the isomeride (S), which is (α) more soluble n water and dilute sulphuric acid than the preceding acid, which (β) forms an easily soluble acid sodium salt, crystalising in colourless needles, and (γ) gives with diazotised *p*-nitraniline a yellowish-red dyestuff compound, is proved o have the constitution, $OH:COOH:SO_3H = 2.3.8$.
—E. B.

English Patents.

Halogenising of Organic Substances, and Apparatus therefor; Impts. in ——. L. Marckwald, Charlottenburg, Germany. Eng. Pat. 17,695, Aug. 12, 1902.

In order to prevent the formation of more highly haloenised products, the halogen is continually kept in contact with a large excess of the original compound, and the mixture of unattacked material and halogenised product so obtained is continuously withdrawn from the further action of the halogen. The liquid to be halogenised is boiled in the still *a* in presence of a halogenising agent such as phosphorus trichloride. The vapour passes through the rectifying column *b*, and the more volatile portion condenses in *g*. The condensed but boiling liquid is halogenised in c, which is provided, if necessary, with a reflux condenser *d*, and flows back into the still through the pipe *f*. Halogen hydrides escape through *k*. If it be desired to halogenise at a lower temperature, the modified apparatus of Fig. 2 is used. When a thermometer in *g* indicates a rise in temperature, the liquid in *a* is almost completely halogenised. It is run off through *i* and rectified.—E. F.

Fig. 1.

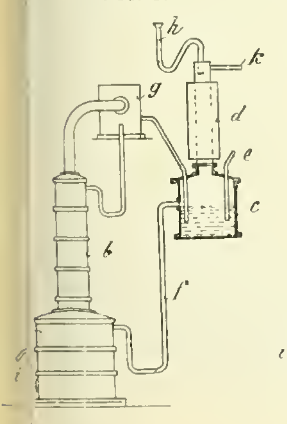
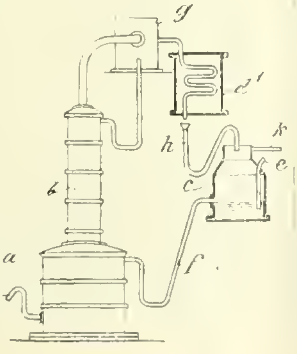


Fig. 2.



Oxidising Organic Compounds; Process for ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Höchst a/M. Eng. Pat. 19,178, Sept. 1, 1902.

The oxidations are conducted under the influence of cerium compounds either by themselves or in an electrolytic bath. Cerium dioxide is employed, as obtained by heating with air the by-products from the manufacture of incandescent mantles. Thus, in order to oxidise toluene to benzaldehyde, cerium dioxide is employed together with 60 per cent. sulphuric acid at 60°—90° C. *o*-Nitrotoluene yields under similar conditions *o*-nitrobenzaldehyde and *o*-nitrobenzoic acid. Other substituted hydrocarbons are acted on in the same way. The reaction may also be used to prepare *m*-tolylaldehyde from *m*-xylene. Ceric salts can also be used. Thus anthracene is converted into anthraquinone by ceric sulphate in presence of 20 per cent. sulphuric acid at 60°—95° C. In the same way naphthalene is converted into naphthoquinone and phthalic acid. The oxidation is much more energetic if a stronger sulphuric acid be used. The ceric sulphate may be replaced by other ceric salts. By this method anthracene disulphonic acid yields the corresponding anthraquinone disulphonic acid, and many other oxidations in the anthracene series may be performed. The tetra-alkylated diamino-diphenylmethanes yield the corresponding hydrols, and triphenylmethane dyestuffs are produced from their leuco bases. For the application to electrolytic oxidation, see U.S. Pat. 729,502; this Journal, 1903, 872.—E. F.

Indigo; Manufacture of Halogenised —— and Analogue and Homologues of Indigo. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik. Eng. Pat. 18,096, Aug. 16, 1902.

See Fr. Pat. 323,977, Aug. 25, 1902; this Journal, 1903, 491.—T. F. B.

Dyestuffs [Azo Dyestuffs] Dyeing Cotton Directly; Manufacture of ——. R. J. Urquhart, Manchester. From Chem. Fabr. vorm. Weiler-ter Meer. Eng. Pat. 16,138, July 21, 1902.

See Fr. Pat. 322,500, 1902; this Journal, 1903, 360.
—T. F. B.

Polyazo Dyestuffs [Azo Dyestuffs]; Manufacture of New ——. C. D. Abel. From Actien-Ges. für Anilin-Fabrikation, Berlin. Eng. Pat. 20, 375, Sept. 18, 1902.

See U.S. Pat. 717,550, Jan. 6, 1903; this Journal, 1903, 140.—E. F.

Colouring Matters [Sulphide Dyestuffs]; Manufacture of Intermediate Products and ——. Read Holliday and Sons, Ltd.; Jos. Turner, H. Dean, and Jas. Turner, Huddersfield. Eng. Pat. 19,341, Sept. 3, 1902.

1.2.4.5 or 1.2.4.6-*m*-toluylenediamine sulphonic acid is condensed with 1.2.4-dinitrochlorobenzene by boiling in aqueous sodium carbonate or sodium acetate solution. On heating the products to 220° C. with sulphur and alkali sulphides, dyestuffs are obtained dyeing cotton in reddish-drab shades, very fast against light and fulling.—E. F.

Colouring Matters containing Sulphur [Sulphide Dyestuffs]; Manufacture of Blue ——. J. Y. Johnson. From The Badische Anilin und Soda Fabrik, Ludwigshafen a. Rh., Germany. Eng. Pat. 19,440, Sept. 4, 1902.

A mixture of a phenol and an alkylated indophenol or sulphur derivative of the same is heated with sulphur and an alkali sulphide. The products are distinguished by the property of dissolving in dilute caustic alkali to form solutions from which they are not precipitated by blowing in air, but may be precipitated by carbon dioxide or by salt. They are also not precipitated by the action of air from their solutions in alkali sulphide solutions, and it is therefore easy to obtain uniform dyeings.—E. F.

Dyestuffs containing Sulphur [Sulphide Dyestuffs]; Production of ——. Read Holliday and Sons, Ltd., J. Turner, H. Dean, and J. Turner, Huddersfield. Eng. Pat. 19,551, Sept. 6, 1902.

p-Aminophenol or *p*-aminophenol sulphonic acid prepared according to Eng. Pat. 2468 of 1899 is treated with picramic or picric acid, sulphur, and an alkali sulphide. Black dyestuffs are so obtained.—E. F.

Black Sulphurised Dyestuff [Sulphide Dyestuffs]; Manufacture of ——. O. Imray. From the Society of Chemical Industry, Basle, Switzerland. Eng. Pat. 13,035, June 10, 1903.

1 : 2 : 4-Dinitrophenol (OH = 1) is melted with alkali sulphide and sulphur under such conditions that the mass does not become dry until the formation of the dyestuff is complete. The fusion may be conducted in an open vessel or under pressure, with or without a reflux condenser. The product dyes cotton in very pure black shades, which may be varied in the direction of greenish black by the addition of copper or its salts, or of dinitrochlorobenzene, to the melt. The sulphurisation is more rapid the higher the temperature, and the shade becomes at the same time more greenish or bluish. The duration of the process has only small influence on the shade.—E. F.

United States Patents.

Azo Dye: Red ——, and Process of Making Same. K. Schirmacher, Soden, Germany, Assignor to Farbwerke vormals Meister, Lucius und Brüning, Höchst-on-the-Main. U.S. Pat. 733,280, July 7, 1903.

The *o*-chlorotoluidine-*p*-sulphonic acid, obtained by nitrating and subsequently reducing *o*-chlorotoluene-*p*-sulphonic acid, is diazotised and coupled with β-naphthol. The sodium salt of the resulting compound is a red powder, soluble in hot water and in alcohol, soluble in concentrated sulphuric acid to a bluish red, and in glacial acetic acid to an orange-yellow solution. Mineral acids precipitate brownish red flakes from its aqueous solution.—T. F. B.

Anthraquinone Dye [Anthracene Dyestuffs]; Green ——, and Process of Making Same. O. Hess, Assignor to the Farbwerke vormals Meister, Lucius und Brüning, Höchst a. M., Germany. U.S. Pat. 731,325, July 21, 1903.

Dialphylaminodihydroxyanthraquinones are sulphonated, forming dyestuffs which are green powders, soluble in water with a green, in concentrated caustic soda solution with a bluish green colour, dyeing unmordanted wool in green and chrome-mordanted wool in yellowish green shades. The dyestuff obtained from di-*p*-toluidodihydroxyanthraquinone is specially claimed.—E. F.

French Patents.

Azo Dyestuffs derived from Chloronitroaminophenols. Fabr. de prods. chim. ci-devant Sandoz, Switzerland. Fr. Pat. 328,281, Jan. 5, 1903.

Blue to blue-black dyestuffs are obtained by diazotising 4-chloro-6-nitro-2-aminophenol and combining with naphthol-, dihydroxynaphthol-, and aminonaphtholsulphonic acids.

Black wool dyestuffs of great intensity, which is increased by chroming, extremely fast to fulling and light, are obtained by combining the diazo compound from 6-chloro-2-nitro-4-aminophenol or from 4-chloro-6-nitro-2-aminophenol with 1.6 or 1.7-naphthylamine sulphonic aci rediazotising the product so obtained, and combining with chromogenes, notably with naphthol sulphonic acid. —E. F.

Dyestuffs derived from Triphenylmethane; Preparatio of ——, by Means of Dimethyl- and Diethyl-p-toluidin Manufac. Lyonnaise de Matières Colorantes, Franc Fr. Pat. 328,314, Jan. 6, 1903.

Dimethyl- or diethyl-*p*-toluidine is condensed with tetra methyl- or tetraethyldiaminobenzhydrol in presence o concentrated sulphuric acid, and the product oxidised in th usual way. Greenish-blue to blue dyestuffs are obtaine of great intensity and brilliancy.—E. F.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Colour Sprays ("Rainbowing"); Cadgène's Method o Treating Tissues with ——. R. Lepetit. Zeits. f Farben- u. Textil-Chem., 1903, **2**, [11], 224—225.

The method of colouring tissues by projecting upon then dyestuff solutions in the form of spray, which was intro duced into practice by Cadgène in 1898 (Eng. Pat. 4613 o 1898; this Journal, 1899, 39), is especially suitable for th treatment of silk tissues. In the operation of colourin them, these are passed, with supporting tissues at the backs, downwards in front of a row of spray pipes fron which the solutions of dyestuffs (usually aqueous or alcoholi solutions of acid dyestuffs) are forced. The pipes may b stationary or may be moved about in any desired directio while the tissue is passing in front of them. They ar generally placed 4—5 cm. apart, but the distance is varie according to the pattern to be produced. Stripe effect (ombrés) darker in the middle than at the edges are mostly produced.—E. B.

Rare Earth Metals: Use of the ——, in Dyein A. Waegner and A. Müller. Zeits. f. Farben- u. Textil Chem., 1903, **15**, 290—292.

The article commences with a summary of work already done on this subject. Cerium salts are said by R. Böttger and by H. Bührig to produce a very excellent aniline-black Witt on the contrary obtained negative results and ascribe previous ones to the effect of impurities in the cerium salt used. By mordanting fabrics with cerium, praseodymium and lanthanum compounds and subsequent treatment wit hydrogen peroxide, coloured superoxides are formed in the fibre. The authors find that the yellow shade produced i this way by the production of cerium superoxide is of poo appearance and deficient in fastness to soaping. They investigated the mordanting effect on wool of the pure salt of various rare earth metals towards alizarin dyestuff. The wool was mordanted with cerous, ceric, didymium and lanthanum salts, and then treated with an acid tartrate Part of each sample was then oxidised by passing throug a bath of ammoniacal hydrogen peroxide. The samples so obtained were then dyed with Alizarin I, Alizarin Orange Alizarin Blue, Alizarin Yellow, and Coeruleïn. The portion treated with hydrogen peroxide almost always yield darker shades. The dyeings are all very fast to washing but not at all fast to acids. They are all strongly affected by boiling 0·1 per cent. sulphuric acid, some bein completely decolorised.—E. F.

Dyeing; Some Recent Contributions to the Theory of —— G. von Georgievics. Zeits. f. Farben- u. Textil-Chem. 1903, **2**, [11], 215—219.

The author finds that no precipitates of the character assumed by Knecht (this Journal, 1902, 544 and 611) are produced from wool which has been purified by prolonged extraction with alcohol, or from silk which, after bein ungummed, has been boiled in distilled water. The inference is that the precipitates, described by Knecht are in the case of the wool fibre, produced by an impurity present in this which is soluble in alcohol. A sligl precipitate is obtained, in a blank experiment, when the filtrate from a Night Blue solution, which has been precipitated with barium hydroxide, freed from excess of the latter with carbon dioxide, and boiled, is added to a solution of Magenta. This is due to the presence of a trace of barium in the solution, as may readily be proved by qualitative tests. This fact also has been overlooked by Knecht.

Binz and Schröter (this Journal, 1903, 23) have discovered that the sulphonic acids of azobenzene are dyestuffs and have thus demonstrated that the sulphonic acid group, as well as the amino- and hydroxyl-groups, is capable of acting as an auxochromous group in transforming chromogens into dyestuffs.

These chemists have also shown that a *p*-amino-azo compound possesses more powerful dyeing properties than ts *m*-substituted isomeride.

They have, however, deduced from their researches ertain erroneous conclusions, which are corrected below:—

Azobenzene Sulphonic Acids.—Azobenzene-*p*-mono-ulphonic acid resembles other acid dyestuffs in dyeing wool) more exhaustively as the proportion of mineral cid applied with it is increased up to a certain limit; hus, from baths composed of 0·15 grm. of the dyestuff nd 150 c.c. of water, 5 grms. of wool absorbed, without ny addition of mineral acid, 0·1 grm., and, with additions f 0·056, 0·112, and 0·56 grm. of sulphuric acid, 0·143, ·144, and 0·143 grm. respectively of the dyestuff. The yestuff, moreover, dyes feebly from a dilute neutral olution (containing one molecular proportion of the yestuff and one molecular proportion of caustic soda). t does not dye at all from an alkaline solution.

p-Hydroxyazobenzene does not dye, as stated, in a rongly alkaline solution: wool (7 grms.) treated with the yestuff (0·6 grm.), along with a small quantity of normal ustic soda solution (10 c.c.), was found to be very nearly olourless after washing with water. The dyestuff can be adily extracted with alcohol from wool dyed with it. here cannot, therefore, be any chemical combination with e fibre, of the nature suggested by Binz and Schröter.

The following acid dyestuffs (exclusive of Alkali Blue, cid Green and similar dyestuffs which are applied in kaline baths and developed with acid) possess the operty of dyeing wool from an alkaline bath:—Oranges I d II, Brilliant Oranges G and R (M.L.B.), Ponceau G G L.B.), Naphthylamine Brown (B.A.S.F.), Azo-eosine y.), Fast Red A (B.A.S.F.), Cloth Reds G and B (By.), cid Violet 4 B N (B.A.S.F.), Chromotrope 10 B (M.L.B.), st Acid Violet A 2 R (M.L.B.). The following dyestuffs en applied in alkaline baths leave the wool quite coloured:—Chromotrope 2 R (M.L.B.), Cochineal Red A.S.F.), Azofuchsine 6 B (By.), Cyanine B (M.L.B.), anol extra (C.). As dyestuffs possessing analogous nstitutions are to be found in both of these groups, it is ident that no explanation of their dissimilar behaviour dyeing is to be gained from a consideration of their emical formulæ.

o-Aminoazobenzene and Di-m-aminoazobene.—There is essential difference, such as has been asserted to exist, ween the dyeing properties of these two bases. Their orption by the fibre (wool) is aided by the addition to dyebath of a small proportion of acid; it is hindered the addition of a large proportion.—E. B.

stness; What Treatments are to be regarded as atisfactory in the Examination of Dyestuffs with espect to ——? H. Lange, Fifth Intern. Congress of Applied Chemistry, Berlin. Färber-Zeit., 1903, **14**, 15], 269—276.

E fastness of a dye on a fabric should be particularly ed with regard to the use to which the material will mately be put. As the fastness varies to a certain ent according to the colour-tone, a light, a medium, and ark shade ought always to be tested.

Vith respect to dyed wool, the material should be tested o its fastness to (1) rubbing; (2) rain and water; (3) hing; (4) milling; (5) hot pressing; (6) acid: (7) bonising; (8) sulphur (sulphur dioxide); (9) ironing;) perspiration; (11) alkali; and (12) light. The author describes shortly how each of these tests is to be performed. (1) The dyed fabric should not impart any colour to a white cloth when rubbed with it. (2) The dyed fabric should be soaked in rain water, and dried at the ordinary temperature, this process being repeated several times. (3) The resistance of the dyestuff on the fabric should be tested in a solution of 5 grms. of soft soap and 3 grms. of sodium carbonate per litre. (4) The dyed fabric should be steeped for 2 to 3 hours in a lukewarm soap solution containing about 100 grms. of soap per litre, then milled. (5) The dyed fabric is placed in boiling water and allowed to cool, then steamed on a hot-press cylinder. (6 and 7) The dyed fabric is placed in a solution of sulphuric acid of 4° to 6° B; the excess of acid is pressed out and the material dried at 80°—90 C. For carbonisation it is placed in a solution of aluminium or magnesium chloride of 5° to 7 B., and dried at 110° C. (8) The dyed fabric is soaped with a solution containing 6 grms. of Marseilles soap, then, after drying, exposed to the vapour from burning sulphur. (9) The fabric should be ironed in the ordinary way, or a damp cloth should be placed over it and ironed until this is dry. (10) The fabric should be worn on the chest or in the armpits by a person for 4 to 6 days. (11) The fabric should be treated with a lukewarm solution of sodium carbonate of 2° to 3° B., and with a solution of 10 to 20 grms. of lime and 10 grms. of ammonia per litre. (12) In testing the fastness to light, it is advisable to expose several shades of the colour, and to expose these both under glass and in the open air. The duration of the exposure must depend on the time of year. After each test the material is to be compared with a pattern which has not been treated.

In the case of cotton goods, the fastness to these various influences should be tested, and also the fastness to chlorine and to hydrogen peroxide. The fastness to chlorine is tested by immersing the fabric in a solution of bleaching powder of 0·5° B. for 2 to 3 hours, then washing in dilute acid and drying.

Linen and ramie are tested in the same way as cotton. It is seldom necessary to test the influence of these various factors on jute.

The resistance of dyed silks to these same influences can be determined by slight modifications of the methods indicated for wool.—J. McC.

Oxalic Acid in the Chromic Acid Indigo-Discharge Process; Function of ——. G. von Georgievics. Zeits. f. Farben- u. Textil-Chem., 1903, **2**, [10], 199—202.

A NUMBER of substances, both organic and inorganic, have the power, possessed by oxalic acid, of accelerating the action of chromic acid on indigo. These are compounds as dissimilar as sulphuric and hydrochloric acids, on the one hand, and alcohol and glycerin, on the other hand, thus showing that the property is not limited to reducing compounds, as Schaposchnikoff and Michirew (this Journal, 1902, 1276) suppose, or to acids, as Prud'homme (this Journal, 1903, 359 and 491) appears to believe. But none of the substances hitherto tried, approaches oxalic acid in intensity of action. Citric and tartaric acid, for example, have only about $\frac{1}{100}$ part of the power of oxalic acid; sulphuric and hydrochloric acids have still less. With indigotin-disulphonic acid, 1 molecular proportion of oxalic acid has the same action as 940 molecular proportions of hydrochloric acid or the equivalent quantity of sulphuric acid.

Assuming that, as Prud'homme has shown is undoubtedly true in the case of concentrated solutions, an organic chromium compound of oxalic acid, having energetic oxidising properties is formed in the cases of solutions of all concentrations, it is nevertheless difficult to explain why acids so closely related to oxalic acid as are acetic, malonic, and succinic acids, do not give similar compounds. As a matter of fact these acids do not increase the oxidising action of chromic acid in the slightest degree.

An important characteristic of oxalic acid is that it influences the oxidising action in direct ratio to the amount of it present, the limit of its influence being reached only with the saturation of the solution.

The reaction between indigo, chromic acid, and oxalic acid, is considerably affected by the concentration of the solutions employed.

Although he considers that with strictly definite proportions of the reacting substances, a distribution of the action of the chromic acid may take place in the sense indicated by Jorissen and Reicher (this Journal, 1903, 623), the author is inclined to believe, especially in view of the fact that the oxidising action of chromic acid proceeds in the presence of a large excess of oxalic acid, that the action of the latter compound in this connection must be classed as a catalytic one (see also this Journal, 1893, 758).—E. B.

Silk; Determination of Inorganic Weighting Agents in ——. R. Gnehm. XXIII., page 968.

Silk; Action of Hydrofluosilicic and Hydrofluoric Acids on ——. R. Gnehm and R. Weber. XXIII., page 968.

Indigo; Determination of ——. *in Substance and on the Fibre.* R. Möhlau and M. R. Zimmermann. XXIII., page 967.

English Patents.

Relief or Raised Ornamentations on Fabrics; Apparatus for Printing and Colouring ——. F. S. Holland, Stockport. From J. Bennett, North Adams, Mass. Eng. Pat. 26,928, Dec. 6, 1902.

The fabric is stretched tightly on a support, and is printed by means of an adjustable roller fixed at such a distance from the support that only the raised portions of the fabric are touched by the roller.—T. F. B.

Vegetable Fibres; Extracting the Inorganic and Organic Foreign Matter from ——. O. Lugo. Eng. Pat. 17,165, 1902. XIX., page 961.

United States Patents.

Artificial Silk Filaments; Apparatus for Producing ——. E. H. Rvon, Waltham, Mass., and C. N. Waite, Lansdowne, Pa., Assignors to the General Artificial Silk Co., Delaware. U.S. Pat. 732,784, July 7, 1903.

The cellulose solution is forced through a forming-nozzle by a fixed plunger, which works in a cylinder containing the solution, and which can be moved relatively to the plunger at a uniform speed, so that a given quantity of the solution is forced through the nozzle in a given time, regardless of the viscosity of the solution.—T. F. B.

Mercerising Apparatus. P. Jeanmaire, Mulhausen, Germany. U.S. Pat. 734,333, July 21, 1903.

A mercerising bath is combined, in a suitable apparatus, with a laterally-acting extensor-roll, or a number of laterally-acting extensor-rolls acting in succession intermittently upon the impregnated fabric, the outer ends of the bars of the rolls being card-clothed, with a smooth intermediate portion. Each extensor-roll is arranged so as to receive the fabric in a wider condition than the preceding roll. The fabric is washed simultaneously with the stretching on the last roll, by directing a washing liquid upon the stretched material, and is then received on a setting roll; a setting-roll is also provided between the last extensor-roll and the preceding one.—B. N.

French Patents.

Textile Tissues and other Materials; Process of Rendering —— *Non-inflammable.* Soc. dite Manuf. d'Impressions de Malaunay. Fr. Pat. 328,368, Jan. 8, 1903.

See U.S. Pat. 723,088 and Eng. Pat. 9658 of 1902; this Journal, 1903, 492 and 694.—E. B.

Bleaching Apparatus; Continuous ——. M. Muntadas y Rovira. Fr. Pat. 327,931, Nov. 10, 1902.

In bleaching apparatus of the type in which liquor-seals, in the spaces between two tanks, one of which is inverted in the other, are employed to prevent the escape of steam from the chamber thus formed, a number of additional seal-columns are provided by fixing partitions alternately to the top and bottom of the chamber. The tissues to be bleached are passed through boiling caustic soda-lye, contained in one set of the seal-columns, steam, and again throug boiling lye, in the other set of seal-columns, or through ly in one set, steam, and boiling water in the other set. T prolong the time of their exposure to the action of th steam, while they are in the chamber, the tissues are allowe to fall into curved, porcelain receptacles, whence, after certain length of them has accumulated, they are withdraw to the lye or water seals. Owing to the employment of larger number (*e.g.*, 8) of liquor seals, greater pressure steam can be applied, with the same head of liquor in th seal-columns, than has hitherto been possible with the u of only two liquor-seals.—E. B.

Cotton Yarns; Apparatus for Mercerising, &c., —— L. Bretonnière. Addition, dated Dec. 31, 1902, Fr. Pat. 324,076, Aug. 27, 1902. (See this Journa 1903, 551.)

Modifications are claimed in the apparatus describe (*loc. cit.*). The framework upon which the hank-carryin rollers are placed is constructed of iron, instead of woo and the rollers consist of iron tubes. After immersing t hanks in the mercerising solution and draining them f a while, the rollers are revolved by means of handle which are affixed to their ends for the purpose, to rend the action upon the hanks more uniform.—E. B.

Printing Indigo [*Production on the Fibre*]. Soc. Chi des Usines du Rhône (formerly Gilliard, P. Monnet Cartier). Addition, dated Jan. 3, 1903, to Fr. Pa 316,121, Nov. 22, 1901. (See this Journal, 1902, 704

Besides acetic acid, other (carboxylic and sulphonic) aci have the property of dissolving *o*-nitrophenyllactoketon for example, a mixture of 1 part of the ketone and 3 par of sodium *p*-toluene sulphonate dissolves in 6 parts water, and is stable in the absence of light. The solutio suitably thickened, can be employed in tissue printing f the production of indigo, in the same manner as the ace acid solution. (See also Eng. Pat. 11,522 and Fr. Pa 325,109 of 1902; this Journal, 1903, 490 and 622.)—E.

Printing Indigo [*Resists*]; *New Process for* ——. J. Ribbert. Fr. Pat. 327,763, Dec. 27, 1902.

Tissues, prepared with glucose and dried, are print with resist-mixtures, similar to those employed in t frame-dripping style of calico printing, containing, f example, the sulphate, nitrate, acetate, and basic aceta (verdigris) of copper, china clay and gum, with or wi out lead sulphate, soluble lead salts and zinc sulphat They are then over-printed (covered or padded) with caustic soda-indigo mixture, such as is used in t Schlieper and Baum method (this Journal, 1884, 55 being afterwards dried, steamed for 20—30 seconds, washe soured, washed and dried. After steaming, the tiss may be passed in a continuous manner through an indi vat, to dye them on their unprinted side any desired sha of blue, the printed side being simultaneously dyed, b remaining, with the colour previously applied, darker th the unprinted side. The resist is then removed by wash and souring.—E. B.

Wool and Half-Wool Fabrics; Process for Obtaining ——, *Mixed or "Vigorous" Effects.* H. Giesler. Pat. 327,485, Dec. 18, 1902.

Wool, or cotton and wool fabrics, are printed, on one both sides, with a solution of alkali (carbonate or hydroxi in the desired pattern, in small spots or lines, washed a then dyed in a tepid neutral bath, without mordant. T design is then fixed by means of a steam or boiling wa treatment, with or without mordant. The fabrics, after t alkali printing, may be dyed completely in a boiling ba and then the design dyed, in another colour, in a te bath.

When the process is applied to wool fabrics contai vegetable matter (*e.g.*, mercerised cotton, ramie, &c.), t latter is unaffected by the dyeing.

After the alkali printing, a resist in fatty matter may applied, and the fabric dyed in a tepid bath. Res composed of tin salts, zinc powder, &c., may also be use —T. F. B

Threads [Artificial Silk]; Making Brilliant ——. J. Stoerk. Fr. Pat. 327,301, Dec. 13, 1902.

Having found that the percentage of water contained in nitrocellulose has a great influence on the resulting threads, the inventor claims the process of dissolving, in ether-alcohol, nitrocellulose containing from 12—20 per cent. of water. This is obtained by pressing the crude (washed) nitrocellulose in a hydraulic press, cutting the cakes thus obtained into thin sheets, and drying these to the required degree.—T. F. B.

Resists Over or Under Azo Colours Developed on the Fibre; Process for Obtaining ——. K. Oehler, Anilin- und Anilin Farben Fabrik. Fr. Pat. 327,554, Dec. 20, 1902.

The fabric, impregnated with an alkali salt of a phenol, is printed with a resist of a derivative of hydrazine or hydroxylamine (*e.g.*, the ammonium salt of phenylhydrazine sulphonic acid), with or without colouring matter and mordant, and then developed in any of the ordinary di- or tetrazonium solutions.

Semi-resists are obtained on fabrics dyed with substan-ive dyestuffs, by printing with the same mixture, passing hrough the diazonium solution, and fixing.

Fabrics, printed with substantive colours which can be iazotised, are treated with the same hydrazine compound, nd then developed in a nitrous acid bath, and finally oupled with an amine or phenol.—T. F. B.

eproducing Designs in Colours [by means of Stencils]; Process and Apparatus for ——. G. L. Courtot. Fr. Pat. 327,814, Dec. 30, 1902.

yestuff solutions are sprayed through stencils, made by rawing the design to be reproduced upon a sheet of uitable material, cutting through, where this is practicable, he lines of the drawing, and bending back, in places, the ut edges of the material to give the spray freer access to e tissues, which are stretched behind the stencils during e operation of spraying.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

agnesium Carbonate Trihydrate; Preparation of Crystalline ——, *from Magnesium Hydroxide.* Salzbergwerk Neu-Stassfurt. Ger. Pat. 143,594, March 8, 1901. Zeits. angew. Chem., 1903, **16**, [30], 729.

agnesium hydroxide suspended in water or in aqueous lution of sodium chloride, is subjected to the action of ses containing carbon dioxide, the proportion of carbon oxide in the gases being continuously increased as the gnesium carbonate forms. It is claimed that by this ocess no basic or amorphous compounds are produced, t only the crystalline magnesium carbonate trihydrate, itable for use in the manufacture of potassium carbonate the magnesia process.—A. S.

otassium Magnesium Carbonate; Preparation of ——. Salzbergwerk Neu-Stassfurt. Ger. Pats. 143,408, April 5, 1900; 143,595, March 29, 1901; 143,409, April 13, 1900. Zeits. angew. Chem., 1903, **16**, [30], 730.

e preparation of potassium magnesium carbonate is the st step in the manufacture of potassium carbonate by the gnesia process (see Ger. Pat. 15,218), but the method its preparation has up to the present been unsuccessful the large scale. It is now found that for the utilisation potassium chloride according to the equation:— $Mg(CO_3.3H_2O) + 2KCl + CO_2 = MgCl_2 + 2(MgCO_3.$ $HCO_3.4H_2O)$, the temperature must be kept within finite limits, and also the conditions must be such that reverse reaction will not take place. According to the sent patent, a solution of potassium chloride containing gnesium carbonate in suspension, is subjected to the ion of carbon dioxide, the temperature being maintained 17°—24° C. by artificial cooling, and the reverse reaction ng prevented by passing in a current of gas containing bon dioxide, so as to keep the potassium magnesium bonate suspended in the liquid.

The preparation of potassium magnesium carbonate is effected in two steps:—(1) the preparation of magnesium carbonate trihydrate; (2) the conversion of the latter into potassium magnesium carbonate. According to the present invention, after the magnesium hydroxide has been converted into magnesium carbonate, a portion of the liquid is removed by decantation, siphoning or the like, then to the residual liquid containing the magnesium carbonate in suspension, potassium chloride is added, and carbon dioxide passed in. In this way, it is claimed, a more complete utilisation of the potassium chloride is attained.

Preparation of Potassium Carbonate from Potassium Magnesium Carbonate.—In the preparation of potassium carbonate from potassium magnesium carbonate, it is desirable to separate the magnesium in the form of crystalline magnesium carbonate trihydrate, which can be readily separated from the liquid, and can be used over again for the preparation of potassium magnesium carbonate. The method consists in decomposing the potassium magnesium carbonate by means of water, under such conditions that the temperature does not rise above 80° C., and then rapidly separating the magnesium carbonate trihydrate from the potassium carbonate solution, thereby avoiding the formation of the amorphous magnesium carbonate dihydrate.—A. S.

Caustic Soda; Influence of Impurities on the Yield of ——, *by the Amalgam Process.* J. W. Walker and C. S. Paterson. Trans. Amer. Electro-Chemical Soc., 1903, **3**, 185—194.

The apparatus used consisted of a glass cell, closed at its lower end by a rubber cork, through which passed two platinum wires, one ending immediately above the stopper and covered with a layer of mercury, which served as cathode; and the other prolonged upwards and encased in a glass tube, ending in a platinum anode. The upper end of the glass cell carried a capillary tube, through which the gases evolved during an experiment were driven over into a gas pipette, by raising a reservoir attached to the apparatus by a side tube. The cell was fitted with 200 c.c. of the salt solution, and a current of 0·5 ampère passed for 15 minutes, the cell being covered with a dark cloth to prevent reunion of the hydrogen and chlorine. The gases were transferred to the gas pipette, the chlorine removed by a 25 per cent. caustic soda solution, the oxygen by means of alkaline pyrogallol, and the residual hydrogen measured, this representing the loss of caustic soda during an experiment. The current density worked out to 15 ampères per square decimetre.

With purest salt, and with ordinary commercial table salt, the loss was only 1·6 per cent.

The addition of small quantities of potassium chloride, calcium chloride, magnesium sulphate, or of ferrous chloride, caused the losses to vary between 0·0 and 2·5 per cent. When nickel sulphate or cobalt nitrate were added in small quantities (about 1:10,000), the losses lay between 1·5 and 35·8 per cent.

If, however, a small quantity of iron salt be added to a solution containing traces of calcium and magnesium, the losses are great, between 10·4 and 50·7 per cent. During these experiments, hydrogen was evolved intermittently from the mercury cathode, and this became covered with a solid deposit. Iron salts produce a similar effect when calcium or magnesium only are present, but the loss is only about 1/10th of that occurring when both calcium and magnesium are present.

Nickel gave similar results. Both in the case of iron and of nickel, several experiments arranged under precisely similar conditions gave divergent results, for which no explanation could be found.

The amalgam formed when chemically pure salt was used, showed no immediate signs of decomposition on switching off the current; when iron or nickel was present, decomposition commenced immediately, and was very rapid in the case of nickel. These results are of interest in connection with a recently proposed process (this Journal, 1902, 125) for the rapid extraction of sodium from amalgam. If iron or nickel be used in this process to hasten the decomposition of the amalgam, it will certainly be efficient.

It is concluded that the apparatus used for the amalgam process must be kept scrupulously free from iron salts.
—L. F. G.

Hydrated Salts: Peculiar Property of Certain ——. A. de Schulten. Bull. Soc. Chim. 1903, 29, [14], 724—726.

In the case of most salts which form several hydrates, gradual rise of temperature yields in turn, from the hydrate containing most water, those containing successively less and less. The author draws attention to some exceptions to this rule. 1. Gay Lussite, $CaCO_3.Na_2CO_3.5H_2O$, loses all its water at 100° C., while pirssonite, $CaCO_3.Na_2CO_32H_2O$, does not lose any water below 130 C. 2. Magnesium phosphate, $Mg_3(PO_4)_2.22H_2O$, loses $18H_2O$ very rapidly at 100° C., and suffers further loss if the heating at that temperature be prolonged; while artificial bobierrite, $Mg_3(PO_4)_2.8H_2O$, undergoes no change at 100° C. 3. Crystallised magnesium arsenate, $Mg_3(AsO_4)_2.22H_2O$, loses $17H_2O$ at 100° C., while artificial hoernesite, $Mg_3(AsO_4)_2.8H_2O$, is unchanged.
—J. T. D.

English Patents.

Sulphuric Acid; Apparatus for Concentrating ——. H. Ellison, Cleckheaton, Yorks. Eng. Pat. 17,760, Aug. 13, 1902.

The apparatus consists of a closed cast-iron boiling pan, within which is a pipe, of acid-resisting material, of rather less diameter than the pan and having its bottom edge serrated. The pan, filled up to an outlet pipe near the top with concentrated acid, is heated from below. Dilute acid is led into the inner conduit or pipe, and is there concentrated by the heat from the surrounding strong boiling acid. The steam escapes through an exit pipe in the cover. As the acid in the conduit becomes concentrated, it flows through the serrations to replace the concentrated acid in the boiler, as that acid flows through the exit pipe in the side. A leading object of the invention is to secure that only concentrated acid shall come into contact with the cast-iron boiler.—E. S.

Contact Substances Employed in the Manufacture of Sulphuric Anhydride and Sulphuric Acid; Means for Effecting the Revivification of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen a/R. Eng Pat. 20,915, Sept. 25, 1902.

See Fr. Pat. 324,751, 1902; this Journal, 1903, 628.
—T. F. B.

Chrome Ironstone; Treatment or Extraversion of ——, for the Separation of the Iron and the Obtainment of Chromium Compounds. J. Y. Johnson, London. From the Chemische Fabrik Griesheim-Elektron, of Frankfort-on-Maine, Germany. Eng. Pat. 5902, March 13, 1903.

Chrome ironstone is heated with about twice as much sulphuric acid as is necessary to combine with the bases, and sufficient of an oxidising agent, such as chromic acid, lead dioxide, manganese dioxide, or a permanganate, is added, to convert the iron present from the ferrous to the ferric state. At about 150° C. the iron is precipitated as difficultly soluble ferric sulphate, from which the solution of chromium-sulphuric acid can be readily separated. A smaller proportion of oxidising agent may be used, provided such agent is constantly regenerated by electrolytic oxidation. Compare Eng. Pat. 12,250, 1901; this Journal, 1902, 548.—E. S.

Hydrosulphites of Metals; Processes for Producing ——. L. Descamps, Lille, France. Eng. Pat. 6933, March 25, 1903.

A reducing powder, such as powdered zinc, iron, tin or the like, is rapidly added to an aqueous, alcoholic, or glycerin solution of sulphurous acid, the metal being of such purity and in such proportion as to effect a speedy, complete and simultaneous reduction of the whole solution. Various applications of the hydrosulphites thus produced are also claimed. Compare Eng. Pat. 8304, April 9, 1902; this Journal, 1902, 1533; and Fr. Pat. 320,227, April 5, 1902; this Journal, 1903, 91.—E. S.

United States Patents.

Magnesium and Calcium Carbonates; Process of Producing —— [from Dolomite]. F. S. Young, Norristown Pa. U.S. Pat, 734,030, July 21, 1903.

Calcined dolomite is mixed with water, and the solutio of calcium hydroxide is separated from the deposite magnesia, and is carbonated to obtain calcium carbonate Part of the magnesia, made into a milk with water, i caused to drop through an atmosphere of carbon dioxid in a percolating tower. The solution of magnesium bicar bonate thus produced is treated with the remainder of th magnesia to obtain magnesium carbonate. See Eng. Pat 25,776, Dec. 17, 1901; this Journal, 1902, 872.—E. S.

Sulphur-Burner. H. Blumenberg, jun., Daggett, Cal. U.S. Pat. 734,397, July 21, 1903.

A long, horizontally-arranged burner chamber has a mai air-supply pipe and discharge opening; and an independe air-supply pipe outside the chamber has branches, a intervals, projecting therein to near the bottom, there bein means for supplying both pipes with air under pressure. door for admitting the charge of sulphur is furnished wit a counterweight and with means for clamping.—E. S.

Alkaline-Earth Dioxides; Process of Making Hydrat of ——. G. F. Jaubert, Paris. U.S. Pat. 734 71 July 28, 1903.

See Eng. Pat. 2504 of 1901; this Journal, 1901, 474.
—T. F. B.

French Patents.

Furnace for Roasting Pyrites or other Substance F. Benker and E. Hartmann. Fr. Pat. 327,832, Dec. 1902.

The furnace is a long, rotating metallic cylinder, brick lined within, slightly inclined to the horizontal, an characterised by the absence of any internal mechanis for moving or mixing the charge. At its upper end th cylinder is connected by a special joint to a fixed combi tion of dust chambers, through which the gases pass their way to a Glover's tower or the like. The lower en of the cylinder is provided with a register for regulating th admission of air; and near the end is a discharge val operating automatically at each revolution to discharge portion of the spent ore. The charging of material or o into the cylinder is also automatically effected at ea revolution from a hopper fixed immediately above the upp part of the cylinder. The mechanism used in chargi and in discharging is claimed.—E. S.

Hydrogen; Preparation of ——, by means of Calci Derivatives. G. F. Jaubert. Fr. Pat. 327,878, Dec. 3 1902.

The hydrogen evolved in such industrial processes as t production of electrolytic soda, is collected, deprived any oxygen present (as by passage over red-hot coppe is completely dried, and directed into an iron tube charg with calcium in small pieces, and heated for some hours redness by an electric resistance coil, for instance. T dark grey calcium hydride thus obtained is preserved closed vessels. When the hydride is brought into cont with cold water, there is a violent evolution of hydrogen.
—E. S.

Oxygen; Process for the Separation of ——, from Nitrogen of Liquid Air. Société pour l'Exploitat des Procédés Georges Claude. Fr. Pat. 328,245, Jan. 1903.

In apparatus for the separation of oxygen from nitro by the method of evaporating liquid air with simultane liquefaction of gaseous air at a higher pressure, the pres invention combines the methodical circulation of gaseous air, in inverse sense, with the liquid air, with par liquefaction of the former, and with backward return the liquid formed, under which conditions the residual becomes continually poorer in oxygen. Other claims rel to supplementary processes, and to obtaining in liquid of homogeneous composition, a systematic variation mperature, with methodical condensation, with the appli- ition of a tall column conveying liquid air into chambers herein it is sprayed, in which column the boiling point of e liquid air increases from the surface down to the bottom. increase of pressure. Compare Eng. Pat. 12,905, 1900; is Journal, 1901, 1018; Addit. to Fr. Pat. 296,211, 1900; . Pat. 324,097, 1902; Fr. Pat. 324,460, 1902; and Addit. Fr. Pat. 324,460, 1902; this Journal, 1903, 298, 485, 4, and 796.—E. S.

mmonia; Process for the Synthetic Production of ——. H. C. Woltereck, Great Britain. Fr. Pat. 328,415, Jan. 10, 1903.

e Eng. Pat. 2461, 1902; this Journal, 1903, 695.
—T. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

United States Patent.

ate Glass; [Electrical] Manufacture of ——. R. M. Gow, Pittsburg, Pa., Assignor to St. Louis Plate Glass Co., Valleypark, Mo. U.S. Pat. 734,125, July 21, 1903.

ring the rolling of the glass into plates or sheets, a rent of electricity is passed through the successive tions of the glass. The current may pass between the ming surfaces, and may be an alternating current of low ltage and high ampèrage.—A. G. L.

French Patents.

Glass; Manufacture of ——, by the Electric Arc. B. Becker. Fr. Pat. 327,901, Dec. 31, 1902.

e Eng. Pat. 28,955, 1902; this Journal, 1903, 420.
—T. F. B.

ass; Process and Apparatus for Making ——. N. Harrison, J. Wharton, and S. R. Wightman, U.S.A. r. Pat. 328,290, Jan. 6, 1903.

Eng. Pat. 354, 1903; this Journal, 1903, 796.
—T. F. B.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

tland Cement from Slag. U.S. Cons. Reps., No. 1700, July 18, 1903.

rtland cement has been made from blast-furnace slag several years in cement works in Germany, Luxemburg, Belgium, and has yielded satisfactory results, especially egard to quality. Negotiations are being carried on with e blast furnace works with a view to the introduction of slag-cement industry into England, Austria, and France. ome respects a blast works has a considerable advantage other Portland cement factories, because the motive er for the cement works can be supplied by a blast- ace gas motor with electric transmission, the rubble or e coke from the blast furnaces can be utilised in the ent kiln, and the principal raw materials—namely, the ulated slag and the limestone—are close at hand. des, there are other minor advantages.

ortland slag cement has also some advantages over ral Portland cement; for, while the yield from the raw erials when the former is used is about 80 per cent., the l when the ordinary raw materials are used is seldom e than 60 per cent. As the cost of production per ton aw materials is nearly equal in both cases, a saving of it 20 per cent. in fuel, labour, &c., is effected in the of slag cement. Besides this, Portland slag cement is trustworthy and more regular, and its manufacture be more easily controlled than that of the so-called ral Portland cement, because the principal raw material amely, the blast-furnace slag—is, as a rule, a regular uct whose chemical composition is easily controlled; equently, any alterations which are liable to take place known beforehand, and precautions can accordingly be n in time. This is not the case when the natural raw rials are used.

Some recent tests with Portland cement from blast-furnace slag, made in the municipal laboratory at Vienna, showed that mortar composed of 3 parts of sand with 1 part of this cement gave the following results:—

1. *After Seven Days' Hardening.*—Tensile strength, 383 pounds per square inch; strength of compression, 3,880 pounds per square inch.

2. *After Twenty-eight Days' Hardening.*—Tensile strength, 551 pounds per square inch; strength of compression, 5,411 pounds per square inch.

English Patents.

Fire-Proof Material; An Improved ——. R. Heinrich and T. Haardt, both of Geisweid, Germany. Eng. Pat. 16,100, July 19, 1902.

The material is composed of 75 per cent. of asbestos, 20 per cent. of blast-furnace dust, 5 per cent. of Portland cement, and sufficient water to form a pulp which can be moulded and dried by heat or in the open air.—A. G. L.

Kilns; Continuous ——, for Burning Bricks and other Clay Goods, also for Limes and Cements. R. A. Vaughan, Belfast. Eng. Pat. 12,256, May 29, 1903.

This patent is an improvement of the inventor's Eng. Pat. 19,168 of 1899 (this Journal, 1900, 50). Transverse flues are constructed in the kilns above the chamber arches. These flues lead directly to the main flue for the purpose of extracting steam from the tops of the chambers. In the floor of the chambers, combined hot air flues and grates are placed which distribute hot air and waste heat from the burnt chambers.—A. G. L.

Cement; Apparatus for the Manufacture of ——. R. C. Carpenter, Ithaca, New York. Eng. Pat. 4821, March 2, 1903.

Two rotary kilns, mounted at a slight incline, include between them at the upper, feeding end, an auxiliary furnace, an upright tubular boiler with widely-spaced vertical water-tubes, an adjacent by-pass, a set of "economiser" tubes to receive the gases traversing the boiler, a fan to regulate the movement of the kiln gases, and other accessory parts. Burner tubes enter the lower, delivery ends of the kilns, which are heated by jets of powdered fuel, oil, or gas. The two kilns deliver their charges into a single chamber, whence the clinker is taken by an enclosed elevator to the top of a cooling tower provided with oppositely inclined deflecting plates, to fall into a clinker-cooling chamber. Air is forced by a fan or the like, through this chamber, the tower, the casing to the elevator, and so into the kilns, which it reaches in a heated state to support combustion of the fuel. The gases of combustion then pass on to heat the boilers, &c.—E. S.

Walls or Ceilings; Methods of Covering ——, and Compositions therefor. F. R. A. Sundell, Stockholm, Sweden. Eng. Pat. 7976, April 6, 1903.

The composition, or surface mass, which is to form the surface layer of the covering, is obtained by mixing 10 parts by volume, of marble cement (Keene's cement) with 1 to 12 parts of alum, and stirring the mixture into water containing ½ to 3 kilos. of glue per 100 litres, after which the mass is strained. The addition of 100 to 500 grms. of sugar per litre of glue solution causes the mass to present a polished appearance as soon as it has set. Plaster of Paris may be substituted for Keene's cement, but the composition obtained is inferior.

The surface mass is poured on to the surface of a horizontal glass plate so as to form a layer of 2 to 4 mm. thickness, and is then hardened somewhat, either by allowing some of the water to evaporate or, better, by sprinkling plaster of Paris or cement powder on its surface. The glass plate is then placed at a distance of about 1 cm. from the wall it is intended to cover, suitable supports are placed around its edges, and a binding mass is poured into the space between the plate and the wall, which, in setting, binds the surface mass to the wall.

To cover ceilings, the binding mass is placed on the surface mass, after this has solidified to some extent, while the glass plate is in its first position, and the whole is then applied to the ceiling, against which the glass plate is supported until the binding mass has set.—A. G. L.

Composition [Plaster] from Calcined Gypsum; Manufacture of a ——. L. Mack, Stuttgart, Germany. Eng. Pat. 12,584, June 3, 1903.

Gypsum is heated together with sulphur, resin, tallow, wax, fat, oil, or other easily fusible or liquid substances. Thus the gypsum may be mixed with 2 per cent. of colophony and heated at a temperature not exceeding 150° C. If the gypsum contains calcium carbonate, a small quantity of alum or aluminium sulphate is added to it, the product then being of a very light porous nature. A very active disinfectant (plant parasites, &c.) is said to be obtained by heating gypsum and sulphur with colophony, tallow, wax, fat, or oil.—A. G. L.

United States Patents.

Refractory Linings; Process of Making Bricks or Bodies for ——, or Other Uses. E. W. Engels, Düsseldorf, Germany. U.S. Pat. 734,457, July 21, 1903.

Carborundum is mixed with a binding agent, and the mixture applied in a wet state to the surface of a less refractory brick or lining-body, after which the moisture is evaporated so as to cause the coating to adhere to the surface. The whole may then be subjected to the action of heat, whereby the carborundum is intimately incorporated with the substance of the brick.—A. G. L.

Refractory Linings; Process of Making Bricks or Bodies for ——, or Other Uses and the Product thereof. E. W. Engels, Düsseldorf, Germany. U.S. Pat. 734,458, July 21, 1903.

Carborundum is applied to the surface of the unburnt brick, while in a plastic state, and forced into the surface by pressure, after which the brick is burnt at a temperature below that of the electric arc.—A. G. L.

French Patents.

Artificial Stone; Manufacture of ——. L. Lefranc (France). Fr. Pat. 328,262, Jan. 5, 1903.

Chalk, marble, gypsum, siliceous sand, clay, &c., are mixed with calcium fluoride (fluorspar) in molecular proportions, *e.g.*, 37 parts of fluorspar to 63 parts of calcium sulphate. The mixture is then heated to fusion, which takes place below 1100° C., and stirred, if necessary, till homogeneous. It is then introduced into moulds of suitable form and allowed to cool slowly. The product is called "gypsite." By adding 25 per cent. of silica, clay, or a mixture of both to the above ingredients, a product called "florite" is obtained which resists the action of heat and moisture better.—A. G. L.

Bricks or Artificial Stone; Methods and Apparatus for Making ——. The Hydraulic Brick and Stove Co., Ltd., England. Fr. Pat. 328,412, Jan. 10, 1903.

See Eng. Pat. 20,534 of Sept. 20, 1902, by J. S. Rigby; this Journal, 1903, 867.—A. G. L.

Cements; Manufacture of Oxychloride ——, and Method of using same. A. Verdier, France. Fr. Pat. 328,317, Jan. 9, 1903.

The materials to be agglomerated, such as powdered marble, sand, asbestos, sawdust, &c., are first mixed, reduced to powder, if necessary, and then impregnated with a solution of magnesium chloride of 32° B., from which the impurities have been previously precipitated by adding to one litre 5 to 15 grms. of magnesium or aluminium fluosilicate, or of magnesium carbonate. The powdered mixture may be heated to 60° to 100° C. before the magnesium chloride is added.—A. G. L.

Roasting and Calcining Raw Materials from which Cement, Minerals, &c., are made; Process of ——, and Furnace used in the Process. M. Williams, Great Britain. Fr. Pat. 328,335, Jan. 7, 1903.

See Eng. Pat. 10,853, 1902; this Journal, 1903, 629.

—T. F. B.

X.—METALLURGY.

Chlorine Smelting, with the Aid of Electrolysis. J. Swinburne. Electrician, 1903, **51**, [1312], 495—496, [1314 583—584.

The author gives a description of the Swinburne an Ashcroft process for the chlorine smelting of sulphid ores. (See Eng. Pats. 17,611 and 17,612 of 1900, 14,27 of 1899, and 6,857 of 1901, and U.S. Pats. 691,822 an 695,126; this Journal, 1901, 907; 1902, 349, 417, 351, an 482; also this Journal, 1901, 1,216).

Cost of Process.—The following rough estimate is give for the treatment of 100,000 tons of bluestone ore pe annum, with steam generating plant for the purpose. Th ore as delivered would contain 22 per cent. of zinc, 18 pe cent. of lead, 4 per cent. of iron, 3 per cent. of manganes 35 per cent. of gangue, 18 per cent. of sulphur, with 15 oz of silver per ton. The capital required would be abou 550,000*l.*, including the generating plant, with n debentures, but excluding payment for patent rights. Th costs of working would be:—100,000 tons of ore delivere at 2*l.* 10*s.* per ton, 250,000*l.*; 100,000 tons of ore carrie through process, excluding cost of energy, 150,000*l* electrical energy, 94,200*l.*; allowance for loss of metal and chlorine, 15,000*l.*; cost of realising products, 16,000*l.* total, 525,200*l.* The value of the products, reckonin zinc at 20*l.* per ton, lead at 12*l.* per ton, silver at 2*s.* per oz two-thirds of the sulphur at 3*l.* per ton, iron oxide at 2 per ton and manganese oxide at 5*l.* 5*s.* per ton, would l 866,400*l.*, or a profit of 341,200*l.* If the energy wer bought at 0·1*d.* per kilowatt-hour from a power-suppl station, the cost would be increased by 55,800*l.*, but th capital would be reduced to about 275,000*l.* Th subjoined rules will give the approximate cost for an given ore.

Rule for Capital.—For each ton of ore to be treate per annum, allow 0·1*l.* per unit of zinc, 0·05*l.* per uni of copper and 0·03*l.* per unit of lead, and for other metal which are extracted in the metallic state in proportio inversely as their equivalents. These figures will give rough estimate of the capital required for process plant an working capital. If steam or gas generating plant is to b put down, the capital must be doubled.

Rule for Working Costs.—For each ton of ore treated allow cost of ore delivered, plus 1*l.* 10*s.* per ton fo treatment, including everything but cost of electrica energy, and allow 5 per cent. extra on cost of ore to cove all waste. The cost of electrical energy depends on th metal content of the ore, and on the cost of generation Steam may be taken at 0·25*d.*, gas at 0·125*d.*, and wate at 0·1*d.* per kilowatt-hour.

Cost per Unit of Metal recovered, as below.	Steam Power.		Gas Power.		Water Powe	
	£	Pence	£	Pence	£	Pene
Antimony (if as metal)	0·012	10·0	0·021	5·0	0·016	4·0
Copper	0·0175	4·2	0·009	2·1	0·007	1·7
Iron (as oxide)	..		..		..	
Manganese (as oxide)	..		..		..	
Lead (desilverised)	0·0107	2·6	0·0054	1·3	0·0043	1·0
Nickel	0·038	9·0	0·019	4·5	0·015	3·6
Silver and gold	Inappreciable		..		..	
Tin	0·038	9·0	0·019	4·5	0·015	3·6
Zinc	0·0342	8·2	0·017	4·2	0·0136	3·5

The value of the products may be estimated by addin together the values of all the metals in full, the waste o loss being amply covered by the 5 per cent. extra allowe on the cost of the ore. The iron and manganese shoul however, not be reckoned, as they are recovered as oxides for which the market is uncertain. Two-thirds of th sulphur of the ore may be allowed for at market price.

—A. S.

Antimony; Volumetric Determination of ——, *Antimonial Lead.* H. Nissenson and P. Siedle XXIII., page 967.

alcium Carbide; Reduction by Means of ——. F. von Kügelgen. Chem.-Zeit., 1903, **27**, [59], 743—744

EUMANN's contention (see this Journal, 1901, 46) that rbon monoxide is the gaseous product of the reduction of etallic oxides, with or without chlorides, by means of lcium carbide, was called in question by von Kügelgen ee this Journal, 1901, 582), and again affirmed by eumann (see this Journal, 1902, 1302). The author s now continued his experiments, using a hard glass tube contain the mixture, and conducting them in an atmosphere of nitrogen It was found that although carbon onoxide was commonly present, it was in relatively small portion, say 5—15 per cent. of the gases produced, ainst 95—85 per cent. of carbon dioxide. Moreover, en the mixture was made to correspond to Neumann's ation

$$(M''Cl_2 + 2M''O + CaC_2 = CaCl_2 + 3M'' + 2CO)$$

bon was left, and only about half the quantity of gaseous duct was formed, that resulted when the mixture was $Cl_2 + 4M''O + CaC_2$. The equation in the former e was, therefore—

$$''Cl_2 + 2M''O + CaC_2 = CaCl_2 + 3M'' + CO_2 + C.$$

en the temperature of the change was relatively low, as en sand was added to the mixture, or when an easily ucible oxide was used, the proportion of carbonic oxide the gases was much less. An exception to this was nd in the case of stannic oxide, but this is explained by tin oxide being less readily reduced by carbon than are other oxides. Neumann has called in question von gelgen's statement as to the value of these reactions in alloying industry. But it is now shown that brass may economically made from copper oxide and zinc chloride calcium carbide, if the mixture be fired at one point in cold, and the reaction be allowed to proceed throughout mass without the aid of external heating. The crucible aining the resulting mixture of reduced material is then ed in a pot-furnace, and heated to a sufficiently high perature to run the charge together. In this way there latively little loss of zinc chloride, and practically no of zinc in melting. The materials for the charge are p, and the calcium chloride slag produced in the tion is not without value.—W. G. M.

English Patents.

Z Blende; Separation of ——, from Ores with which it associated. A. F. Spooner, London. From Magnetic e Separating Company Proprietary, Limited, Melbourne, stralia. Eng. Pat. 12,644, June 4, 1903.

T powdered and wet ore is treated with chlorine, gaseous or therwise, in order to attack the surface of the zinc bl le, that it may be thereby rendered more readily se able from the gangue. The treated ore is passed on to vanning or percussive table, or other suitable ore-se ating device, to effect the required sorting. Compare E Pat. 18,102, Sept. 10, 1901; this Journal, 1902, 54. —E. S.

Ti and Zinc; Recovery of ——, from Tinned and lvanised Scrap Metal. L. Wirtz, London. Eng. . 20,496, Sept. 19, 1902.

Tr crap is immersed in a solution of hydrochloric acid, an he solution of tin and iron chlorides thus produced is tre d with zinc scrap, whereby tin is deposited as a non-adl ive precipitate. The resulting zinc chloride solution ma e treated by ordinary means.—E. S.

Co er; Recovering ——, from Residual Products con- ing the same. H. Mennicke, Hattersheim, Höchst-Main, Germany. Eng. Pat. 17,617, Aug. 11, 1902.

Th upreous residues are heated with sodium bisulphate to r 400° C.; or with a mixture of sodium bisulphate and oncentrated sulphuric acid to 100°—110° C., with stir g. The melt, when cool, is lixiviated, and copper is rec ered from the solution by electrolysis or otherwise, the other liquor being further treated for the recovery of zinc Compare Eng. Pat. 17,616, of the same date; this Jou al, 1903, 913.—E. S.

United States Patents.

Metals; Furnace for Melting ——. J. J. Anderson, South Haven, Mich. Assignor to Oil Burner Furnace Co., Wisconsin. U.S. Pat. 733,931, July 21, 1903.

A tilting furnace is arranged with a pouring shelf or "ladle-supporting shelf," so attached to one side that the shelf is always horizontal, without reference to the angle through which the furnace is tipped. The furnace is closed at the top and bottom, and has laterally projecting trunnions at the sides. There are also burners projecting into the furnace above the surface of the melted metal, and supplied by means of air and fuel pipes.—W. G. M.

Gold from Sea-Water; Process of Obtaining ——. J. F. Duke, London. U.S. Pat. 734,683, July 28, 1903.

See Eng. Pat. 12,610 of 1899; this Journal, 1900, 541. —T. F. B.

Ingot or Casting; Metallic ——. G. Thomson, Elizabeth, N.J. U.S. Pat. 734,286, July 21, 1903.

The body of the casting is of steel, the lower face being of a nickel-copper alloy of higher specific gravity, merging gradually into the homogeneous steel body.—W. G. M.

Metal Castings; Process of Manufacturing Homogeneous ——. H. Goldschmidt and W. Mathesius, Essen-on-the Ruhr, Germany. U.S. Pat. 733,957, July 21, 1903.

A mixture of an oxygen compound of a metal, and a metal (*e.g.*, aluminium) capable of reacting with it, is plunged and retained beneath the surface of the molten metal prior to casting the latter.—W. G. M.

French Patents.

Iron Castings; Manufacture of ——, having a Resistance of from 20 to 30 kilos. per sq. mm. A. Zenzes, Germany. Fr. Pat. 328,381, Jan. 13, 1903.

Iron is subjected to oxidation in a converting furnace up to a certain point, to reduce the proportion of carbon, silicon, and manganese present, and produce a white metal; a stated proportion of ferro-silicon is added to obtain a cast-iron having great resistance.—E. S.

Vanadiferous Ores and Products; Process of Treating ——. H. L. Herrenschmidt. Fr. Pat. 328,421, Jan. 10, 1903.

Lead vanadate is decomposed by fusion with an alkali carbonate, sulphide or sulphate, and carbon. Sodium vanadate is washed out of the product, and may be used to obtain an alloy of vanadium with iron, aluminium, copper, or other metals. For instance, to obtain ferro-vanadium, the sodium vanadate solution is precipitated by ferrous sulphate, and the precipitate is heated in the electric furnace, or by aluminium combustion, to form the alloy. Or sodium vanadate solution may be decomposed by a metal sulphate or chloride, with or without the addition of sodium carbonate to the solution concentrated to a syrupy consistence, and the product reduced. Vanadiferous ores, such as "grès du Colorado," may be attacked by sulphuric acid, and the solution, containing vanadium and iron sulphate, may be treated as above, or in certain other described ways.—E. S.

Mattes and Crude Metals; Process and Apparatus for the Industrial Treatment of ——, in Reverberatory Furnaces. Second Addition, dated Jan. 3, 1903, to Fr. Pat. 321,392 of May 24, 1902; see this Journal, 1903, 215.

A solid oxidiser formed by the oxide of the metal to be treated, in powder or in grains, is injected on to the hearth of the furnace by the jets from the tuyères, together with the flux employed (as silica, chalk, &c.) and with steam and air, whereby an energetic oxidation is promoted in the bath. Divided hoppers, for the delivery of the oxides and of the fluxes simultaneously into the tuyères are provided, with other special apparatus for preparing the oxides used,

&c. For the First Addition to the patent, see this Journal, 1903, 499; and compare Eng. Pat. 10,101, May 15, 1901; this Journal, 1902, 862.—E. S.

Antimony Ores; Process of Treating ——. F. E. Chatillon. First Addition, dated Jan. 6, 1903, to Fr. Pat. 317,604 of Jan. 7, 1902. See this Journal, 1902, 1399.

The present improvements relate to the conduct of the process when the ores are in powder, or abound in easily fusible sulphides. A slightly inclined hearth is joined to the cupola furnace, having many charging openings in its arch, and working doors for introduction of iron tools for pushing the charge into the body of the furnace. The dampers to the ash-pit may be completely closed to ensure a reducing atmosphere when required. The metallic dust resulting from the preliminary processes is mingled with sawdust or carbon powder, and charged into the reducing furnace through upper openings. Such a mixture may be injected continuously in a direction opposite to the movement of the gases. The cupola is divided by vertical partitions into a number of compartments, and the air-passages are arranged in a special manner. The gases leaving the auxiliary reducing furnace are led through the tubes of a steam-boiler for utilisation of their heat, and pass thence into a large condensing chamber, provided in its upper part with arrangements for drying the metallic powders condensed in water from the furnace vapours.
—E. S.

Alloys of Iron or Steel with other Metals. J. W. Chenhall, England. Fr. Pat. 328,266, Jan. 5, 1903.

See Eng. Pat. 58, 1903; this Journal, 1903, 368.
—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Electrical Endosmose; Notes on ——. W. D. Bancroft. Trans. Amer. Electrochem. Soc., 1903, **3**, 261—263.

With a 10 per cent. copper sulphate solution and an ordinary porous cup, one can easily get a flow of 20 c.c. of the solution per ampère-hour. The endosmose of a salt solution, containing 200 grms. per litre, through an ordinary porous cup is small, not over 2 to 3 cc. per ampère-hour. In spite of this, a porous cup containing this salt solution cannot be placed in a beaker containing caustic soda and electrolysed without due precautions, chloride always being found in the cathode chamber. By placing a platinum spiral in the bottom of the porous cup, and dipping it just below the surface of the solution, and placing the cathode directly beneath, no chloride could be found in the cathode chamber after a run of two ampère-hours. On dipping the porous pot further into the solution, chloride is found in the cathode chamber.—L. F. G.

Nitric Acid; Formation of ——, *by Electric Energy.* C. W. Volney. Trans. Amer. Electrochem. Soc., 1903, **3**, 285—289.

A current of 8 ampères at 8 volts was sent through nitric oxide, the electrodes being 15 mm. apart, in a reaction flask of 1 litre capacity. The nitrogen peroxide formed, was determined with N/10 permanganate solution, the gas being absorbed by concentrated sulphuric acid. After passing through sulphuric acid, the gas was conducted into a eudiometer, filled with and standing in N/10 solution of permanganate. The unabsorbed nitrogen was measured. The nitrogen found, corresponded with the quantities of peroxide formed according to the equation $2NO = NO_2 + N$. The results showed "that the same electric energy decomposes in five minutes 2·73 per cent., in 10 minutes 3·3 per cent., and in 20 minutes 3·58 per cent. of nitric oxide gas into peroxide and nitrogen." It is probable that this small yield may be increased by changes in apparatus and manipulation, but the author believes that the whole result of these experiments shows the occurrence of oxidation and deoxidation processes, under the influence of the electric discharges and hig temperatures, and that therefore the reaction in a close space will always be a limited one.—L. F. G.

Caustic Soda; Influence of Impuriti on the Yield o ——, *by the Amalgam Process.* J. W. Walker an C. S. Paterson. VII., page 919.

English Patents.

Peat Fuel, Peat Charcoal, and Fibrous Peat; [Elec trical] Manufacture of ——. J. B. Bessey. Eng. Pat 19,719, Sept. 9, 1902. II., page 943.

Batteries; Electric ——. H. Piqueur, Brussels. Eng Pat 4234, Feb. 23, 1903.

The positive pole is a porous block of carbon with a serie of wide vertical holes from the top to near the bottom, a intermediate vertical channels from the bottom nearly t the top. Each of the larger holes is fitted with a tube o ebonite, or other insulating substance, filled with granulate zinc. Hypochlorous acid is introduced into the spac between the containing vessel and the carbon block, and rising through the narrower channels, acts as a depolarise finds its way through the porous carbon, and, reduced t hydrochloric acid, forms the exciting fluid for the zinc The solution is finally conducted away through another tub near the top of the cell, which is covered by a tightly-fittin lid clamped on with rubber and lead washers. The sup of fluid to the cell is automatically controlled by means o valves communicating with a compressed-air retainer an the atmosphere respectively, the valves being actuated b means of an electro-magnet, energised in proportion to th current used. A special device is arranged to prevent th escape of hypochlorous acid into the air from the reservoi containing it.—W. G. M.

Alkaline Earth Metals and other Heavy Metals Electrolytic Preparation of Permanganates of ——, *an the Obtaining of By-Products in the Process.* G. W Johnson, London. From Chemische Fabrik Griesheim Elektron, Frankfort-on-Maine. Eng. Pat. 8833, April 1 1903.

A mixture of a solution of alkali permanganate o manganate and an oxygenated or halogen compoun the metal, of which the permanganate is required, is s mitted to electrolysis in the anode compartment of electrolytic cell, having a diaphragm separating the lat from the cathode compartment.—W. G. M.

United States Patents.

Battery. D. Drawbaugh, Eberlys Mill, Pa. U.S. Pat 733,919, July 21, 1903.

This is a dry battery, consisting of an outer electr surrounding a central electrode, around which is a com position of carbon and plumbago, the space betwee th composition and the containing electrode being filled w a porous material, such as plaster of Paris, containing excitant consisting of an alkali.—W. G. M.

Battery: Electric ——. H. Csányi, Felsö-Dobsza, Austria-Hungary. U.S. Pat. 734,826, July 28, 1903.

See Eng. Pat. 8964 of 1903; this Journal, 1903, 872.
—T. F. B.

Alkali Chlorides: Apparatus for the Electrolyti D composition of ——. C. Fournier, Geneva, Switzer an U.S. Pat. 734,312, July 21, 1903.

Compare Fr. Pat. 321,422, May 26, 1902; this Jour 1903, 216.—W. G. M.

Plate Glass; [Electrical] Manufacture of ——. A. Gow, Assignor to St. Louis Plate Glass Co. U.S. P 734,125, July 21, 1903. VIII., page 951.

Lead Peroxide; Manufacture of ——. E. Q[illegible] Duisberg, Germany, Assignor to Chemische Fab Griesheim-Elektron, Frankfort-on-Maine. U.S. 734,950, July 28, 1903.

See Eng. Pat. 12,186 of 1901; this Journal, 1902, 620.
—T. F. B.

French Patent.

Electric Currents; Apparatus for the Generation and Electrolytic Application of ——. F. E. Elmore. Fr. Pat. 327,886, Dec. 31, 1902.

EE Eng. Pat. 26,673 of 1901; this Journal, 1903, 371.
—T. F. B.

(*B.*)—ELECTRO-METALLURGY.

Electroplating Solutions; Notes on the Composition of ——. N. S. Keith. Trans. Amer. Electrochem. Soc., 1903, **3**, 227—231.

HE use of strong solutions as electrolytes, with rapid gitation or circulation, allows of the use of great densities f current, insuring the rapid deposition of metal.

For refining lead base-bullion a bath of sodium acetate is sed, with lead sulphate, which is readily soluble in this olution. The anion SO_4 readily attacks the lead anode, nd the solution at once dissolves the lead sulphate. n the absence of oxygen the lead remains bright, the ame amount depositing as is dissolved, and no gases eing evolved. The acetate of soda remains unchanged.
—L. F. G.

Zinc; Electrolysis of Alkaline Solutions of ——. R. Amberg. Ber., 1903, **36**, [11], 2489—2494.

INC can be deposited in a coherent form from its solution n potassium hydroxide without the addition of another lectrolyte. A sufficient excess of potassium hydroxide ust be present—at least 10 grms. per 0·5 grm. of zinc. he volume of the solution should be about 150 c.c., the olution should be warm (60°—70° C.) at the beginning of e operation, the voltage 3·0—3·1, and the current density fter cooling should be regulated to about 0·5 ampère per 00 sq. cm. till near the end of the deposition, when it must e allowed to rise, and may safely exceed 3 ampères per 00 sq. cm. The deposited metal must not be allowed to ome in contact with air till completely cooled, or oxidation ay occur. The anode must of course be of platinum, but e cathode is preferably of nickel, either as a plate or a asin; the zinc can be afterwards removed by dilute cold ydrochloric acid, without sensible loss of metal. The ddition of potassium cyanide gives a peculiar bluish tinge the surface of the deposited zinc, but the operation takes ree or four times as long to finish as without this ddition.

Ammonia in not too large amount (in the electrolysis of nc ammonium sulphate, for example) does not interfere ith the deposition, nor do alkaline earth hydroxides. agnesium and aluminium do not deposit with the zinc, it bismuth, iron, and manganese may go down in traces ith it, if not removed from the solution.—J. T. D.

ickel; Notes on the Electro-Deposition of ——. W. A. Johnson. Trans. Amer. Electrochem. Soc., 1903, **3**, 255—260.

HE tendency of nickel deposited at a high current density curl up, is attributed to the formation of a hydride. If e electrolyte be freed from dissolved gases by allowing to drop through a vacuum, the tendency of the nickel curl up is diminished, as the hydrogen which is ordinarily cluded by it, is dissolved in the electrolyte. It is thus ssible to make heavy platings of nickel, provided the culation of the gas-free electrolyte keeps pace with the mation of hydrogen at the nickel cathode.—L. F. G.

etals; Electrolytic Production of ——, *especially of Zinc, in the Wet Way.* W. Strzoda. Chem.-Zeit., 1903, **27**, [59], 741—743.

ECTROLYSIS of zincate solutions in special apparatus ed give but little trouble, the formation of zinc sponge at e cathode being practically avoided if air be blown under essure into the solution and sand be thus kept in constant otion in the liquid so that it may exert a scrubbing luence on the electrodes. The current density should not ceed 50 ampères per square metre. The chloride process zinc is beset with many difficulties, especially in regard to the by-products, and although they can be overcome they reduce the small margin of profit overmuch. The difficulties attendant on the sulphate process are even greater. Processes in which the ore is introduced into the electrolytic tank to be dissolved, do not readily yield pure zinc. The author has patented a process (Ger. Pat. 118,291) in which the ore is placed on the cathode, instead of at the anode, in an electrolyte of caustic soda; and this has been found by F. Peters to give results far superior to those processes in which the ore is placed at the anode. In his experiments a copper cathode and a carbon anode were used, with a 10 per cent. solution of caustic soda and finely-crushed calamine containing 5·8 per cent. of zinc. With a P.D. of 3·2 volts, which was constant after an hour's run, 1·6 grms. of zinc were deposited by 10·3 ampère hours. Working on the fine dust from zinc furnaces, a metallic product containing 80 per cent. of zinc was obtained; and this, on distillation, yielded an almost pure zinc, containing about 0·24 per cent of lead. The cost of the zinc thus distilled, prepared from flue-dust carrying 10 — 12 per cent. of zinc, was 22 — 24 marks per 100 kilos. The choice of the material for insoluble anodes in aqueous electrolysis is of great importance. Platinum has many disadvantages, the ferro-silicon material patented by Höpfner has not in the author's experiments satisfied him as to its power of resistance, and carbon is still the best material for the purpose. It should be pressed into blocks, fired, and sawn into slabs of the necessary thickness, the slabs being finally treated according to the solution in which they are to be used. There is, however, ground for hope that a practicable iron-alloy may ultimately be perfected, as the author has worked with one which lost only 0·1 mm. in thickness after being two months in use as anode.—W. G. M.

French Patents.

Zinc; Apparatus for Electrolytically Coating Sheet, Metals with ——. "Columbus" Elektricitäts-Gesellsch., Germany. Fr. Pat. 328,282, Jan. 5, 1903.

See Eng. Pat. 15,128, July 7, 1902; this Journal, 1903, 804.—W. G. M.

Steel; Electro-Metallurgical Process for the Manufacture of ——. Soc. Électrometall. Franç., France. Fr. Pat. 328,350, Jan. 7, 1903.

An electric furnace, say of the oscillating type (compare Eng. Pat. 14,643 of 1901; this Journal, 1902, 915), is erected by the side of a Bessemer converter, and the cast-iron is first "blown" in the latter to any desired extent, or is treated in an open-hearth furnace, and the recarburisation is effected, preferably according to Fr. Pat. 320,682, of April 25, 1902 (this Journal, 1903, 148), after transferring the metal to the electric furnace.—W. G. M.

Magnets; Standardisation of Steel ——, *in regard to Magnetic Force.* B. J. Brander, Great Britain. Fr. Pat. 328,413, Jan. 10, 1903.

The magnet to be tested is joined up by soft iron bars with a standard magnet, so as to form a magnetic circuit. A compass-needle is placed midway between the connecting bars, and the position of the needle then indicates the direction of the lines of force, and, therefore, the relative strengths of the two magnets.—W. G. M.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Linseed Oil; Examination of ——. B. Sjollema. XXIII., page 969.

English Patents.

Fatty Substances; Processes for Saponifying ——. F. Perrelet, Offenbach a/M. Eng. Pat. 15,586, July 12, 1902.

See Fr. Pat. 322,777 of 1902; this Journal, 1903, 372.
—T. F. B.

Tanks; Rendering or Reducing ——, for Use in Treating Fish Waste or other Oil- or Grease-Yielding Material. H. J. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 7519, March 31, 1903.

In this apparatus means are provided for the shell forming the exterior wall of the inner chamber to expand or contract with the alterations in temperature, independently of the outer wall of the jacket chamber.—C. A. M.

Oil; Process of Preventing —— from becoming Turbid or Gelatinous when Heated. W. Traine, Wiesbaden, Germany. Eng. Pat. 26,929, Dec. 6, 1902.

Claim is made for the addition of an alkaline substance, preferably slaked or unslaked lime.—C. A. M.

Soaps; Manufacture of ——. C. Dreymann, Turin, Italy. Eng. Pat. 3973, Feb. 19, 1903.

See Fr. Pat. 320,886 of 1902; this Journal, 1903, 150.
—C. A. M.

United States Patents.

Oil from Cotton Seed; Process of Extracting ——. F. M. Pratt, Decatur, Ill., U.S.A. U.S. Pat. 734,239, July 21, 1903.

The "unhulled and unlinted" seeds are flattened by a roller or grinder so as to disarrange the structure of the hulls and "meat," and are then submitted in a percolator to the action of a hydrocarbon solvent. The seed is subsequently deodorised and the lint separated.—M. J. S.

Oil; Process of Refining ——. C. B. Graham, South Haven, Mich. U.S. Pat. 732,937, July 7, 1903.

The oil is passed through a mixture of lime water, pyrogallic acid (pyrogallol), and caustic potash.
—T. F. B.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

United States Patents.

Pigments; Process of Making ——. W. J. Armbruster, St. Louis. U.S. Pat. 734,391, July 21, 1903.

Pigment, and Process of Making same. W. J. Armbruster, St. Louis. U.S. Pat. 734,392, July 21, 1903.

See Eng. Pat. 6521, 1903; this Journal, 1903, 807.
—T. F. B.

(*C.*)—INDIA-RUBBER, &c.

Vulcanising Apparatus. B. W. Wittenberg, E. Brock, and E. Koch, Riga, Russia. U.S. Pat. 734,489, July 21, 1903.

Two vulcanising vessels are used in combination and are connected by a pump capable of transferring the contents of one to the other, and also by a return pipe by which a circulation of the contents is effected. Ventilating valves, cut-off valves and means for heating the vessels are also provided.—M. J. S.

French Patent.

Gutta-Percha; Artificial ——. Siemens and Halske Akt.-Ges. Fr. Pat. 327,745, Dec. 27, 1902.

Colophony (100 parts), Carnauba wax (100 parts), or any other similar wax, are melted with gas- or wood-tar (40 parts), at about 170°—180° C., and then saponified with milk of lime (75 parts of sp. gr. 1·06) or equivalent alkalis. This soap is then intimately mixed with an amount of caoutchouc suitable for the product desired, at a temperature of 90° C. or higher, and the whole rendered homogeneous by passing it between rollers.—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Fat Liquors for Chrome and Other Leather. C. Dreher. Leather Trades Rev., 1903, **36**, [908], 472—474.

Ordinary fat-liquors are usually emulsified with the aid of alkali-soap (which is either added as such, or produced by saponifying a considerable portion of the ingredients with alkali), and this soap, when afterwards washed out to prevent spueing, removes much of the natural filling material of the leather, causing it to become thin and rough. The author has designed the following fat liquors, to be used in connection with the new fast-colours made with "corichrom," containing a minimum of alkali. The finishing liquor contains only 1 per cent. of real sodium carbonate on the weight of fatty substances employed.

"*Preparatory Liquor.*"—50 grms. of crystallised sodium carbonate are dissolved in 2 litres of water at 70° C. To this, 70 grms. of potato starch made to a paste with ½ litre of warm water are added, and then ½ litre of castor oil, warmed till quite liquid, is stirred in. This liquor may be diluted to any extent with warm water, whilst the quantities of soda and oil may be doubled if the skins lack fat. An alternative liquor is ½—1 per cent. solution of Turkey-red oil in water, clarified with a few drops of ammonia, and this seems to give a softer leather.

"*Finishing Liquor.*"—Soft water at 70° C. (5 litres), soda crystals (100—120 grms.), starch (100—120 grms.), and castor oil (1 litre), are compounded as before, and the following ingredients, all previously warmed, are then added gradually, and stirred well in: for a full soft leather, cod oil or dégras, or mixture of both (2 kilos.), neatsfoot oil (1—2 kilos.), and vaseline oil (1 kilo.). To produce the smell of Russian leather, birch tar-oil (100—200 grms.) is also added. If properly mixed, the above remains an emulsion, even when a glassful is poured into a pailful of (warm) water. More starch or soda (up to 200 grms.) may be added, if necessary, and it is well to use an emulsifying machine. The liquors must always be mixed with warm water, but never boiled or allowed to become cold, and must be applied to warm skins, kept warm till dry or, at least, till set out.

Mode of Using.—The rinsed (neutral) skins are warmed through in a tumbler of warm soft water, to which the "preparatory liquor" is then added (sufficient to give ½ lb. of castor oil per 100 lb. of skins), and run for 10 minutes, in which time the oil should be absorbed, and the liquor become clear. They are then rinsed in warm water (this is not essential), and dyed with "corichrom." This first fat liquor produces brighter and more even shades, and enables the skins to stand a higher temperature in the dye-bath. If the skins are to be dyed through, blue-black, ½ grm per litre of a basic or neutral aniline dyestuff (Methyl Violet, Neutral Violet, Fast Blue, or Nigrosine) may be added to the warm water used for heating the skins, whilst other dyestuffs in solution may be added with the "preparatory liquor." The dyed skins are now run in a tumbler with water and tumbled with the "finishing liquor" somewhat diluted, for about half an hour, then rinsed with warm water (not essential), set out whilst warm, slightly rubbed with glycerin, glazed, and finished. Hand stuffing is usually unnecessary with these fat liquors. For full soft leather, cod-oil and dégras should be the main constituents, but neatsfoot oil and vaseline give better glazing results.
—R. L. J.

French Patents.

Organic Liquids [Tanning Extracts]; Decolorisation and Clarification of ——. G. A. Clowes and E. P. Hatschek Fr. Pat. 327,806, Dec. 29, 1902.

For the clarification and decolorisation of organic liquids especially tanning extracts, the liquids are treated with inert yeast cells which have previously been extracted by suitable treatment. Such cells have a considerable affinity for the colouring matters without removing the tannin constituents of the liquors. The yeast is prepared by heating it with water, preferably *in vacuo*, at about 50° C for several hours; it is then digested with a 1 per cent olution of hydrochloric acid, and subsequently with a per cent. solution of caustic alkali. The exhausted cells re finally soured with acid and washed.—J. F. B.

Chrome-Tannage; New ——. L. L. Lesellier. Fr. Pat. 328,338, Jan. 7, 1903.

HE skins, prepared in the usual manner, are tumbled in a rst bath containing hydrochloric acid (5 per cent.), sodium hiosulphate (2·5 per cent.), and sodium bichromate (5 per ent.) for about 12 hours. For heavy skins this liquor hould be of 7° B. density and, for lighter ones, 5° B. he second bath contains hydrochloric acid (4 per cent.) nd sodium thiosulphate (5 per cent.), and the skins are rummed in this until tanned through. They are then rummed in fresh water and finished in the ordinary anner.—R. L. J.

elatin and other Materials; Iridescent Effects on ——, by means of Collodion. F. Alary-Ruelle and A. Choisy. Fr. Pat. 328,357, Jan. 8, 1903.

HE gelatin or other basal material is coated with resin, um dammar, or other highly refracting substance suitably issolved in benzene, turpentine oil, or carbon bisulphide, c. When dry, this is coated with collodion solution. —R. L. J.

anning; Impts. in ——. [Use of Titanium Compounds in.] M. C. Lamb. Fr. Pat. 327,945, April 25, 1902. Compare Eng. Pat. 11,092, May 30, 1901; this Journal, 1902, 1,286.

HE use of titanium salts or compounds, preferably the sic titanium sodium sulphate $TiOSO_4Na_2SO_4$, is claimed conjunction with mineral tannages and combination getable and mineral tannages.—R. L. J.

anning Process. C. Dreher, Germany. Fr. Pat. 328,244, Jan. 3, 1903.

E Eng. Pat. 5211 of 1903; this Journal, 1903, 906. —T. F. B.

XV.—MANURES, Etc.

enitrifying Bacteria in Manure, Straw, and Soil. C. Hoflich. Centralbl. Bakt.- u. Par., 1902, **8**; through Bied. Centralbl. Agrik. Chem., 1903, **32**, [8], 521—524.

IE author has isolated and characterised the species of e denitrifying bacteria occurring in cattle dung, straw, d soil in the same district. His investigations show that (1) Soils normally contain denitrifying bacteria; (2) special distinction exists between manured and unanured soils as regards the presence of denitrifying cteria; (3) The denitrifying bacteria in the soil are le to retain their vitality without yearly manuring; (4) ils contain no specially characteristic denitrifying cteria; these are of the same species as exist in farmrd manure; (5) The denitrifying bacteria in the manure, aw, and soil of a district stand in intimate mutual ationship.—J. F. B.

XVI.—SUGAR, STARCH, GUM, Etc.

etroot Juice; Action of Lime on certain Nitrogenous Components of ——. E. Sellier. XXIII., page 969.

gar in Boiler Feed Water; Quick Method of Determining ——. H. Pellet. XXIII., page 969.

English Patent.

w Sugar; Purification and Preservation of ——. J Weller, London. From M. Weinrich, Yonkers, U.S.A. Eng. Pat. 21,146, Sept. 29, 1902.

w sugar is treated with a quantity of powdered quicke sufficient to convert the sugar of the molasses adhering the crystals into calcium sucrate, and to decompose the rogenous and other impurities. The treated sugar is n steamed and aërated and separated by washing into pure gar and sucrate on the one hand and impure waste syrups on the other. The purified sugar containing the sucrate is then dissolved, treated with phosphoric acid or carbon dioxide, and refined.—J. F. B.

United States Patents.

Sucrate of Lime; Apparatus for Making ——. G. Dinkel, Jersey City. Assignor to the American Sugar Refining Co., New Jersey. U.S. Pat. 734,164, July 21, 1903.

The apparatus comprises an inclosing vessel, a cone-shaped hopper, means for causing the solution to be treated to move over the hopper in a thin current, and means "for depositing a pulverulent material on the surface of the moving stream," said means consisting of a fixed perforated plate, a rotating "spider" situated over the plate and carrying means to act upon its surface so as to force the pulverulent material through the perforations.—J. F. B.

Sucrate of Lime; Process of Obtaining ——. G Dinkel, Jersey City. Assignor to the American Sugar Refining Co., New Jersey. U.S. Pat. 734,223, July 21, 1903.

Sugar solution is caused to move forward in a thin current, and at several points of its course a definite quantity of finely-divided lime is added to and mixed with a definite quantity of the juice, the amount of each addition being less than that required to combine with the quantity of sugar present. The liquid is cooled between each point of treatment, and the addition of further charges of lime is continued until the whole of the sugar has been precipitated. —J. F. B.

French Patents.

Sugar; Apparatus with Agitating Gear for Boiling —— in Vacuo. H. Karlik and J. Czapikowski. Fr. Pat. 328,247, Jan. 3, 1903.

The boiling pan consists of a horizontal cylindrical vessel in the lower portion of which is situated a shaft carrying arms which support a number of pipes arranged parallel to the axis. These pipes serve to agitate the mass and to provide means for heating or cooling it as required. —J. F. B.

Sugar Refining; Process for Obtaining the First Jet in ——. Soc. Nouvelle de la Raffinerie D'Aubervilliers. Fr. Pat. 328,406, Jan. 10, 1903.

Raw sugar is dissolved in syrups from first jet sugar and hot water so as to obtain a syrup containing 20 per cent. of water. This syrup is heated to 103°—105° C., skimmed, and decolorised by zinc "hydrocarbonate" or other suitable reagent. It is then filtered hot and discharged at a temperature of 103°—105° into a vessel with heating or cooling coils, for crystallising with agitation under vacuum and cooled more or less slowly to a temperature of 50°—55° C., the size of the grain being regulated by the speed of cooling.—J. F. B.

Starch; Process for Manufacturing ——. The Improved Process Manufacturing Co. Fr. Pat. 328,293, Jan. 6, 1903.

The raw material is ground and suspended in water; the liquor is then passed into a series of vessels in the form of inverted cones in which the non-farinaceous matter is deposited at the bottom or points of the cones, whilst the starch takes an intermediate position and the water collects in the upper parts. The starchy liquors are separated and washed and again passed through a series of separating cones, the process being repeated until pure starch settles and is withdrawn from the points of the conical vessels. —J. F. B.

Rice Starch; Impts. in the Manufacture of ——. Soc. des Prod. Amylacés. Second Addition, dated Dec. 30, 1902, to Fr. Pat. 316,582, Dec. 5, 1901.

The mashes, rich in gluten, derived as by-products from the manufacture of starch from rice or maize, are saccharified by malt and fermented in order to obtain alcohol and bakers' yeast. The highly nitrogenous worts have a very favourable effect upon the crop of yeast.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malt: Notes on ——, and the Activity of Diastase. W. Duncan. J. Fed. Inst. of Brewing, 1903, 9, [4], 383—402.

A HIGH proportion of ready-formed soluble carbohydrates in malt is not in itself objectionable, but it is generally accompanied by an undue proportion of soluble non-coagulable albuminoids, which is apt to lead to degeneration of the yeast. No definite standard can be set up for the cold water extract, but the results must be considered in relation to the length of growth, the rootlet development and the kiln treatment; and the standard has to be varied accordingly. "Forcing" usually coincides with high diastatic activity, and the subsequent kilning fails to determine restriction proportional to colour development, so that an abnormal ratio of diastatic activity to colour value would be suspicious.

The acidity of the malt should always be determined, with phenolphthalein if possible; the acidity depends chiefly upon the acid phosphates and amides, which constituents have a stimulating action upon diastatic conversion and influence the determinations of diastatic power. Recently several chemists have investigated the bearing of Kjeldahl's law of proportionality in starch conversion and have found that the limit up to which it holds good, is liable to vary with the nature of the malt. Up to the limit of starch conversion at which this law is applicable (R = 40 — 50), the presence of acid phosphates and amides has a considerable accelerating influence on the conversion. Consequently a malt having little diastatic power and a high acidity may show by Lintner's method a diastatic power equal to that of a malt containing much diastase, but little of the stimulating constituents. After the point at which the diastatic power is determined, however, the conversion of the starch by the two malts would take very different courses. The starch reaction in the case of the small quantity of diastase would disappear very gradually, whilst in the latter case, complete conversion would be relatively rapid. Starch conversions by raw barley or under-modified malt take the former of these two courses, being very rapid at first, but never complete. Ling has shown that green or air-dried malt does not convert in accordance with Kjeldahl's law, and the author has confirmed this by performing starch conversions with extracts from the same malt before and after kilning. The results indicated a far more rapid falling away from Kjeldahl's law, and a more gradual subsequent conversion in the case of the green malt than in that of the kilned malt. Diastatic powers should always be considered in conjunction with the time required for total conversion and with the acidity of the malt. The kilning process is not merely one of drying, but is accompanied by an increase in acidity.
—J. F. B.

Malt; The Proteolytic Enzyme of ——. P. Schidrowitz. J. Fed. Inst. of Brewing, 1903, 9, [4], 361—382.

THE proteolytic enzyme of germinating barley is present both in the endosperms and embryos. If readily assimilable nitrogenous compounds, such as asparagine or ammonium nitrate, be freely supplied to the barley during germination, the secretion of the proteolytic enzyme is restricted or entirely inhibited, ammonium nitrate being more effective than asparagine in this respect. This effect is analogous to the inhibitive action of assimilable carbohydrates upon the secretion of diastase. It was shown further, that asparagine and ammonium nitrate were practically without influence upon the activity of the malt protease, when once it had been formed. The above results were determined by Fermi's method employed by Windisch and Schellhorn (this Journal, 1900, 759), by noting the time required for the liquefaction of gelatin by the malt enzyme, under standard conditions. Subsequently, the author has improved this method so as to afford a numerical expression for the gelatin-liquefying power, methods based upon the determination of the products of the proteolysis being as yet unavailable. The present method rests upon the same principle as Lintner's method for the determination of the diastatic activity. Nine test tubes are charged with 6 c.c. of an 8 per cent. solution of gelatin containing thymol at 40° C. Measured quantities of a malt extract prepared at 15° C. are added in an ascending scale to each test tube, the volume of the liquor added to each being made up to 9 c.c. with distilled water. The tubes are kept in an incubator at 40° C. for 20 hours, then rapidly cooled to 15° C. and maintained at that temperature for one hour. The smallest quantity of malt extract which prevents the gelatin from setting under these conditions is divided into 100, and is taken as the proteolytic power. In this way, definite results can be obtained with quantities of malt extract differing by 0·25 c.c. The extract must be made by digesting the finely ground malt with four times its weight of water at 15° C. and filtering bright. Determinations by the author showed that a marked decrease of proteolytic power takes place during the withering of the green malt and a still further decrease during the kilning. The decrease in proteolytic power is greater if the malt be loaded wet on the kiln than if it first be withered. The presence of gypsum in the steep waters appears to have a slight restrictive influence upon the development of the enzyme. Determinations are also quoted showing the course of the development of the proteolytic enzyme during the growth of the barley on the floor.—J. F. B.

Hops; Question as to whether Mustard Oil, or a Glucoside forming it, is contained in ——. O. Neumann. Woch. f. Brau., 1903, 20, [31], 358—359.

THE author concludes that all the samples of hops examined by him were perfectly free from mustard oil, in spite of the fact that all the indirect methods of testing indicated the presence of considerable quantities. The garlic odour of some hops must be attributed to some constituent other than mustard oil. The experiments also showed the apparent absence from hops of any glucoside capable of producing mustard oil.—J. F. B.

Yeasts; Practical Work on English Single Cell ——. A. Jörgensen and W. A. Riley, jun. J. Fed. Inst. of Brewing, 1903, 9, [4], 294—313.

YEAST prepared from single cells has been in use in some English breweries for several years, and it is definitely ascertained that a suitably selected single-cell yeast is capable of conducting both primary and secondary fermentation and proper conditioning in cask, and that the presence of wild yeasts is both unnecessary and harmful. It has been found that many abnormal results have been due to degeneration of the type of yeast in practice and the development of definite new varieties. If a suitable single-cell culture has been selected from the stock yeast of the individual brewery, great care must be taken in propagating a sufficient quantity of it for industrial use. It is essential that this operation should be in no degree hastened or forced; it should be performed first in Pasteur flasks, then in Carlsberg vessels, and then in open tuns in gradually increasing volumes of wort until a sufficient crop of yeast has been obtained and its characteristics have been definitely established. Great care also is necessary in selecting the single cell, which is to form the basis of the new yeast; a large number of the varieties of a good stock yeast mixture are not capable of carrying ou all the stages of industrial fermentation in a satisfactory manner. Several single cells, therefore, should be isolated from the brewery yeast and the cultures prepared from each should be propagated and tried separately as regards their behaviour in practice. A case is quoted where only two cells out of seven isolated, were found to be really satisfactory. The sample of brewery yeast from which the single cells are isolated should be taken from the tun about 50—75 hours after pitching. When a stock of single-cell yeast has been put into work, it should be examined microscopically at least once a week, since it may become contaminated or may degenerate in type. In such a case a fresh stock must be propagated from the original cultur or a new single cell must be selected.

The original cultures are preserved in the laboratory in small flasks containing a solution of cane sugar, the yeast entering into a state of rest. Every time a new batch ha to be propagated for the brewery, the yeast in such flasks is shaken up and a drop is withdrawn. It is frequently observed, especially with certain races of yeast, that the preserved yeast in the small flask from which inoculations are made, degenerates after a certain time. The fact is that the repeated agitation may in itself bring about this degeneration, whilst other flasks containing the same yeast which have been kept at rest, show no alteration.

The authors have, therefore, devised a form of preserving-flask from which a Pasteur flask may be inoculated with a few drops of the yeast sediment without disturbing the main bulk of the deposit. But even absolute repose, in the case of certain races, is no guarantee of perfect preservation. If such cases are capable of prolonged preservation at all, they must be kept in a special medium, devised by Holm, which is composed as follows:—Cane sugar, 10·0; ammonium tartrate, 0·5; potassium monophosphate, 0·1; magnesium sulphate, 0·2; and water, 89·2; with an admixture of yeast decoction in the proportion of 100 grms. per litre.—J. F. B.

Brewing; The Filter-Press Process of ——. H. Johnson. J. Fed. Inst. of Brewing, 1903, **9**, [4], 344—355.

If the mash is to be passed through a filter-press it is best prepared in a steam-jacketed convertor rather than the ordinary type of mash-tun; the rakes should be kept in motion during the whole of the mashing process, there being no occasion for the goods to "stand." The malt in the filter-press process is always ground to flour, and the full yield of extract is thus obtained, even from steely material; the conversion is far more rapid than when ordinary grist is employed. When saccharification has proceeded far enough and been arrested by raising the temperature to 162° F., the speed of the rakes is increased and the mash is discharged into the filter-press, which should be situated about eight feet below the convertor, and connected with the latter by a straight pipe not less than six inches in diameter. The proportion of liquor required to make the mash flow is about three barrels to the quarter. The filter-press as originally introduced by M. Meura for the brewery consists of alternate grooved plates and spacing frames, the latter from 2 to $2\frac{1}{2}$ inches in width; the wort runs away from each grooved plate. When the main wort stops running, a little air pressure is applied to remove as much wort as possible; the wash water is introduced only into every alternate compartment, between the grooved plates and the cloths, passing through the cakes and escaping by the grooves of the opposite plates. Washing may be interrupted from time to time in order to apply an air pressure on the goods. One very great advantage of the process lies in the fact that the brewer can devote the whole of his attention to obtaining the highest yield of extract in the form of a wort of suitable composition without any fear of complications ensuing in the filtration. Fine grinding facilitates the filtration owing to the complete absence of unconverted starch, the hard ends of the corns are fully converted, partially converted albuminoids are absent, and the wort remains in contact with the husks for a shorter time. The process is eminently suitable for the brewing of raw grain; this is cooked under pressure or otherwise, cooled to 160 F., and mixed with 10—15 per cent. of ground malt; the mash s saccharified for half an hour, run into the filter-press, and the conversion of the wort is completed by mixing it in an under-back with the all-malt worts from the mash-tun.
—J. F. B.

Brewery Effluents. W. H. Blake. J. Fed. Inst. Brewing, 1903, **9**, [4], 404—423.

The best means of dealing with brewery wastes is to discharge them into the public sewers, but when the quantity of brewery effluent forms a large proportion of the total sewage, trouble is likely to occur at the treating station owing to the introduction of foreign organisms such as yeast to the sewage beds, and to the tendency of these wastes to undergo acid decomposition. Country breweries may best dispose of their waste liquors by systematic field irrigation, provided that they can command a sufficient area of suitable land and do not give it excessive work to perform. Breweries not so favoured must so treat their wastes that they can be discharged without injurious effects on to public or private sewage beds. Two systems of treatment are available, viz.: precipitation and filtration, and the bacterial treatment. The precipitation system consists in coagulating the suspended matters by the addition of alumino-ferric cake and subsequently of lime, settling the sludge in catch-pits and passing the liquor through suitable filter-beds. Naturally the effluent though clear is still very rich in dissolved organic matter and it is absolutely necessary that it should be further purified by irrigation or bacteria beds if subsequent putrefaction is to be avoided. The bacterial treatment may be conducted on the intermittent or continuous system by means of aërobic filter beds, as is customary with town sewage. The process may be combined with the septic tank treatment to effect a preliminary breaking down of the more complex organic matter by anaërobic bacteria. Recently it has been found that by infecting the brewery waste in the septic tank with putrid sewage sludge, the decomposition of the carbohydrates can be effected without the objectionable production of acid.—J. F. B.

Brewing Materials; Electrolytic Estimation of Minute Quantities of Arsenic, more especially in ——. T. E. Thorpe. XXIII., page 965.

Wines; Physical Method for the Detection of "Mouillage" [Dilution] of ——. G. Maneuvrier. Comptes rend., 1903, **137**, [4], 281—283.

The electrical resistance of a wine of known origin and age is a definite characteristic varying within narrow limits for different samples of the same wine. It is also a property which increases definitely and considerably when the wine is diluted with water, provided that no other soluble saline or acid substance be added which would increase the conductivity.

The above considerations led the author to propose the measurement of the electrical resistance as a rapid test for the "mouillage" or dilution of wine.

Samples of typical wines known to be pure are generally obtainable, and it is proposed to dilute such type wines with water to various known extents, measuring the electrical resistance of a definite column of the liquid in each case, and expressing the results in the form of "curves of dilution" for future reference. The electrical resistance of a suspected wine can then be measured, and by referring to the curve for the genuine wine of the same type, the extent of the adulteration can be approximately deduced The conclusions so obtained are at least as valid as those based upon analytical results.—J. F. B.

Rectified Spirits; Furfural in ——. C. Nagel. Zeits. Spiritusind., 1903, **26**, [32], 533.

In a case quoted by the author, in which certain casks out of a consignment of rectified spirits were rejected on arriving at their destination, because the spirit was found to contain traces of furfural. The whole consignment was taken from the same batch, and before despatch the spirit was perfectly free from furfural. The origin of the furfural was traced to the oak-wood staves of the casks. Such staves are bent under the action of fire, with the result that furfural is produced and is subsequently extracted by the spirit. The casks in question were enamelled inside, but in some cases the enamel was damaged and in others new staves had been used to repair old casks. Unless the casks be freshly enamelled before being filled, this extraction of furfural is liable to occur. Furfural may also be produced by drying oak casks with superheated steam or in an oven. In the author's opinion the presence of such minute traces of furfural is quite unobjectionable.—J. F. B.

Denaturing Alcohol; New Substance for ——. Cari-Mantrand. Bull. Soc. Chim., 1903, **29**, [14], 765.

In 1895, the author showed how from alcohol denatured in the statutory way (by means of methylene, crude benzene, or petroleum homologues, and Malachite Green) at least 75 per cent. could be recovered in the pure state, and suggested a new substance for the purpose, from which it was impossible again to free the alcohol. He now states that this substance is acetonitrile.—J. T. D.

English Patents.

Malt Extract; Process and Apparatus for Drying ——. A. W. Ball, London. Eng. Pat. 11,756, May 22, 1903.

Moist malt extract is desiccated by distributing it upon a revolving steam-heated drum surrounded by a casing in which a vacuum is maintained, continuously withdrawing the vapours and removing the desiccated material by means of a scraper.—J. F. B.

Malt Meal; Manufacture of a Thick Mash of ——. V. Lapp, Leipzig, Germany. Eng. Pat. 12,040, May 26, 1903.

See U.S. Pat. 719,179; this Journal, 1903, 313.—J. F. B.

United States Patents.

Beer; Process of Preserving ——. F. Crôtte, New York. U.S. Pat. 734,305, July 21, 1903.

See Eng. Pat. 2,690 of 1901; this Journal, 1901, 492.
—J. F. B.

Fermented Liquors; Manufacture of ——. J. Schneible, New York. U.S. Pat. 734,756, July 28, 1903.

See Eng. Pat. 1428 of 1903; this Journal, 1903, 434.
—T. F. B.

French Patents.

Alcohol; Denaturation of Industrial ——. G. Hache. Fr. Pat. 328,420, Jan. 10, 1903.

Coal tar is mixed with a certain quantity of 95 per cent. alcohol, varying from 50 to 200 per cent. of the volume of the coal tar, according to its richness in hydrocarbons. The mixture is then distilled with or without the addition of water, or else merely the alcoholic portion of the liquid may be distilled after decantation. The denaturing agent so obtained is mixed with from 1 to 10 per cent. of light or heavy naphtha, and finally its alkaline reaction due to ammonia is neutralised by an acid. (Compare Fr. Pat. 320,592; this Journal, 1903, 108, 434, and 567.)—J. F. B.

Alcohol and other Liquids; Process and Apparatus for the Distillation and Rectification of ——. V. Slavicek, Vienna. Third Addition, dated Jan. 3, 1903, to Fr. Pat. 282,450, Oct. 26, 1898.

Arrangements are described whereby the rectifying apparatus (see U.S. Pat. 696,206; this Journal, 1902, 633) can be fitted to any existing intermittent or continuous plant so as to produce continuously strong rectified spirits direct from fermented liquor. (See also Eng. Pat. 27,063 of 1902; this Journal, 1903, 877.)—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Maize; The Albuminoids of ——. Donard and Labbé. Comptes rend., 1903, **137**, [4], 264—266.

White maize, previously freed from fat and dried and then containing nitrogen corresponding to 14·62 per cent. of albuminoids, was treated four times for 8 hours each time with alcohol of 70°, containing 3 grms. of caustic potash per litre. This liquid is a good solvent for the glutens of cereals, and by this means 9·84 per cent. of albuminoids were extracted from the maize, leaving 4·78 per cent. of nitrogenous matter of some other kind.

The extracted albuminoids were treated three times in succession with boiling amyl alcohol, the solvent for maizin, by which means 5·27 per cent. of this substance was obtained, calculated on the raw material. When boiled with ethyl alcohol of 90°, 6·90 per cent. of albuminoids were dissolved. Ethyl alcohol dissolves maizin, but it also extracts some of the other albuminoids of the grain. Hence three kinds of mazin appear to exist: maizin-α soluble in amyl alcohol, maizin-β insoluble in amyl alcohol, but soluble in ethyl alcohol, and maizin-γ insoluble in both media, but soluble in alcoholic potash.

Maize, in its normal state, was treated with the above solvents, and the albuminoids were separated in the following proportions:—Total nitrogenous matter (from nitrogen), 11·86; maizin-α, 4·82; maizin-β, 1·32; maizin-γ, 1·33; non-extractible nitrogenous matter, 4·90 per cent. Maizin-β is very similar in properties to maizin-α, but it contains less nitrogen, and although it is insoluble in boiling amyl alcohol, it is gradually dissolved after long boiling with that solvent, being mainly converted into maizin-α.
—J. F. B.

English Patents.

Butter; Process for Refining and Preserving ——. H. H. Lake, London. From Soc. Française pour la Conservation des Beurres, Boulogne (Seine), France. Eng. Pat. 18,137, Aug. 18, 1902.

See U.S. Pat. 726,065, 1903; this Journal, 1903, 615.
—T. F. B.

Eggs; Treatment of ——, *for Preserving the same.* G. C. Marks, London. From A. Pfaff, Melbourne. Eng. Pat. 12,867, June 8, 1903.

The eggs are placed in vulcanite baskets which are then arranged in an air-tight chamber, connected with a vacuum pump. The air is exhausted from the chamber, and shortly afterwards a mixture of sterilising gases consisting of sulphur dioxide, chlorine, and carbon dioxide is admitted. After sufficient treatment, the baskets of eggs are removed and immersed for about 15 hours in a dilute solution of sulphuric acid (20 per cent. by volume), either cold or warmed to a temperature not exceeding 176° F. The action of the acid causes the partial conversion of the shell into calcium sulphate which closes up the pores of the shell.
—J. F. B.

Albumin; Extraction of ——, *from Substances containing the same.* D. Finkler, Bonn a/Rhein. Eng. Pat. 22,254, Oct. 13, 1902.

See U.S. Pat. 728,385, 1903; this Journal, 1903, 756.
—T. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Brewery Effluents. W. H. Blake. XVII., page 959

French Patents.

Water; Purification of ——. M. Duyk. Fr. Pat. 328,304, Jan. 6, 1903.

A dilute solution of ferric chloride is added to the water, and then a solution of hypochlorite of calcium, sodium, or potassium. Aluminium sulphate may also be added. The water is subsequently filtered.—W. P. S.

Sewage; Purification of ——. A. J. Pottier. Fr. Pat. 328,306, Jan. 6, 1903.

Milk of lime is added as a precipitating agent.—W. P. S.

(*C.*)—DISINFECTANTS.

English Patent.

Composition from Calcined Gypsum; Manufacture of a ——. L. Mack. Eng. Pat. 12,584, June 3, 1903. IX., page 952.

French Patents.

Antiseptic Paper [Thymol Paper]. M. Jerreto. Fr. Pat. 327,752, Dec. 27, 1902.

Paper is dipped in a solution containing thymic acid, salicylic acid, and boric acid. The prepared paper forms an antiseptic wrapper for foods and the like.—W. P. S.

Anti-Mould Pulp; Preparation of ——, *containing Cupric Sulphate, Sodium Carbonate, and Calcium Sucrate.* H. E. Petit. Fr. Pat. 328,393, Jan. 9, 1903.

A powder is formed by mixing the salts named in the title in equal (or other) proportions, and when required for application to plants threatened with cryptogamic growths, the powder is stirred in water to the desired consistence.
—E. S.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

'egetable Fibres; Extracting the Inorganic and Organic Foreign Matter from ——. O. Lago, New York. Eng. Pat. 17,465, Aug. 8, 1902.

he inorganic matter (especially silica and silicates) is moved from the fibre by treatment with a solution of droflaoric acid; the fibre is washed and then treated ith a sodium hydrate or carbonate solution to remove the sins, gums, and colouring matters. After washing, the aterial or pulp is treated with dilute hydrofluoric acid · acid bleaching reagent, finally washed with water, and ien dried.—T. F. B.

ulp Stock; Apparatus for Treating ——. U.S. Fibre Stopper Co., St. Louis, U.S.A. Eng. Pat. 8,984, April 21, 1903.

ulp in a fluid condition is fed on to a rotating wire-gauze linder, which is provided internally with a drainage cup id pipe. The pulp is thus formed into a thin "bat" or web, hich when it arrives at the lower part of the cylinder is own off by an air blast on to a wire screen conveyor avelling at right angles to the plane of rotation of the rming cylinder. The partially drained pulp is conveyed tween two guide bars underneath suitable press rolls by hich means it is condensed and further dried and brought to a condition suitable for being fed into a forming achine.—J. F. B.

opying Paper; Manufacture of ——. F. Hawke, London. Eng. Pat. 28,423, Dec. 24, 1902.

mixture of ferric chloride, sodium bichromate, and ibsorbine" [a soap of a sulphonated fatty acid] is added the paper in the course of manufacture.—J. F. B.

lotting Papers; Manufacture of ——. J. Hawke, New Barnet. Eng. Pat. 12,675, June 5, 1903.

n improved blotting paper is made by impregnating the lp with salts of sodium in combination with salts of iron precipitated iron oxide. In the manufacture of 500 lb. paper, two or three gallons of a 40 per cent. solution of rric chloride, and 4 to 6 lb. of sodium bicarbonate are ployed.—J. F. B.

'otting Paper; Manufacture of ——. J. Hawke, New Barnet. Eng. Pat. 12,674, June 5, 1903.

ie absorbent properties of blotting paper are considerably hanced by strongly impregnating the pulp with salts of dium. The best result is obtained when the finished per is caused to contain 0·5—0·75 per cent. of sodium arbonate.—J. F. B.

United States Patents.

iper-Pulp from Cotton Seed Hulls; Bleached ——. W. C. Johnson, Memphis, Tenn. U.S. Pat. 733,969, July 21, 1903.

ie cotton seed hulls are broken by attrition and the loose ll particles are separated; the remaining cotton seed lls are treated with chemicals at very high pressure and nperature, the mass is washed while hot with hot water, d bleached, the material being agitated during washing l bleaching. Any remaining traces of hulls which have n completely dissolved by the bleaching agent are shed out, and the material is then subjected while in its se and absorbent condition to the action of hot fluid for ing it.—J. F. B.

llulose Esters; Process of Making ——. G. W. Miles, Belmont, Mass., Assignor to F. L. Pierce, Brooklyn. J.S. Pat. 733,729, July 14, 1903.

llulose is treated, at temperatures below 100° C., with anhydride of a monobasic fatty acid in the presence of ne substance which, with water, will effect the hydrolysis cellulose. Cellulose acetate is obtained by treating ous cellulose with a mixture of acetic anhydride, glacial acetic acid, and sulphuric acid, for two or three hours, at about 70° C.; water is added, and the resulting precipitate is dried.—T. F. B.

Acetyl Cellulose. A. Eichengrün and T. Becker, Elberfeld, Germany. Assignors to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 734,123, July 21, 1903.

See Fr. Pat. 317,007; this Journal, 1902, 870.—J. F. B.

French Patent.

Paper; Process for Avoiding Losses of Mineral Matter in the Manufacture of ——. O. Goy, jun. Fr. Pat. 327,766, Dec. 27, 1902.

See Eng. Pat. 5339 of 1903; this Journal, 1903, 817.
—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Bismuth Salts; Crystallised ——. A. de Schulten. Bull. Soc. Chim., 1903, **29**, [14], 720–724.

Bismuth Subnitrates.—Dissolve 50 grms. of $Bi(NO_3)_3$, $5H_2O$ in 50 c.c. of nitric acid of sp. gr. 1·2, and gradually add, while stirring, 3 litres of water. After 12 hours, collect the crystals, press with filter paper, and dry in the air. The crystals are colourless, clear, thin, striated hexagonal plates, of sp. gr. 4·928 at 15° C. Analysis gives the formula $5Bi_2O_3.5N_2O_5.9H_2O$. The crystals dissolve in water, and the solution deposits the salt $5Bi_2O_3.4N_2O_5.8H_2O$, which is also the sole product of diluting with water the mother-liquor from the preparation of the previous salt. The crystals so deposited are monoclinic rectangular tables, clear and colourless, permanent in air or over sulphuric acid and of sp. gr. 5·290 at 15° C.

Bismuth Phosphate, $BiPO_4$.—Prepared from solutions of bismuth nitrate and sodium phosphate by the author's drop-by-drop method (this Journal, 1902, 827). Microscopic monoclinic prisms, colourless and brilliant, sp. gr. 6.323 at 15° C., unchanged at red heat.

Bismuth Arsenate, $BiAsO_4$.—Similarly prepared. In appearance like the phosphate. Sp. gr. 7·142 at 15° C.
—J. T. D.

Tannin; Compounds of Bismuth with ——. P. Thibault. Bull. Soc. Chim., 1903, **29**, [14], 747—752.

Cap first prepared a bismuth compound of tannin, by triturating tannin with bismuth hydroxide; and Sieker, later, prepared the same substance by treating crystallised bismuth nitrate with a concentrated solution of tannin. The author finds that tannin does not react on bismuth oxide, but only on the hydroxide. The compound $C_{14}H_9C_{10}Bi.9H_2O$, is prepared by allowing the theoretical quantities of bismuth hydroxide and tannin solution to remain in contact for 24 hours and washing and drying the solid product. The whole of the tannin is absorbed by the hydroxide, and the product is completely soluble in sodium hydroxide solution or mineral acids. If tannin or digallic acid in excess be used, the *bismuthotannin* formed fixes additional tannin in proportions equivalent to from $\frac{1}{4}C_{14}H_{10}O_9$ to $\frac{1}{2}C_{14}H_{10}O_9$ for each molecule of the compound $C_{14}H_{10}O_9Bi$. The bismuth, in this compound, substitutes some of the phenolic hydrogens, leaving the acid function free.—J. T. D.

Chloroform, Bromoform, and Iodoform; Colour Reactions of ——. R. Dupouy. XXIII., page 967.

Sparteïne. C. Moureu and A. Valeur. Comptes rend., 1903, **137**, [3], 194—196.

The authors have carefully re-examined the properties of this alkaloid, prepared by means of sodium hydroxide from the officinal pure sulphate. Colourless, thick oil, bitter taste, piperidine-like smell. Distils in dry hydrogen under 754 mm. pressure at 325° C., and at 188° C. under 18·5 mm. Density 1·034 at 0° C., 1·0196 at 20° C. $[\alpha]_D = -16·42°$ in alcoholic solution, $n_D = 1·5293$ at 19° C. Practically insoluble in water, soluble in alcohol, ether, and benzene. Slowly browns in air. It is a bitertiary diamine, it contains no methyl group attached to nitrogen, and it is not affected by reducing agents, so that there are no double linkings in the molecule.—J. T. D.

Caffeïne-ethylenediamine; Preparation of ——. Farbwerke vorm. Meister, Lucius und Brüning. Ger. Pat. 142,896, July 23, 1902. Zeits. angew. Chem., 1903, **16**, [30], 730.

Caffeïne - ethylenediamine, its salts and its acetyl derivative, are therapeutic compounds, which, owing to their ready solubility in water, are said to possess an advantage over aminocaffeïne and substituted derivatives of the same. Caffeïne-ethylenediamine is prepared by heating chloro- or bromo-caffeïne with excess of ethylenediamine in aqueous or alcoholic solution.—A. S.

Sandarac Oil. Haensel's Report. July, 1903. Chem. and Druggist, 1903, **63**, [1228], 270.

The oil is obtained by steam distillation from sandarac resin. It is golden yellow in colour; sp. gr., 0·8781; optical rotation, 67° 20′. It distils almost entirely between 167° and 170° C., and is soluble in chloroform, alcohol, benzene, and light petroleum spirit (petroleum ether).
—A. S.

Peppermint Oil; Adulterated ——. E. J. Parry and C. T. Bennett. Chem. and Druggist, 1903, **63**, [1226], 154.

Many samples of peppermint oils proving to be adulterated, have recently been examined by the authors. The general characters of the oils were in close agreement, falling within the following limits:—Sp. gr. at 15° C., 0·909 to 0·912; optical rotation, − 3° to + 3° 30′; refractive index, 1·4760 to 1·4820; esters (as menthyl acetate), average, 5·8 per cent.; total menthol, average 34 per cent. When the oils were shaken with 70 per cent. alcohol, oily drops separated and sank. The oils were soluble in absolute alcohol, and in 90 per cent. alcohol with opalescence. By distillation under reduced pressure, a fraction of high boiling point and high dextro-rotation was separated, which after being twice distilled over sodium had the following characteristics:—Sp. gr., 0·921 to 0·925; optical rotation, + 32° to + 45°; refractive index, 1·5014 to 1·5071; b. pt., 258°—268° C. This fraction strongly resembles *d*-cadinene; it is not soluble in water and 90 per cent. alcohol, but soluble in absolute alcohol, chloroform and ether. It is not readily attacked by sulphuric acid nor by alcoholic potash; it absorbs bromine, giving a bluish-violet colour, which becomes green on heating; and it is oxidised by potassium permanganate in acid solution. The authors conclude that the adulterant is the oil distilled from African copaiba, and give the results of the examination of some samples of the latter in confirmation of this view.—A. S.

English Patents.

Halogenising of Organic Substances, and Apparatus therefor; Impts. in ——. L. Marckwald. Eng. Pat. 17,695, 1902. IV., page 945.

Aldehydes, Ketones, and Quinones; Oxidising Processes and Manufacture of ——. W. Lang, Salbke a/Elbe. Eng. Pat. 18,215, Aug. 19, 1902.

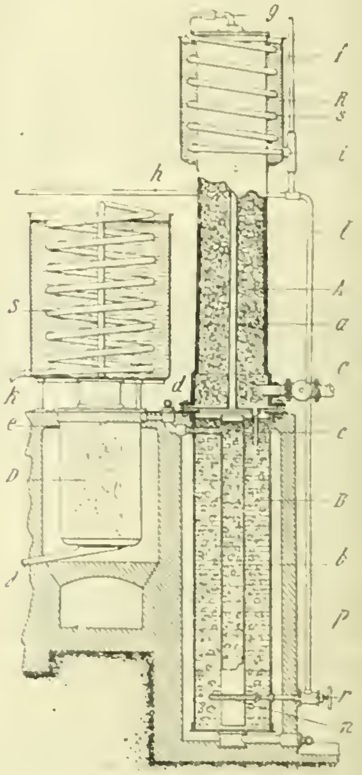
See Fr. Pat. 323,916, 1902; this Journal, 1903, 571.
—T. F. B.

French Patents.

Carbon Tetrachloride; Continuous Apparatus for Making ——. E. F. Cote and P. R. Pierron. Fr. Pat. 327,322, Dec. 13, 1902.

A cylindrical iron column (A) is filled with fragments of coke, or some other porous material, which is impregnated with a dry chloride (*e.g.*, manganous chloride). Below this column is a second metal column (B), into which is introduced carbon bisulphide vapour, which passes up a pipe (*a*), leading through the tower (A) to a condenser (S), whence it descends continuously on to the porous material contained in A, and meets an ascending stream of chlorine introduced through the pipe C.

The resulting mixture of carbon tetrachloride an chlorides of sulphur, which is at a temperature of abou 60° C., falls through the tube c into the column B, whic contains some metal or metallic sulphide (*e.g.*, iron or iro sulphide); a further quantity of carbon bisulphide vapou is now introduced, through a perforated annular tub (*n*), into this column, which is kept at a temperature 60°—65° C. The carbon bisulphide, so far unacted upo returns up the column A, whilst the carbon tetrachlorid containing sulphur in solution, passes up the pipe *b*, an is run off through the pipe *d* to a still (D), which contain fragments of some good conductor of heat (*e.g.*, porcelain where it is rectified.—T. F. B.



Flask for Holding Ethyl Chloride and other Volatil Liquids. M. Thilo. Fr. Pat. 328,431, Jan. 12, 190 I., page 942.

Formaldehyde and Alkali Metals; Preparation of Der vatives of ——. A. Foelsing. Fr. Pat. 328,425, Jan. 1 1903.

The compounds are prepared by acting on the meta with the dry gas. For instance, dry formaldehyde acts o metallic sodium to form a white powder, having the probabl formula NaCHO.—W. P. S.

Perfumes; Manufacture of Floral —— *with Certa Esters.* Soc. F. Hitt and Co., Ges. mit beschr. H. F Pat. 327,467, Dec. 18, 1902.

A current of hydrochloric acid gas is passed throug a hot concentrated solution of anthranilic, salicylic, "myristicinic acid" in one of the terpene alcohols $C_{10}H_{18}$ or $C_{10}H_{20}O$ (geraniol, terpineol, &c.). The crude product treated with sodium carbonate, and the ester is purified b steam distillation or extraction with ether. These este have powerful floral odours, and, mixed with alcohol, nitrobenzene, and essential oils, &c., are suitable for perfumery.
—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

French Patents.

ges [Catatype]; Reproducing ——. O. Gros. Second Addition, dated Dec. 16, 1902, to Fr. Pat. 315,852, Nov. 12, 901. (See Eng. Pat. 22,841 of 1901; this Journal, 903, 380.)

is addition covers various "catalysers" and their applica- t. For instance, an alkaline solution of a permanganate applied to paper with a brush; this method gives a er coated with oxides of manganese, which acts as a alyser. Cobalt salts are also suitable, with the aid of rogen peroxide. "Weldon mud" also acts similarly hydrogen peroxide.—T. F. B.

igns or Tracings; Process for Reproducing ——, *by hemical Action of the Original on a Transfer Surface.* . Gros. Fr. Pat. 327,379, Dec. 16, 1902.

patent gives applications of the pictures reproduced by lysis as described in Eng. Pat. 22,841 of 1901 (this rnal, 1903, 380).

or instance, the picture, obtained by means of hydrogen xide, is introduced into a solution of gelatin containing e substance which coagulates gelatin, in presence of rogen peroxide. Thus a colloidal image is obtained. the addition of some pigment to the gelatin solution ., lamp-black or ferric gallate) a coloured reproduction he original is obtained.

or reproducing tracings, &c., the paper is coated with nented gelatin, and a catatype image obtained by the of hydrogen peroxide. This is introduced into a tion of ferrous sulphate, and then into a solution of ssium thiocyanate. By lightly brushing the resulting ice, the colouring matter is removed from the parts h hold no hydrogen peroxide.—T. F. B.

chromatic Dry Plates; Process for Preparing ——. . Miethe and A. Traube. Fr. Pat. 327,718, Dec. 26, 902.

U.S. Pat. 724,311 of 1903; this Journal, 1903, 572.
—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

English Patent.

keless Powder, and Method of Manufacturing the same. M. Justice, London. From The International Smoke- ss Powder and Chemical Company, Philadelphia, S.A. Eng. Pat. 13,457, June 16, 1903.

rocotton containing over 13 per cent. of nitrogen is olved in acetone, and to this is added varying quantities itrocotton containing under 13 per cent. of nitrogen, olved in ether-alcohol.

is claimed that this admixture, whilst permitting of a nitrogen content, produces a colloid powder of oved physical condition.—G. W. McD.

French Patents.

plosives and Detonators; New Material for ——. A. Angeli. Fr. Pat. 327,892, Dec. 31, 1902.

calcium, strontium, and barium salts of the hydroxamic are proposed as a substitute for fulminate in caps and nators.—G. W. McD.

plosives: Manufacture of ——. C. E. Bichel. Fr. Pat. 327,868, Dec. 22, 1902.

the purpose of increasing the safety of explosives for n dangerous mines, the addition of some 5 to 10 per of ammonium chloride with an equivalent quantity tassium or sodium nitrate is claimed.—G. W. McD.

Guncotton, Collodion, Nitrocellulose, Nitrostarch, and Analogous Products; Method of rapidly De-acidifying and Stabilising ——, *with Elimination, by Spinning, of the Products of Decomposition formed in these conditions.* Selwig and Lange. Fr. Pat. 327,803, Dec. 29, 1902.

Guncotton, either in the fibrous or pulped condition, is placed in the basket of a centrifugal machine, into which, while spinning, steam is introduced for the purpose of stabilising the explosive. The products of decomposition are thus immediately and continuously removed in the condensed water, and the guncotton after rinsing is ready for use. Purification is said to be attained very rapidly, and there is no necessity for transference to a special washing machine to complete the operation.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Calcium and Magnesium; Determination of ——, *when simultaneously present in Solutions of Sodium Chloride.* A. d'Anselme. Bull. Soc. Chim., 1903, **29**, [14], 734—735.

A normal solution is made, containing $4Na_2CO_3 + NaOH$, and standardised against normal sulphuric acid, using methyl orange. This solution precipitates magnesia completely from solutions saturated with sodium chloride. The method of determining calcium and magnesium consists of two operations:—1. To 100 c.c. of the sample add 10 c.c. of the carbonate-hydroxide solution, heat, filter, wash, and titrate the excess of alkali in the filtrate; this gives the alkali-equivalent of the two metals. 2. To 100 c.c. of the sample add 100 c.c. of 10 per cent. ammonium chloride solution, then 10 c.c. of the carbonate-hydroxide solution; filter cold, wash, and titrate the filtrate; this gives the alkali-equivalent of the calcium alone. The magnesium is obtained by difference.—J. T. D.

Barium, Strontium, and Calcium; Separation and Simultaneous Determination of ——. L. Robin. Comptes rend., 1903, **137**, [4], 258—259.

The bases are brought into solution in the form of chlorides or nitrates, the liquid is then made faintly ammoniacal, and about 2 per cent. of ammonium chloride, free from sulphates, is added. The solution is slightly acidified with acetic acid, brought to the boil, and a considerable excess of a saturated solution of potassium bichromate is added to the boiling liquid. The solution should have a reddish colour. After boiling for five minutes, the liquid is cooled rapidly, and the barium chromate is collected on a tared filter. The precipitate is washed with a warm solution containing 0·5 per cent. of ammonium acetate with a trace of ammonia, and finally with 10 per cent. alcohol. The filter is dried at 100°—110° C. for at least two hours, and the barium chromate is weighed. The filtrate from the barium chromate is made ammoniacal and boiled, 3—4 per cent. of crystallised ammonium sulphate is then introduced, and the liquid is maintained at the boiling point for 15 minutes with the addition of ammonia if necessary, then cooled, and the strontium sulphate is filtered off; the liquid should have a golden-yellow colour. The precipitate is washed with an ammoniacal solution containing 0·5 per cent. of ammonium sulphate, then with 10 per cent. alcohol, and finally dried and incinerated. The filtrate is brought to a temperature of 80° C., ammonium oxalate is added, the precipitate is allowed to stand for half an hour, then filtered and washed with hot ammoniacal water, dried, and incinerated, and weighed as calcium carbonate or sulphate.
—J. F. B.

Arsenic; New Method of Detecting and Determining Minute Traces of ——. A. Gautier. Comptes rend., 1903, **137**, [3], 158—163.

The arsenic is precipitated along with iron, and the precipitate, after solution in acid, treated in the Marsh apparatus. Dissolve 100 grms. of crystallised ferrous sulphate in 500 c.c. of distilled water and 25 grms. of pure sulphuric acid, treat with hydrogen sulphide, boil, and filter. In the hot filtrate, peroxidise the iron with 28 grms. of pure nitric acid. Precipitate the iron by excess of pure ammonia, wash, and redissolve the precipitate in the cold in dilute sulphuric acid. To remove traces of arsenic, digest for two days with pure zinc, and boil *in vacuo*. Peroxidise again, precipitate by excess of ammonia (enough to redissolve the zinc hydroxide), wash, and dissolve the precipitate in cold dilute sulphuric acid, diluting so that 100 c.c. contain 30 grms. of Fe_2O_3. Distilled waters, prepared in a tinned copper still, and in glass after addition of 0·5 per cent. of sodium carbonate, when 2 litres were boiled down with 40 c.c. of pure nitric and 10 c.c. of pure sulphuric acid till sulphuric acid vapours appeared, and the residues were tested by the author's modification of the Marsh-Berzelius process, showed 0·0007 and 0·0011 mgrm. respectively of arsenic per litre; the same waters, boiled after addition of 5 c.c. per litre of the ferric sulphate reagent, allowed to cool, precipitated by ammonia, boiled, filtered, and the filtrate evaporated and treated as above, showed no trace of arsenic. To 2 litres of this purified water, 0·002 mgrm. of arsenic was added as sodium arsenite, then 5 c.c. of the ferric sulphate reagent; this liquid was boiled, precipitated by ammonia, filtered, and the precipitate dissolved in dilute sulphuric acid and tested directly in the Marsh apparatus; it showed 0·002 mgrm. of arsenic. To 1 litre of another distilled water, 0·05 mgrm. of arsenic was added, and the water was then treated with the reagent; the filtered water was absolutely free from arsenic. Traces of arsenic may thus be rapidly determined in waters, salts, and inorganic substances generally; acids, acid salts, or bases must first be neutralised, and reducing gases must be oxidised by bubbling through nitric acid. The method may be readily applied to organic substances.—J. T. D.

Arsenic in Sea Water, Rock Salt, Table Salt, and Mineral Waters, and its Determination in Certain Common Reagents. A. Gautier. Comptes rend., 1903, **137**, [4], 232—237.

THE author communicates results obtained with his new method for the determination of small quantities of arsenic using ferric sulphate. Sea-water always contains small quantities of arsenic, the amount being considerable near the bottom in the neighbourhood of volcanic regions (Azores). Brine springs, ferruginous waters, purified sea salt, and rock salt also contain traces, whilst sodium chloride from a volcanic fissure on Vesuvius contained a considerable amount.

Further determinations showed that nearly all the ordinary so-called pure chemical reagents contain more or less arsenic, and the quantity of this substance introduced in the reagents employed for its determination by the older methods has to be taken into account. For instance, traces of arsenic were found in distilled water, nitric acid, sulphurous acid, bisulphites, ammonia, ammonium carbonate, and especially in sulphuretted hydrogen. By the most perfect of the older methods a quantity of 0·001 to 0·0005 mgrm. of arsenic is likely to be introduced with the reagents.—J. F. B.

Fuel; Determination of Arsenic in ——. T. E. Thorpe. Chem. Soc. Trans., 1903, **83**, 969—974.

THIS process consists in burning a known quantity of the finely-powdered fuel in a stream of oxygen, passing the products of combustion through a suitable absorbing apparatus, and determining the amount of arsenic so absorbed as well as that left in the ash. (Compare also Wood-Smith and Jenks; this Journal, 1901, 437.)

Ten grms. of the finely-divided fuel are introduced into the hard glass tube A, which is about 60 cm. long, in such a way that it occupies about 30 cm. of the length of the tube, leaving empty about 6 cm. of the tube next to the bent portion. The tube is then connected with the absorption apparatus, B, containing dilute sulphuric acid. A convenient form of apparatus consists of a modified de Koninck absorption tube, the straight limb of which contains glass beads or short lengths of thin glass tubing, so as to offer a considerable surface to the passage of the gaseous products of combustion. The hard glass tube, A, is placed in an ordinary combustion furnace and connected with an oxygen reservoir.

The burners of the furnace beneath the empty portion the tube are first lighted, a rapid current of oxygen passin meanwhile through the apparatus. The powdered fuel then heated at the place where the stream of oxygen fir impinges on it. As soon as the combustion has starte very little external heat will be required, and the coal coke gradually burns away without the formation of soot tarry products. The operation takes two to three hour The arsenic present in the fuel will be found partly in th ash and partly in the constricted end of the glass tube a in the absorption apparatus.

FIG. 1.

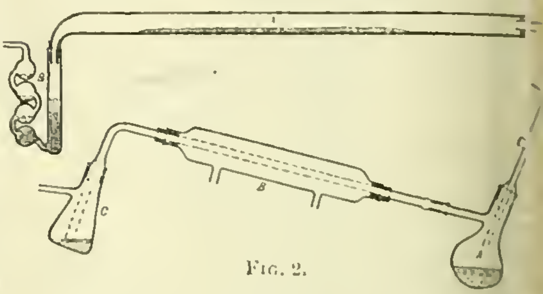


FIG. 2.

To determine the arsenic in the ash, this is shaken o into a Würtz flask, A, of 100 c.c. capacity, which is attach by means of ground-glass joints as shown in Fig. 2, to small reflux condenser, B, connected with a flask, C, about 70 c.c. capacity, containing about 10 c.c. of arsen free hydrochloric acid (sp. gr. 1·1). Into the flask, containing the coal ash, 25 c.c. of arsenic-free hydrochlor acid, containing 0·25 c.c. of bromine, are added by mea of the ground-in tap-funnel, D. The contents of the fla are kept at a gentle ebullition for about two hours. Aft cooling, about a gram of potassium metabisulphite is adde and the liquid again heated until the free bromine disappea The solution is filtered from the suspended silica and t filter washed with the acid contained in the small flask, The filtered solution is returned to the distilling flask, st connected with the reflux condenser, and boiled to expel t sulphurous acid. The condenser is then reversed and t liquid distilled into the flask, C, until the residue in flask, A, is syrupy; 10 c.c. of hydrochloric acid are added the residue, and the solution again distilled. The tot distillate is made up to 100 c.c. and an aliquot porti taken for testing. This is transferred to a small porcela dish, 5 c.c. of pure nitric acid (sp. gr. 1·4) and 2 c.c. pure concentrated sulphuric acid are added, and the soluti evaporated until fumes of sulphuric acid are freely evolv The dish is cooled and the liquid diluted with about 20 c of water and transferred to a small flask. 0·5 grm. potassium metabisulphite is added and the solution boil until free from sulphurous acid, and when cold used the test.

To determine the amount of arsenic which is volatilis in the combustion of the fuel, the acid in the absorpti tube is poured into a small beaker, and the absorption tu rinsed with a little water. The end of the hard glass tu is then well washed by repeatedly drawing the liquid in t small beaker into it. The whole of the solution and was ings are made up to 50 c.c., and half this volume us directly for the test.

The determination of the arsenic in the solutions may made by an electrolytic method (see next abstract) or means of the Marsh apparatus, in which case it is unnece sary to remove the hydrochloric acid by evaporation w nitric and sulphuric acid. In either case, the amount arsenic is determined by comparison with arsenic depos obtained from known quantities of arsenious oxide.

Figures are given illustrating the accuracy of this meth and it would appear that the greater quantity of the arse which may be present in fuel is not volatilised, but retained by the ash. This is notably the case with co (compare Ling and Newlands, this Journal, 1901, 1008).

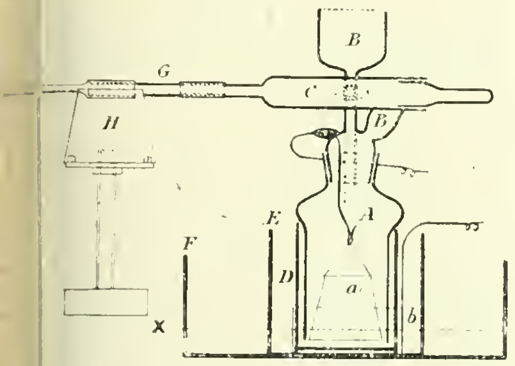
he author expresses the view that the greater portion of th rsenic which may be found on malt has been deposited on in the form of coal ash, and ought, therefore, to be re ved from it by brushing and screening.—J. L. B.

A nic; *Electrolytic Determination of Minute Quantities ——, more especially in Brewing Materials.* T. E. orpe. J. Chem. Soc. Trans., 1903, **83**, 974—986.

Th committee, of which the author is a member, appointed by e Board of Inland Revenue on the recommendation of th Royal Commission on Arsenical Poisoning, report that th methods which depend on the conversion of the arsenic in hydrogen arsenide and the subsequent deposition of the ar ic in the elementary form by heating the gas are, on th hole, to be preferred. The hydrogen arsenide may be fo ed by the action of nascent hydrogen on the arsenic pr nt. The hydrogen may be evolved either electrolyti- a or by means of dilute hydrochloric acid on zinc ad- m d with, or containing, such an amount of copper or ot suitable metal as to give rise to a sufficiently rapid v tion of the gas. The amount of arsenic deposited by he ng the hydrogen arsenide so formed, is then deter- mi d by comparison with deposits obtained in precisely h ame manner from wort, beer, malt, &c. containing kn n quantities of arsenic.

e electrolytic process described by the author is an m ovement on that described by Bloxam (Quart. Jour. Ch . Soc., 1861, **13**, 12 and 338).

FIG. 1.



e glass vessel A (Fig. 1) forms, with the porous vessel D, e inner cell for the cathode, where the hydrogen and hy gen arsenide are produced on passing the electric cur- ren The vessel A is open at the bottom and fitted at the top wit he ground-glass stopper B, through which is passed, to a p t just below the neck of the vessel, the stem of the tap fun . The glass stopper also carries the gas-exit tube, on ich is a bulb. The tube is bent, and is connected by mea of a ground-glass joint with the drying tube C. A pie of platinum wire is fused through the glass cap for ma g the connection on the outside with the current, and wit the vessel with the electrode.

T inner electrode, forming the cathode, is of sheet pla um and cone-shaped, with several perforations. It is s ded from a hook made on the end of the wire passing thr h the glass stopper, and is adjusted so that when the stop r is in position, the lower edge of the electrode is n above the bottom of the vessel A. It is then securely tta ed to the wire by closing the hook. The hook must be e ctually closed and the contact complete, or there may be anger of sparking, which might cause an explosion if the paratus contained a sufficient proportion of air.

T porous vessel D, which is of unglazed highly s lic s ware, is from 1 to 1·5 mm. in thickness, and is larg by 2 to 3 mm. in diameter and in depth than the cyli rical portion of the glass vessel A.

T cell for the anode consists of the stout glass vessel E, po the flat bottom of which the porous vessel D, con- tain the glass vessel A, stands. The anode is a band of plat um, 2 cm. broad, passing loosely round the porous cell, d connected with the current by means of a platinum wire. The liquid in the vessel E should be kept below 50° C., and the vessel is therefore placed in a larger dish, F, containing cold water.

The drying tube C is packed with a piece of cotton wool, then pure anhydrous calcium chloride, another piece of cotton wool, followed by a roll of lead acetate paper. A spiral coil of lead acetate paper is also placed within the enlarged end of the exit tube, to which the calcium chloride tube is attached.

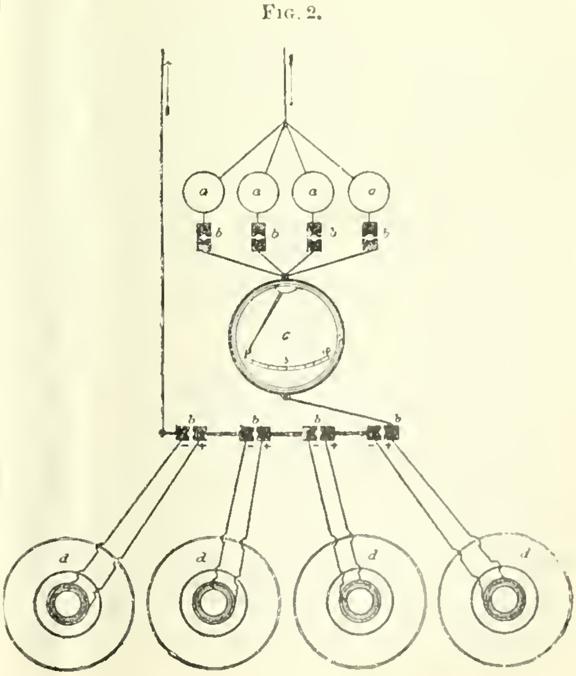
The hard glass constricted tube, in which the arsenic is to be deposited, is connected to the end of the drying tube by means of unvulcanised rubber tubing. For making the tubes, Jena glass tubing, with an external diameter of 5 mm. and an internal diameter of 3·5 mm., is used. The restricted portion of the tube has an external diameter of 2 mm. The tube is supported in a horizontal position by resting in the slots on the upper edge of the cone which surrounds the flame of the small Bunsen burner. A piece of platinum gauze, about 2 cm. in diameter, is wrapped round the tube at the point where it is to be heated by the flame.

The apparatus, when employed in the manner to be described, has an apparent resistance of 1·4 ohms, the potential difference between the ends of the wires of the poles being 7 volts with a current of 5 ampères. This strength of current gives about 40 c.c. of hydrogen per minute, which furnishes a steady flame about 2 mm. in height, and is the strength of current recommended for the purposes of the test. To reduce the intensity of the main laboratory supply, a rheostat of incandescent lamps may be used. The lamps are arranged in parallel with each other, but in series with the apparatus, and, according to the current desired, lamps of different candle power may be inserted. An ammeter is included in the circuit.

The apparatus may be arranged for the simultaneous execution of a number of tests. By suitable construction of the charging board the electric current passes through the solutions arranged in electrolytic cells in series, and any of these may be brought into or out of the circuit as desired. The current is brought to the required strength, 4·5 to 5 ampères, by the introduction in the rheostat of lamps of the requisite power according to the number of tests to be carried out simultaneously. Fig. 2 shows this arrangement.

The sulphuric acid employed in the apparatus is prepared by mixing one volume of concentrated arsenic-free acid with seven volumes of water. Frothing of the solutions to

FIG. 2.



be tested may be obviated by adding 1 or 2 c.c. of rectified amyl alcohol to the acidified liquid undergoing electrolysis. The author points out that it is advisable to saturate the stock of dilute acid with the products of its electrolytic decomposition before use in the apparatus.

Mode of Working.—The porous vessel D (Fig. 1) containing the vessel A, is placed in E, which is surrounded by cold water contained in F. The calcium chloride tube C is fitted on, and to it is attached the hard glass tube G. This rests on the small Bunsen H in such a position that when lighted the flame will heat about 2 cm. of the tube just before the constriction commences. The connections with the battery wires are made by means of binding screws, in such a manner that the current will pass from the vessel E to the cell D; 30 c.c. of dilute sulphuric acid are then poured into E, containing the anode, and 20 c.c. of the acid are also run into the cell D by means of B, the stem of which must be left full of liquid. The connections are now completed, the current is switched on, and the time noted. The apparatus is free from air in 10 minutes, and the hydrogen may be lighted. The flame of the Bunsen is then adjusted so that the small piece of platinum gauze is maintained at a red heat. The heating of the tube is continued for 15 minutes, and if there be no deposit, the apparatus and acid may be considered free from arsenic. Two c.c. of amyl alcohol are run into D by means of the funnel tap B. This is followed by the solution to be tested, 5 c.c. of water being used for rinsing out the containing vessel. No air must be admitted, and the stem of the funnel must be left full of liquid. If arsenic be present in the added liquid, a deposit begins to form in a few minutes, and is generally completed at the end of 30 minutes. The tube is then sealed full of hydrogen by opening the stopper of the funnel and impinging a small pointed flame at a point 3 cm. from the deposit, between the deposit and the turned-up end of the tube. The end is drawn off, the electric current is disconnected, and the tube drawn off just below the shoulder. The deposit of arsenic must on no account be heated by the flame during the sealing of the tube.

Preparation of the Standard Deposits.—Although there is good reason to believe that the amount of arsenic deposited is not affected by the nature of the substance with which the arsenic may be associated, nevertheless, as the quantitative estimation is based on comparison, it is advisable to make use of deposits prepared by the addition of known amounts of arsenic to arsenic-free specimens of each class of substance. Pure, resublimed arsenious oxide is ground to a fine powder in an agate mortar and dried at 100° C. 0·1 grm. is accurately weighed on a watch glass and transferred to a litre flask by washing it down a funnel, placed in the neck of the flask, with 1 or 2 c.c. of pure concentrated hydrochloric acid. The liquid must not be heated. When the solution is complete it is diluted to 1 litre with distilled water and thoroughly mixed. Each c.c. of this solution (A) contains 0·0001 grm. or 0·2 mgrm. of arsenious oxide. Of this solution 100 c.c. are carefully measured and transferred to another litre flask and diluted with water to 1 litre. This solution (B) contains in each c.c. 0·00001 grm. (0·01 mgrm.) of arsenious oxide. To different materials free from arsenic, known quantities of arsenic were added and subjected to the same treatment as the materials under quantitative examination for arsenic. In this way standards were prepared, representing quantities from 0·002 mgrm. to 0·018 mgrm. of arsenious oxide.

The following is a description of the methods to be used in preparing the extracts or solutions of the various substances so as to render them suitable for testing :—

(1) MALT: *Unground Malt.*—40 c.c. of the dilute sulphuric acid (*loc. cit.*) and 60 c.c. of water are mixed together, raised to a temperature of 50° C., and added to 40 grms. of malt contained in a wide-mouthed, stoppered bottle. The bottle is shaken at intervals during 20 minutes and the liquid poured off; 25 c.c. are transferred to a small flask, half a gram of potassium metabisulphite added, and the solution boiled until free from sulphurous acid. When cold the solution is used for the test.

Basic Method for Ground Malt.—10 grms. of the ground malt are placed in a porcelain or platinum dish about 3 ins. in diameter, 30 c.c. of arsenic-free lime water added, and the dish heated over a small Bunsen flame f few minutes. About 0·5 grm. of arsenic-free magnesi lime is then added and well mixed with the contents of dish, the heating of which is continued until the org matter is completely charred. The dish is then heate a muffle until practically all the carbon is burnt off. W cold, the ash is moistened with water and 20 c.c. of dilute sulphuric acid added. The dish is warmed, contents transferred to a 4 oz. flask, 0·5 grm. of potass metabisulphite added, the solution boiled until free f sulphurous acid. After cooling, the solution is ready t tested.

(2) MALT SUBSTITUTES: *Glucose, Invert Sugar, C mel, &c.*—5 grms. are weighed into a small flask dissolved in 20 c.c. of water, 0·5 grm. of potassium m bisulphite and 5 c.c. of the dilute sulphuric acid are added, and the solution, after being boiled until free f sulphurous acid and cooled, is tested.

(3) WORT.—It is unnecessary to destroy the org matter. 25 c.c. of the wort are placed in a small fl 0·5 grm. of potassium metabisulphite and 5 c.c. of di sulphuric acid added, and the solution boiled until free f sulphurous acid, cooled, and tested.

(4) HOPS AND HOP SUBSTITUTES.—5 grms. of the stance, ground if necessary in a mortar, are placed i platinum dish and treated in the manner described ground malt.

(5) BEER.—25 c.c. of the beer are placed in a s flask and treated in the same way as wort.

(6) YEAST AND YEAST FOODS.—5 grms. are placed flask and gently warmed with 20 c.c. of water, 0·5 grm potassium metabisulphite and 5 c.c. of dilute sulph acid are added, and the solution boiled until free from phurous acid. If the yeast food is liquid, 25 c.c. are ta for the test, the subsequent treatment being the same.

(7) CHEMICALS: (*a*) *Sulphites.*—1 grm. is dissolve 25 c.c. of water, 5 c.c. of dilute sulphuric acid are ad and the solution boiled until free from sulphurous a 25 c.c. of solutions of sulphites are taken and boiled in same manner with 5 c.c. of sulphuric acid.

(*b*) *Acids: Sulphuric Acid.*—5 c.c. are diluted 20 c.c. of water, 0·5 grm. of potassium metabisulphite ad and the solution boiled to expel the sulphurous acid.

Hydrochloric Acid.—5 c.c. are placed in a porcelain and diluted with 5 c.c. of water; 5 c.c. of pure nitric (sp. gr. 1·4) and 2 c.c. of concentrated sulphuric acid then added, and the contents of the dish evaporated on sand-bath until the sulphuric acid fumes. When 20 c.c. of water and 0·5 grm. of potassium metabisul are added, the solution transferred to a flask, and b until free from sulphurous acid.

(*c*) *Sulphur.*—10 grms. are taken, and burnt in a curr of oxygen in the manner described in connection with estimation of arsenic in fuel (see preceding abstract). temperature to which the glass tube is heated shoul as low as possible consistent with the burning of the sulp and the empty portion of the hard glass tube, next t bent and drawn out end, should not be heated until sulphur in the other part of the tube has been burnt. liquid in the absorption tube is boiled to expel sulphu acid, and any sulphur or other solid substance which have passed into the absorption tube in the process of c bustion is rendered soluble and in suitable conditio addition to the electrolytic apparatus by the me described for treating the ash of fuel (see prece abstract).

(*d*) *Other Chemicals.*—Of solids, 1 grm. is taken dissolved in 25 c.c. of water. 25 c.c. of liquids are ta In either case, if the solution be alkaline, it must be ne lised with dilute sulphuric acid. To the neutral li 0·5 grm. of potassium metabisulphite and 5 c.c. of d sulphuric acid are added, and the solution boiled free sulphurous acid, cooled, and tested.

(8) FININGS.—5 grms. are weighed out into a 20 c.c. of water added, and gently warmed. If sulphu acid or a sulphite be present, 5 c.c. of dilute sulp acid are added, and the solution boiled until free

s hurous acid. If no sulphurous acid be present in the fi ngs, 0·5 grm. of potassium metabisulphite is added, and t solution treated in the manner just described.—J. L. B.

imony; Volumetric Determination of ——, in Antimo ial Lead. H. Nissenson and P. Siedler. Chem.-Zeit., 903, **27**, [60], 749—752.

ODIFICATION of the method first suggested by Gyory, i which the antimony as chloride in hydrochloric acid s tion is titrated with potassium bromate solution, using n hyl orange (the authors prefer indigo) as an indicator. P ssium bromate "puriss. for analysis" is three times r ystallised, dried at 100° C., and finally over sulphuric a in a desiccator, and 2·7852 grms. are dissolved in w er and made up to a litre. About 1 grm. of the finely-d ded metal is taken, 20 c.c. of hydrochloric acid contain- i bromine poured over it, and the whole kept warm and o sionally shaken till solution is complete. The liquid i ow boiled to expel the bromine, cooled a little, two or t e small crystals of sodium sulphite are added, the li d is again boiled till all sulphur dioxide is expelled. 2 .c. of dilute hydrochloric acid are added, the liquid b ight to the boiling point, and titrated hot with the d normal potassium bromate solution. Three drops of a s huric acid solution of indigo are used as indicator; in t first instance (with an unknown sample) this is added a e beginning, and the blue colour gradually fades into g n and disappears; three drops more are added and the u tion continued till the sudden disappearance of the c ur. In titrating a second portion of the same sample, t bromate is run in nearly to the finish, as indicated by the fi titration, the indicator then added, and the titration p ued to the end. The results are accurate, and the im- p ties usually present in antimonial lead do not, in the q tities in which they usually occur, affect the process. —J. T. D.

ORGANIC—QUALITATIVE.

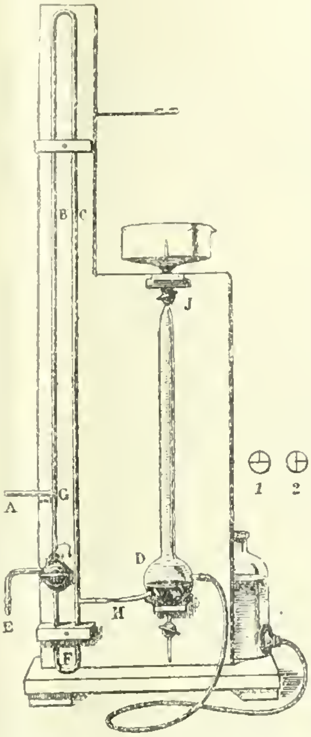
roform, Bromoform, and Iodoform; Colour Reactions ——. R. Dupouy. Bull. Soc. Pharm. de Bordeaux, ay 1903, 140. Chem. News, 1903, **83**, [2278], 37.

OROFORM, when treated with phenols in the presence of d caustic potash, gives brilliant colorations, due, pro- b y, to the formation of dyestuffs of the aurin group. O nary phenol gives a yellow, resorcinol a bright red, and n thol a blue colour. By using isopropylmethylphenol o ymol, and acting with sulphuric acid on the product fi formed, a colour reaction is obtained by means of w h very small quantities of chloroform can be detected. O dding to 0·5 c.c. of a 5 per cent. alcoholic solution of t ol, a drop of chloroform and a very small quantity of ca tic potash, and boiling for about half a minute, a yellow co r is produced with a more or less pronounced reddish ti according to the amount of chloroform present. On n adding, very carefully, 1 c.c. of sulphuric acid and ag n heating to boiling, a fine violet colour is produced, w h is generally too intense to allow of direct examina- ti with the spectroscope. If a few drops of the violet li l be poured into a little acetic acid, and a spectroscopic e mination made, the spectrum observed is similar to that o xyhæmoglobin, with two bands situated in the green, b nearer the red end of the spectrum than that of the la . If a few drops of the violet liquid be mixed with w r, a blue liquid is obtained which gives a spectrum c racterised by a band situated between the D line and th ed. The colour reaction described is also given by br oform and less readily by iodoform; and the author st s that the same may be said of all the colour reactions of loroform.—A. S.

ORGANIC—QUANTITATIVE.

itrogen; Apparatus for the Determination of ——. larquis. Bull. Soc. Chim., 1903, **29**, [14], 780—782.

T apparatus is intended to be attached to the combustion tu in Dumas' process of nitrogen determination, so as to all of the exhaustion of the tube to remove air adhering to the copper oxide. The tube G B C F, about 80 cm. high, communicates with the measuring tube J D by the tube H (constricted so as to prevent a sudden rush of gas), is attached to the combustion tube by A, and is furnished with the three-way stopcock R. The bulb D of the measuring tube is about 6 cm. in diameter, the tube 3 cm. in diameter and 20 cm. long; the whole contains about 200—250 c.c. of potash solution. The bulb D is filled with mercury to about 1 cm. above H, and the upper part and the tube are then filled with potash by opening J and raising the reservoir. A is connected with the combustion tube, R is placed in position 1, and the whole exhausted by the pump connected to E. R is now closed, carbon dioxide is generated, and passes through H into J D, carrying air with it. The exhaustion is repeated as often as necessary, and when done for the last time, R is cautiously turned to position 2, and the mercury allowed to rise almost to G, when R is closed. The stopcock being thus covered with mercury, there is no leakage, and the combustion can be safely proceeded with.—J. T. D.



Indigo; Determination of ——, in Substance and on the Fibre. R. Möhlau and M. R. Zimmermann. Zeits. f. Farben- u. Textil-Chem., 1903, **2**, [10], 189—193.

Preparation of Pure Indigotin.—In view of the importance of obtaining pure indigotin in connection with the preparation of standard solutions of indigotin-disulphonic acid, for analytical purposes, the authors have devised the following process, which is based upon the conversion of indigotin into the indigo monosulphate described by Binz and Kufferath (this Journal, 1903, 20):—4 grms. of Indigo pure (B.A.S.F.) are heated on the water-bath for half an hour with a mixture of 50 c.c. of acetic acid and 10 c.c. of concentrated sulphuric acid. The solution is allowed to cool; the crystals of the monosulphate which separate are collected on a Neubauer platinum-dish filter, drained, and washed with a mixture of acetic and sulphuric acids until the filtrate shows only a pale blue colour. Thereupon the crystals are dissolved in 500 c.c. of the acetic-sulphuric acid mixture, the solution filtered, and gradually mixed at a temperature of 70° C. with 200 c.c. of boiling water. The precipitated indigo is collected, washed, and dried at 105° C. It is next redissolved in 60 c.c. of the acetic-sulphuric acid mixture, the solution being allowed to cool, and the crystals collected on a filter and washed as before. Finally, the crystals thus purified, are hydrolysed with 95 per cent. alcohol. The indigotin so formed is collected on a platinum filter, and is washed first with 100 c.c. of hot, dilute (1:10) hydrochloric acid, and then with 200 c.c. of hot water. It is then dried at 105° C. 2·5 grms. of indigotin of 99·9 per cent. purity are thus obtained.

Determination of Indigotin in Natural Indigo.—0·1 grm. of the indigo, which has been finely ground and sifted through silk gauze, is weighed into a flask of 100 c.c. capacity, a few garnets are added, and then 50 c.c. of a mixture of

100 c.c. of acetic acid and 4 c.c. of sulphuric acid. The flask is then heated on the water-bath, with occasional shaking, for about 15 minutes. The solution is filtered through a toughened filter paper, previously moistened with the acid mixture, or through a platinum filter, into a 300 c.c. beaker, the flask and filter being afterwards washed with 50 c.c. of hot acetic-sulphuric acid mixture. 50 c.c. of this are added to the filtrate, which is next heated to 70° C. and gradually mixed with 100 c.c. of boiling water. The mixture, after being allowed to cool, is filtered, the precipitate being collected on a tared filter and washed successively with 50 c.c. of hot, dilute (1:10) hydrochloric acid, 50 c.c. of hot water, and 2—5 c.c. of 95 per cent. alcohol, before being dried at 105° C. and weighed. The ash is then determined, and its weight is deducted from the weight thus found, the difference being the amount of indigotin.

Determination of Indigotin in Synthetical Indigo.—As Wangerin (Inaug. Dissert., 1902) has shown, synthetical indigo contains a red dyestuff, resembling, but apparently not identical with indirubin, which is with difficulty separated from the accompanying indigotin, its best solvent, namely, pyridine, removing it incompletely.

The analysis of synthetical indigo is performed as described above, but inasmuch as only 75 per cent. of the red dyestuff in question is left in solution when the indigotin is precipitated, it is necessary to continue the purification of the latter until a colourless solution is obtained. The percentage amount of the red dyestuff present may, however, be readily calculated by deducting from 100 the sum of the percentages of moisture, ash, organic impurities insoluble in the acetic-sulphuric acid mixture, and crude indigotin found in the manner described, and multiplying the difference by $\frac{4}{3}$. The percentage of pure indigotin is obtained by deducting from that of the crude indigotin one-third of the percentage of the red dyestuff thus found.

Moisture is estimated by drying for two hours at 105° C.

Insoluble organic impurities are estimated by treating the Indigo with the acetic-sulphuric acid mixture, filtering through a platinum filter, washing the residue, drying it at 105° C., weighing, incinerating, and deducting the weight of ash.

The results of the analysis of two samples of synthetical Indigo are given.

Determination of Indigo on the Dyed Fibre.—(In collaboration with J. L. Fitzke.) Binz and Kufferath (this Journal, 1903, 21) have pointed out the advantage of the use of a mixture of acetic and sulphuric acids in extracting indigotin from dyed fabrics (see also this Journal, 1903, 825). The authors prefer to employ a mixture containing proportions of the acids different from those used by the chemists named, according to the following method:—About 10 grms. of the indigo-dyed fabric are cut into small portions and placed in a flask of 250 c.c. capacity. 50 c.c. of the acid mixture (100 c.c. of acetic acid and 4 c.c. of concentrated sulphuric acid) are added, in the case of cotton fabrics, 200 c.c. in that of woollen fabrics. The flask is then heated for half an hour on the water-bath. The solution obtained, is filtered through a toughened filter-paper. The extraction is then repeated with 50 c.c. of the acids and the solution is again filtered, the residue being washed with a warm mixture of the acids so long as any dyestuff is dissolved. The united filtrates and washings are then heated to 50° C., and gradually mixed with 1½—2 volumes of boiling water.

The indigo which is thus precipitated in fine needles filtering readily, is collected on a tared filter. After being washed, in succession, with hot water, 1 c.c. of 95 per cent. alcohol, and 100 c.c. of ether, it is dried at 105° C. and weighed. In the case of cotton fabrics, 0·22 must be deducted from the percentage found, for cellulose attacked and dissolved by the mixture of acids and precipitated in a modified form along with the indigo.—E. B.

Silk; Determination of Inorganic Weighting Agents in ——. R. Gnehm. Zeits. f. Farben- u. Textil-Chem., 1903, **2**, [11], 209—210.

About 2 grms. of the silk to be tested, and in which the moisture present has been determined, are immersed, with frequent stirring, for an hour at the ordinary temperat in 100 c.c. of a 5 per cent. solution of hydrofluosilicic a The solution is removed and the treatment repeated w 100 c.c. of fresh acid of the same concentration. The is then washed seven times, each time for ¼—½ hour w about 150 c.c. of distilled water, after which it is dried 95°—105 C. The difference between the weight so fo and that of the dry silk taken, corresponds with the amo of inorganic loading agents present. From the percent of this (z), that of the load above par (x + 80 − 100) m be calculated from the formula, y : z :: 80 : x, y being percentage of pure silk (fibroïn) found in the sample tes and the loss in ungumming being assumed to be 20 cent.—E. B.

Silk; Action of Hydrofluosilicic and Hydrofluoric A on ——. R. Gnehm and R. Weber. Zeits. f. Farben- Textil-Chem., 1903, **2**, [11], 210—214.

Action of Hydrofluoric and Hydrofluosilicic Acids on N loaded Silk.—With a view to ascertaining whether th acids have any action upon silk, under the conditi adopted for the quantitative determination of the inorga loading agents in silk fabrics (see preceding abstra samples of raw, souple, and boiled-off silks were trea with the two acids in the manner described. The res are given in the table below:—

——	Loss with Hydrofluosilicic Acid.	Loss wit Hydroflu Acid.
	Per Cent.	Per Cent
Raw silk (tram)	0·05	0·05
„ „ (organzine)	0·49	0·51
Souple silk	0·07	0·60
Boiled-off silk (organzine)	0·48	0·81

On treating the raw silk (tram) ten times in this way, total loss (calculated on the dry fibre) amounted to 7·46 cent. with hydrofluosilicic acid, and to 5·22 per cent. hydrofluoric acid, the percentage of inorganic matters (in the silk becoming reduced from 0·75 to 0·28 and 0 respectively. In the case of the boiled-off silk, the lo weight in seven extractions with hydrofluosilicic amounted to 1·01 per cent., the content in inorganic mat being at the same time lowered from 0·71 to 0·12 per c

From these results it would appear that the silk fib not injured by either of the acids experimented with, w applied in the manner adopted.

Action of Hydrofluosilicic and Hydrofluoric Aci Silk loaded with Stannic Phosphate and Silicat—2·1264 grms. of Chinese silk (tram) containing 8·85 cent. of moisture (*i.e.*, 1·9384 grms. of dry silk) and 43 per cent. of inorganic matters (ash) were treated, as in above examples, with hydrofluosilicic acid. The purified weighed 0·9176 grm. (=43·15 per cent.), the loss in we being 1·0208 grms. (= 48 per cent.). The load above thus found is 68·9 per cent. With hydrofluoric acid number obtained was 69. The load, according to the dyer who had treated the silk on the large scale, was 69 cent. above par.

Other samples of silk yarns containing known cha were submitted to examination. In no case were differe found which were greater than could be accounted fo being due to variations in the amount of moisture prese the yarns during the operations of weighting on the l scale.

Action of the Hydrofluosilicic and Hydrofluoric Acid Black-dyed and Loaded Silk.—A sample of Japanese (tram), which had lost 19 per cent. of its weight in operation of boiling-off, and which had been dyed b and loaded to the extent of 203 per cent. above par, taining in this condition 12·58 per cent. of moisture 36·4 per cent. of inorganic matters (ash), was treated the two acids, as described. With hydrofluosilicic acid inorganic matters were reduced, in two extractions, to 31 and in eight extractions, to 28·23 per cent; with hy fl ic acid they were reduced to 4·61 and 2·92 per cent. re ectively by the same treatment. The method is, conse- qu tly, not suitable for the estimation of the loading matters in yed silks. For these the method which consists in de mining the nitrogen (of the fibroïn) must still be used. E nations of the nitrogen in the dyed silk upon which th above experiments were made, gave results correspondin with a charge of 186·8—192·4 per cent. above par.

e Müller (this Journal, 1903, 622) on the use of h ofluoric acid in stripping loaded silks.—E. B.

L eed Oil ; Examination of ——. B. Sjollema. Zeits. nters. Nahr.- u. Genussm., 1903, 6, [14], 631—637.

L EED oil differs from most other oils in remaining co pletely liquid when cooled below 0° C. In presence of ree fatty acids however, crystallisation may occur; w t certain varieties of linseed oil (*e.g.*, North Russian), w h remain clear at − 14° C., can be mixed with several pe cent. of cotton-seed oil and then show the same temperatu of turbidity as genuine linseed oil of other origin.

the author's opinion the determination of the refractive in x of linseed oil is of more value than the iodine value.

determining the refractive index the following points ar o be taken into account :—(1) The reading is greatly lo red by the presence of free fatty acids. (2) A correcti of approximately 0·6 scale division must be made for ea degree C. when the reading is taken at other temperatu than 15° C. (3) Oxidation raises the refractive in x, so that incorrect values are obtained with a small qu tity of oil (0·025 grm.) dried for 2 hrs. at 100° C. (4 The refractive index of mineral or rosin oil is higher th that of linseed oil, whereas most other vegetable oils ar animal oils give lower readings.—C. A. M.

B root Juice ; Action of Lime on certain Nitrogenous mponents of ——. E. Sellier. Bull. de l'Assoc. des im. de Sucr. et de Dist., 1903, 20, [12], 1251—1261.

T method adopted by the author for determining aminoac in vegetable products and beetroot juice, consists in ad g 2·5 to 5 c.c. of concentrated hydrochloric acid to 50 . of juice, then 50 c.c. of water, heating for an hour n bath of boiling water and distilling off the ammonia standard acid by heating with magnesia. The amm a obtained, corresponds to the ammonia pre-existing in h juice together with half that contained in the amino ac , that is, in asparagine and glutamine.

e loss of nitrogen during the working up of juice, ca d by disengagement of ammonia, comes exclusively fr hydration of amino acids and pre-existing ammonia; th other nitrogenous substances found in the juice not u ing decomposition by the heat and alkalinity obtaining practice.

rzfeld has shown that albumin coagulated by heat is no decomposed by heating with 2 per cent. of lime at 95 C., but, in limed juice, lime is not the only alkaline su ance capable of acting, the potash and soda liberated by e lime must also be taken into account.

order that it may not be necessary to separate the alb in coagulated by heating the juice, the limed juice b d only be heated to 80° C. for a period not exceeding 30 nutes.—L. J. de W.

Su r in Boiler Feed Water ; Quick Method of Determi ion of ——. H. Pellet. Bull. de l'Assoc. des Chim. Sucr. et de Dist., 1903, 20, [12], 1266—1267.

Th author recommends the following method of applying th α-naphthol test for the detection and estimation of sm quantities of sugar as being equally expeditious and les able to error than the use of the apparatus proposed by amand: tubes graduated to 2·5 c.c. are filled to the ma with concentrated sulphuric acid, 1 c.c. of the water to tested added from a pipette, and then 2 to 3 drops of a f hly prepared 2·5 to 3 per cent. alcoholic solution of a n hthol added. Standards for comparison are made con ining 0·01, 0·05, and 0·10 grm. of sugar per litre.

—L. J. de W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-active Emanation ; Scintillating Phosphorescence of Sidot's Blende caused by ——. J. Elster and H. Geitel. Physikal. Zeits., 1903, 15, [4], 439; Chem. News, 1903, 88, [2278], 37.

In an experiment made for the purpose of producing distinct phosphorescence by means of the active emanation contained in the air of the ground, the authors introduced into a dark space of about $1\frac{1}{4}$ cb.m. capacity, which contained the radio-active emanation of the ground, an insulated screen of Sidot's blende, which had previously been kept in the dark for some days, and maintained it for about two hours at a negative potential of 2,000 volts. The screen became luminous, but on close examination in the dark it was observed that the illumination was not uniform, the intensity of the light of the individual parts of the luminous surface being subject to constant change. By aid of a microscope, the scintillation of the screen was found to be due to a number of separate luminous specks, each of which only flashed out momentarily. In an experiment with Giesel's "emanation substance" (see this Journal, 1903, 322), the scintillating luminosity of the screen was also visible in an incompletely darkened space; and it could be shown that the phosphorescent light is not extinguished by the influence of red light. When the emanation substance was laid directly on the (non-electrified) screen, the latter showed the same scintillating phosphorescence. A luminous screen of calcium tungstate, after an exposure of about 1 hour, was rendered lastingly luminous, but the characteristic scintillation of zinc blende was not visible. A current of air led over the blende screen had no influence on the scintillations, and the latter also remained the same whether the screen was closely pressed with its luminous side against a glass plate or not.—A. S.

Active Oxygen. VIII. Autoxidation of Cerous Salts and Indirect Autoxidation. C. Engler. Ber., 1903, 36, [11], 2642—2651. (See also this Journal, 1897, 832; 1899, 65; 1900, 682, 697; 1901, 1151.)

According to Job (Ann. chim. phys., 1900, 20, 205), cerous carbonate dissolved in potassium carbonate solution, when shaken with air, forms a peroxidised compound which may be isolated in the form of the double salt, $Ce_2O_3(CO_3)_3.4K_2CO_3.12H_2O$. This is considered by Job to be a case of direct autoxidation, *i.e.*, the direct union of oxygen with the cerous salt with the formation of the peroxidised compound.

The author has investigated the reaction, and has arrived at the following conclusions :—Two atoms of cerium in the form of a cerous salt absorb only 1 mol. of oxygen, and of the oxygen absorbed, one-half is rendered active, just as in all other known cases of autoxidation. The peroxidised compound formed, is not a primary reaction product, but a secondary one, being produced by the action of the hydrogen peroxide formed by the primary autoxidation. The reactions may be explained in the following manner :—Cerous salts have, in consequence of the unsaturated character of the metal, a tendency, in potassium carbonate solution, to become saturated with hydroxyl groups (ions), forming basic ceric carbonate, whilst the free hydrogen atoms (ions) produced, unite with oxygen with the formation of hydrogen peroxide.

$$.Ce \vdots (CO_3)_3 \vdots Ce. + 2H_2O + .O_2. \rightarrow$$
$$OH.Ce \vdots (CO_3)_3 \vdots Ce.OH + H_2O_2.$$

These primary products of the autoxidation—basic ceric carbonate and hydrogen peroxide—however, act further upon one another, with the ultimate formation of the peroxidised compound which Job isolated in the form of a double salt (see above).

$$OH.Ce \vdots (CO_3)_3 \vdots Ce.OH + 2H_2O_2 \rightarrow$$
$$OH.O.Ce \vdots (CO_3)_3 \vdots Ce.O.OH \rightarrow H_2O + Ce_2O_3(CO_3)_3.$$

(hydrated cerium peroxide)

The author considers that the behaviour of cerous compounds on autoxidation may give a clue to the processes which take place in the Auer light. The lower oxides of cerium in presence of air and glucose act as oxygen carriers; the glucose reduces the peroxide formed by autoxidation back to a cerous compound, and the latter then absorbs more oxygen, and so on. In a similar manner, a system of reducing and autoxidising reactions between the different oxides of cerium (Ce_2O_3, CeO_2, CeO_3) may be brought about by the reducing gases and oxygen present in the unburnt gas mixture, the effect being to greatly increase the intensity of the combustion, and, consequently, the temperature and the light emission. Here, of course, the case would be one of direct autoxidation, and not indirect, as in the case of solutions of cerous salts. (See also this Journal, 1902, 257, 720, 795; 1903, 168.)—A. S.

Sulphur; Bromides of ——. O. Ruff and G. Winterfeld. Ber., 1903, **36**, [11], 2437—2446.

Mixtures of sulphur monobromide, S_2Br_2, with excess of sulphur and with excess of bromine were made, and the melting- and freezing-points of these were determined. The resulting curve shows a regular depression from the monobromide, S_2Br_2 (71·38 per cent. of bromine) to a eutectic mixture containing 80 per cent. of bromine, and then a regular rise to 93 per cent. of bromine. No indication whatever is given of the existence of compounds corresponding to the formulæ SBr_2, SBr_3, or SBr_4. The vapour pressure curve of mixtures varying from pure monobromide to pure bromine is also a straight line, without any suggestion of a higher bromide. The sulphur monobromide for this investigation was prepared by heating together the theoretical quantities of pure, absolutely dry sulphur and bromine in sealed tubes in a water-bath tube-oven, and distilling the product under very low pressure (b. pt. 57° at 0·22 mm.). The pure substance melts at −46° C., and its sp. gr. at 20° C. is 2·6355. (Compare this Journal, 1903, 296.)—J. T. D.

Ferrisulphuric Acid and Ethyl Ferrisulphate. A. Recoura. Comptes rend., 1903, **137**, [3], 189—191.

Ferric sulphate combines readily with sulphuric acid, forming the compound $Fe_2O_3.3SO_3.SO_4H_2.8H_2O$. This the author regards as a dibasic *ferrisulphuric acid.* It is dissociated by water, and hence its salts cannot be prepared; but when boiled with absolutely dry alcohol and allowed to stand for some months, the solution deposits a yellow solid *ethyl ferrisulphate,* $Fe_2O_3.3SO_3.SO_4(C_2H_5)_2.4H_2O$. As ferrisulphuric acid at 80°—100° C. loses $6H_2O$, and at 135° C., SO_4H_2 and $2H_2O$ together, the author formulates it as $Fe_2O_3.3SO_3.SO_4H_2.2H_2O + 6H_2O$. If ferric sulphate be dissolved in boiling hydrochloric acid (this Journal, 1902, 1076 and 1453), the solution deposits crystals of ferrisulphuric acid and contains ferric chloride. The sulphuric acid formed by the reaction of hydrochloric acid on one part of the ferric sulphate reacts at once on another part of the ferric sulphate to form ferrisulphuric acid.—J. T. D.

New Books.

Guide to the Search Department of the Patent Office Library, with Appendices. Second Edition. [Patent Office Library Series. No. 1.] Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1903. Price 6*d*.

Grundriss der reinen und angewandten Elektrochemie. Von P. Ferchland, Ph.D. Wilhelm Knapp, Halle-a.-S., Germany. 1903. Price M. 5.

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Iron and Steel, 1901. Statistical Tables. 240. Price

This memorandum, which has been drawn up in the C mercial, Labour, and Statistical Department of the B of Trade, deals with the production and consump during the 12 years 1890 to 1901, of iron ore and pig-i and the production of steel in the United Kingdom an the principal foreign producing countries, *viz.*, Ru Sweden, Germany (including Luxemburg), Belg France, Spain, Italy, Austria-Hungary, and the Un States.

Trade Report.

I.—GENERAL.

Germany; Chemical Statistics of ——.

Foreign Office Annual Series, No. 3042.

The chemical industry to-day ranks fifth in the comm of Germany.

According to official statistics, the goods produced by chemical industry in 1897 amounted to 8,311,279 tons, represented a value of 947,902,570 marks. 6,589 chem concerns were then counted, with 135,350 hands (in year 1900, 7,169 concerns; in the year 1901, 7,352 concer). In the year 1898 the total of wages paid amounted 129,638,202 marks (in 1900, 154,000,000 marks; in 1 159,000,000 marks), *i.e.*, on an average, 918 marks earned per annum, against 885 marks in 1894. The tr of raw material and finished goods in the chemical indu is shown in the following tables.

I. *Raw Material.*

Year.	Import.		Export.	
	Quantity.	Value in 1,000,000 Marks.	Quantity.	Value in 1,000,000 Marks.
	Tons.		Tons.	
1892	1,051,645	156·5	252,470	31·1
1893	1,148,361	163·8	354,576	33·9
1894	1,224,236	164·6	382,484	35·8
1895	1,326,160	188·9	387,229	37·2
1896	1,399,376	169·0	460,774	36·3
1897	1,517,935	175·4	529,993	37·1
1898	1,584,219	176·6	587,893	38·6
1899	1,811,622	207·5	693,390	44·4
1900	1,928,062	218·4	726,776	45·2
1901	1,940,214	220·9	863,274	45·4

II. *Finished Goods.*

Year.	Import.		Export.	
	Quantity.	Value in 1,000,000 Marks.	Quantity.	Value in 1,000,000 Marks
	Tons.		Tons.	
1892	210,324	109·7	458,238	254·5
1893	232,735	109·3	506,365	265·2
1894	221,470	106·9	524,298	268·8
1895	239,821	110·9	540,073	301·7
1896	275,958	115·2	590,647	324·4
1897	286,366	109·7	594,677	321·5
1898	293,079	104·6	647,699	339·2
1899	311,457	108·8	700,596	345·4
1900	322,220	113·0	749,519	352·4
1901	349,050	110·7	789,297	362·0

About two-fifths of the German manufactures are ex- rted, three-fifths are consumed by the home market. e import of finished goods has remained about stationary to values, but in quantities has materially increased. e export of manufactured goods, however, has increased nsiderably both as to quantities and values.

GERMANY; NEW CUSTOMS TARIFF OF ——.

Foreign Office Annual Series, No. 3042.

t is expected that the trade of Frankfort will be terially affected by the new Customs tariff, according as duties are increased or reduced thereby.

n the following articles entirely new Customs duties are posed :—

Articles.	Rate per 100 Kilos.
	Marks.
k sugar	80
ic and tartaric acid	8
nonium carbonate	5
imony tartrate	8
mbar	10
-nuts and catechu	3
bracho bark	7
in	10
ral hydrate	20
m of tartar	8
ined tin	6
er sulphate	2
ylated spirit	20
harin	8,000
acts, tinctures, non-etheric, without alcohol	40
nt medicines	500
ngal	50
e canella	50
r oil	2
oil	2

The Customs duties are to be increased on the following articles :—

Articles.	Customs Duties per 100 Kilos.		
	Present Rate.		Future Rate.
	M.	Pf.	M.
Aniseed, fennel seed, coriander, cummin, &c.	3	0	4
Sperm	10	0	15
Fish glue	3	0	10
Arrowroot	12	50	15
Dextrin	12	50	18
Grape sugar	36	0	40
Potash	1	50	2
Ether of every kind	125	0	180
Artificial scents	50	0	80
Chloroform	20	0	30
Collodion	20	0	24
Extracts, tinctures, containing ether or alcohol.	20	0	60

The rates are to be reduced on :—

Articles.	Customs Duties per 100 Kilos.			
	Present Rate.		Future Rate.	
	M.	Pf.	M.	Pf.
Sodium carbonate	2	50	1	50
Crystal soda	1	50	0	90
Sodium bicarbonate	2	50	1	50
Caustic soda	4	0	3	50
Bleaching powder	3	0	1	0
Vegetable wax	15	0	10	0
Beeswax	15	0	10	0

YOKOHAMA, JAPAN; TRADE OF ——, IN 1902.

Foreign Office Annual Series, No. 3037.

Imports.

Articles.	Increase or Decrease.	Remarks.
	£	
Coke	− 2,570	Used in Government arsenals and docks; refused if finer than 1-inch sieve; chemical tests severe; two-thirds import British, one-third German.
Drugs and chemicals.	+ 16,554	Increase general but slight; 12,000*l.* in caustic soda, chiefly from the United Kingdom.
Dyestuffs	+ 37,584	Increase almost entirely in aniline dyes to Germany's profit.
Italian cloth	+ 24,945	From the United Kingdom; Germany and Belgium supply small fraction.
Kerosene oil	− 19,491	Japanese oil wells in Echigo compete somewhat with import.
Beer	+ 20,020	From the United Kingdom for a British brewery at this port.
Malt	− 19,664	Chiefly from Germany; none from the United Kingdom.
Oil cake	+ 70,846	Almost entirely bean manure from China; the decrease of 30,000*l.* in phosphatic manure is confined to Yokohama; total import for Japan increased; the United Kingdom now enjoys more than a half share of this import as against a quarter share in 1901.
Paper	+ 91,313	Import cannot be expected to increase indefinitely: Japanese mills find thick paper more profitable to manufacture, and very thin paper is therefore imported; sooner or later thin paper will be turned out locally.
Cigarette paper	+ 17,600	Supplied by France and Austria-Hungary: increased quantities needed in connection with import of United States leaf tobacco, which rose from practically *nil* to 23,965*l.*
Fancy paper	+ 13,600	From Germany, Belgium, Austria-Hungary, the United Kingdom.
Printing paper	+ 26,556	Especially for newspapers: from Belgium, the United Kingdom, Germany, United States, Austria-Hungary.

Exports.

Articles.	Increase or Decrease.	Remarks.
	£	
Drugs ...	+ 17,683	Increase chiefly in menthol crystals, for which the United States, followed by the United Kingdom, are Japan's best customers.
Fish oil.	+ 36,549	An exceptionally good year; chiefly to Hong Kong, Germany, Belgium; Japan's production of crude sharks' oil obtained by boiling the flesh, of which the residue is used as manure, is over 17,000 tons; price, crude, 18*s.* 4*d.*, refined, 1*l.* 4*s.* 6*d.* per 133 lb.

JAPAN; DRUGS AND CHEMICALS FOR ——.

Chemist and Druggist, Aug. 8, 1903.

Drugs, chemicals, &c., valued at 283,543*l.* were imported into Yokohama during 1902, compared with 237,817*l.* in 1901. They included the following:—

		1901.		1902.	
		Quantity.	Value.	Quantity.	Value.
			£		£
Acetic acid.......	lb.	..	.	313,850	5,184
Carbolic acid.....	"	309,373	11,505	585,477	15,903
Alcohol..........	galls.	..	11,818	226,260	11,465
Bismuth subnitrate...........	lb.	11,390	2,087	58,779	13,121
Glycerin..........	"	261,450	6,788	202,921	5,314
Hops	"	151,562	10,828	77,964	5,453
Potass. chlorate..	"	571,549	7,818	563,065	6,788
Quinine..........	oz.	..	6,824	117,318	6,118
Resin............	lb.	..	..	2,237,806	5,225
Saltpetre	"	2,507,808	18,525	2,029,836	17,602
Soda ash	"	5,457,601	14,562	7,123,769	19,636
Soda, bicarbonate	"	2,516,180	7,269	2,563,979	6,804
Soda, caustic.....	"	2,575,580	12,661	5,139,658	24,287
All other		..	126,532	.	139,811
Total		..	237,817	..	283,543

CENTRAL STATES, U.S.A.; TRADE IN THE ——.

Bd. of Trade J., Aug. 6.

Kansas City, St. Louis, and Indianapolis are three important agricultural centres, and, at the same time, are of importance in the distribution of miscellaneous goods over a very large area.

In each of these cities there is a large trade done in dry goods, drugs, chemicals, and hardware.

In the crude drug trade there is a considerable business to be done. The trade, formerly British, has gone to Germany, owing, it is said, to German persistence and quoting f.o.b. New York in United States currency, but orders might still be obtained.

TRINIDAD AND THE ORINOCO; NOTES ON TRADE BETWEEN ——.

Bd. of Trade J., July 30, 1903.

The following is a summary of the exports of Bolivar in 1901 and 1902. Much of the trade of the Delta does not pass through Bolivar, being done direct with Trinidad and British Guiana:—

		1901.	1902.
Gold	£	70,000	10,700
Rubber	Kilos.	162,901	11,375
Balata gum	"	1,186,462	914,276
Copaiba balsam	"	16,310	5,279
Tonca beans	"	7,571	186,496
Cacao.................... ..	"	57,910	46,141
Tobacco.........	"	76,912	8,740
Horns and skins	"	9,614	4,717

Balata Gum.—This trade is only about 12 years old has risen rapidly, and last year 1,200 tons of gum passe through Trinidad. It is at present confined to the are bounded by the Orinoco and Caroni, but large forests ar reported to exist in the south of the State of Guiara. As however, the tree is now cut down in order to secure th gum, wholesale exhaustion of the easily accessible source of supply is going on, and with increasing distance the c of exploitation will, of course, increase. Very little no comes from the district of Maturin, which was the first t export it The quantity received in Trinidad last yea represented the destruction of 180,000 trees, a tree pro ducing on an average 15 lb. of gum. It may be adde that Balata is a valuable hard wood.

It is stated that a large deposit of iron ore, said to be o high quality, exists on the Grand Boca. There are frequen indications of other minerals, but very little is known o them.

MEXICO; IMPORTS OF ——.

Foreign Office Annual Series, No. 3039.

The average annual amount of imports into Mexic during 1893—95, was 7,000,000*l.*; 1898—1900, 10,000,000 The proportion from the United Kingdom during 1893—9 was 17 per cent., and during 1898—1900, 18 per cen From Germany during the periods mentioned, 8 and 11 pe cent. respectively; from France, 14 and 12 per cent.; an from the United States, 52 and 49 per cent.

The total value of imports into Mexico during the fisca year 1901—2 was approximately 13,000,000*l.*, almost th same as in 1900—1, and the proportions were as follows:— the United Kingdom and colonies, 13 per cent.; Germany 10 per cent.; France, 10 per cent.; and the United State 58 per cent.: followed by Spain with 4 per cent., an Belgium, Switzerland, Italy, Austria-Hungary and Hollan in the order given, with 5 per cent. between them an "other countries."

The decline of British trade is the most marked. I 1901—2 the imports from the United Kingdom an colonies were valued at 1,673,079*l.*, against 1,984,900*l.* i 1900—1, a loss of 311,821*l.* Germany follows with a fa from 1,416,000*l.* in 1900—1 to 1,290,000*l.* in 1901—2, difference of 126,000*l.* France comes next with a decrea of 56,000*l.*, that is from 1,313,000*l.* in 1900—1 t 1,257,000*l.* in 1901—2.

The trade of the United States increased from 54 p cent. in 1900—1 to 58 per cent. in 1901—2, that is fro 7,040,000*l.* to 7,480,000*l.*, a gain of 440,000*l.*, almost exact the value of the trade lost by Europe.

The statement of the principal imports into Mexico fro the United Kingdom shows a decline in cement owing t German competition; in coke; in cotton goods bleache and printed, owing to improvements in local manufactures and in iron and steel rails, owing to Belgian competition.

The increases in British imports into Mexico inclu alkali, bleached and dyed cotton yarn and twist, an painters' colours.

In other goods during the past three years we have mo or less held our own.

MEXICO; HINTS TO EXPORTERS TO ——.

Foreign Office Annual Series, No. 3039.

Drugs and Chemicals.—In making shipments of dru and chemicals care should be taken that they are not pack in flasks or vials bearing a label varying from the ne contents, as, in such cases, duties will be collected on t commodity which is subject to the higher rate.

Essential Oils.—It is important to declare the kind essential oils, and a perfect distinction between essenti oils and essences must be made. Essential oils, as defin in the Customs tariff, are the extracts of certain vegetabl or plants which have not been combined with other su stances. When these oils are alcoholised, or contain oth substances, they are rated as toilet extracts or perfumery.

Explosives.—When making shipments of powder or hi explosives be careful to state the kind, as duties will levied in accordance with their classification as dynamit blasting powder, or fine gunpowder.

Glassware.—State whether glassware is plain, engraved, cut, coloured, or decorated in any manner. If mounted, state with what class of metal. Plain glassware of every description without engraving, designs or lettering legible or visible against the light; plain crystal glassware with bevelled edges; plain or chased glass surrounded with common metal and known as "mosaic window glass"; moulded glass, channelled and common plain glassware without engravings or designs, whether white or of one other uniform colour, all pay a lower rate of duty than when cut, decorated, mounted, or when of variegated shades or colours. Plate glass exceeding a thickness of 1 centimetre, if not transparent, pays a lower rate of duty than ordinary glassware.

Leather.—All kinds of leather, cut into such sizes as are only adapted to certain uses, such as shoe soles, pump valves, &c., are considered as "manufactures of leather."

Oils and Paints.—Give commercial name of oil and state whether refined or crude, mineral, animal, vegetable or mixed oils, and for what they are used.

All prepared colours containing varnish or other resinous substances which impart lustre are rated as "coloured varnishes," and not as "prepared colours."

Soap.—State whether soap is scented or not, and whether medicated or toilet, &c. Tar and carbolic soaps are rated as medicated.

Varnishes.—The Customs classification of varnishes includes all solutions of asphalt or turpentine, paints for carriages or furniture, and preparations containing alcohol or oil for cleaning furniture. Varnishes containing metallic substances for gilding pay a higher rate of duty.

Wall Papers.—State whether wall paper is plain, combined with or containing cloth or silk, whether gilt or not, ilvered or velveted; also when it is of the style known as "Lincrusta Walton," whether of raised or relief pattern.

Window Glass.—State whether window glass is plain, plate or bevelled, engraved or decorated, with or without metal mountings.

Wines and Spirits.—State whether wines and spirits are medicinal or for table use, and whether effervescent or not. Aguardiente, brandy, &c., pay duty per litre. Be exact n declarations, and for bottled liquors take the entire ontents of a case as a basis for measurement.

III.—TAR PRODUCTS, PETROLEUM, Etc.

ASPHALT EXPORT OF VENEZUELA.

Foreign Office Annual Series, No. 3017.

A new article of export from Venezuela during the last ear was asphalt, and it is probable that export of this roduct will be important in the future. The asphalt omes from the shores of the Lake Maracaibo. The conession is being worked by an American company, who, uring the last six months of 1902, shipped about 3,355 ons; a railway from the mines to the shore of the lake has lso been built.

IGNITE, PETROLEUM, &C.; MINING FOR ——, IN ITALY.

Foreign Office Annual Series, No. 3022.

From a recent report published by the Italian Ministry Agriculture, Industry, and Commerce, the presence of gnite, petroleum, lead, and manganese oxide is officially scertained in Central Italy; but lack of enterprise on the rt of the inhabitants, combined with the scarcity of ailable capital for undertakings of that description, have oved serious stumbling blocks.

IV.—COLOURING MATTERS, Etc.

DYESTUFFS IN GERMANY.

Foreign Office Annual Series, No. 3042.

Aniline dyes are chiefly imported from Switzerland; ance no longer exports to Germany, and her place has en taken since 1889 by the United Kingdom; altogether, wever, the import only amounts to between 7,000 and ,000 met. centners.

The export of aniline dyes, on the other hand, has, during the last 10 years, increased steadily, as the following table shows. It also establishes how the export has developed to the most important countries of importation, *viz.*, the United Kingdom and United States of America.

Exports.

Year.	Total.		To the United Kingdom.		To the United States.	
	Quantity.	Value in 1,000 Marks.	Quantity.	Value in 1,000 Marks.	Quantity.	Value in 1,000 Marks.
	Met. Centners.		Met. Centners.		Met. Centners.	
1892	107,251	52,553	20,818	10,201	25,262	12,378
1893	115,599	53,176	23,032	10,595	19,755	9,087
1894	123,681	53,183	24,970	10,737	23,259	10,001
1895	157,891	63,156	32,579	13,032	32,248	12,899
1896	162 329	64,932	36,030	14,432	26,844	10,738
1897	176,389	67,028	35,730	13,585	30,008	14,823
1898	197,123	71,950	40 072	14,626	42,314	15,415
1899	227,046	74,925	46,478	15,338	49,283	16,263
1900	237,812	77,289	52,765	17,149	51,521	16,744
1901	250,298	79,631	57,994	13,094	51,281	16,410

The export of aniline dyes has increased during the last nine years by nearly 250 per cent., *i.e.*, from 107,251 met. centners in 1892 to 250,298 met. centners in 1901, whereas the values have only increased about 50 per cent., *i.e.*, from 52,500 to 79,600 marks, for prices of aniline dyes have dropped heavily during this period.

The German statistics note the following average prices per met. centner during the last 10 years:—

	Marks.		Marks.
1892	490	1897	380
1893	460	1898	365
1894	430	1899	330
1895	400	1900	325
1896	400	1901	318

The unit prices accordingly have diminished by 172 marks. The United Kingdom and the United States of America have always been the best customers for German aniline dyes. Whereas, however, the total export to the United States rose from 1892—1901 only by 100 per cent. in round figures, the export to the United Kingdom rose in the same period by 279 per cent., from 20,818 to 57,994 met. centners.

It is said that the chemical industry as a whole has least suffered by the recent commercial set-back; the average dividends of the chemical limited companies prove that the difference between dividends to-day and those during the boom is certainly not very great. The 120 limited companies, working with a paid-up capital of 352,653,100 marks, distributed in 1901 a total of 43,376,135 marks by way of dividends; this equals an average dividend of 12·30 per cent., against 12·33 per cent. in 1900 and 13·52 per cent. in 1899.

The development of the traffic in indigo is of interest.

In 1892 the import amounted to 17,435 met. centners, valued at 18,700,000 marks.

The import fluctuated during the following years, and reached in 1896 its highest figures, with 19,739 met. centners, representing a value of 20,700,000 marks. Since then a decrease of import began, which was slow at first, but augmented rapidly:—

Year.	Quantity.	Value in 1,000 Marks.
	Met. Centners.	
1900	5,643	4·0
1901	6,090	4·3
1902	5,267	3·6

Indigo is chiefly imported from British India. After India, the United Kingdom brought the heaviest quantities on the market; some indigo also came from the Dutch

Indies and from Guatemala. Since 1892 the German import values amounted to :—

	Marks.		Marks.
1892	1,075	1897	900
1893	1,150	1898	800
1894	1,200	1899	750
1895	1,200	1900	725
1896	1,050	1901	700

They have thus diminished by 375 marks, *i.e.*, by more than a third.

A portion of the indigo was again exported. From 1892-96 the export fluctuated between 5,810 and 6,580 met. centners. The export was chiefly directed to Austria-Hungary. In May, 1897, after many years of research, synthetic indigo entered into competition, and since then the export has rapidly increased from 5,079 to 9,180, 13,643, 18,728 and 26,725 met. centners, so that the export has quintupled in five years. For 1902 the increase of export is still more considerable, *viz.*, altogether 52,843 met. centners. The total value of exports has risen from 4,800,000 to 25,100,000 marks in 1902, *i.e.*, more than 400 per cent., though the appearance of artificial indigo caused a reduction in prices.

The main customers for indigo last year were the United Kingdom, 3,181 met. centners; Austria-Hungary, 5,727 met. centners; and United States, 7,103 met. centners. Even British India imported synthetic indigo from Germany, viz. :—290 met. centners in 1899, 146 met. centners in 1900, 90 met. centners in 1901, and 419 met. centners in 1902.

Whereas Germany, from 1892—1896, paid for indigo on an average 11,500,000 marks to foreign countries, it paid only 700,000 marks for indigo in 1902 to foreign countries; even this amount will eventually be further reduced, since it has now been conceded that military cloth may be dyed with synthetic indigo. The Badische Anilin und Soda Fabrik alone is said to have produced, during 1900, 1,000,000 marks worth of it.

INDIGO AT KOBÉ (JAPAN).

Foreign Office Annual Series, No. 3046.

The increase in the import of German indigo (artificial) during the past five years has been remarkable, as will be seen by the following figures which show the import for all Japan from the principal indigo producing countries :—

Year.	British India.		Dutch India.		Germany.	
	Quantity.	Value.	Quantity	Value.	Quantity.	Value.
	Lb.	£	Lb.	£	Lb.	£
1898	2,257,678	215,414	58,505	7,435	847	83
1899	1,833,389	215,097	387,507	65,308	17,481	5,297
1900	1,768,453	212,910	560,148	125,762	41,198	11,371
1901	1,036,518	146,268	133,245	86,168	102,278	25,171
1902	942,842	120,872	401,315	79,193	431,088	101,784

It is not due to any falling-off in quality that Indian indigo has lost the position it formerly held, but to the fact that the increased duties which came into force on January 1, 1899, caused consumers to buy more and more of the better sorts. Duty is levied at the rate of 12·953 yen per 100 kin (about 1*l*. 6*s*. 6*d*. per 133⅓ lb.), irrespective of the quantity of indigotin contained, and, much to the disadvantage of vegetable indigos, the German artificial indigo has been passed by the Japanese Customs at the same rate of duty. It is understood that the German artificial indigo made by the Badische Anilin und Soda Fabrik contains about 98 per cent. indigotin, and costs about 5*s*. 6*d*. a lb., whereas Indian indigos, though only costing from a third to a half and analysing about 30—55 per cent. indigotin, have the same duty per lb. to pay.

As India has not acceded to the Anglo-Japanese treaty, Indian indigo will further suffer, as the statutory tariff will be raised from April 1, 1903, to 21·422 yen per 100 kin. Under the most-favoured-nation clause, German and Dutch indigos, protected by the Anglo-Japanese Conventional Tariff, will continue to pay 12·953 yen, so the future for Indian importers is anything but bright. Against the increase in duty, large quantities of Indian indigo are expected to be imported before it comes into force, so that 1903 is not likely to show the falling-off that it otherwise would do.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

MERCERISED COTTON CLOTHS: U.S. CUSTOMS DECISION.

July 22, 1903.

Cotton cloths which had been bleached and subsequently mercerised are dutiable as "bleached cotton cloths," according to count of threads, weight, &c., under the provisions of the tariff of 1897 (pars. 304 to 310). Duty had been assessed at 40 per cent. *ad valorem* as "coloured cotton cloths," on the ground that the mercerising process produced a change of colour sufficient to make a coloured cloth.

—R. W. M.

VI.—COLOURING WOOD, PAPER, Etc.

WALL PAPER TRADE OF GERMANY.

Foreign Office Annual Series, No. 3042.

The British wall paper manufacturers who, until a few years ago, found a good market in Germany, on account of the superior quality of their goods, are of late being more and more ousted from the German wall paper industry which is seriously beginning to assert itself. British manufacturers will have to use every effort to prevent the tota loss of the German market.

The export of German wall paper is steadily increasing so much so that the German manufacturer is becoming keen competitor also in foreign markets, more especially i Holland.

Germany's export of wall paper amounted to :—

Year.	Quantity.	Value.
	Met. Centners.	Marks.
1897	38,930	3,114,000
1898	43,240	3,213,000
1899	47,830	3,587,000
1900	59,480	4,461,000
1901	71,180	5,328,000

The export has accordingly increased during these five years by 83 per cent.; during the year under report there has been a further increase.

The import, on the other hand, which is mainly of French and British make, has receded as follows :—

Year.	Quantity.	Value.
	Met. Centners.	Marks.
1897	4,180	502,000
1898	5,260	631,000
1900	4,040	565,000
1901	3,300	462,000

A comparison of the respective figures shows that the goods mostly exported are of a cheaper kind, and that those imported include the more expensive makes. However the German industry has also greatly improved in the manufacture of the latter; the British manufacturers would do well to pay greater attention to the patterns here in favour. The days when the so-called "British style" was the fashion, more especially for bedrooms, are over; this fashion materially assisted the introduction and development of the recent German style called "Jugend style," though it is not likely that it will last long, for its exaggerations have a tiring effect; it has, however, given many German industries (wall paper, hangings, furniture, &c.) a new impetus, which must prove detrimental to foreign competitors. During the last year the United Kingdom imported from Germany 10·118 met. centners of wall paper.

d exported thereto only 817 met. centners. For the first months the figures are as follows :—

	Quantity.		
	1902.	1901.	1900.
	Met. Centners.	Met. Centners.	Met. Centners.
port	2,514	2,897	3,578
port	65,662	63,154	52,820

VII.—ACIDS, ALKALIS, Etc.

Bromine in Germany.

Foreign Office Annual Series, No. 3042.

he mutual arrangement by which no bromine is to be orted from Germany to the United States, and none is e imported from there, and by which it was intended to p a free hand in both countries as to the price of bromine, latterly been impaired because American bromine arations are said to be now imported *via* the United gdom. Though the price for such was materially lower German prices, the parties affected did not deem it essary to take steps in self defence, as the American nine productions did not comply with the local require- ts as to chemical purity, and could therefore find prac- lly no market for medical purposes. The annual pro- ion of bromine in America is estimated at 550,000 lb., German at 500,000 kilos.

Copper Sulphate in Italy.

Foreign Office Annual Series, No. 3022.

nce the peronospora has affected Italian vines, a large tity of copper sulphate is being used. Copper sul- e of British origin is considered the best suited for the ose, and manufacturers should make any earnest effort crease their trade in this article. In each Italian town is an association whose duty it is to advise on all ers pertaining to agriculture. These associations are d "Caniizi Agrari," and exporters of copper sulphate other chemicals used in agriculture, as well as manu- rers of agricultural machines and manure, would do to communicate with the Secretary, sending him les and price lists.

Salt Competition in Germany; British ——.

Chemist and Druggist, Aug. 8, 1903.

the course of a report issued by the Halle Chamber mmerce it is pointed out that the importation of sh salt perceptibly increased in the German market g 1902. This rivalry was rendered possible (apart the specially-favoured freight conditions and the luction of the British article free of duty) by the lower f production, whilst the exportation of English salt at fit to the producers was further facilitated by the r prices instituted by the German salt mines on the stitution of the salt association or syndicate. In on to foreign competition, a further danger to the an salt mine owners was brought into play by the of certain of the many potash-boring companies were created during the period of prosperity pre- in 1899 and 1900. These particular potash nies, having lost most of their share capital in ative ventures, sought to restore their fortunes at the se of the salt producers by the working of new salt The salt syndicate at once took steps to counteract w danger by cutting prices, and it is determined to ue the contest, which commenced at the end of 1902, er to maintain the market, in which it finds itself severely pressed. As the new German Customs rovides for the imposition of a duty on sea-borne e preference now enjoyed by British salt companies robably cease on the tariff being brought into on.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Cement Industry; Russian ——.

Chamber of Com. J., Aug. 1903.

There are, says a German consular report, near the station Amwrosienska on the Sscinelnikowo to Taganrog railway, rich quarries of 85 per cent. carbonate of lime, which supplies a cement works there, also the material for the factory at Rostow. This factory, which is in French hands, produces at present about 1,000 casks daily, each containing 9 to 10 pood; the annual production may reach 500,000 pood. The machinery is mostly of German origin, the heating boilers are Russian. The average price of a cask is 3·50 roubles. and for larger quantities 3·30 to 3·40. The sales are principally effected for Baku, the cement being used for the naphtha reservoirs, for which purpose it is particularly well adapted on account of its complete impenetrability. The West Caucasian material is worked up in various factories; it is poor in magnesia and clay, but rich in lime. In the year 1902 these factories sold about 850,000 casks, 450,000 of which were acquired by Government and by some of the railways. No exportation took place, and importation has nearly ceased, as Russia can probably already produce more cement than it requires at present. The said various factories (3) are fitted with modern arrangements, possessed of capital, and hold material sufficient to last for decades; they occupy about 1,700 workmen, and work with success.

Asbestos in Siberia.

U.S. Commercial Agent, Vladivostock, May 10, 1903.

A Moscow firm has been granted permission to work asbestos mines not far from the Kutai, an affluent of the Angara. The asbestos layers are found 7 feet from the surface. There are some asbestos mines in the Urals, in European Russia, but the larger part of the asbestos used for insulators in Russia is imported. Judging from the samples, Siberian asbestos is equal to the Canadian product.

X.—METALLURGY.

Ferrosilicon in France.

U.S. Cons. Reps., No. 1713, *Aug.* 3, 1903.

Ferrosilicon manufactured by electrical process is now being shipped regularly in commercial and rapidly increasing quantities from France to the United States. It is being forwarded both from Grenoble, the shipping point nearest the place of manufacture, and Marseilles. During the year ended June 30, 1903, the exports from Marseilles amounted in value to 33,242 dols., as compared with 196 dols. in 1892, and there are evidences of an increasing demand and capacity to satisfy that demand. The concerns principally interested as manufacturers in this enterprise are the Compagnie Electrothermique Keller, Leleux and Co, 3, Rue Vignon, Paris (works at Livret-et-Gavet, Isère); the Compagnie Générale de l'Electro-Chimie, Bozel. Savoie; and the Société Electro-Chimique de la Romonche, Livret-et-Gavet, Isère.

In the French Alps the work of damming streams for the generation of electricity has been going on for about four years with feverish activity, and a region hitherto without important manufacturing enterprises bids fair to become a great producing centre.

Iron and Steel Production; British ——.

Eng. and Mining J., Aug. 1, 1903.

The following are the figures compiled by the British Iron Trade Association for the production of iron and steel in 1902. The supply of iron ore for the British furnaces is shown in the table at top of page 976.

This would indicate an average consumption of 2·33 tons of ore per ton of pig made, or an average of a little under 43 per cent. iron in the ore. The imported ore was higher in iron than that mined in Great Britain.

	1901.	1902.	Changes.
	Tons.	Tons.	Tons.
Ore mined in Great Britain .	12,266,790	13,426,217	I. 1,159,427
Ore imported	5,548,888	6,341,272	I. 792,384
Total	17,815,678	19,767,489	I. 1,951,811

The chief source of the ore imported was Spain, from which country 5,309,733 tons were received. From Greece there were 335,824 tons; Algeria, 215,632; Italy, 182,053; Sweden, 167,083; Newfoundland, 91,617; France, 66,172; Portugal, 17,223. No other country contributed any considerable quantity.

The total import of manganese ore was 233,333 tons, against 192,654 tons in 1901—an increase of 40,679 tons. The chief sources were: Russia, 112,706 tons; India, 43,093; Brazil, 41,986; Turkey, 12,263; Chile, 11,938; Greece, 8,322 tons.

The total production of pig iron in 1902 was 8,517,693 tons, which compares with 7,851,830 tons in 1901, showing an increase of 665,863 tons. In 1900 the output was 8,908 570 tons, and in 1899 it was 9,305,319 tons. The last figure was the highest ever reached. The figures are as follows:—

——	1901.	1902.	Changes.
	Tons.	Tons.	Tons.
Forge and foundry	3,597,994	3,727,294	I. 129,300
Hematite	3,267,684	3,683,148	I. 415,464
Basic	794,787	922,218	I. 127,431
Spiegel and furo	191,365	185,033	D. 6,332
Total	7,851,830	8,517,693	I. 665,863

		Tons.
Pig iron made		8,517,000
Imported as pig		227,000
Imported in other forms		1,244,000
Total supplies		9,988,000
	Tons.	
Exported as pig	1,103,000	
Exported in other forms	3,557,000	
		4,660,000
Home consumption		5,328,000

The number of blast furnaces active in 1902 was 354, showing an average make of 24,061 tons each.

The statistics for wrought, or puddled, iron are not complete. The make of puddled bar was reported at 998,278 tons, against 974,385 tons in 1901, an increase of 23,893 tons. English makers have adhered to wrought iron more than any others, and a large quantity of shapes and plates is made of wrought iron.

The production of steel for the year is reported as follows:—

——	1901.	1902.	Changes.
	Tons.	Tons.	Tons.
Bessemer	1,606,253	1,825,779	I. 219,526
Open-hearth	3,290,791	3,083,288	D. 207,503
Total	4,897,044	4,909,067	I. 12,023

For the first time in several years the figures show an increase in the proportion of bessemer steel. The bessemer, or converter, metal was largely used for rails, of which 903,216 tons were made last year.

The division according to the processes used was as follows, last year:—

——	Acid.	Basic.	Totals.
	Tons.	Tons.	Tons.
Bessemer (converter)	1,157,180	668,599	1,825,779
Open-hearth	2,676,508	406,780	3,083,288
Total	3,833,688	1,075,379	4,909,067

The basic process showed a gain last year, though three-quarters of the steel made in Great Britain last year was acid steel. The small increase in the total steel production last year was a notable point. It indicates, probably, that a larger proportion of pig iron than usual was exported.

PIG IRON PRODUCTION IN THE UNITED STATES.

Eng. and Mining J., Aug. 1, 1903.

The American Iron and Steel Association has receive from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in the first half of 1903; also complete statistics of the stocks of pig iron which were on hand and for sale on June 30 1903.

The production of pig iron in the first half of 1903 was 9,707,367 gross tons, against 8,808,574 tons in the first half of 1902 and 9,012,733 tons in the second half of 1902 The increase in production in the first half of 1903 over the second half of 1902 was 694,634 tons. The unite production of the second half of 1902 and the first half 1903 amounted to 18,720,100 tons.

The production, as classified by the Association, was a follows in the first half of this year, comparison bein made with the first half of 1902:—

——	1902.		1903.	
	Tons.	Per Cent.	Tons.	Per Ce
Foundry and forge irons	2,530,386	28·7	2,912,270	30·0
Bessemer pig	5,105,932	58·0	5,480,619	56·5
Basic pig	1,053,274	11·9	1,203,803	12·4
Spiegeleisen and ferromanganese	118,982	1·4	110,675	1·1
Totals	8,808,574	100·0	9,707,367	100·0

Included in bessemer pig is a production of 89,723 tons low-phosphorus iron, intended for use in the open-heart furnace. The changes, as compared with the first half 1902, were as follows:—

——	Tons.	Per Cen
Foundry and forge irons	I. 381,884	I. 1·3
Bessemer pig.	I. 374,687	D. 1·5
Basic pig	I. 150,529	I. 0·5
Spiegeleisen and ferromanganese	D. 8,307	D. 0·3
Total	I. 898,793	..

The production, classified according to fuel used, was follows for the first half of the current year:—

——	Tons.	Per Ce
Bituminous and coke (chiefly coke)	8,401,001	86·6
Mixed anthracite and coke..	1,046,161	10·7
Anthracite alone	26,261	0·3
Mixed charcoal and coke	927	..
Charcoal	232,717	2·4
Totals	9,707,367	100·0

The whole number of furnaces in blast on June 30, 190 was 320, against 307 on Dec. 31, 1902, and 286 on June 3 1902. The number idle on June 30, 1903, was 101. the active furnaces on June 30, 1903, 226 used bitumino fuel, 53 used anthracite coal and coke mixed, 4 us anthracite coal alone, and 37 used charcoal alone.

On June 30 there were 32 blast furnaces in course erection in the United States, of which 30 will use co for fuel when completed and two will use anthracite co and coke mixed. About one-half of these furnaces will completed and blown in before the close of 1903, but t remainder will not be ready for blast until 1904 or 19 In addition to the new furnaces enumerated above, o coke furnace in Virginia, upon which work was susp several years ago, is to be completed in the near future, and several coke furnaces are projected. No new charcoal furnaces were being built on June 30, but several charcoal urnaces which had been idle for a long time were about to e revived.

Aluminium Production in the United States in 1902.

Bd. of Trade J., Aug. 6, 1903.

The report on the production of aluminium in 1902, ublished in the *Mineral Resources of the United States*, ives the following figures for the last five years :—

	Lb.
1898	5,200,000
1899	6,500,000
1900	7,150,000
1901	7,150,000
1902	7,300,000

The report states that aluminium is used mainly for the ransmission of electric currents, although a large proortion of the output is manufactured into articles for omestic and culinary use. It is also utilised for the contruction of parts of machines and apparatus which require ghtness rather than great strength, and in the manufacture f alloys. Two other uses of growing importance are for thographic work, the metal being used as a substitute r stone and zinc, and for the production of intense heat y the combustion of the metal in powder.

Tin Industry of the Federated Malay States.

Bd. of Trade J., Aug. 13, 1903.

In the annual report for 1902 of the Resident-General in e Federated Malay States, the figures of the export of tin d tin ore for that year (tin exported in the form of ore ing taken at 68 per cent. of the gross weight of the ore) e given as 780,872 pikuls (46,480 tons). These figures ow a decrease of 4,375 pikuls (260 tons) as compared ith the preceding year. The average sterling price per n was 117*l*. for 1902, and 108*l*. 15*s*. for 1901, the respective llar figures per pikul being 79 dols. and 67·56 dols. aking the sterling average prices above mentioned, the lue of tin and tin ore exported in 1902 was 5,438,160*l*., d in 1901, 5,082,975*l*.

The following table gives figures for each State :—

State.	1901.	1902.
	Pikuls.	Pikuls.
rak	385,066	405,878
langor	302,598	278,368
gri Sembilan	75,243	73,512
hang	22,340	23,114
	785,247	780,872

Perak shows an increased output, its total exceeding any rmer record for that State. This increase, says the report, likely to continue ; the methods of mining are continually ing improved, and recourse to the use of machinery is coming more and more general.

The Batang Padang district, now traversed by the lway, should shortly assume high rank as a tin-producing trict.

XIII. B.—RESINS, VARNISHES, Etc.

Linoleum Industry of Germany.

Foreign Office Annual Series, No. 3042.

The linoleum industry has experienced a bad year, the ef cause of which was over-production. In 1898 there isted in Germany only four factories, with an invested pital of 15,000,000 marks. In 1901 their number had en to nine, with a capital of 35,000,000 marks invested, turnover during the same period only rising from 000,000 to 16,000,000 marks. Two factories were comled to stop work, and the remaining seven factories sed the stock in hand during 12 months by 1,450,000 rks, to the total value of 11,770,000 marks. Only one factory was able to raise the dividend from 11¼ to 12½ per cent. In another case the dividend fell from 5 to 4 per cent. Among the remaining five factories, of which the year before one had paid 13 per cent. and the others 5 per cent., some distributed no dividends at all, while the others recorded actual losses on the year's working.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Trade of Uganda.

Ch. of Commerce J., Aug. 1903.

Replying to a question on July 17 as to the terms and conditions granted to the Italian Colonial Trading Company and the Victoria Nyanza Agency respectively for the collection of rubber in the Uganda Protectorate, Viscount Cranborne said that the text of the concession had not been received. The general terms and conditions were given in the Return laid in Africa No. 7, 1903. The main conditions of the agreement with the Italian company were reported by his Majesty's Commissioner to be—that it was for five years ; that the permit was held subject to any rights of the natives to forest produce ; that the permit carried no rights other than the collection of rubber ; that European supervision was to be employed, and only trained collectors allowed to collect rubber ; that any labour employed within the area of the permit was to be paid for in rupees, and not in shells or food ; that the company planted 20,000 vines during the period of the permit in areas to be approved by the collector ; that at the expiration of the permit the conditions for a fresh permit be considered between the Administration and the company. The agreement with the Victoria Nyanza Agency was also for five years, the firm undertaking to plant 14,000 rubber vines during the period of the permit.

Rubber Production of Brazil.

U.S. Cons. Rep., No. 1714, *Aug.* 4, 1903.

The rubber-crop year for the season of 1902–3 closed June 30 under very satisfactory conditions. Estimates and preparations are now being made for the new season just begun. The crop of 1901–2 was the largest ever produced —29,998 tons. The crop of the season just closed was 29,890, a decrease of only 108 tons, or less than 1 per cent. This is especially satisfactory to the trade. Of last season's crop Europe took 15,261 tons and the United States 14,566 tons, an increase in shipments to the United States over the previous year of 510 tons, while the shipments to Europe fell off correspondingly.

The product was shipped as follows :—

From	To Europe.	To United States.
	Lb.	Lb.
Manaos	16,619,381	18,425,657
Para	13,422,609	13,686,142
Iquitos	3,578,734	..
Serpa	22,583	..
Total	33,643,312	32,111,799

The stock on hand June 30 was 129 tons.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Milk Albumin: U.S. Customs Decision.

July 8, 1903.

An article obtained from milk used as a binder in compressing granulated cork, and similar to casein, has been decided to be free of duty under paragraph 468 as "albumin not specially provided for." This decision follows one by the United States Circuit Court on casein, which was held to be free of duty under the above paragraph on the ground that it was an albumin in common speech, though not so in technical chemical language. The Government having acquiesced in this decision, it is now final.—R. W. M.

LEATHER IN THE UNITED STATES OF AMERICA.

Bd. of Trade J., Aug. 6, 1903.

As there is a good demand for certain classes of imported leather, the following figures may be of interest.

Imports of leather into the United States for the ten months ended 30th April:—

——	1901.	1902.	1903.
	Dols	Dols	Dols.
Band or belting, and sole leather..	29,767	16,713	53,905
Calfskins, tanned or tanned and dressed, and patent, enamelled and japanned....................	45,950	125,422	748,523
Skins of morocco	2,380,984	1,630,617	1,830,878
Upper leather, dressed, and skins dressed and finished............	2,342,714	2,477,748	1,603,081
Total .... Dols,	4,799,415	4,280,500	4,245,387

If British manufacturers were prepared to supply a patent leather to compete with the best German, a good trade might be done.

XV.—MANURES, Etc.

PHOSPHATE DEPOSITS AT SHIMA (JAPAN).

Bd. of Trade J., Aug. 6, 1903

The Board of Trade have received a *precis* of a report, drawn up in the Fertiliser Surveyor Office, Tokyo, on the subject of the phosphate deposits at Shima, in the Prefecture of Mie.

The deposits in question are found near the village of Kamo, near the town of Toba, and were discovered in the course of digging the ore in a manganese mine. The quality of the deposits varies, but would seem to contain on an average about 10 per cent. of phosphoric acid. As far as can be at present ascertained the deposits show signs of existing in considerable quantities. The mine, however, is absolutely undeveloped, and will not be a really working concern for some time to come. The cost of digging and transport (per ton) under present circumstances is given as 3·45 yen, and as the mine is not more than 1½ or 1¾ miles from the village of Funatsu on Toba Bay, the phosphate can easily be carried so far by cart and thence to its destination by sea.

The questions of the satisfactory separation of the manganese, &c., from the phosphate, and the manufacture of the latter into phosphate or double superphosphate of lime for commercial purposes are not yet solved.

XVI.—SUGAR, STARCH, Etc.

SUGAR CONVENTION REGULATIONS.

(From a Supplement to the *London Gazette*.)

At the Court at Buckingham Palace, the 11th day of August, 1903. Present—the King's most Excellent Majesty in Council.

Whereas by the Sugar Convention Act, 1903, after reciting that by Article VII. of the Convention, signed on the 5th day of March, 1902, in relation to sugar, provision was made for the establishment of a permanent commission (in the Act referred to as the Permanent Commission) charged with watching the execution of the provisions of the convention, it is enacted that where it is reported by the permanent commission that any direct or indirect bounty is granted in any foreign country on the production or export of sugars His Majesty may, by Order in Council, make a prohibition Order, that is to say an Order prohibiting sugar, from that foreign country, to be imported or brought into the United Kingdom, subject to any provision which might be made by Parliament in lieu of such prohibition to impose a special duty on such sugar in accordance with the convention; and that, while a prohibition Order is in force, the laws relating to the Customs shall apply as if the sugar in respect of which the Order is made were specified, with exception as to transit, in the table of prohibitions and restrictions inwards contained in section 42 of the Customs Consolidation Act, 1876. And it was also enacted that Hi Majesty might, similarly, make such regulations as shoul appear to him necessary in relation to any such Order, an in particular require the origin of all sugar imported o brought into the United Kingdom, whether in transit o otherwise, to be proved by such certificate or other evidence as might be provided in the Order, but no Order made wa to apply to molasses.

And whereas it appears from the findings of the permanent commission, as contained in Command Paper 1632 presented to Parliament, that the said permanent commission has reported that a bounty on the exportation of sugar is granted in Denmark, Russia, and the Argentine Republic

Now, therefore, His Majesty, in exercise of the power vested in him by the said first recited Act, by and with th advice of his Privy Council, is pleased to order, and it i hereby ordered:—

That, from and after the 1st day of September next, an subject to any such provision by Parliament as hereinbefor treated, all sugar from Denmark, Russia, and the Argentin Republic (not including molasses and sugar-sweetene products) shall (except in transit) be prohibited to be imported or brought into the United Kingdom; and that i relation to this Order the regulations in the Schedule heret annexed are to be deemed as made and prescribed.

A. W. FITZ ROY.

Schedule to which the foregoing Order refers.

Regulation I.—All sugar (other than molasses an sugar-sweetened products) imported or brought into th United Kingdom from any place outside the same, shall b accompanied by such evidence of origin as hereinafte required; and all such sugar imported or brought into th United Kingdom not accompanied by such evidence shal be deemed to be so imported or brought in contrary to restriction contained in section 42 of the Customs Consolidation Act, 1876, and subject as hereinafter provided, shal be dealt with accordingly, as if the same were good enumerated and described in the table to the said section.

Regulation II.—The evidence of origin required shall b in accordance with that laid down by the Permanent Commission in certain Articles agreed to by them for du observance of the Convention, so far as the same ar applicable to the United Kingdom; that is to say:—

All sugar (other than molasses and sugar-sweetene products) shall be accompanied by a certificate of origi indicating (*a*) the kind and quantity of the sugar; (*b*) th kind, number, and marks of the packages; (*c*) the countr of production, of origin, or of manufacture, and th country of destination of the goods; and (*d*) the mode o carriage by land or water.

Regulation III.—The certificate must be signed, an issued, by the fiscal authority having jurisdiction in th country of production, of despatch, or of transformation such fiscal authority being duly empowered for that purpo by the Government of the State.

Regulation IV.—When the country of origin of an sugar the subject of a certificate is a State not party t the Convention, the certificate must, in addition to th particulars required above, state that the goods are derive from a factory which does not work sugar coming fron either Russia, Denmark, or the Argentine Republic; an any such certificate must, as a guarantee of due signatur and issue, be viséd by the proper British Consul or Vice Consul.

Regulation V.—No certificate is to be deemed vali after the expiry of 12 calendar months from the date of i issue, or such less time (if any) as may be mentione in the certificate by the fiscal authority issuing the same.

Regulation VI.—Inasmuch as it is possible that suga may occasionally reach the United Kingdom before th arrival of the certificate of origin relating to the same, an it would be inconvenient and expensive to importers i such sugar were not delivered from Customs charge u ti the arrival of the certificates, it shall be competent for th Commissioners of Customs to authorise the delivery such sugar, on the security of a deposit of such amoun or of a bond in such penalty as they may think fit, fo the due production of the necessary certificate within prescribed period, provided that they see no reason for suspecting that the sugar emanates from a prohibited country.

At the Court at Buckingham Palace, the 11th day of August, 1903. Present: The King's Most Excellent Majesty in Council.

Whereas, by the Sugar Convention Act, 1903, it is in pursuance of a provision to that effect in the Convention enacted that His Majesty may, by Order in Council, declare that every sugar factory and sugar refinery and factory for the extraction of sugar from molasses in the United Kingdom shall be subject to the supervision either of the Commissioners of Customs or of the Commissioners of Inland Revenue.

Now, therefore, His Majesty, in exercise of the said power, and by and with the advice of His Privy Council, is pleased to order, and it is hereby ordered:

That, from and after the 1st day of September next, inclusive, every sugar factory and sugar refinery and factory for the extraction of sugar from molasses in the United Kingdom shall be under the supervision either of the Commissioners of Customs or of the Commissioners of Inland Revenue.

A. W. FitzRoy.

Sugar Cultivation in Germany.

Bd. of Trade J., Aug. 6, 1903.

In virtue of a decision of the Bundesrath of 14th June, 1895, returns are made by proprietors or managers of beet-sugar factories of the area planted by them with sugar beets. The following is a summary of these returns as published in the *Reichsanzeiger*. The figures stated for the year 1903 relate to factories intending to work up sugar beets during the 1903–04 sugar campaign, and the figures for 1902 to those factories working during the 1902–03 campaign:—

——	1902.	1903.
Number of sugar factories using beets ... No.	392	385
Area of beet planted for factories... Hectares	429,341	415,856

Sugar Production.

According to statisties published in the *Reichsanzeiger*, he quantity of raw sugar produced in Germany during the eriod from 1st August to 30th June last, being the first 1 months of the 1902–03 sugar campaign, was 1,503,065 netric tons,[*] as compared with 2,020,725 metric tons proiuced during the corresponding period of the previous ugar campaign. The quantity of refined sugar produced icreased from 1,248,463 metric tons during the period ugust, 1901, to June, 1902, to 1,263,185 metric tons uring the period August, 1902, to June, 1903. The total igar output in Germany during the period from 1st August 902, to 30th June, 1903, reduced to terms of raw sugar, mounted to 1,733,660 metric tons, as compared with 269,895 metric tons in the previous campaign.

Sugar Outlets in Germany.

Foreign Office Annual Series, No. 3042.

In January, 1903, a committee of the "Union of the erman Sugar Industries" met delegates from the Imperial overnment in connection with the manufacture of marmaides and jams, which in Germany, in spite of an abundance fruit and sugar, has never prospered. A commission, companied by a representative of the Government, visited e such German factories during last autumn which were und to be using glucose for the preparation of jams and armalades. The manufacturers pointed out that they uld not compete with the British makers on account of e high excise duties on sugar. Yet it is reported that a w factory is being erected on a large scale with the object manufacturing marmalades according to the British thods; an already existing factory has consented to manufacture "English" marmalades, and to submit them to the laboratories of the above-mentioned union for chemical examination. A laboratory for research in this matter is also to be added to a school already existing. The delegates further demanded that the excise duties be remitted on such sugar as is being used for the manufacture of marmalades, or, as an alternative, that glucose too should become subject to an excise.

Sugar Beets; Dried ——, as Food for Farm Animals.

U.S. Cons. Reps., No. 1707, *July* 27, 1903.

According to an article in the *Frankfurter Zeitung* of June 29, 1903, in the drying of sugar beets—a process which even under the most unfavourable conditions has proved profitable—German agriculture has found a means to prevent the over production of sugar.

According to the *Blätter für Zuckerrübenbau*, the Dingelbe Sugar Factory, near Hildesheim, in the province of Hanover, dried 30,000 centners of beets in March, 1901, and from the crop of 1902 the frozen beets from 60 morgen (38 acres) of land by means of a Petry and Hecking drum apparatus. One centner of dried beets was produced from 4½ centners of chopped raw beets. The dried beets were sold at a fixed price of M. 5 per centner. The cost of drying was M. 1·40, so that at M. 5 per centnerof dried beets each centner of raw material brought 80 pfennigs. Other experimenters have received M. 6 which means M. 1·02 for each centner of raw beets. Prof. Lehmann, of Göttingen, claims, however, that in comparison with wheat bran and maize the nutritive value of dried beets is M. 7·30 or M. 1·31 per centner of raw beets used. Although M. 7·30 has not yet been obtained for the article, those farmers who, instead of selling their dried beets, use them for feed practically obtain this price in full through not using the equivalent amount of dearer materials. To this price of M. 1·31, more over, must be added the value of the leaves and heads, which, when used as green fodder, are estimated to be worth 40 marks per morgen (0·63 acre). The surplus of leaves and heads not used as green feed may also be dried.

At Dingelbe no difficulty whatever has been encountered in keeping dried beets which had been promptly sacked and stored.

As soon as a price can be obtained for dried beets which is equivalent to that fixed for other feed materials, they will probably at once become an important article of trade. As its nutritive value makes it a suitable substitute for maize, the importation of the latter can then be correspondingly lessened. Thus, in future, German farmers can, at times when sugar prices are low, utilize their crops more profitably by drying the beets for use as cattle feed.

Sugar Imported from Holland; Indian Countervailing Duty on ——.

Indian Customs Circular, No. 13, 1903; *through Bd. of Trade J., July* 30, 1903.

The Government of India have decided, in consequence of certain difficulties having arisen as to the system of levying countervailing duties on the net bounty paid on Dutch sugar, that, in future, duty shall be levied in the first instance at the full rate of bounty allowed under the Dutch law, and that as soon as the net bounty actually paid is ascertained and declared, a refund shall be allowed to the importers of the difference between the duties levied and the net bounties received.

Sugar Law in Russia; New ——,

U.S. Cons. Rep., July 16, 1903.

The new sugar law, sanctioned by His Majesty this 12th/25th day of May, 1903, has just been published by the Messenger of Government.

The principal changes which have been made by the enactment of this law are—

1. The yearly production for the home market has been increased from 60,000 poods (2,166,720 lb.) for each mill to 80,000 poods (2,888,960 lb.).

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[*] *Note.*—Metric ton = 1,000 kilos. = 2,204 lb. avoirdupois.

2. An increase of the home consumption is introduced by a measure of denaturalisation—in using residuum for feeding cattle and for technical purposes. This enactment is made for the term of three years.

SUGAR AT YOKOHAMA (JAPAN) IN 1902.

Foreign Office Annual Series, No. 3037.

The year 1902 opened with heavy accumulated stocks of refined sugars, chiefly German, imported in the previous year in order to escape the heavy consumption or excise tax, which came into operation on October 1, 1901, and it was not until towards the latter end of the year that these were worked off, the market in the meantime being characterised by general dulness, attended by a low range of prices. There were some little recovery towards the close of the year, but the year taken as a whole was a very bad one both for foreign imported and native refined sugars. The production of the latter is, however, gradually increasing, and the Japanese refineries are now taking a prominent part in supplying the needs of the country.

The import of both white refined and brown sugars was much restricted as compared with 1901, although figures of browns were to some extent maintained by importations for the native refineries.

XVII.—BREWING, WINES, SPIRITS, Etc.

BREWING FROM RICE IN U.S.A.

Brewing is an industry of the greatest importance in St. Louis, the capital invested in it amounting to upwards of £5,000,000.

In the manufacture of beer the breweries consume considerable quantities of imported broken rice. It comes chiefly from India by way of Hamburg, and is carried, presumably, in German vessels. This is a trade which would seem worth looking after by British shippers.

Over 70,000 tons of rice, rice-flour, and broken rice are imported annually into the United States, of which about 50 per cent. is broken rice. The quantity of rice-flour and broken rice imported has increased from a little over 1,000 tons per month in 1900 to over 3,000 tons per month this year.

ARGOLS AT LECCE (ITALY).

Foreign Office Annual Series, No. 3035.

The production of argols and tartaric acid appears to have been approximately 600 tons in 1902; of these have been traced the shipment of 141 tons to Austria-Hungary, 23 tons to Russia, 170 tons to France, and 111 tons to the United Kingdom, making a total of 445 tons.

Wine-lees were exported on a considerable scale during 1902, 7,258 tons having been shipped (principally from Gallipoli) to Austria-Hungary, 26 tons to Messina, 25 tons to Bari, and 10 tons to Naples—total, 7,319 tons. It is understood that this article, which is called locally "Vinaccia," is rendered by chemical treatment a useful and valuable product. An establishment is in process of erection at Brindisi for the chemical treatment of wine bye-products such as this, so that in future it may cease to be so large an article of export.

XVIII. A.—FOODS.

DRIED FRUIT IMPORTED INTO GERMANY; SULPHURING OF——.

Foreign Office Annual Series, No. 3042.

In 1902 foreign preserved fruit has been seized in a number of German cities on the charge of being unfit for consumption owing to its high percentage of sulphurous acid. This measure was applied to dried apples, pears, peaches, apricots, and plums. Those interested in this trade deem themselves injured by such a summary proceeding on the part of the authorities; injured not only by the loss of the goods already imported, but also by the difficulties thus raised in the dried fruit trade. They point out that for long past sulphurous acid has been used to preserve articles of food on a large scale, and they desire the Imperial Sanitary Board to fix a maximum percentage of sulphurous acid which shall be permissible in such articles. In th recent confiscations of dried fruit no regard was paid to th question whether the percentage of sulphurous acid wa sufficiently large to prove injurious to health; the fact tha sulphurous acid was found to have been applied to the drie fruit at all was deemed sufficient to prohibit its sale.

XVIII. B.—SANITATION.

"ACAPRIN": U.S. CUSTOMS DECISION.

July 9, 1903.

A substance of the above name made from cresylic aci and sodium sulphite and hyposulphite, and used for th treatment of mange and scab in sheep, has been decided t be free of duty under paragraph 657 of the Tariff Act 1897, as "sheep dip."—R. W. M.

INJURY TO HEALTH, &c., OF WORKPEOPLE IN GERMAN

Chem. Ind., July 15, 1903.

The number of accidents occurring in 1902 was 8,42 almost exactly the same as in the previous year, but the were fewer fatal cases, 95 instead of 104, and few that required compensation, 1,244 as against 1,273. the various causes, that which was responsible for th greatest number of accidents was the action of hot m terials and dangerous chemicals, including molten me gases and vapours. The number of accidents under th heading was 1,199, causing injury to 165 persons, of who 34 died. There were 48 accidents with explosives, injuri 27 persons, of whom 14 were killed. The other misha were due more or less to the machinery and applianc used. In most cases the accidents were caused by th carelessness of the workmen, who were often acting direct contrary to the regulations. In some instances the failu of the safety arrangements was responsible. Only a fe accidents were to be ascribed to unavoidable mischance.

XIX.—PAPER, PASTEBOARD, Etc.

WOOD PULP IN NORWAY IN 1902.

Foreign Office Annual Series, No. 3040.

There was a large increase in the production mechanical pulp, some large new mills having been erecte The market was not satisfactory, owing to increased pr duction, while there was a decreased consumption. T total quantity exported from the whole country, and fro Christiania alone, in 1902 compared with the two previo years was:—

Year.	Whole of Norway.		From Christiania.	
	Dry.	Wet.	Dry.	Wet.
	Tons.	Tons.	Tons.	Tons.
1902	20,007	341,653	6,819	31 465
1901	19,121	299,356	6,695	35,957
1900	21,546	301,545	6,670	38,052

The total value of the export of this article in 1902 estimated at about 732,800*l*., being some 33,000*l*. more th in 1901.

The manufacturers of chemical pulp have been work under the same unsatisfactory conditions as the man facturers of the mechanical pulp. Three mills have be out of work for a great part of the year. Prices declin throughout, without almost any check. The quanti exported amounted to 100,443 tons dry and 13,713 to wet, a very large increase over the two previous years. this quantity, Christiania exported 29,696 tons dry a 4,292 tons wet. The value of the export for the wh kingdom corresponded almost exactly with the estimat value given of the mechanical pulp, both for 1902 a 1901. The bulk of this production goes to the Unit Kingdom. In the five years 1897—1901 the quantity pulp of both kinds exported has risen from 302,359 to of the value of 994,000*l*., to 382,846 tons of the value 1,249,366*l*. These figures do not include the Swedish pu exported over Norway.

The slack times affected the consumption of wrapping per, and German paper makers rendered competition ore acute, as they had, through over-production, to export hat they could previously sell in their own home markets. ie Norwegian mills have, however, been able to keep going ll time. Randsfjord Papirfabrik, which was burnt down 1901, has been rebuilt and started. Moss Cellulosefabrik increasing production, and at Granfos Papirfabrik alteraons are being carried out for the same purpose. The ion Company has started a new pulp mill, which will anufacture sufficient wood pulp for its own requirements. the Ranheim Cellulose and Papirfabrik, the manufacture cellulose has been reduced to the extent of its needs for production of paper. The quantity of paper exported about 52 720 tons (of which the United Kingdom takes ,471 tons) of all descriptions, of the estimated value of 1,077*l.* The principal centres of the export of this icle are Skien, Drammen, Christiania, Christiansand, psborg, Brevik, Porsgrund and Trondhjem; and the gest customers next to the United Kingdom, but to a ch less extent, are Germany and Holland.

WOOD PULP AT YOKOHAMA (JAPAN).

Foreign Office Annual Series, No. 3037.

Wood pulp first figured in the Customs returns in 1898, l, though the import has not grown to large dimensions, 36 tons were shipped to Japan in 1902, of which 1,366 s were landed at Yokohama. The duty per 133 lb. is 2 sen ($8\frac{1}{2}$*d.* approximately). The manufacture of pulp-de paper is growing largely, with the result that the nand may advance for some years yet; but the material n the country, and only proper methods of working and nsport are needed to obtain a local supply. As an ance it may be mentioned that the Oji Papermaking npany, near the capital, which as recently as 1900 orted from abroad, has now set up a mill in the wooded ricts and manufactures its own pulp, both chemical and hanical.

he chief foreign supplies come from Germany and rway. Canada only imported 313 tons in 1902—figures ch should be capable of great expansion if attention e given to the matter.

XX.—FINE CHEMICALS, Etc.

OIL OF PETIT GRAIN IN PARAGUAY.

U.S. Cons. Reps. No. 1701, *July* 20, 1903.

he industry of making essence from orange leaves dates k more than 150 years, when trees were planted by priests for essence making. To-day they form immense sts, which are full of small establishments for extracting nce. The natives look upon essence of orange as a ing ointment. They apply it to wounds and cuts, aring that it permeates every part of the flesh, curing diseased parts very quickly. They also say that it is c hair tonic. The orange peel is prepared for shipment used for the purpose of making bitters, marmalades, The essence is shipped in sealed cans, packed in strong len boxes. The law of this country grants free exporta- to "petit grain" manufactures. The quality of the ice seems to be very good, and most of it is shipped to ce.

XXIII.—ANALYTICAL CHEMISTRY.

THE GOVERNMENT LABORATORY IN 1902–3.

e report of the Principal Chemist (T. E. Thorpe, C.B., S.) upon the work of the Government Laboratory for year ended March 31, 1903, has been published as a amentary paper [Cd. 1680]. It deals with a great ty of subjects, the advice of the laboratory being ently asked for by most Government departments. ork may be divided into two main branches—(1) that nnection with the revenue departments, and (2) that nnection with other departments. As regards the ms, the work of the year was much increased by the imposition of the corn and grain duties. Dr. Thorpe says:—

The total number of analyses and tests made in this laboratory during the past year was 61,442. Although this is numerically less than in the preceding year, the amount of work involved was greater, since the articles submitted for test under the corn and grain duties did not lend themselves so readily to classification under fixed rates of duty as did the sugared goods, many of which were thus disposed of last year without actual test.

The articles examined in the Customs Laboratory may be conveniently classified as follows:—

A. Goods liable to spirit duty:—

Beer, spirits, wine, preparations containing, or made with, spirit.

B. Dry goods:—

Chicory, coffee, cocoa, dried fruit, tea, tobacco.

C. Saccharin substances. (1) Imports, (2) exports. Sugar, molasses, glucose, saccharin, and composite goods containing them.

D. Cereal products and articles made therefrom:—(1) Imports, (2) exports.

E. Coal and fuel:—Exports only.

F. Hydrometers and gauging instruments.

G. Goods tested at the outports, and re-tested at the Customs Laboratory.

The descriptions of imports as given in the merchants' entries are often very erratic, and give no clue whatever to the real nature of the goods. For example—crushed bones were entered as "semolina," formaldehyde as "acetic acid," fruit juice as "tinned fish," gingerbread as "paints," peas as "cabbage seeds" and "bulbs," sodium peroxide as "fancy goods," varnish as "iron goods," whilst "machinery" and "razor strops" turned out to be tobacco fumigating powder and sugar-coated pills respectively.

A great number of goods liable, or supposed to be liable, to spirit duty were examined during the year, and many other classes of articles were also submitted. As regards sugar, the report says:—"Sugar, both imported and exported, is now tested locally by officers instructed in the use of the polariscope, at the following ports as well as in London:—Bristol, Glasgow, Greenock, Leith, Liverpool, and Southampton; and at Liverpool imported molasses also are tested locally by officers specially instructed for this purpose at the Customs Laboratory. In the case of both sugar and molasses, the local tests are checked by the selection of certain of the samples for retest in the Central Laboratory. The result of these retests proves that the testing at the outports is, in general, very satisfactory.

The "rendement" or theoretical yield of crystallizable sugar has been determined in many cases with a view to the comparison with the present scale of sugar duties, which is based upon this principle, and the results of these tests, which are still being continued, will be the subject of a special report.

Glucose being a tariff article and caramel usually made from it having a fixed rate of duty is not regularly sampled for test, the few samples received being only doubtful cases, improperly or insufficiently described on entry and sent for opinion as to correct rating. The imposition of a duty on starch as well as upon cereals from which it is usually commercially derived necessitated an increase in the duty on solid and liquid glucose manufactured from starch. This in turn caused a rise in the duty on caramel and other imported articles made from glucose, the rates on which had therefore to be revised.

Saccharin, owing to the heavy duty of 1*l.* per lb. imposed thereon, and the convenience with which it can be transported, presents great temptations to the smuggler, whose ingenuity has been exercised in a variety of ways to defraud the Revenue.

The most notorious case was that of Kramer, tried at the High Court of Justice in February last.

The defendant, after hearing the case stated by the Attorney-General, pleaded guilty, and was fined 9,300*l.*

Preparations consisting partly of saccharin are charged at the full saccharin rate of duty. Of 657 samples sent to the laboratory as being suspected to contain saccharin, 60 were found to be dutiable and 597 free, but in addition to these the laboratory officers find it necessary to test a very large number of the ordinary samples for the presence of this substance, as it has been found surreptitiously admixed with the most unlikely materials with the view of evading duty.

Besides the saccharin smuggling case above referred to, laboratory officers have been called to give evidence in a case of falsification of a Customs document, and in two cases of the illegal sale of sweetened tobacco.

The increase in the amount and variety of the work thrown upon the laboratory by the imposition of the Corn Duties in April, 1902, was due to the fact that duty is charged not only upon the raw grain or flour, but also upon the numerous manufactured products derived from cereals and used both for food and for industrial purposes.

The distinction between flour or meal and the offals or inferior products of milling was a question difficult of satisfactory solution. Its importance to the revenue and to the merchant lies in the fact that the duty on the meal is 5*d.* per cwt., whilst that on the offals was reduced to 1½*d.* per cwt., but there is in most cases no distinct line of demarcation between them, and the different grains yield different qualities of offals. It was necessary, however, to decide upon some definition of "offal" which would be applicable to all dutiable grains and be fair alike to the revenue and to the trade. A *maximum* limit of 50 per cent. of starch was adopted as the most generally applicable standard for offals, and this as determined by the official method of analysis and accepted by the leading analysts to the trade has worked very satisfactorily—the greater majority of *bonâ-fide* feeding stuffs falling into the category of "offals," and only those secondary milled products which from their high quality were fairly liable to the higher rate as flour or meal being so charged.

The number of analyses and examinations made in the Excise Branch of the Government Laboratory during the year ended 31st March, 1903, amounted to 83,370, or 2,949 more than in the preceding year. The increase is principally in the samples examined for revenue purposes, but is also largely due to the numerous instances in which it is now deemed necessary to ascertain that materials used in the brewing of beer are not seriously contaminated with arsenic.

Eleven hundred and seventy-three samples of beer, wort, and brewing materials were tested for the presence of arsenic, the great majority of which were either quite free from that impurity or contained only traces; but in 44 instances the amount was so notable that the brewers were informed in the case of materials that they should not be used, and in the case of wort or beer that it should not be sent into consumption. The largest quantity of arsenious oxide found was: in malt, 1/50th of a grain per pound; in glucose, 1/40th of a grain per pound; in wort, 1/36th of a grain per gallon; and in water-softening material, 7/10ths of a grain per gallon.

In connection with one of the samples of wort containing 1/36th of a grain of arsenious oxide per gallon, a sample of a substitute for hops sold as "Hop Compo" was forwarded for examination, and found to contain not only 1/4th of a grain of arsenious oxide per pound, but also 35 grains of oxide of antimony per pound. The Commissioners of Inland Revenue at once directed an inquiry to be made into the origin of the "Hop Compo," and an inspector, in conjunction with the local medical officer of health, elicited that it consisted of hops, chiretta, and tannic acid, and had been made by a druggist in the Midlands. This druggist does a large business in veterinary medicines, one of which is a horse powder containing a considerable proportion of oxide of antimony, and it transpired that some of the vessels used in making the horse-powder had also been used in making "Hop Compo." Although it was alleged that the vessels had been cleaned between the two operations, there can be little doubt that in this way the "Hop Compo" had become contaminated with oxide of antimony containing traces of arsenic. No "Hop Compo" was found in stock, and there is no reason to doubt the statements that its sale was v small, and that only 2 lb. had been made at the time of sale to the brewer in question.

Details as to the action taken by the Government Lab tory, by direction of the Commissioners of Inland Reven to prevent the use of material containing arsenic in the ma facture of beer, have been brought to the knowledge of Royal Commission by the chairman of the Board.

The Royal Commission on Arsenical Poisoning, in th first report, advised that the Board of Inland Reve should possess and should exercise powers to specify detail individual ingredients of beer which are liable, fr their origin or mode of preparation, to be contaminated arsenic, to prescribe for every such ingredient, and for different materials used in their preparation, an adequ test which should ensure their freedom from arsenic, an prohibit, under penalty, the use in a brewery of any mate which infringes the prescribed test.

With a view to carrying into effect the above recomme ation, the Board of Inland Revenue, with the approval my Lords, decided to appoint a small committee to ad them as to the tests that might properly be described the several ingredients that may be held to be liabl contamination. The committee was constituted as follows T. E. Thorpe, Esq., C.B., F.R.S., Principal of the Gov ment Laboratory (chairman); Professor W. A. Til D.Sc., F.R.S.; Professor H. B. Dixon, M.A., F.R Graham Aldous, Esq., John Pattinson, Esq., F.I.C., a Mr. T. J. Cheater, of the Government Laboratory, secretary.

This committee has reported to the Board of Inl Revenue, and their report has been laid before the R Commission on Arsenical Poisoning by the Chairman of Board.

The investigations undertaken for the Home Office h most largely consisted of the examination of pottery gla and of other substances liable to contain lead. Fourtee such samples (against 55 in the previous 12 months) w submitted by pottery manufacturers, and were exami either as to the total amount of lead which was prese the glaze or glaze-making material, or as to the proport of lead present in the soluble condition as defined in Home Office regulations. The remainder of these sam were taken by the Home Office inspectors from the w of manufacturers claiming exemption under the H Office rules—(1) as users of leadless glaze, or (2) as employing glazes in which the lead present was al wholly in the insoluble condition. A complete staten can only be furnished by the Chief Inspector of Facto as to the progress made in the direction of securing t pottery shall be produced by the use either of lead material or of material in which the lead present shall in such a state of combination that in consequence of insolubility there is little chance of its injuring the he of the workpeople employed in the manufacture. adjourned arbitration proceedings with reference to rules to be ultimately enforced in the industry will sho be resumed.

SCIENTIFIC APPARATUS: U.S. CUSTOMS DECISION.

July 10, 1903.

The following articles, imported for use by the versity of Missouri, and not for sale, have been held to free of duty as "philosophical and scientific instrument apparatus" under paragraph 638 of the Tariff Ac 1897:—Erlenmeyer flasks, crystallising dishes, beak beaker glasses, flasks, porcelain evaporating dishes crucibles, condensers, calcium chloride tubes, cassero distilling flasks, thermometers.

In another case the Board held the following article be subject to duty:—iron weights, grinding appara forceps, crucible tongs, glass tubing.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and .S.], "Complete Specification Accepted."
Where a Complete Specification accompanies an Application, an terisk is affixed. The dates given are (i) in the case of Applicans for Patents, the dates of application, and (ii) in the case of mplete Specifications Accepted, those of the Official Journals which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to spection at the Patent Office immediately, and to opposition thin two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

A.] 17,027. Werner. Condensers. Aug. 5.

,, 17,161. Winzer. Continuous muffle furnaces or kilns. Aug. 7.

.S.] 22,323 (1902). Griffin. Chemical and physical balances. Aug. 19.

,, 14,939 (1903). Godden. Process of saturating air or gases with other vapours to different degrees of saturation. Aug. 19.

II.—FUEL, GAS, AND LIGHT.

.] 17,183. Schulte-Steinberg. Utilisation of blast-furnace waste.* Aug. 7.

, 17,215. Westinghouse (Gow). Method of and apparatus for the manufacture of gas. Aug. 7.

,, 17,283. Koppers. Coke furnaces. Aug. 8.

, 17,319. Davies and Davies. Bunsen gas burner.* Aug. 10.

, 17,327. Von Bauer. Coke ovens. Aug. 10.

, 17,471. Middleton. Agglomerant for making compressed fuels. Aug. 12.

, 17,495. Schweich. Gas producers. Aug. 12.

17,514. Thompson. Peat blocks for fuel. Aug. 12.

17,594. Dietmar. Furnace for dry-distilling peat and slow-burning or distilling coal. Aug. 13.

S.] 16,986 (1902). Thwaite. Producing gas for motive power purposes. Aug. 12.

17,318 (1902). Adam. Manufacture of incandescent mantles. Aug. 12.

21,615 (1902). Mitchell. Incandescent smokeless fuel. Aug. 12.

2267 (1903). Stacey and Matthews. Manufacture of gas. Aug. 12.

7466 (1903). Lake (Leiter). Coking ovens. Aug. 12.

9573 (1903). Turner. Apparatus for manufacturing gas. Aug. 19.

13,202 (1903). Jensen (Hiorth). Revivifying gas purifier waste. Aug. 12.

13,748 (1903). Abel (Gasmotoren Fabrik Deutz). Production of heating-gases free from hydrocarbons from gas-containing fuel in gas-producers. Aug. 19.

III.—DESTRUCTIVE DISTILLATION. TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[17,266. Schultz and Chem. Fabr. Ladenburg G. m. b. H. Separation of the phenols of coal-tar from the neutral constituents. Aug. 8.

17,585. Schwab. Saturators for sulphate of ammonia. Aug. 13.

[C. 22,381 (1902). Zechmeister. Process for distilling lignites, coal, peat, wood, &c. Aug. 19.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 16,995. Johnson (Badische Anilin und Soda Fabrik). Manufacture of azo dyestuffs and products to be used therefor. Aug. 1.

,, 17,565. Newton (Bayer and Co.). Manufacture of new anthraquinone derivatives. Aug. 13.

[C.S.] 23,437 (1902). Abel (Act.-Ges. f. Anilinfabr.) Manufacture of a sulphurised colouring matter directly dyeing cotton. Aug. 19.

,, 23,830 (1902). Imray (Meister, Lucius und Brüning). New colour lakes. Aug. 19.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 17,076. Molesworth. Rendering animal fibre and materials composed therefrom unshrinkable. Aug. 6.

,, 17,365. Scott. Cleansing fluid for wool and other animal fibres. Aug. 10.

,, 17,608. Hardcastle. Machinery for treating yarn or cloth with liquors, gases, vapours, &c. in motion. Aug. 14.

,, 17,616. Hoyle and Barker. Production of bleached yarn, and appliances therefor. Aug. 14.

[C.S.] 17,397 (1902). Barbe. Method of and apparatus for dry cleaning. Aug. 19.

,, 18,756 (1902). Wetter (Halle and Co.). Apparatus for treating textiles with liquids. Aug. 19.

,, 20,672 (1902). Boult (Chevolleau). Mercerising machines. Aug. 12.

,, 21,602 (1902). Weiss. Impressing patterns on textile fabrics. Aug. 12.

,, 21,848 (1902). Burghardt and Reid. Process for decreasing the inflammability of cotton yarns and fabrics. Aug. 19.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 17,449. Tcherniac. Manufacture of cyanides. Aug. 11.

,, 17,588. Johnson (Chem. Fabr. Griesheim Elektron). *See under* XI.

,, 17,589. Johnson (Chem. Fabr. Griesheim Elektron). *See under* XI.

,, 17,640. Ashcroft. Production of alkali metals. Aug. 14.

[C.S.] 17,316 (1902). Evers. Apparatus for the manufacture of sulphuric acid. Aug. 12.

,, 17,976 (1902). Tcherniac. Manufacture of cyanides from sulphocyanides. Aug. 19.

,, 18,108 (1902). Spence and Sons, Ltd., and Spence. Production of a new titanous sulphate. Aug. 19.

,, 19,774 (1902). Ferrand. *See under* XI.

,, 11,126 (1903). Dumars. Apparatus for separating air into its constituent gases. Aug. 12.

,, 14,194 (1903). De Wilde. Manufacture of dicalcium phosphate, precipitated calcium sulphate, and the regeneration of the hydrochloric or nitric acid used therein. Aug. 12.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 17,075. Slowak. Pottery kilns or the like. Aug. 6.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 17,061. Wilson. Brick kilns.* Aug. 5.

[C.S.] 2011 (1903). Czermak and Buxbaum. Manufacturing artificial marble. Aug. 19.

X.—METALLURGY.

[A.] 17,434. Mills (Bradley). Reduction of iron and other metals from their ores.* Aug. 11.

„ 17,641. Sulman and Kirkpatrick-Picard. Recovery of mercury from its ores or compounds. Aug. 14.

[C.S.] 17,709 (1902). De Alzugaray. Extraction of precious metals from their ores. Aug. 12.

„ 26,980 (1902). Leitch (Massenez). Manufacture of steel from chromic pig iron. Aug. 12.

„ 27,360 (1902). Sulman and Kirkpatrick-Picard. Recovery of precious metals. Aug. 12.

„ 28,605 (1902). M'Arthur. Solder for aluminium. Aug. 12.

10,648 (1903). Huffelmann. Preparing fine, granulated, or sand ores for making into briquettes and making them fit for use in the blast-furnace. Aug. 19.

„ 13,557 (1903). Callmann and Bormann. Liquid soldering composition. Aug. 19.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 16,989. Steenlet. Process for obtaining copper by electrolysis from solutions.* Aug. 4.

„ 16,992. Gaye. Electrolytic cells. Aug. 4.

„ 17,399. Fuery (McCarty and Beebe). Process of decomposing water by electrolysis.* Aug. 11.

„ 17,587. Johnson (Chem. Fabr. Griesheim Elektron). Manufacture of electrodes for electrolytic purposes. Aug. 13.

„ 17,588. Johnson (Chem. Fabr. Griesheim Elektron). Production of bichromates and alkali from alkali chromates. Aug. 13.

„ 17,589. Johnson (Chem. Fabr. Griesheim Elektron). Production of potassium chromate from chrome ironstone. Aug. 13.

[C.S.] 19,774 (1902). Ferrand. Production of caustic soda and sodium hydrochlorite by electrolysis. Aug. 19.

„ 9932 (1903). Howorth (Trollhättans Elektriska Kraftaktiebolag). Treating materials by radiated or reflected heat in electric furnaces. Aug. 19.

„ 10,703 (1903). Harrison (Buffa). Primary and secondary electric cells. Aug. 12.

„ 14,823 (1903). Starrett. Metal anodes. Aug. 12.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 17,035. Leppert and Rogovin. Process for the boiling of dry oils for lacquer and varnish manufacture. Aug. 5.

[C.S.] 21,088 (1902). Stanley and Cotton Seed Co., Ltd. Treatment of cotton seed. Aug. 19.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 17,120. Kollinger. Binding media for oil colours Aug. 6.

[C.S.] 10,280 (1903). Robinson. Damp-proof coating or paint. Aug. 19.

„ 13,102 (1903). Armbruster and Morton. Processes of making pigments. Aug. 12.

„ 14,385 (1903). Bollé (Hirschfeld). Manufacture of paints and pigments. Aug. 19.

B.—Resins, Varnishes.

[A.] 17,035. Leppert and Rogovin. *See under* XII.

„ 17,135. Tixier and Rambaud. Manufacture of
nishes by the direct solution of gums with
previous fusion. Aug. 6.

C.—India-rubber, &c.

[A.] 17,156. Frankenberg, Ltd., Frankenberg and
teridge. Rubber solutions or compounds. Au

XVI.—SUGAR, STARCH, GUM, Etc.

[C.S.] 7998 (1903). Stein and Crosfield. Manufac
and refining of beet, cane, and other sug
Aug. 12.

XVII.—BREWING, WINES, SPIRITS, Etc.

[C.S.] 10,729 (1902). Wyers. Preserving yeast. Aug

„ 20,228 (1902). Sefton-Jones (Highton). Pu-
cation of raw or immature alcoholic liqu
Aug. 12.

„ 10,426 (1903). Lapp. Process for germinating g
under pressure in closed receptacles. Aug. 1

„ 11,325 (1903). Soulé. Treatment of malt
alcoholic fermentation. Aug. 12.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 17,124. Brooks. Composition for preserving e
(U.S. Appl., Oct. 8, 1902).* Aug. 6.

„ 17,322. Brookes (Libby). Food compou
Aug. 10.

[C.S.] 17,486 (1902). Ekenberg. Manufacture of
powder. Aug. 19.

B.—Sanitation; Water Purification.

[A.] 17,661. Boult (Vasseux). Treatment of wash
other waste waters or residues. Aug. 14.

„ 17,713. Duncan. Treatment of sewage. Aug

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 17,347. Johnson (Badische Anilin und Sodafa
Manufacture of oxybenzaldehydes and oxyben
acids, and intermediate products. Aug. 10.

[C.S.] 23,988 (1902). Newton (Bayer and Co.). Ma-
facture of pharmaceutical compounds. Aug 2

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nitrocellulose. Aug. 12.

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ERRATUM.

LEVAN: A NEW BACTERIAL GUM FROM SUGAR.

R. GREIG-SMITH AND THOS. STEEL.

(This Journal, 1902, 1381—1385.)

Page 1385, col. 1.—Two last sentences of the par, beginning with "Comparatively speaking," should transferred to end of discussion, same page, col. 2.

Obituary.

JOHN CALDERWOOD.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY

John Calderwood, born in Edinburgh on Novem 25th, 1840, was the second son of William Calderwo and a younger brother of the late Prof. Henry Cald wood, LL.D., of Edinburgh. He was educated at Edinburgh Institution and the Royal High School. these early days it would appear that he was stron attracted to the legal profession, for which his log mind undoubtedly fitted him. After entering Edinbur University, however, he decided to take up the study chemistry, being largely influenced by the character his teacher, Prof. George Wilson. After complet his studies at the University, he proceeded to Germa to extend his acquaintance with scientific methods. his return to this country he entered the laboratory Dr. Angus Smith, of Manchester, and, after a b residence in that city, he was selected to fill the post research chemist in the laboratory of Dr. James You F.R.S. Dr. Young was at that time engaged in extensive series of experiments on the destruct distillation of various coals for the purpose of obtain paraffin. As one result he obtained in 1850 a pat for the manufacture of paraffin and paraffin oil fr bituminous coal, which became the basis of the Sco oil industry. Dr. Young's business having been c verted into a company (the present Paraffin Light Mineral Oil Co.), Mr. Calderwood was appoi manager of the works at Addiewell, Midlothian.

He was thus closely connected with the early devel ment of the Scotch oil industry, which has since ri to a position of national importance.

In 1879, he was admitted a fellow of the Ro Society of Edinburgh.

In 1880, Mr. Calderwood was appointed manager Price's Patent Candle Co., Ltd., becoming a few ye later managing director.

He applied his scientific knowledge and experience to e improvement of old and the introduction of new rocesses, and his commercial ability was devoted to irecting the policy of the company with eminent ccess.

Mr. Calderwood's exceptional qualities were fully cognised in the technical and commercial world, and s straightforward and firm character gained him the spect and confidence of his associates. In addition to this, he was always mindful of the welfare of the workers in his charge, and it is to his initiative that they owe the institution of an old age pension scheme.

Mr. Calderwood was an original member of this Society.

In 1886, and again in 1889, he was elected a Member of Council, becoming a Vice-President in 1894.

After a long illness he died on the 20th of August, aged 63 years.

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I.—PLANT, APPARATUS AND MACHINERY.

e Gases; Apparatus for the Preparation of ——. H. Morrison. VII., page 995.

ENGLISH PATENTS.

fugal Machine for Separating Fluids of Different sities. J. W. Macfarlane, Glasgow. Eng. Pat. 1 28, July 16, 1902.

An improvement on Eng. Pat. 21,744, 1892, consisting of a separating device in the drum, made of dished discs. The [illegible] is in two sections, with an annular space between [illegible] into which the liquids are fed. The outer and inner [illegible]s may be in one piece, in which case a series of holes or slots, permits communication between the plates. —W. P. S.

Evaporating Apparatus; Impts. in ——. F. W. Scott, London. Eng. Pat. 20,401, Sept. 18, 1902.

For the purpose of maintaining a constant level of liquid in evaporating apparatus, the evaporator is connected at its upper and lower ends with a separate closed vessel, which is provided with a supply pipe controlled by a float valve and with a sight-glass.—R. A.

Separating Solid or Liquid Particles from Gases and Vapours; Method and Apparatus for ——. E. Theisen, Baden-Baden, Germany. Eng. Pat. 13,034, June 10, 1903.

THIS method, which is applicable for purifying blast-furnace gases, drying steam, or in distilling or evaporating apparatus for tar, saccharine liquors, brine, &c., consists in projecting the gases or vapours upon a quiescent cushion of gas or vapour, so that the solid or liquid particles contained in the former are caused by their momentum to pass into and be retained in the cushion, while the gases or vapours are deflected by the cushion and pass away. (See also Eng. Pat. 12,693 of 1901, and U.S. Pats. 704,593 and 709,527; this Journal, 1902, 904, 1322, and 1903, 147.) —R. A.

UNITED STATES PATENTS.

Mixing and Dissolving Apparatus. L. P. Burrows, Washington, D.C. U.S. Pat. 735,206, Aug. 4, 1903.

INSIDE a vessel is fixed a rotating shaft carrying an outer and an inner set of stirring-blades, which are arranged spirally round the shaft and inclined in opposite directions. —L. F. G.

Evaporating Liquids; Apparatus for ——. H. Deininger, Bernau, and H. André, Buch, Germany. U.S. Pat. 735,348, Aug. 4, 1903.

See Eng. Pat. 6847 of 1903; this Journal, 1903, 787. —T. F. B.

Centrifugal Apparatus. F. Kessler, Rosario, Argentina. U.S. Pat. 735,524, Aug. 4, 1903.

A collapsible jacket, which is opened out and placed between the drum and the outer casing of a centrifugal separating apparatus, directs the liquid thrown off by the centrifugal drum to a convenient outlet; when the jacket is made to collapse, the liquid is projected against the inner wall of the outer casing, and passes thence to a different outlet.—L. F. G.

Gas [Crucible] Furnace. P. S. Harvey, Assignor to the Acme Gas Co., Chicago, Ill. U.S. Pat. 735,765, Aug. 11, 1903.

The chamber of the furnace consists of a hollow cylindrical mould with side openings inclined downwardly; it is surrounded by a metal casing, the space between casing and mould being filled with mineral wool or the like. The bottom of the mould is removable, and is provided with a set of upward projections adapted to support the crucible. The cover is also removable, and consists of two parts, one of which is provided with a vent. The gaseous fuel is supplied through pipes having nozzles located in the side openings of the mould, which direct the fuel downwardly and inwardly against the projections on the bottom of the mould. With this arrangement the jets of fuel meet below the crucible, and the nozzles are out of the way of matter dripping from the crucible.—R. A.

French Patents.

Milling and Mixing Machinery for Paper-making and other Raw Materials. J. Wüstenhöfer, Germany. First Addition, dated Jan. 16, 1903, to Fr. Pat. 282,990, Nov. 14, 1898.

The pendulum mill described in the main specification (Eng. Pat. 26,718 of 1898; this Journal, 1899, 255), originally intended for reducing rags, &c., may be adapted for grinding hard materials. The main shaft, which gives the suspended pestles their motion in a circular path, is driven from below, and by means of gearing at the top it simultaneously imparts an independent rotation to the pestles about their own axes in either direction.—J. F. B.

Measuring Tanks of Adjustable Capacity. A. Bontemps. Fr. Pat. 328,552, Jan. 17, 1903.

Two precisely similar tanks are placed side by side. The liquid enters one tank through an inlet cock, and rises in the tank and an outside gauge tube, till it overflows over a weir placed in the latter. The overflow passes through a valve into the other tank. The gauge tube is made of two pipes, sliding one inside the other, and the height of overflow and therefore the capacity of the tank, can be regulated by raising or lowering this tube by means of a screw and hand-wheel. The inlet and outlet cocks are provided with hand wheels, which are so constructed that neither cock can be opened before the other is shut.—L. F. G.

Filters for Wine, Oil, and other Liquids. J. Salvarelli, France. Fr. Pat. 328,715, Jan. 23, 1903.

The filter consists of a chest having two of its sides pierced with rectangular openings, into which hollow filtering frames slide like drawers. Each frame is enveloped in a bag of filtering cloth; the liquid filters inwards, and escapes from the interior of the frames by means of taps. The butts of the frames are clamped by screws to the outside of the chest, and the joints, through which the ends of the cloths project, are made tight by rubber or leather packing. —J. F. B.

Filter-Presses. P. Meura, Belgium. Fr. Pat. 328,918, Jan. 29, 1903.

Plates pierced with fine truncated holes, 350,000 to 500,000 per square metre, are used as filtering material. Each plate fits flush into a recess of the filter-press frame, and a ti joint is made by pressing this frame against the next which a caoutchouc ring lies in a groove and abuts aga the edge of the perforated plate. These filter-presses be sterilised with vapours.—L. F. G.

Separating Liquids from Solids; Apparatus for —. C. S. Wheelwright and J. T. Fiske, jun. Fr. Pat. 329,1 Feb. 3, 1903.

See U.S. Pat. 719,541 of 1903; this Journal, 1903, 28 —T. F.

Drying Solid or Non-solid Materials with Absorbe Process for ——, *in Vacuo.* L.-A. Morel. Fr. 329,092, Feb. 4, 1903.

The materials are submitted to as perfect a vacuum possible, without being heated, and the aqueous vap absorbed by sulphuric acid or phosphoric anhydride. process is adapted for the drying of gluten, starch, fl flowers, fruits, tomatoes, the white and yolk of eggs, coc chocolates, butters, and fats.—L. F. G.

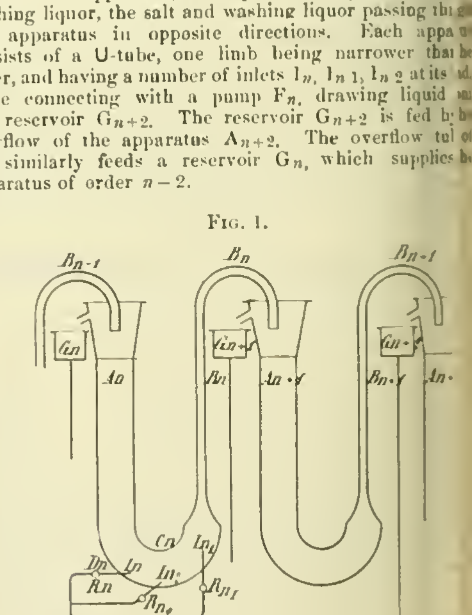
Evaporating Sugar Extracts, Saline Solutions, &c.; paratus for ——. A. Freitag, Germany. Fr. 329,015, Feb. 2, 1903.

Low-pressure steam is used for heating, and is through a long system of heating tubes at a consider speed, the heating-tube system being provided intern with baffle plates placed obliquely to the entrance of steam; to ensure high speed of the steam, the ent pipe is wide, and a fan is placed inside it. In the c of the heating tubes is placed a vertical circulation and inside this an endless screw is placed eccentric which keeps the liquid to be evaporated thoroughly m Another pipe is laid on for high-pressure steam, to com the evaporation at any desired higher temperature, the pressure steam being first shut off.—L. F. G.

Washing Salt; Apparatus for ——, *and other Mate* L. M. A. Butin. Fr. Pat. 329,396, Feb. 14, 1903

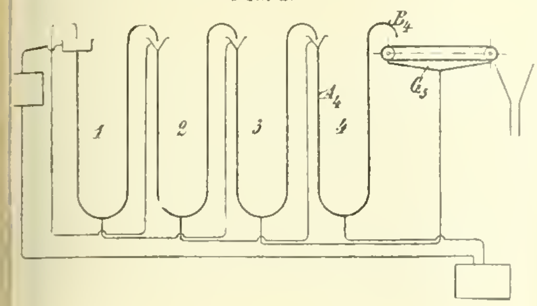
The salt or other material is washed by passing it thr a series of apparatus, and systematically supplying washing liquor, the salt and washing liquor passing th the apparatus in opposite directions. Each appa consists of a U-tube, one limb being narrower than other, and having a number of inlets I_n, I_{n1}, I_{n2} at its these connecting with a pump F_n, drawing liquid the reservoir G_{n+2}. The reservoir G_{n+2} is fed b overflow of the apparatus A_{n+2}. The overflow tu A_n similarly feeds a reservoir G_n, which supplies apparatus of order $n-2$.

Fig. 1.



The apparatus works as follows:—The pump F_n in action, and a mixture of salt and liquor falls into A_n the tube B_{n-1}. The salt descends the tube A_n, a current of liquor enters the lower limb of the rough D_n, I_n, &c., rising in A_n and forcing out the uor that entered with the salt into G_n. The salt is rried *through* the U-tube, and leaves at B_n, falling into e tube A_{n+1} of the next apparatus.

Fig. 2.



he salt is fed from a hopper into the first tube A_1 (Fig. 2), l carried down by water from the reservoir G_5. The rflow from the first apparatus is filtered and supplied to last apparatus. This last tube B_4 discharges its mixture salt and liquor on to a sieve or endless band, whence salt is carried to the drying chambers; while the liquor ls into the reservoir G_5 and is pumped to the last but apparatus. The liquor from the overflow tube A_4 of last apparatus is pumped into the antepenultimate paratus (2).—L. F. G.

II.—FUEL, GAS, AND LIGHT.

ses; New Quantitative Method for Determining Dust in ——. L. Martius. XXIII., page 1016.

English Patents.

Carbonising Peat. T. Ledermülier, Lemberg. Eng. Pat. 21,587, Oct. 3, 1902.

e peat is subjected simultaneously to heat and heavy ssure by means of an oven and an external hydraulic ss, the cylinder and piston of which are below the oven, l are protected from the heat of the latter by an interning spacing box. Means are provided for feeding the t into moulding boxes, running on tracks on the presste frames; and the press plates are ribbed, to form nnels for the passage of fire gases. To facilitate the rage of heat in the plates, the channels are faced with a terial of greater heat capacity than the plates themselves. e mould boxes are mounted on lateral wheels so as to tip one end, and this end is fitted with a third wheel running a roller path. The oven is provided with a number of l openings, closed by counterpoised slides. The carnised peat is dumped from the moulds into a pit, the ulds being then righted by a pair of arms fitted with s engaging with the end of the mould box. A receiving in the pit has counterbalanced hinging covers, which n downward under the weight of the peat and then close omatically. The filled cars run on tracks surrounded cooling channels for preventing the ignition of the hot t.—C. S.

nbustible Materials; Improved Process for the Agglomeration of ——. G. Charles, Paris. Eng. Pat. 14,098, une 24, 1903.

. Fr. Pat. 32?,341, Jan. 7, 1903; this Journal, 1903, 944. —A. S.

ing Ovens or Furnaces; Impts. in [Gas-Heated] ——. . Pallenberg, Dortmund, Germany. Eng. Pat. 9605, pril 28, 1903.

enable the heating to be varied, as required, at different s of an under-fired coking oven or furnace, and to permit gas jets to be removed for cleaning, &c. without interting the working, the gas-supply pipe has a series of e-controlled branch pipes arranged underneath each wall of the oven, each branch pipe having a series of heating jets, and being adapted to heat a certain portion of the oven wall.—R. A.

Oil-Fuel Burners. T. Clarkson and The Clarkson and Capel Steam Car Syndicate, Ltd., Chelmsford. Eng. Pat. 18,501, Aug. 22, 1902.

The invention relates to oil-fuel burners, and refers mainly to subsidiary burners for vaporising the fuel necessary to start a liquid hydrocarbon burner, and maintain it until the vaporiser, directly heated by the main burner, is raised to the necessary temperature. The burner consists of a series of wicks of asbestos, &c., mounted on a peg or support, with or without a wrapping of wire or gauze; and a fan is provided for sending a current of air through the box containing the wicks, and thus delivering the flame on to the vaporising tube.—C. S.

Furnace for Gas Generators, Producer-Gas Plant, Refuse Consumers, and the like. A. Desgraz, Hanover. Eng. Pat. 11,820, May 23, 1903.

The furnace grate consists of a cooling worm or coil of suitable material, fitted with arrangements for turning, and supported by suspension from a joist provided with notches for the reception of the convolutions of the coil. An ash trough is mounted within the coil, to prevent the accumulation of ashes on the lower part of the convolutions.—C. S.

Gas Producers. W. J. Crossley and T. Rigby, Openshaw, Manchester. Eng. Pat. 18,892, Aug. 28, 1902.

An internal cylindrical casing, lined with firebrick, is fixed within another concentric casing, which latter extends below the inner casing, and is enclosed at the bottom to form a water seal. The fuel is fed into the producer through two or more hoppers, which are placed round the outside of a bell-shaped gas exit, so that the fuel gets heated before it reaches the working level of the producer. The air is heated in the annular space between the two casings, and passes through a cylinder, the lower part of which is sealed in water, before entering the fuel bed. The fire grate, which may have a convex or concave face, is supported on this cylinder, and is provided with a sand seal, which is not affected by the heat of the furnace.

The fire grate can be revolved if desired, being mounted on ball bearings.—T. F. B.

Fumes and Gases; Apparatus for Purifying ——. S. Elliott, Newcastle-on-Tyne. Eng. Pat. 16,889, July 30, 1902.

Smoke or furnace fumes are purified from soot, dust, or noxious vapours, the sooty particles being recovered in a form suitable for use as lamp-black, whilst the noxious vapours or gases, such as sulphur dioxide and ammonia, are absorbed by water to obtain a solution suitable as a disinfecting liquid or a fertiliser. The gases are forced through a tank or scrubber partly filled with water and covered with strainers, the water which passes through the strainers being discharged into a settling tank, so as to establish a continuous circulation of the liquid, whilst the fumes or gases passing through the strainers are led off at the top. The washing tank is provided with a rotary beater mounted on a hollow axle, through which the fumes or gases are introduced.—R. A.

Light, Artificial; Means for Changing the Colour of ——. The British Thomson-Houston Co., Ltd., London. Eng. Pat. 18,083, Aug. 16, 1902.

In order to counteract the objectionable green tint of the light from a mercury-vapour electric arc-lamp, the light is transmitted through a fluorescing medium, such as a solution of Rhodamine, the solvent being either an aqueous solution of gelatin, water-glass, or some other inorganic material, this being applied to the surface of a screen.—C. S.

United States Patents.

Fuel; Process of Manufacturing Artificial ——. H. C. B. Forester, Sketty. U.S. Pat. 736,083, Aug. 11, 1903.

See Eng. Pat. 7905 of 1900; this Journal, 1901, 350. —T. F. B.

Kiln; Continuous ——. W. A. Butler, San Francisco, Cal. U.S. Pat. 735,462, Aug. 4, 1903.

The fuel is "burned in suspension" in combustion chambers extending lengthwise below the floor of the kiln and opening into the kiln. These chambers are parallel with and between the side walls of the kiln, and parallel or concentric with the semi-annular walls at the ends of the kiln. They are combined with fuel pipes and horizontal damper-controlled draught flues, for supplying fuel and air to the burners in the combustion chambers.—A. G. L.

Gas; Process for Making ——. W. Kent, Passaic, N.J. U.S. Pat. 735,272, Aug. 4, 1903.

The charge of coal is "blasted to incandescence," a fresh charge of coal put on, and air blown into the charge at its top and bottom, steam or water being simultaneously fed in at the zone of highest temperature. The gas is withdrawn from half-way up the charge.—L. F. G.

French Patents.

Burner [Heating] for Alcohol. Soc. Legrand et Desalles. Fr. Pat. 328,724, Jan. 26, 1903.

A ring-shaped burner, for boiling, intended to consume alcohol or other liquid combustible; it contains a vaporising chamber in contact with the place of combustion, and so arranged that when first brought into use, liquid fuel trickles from the orifice which afterwards serves as the air-injector jet, falling into a basin underneath the burner proper, where it can be ignited. The flame plays on the vaporiser until liquid fuel no longer reaches the jet and the basin is no longer replenished, when the apparatus behaves normally as a vapour burner, the working flame supplying the heat required for vaporisation.—F. H. L.

Combustible Liquid for Explosion Motors. F. de Mare. Fr. Pat. 328,909, Jan. 29, 1903.

See Eng. Pat. 3626 of 1903; this Journal, 1903, 860.
—T. F. B.

Gas; Illuminating ——, and its Manufacture. W. H. Gaze. Fr. Pat. 328,955, Jan. 30, 1903.

See Eng. Pat. 2283 of 1903; this Journal, 1903, 900.
—T. F. B.

Retorts; Vertical Regenerative ——, for the Gasification of Coal, &c. C. Westphal. Fr. Pat. 329,008, Feb. 2, 1903.

Vertical retorts are described, larger at the base than at the top, set in regenerative furnaces, and fitted with apparatus for the constant delivery of coal at the top and constant removal of coke at the base. They are also claimed to be suitable for the carbonisation of wood and peat, and for the causticisation of chalk.—F. H. L.

Water-Gas Producer. F. Bauke and C. Fuchs. Fr. Pat. 329,028, Feb. 2, 1903.

In a small-sized continuous water-gas producer intended for such purposes as the supply of explosion engines, the gas is drawn out of the heating chamber by means of a water injector. The gas leaves the producer through an annular space surrounding a vessel containing water, the level in which can be set to, and maintained at, any desired point. Here the gas vaporises the water, in quantity depending on the amount of liquid present, and the steam is drawn by the suction of the aspirator into the producer through a coil lying among the fuel. The injector leads into a chamber acting as a displacement holder, the depth of liquid in which is also under control; and thus it delivers gas at the desired constant pressure. It is claimed that the apparatus may be made to yield much hydrogen and little carbon monoxide, or *vice versa*, as may be wished; and it is also claimed that the porous fuel in the producer is kept at a very high temperature by the steam drawn in.—F. H. L.

Washing Furnace Gases, Generator Gas, Fumes, &c.; Process and Apparatus for ——. E. Kratochvil. Fr. Pat. 328,798, Jan. 26, 1903.

See Eng. Pat. 6387 of 1903; this Journal, 1903, 860.
—T. F. B.

Illuminating-Gas [Acetylene], and Apparatus for its Production. J. Reid. Fr. Pat. 329,142, Feb. 6, 1903.

Acetylene gas is led to a twin, Argand, or other proper acetylene burner, where it is burnt so as to produce a self-luminous flame, upon which streams of oxygen impinge.
—F. H. L.

Arc Lamps; Production of a "Pure" Light from ——. A. Rignon and F. Christen. Fr. Pat. 328,829, Jan. 19, 1903.

The carbons employed in arc lamps are freed from metallic impurity by suitable treatment, such as washing in dilute nitric acid and water: and they are supported in position so as not to come into contact with any metallic portion of the lamp conducting the current, but touching only the cables bringing the current, which cables must not "touch any metallic part." This method of treatment is claimed to prevent any alteration in colour of the light developed, to make the electrodes last longer, and to yield a specially "pure" light.—F. H. L.

Mantles for Incandescence Lighting. R. Berthold. Fr. Pat. 328,824, Jan. 27, 1903.

See Eng. Pat. 1954 of 1903; this Journal, 1903, 789.
—T. F. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Ammonium Sulphate; Manufacture of ——. G. Keillor jun. J. Gas Lighting, 1903, **83**, [2100], 361—366. (Paper read before the North British Association of Gas Managers.)

The question is discussed whether it is profitable to manufacture ammonium sulphate in small gasworks, and the author, in describing his plant and giving the cost of working, indicates that it may pay well.

The plant used is of the continuous type, and is not ru usually for more than an hour or two at a time. The saturator, which is of rolled-plate lead, is used three-quarters full of sulphuric acid of 1·34 sp. gr., working preferably at a temperature of 225°—230° F.

The average sample of liquor shows a specific gravity of 1·018, and contains 1·58 per cent. of "free" ammonia The fixed ammonia, 0·17 per cent., is not utilised. As the result of a year's working, 38 tons of ammonium sulphat were produced from about 98,800 galls. of liquor, an realised 437*l*. This represents the liquor from 3,438 ton of coal. The cost of production averaged 4*l*. 19*s*. 7·2*d* per ton (including 2*l*. 17*s*. 10·73*d*. for acid), thus showin a net profit on the year's work of 232*l*. 5*s*. 8*d*., or 1*s*. 4¼*d* per ton of coal used.

The total profit, for sulphate, tar, and crude naphtha works out at 514*l*. 15*s*., or 3*s*. per ton of coal, as compared with 9⅓*d*., which was the amount realised on th tar and liquor per ton of coal, before sulphate-makin and tar distillation were commenced. The average figure for 12 gasworks in Scotland, which distil their tar an liquor, are:—Formerly realised for tar and liquor, 2*s*. 1¼*d* per ton of coal; sulphate made, 2*s*. per ton of coal tar distilled, 1*s*. 5¾*d*. per ton; showing an average ne increase of 1*s*. 4½*d*. per ton of coal.—T. F. B.

Petroleum in California. E. O'Neill. J. Amer. Chem. Soc., 1903, **25**, [7], 699—711.

Although petroleum oil is found in every part of Cali fornia, only the southern districts produce it in an quantity. Not much success was met with in obtainin the oil, until in Los Angeles, in 1892, a boring of 365 f was made, after which other wells were sunk, and th production of oil rapidly increased, reaching a total c 1,400,000 barrels in 1897. In this district, the oil san averages about 60 ft. in thickness, whilst a second sand ha been worked, and a third is believed to exist.

The oil obtained from Whittier, Fullerton, and Puento usually of light specific gravity, so that most of it can distilled, and only the residuum used for fuel. In her parts of the county the wells are more than 000 ft. in depth, and yield a heavy oil, averaging about 1° B.

The largest oil-field yet discovered is in Kern County, hence 20,000 to 25,000 barrels are shipped daily, whilst ving to lack of demand, many of the wells are not being orked at present. The wells range in depth from less an 500 to less than 1,100 ft., the average being about 0 ft. The oil is thick, black, and heavy (9° to 22° B.). contains from 10 to 40 per cent. of asphaltum, and rries a large amount of fine sand, which separates on anding. The total amount of oil produced throughout alifornia in 1902 is estimated at 13,000,000 barrels, and, otwithstanding this increased supply, the price of oil is adually rising.

As regards the quality of the oil, there is little difference tween the products of different districts, the extreme iriations being from 10° B. to 35° B. A water-white oil of 50° B. which is found in the Newhall district is regarded as a natural filtrate or distillate.

The oils from San Mateo, Colusa, and Humboldt differ from most of the others in containing little or no asphaltum. Their specific gravity ranges from 17° to 50° B.

Regarded from a chemical standpoint, Californian petroleums are intermediate between Russian and Eastern oils. They contain paraffins, benzenes, and naphthenes, and, usually, nitrogen and sulphur. The sulphur is present in a volatile constituent, which is frequently almost completely eliminated in one of the distillation fractions. The amount of sulphur found in 10 samples of different origin ranged from 0·5 to 0·95 per cent., whilst the nitrogen in nine other samples varied from 0·001 to 0·669 per cent. (by vol.).

An elementary analysis of 19 oils gave the following results:—Hydrogen, 10·70 to 12·88 per cent.; and carbon, 80·42 to 88·26 per cent.

The amount of volatile matter at different temperatures shows great variations, as is seen in the following typical examples selected from the author's long table of results:—

District.	Water.	Below 100° C.	From 100° C. to 150° C.	From 150° C. to 250° C.	From 250° C. to 350° C.	From 350° C. to Asphalt.	Asphalt.	Loss.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
ern	1·40	0·00	0·00	3·9	34·0	27·2	31·60	1·9
ıalinga	0·00	0·00	32·60	28·20	17·20	16·00	5·00	1·0
entura	9·50	0·00	0·00	11·20	34·05	8·75	36·50	..
umboldt	0·00	5·20	27·40	28·20	17·20	16·00	5·00	1·0
ewhall	0·60	12·50	46·20	32·27	..	3·23	5·30	0·5
nta Cruz	21·50	0·00	0·00	6·20	34·00	14·40	22·80	1·1

The specific viscosity of the crude oil shows wide iriations at 15·5° C., but diminishes very rapidly with the crease in temperature, approximating to that of water 100° C. The following results are given, among others, illustrate the difference in the oils from different stricts:—

Specific Viscosity at 15·5° C.	Specific Viscosity at 80° C.
4·88	1·28
63·15	2·12
299·59	4·70
1·57	1·05
1759·13	7·51
373·11	3·67
3259·27	9·00

The calorific value of different samples determined in ahlers' bomb gave results ranging from 10,190 to ,192 T.U. (calories).

The chief use of the crude petroleum is for fuel, and has taken the place of nearly half of the total amount coal formerly used in California. In order to make it urn readily, it is usually injected in the form of a very ne spray, by means of steam, on to the brickwork or ttom of the firebox. From the results of practical periments under boilers, it has been found that 4 to barrels of oil are equivalent to 1 ton of good coal. The uelters on the coast are now using the oil, and saving ore than 50 per cent. in the cost of fuel.

The crude oil is also used to a small extent in the manucture of gas, as a coarse lubricant, and as an insecticide r fruit trees.

It is refined in 33 factories, which produce on the gregate from 8,000 to 10,000 barrels a day. The usual stillates (benzines, illuminating and lubricating oils) are oduced, but only the benzines are of very good quality. he distillates are chiefly used in admixture with Eastern ls.—C. A. M.

Pyridine in Aqueous Solution; Determination of ——. M. François. XXIII., page 1017.

cetic Acid and Vinegar; Detection and Determination of Mineral Acid in ——. P. Schidrowitz. XXIII., page 1018.

French Patents

Peat; Process and Apparatus for Carbonising ——. E. Meyer and A. Roeder, Switzerland. Fr. Pat. 328,706, Jan. 22, 1903.

Peat is converted into an oily product by heating it in hermetically sealed vessels, so that the carbonisation takes place under a pressure produced by the products of decomposition. The peat is enclosed in sealed tubes, a number of which are stacked on a framework in the heating chamber. A device is provided for changing the position of each layer of tubes, so as to ensure all being similarly heated.—T. F. B.

Carbonisation of Animal and Vegetable Matter; Apparatus for the ——. O. Ricklefs. Fr. Pat. 329,160, Feb. 7, 1903.

See Eng. Pat. 100 of 1903; this Journal, 1903, 485.
—T. F. B.

Petroleum Oils and similar Substances; Process for Chemically Purifying and Deodorising ——. H. Vitteuet, France. Fr. Pat. 329,076, Feb. 5, 1903.

One hundred litres of petroleum are agitated for 15 minutes with 10 kilos. of sulphuric acid of 66° B. The oil is decanted and shaken for some time with 10 kilos. of sodium bisulphite solution (36° B.), decanted again, and shaken with a solution of 400 grms. of caustic soda in 100 litres of water, after which it is decanted, washed with water, and dried over calcium chloride or calcium carbide. The process may be repeated if desired.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo; Tinctorial Character of ——. G. Heller. Zeits. f. Farben- u. Textil-Chem., 1903, 2, [16], 309—310.

The author considers that the experiments of R. Möhlau and M. R. Zimmermann, who dyed fabrics with colloidal indigo (this Journal, 1903, 208), show that indigo has affinity for the fibre. He himself has obtained a complex compound in which a methylene group is united to indigo molecules. This compound, which possesses a colour closely resembling that of indigo, only dyes in very weak shades under the same conditions, showing that its leuco compound has much less affinity for the fibre. Its sulphonic acids also show only very weak dyeing properties. On the other hand, methyl indigo, which is analogous in constitution, but with a much smaller molecular weight, differs very little in dyeing properties from ordinary indigo. Benzylidene-indigo, which resembles the mother substance closely in appearance, scarcely dyes at all. These facts show that the atomic grouping which causes the characteristic colour of these compounds, does not necessarily cause affinity for the fibre.—E. F.

Tetramethyldiaminodiphenylenephenylmethane ; Unsymmetrical ——, and the Dyestuff derived from it. A. Guyot and M. Granderye. Comptes rend., 1903, **137**, [7], 413—414.

Haller and Guyot (this Journal, 1901, 799) showed that a series of dyestuffs could be prepared bearing to diphenylenephenylmethane the same relations as those derived from triphenylmethane bear to that hydrocarbon, and described one of them, namely, fluorene blue. The present authors have now examined some others of the series.

Tetramethyldiaminodiphenylenephenylmethane is obtained by dissolving *o*-amino-leuco malachite green in 1:3-sulphuric acid, diazotising, and decomposing the diazocompound at 100° C. The yield is 16 per cent. of theory, the rest being the *o*-hydroxy derivative. The substance, purified by several precipitations from benzene by boiling alcohol, forms minute white crystals, melting at 149° C. Oxidising agents (lead peroxide) produce from it a dirty violet dyestuff, the hydrochloride and nitrate of which have been prepared. This dyestuff is neither substantive nor fluorescent. With alumina or iron mordants it dyes a greyish violet, far less intensely than fluorene blue.—J. T. D.

English Patent.

Colours containing Sulphur [Sulphide Dyestuffs] ; Manufacture of ——. Read Holliday and Sons, Ltd., Jos. Turner, H. Dean, and Jas. Turner, all of Huddersfield. Eng. Pat. 20,125, Sept. 15, 1902.

50 parts of the product obtained by condensing 1.2.4-dinitrochlorobenzene with sulphonated aminosalicylic acid (obtained by boiling nitrosalicylic acid with sodium bisulphite solutions ; see this Journal, 1900, 340), are heated with 120 parts of crystallised sodium sulphide, 35 parts of sulphur, and 30 parts of water to 105°—160° C. The resulting dyestuff gives deep blue-black shades.—T. F. B.

United States Patents.

Sulphur Dye ; Substantive ——. P. Julius and F. Reubold, Assignors to Badische Anilin und Soda Fabrik, all of Ludwigshafen-on-Rhine. U.S. Pat. 735,775, Aug. 11, 1903.

See Eng. Pat. 16,998 of 1900 ; this Journal, 1901, 889.
—T. F. B.

Nitro and Azo Compounds ; Reduction of ——. M. Buchner, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof. U.S. Pat. 736,204, Aug. 11, 1903.

See Eng. Pat. 19,879 of 1900 ; this Journal, 1901, 259.
—T. F. B.

Nitro Compounds ; [Electrolytic] Reduction of ——. M. Buchner, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof. U.S. Pat. 736,205, Aug. 11, 1903.

See Eng. Pat. 13,543 of 1900 ; this Journal, 1900, 893.
—T. F. B.

Aromatic Nitro Compounds ; [Electrolytic] Reduction of ——. M. Buchner, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof. U.S. Pat. 736,206, Aug. 11, 1903.

See Eng. Pat. 25,100 of 1901 ; this Journal, 1902, 260.
—T. F. B.

French Patents.

o-Nitrophenyl-β-lactomethylketone and its Homologues ; Manufacture of Preparations of ——, Soluble in Water [Indigo Dyestuffs]. Cie. Parisienne de Couleurs d'Aniline. Fr. Pat. 327,973, May 26, 1902.

See Eng. Pat. 11,522 of 1902 ; this Journal, 1903, 490.
—T. F. B.

Lakes [Azo Dyestuffs] ; Production of Red ——. Actienges. f. Anilin Fabrikation, Berlin. Fr. Pat. 328,575, Jan. 17, 1903.

Diazobenzene, its homologues or substitution products, are combined with 2·3-oxynaphthoic acid, and the alkali salts of the dyestuffs so obtained are treated in aqueous suspension with the salts, oxides, or hydroxides of calcium, barium, strontium, magnesium, aluminium, zinc, or other metals. The lakes so obtained are distinguished by vividness of shade, fastness to water and to light, and insolubility in oils. It is useful to add barium sulphate or aluminium hydroxide as a substratum. The dyestuffs themselves are also claimed.—E. F.

Lakes [Azo Dyestuffs] ; Production of Red —— Actienges. f. Anilin Fabrikation, Berlin. Fr. Pat. 329,037, Feb. 3, 1903.

The dyestuffs obtained by the combination of β-naphth with diazotised phenetidine- or anisidine-sulphonic acid (NH_2, SO_3H, OR = 1, 2, 4) are converted into lakes by treating their alkali salts in aqueous suspension with the salts, oxides, or hydroxides of calcium, strontium, barium, magnesium, aluminium, zinc, or other metals. The lakes so obtained are distinguished by their bluish shade.—E. F

Dyestuff from Naphthalene ; Production of a Blue-Black ——. Badische Anilin u. Soda Fabrik, Ludwigshafen a/Rh., Germany. Fr. Pat. 328,768, Jan. 24, 1903.

The intermediate product obtained by reduction of 1.8-dinitronaphthalene in concentrated sulphuric acid according to Fr. Pat. 236,852, March 8, 1894, and its Addition, dated June 27, which has itself no appreciable tinctorial properties, is converted by treatment with sodium hydrosulphite in dilute sulphuric or other mineral acid solution into a violet crystalline dyestuff, dyeing unmordanted wool in violet shades, passing, on subsequent chroming, to greenish-black, and chromed wool in blue-black shades. The dyestuff behaves like a leucothiosulphonic acid. It is oxidised by treatment with boiling water, and dissolves in caustic soda to a green liquid, turning blue in the air. On heating with sodium bisulphite, it is changed to a compound soluble in water with a brown colour, which can be printed on cotton in presence of chromium acetate, producing green-black shades.—E. F.

Dyestuffs derived from Diphenylnaphthylmethane [Triphenylmethane Dyestuffs] ; Production of New —— Manufacture Lyonnaise de Mat. Colorantes, France Fr. Pat. 328,878, Jan. 27, 1903.

Dyestuffs of this series containing an alkyl-oxy group in the naphthalene nucleus and in ortho-position to the methane carbon atom are obtained from the condensation products of tetra-alkyldiaminobenzhydrol with 2.3.6- or 2.6.8-naphtholdisulphonic acid by either oxidising and then alkylating or by alkylating and then oxidising. The products obtained are identical, but in the first case alkyl esters of aromatic sulphonic acids or dialkyl sulphuric esters must be employed as alkylating agents, whereas in the second case alkyl haloids must be employed. The dyestuffs give green to yellowish-green shades on wool, fast to washing and to alkalis, very fast to light, and perfectly even. The 6.8-disulphonic acid gives dyestuffs of more yellowish shades than those derived from the 3.6-disulphonic acid. The dyestuff obtained from the latter, tetra-ethyldiaminobenzhydrol and a methylating agent, gives dyeings resembling in shade those from Acid Green.—E. F.

Indoxyls [Indigo-Dyestuffs] ; Production of —— A. Foelsing, Germany. Fr. Pat. 329,126, Feb. 5, 1903

Indoxyls are obtained by melting aromatic glycines of all kinds, and their derivatives, with caustic alkali and an alkali peroxide at about 180° C. The melt is dissolved in a little water, and indigo can then be obtained directly from the solution by oxidising in the usual manner. The yield of indigo is said to be better than that obtained by any known method.—E. F.

Tanning and Dyewood Extracts ; Manufacture of —— A. E. Peyrusson. Second Addition, Feb. 7, 1903, t Fr. Pat. 318,523, 1902. XVI., page 1008.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Dyeing; The Theory of ——. E. Knecht. Zeits. f. Textil- u. Farben-Chem., 1903, 2, [16], 310—311.

In consequence of the criticism of von Georgevics (this Journal, 1903, 946), the author has repeated and amplified his former experiments (this Journal, 1902, 544, 611). Carefully purified wool was dyed with 2 per cent. of Night Blue and then partially extracted with alcohol. The alcoholic solution was concentrated and added to a warm dilute solution of barium hydroxide, which precipitated the Night Blue base. This was filtered off and the filtrate treated with carbon dioxide, filtered, and evaporated to dryness. An amorphous yellow residue remained, which burned with a smell like wool. If dissolved in water this residue gave precipitates with aqueous solutions of Night Blue and of Magenta, these precipitates being soluble in alcohol. A similar yellow substance can be obtained by extraction of the residual Night Blue with hot dilute ammonia solution. Analogous results were obtained with silk.—E. F.

Logwood-black Prints on Naphthol Grounding; Production of ——. P. P. Wicktoroff. Zeits. f. Farben- u Textil Chem., 1903, 2, [16], 312.

The logwood composition is printed on to the naphthol grounding, and the goods, after drying, are then passed directly through the diazo solution. The following compositions are used:—

I. Logwood extract, acetic acid, sodium chlorate solution, potassium ferricyanide solution, and starch thickening. Immediately before use this is mixed with ferrous sulphate solution. It decomposes very soon after mixing.

II. Logwood extract and sodium bichromate solution are mixed and poured into dilute hydrochloric acid. Starch thickening is then added. Very fast shades are obtained, but not so full as those produced by I. It is advisable to also add ferric chloride.

III. Logwood extract, acetic acid, potassium or sodium sulphite solution, and ferrous sulphate are warmed together. After cooling, starch thickening is added. This mixture does not decompose, and gives full shades. Its cheapness and convenience make this recipe the best of the three. —E. F.

Picric Acid Stains; Method of Removing ——. J. Bougault. J. Pharm. Chim., 1903, 18, 158.

Stains produced by picric acid may be removed by rubbing with a solution of an alkali sulphide or polysulphide, followed by washing with soap and water. Care should be taken to thoroughly remove the excess of sulphide, otherwise the treated spot will develop a black stain on contact with common metals. Should this occur, the black mark may be removed by treatment with hydrogen peroxide acidified with hydrochloric acid.—J. O. B.

English Patents.

Mercerising Yarn in the Form of Skeins; Machine for ——. P. Hahn, Niederlahnstein, Germany. Eng. Pat. 22,235, Oct. 13, 1902.

See Fr. Pat. 325,239 of 1902; this Journal, 1903, 739. —T. F. B.

Mercerising Cotton Yarns; Apparatus for ——. L. Cipollina, Rivarolo Ligure, Italy. Eng. Pat. 9633, April 29, 1903.

An upper row of metallic cylinders is sustained in a definite position by two cross bars to the principal frame of the machine, and a similar lower row is sustained by cross bars suspended from four rods, the latter carrying male and female screws, so that by means of an endless screw and wheel, a down or up motion may be imparted to the rods and to the lower cylinders, and a uniform tension thus given to or quickly taken off the skeins of cotton. An automatic arrangement stops the downward motion when the required tension is obtained. The cylinders are arranged so that two, one in each row, form a pair, each one in the upper row being rotated by an endless screw and wheel, while the lower set is driven from the upper by spur and bevel gearing. For introducing and removing the skeins, the front cross bars supporting the two sets of cylinders are made to revolve on suitable pivots. The bath of caustic soda is then raised into position by a rack and pinion, the latter gearing with an endless screw, and after a few minutes' use is lowered, and covered to preserve its contents. Rubber cylinders, pressing against the lower row of metallic cylinders, squeeze out the excess of liquid, the pressure being maintained by springs attached to the main frame and by vertical rods to the supports for the rubber cylinders. Steam at 90 lb. pressure is used for driving water, on the injector principle, through pipes with many small outlets, so as to spray and thus finally wash the moving cotton with warm water.—B. N.

Warps for Weaving; Method of and Apparatus for Dyeing ——. R. W. Goddard, Bradford. Eng. Pat. 19,319, Sept. 3, 1902.

Horizontally-slotted metal supports are fixed to the sides of the dye-bath and vertically-slotted hangers are fixed to these supports by bolts, the latter serving for both horizontal and vertical adjustment of the hangers. These hangers carry at their lower ends the guide rollers in suitable bearings, and the latter are thus prevented from becoming twisted and thrown out of line when wood is used in the construction of the dye-bath.—B. N.

Indigo Dyeing; Impts. in ——. H. Muller, Paris. Eng. Pat. 9532, April 28, 1903.

This is a process for considerably shortening the time of preparation of an indigo bath, and for dyeing with the same in a single operation in a jigger or foulard machine. For cotton, 50 grms. of artificial or natural indigo are made into a paste and boiled with 150 c.c. of acetate of tin, 20° to 25° B., the latter prepared from stannic or stannous oxide, or the hydrated compounds, and acetic acid. When the acetic acid is nearly evaporated, add 450 c.c. of caustic soda or potash, 40° B., boil till all indigo is dissolved, add 350 c.c. of water, and strain the yellow solution after a final boiling. The material is passed through this for about 12 seconds, squeezed, aired, then passed for about 45 seconds through 2 grms. of bichromate of potash, or other soluble chromate, dissolved in 1 litre of water and 25 c.c. of hydrochloric acid, and finally washed, soaped, rinsed, and dried. For wool and silk, a similar process is used, but the first bath is used hot and the proportions are varied, thus: 50 parts of indigo paste are heated with 200 parts of 90 per cent. acetic acid, 200 parts of "stannic oxide" are added, the whole boiled, and just sufficient caustic added to reduce and dissolve the indigo, finally boiling and making up to 1,000 parts with water.—B. N.

United States Patents.

Mordanting Wool; Process of ——. H. Schrader, Hönningen. U.S. Pat. 735,599, Aug. 4, 1903.

See Eng. Pat. 20,851 of 1902; this Journal, 1903, 920. The wool is mordanted with chromium compounds and the acids of vinasse having the composition—

$$(CH_3)_3(HO)N.CH_2.COOH.$$

—T. F. B.

Dyeing or Bleaching; Apparatus for ——. F. A. Weller, Philmont, N.Y. U.S. Pat. 735,183, Aug. 4, 1903.

A yarn- or skein-dipping apparatus, in which the yarn is carried on horizontal rods connecting two endless chains, which pass over two pairs of sprockets, one in the vat and the other above it. Various mechanical details are claimed, including a drag-bar, to cause the yarn to alter its position with respect to the rods which carry it.—T. F. B.

French Patents.

Textile Fibre from the Cotton of New Zealand; Process for Producing a ——. Madame Jacob and W. Pritzkow. Fr. Pat. 327,958, May 12, 1902.

See Eng. Pat. 3722 of 1902; this Journal, 1903, 362. —T. F. B.

Fibres of Ramie [China-grass], Aloes, &c., and other Textile Fibres; Extraction of Gum from the ——. C. Brumaire and S. Diss, Algiers. Fr. Pat. 328,657, Jan. 15, 1903.

The fibres are first fixed to a suitable arrangement so that during the ebullition of the liquid in which they are immersed, they maintain their parallelism and do not bear upon the interior of the containing vessel. In the first operation the liquid consists of 200 parts each of salt and carbonate of soda dissolved in 1,000 parts of water, or 168 parts of salt and 192 parts of carbonate of soda in 1,000 parts of sea water, the latter proportions being used where sea water is available. After immersing the fibres, the liquid is brought to boiling, about 112° C. to 115° C., and maintained thus for four hours, boiling water being added from time to time to maintain the liquid at a constant strength. The fibres are afterwards carefully washed in fresh water to extract salt and suspended matter. In the second operation the fibres are immersed in a solution of 10 parts of soft soap in 1,000 parts of water, then raised to the boiling point and maintained thus for two hours, boiling water being used to replace the portion evaporated. The fibres are finally washed in fresh water and dried.
—B. N.

Dyeing Machines. Vacuum Dyeing Machine Co. Fr. Pat. 329,212, Feb. 9, 1903.

See U.S. Pat. 721,630 of 1903; this Journal, 1903, 416.
—T. F. B.

Printing Slubbing or Sliver for the Production of "Vigoureux" Threads; Process for ——. H. Giesler, Germany. Fr. Pat. 328,504, Jan. 14, 1903.

This is a process for the production of *mélangé* threads in the "vigoureux" style. In the usual process the ribbon of sliver is first dyed or bleached, printed in transverse white or coloured bands, then submitted to the action of steam, and finally washed and dried. By means of gill-boxes the position of the threads is changed so as to produce the mixture or "mélangé" aspect. The preliminary dyeing and bleaching is expensive, and the length of the processes is liable to give rise to felting, knotting, &c. In the present process, instead of one cylinder, two or more printing cylinders are used, coupled together, one printing the usual transverse bands, the other or others printing the intervals between, with colour or with bleaching agents, so as to avoid the preliminary dyeing or bleaching. The sliver is then finished by treating with steam, &c., as usual.—B. N.

Printing Textile Fabrics; Impts. in Machines for ——. J. G. Sanderson, England. Fr. Pat. 328,932, Jan. 29, 1903.

The invention deals with the type of machine, for printing textile fabrics, in which the printing rollers are placed in and out of contact with the fabric by means of suitable projections placed at intervals. Movable chains are employed, and have small links provided with pins, which regulate the intervals of contact of the fabric with the printing rollers, so that by varying the distances between the pins a great diversity in the intervals of contact may be obtained. The pins in their movement act on suitable levers, and these, by putting a clutch in gear, communicate movement to certain cams which put the printing rollers out of contact with the fabric, the cams being so arranged that the printing rollers may be again placed in contact by the action of gravity or by means of suitable springs. The principal printing cylinder of the machine is mounted on a hollow shaft, which is turned by gearing worked from an eccentric actuated by levers from the pins of the chains, and the shaft carrying the cams for raising the printing rollers passes through this hollow shaft.—B. N.

Printing Automatically in Colours on Carpets, Plush, Textile Fabrics, Hair for Upholstering, &c.; Machine for ——. A. H. Oxenford, England. Fr. Pat. 329,390, Feb. 14, 1903.

This is an improvement on Hallensleben's Fr. Pat. 307,322, Jan. 22, 1901, in which the printing is done by means of a waggon furnished with a printing mechanism travelling along the length of the thread. The improvements allow of the printing of the whole of the desired colours in a single journey of the printing waggon. The latter is provided with a specially prepared printer for each colour, and the movement is controlled by a mechanical Jacquard in such a way that when arrested, one of the printers is brought into action. The waggon advances automatically and meets raised fallers, worked by the Jacquard, each row of fallers encountered bringing into action its corresponding printer.—B. N.

Bronzing, Talcing and Wiping, Glazing, Gumming, and Sizing; Machine for ——. J. R. Martini, France. Fr. Pat. 329,215, Feb. 9, 1903.

A rotating drum is provided with an arrangement for gripping, and thus fixing the edge of the sheet of paper to be treated. Bronze, talc, &c., is contained in a suitable trough, and the material is carried by means of an india-rubber-covered roll and deposited on the sheet of paper. The roll, which is disposed concentrically in the trough, is pressed by adjustable springs against the drum and sheet of paper, and is also provided with an arrangement for removing the excess of material. Suitable means are also provided for removing any excess of material from the paper.—B. N.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

French Patents.

Pulverising Liquid Colours on Wall Paper, Textile Fabrics, &c.; Impts. in Apparatus for ——. C. L. Burdick, England. Fr. Pat. 328,714, Jan. 22, 1903.

Air, under pressure, is used for pulverising the colour on the wall paper, textile fabric, or other analogous material. The paper is carried, by means of an apron, over a templet, an arrangement being used for setting the paper, apron, and templet to a uniform speed. The templet is provided with suitable perforations, so that the protuberances on the paper fitting into these openings are exposed to the action of the liquid colour and the air blast. The blast pipes for pulverising the colour may be set perpendicularly or obliquely, and may be suitably disposed in single or multiple rows. The method of regulating the admission of colour or air, which may be cold, or warmed in a suitable manner, is such that the blast pipes may be commanded by the movement of a single rod, but such that the air-valve for each blast pipe is opened a little before and shuts a short time after the colour valve. Means are also provided for discharging the excess of colouring fluid from the surface of the templet.
—B. N.

Paper which Dyes more Easily, giving Faster Shades; Process of Manufacturing ——. C. Dreher, Germany. Fr. Pat. 328,854, Jan. 27, 1903.

Paper pulp, or finished paper, is impregnated with titanic acid or titanium salts; paper thus prepared gives, with basic dyestuffs, colours much faster to water; with mordant dyestuffs the colours are almost fast to water, air, and light; whilst with tannin a good yellow colour is obtained, which is made quite fast by addition of resin, casein, &c.

An example of treatment for mordant dyestuffs is as follows:—100 parts of the pulp are treated, in a cylinder-mill, with six parts of resin; this is saponified with a solution of sodium carbonate containing 30 grms. of alizarin black paste. Titanic acid, dissolved in sulphuric acid, is added till all the resin is precipitated. A black paper is thus obtained, fast to acids, alkalis, air, and light.—T. F. B.

Linoleum Carpets, Tapestry, &c., with the Design Inlaid in Colour; Process of Making and Colouring ——. A. F. Lundeberg. Fr. Pat. 328,749, Jan. 23, 1903.

See Eng. Pat. 9707 of 1902; this Journal, 1903, 739.
—T. F. B.

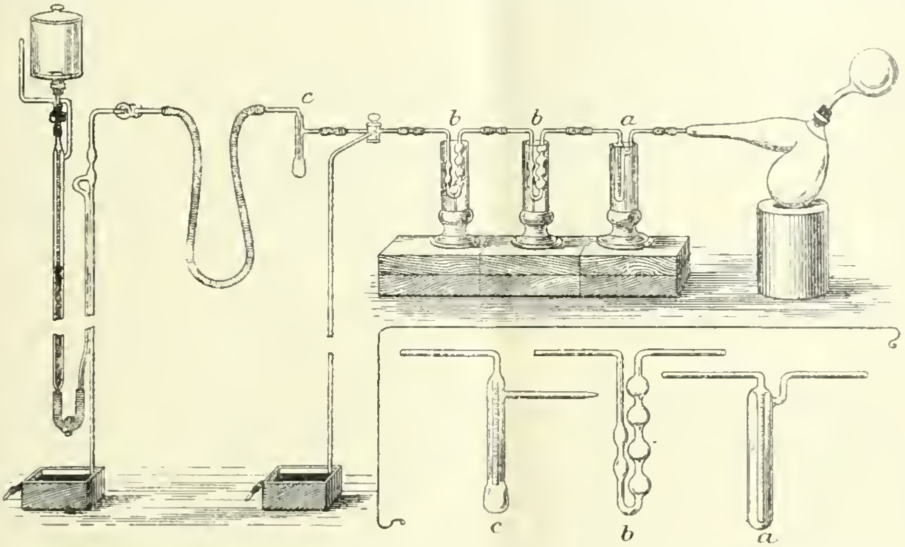
VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid ; Chemical Kinetics of the Contact Process of Making ——. M. Bodenstein. Fifth Internat. Congress of Applied Chemistry, Berlin. Zeits. f Elektrochem., 1903, **9**, [34], 696—697.

The experiments were made at 246° C. and 264° C., and he observed diminution of pressure at constant volume aused by the reaction $2SO_2 + O_2$ (3 vols.) = $2SO_3$ (2 vols.) vas taken as the measure of the velocity of the reaction. 120 grms. of platinum wire gauze were used as catalyser.

The velocity of reaction was found to be absolutely independent of the concentration of the oxygen. It was oncluded that by the sulphur trioxide formed, the reaction vas seriously retarded. The results are well represented by $\frac{dx}{dt} = k.\frac{C(2SO_2)}{m + C(2SO_3)}$, in which *m* is a constant, and $2SO_2$ and $2SO_3$ are expressed in mm. of mercury. The value of *n* increases with the temperature ; it is 42·7 at 246° C. and 30·0 at 264° C.

In the discussion, Nernst stated that the retardation of the eaction is caused by the slow rate of diffusion of sulphur lioxide to the surface of the catalyser, the oxygen diffusing nuch faster.—L. F. G.



arbon Dioxide from Sodium Carbonate Solutions ; Liberation of ——. F. W. Küster. Zeits. f. Elektrochem., 1903, **9**, [34], 679—682. (See also this Journal, 1903, 417.)

ontinuing the experiments on the evolution of carbon ioxide from solutions of sodium carbonate, containing rying amounts of caustic soda, the author finds that the rve connecting the amount of carbon dioxide evolved, d the percentage of sodium carbonate in the solution, even, with no bends, and not the slightest irregularity at e point where the composition of the solution corresponds that of trona ($Na_2CO_3 + 2NaHCO_3$). Precisely similar sults were obtained with solutions of sodium bicarbonate, 90° C.

The curve connecting the conductivities of mixtures of ormal solutions of sodium bicarbonate, carbonate, and ydroxide at 25° C., with their percentage composition, as likewise continuous and even.—L. F. G.

Pure Gases ; Apparatus for Preparation of ——. H. Moissan. Comptes rend., 1903, **137**, [6], 363—369.

he principle of the method consists in passing the gas fficiently dried and purified through the tubes, *a*, *b*, *b*, which it is further dried and purified by keeping them mersed in Dewar-tubes containing refrigerants at approiate temperatures from −30° to −200° C. The gas is en collected in a receiver, *c*, where it is liquefied or lidified by still greater refrigeration.

In delicate experiments the rubber connections are substituted by connections of glass or metal tubing made tight by a resinous cement. When the receiver is full, its connection with the mercury pump (see figure), which serves to withdraw air and other uncondensed gas from the apparatus, is closed either by the stopcock or by sealing off the glass connecting-tube, the three-way cock is turned to connect with the delivery-tube (more than 80 cm. long) dipping into the mercury trough, the temperature of the receiver is allowed to rise slowly, and the evolved gas is collected in appropriate vessels. The following details are given :—*Carbon dioxide :* Prepared from marble and hydrochloric acid, washed in alkali bicarbonate solution, and passed over solid bicarbonate ; purifiers at −70° C. in acetone and liquid carbon dioxide, receivers at −182° C. in liquid oxygen. *Hydriodic acid :* Prepared in the usual way ; purifiers at −32° C. and receivers at −60° C. *Hydrochloric acid :* From sodium chloride and sulphuric acid ; purifiers at −80° C., receivers at −150° C. *Phosphine :* Prepared by any ordinary process ; purifiers at −80° C., receivers at −182° C. The evolved gas is not spontaneously inflammable. *Hydrogen sulphide :* From ferrous sulphide and sulphuric acid ; purifiers at −70° C., receivers at −100° C. The hydrogen simultaneously produced passes out by the pump. *Nitrogen dioxide :* From nitric acid and copper ; *a* is kept at −60° C., *b b* at −100° C., receiver at −182° C. Water is stopped in *a*, nitrogen monoxide in *b b*, nitrogen passes away through the pump, and the receiver contains pure nitrogen dioxide.—J. T. D.

Silver in Commercial Potassium Cyanide. K. Friedrich. XXIII., page 1016.

English Patents.

Hydrocyanic Acid ; Production of ——. W. Feld, Hoenningen-on-Rhine. Eng. Pat. 21,017, Sept. 26, 1902.

See Second Addition to Fr. Pat. 315,837 of 1901 ; this Journal, 1903, 571.—T. F. B.

Gases ; Separation of ——, *from their Mixtures, especially Oxygen and Nitrogen from Atmospheric Air, and Apparatus therefor.* R. J. Lévy and A. Helbronner, both of Manchester. Eng. Pat. 16,615, July 26, 1902.

See Fr. Pat. 328,770, page 996.—E. S.

United States Patent.

Sulphuric or other Acids ; Apparatus for Making —— J. G. Graham, Stockport. U.S. Pat. 736,087, Aug. 11, 1903.

See Eng. Pat. 6051 of 1902 : this Journal, 1903, 907.
—T. F. B.

French Patents.

Titanic Acid; Extracting ——, from its Combinations with Iron, Aluminium, and other Metals. C. Dreher, Germany. Fr. Pat. 328,855, Jan. 27, 1903.

Substances (such as bauxite residues) containing titanic acid associated with iron, aluminium, and other metals, are treated with sulphuric or other acid, and nascent hydrogen is produced in the solution by electrolysis or other means. The acids are nearly neutralised by an alkaline earth or corresponding carbonate; or substances, such as sulphates, acetates, or formates, may be added to bind the acid employed, without dissolving the titanous oxide which is precipitated.—E. S.

Ammonium Formate and Ammonia; Preparation of ——. J. Schlutius. Fr. Pat. 328,674, Jan. 21, 1903.

See Eng. Pat. 2200 of 1903; this Journal, 1903, 865.
—T. F. B.

Copper Sulphate; Manufacture of ——. G. Gin and the Soc. Anon. la Métallurgie Nouvelle, France. Fr. Pat. 328,800, Jan. 26, 1903.

Crude copper sulphate solution containing iron, is boiled with cupric oxide, whereby ferric oxide is precipitated from the ferric sulphate present, leaving ferrous sulphate in solution. Or the ferric salt may be reduced to the ferrous state by boiling with iron. The copper sulphate solution, now containing only ferrous sulphate, is heated in a suitable copper boiler, under pressure, up to about 180° C., at which temperature the ferrous sulphate is insoluble in the copper sulphate solution. The liquid is then filter-pressed, special arrangements being made to avoid rapid cooling. Two presses are alternately used, one being washed out while the other is in use.—E. S.

Saline Solutions, Sugar Extracts, &c.; Apparatus for Evaporating ——. A. Freitag. Fr. Pat. 329,015, 1903. I., page 988.

Washing Salt and other Materials; Apparatus for ——. L. M. A. Butin. Fr. Pat. 329,396, Feb. 14, 1903. I., page 988.

Gaseous Mixtures [Oxygen and Nitrogen]; Separation of ——. R. J. Lévy and A. Helbronner, France. Fr. Pat. 328,770, Jan. 24, 1903.

The process consists, generally, in effecting a series of successive exchanges, separate and frequently repeated, between two contrary currents of the mixture of oxygen and nitrogen, one liquid and the other gaseous, of which the liquid becomes richer in oxygen at each stage, whilst the gaseous current becomes successively richer in nitrogen.
—E. S.

Gaseous Mixtures [Oxygen and Nitrogen]; Process and Apparatus for Separating ——. R. J. Lévy and A. Helbronner, France. Fr. Pat. 328,984, Jan. 31, 1903.

A series of separate and successive exchanges are effected between liquid air and a counter-current mixture of oxygen and nitrogen gases, under a pressure greater than that of the atmosphere. The gases are caused to come into intimate contact with the liquid in many superposed tiers of vessels, and at many places in each tier, with passage through exchangers, with the result that on each successive lower tier the liquid becomes enriched in oxygen, while the gaseous ascending mixture becomes correspondingly richer in nitrogen. The liquid, nearly pure, oxygen reaching in the final operation the lowest chamber of the apparatus, is subjected to a series of partial vaporisations, whereby it is entirely freed from nitrogen. The process admits also of obtaining liquid nitrogen of 98 per cent. purity from re-liquefied gases, from which liquid it is stated that the pure gas may be volatilised. The last rectification is effected at atmospheric pressure.

In this process, it is claimed the air need be only partially liquefied to separate its constituents. The liquid is then fractionated under pressure, with partial re-liquefaction of the remaining gases, the last liquid being fractionated under atmospheric pressure.—E. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Iron and Steel; Permanent Protection of ——. M. Toch. J. Amer. Chem. Soc., 1903, **25**, [7], 761—766.

The results of experiments on the use of Portland cement for the protection of iron and steel have led the author to the following conclusions:—(1) If a suitable cement paint be applied to a surface that has begun to oxidise, oxidation is arrested. (2) A fine cement, free from iron, calcium sulphate, and sulphides of low specific gravity, rapidly sets on the surface of the metal, and will not eventually be washed off by rain. (3) By painting the cement with an adherent alkali-proof paint, the iron is rendered proof against moisture, carbon dioxide, and chemical fumes. (4) Pure water must be used for mixing the cement, and the paste must be stirred for not less than 15 minutes for the lime to be liberated. (5) Free lime on the surface of the applied cement is rapidly carbonated, and is then even advantageous when linseed-oil paint is applied.

The application of a coating of cement mixture to a newly set and moist brick wall enables the surface to be immediately painted with a linseed-oil paint, which without such a base would rapidly peel off. Painting the outside wall of a building in this way helps to protect iron and steel used in the construction by excluding moisture, carbon dioxide, and gases. Structural metal work protected by a coating of cement on which is placed a layer of insulating hydrocarbon paint will be perfectly immune from oxidation when embedded in masonry. Pipes and underground conduits may be protected in the same way.

Pure Portland cement mixed with water does not readily set as a wash on metal, and is liable to crack, and should therefore be diluted to some extent. Where it cannot be applied by means of a brush it may be sprayed on, but several coatings must then be applied.—C. A. M.

Blocks and Stones; Influence of the Size of Grains on the Structure of ——. O. Mühlhaeuser. Zeits. angew Chem., 1903, **16**, [32], 761—764.

In a previous communication the author showed that the different classes of grain of burnt brick have approximately equal volume-weights, and in this instance he has investigated the effect, during drying and burning, which grains of these different sizes have upon the structure of clay bodies made with them. The following results were obtained:—The water-content of the blocks and the contraction on drying, baking, and complete burning are related to the size of the grain of the burnt materia employed. The finer the grain of the material, the more water do the blocks made from it, take up, and the less plastic do the blocks formed appear, and the greater is the contraction on drying and burning of the stones. The blocks made from all grades yield, on burning, stones whicl do not differ in any marked degree in volume-weight or porosity. The penetration of the stones by water is in direct proportion to the size of the burnt material employed The larger the grain the more easily penetrated are the stones, and the finer the grain the greater the resistance they offer to the penetration of water and gases, for example, steam.—W. C. H.

Tiles of Cement and Sawdust. H. Seger and E. Cramer Tonind.-Zeit., 1903, **27**, [78], 1252.

The reason why many attempts to make tiles of cement and sawdust have failed, while good results are obtaine with magnesite and magnesium chloride with the same filling, is owing to the fact that the sawdust is used in dry state and thus withdraws from the cement the moisture necessary to ensure proper setting. A method recommended for manufacturing such tiles is to well moiste sifted sawdust and leave it for 24 hours, a uniform conten of moisture being secured by damping the mass again a the end of six hours and turning it over thoroughly with the shovel. Three parts by volume, or 100 by weight, of the damp sawdust are then intimately mixed with 2 parts by volume (240 by weight) of Portland cement, 48 parts by weight of water being thoroughly incorporated with the mass, which is then pressed into moulds. The tiles should be repeatedly sprinkled with water during the setting process, to prevent them becoming too dry. The weight of these tiles is 1 kilo. per square metre for each millimetre of thickness.

The compression tests made with tiles prepared in this way gave a strength of 52·6 kilos. per sq. cm. at the seventh day and 94 kilos. on the 28th day. These tiles are superior to those containing magnesium carbonate, on account of the hygroscopic character of the latter substance; they may also be easily nailed or drilled without cracking off.—C. S.

Cement; Manufacture of ——, from Marl and Clay. H. S. Spackman. Paper read before the Engineers' Club of Philadelphia. Scientific American, 1903, **55**, [1433], 22964—22967.

In the United States the lime used in the manufacture of Portland cement is found in several forms, which may be classified under three general groups—argillaceous limestone, marl, and limestone, in the order of their relative importance, so far as cement production is concerned. A considerable amount of cement is also manufactured from furnace slag. Marl is of organic origin, the deposits being found in low lands, marshes, and the bottoms of lakes. In texture it is smooth and soft, varying in consistency from that of putty to that of river mud. Marl deposits of a different character occur in Northern Ohio, the marl being largely of chemical origin, formed by the crystallisation and deposition of lime through evaporation of the water which overflowed the low lands in periods of floods, &c. Marl deposits vary in depth from a few inches to 30 feet, but should average at least 10 feet for profitable working. For the manufacture of cement, the chemical composition of the marl should be within the following limits:—Silica, 0·0—3·0; alumina and ferric oxide, trace to 5·0; lime, 45·0—56·0; magnesia, 0·0—1·5; sulphuric anhydride, 0·0—1·0; organic matter, 0·0—5·0 per cent. The wet process of manufacture is generally used, although the drying of the marl before grinding and mixing, after having been tried and condemned, is now again being taken up. The clay used in the manufacture of cement from marl should be low in magnesia and lime, and free from sand and pebbles, whilst the combined iron and alumina in the clay should be from one-half to one-third of the silica. The method of excavating the marl and delivering it to the mill, varies according to the nature of the deposit, but probably the most successful device for delivering the marl from the dredge to the mill is a double cylinder with compressed air, the marl itself acting as piston. The pump consists of two tanks, which are alternately filled and emptied; when one tank is filled, the compressed air is turned on, and the contents forced into the pipe line. The clay is generally dried, ground, and mixed with the marl at the pug-mill, but at a mill in Detroit the clay has not been dried, but made into a slurry separately, and then mixed with the marl. The handling of the raw materials after delivery at the mill is done by pumps—cylindrical pumps, centrifugal pumps, and compressed-air pumps all being in use. For grinding the marl the wet-tube mill is generally used, but, in some of the Canadian mills, millstones are employed with satisfactory results. After burning the clinker, the process is similar to the dry method, but the clinker from marl is more easily ground.

The principal advantages and disadvantages of the manufacture of cement from marl and clay, as compared with the manufacture from argillaceous limestone, or limestone and clay, are as follows:—When marl and clay are the raw materials, the excavation and grinding are much less difficult, as the materials are all soft, but there are the following disadvantages:—(1) With each 100 lb. of raw materials, 100 lb. of water have to be handled. (2) In the process of manufacture, the raw materials must be kept in a state of agitation. (3) The consumption of fuel is 50 per cent. greater than by the dry process; the author considers that the increased consumption of fuel is not entirely due to the amount of water in the slurry, but also to the more refractory nature of the raw materials, and to the decreased production per kiln. In the wet process the best stack temperature is about 400° F., whilst in the dry process the stack temperature varies from 800° F. to 1200° F., or even higher. (4) It is difficult to work in cold weather. (5) The production per kiln is less; by the wet process the average production per kiln per day is about 100 barrels; by the dry process, 175 barrels.

The author gives a detailed account of a factory where cement is manufactured from marl and clay. The marl and clay are mixed with water separately at the mill, and are then mixed together in the proper proportions before grinding. The slurry is then fed by gravity to the tube mills, thence to storage pits, and is finally pumped to the kilns, an even pressure being maintained by two stand-pipes, through which the overflow returns to the pit from which the slurry is being pumped. The rotary kilns are of the ordinary type, six feet in diameter and sixty feet long, and each provided with a speed regulator, by means of which the speed of rotation may be varied from one revolution in 45 seconds to one revolution in three minutes. The hot clinker is discharged into vaults below the kilns, which are of sufficient size to take four times the daily production of the kilns. Cooling is effected by forcing cold air in at the bottom of the vaults and exhausting it from the top, and also by an auxiliary system of rotary coolers. The fans exhausting from the top are those used for blowing the powdered coal into the kilns, thus effecting a saving of fuel, the temperature of the hot blast obtained in this way being about 700° F. The powdered coal is of such fineness that 95 per cent. will pass a No. 100 sieve. The grinding machinery differs little from the standard practice, ball- and tube-mills being used. In some works Griffin mills are used. The entire plant is electrically driven.

The author states that there is a growing tendency to favour limestone and clay as raw materials for the manufacture of cement. The following table shows the approximate amount of cement manufactured from the different materials during the past five years in the United States.

Date.	Argillaceous Limestone.		Marl.		Limestone.		Total.
	Production.	Per Cent	Production.	Per Cent	Production.	Per Cent	Production.
	Barrels.		Barrels.		Barrels.		Barrels.
1899	4,100,000	73	1,200,000	21	300,000	5	5,600,000
1901	8,700,000	70	2,150,000	17	1,850,000	13	12,700,000
1903 (estimated)	11,600,000	61	3,200,000	17	4,200,000	22	19,000,000

—A. S.

Portland Cement as Solid Solution. C. Richardson. Tonind.-Zeit., 1903, **27**, 942; Chem.-Zeit., **27**, [65], Rep. 197—198.

A better elucidation of the constitution of Portland cement is obtained when the cement is regarded as a solid solution, than when judged from the results of purely analytical examination. The cement must be regarded as an alloy of tricalcium silicate and bicalcium aluminate, in the molecular proportion of 85 per cent. of silicate and 15 per cent. of aluminate, and should exhibit the characteristics of a solid solution of these materials, obtained by sintering them at a temperature below the fusing point, and solidifying them to a more or less crystalline mass. Commercial Portland cement is a similar, but more complex alloy containing a compound of iron and lime corresponding to the aluminate, magnesia, alkalis, and sulphuric acid being non-essential constituents. Where there is a deficiency of lime, bicalcium silicate and probably also a little monocalcium silicate, will be present. The accessory constituents form, with the iron and lime compound, a magma of low setting point and indeterminate composition; and bicalcium silicate and magnesia compounds also separate out in the form of globules and streaks respectively. It is important that the minor constituents should not be present in sufficient quantity to retard the formation of a true solid solution of tricalcium silicate and bicalcium aluminate. In order that the cement may retain its volume and prove satisfactory, the trisilicate must be exclusively a calcium salt; and sufficient lime should be present to ensure the whole of the silicate being in the tribasic, and not the bibasic, form. The fulfilment of these conditions is revealed by the solid solution giving lustrous interference colours in polarised light.—C. S.

English Patents.

Marble, Stone, or the Like; Compositions for and Manufacture of Imitation ——. G. A. Newton, J. W. Soar, H. Dickinson, and D. Mitchell, all of Bootle. Eng. Pat. 16,665, July 28, 1902.

The composition consists of burnt fireclay or china clay, spar, quartz, gypsum, marble chippings, &c., ground to powder and mixed with magnesite (Venetian cement), magnesium chloride, and water. A colouring matter may also be added, and the solid magnesium chloride and water may be replaced by a solution of magnesium chloride in water. To produce smooth polished articles, such as table tops, a mould, having a polished glass plate or other smooth internal surface, is used, into which the colouring matter, mixed with a little magnesite and magnesium chloride solution, is first introduced. A thin layer of a mixture of 6 parts of magnesite, 16 parts of ground pottery, $6\frac{3}{4}$ parts of magnesium chloride, and $13\frac{3}{4}$ parts of water is then placed lightly over the first layer, and, just before this sets, a backing of similar composition, but consisting of coarser particles, is put into the mould so as to form one block with the previous layers.
—A. G. L.

Plaster, Cement, Alabaster, or the like; Impts. in Colouring in the Mass of Plastic Material Composed of ——, *with Applications for the Purpose of Imitating Objects of Art or the like.* P. Gonnella, Lyons, France. Eng. Pat. 16,854, July 29, 1902.

Pigments are incorporated with a mixture composed of plaster, alabaster, and cement in order to produce various imitations. To imitate wood, a mixture of burnt sienna, umber, and cologne earth is used; for bronze, burnt sienna, "ivory green," and ivory black; to imitate ancient statuettes, a red or yellow pigment is added, the polychrome patina due to the action of the weather being obtained by employing the composition in certain parts only. The objects are subjected to the action of a furnace, and can be hardened and rendered unchangeable by means of boiled linseed oil, or stearine, or carnauba.—A. G. L.

Fireproofing of Combustible Materials. A. W. Baxter, London. Eng. Pat. 20,592, Sept. 22, 1902.

Soft woods, such as pine or firwood, are impregnated with a solution obtained by neutralising ammonia in aqueous solution with an acid, preferably sulphuric acid, adding a silicate solution, such as is obtained when silica is fused with potassium or sodium carbonate, and the melt dissolved in water, and finally neutralising the mixed solutions with sulphuric acid until just acid to litmus. The final solution should not contain more than 20 per cent. of solid matter. Good results are given by a solution obtained by fusing $2\frac{2}{3}$ parts of silica with $5\frac{3}{4}$ parts of potassium carbonate and 4 parts of sodium carbonate, dissolving the melt in $52\frac{1}{4}$ parts of water by boiling for 30 minutes, and adding the filtered liquid to 72 parts of water in which $13\frac{3}{4}$ parts of ammonium sulphate have been previously dissolved. The mixture is then neutralised as above.—A. G. L.

Protective Composition [for Wood and Similar Material]; An Improved ——, *and Method of applying same.* O. A. Stempel, Lakeland, Polk, Florida, U.S.A. Eng. Pat. 12,645, June 4. 1903.

To prepare a composition which shall be tough, durable, elastic, fireproof, and resistant to the attacks of rodents and insects, asphaltum (20 parts), asbestos (10 parts), and an obstructive material, such as sand, ground stone, kaolin, &c. (70 parts—all by volume), are mixed cold in the state of fine powder. In applying the composition to any object, the surface is first covered with a thin coating of powdered asphaltum, which is then fused by a hot plate. The composition is then spread in powder over the surface, and is also fused in the same way.—M. J. S.

Wood; Fireproofing ——. W. H. Peddle, New York, U.S.A. Eng. Pat. 14,522, June 30, 1903.

The wood is saturated with a fireproofing solution consisting of appropriate salts dissolved in water and a monatomic alcohol (wood spirit or ethyl alcohol) which is a solvent of resins. The solution is then drawn off and the wood dried. The action of the alcohol is to dissolve the resins present in the wood, thereby increasing the penetrative power of the solution, and removing the resins with the residual solution.—A. G. L.

Cement; Process for Producing ——. H. Passow, Hamburg. Eng. Pat. 18,953, Aug. 28, 1902.

See Fr. Pat. 324,687 of 1902; this Journal, 1903, 630.
—T. F. B.

United States Patents.

Brick or Article; Refractory ——. F. J. Tone, Niagara Falls, N.Y. U.S. Pat. 735,022, July 28, 1903.

A refractory material, such as granular silica or other refractory oxide, which is non-coherent when used alone, is mixed with carborundum as a binding agent and baked.
—A. G. L.

Bricks for Furnaces; Manufacture of ——. J. E. Kirkpatrick, Taunton, England. U.S. Pat. 735,528, Aug. 4, 1903.

Pure native magnesite (such as that found in the South of India) is first "dead-burnt," then crushed to powder and exposed to the air, the mass being frequently turned over, after which it is mixed with a small proportion of borax and only just sufficient water to cause it to cohere. The mass is then moulded, dried, and burnt at a high temperature. It may also be subjected to great pressure before being burnt.—A. G. L.

French Patents.

Refractory Material; Manufacture of ——. British Uralite Co., Ltd. Fr. Pat. 328,891, Jan. 28, 1903.

See Eng. Pat. 18,829 of 1902; this Journal, 1903, 867.
—T. F. B.

Bricks, Blocks, or Crucibles; Process of Making Articles of Refractory Material, such as ——. The Carborundum Co. Fr. Pat. 329,328, Feb. 13, 1903.

See Eng. Pat. 3308 of 1903; this Journal, 1903, 698.
—T. F. B.

Bricks, Artificial Stone, &c.; Manufacture of ——. F. W. Jenkins, England. Fr. Pat. 329,346, Feb. 13, 1903.

Molasses, or the waste of sugar refineries, and sand are mixed together, *e.g.*, in the proportion of 3 per cent. of molasses to 97 per cent. of sand. The mass is then moulded under pressure, and the resulting brick, &c., burnt. The molasses or the sand may be mixed with water before use.
—A. G. L.

Hydraulic Cements; Manufacture of ——. J. Gresly, Switzerland. Addition, dated Jan. 28, 1903, to Fr. Pat. 325,661, Sept. 3, 1902.

Substances consisting essentially of silicates of alumina, natural or artificial, such as clay, kaolin, clinker, &c., are mixed, with or without the addition of a small quantity of gypsum or other sulphate possessing similar properties, with calcareous substances, consisting chiefly of calcium carbonate, in the proportions expressed by the formulæ—

$$x(SiO_2) + y(Al_2O_3) + v(CaCO_3) \text{ or}$$
$$x(SiO_2) + y(Al_2O_3) + z(MSO_4) + v(CaCO_3),$$

in which v is greater than the sum of x and y, and preferably equal to twice their sum. The mixture is burnt at a temperature below its clinkering point. See Fr. Pat. 325,661; this Journal, 1903, 744.—A. G. L.

Blast-Furnace Slags; Treatment of —— [*for Producing Cement, &c.*]. H. Passow, Germany. Fr. Pat. 328,533, Jan. 16, 1903.

The object of the invention is to produce granules or particles from molten slag, varying in size and in "chemical activity" in a manner capable of being regulated, mainly for the production of cement from a mixture of two varieties of the particles. In one form of apparatus a flow of the molten slag is intercepted by a jet of steam, air, or gas, which pulverises and impels it against an upright screen cooled by water, from which the particles fall on to a similarly cooled horizontal receptacle; and the required modifications are produced in the granules by modifications or alterations in the force of the jet, and by regulating the temperature of the surfaces against which the particles impinge. In another apparatus, the stream of molten slag is received on the top of a cooled revolving cone, which projects the particles centrifugally against the cooled sides of the containing vessel, whence they descend on to other cooled surfaces.—E. S.

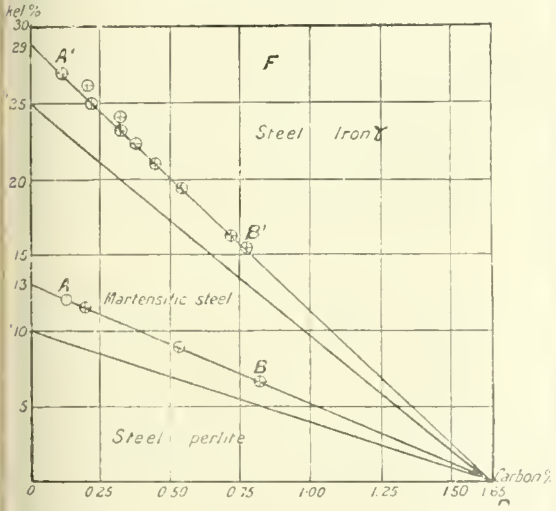
Portland Cement; Manufacture of ——. T. A. Edison, United States. Fr. Pat. 328,917, Jan. 29, 1903.

See Eng. Pat. 1404 of 1903; this Journal, 1903, 555.
—A. G. L.

X.—METALLURGY.

Nickel Steels; Diagram showing Properties of ——. L. Guillet. Comptes rend., 1903, **137**, [7], 411—413.

The author bases, on his classification of steels, and on Osmond's law of the equivalence of manganese and nickel to carbon in hardening effect, the following diagram :—



The points A and B represent (Ox indicating content of carbon, and Oy content of nickel) two steels at the limit of composition producing martensitic steels, *viz.*, carbon, 0·120 per cent., nickel, 12 per cent.; and carbon, 0·800 per cent., nickel, 7 per cent. The line drawn through these points represents the limit of martensitic steels. Similarly, A′ and B′ represent two steels (carbon, 0·125, nickel 27; and carbon, 0·796, nickel, 15 per cent.) at the limit of composition producing polyhedric or γ-iron steels. The line drawn through these points represents the limit of polyhedric steels. Both of these lines cut the axis of x at the point indicating 1·65 per cent. of carbon—the percentage which Osmond has shown to be most favourable to the production of austenite; while the martensitic line and the γ-iron line cut the axis of y at points indicating 13 and 29 per cent. of nickel respectively.

The author has verified this diagram for a great number of steels, but has found that below each of these two lines there is a zone of transformation indicated by the lines D C′ and D E′, so that the quadrant is cut into five zones, namely :—

O D C′, corresponding to steels of the structure of ordinary carbon steels.

C′ D C, corresponding to steels formed of α-iron and martensite.

C D E′, corresponding to steels formed of martensite alone.

E′ D E, corresponding to steels formed of martensite and γ-iron.

E D F, corresponding to steels formed of γ-iron alone.

Thus the structure, and consequently the mechanical properties, of the steel can be deduced from its composition.
—J. T. D.

Sulpho-Telluride [*Gold*] *Ores at Kalgoorlie; Treatment of* ——. W. A. Prichard and H. C. Hoover. Eng. and Mining J., 1903, **76**, [5], 156.

The authors make a comparison of the Diehl process and the roasting process for the treatment of Kalgoorlie ores (see this Journal, 1900, 828; 1902, 1029; 1903, 911). The essential features of the Diehl process in its best development are: (1) Breaking in gyratory breakers; (2) wet-crushing in stamp mill; (3) concentration on Wilfley tables; (4) amalgamation, either on plates prior to concentration, or by treating the concentrates in pans afterwards; (5) reduction of all tailings to a slime, in Krupp tube mills; (6) agitation with cyanide and cyanogen bromide; (7) separate or combined treatment of concentrates by roasting; (8) filter-pressing to recover gold solution; and (9) zinc precipitation. The roasting process consists of: (1) Breaking in gyratory breakers; (2) dry-crushing in Griffin or Krupp ball mills; (3) roasting to oxidise sulphides and tellurides; (4) amalgamation and sliming in pans; (5) separation of sands and re-grinding in pans; (6) agitation of slimes with cyanide; (7) recovery of solution from slimes by filter-pressing; and (8) precipitation of gold by zinc shavings.

The extraction obtained by the two methods on ore of the same grade shows a difference of from 1 to 3 per cent., generally in favour of the Diehl process. The initial expenditure is less in the case of the Diehl process, largely owing to the more limited outlay on roasting and appliances and less cost of erection. In working expenditure the Diehl process possesses the following advantages :—(1) Preliminary breaking in one stage; (2) the wet-crushing is cheaper; (3) by concentration, the product requiring to be roasted is less than 5 per cent. of the total ore, against 100 per cent. in the roasting process; (4) the cost of maintenance and wear and tear are less. The advantages of the roasting process are: (1) less cost of chemicals; and (2) no royalties. On the whole, the Diehl process, under equally efficient management, should have about 2½ shillings or 60 cents per ton the advantage as regards costs.—A. S.

Slimes; Desulphurisation of ——, *by Heap-Roasting, as conducted by the Broken Hill Proprietary Co., Ltd.* E. J. Horwood. Trans. Australas. Inst. Min. Eng., 1903, **9**, [1], 106—114.

In crushing this Company's ores for concentration, much slime is produced, an analysis of one sample showing per cent. :—Galena, 24; blende, 29·4; pyrites, 3·4; iron oxides, 5·2; manganese oxide, 6·7; alumina, 5·4; lime, 3·4; silica, 23; and silver, 0·06. In practice, about 1,200 tons (11 per cent. of the gross weight of ore treated) of slimes, containing about 20 per cent. of lead, 17 per cent. of zinc, and 18 oz. of silver, are obtained weekly. Large accumulations of these slimes exist, untreated, partly owing to the roasters being fully engaged with the more valuable concentrates. The heaps are now being picked down in lumps of about 5 ins. thick—a suitable size for heap-roasting—the resulting slimes being mixed in a pug-mill with water, and treated in the same way as the current slimes, as follows :—They are tipped in a semi-fluid condition, and left until (soon) they can be cut with a shovel into rough bricks, which dry quickly, and are then loaded, as required, into railway trucks. One man can cut about 20 tons of bricks per diem, and the cost is thus smaller than treating the slimes in other ways, such, for example, as bricking. About 10 per cent. of smalls is made in handling the lumps on the way to the heaps, and these smalls are worked up again, a part of the mixture from the pug-mill being, however, used for covering the heaps to exclude an excessive amount of air. The heaps are 7 ft. high and 22 ft. wide at the base, the sides sloping up rather flatter than one to one; the tops are flat. The length should be as great as possible, as there is left at the end of the operation, a crust, 6 ins. deep, imperfectly roasted. The Company is building the heaps 200 ft. in length. They should be burnt regularly and not too rapidly, avoiding sintering, which is very liable to take place, and which prevents perfect roasting. At 400° C. the sulphide slime is converted into basic sulphate, whilst at 800° C. it sinters and forms fusible lead silicate. No chimneys are provided, but a strip 5 ft. wide, along the crest of the pile, is left uncovered. The draught can be regulated sufficiently by means of the flues at the base of the pile. The roasting is complete in about a fortnight, by which time the sulphur contents of the pile should have become reduced from 14 per cent. to from 6·5 to 8·5 per cent. The rapidity of the oxidation is ascribed by Carmichael, in part, to the manganese oxide and calcium sulphide becoming oxidised to higher oxide and sulphate respectively, and then acting as carriers of oxygen to the lead sulphide. The loss of lead sulphide by volatilisation is not great, and that of silver is inappreciable; but there is a loss of zinc, which, however, is favourable to the subsequent smelting process.—W. G. M.

Cyaniding; Treatment of Slimes by ——, *and Electrical Precipitation on Mercury.* F. T. Mumford. Trans. Australas. Inst. Min. Eng., 1903, 9, [1], 96—105.

In treating slimes, filter-pressing after agitation as practised in Western Australia, is efficient; the slimes, too, may be readily washed, so that the extraction by this process is good, but the high working costs, due chiefly to labour, compressed air, and general upkeep, restrict its application to high-grade material. The decantation method, as used in South Africa, allows of low working costs, but it also gives low yields, owing to imperfect washing; moreover, the solution to be handled is very voluminous. In either case the solution must be clear before precipitation by means of zinc can be attempted. The advantages claimed for electrolytic precipitation of gold on mercury are as follows:—Extraction and precipitation may be effected without filtration; the solution need not be clear for precipitation; the precipitation is equally good whether from strong or very weak cyanide solutions; the presence of copper salts is not detrimental; the gold is recovered as an amalgam, which only requires retorting and melting; amalgamation of slimes beforehand is unnecessary, as any coarse gold present is amalgamated during precipitation. The essential features of a mercury cathode are thus summarised:—The surface of the mercury should be as large as possible, and be kept in perfect condition by some simple means; the minimum quantity of mercury should be used; and the right current density should be employed.

The Riecken Process has been employed at the South Kalgurli Mine since December 1900, about 3,000 tons per month being now treated. In this process an iron vat is used with vertical ends, 11 ft. high by 8 ft. wide, with inclined sides 13 ft. long, and rounded bottom. It holds 17 tons of ore. Paddles mounted on a horizontal shaft passing through stuffing boxes at the ends are rotated at 12 revolutions per minute. The sides and bottom form the cathode, and are lined with amalgamated copper, over which mercury is kept flowing, being drawn off below and elevated by compressed air to the top of the vat. Iron bars, 3 ins. by 1 in., suspended about 18 ins. from the bottom, serve as anodes. The discharge valve for the pulp is placed 4 ins. from the bottom, and the mercury remains in the vat during the discharging period. About 400—500 lb. of mercury are required for one vat.

Mumford's Electro-cylinder consists of a steel-plate cylinder, lined with amalgamated copper, and with wooden ends; it is supported on rollers, and rotated at five revolutions per minute. The anodes are 2-in. round iron bars, supported from end to end of the cylinder, and making electrical contact by means of brushes outside the cylinder at one end. Wooden bars to assist the agitation are similarly supported. A 6-in. valve with an elbow is placed at one end, 3 ins. from the bottom, for use as a discharge in that position, or as an inlet when the cylinder is turned through a half-revolution. A spring-valve for the escape of gases is also provided, opened automatically by a tappet when it is at its highest point. A locked mercury-cock is placed in the periphery of the cylinder. In use, mercury is charged in until it is ½ in. deep on the bottom, and the cylinder is filled with charge to within a few inches of the top. The whole is then rotated on its horizontal axis at five revolutions per minute, and current is supplied at a density of 0·5 amp. per square foot of the amalgamated copper cathode surface. The latter is kept clean by its frequent plunge beneath the mercury bath. Most of the amalgam passes into the mercury, and can thus be run off at the "clean-up." Amalgam adhering to the copper is removed by returning the cleaned mercury and agitating it with sand, if necessary, after softening the amalgam by means of steam. A cylinder 20 ft. long and 5 ft. in diameter holds 16 tons of pulp (equal weights of solution and ore), and requires about 300 lb. of mercury and 150 amp. A slime assaying 6 dwt. of gold would require about eight hours for complete precipitation, or one assaying 1 to 2 oz. about 12 to 16 hours. Prior to use, battery tailings would be classified to separate sand, and the slimes would be thickened to the right consistency in spitzkasten; they would then be transferred to agitation-vats and mixed with cyanide. By modifications described, the process is applicable to sulpho-telluride ores. The current-density to be employed depends largely upon the condition of the surface of the mercury. When the cylinder was maintained in rotation, a C.D. of 0·8 amp. per square foot could be used as a maximum, but any higher density led to a partial surface-deposit of gold, which did not amalgamate, and which was mechanically retained in the pulp. At 2 amp. per square foot, none of the deposited gold amalgamated, but all was lost. T. K. Rose has fixed 0·01 amp. per square foot as the maximum for simultaneous precipitation and amalgamation, this low figure being probably accounted for by the difficulty of keeping the mercury surface in good order. With weak solutions it was found that the weight of gold deposited was not in proportion to the current-density, and a C.D. of 0·5 amp. was practically as good as one of 0·8 amp. per square foot. The P.D. may be from 3 to 5 volts. It is recommended to add salt if fresh water be used.—W. G. M.

Cyaniding; Some Modern Methods in Ore-Treatment by ——. E. O. Watt. Trans. Australas. Inst. Min. Eng., 1903, 9, [1], 76—96.

The sulpho-telluride ore of the Kalgurli mine yields less than 10 per cent. of the gold present by amalgamation, and but little over 50 per cent. by direct extraction with cyanide. The ore is tipped over the grizzlies on to two cone rock-breakers, and the fragments (about 2 ins. in diameter) fall into a bin, and are thence conveyed to elevated bins, whence they are supplied to mills, in which the ore is crushed to pass a sieve of 40 meshes to the linear inch. The fine ore is then fed into Edward's roasting furnaces by mechanical feeders, the initial temperature to which it is subjected being 450° F., and the final (at the discharge end of the roaster) 1,170° F. From the furnaces the ore is conveyed to a mixer, and thence, after mixing with water, to hydraulic classifiers. The sand and concentrates are here separated from the slime, which is settled, and then, after agitation with cyanide, is conducted to filter-presses, whilst the concentrates are separated from the sand, and the latter is treated with cyanide by percolation, after passing over amalgamated copper plates and Halley's concentrating tables to separate a small portion of concentrate, which is then ground to slime in a Wheeler pan, and mixed with the other slimes. Air-lifts are used to raise the sands to the leaching vats, in which they are treated for 12 days. The lift-well should not be less deep than the height of lift above it. The pressure of air should be just sufficient to force air through a pipe to the bottom of the well. On the Kalgurli Mine, an 8-in. column ıises 130 tons dry weight of sand and slime in 24 hours, the :e having a sp. gr. of 3. The air-lifts are cheap to instal, ıd are specially useful for raising ores which clog ordinary ımps, the best work being done when the lifts are installed duplicate. Although their efficiency is low, they may rove as economical as pumps when continuity is essential, :d when loss of time and wear and tear are taken into count. A process of agitating the slime by compressed r for three hours in pneumatic agitators is successfully plied on the Kalgurli mine. Preliminary experiments ith a concentrated sand containing 4 oz. 17 dwt. of gold per n showed that after three hours' treatment with cyanide lution in the agitators, 32·3 per cent. of the sand had en reduced to slime, and 97 per cent. of the gold had en extracted. The agitators are closed vessels, $6\frac{1}{2}$ ft. in ameter and $13\frac{1}{2}$ ft. deep. They are provided with valved ling- and discharge-pipes for the pulp, and with air-inlet ıd -exhaust pipes and overflow pipes. Each agitator kes 6 tons of slime in a cyanide solution of 0·10 per nt. of available potassium cyanide. Five agitators are ranged in series, so that the air (which is notably charged th cyanogen when leaving the first) passes through each succession, an initial air-pressure of 22 lb. per square ch sufficing for the agitation of the whole series. High-essure air at 30 lb. is employed to discharge the pulp to the filter-presses. In one experiment with this plant, e cyanide solution, which initially assayed 0·10 per cent. of tassium cyanide, gave the following assays from the five ıts respectively after treatment; 0·06, 0·10, 0·115, 0·115, ıd 0·06 per cent. of available potassium cyanide. The w results in Nos. 1 and 5 vats were due to loss of potas-ım cyanide, removed by the air, whilst the gain in Nos. 3 ıd 4 vats was explained by the recovery of cyanogen echanically carried over in the air from Nos. 1 and 2 vats. ıe gain effected by the use of the process may be shown comparing the old results, when the slimes were stirred r 24 hours by mechanical means, with those obtained by ing pneumatic agitators for three hours. In the former se the consumption of cyanide was $2\frac{1}{4}$ lb., and in the tter case 1 lb., per ton of ore.—W. G. M.

Phosphorus in Steel; Rapid Determination of ——.
G. Aucby. XXIII., page 1016.

Silver in Commercial Potassium Cyanide.
K. Friedrich. XXIII., page 1016.

English Patents.

nc and other Volatile Metals; Distillation of ——, from Material Containing the same. F. W. Howorth, London. From Trollhättans Elektriska Kraftaktiebolag, Stockholm. Eng. Pat. 23,756, Oct. 30, 1902.

e Fr. Pat. 325,895 of 1902; this Journal, 1903, 748.
—T. F. B.

copodium Powder; Manufacturing a Substitute for ——, for Foundry Use. M. Helbig, Dresden, Germany. Eng. Pat. 7838, April 4, 1903.

fat, wax, or oil of any kind, is dissolved in petroleum the like, and to the resulting milky liquid a soft, non-groscopic powder, such as chalk or kaolin, is added to tain a pasty mass, which is dried on a porous surface, d then powdered, for use as a substitute for lycopodium wder in foundries.—E. S.

nd-like or Dusty Ores; Process to Smelt ——. J. Loewenthal and B. Lippert, Magdeburg, Germany. Eng. Pat. 10,659, May 11, 1903.

ıe dusty ores are made into bricks with powdered char-ıl and coke, and a cement of magnesium chloride and gnesite. The rows of bricks filled into the furnace are vered with white or "welding" sand, mixed with tassium salts, in order to form in the smelting an easily novable vitreous slag.—E. S.

tallurgical Furnaces [Liquid Fuel]. M. P. Boss, San Francisco, Cal. Eng. Pat. 14,565, June 30, 1903.

e U.S. Pat. 732,269, June 30, 1903; and compare U.S. ts. 732,263 to 732,268 inclusive, of the same date; this Journal, 1903, 914. Compare also U.S. Pat. 708,116, Sept. 2, 1902; this Journal, 1902, 1400.—E. S.

United States Patents.

Chromium-Nickel Steel. R. A. Hadfield, Sheffield.
U.S. Pats. 735,365 and 735,666, Aug. 4 1903.

See Eng. Pats. 27,752 and 27,753 of 1897; this Journal, 1899, 49.—T. F. B.

Precious Metals; Process of Extracting ——. F. R. Carpenter, Deadwood, S.D. U.S. Pat. 735,132, July 28, 1903.

The ore is smelted so as to obtain the silver and gold in the form of a matte, and, while the latter is still fluid, molten lead or superheated molten lead is caused to flow beneath the matte, and so extract the precious metals. The molten lead or superheated molten lead may also be allowed to flow continuously below the matte, and so effect the extraction during transit, or the bath of molten lead may be maintained continuously below the furnace charge, and so caused to flow beneath the matte. A method is also described whereby molten lead under pressure may be supplied at a point under and in contact with the matte, additional molten lead being added as the metal is withdrawn, so as not to exhaust the bath.—B. N.

Gold and Silver; Process of Extracting ——, from Ores. C. A. Harp and J. F. Starkweather, sen., Stockton, Cal., Assignors to G. Marks, Sacramento, and B. Davis, W. A. Morris, and J. F. Starkweather, jun., Stockton, Cal. U.S. Pat. 735,501, Aug. 4, 1903.

The powdered ore is mixed with kaolin, brickdust, limestone, sawdust, and charcoal, and the mixture is heated in a suitable oven, with constant stirring, until sulphur has disappeared, when saltpetre is added.—E. S.

Gold, Silver, Copper, Nickel, and Zinc; Treatment of Ores containing ——. H. Hirsching, San Francisco, Cal. U.S. Pat. 735,512, Aug. 4, 1903.

The roasted or chlorinated ores or tailings are washed with an acidulated solution or with water, to which ammonia or an ammonium salt is added, and the wash water from a previous washing or boiled-out solution. The gold and silver are separated from the solution by "galvanic action" or by any other "approved method," and the base metals are precipitated as oxides by caustic soda and boiling. From the precipitate, zinc hydroxide is dissolved out by caustic soda solution, and is reprecipitated by dilution and boiling. The residual precipitated oxides are then treated with a solution of an ammonium salt to dissolve nickel oxide, leaving the copper oxide undissolved. Nickel hydroxide is then precipitated from the ammoniacal solution, and the ammonia liberated is recovered for re-use. Several modifications of these processes are claimed. See also U.S. Pat. 727,362, May 5, 1903; this Journal, 1903, 702.—E. S.

Zinc, Lead, and Silver Sulphides; Extraction of ——, from their Ores. G. D. Delprat, Broken Hill, Australia. U.S. Pat. 735,071, Aug. 4, 1903.

The finely-divided ore is fed into a bath containing nitric acid and sodium nitrate (or other nitrate), or the latter may be added subsequently, to increase the density of the bath. The gas-bubbles attached to the ore particles cause them to rise to the surface, whence they are removed or floated off. Compare Eng. Pat. 26,279, Nov. 28, 1902; this Journal, 1903, 913; and Fr. Pat. 326,867, Dec. 1, 1902; this Journal, 1903, 871.—E. S.

Lead or other Metals; Process of Obtaining ——, from Ores or Mattes. C. Hoeptner, Frankfort-on-the-Main, Germany. U.S. Pat. 735,098, Aug. 4, 1903.

The ores are leached with a solution containing "reactive" chlorine and a solvent of lead and silver chlorides; the silver in the resultant liquor is precipitated by copper in contact with mercury to form an amalgam, and the lead is precipitated as a sulphite. The residual solution, after enrichment with chlorine, is again used. When iron is present in the solution, it is precipitated by an "oxygen compound." In the case of ores containing silver, lead, iron, and zinc, the leaching solution contains cupric chloride and an alkali chloride (such as sodium chloride), and after separation of the silver by a suitable reagent, iron is precipitated by copper oxychloride, lead as sulphite by zinc sulphite, and the resulting cuprous chloride is converted into cupric chloride, and, without removal of the zinc chloride, is used in leaching a fresh portion of ore; or the copper is precipitated by zinc; or by electricity, in which case the solution for re-use contains available chlorine. The numerous claims include several modifications of these processes. Compare U.S. Pats. 704,639, 704,640, and 704,641, July 15, 1902; this Journal, 1902, 1081.—E. S.

Wolfram [Tungsten] and Lead; Process of Making Articles of ——. E. Polte, Magdeburg-Sudenburg. U.S. Pat. 735,293, Aug. 4, 1903.

See Eng. Pat. 7855 of 1903; this Journal, 1903, 801.
—T. F. B.

Zinc or other Ores; Treatment of —— [*Zinc White Production*]. W. B. Middleton, London. U.S. Pat. 735,894, Aug. 11, 1903.

See Eng. Pat. 12,271 of 1901; this Journal, 1901, 911.
—T. F. B.

Zinc Ores; Treating ——. C. V. Petraeus, Iola, Kans. U.S. Pat. 735,902, Aug. 11, 1903.

Zinc ores are mixed with carbon and strongly heated, with exclusion of air, to volatilise the greater portion of the zinc. The residue is roasted to oxidise the remaining zinc and any lead present, and drive them off as a fume, which is collected by screening the furnace gases. Finally, the fume is whitened by subjection to a red heat.—E. S.

Zinc Ores; Manufacturing Spelter from ——. O. H. Picher, Joplin, Mo. U.S. Pat. 735,903, Aug. 11, 1903.

Zinc ore containing lead, with or without pyrites, is heated in contact with air to a temperature sufficient to sublime the lead, but insufficient to sublime the zinc in material quantity. The residue is then freed from sulphur and the pyrites rendered porous by calcination, and, after removal of the latter, the desulphurised ore is mixed with carbon and retorted to obtain the zinc.—E. S.

Zinc Ores; Treatment of ——. C. V. Petraeus, Iola, Kans. U.S. Pat. 736,008, Aug. 11, 1903.

The ores are mixed with carbon and highly heated, with exclusion of air. The metal distilled is condensed, and the fumes which escape condensation are mixed with the residue of the distilling process, which mixture is treated "to reduce and oxidise the metals in order to drive off its metallic contents as a fume," and the fume is recovered by screening the furnace gases.—E. S.

Ores containing Zinc or other Metals; Treatment of ——. C. V. Petraeus, Iola, Kans. U.S. Pat. 736,009, Aug. 11, 1903.

Ores containing zinc with other "valuable metals" are mixed with carbon, and the mixture is heated, with exclusion of air, to obtain most of the zinc as a distillate; the residue is further heated with carbon to drive off zinc oxide as a fume, which is recovered by screening the furnace gases. The cindered residue is then smelted to recover the contained metals.—E. S.

Zinc Oxide; Method of Smelting ——. C. V. Petraeus, Iola, Kans. U.S. Pat. 736,010, Aug. 11, 1903.

Zinc fume (sublimed zinc oxide) is roasted to eliminate sulphur, and is then wetted and mixed into a pulp with finely-divided carbon, which pulp is charged into retorts for final "smelting."—E. S.

Quicksilver [Mercury] Furnace. A. A. Tregidgo, San Francisco, Cal. U.S. Pat. 735,919, Aug. 11, 1903.

The shell of the furnace has in its upper portion a shaft with a vapour-exit pipe in its side above, and a contracted base formed with a conical seat, co-operating with which is a vertically movable hollow perforated cone to close and open the base, to support and to drop the ore. The cone is attached to a central rod, which can be raised or lowered by a lever, worked outside the lower continuation of the shaft, through an upwardly-inclined opening in the shell, nearly opposite the downwardly-inclined discharge opening. The top of the shaft is hopper-shaped to receive the ore. The heating chamber is below the cone, communicating with a side opening for a fuel burner, of which opening the inner top wall is upwardly inclined.—E. S.

Tinning Baths; Compound for Use in ——. A. W Burwell, Assignor to E. A. Sperry, Cleveland, Ohio U.S. Pat. 735,941, Aug. 11, 1903.

The compound consists of non-drying ingredients, includin a mineral oil boiling at a higher temperature than that a which tin melts, and palmitic, stearic, and oleic acids.
—E. S.

Metal-Extracting and Ore-Lixiviating Apparatus. G. S Foster, St. Louis, and S. A. D. Stringer, St. Clair, Mo. Assignors to the Ore Reduction and Smelting Co. St. Louis, Mo. U.S. Pat. 735,960, Aug. 11, 1903.

An elevated solution-supply tank is connected to a serie of leaching tanks communicating by overflow pipes, an having fume-conducting connection with a water tank from which a gas-conducting pipe passes to the solution supply tank. The leaching tanks are provided with uprigh distribution tubes, from the lower ends of which horizonta perforated tubes extend laterally. Drain pipes lead fro the leaching tanks to a launder, into which they discharge in which launder suitably connected electrodes are placed A charcoal box receives the flow from the launder.—E. S.

French Patents.

Steel; Process for Transforming into ——, *Cast-iro containing considerable Quantities of Chromium.* Massenez, Germany. Fr. Pat. 329,132, Feb. 6, 1903.

Cast-iron containing 1 per cent. or more of chromium i fused in a reverberatory furnace, with addition of sma portions at a time of alkali chlorides or fluorides or th corresponding salts of the alkaline-earth metals, or alka carbonates, or mixtures of these, to give a sufficiently flu slag, which latter is withdrawn after each addition of flu By these means it is stated that steel may be obtaine containing 0·3 per cent. or less of chromium. The slag are worked up by suitable means to obtain the chromiu absorbed, as ferrochrome or as a chromate, for instance.
—E. S.

Stereotype Printing Metal; Process for Preparing —— G. A. W. Stavenow. Fr. Pat. 328,484, Jan. 14, 1903.

See Eng. Pat. 1019 of 1903; this Journal, 1903, 557.
—T. F. B.

Sulphide Ores or Carbonates; Furnace for Calcining Roasting ——. V. Spirek, Italy. Fr. Pat. 328,61 Jan. 20, 1903.

The ore descends by gravity down a series of numero ʌ-shaped superposed roofs, heated from above and fro below, and so arranged that the apex of each is immediate below the space intervening between the pair of roofs abov The air necessary for the roasting, enters partly by t grate and partly through special conduits distributing it a heated state throughout.—E. S.

Copper; Extracting ——, *from its Sulphide Ores.* G. G and the Soc. Anon. la Métallurgie Nouvelle, Franc Fr. Pat. 328,801, Jan. 26, 1903.

Sulphide copper ores are roasted, and the sulphurous ac recovered, is used in lixiviating the mass. The concentrat liquors contain cupric sulphate, cuprous-cupric sulphit and ferrous salts. The latter are removed by heating t liquor in a copper boiler under pressure to about 180° (see Fr. Pat. 328,800, page 996), the cuprous-cupric s phite decomposing with separation of copper, and formati of cupric sulphate and sulphurous acid. The liquor

lter-pressed hot, and the separation of the copper from ie ferrous salts is effected by washing with water, then xidising the ferrous sulphite, and again washing. Compare r. Pat. 319,556, March 13, 1902 ; this Journal, 1902, 1537.
—E. S.

Aluminium Compounds ; Process of Reducing ——. H. F. D. Schwahn. Fr. Pat. 329,071, Feb. 3, 1903.

ee U.S. Pat. 719,698 of 1903 ; this Journal, 1903, 302.
—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

lectrolytic Reduction and Oxidation ; Specific Actions of Metals in ——. A. Coehn. Zeits. Elektrochem., 1903, **9**, [32], 642.

he author refers to the overcharge ("Ueberspannung") quired for the evolution of hydrogen and of oxygen at ectrodes of different substances (see this Journal, 1903, 0). By the aid of this phenomenon of overcharge, an planation can be found for many chemical processes, hich have not hitherto been clearly understood. For ample in the Marsh arsenic test, by the addition of atinum a vigorous evolution of hydrogen is obtained, but e potential of the latter is not sufficiently great for the rmation of arseniuretted hydrogen. If only zinc be esent, the potential of the evolved hydrogen is sufficient r the purpose. Attempts to effect the electrolytic oxidan of *p*-nitrotoluene to *p*-nitrobenzoic acid have hitherto t succeeded, but the author states that this reaction uld be carried out by making use of the overcharge of ygen evolved at a lead peroxide anode.

Besides the phenomena due to overcharge, there are hers caused by catalytic action of metals, *e.g.*, the decomsition of formic acid into hydrogen and carbon dioxide contact with iridium and rhodium, but not with platinum d palladium.

The behaviour of metals in chromous chloride solution is henomenon due purely to overcharge, and has hitherto t been described. Chromous chloride is such a strongly ctive compound that in concentrated acid solution it olves hydrogen spontaneously, and in weaker solutions er introducing platinised platinum. The reduction tential of the chromous chloride, that is the maximum ssure with which the hydrogen is evolved, cannot be asured, since platinised platinum can give off hydrogen n at atmospheric pressure. If, however, electrodes are roduced into the solution at which hydrogen shows an rcharge, these are charged to a higher potential. In a niliar manner, in the case of substances capable of olving oxygen, as hydrogen peroxide, sodium hypochlorite, l persulphates, the potential varies according to the rcharge for oxygen exhibited by the metal immersed in solution.—A. S.

saturated Compounds ; Electrolytic Reduction of ——. Marie. Zeits. Elektrochem., 1903, **9**, [32], 633.

e addition of hydrogen to unsaturated compounds may dily be effected by electrolysis, if a suitable cathode be sen. With mercury, for example, unsaturated acids, as aric, cinnamic, and aconitic acids, can be converted into corresponding saturated compounds. For bodies which easily oxidised at the anode, the following method can employed: Into a vessel of large diameter, the bottom which is formed by a diaphragm, a layer of mercury is oduced, and above the latter the solution to be reduced. e vessel is then immersed in an alkaline (caustic soda) tion, in which is placed the anode, whilst the cathode s in the mercury. When the current is passed, sodium lgam is continuously formed, and effects the desired uction.—A. S.

English Patent.

Deleterious Vapours by Electric Discharges in Air ; Prevention of Formation of ——. H. Viertel and Gebr. Siemens & Co., Berlin. Eng. Pat. 16,341, July 22, 1902.

See Fr. Pat. 324,052 of 1902 ; this Journal, 1903, 560.
—T. F. B.

United States Patents.

Electrolytic Diaphragm. E. A. Byrnes, Washington, D.C. U.S. Pat. 735,464, Aug. 4, 1903.

The diaphragm consists of a body of but slight conductivity composed of an electrically-conductive material broken up by passages, or in a loose, granular, or porous state, so that it does not conduct as a body. The material may be magnetic oxide of iron.

The diaphragm is used in conjunction with a liquid electrode on which it floats. The liquid metal may be fusible metal heated above its melting point by suitable appliances attached to the electrolytic cell. The melted fusible metal forms the cathode, and is in contact with the lower end of the anode chamber ; the diaphragm floats on the latter and is prevented from passing out of the anode chamber.—A. G. L.

Electrolytes ; Composition of Matter for Battery ——. W. Peto and J. W. T. Cadett, both of Ashlead, Essex. U.S. Pat., 735,808, Aug. 11, 1903.

See Fr. Pat. 329,376 of 1903, page 1004.—T. F. B.

Batteries, Secondary ; Method of Treating Lead Plates for Use in ——. C. J. Reed, Philadelphia, Pa. U.S. Pat. 735,820, Aug. 11, 1903.

The lead plates are treated, moist, with hydrochloric acid gas and an oxide of nitrogen or oxidising agent, and the lead chloride thus produced is reduced to spongy lead. Other compounds of hydrogen with a halogen may be substituted for hydrochloric acid.—W. G. M.

Electricity ; Process of Generating ——. J. H. Reid, East Orange, N.J. U.S. Pats. 736,016 and 736,017, Aug. 11, 1903.

See Eng. Pat. 1670 of 1903 ; this Journal, 1903, 803.
—T. F. B.

Generation and Application of Electric Currents for Electrolysis ; Apparatus for the ——. F. E. Elmore, London. U.S. Pat. 736,331, Aug. 11, 1903.

See Eng. Pat. 26,673 of 1901 ; this Journal, 1903, 371.
—T. F. B.

Electrolysis of Fused Substances ; Apparatus for the ——. C. W. Roepper, Philadelphia, Pa. U.S. Pat. 736,020, Aug. 11, 1903.

The walls of the fusion-vessel are supplied with cooling spaces, and carried on a recessed portion of the supporting structure, the recess having also cooling spaces. The bottom of the fusion-vessel is formed by a heating plate gripped between the bottom of the walls of the vessel and the recessed part of the support.—W. G. M.

Water ; Apparatus for the Electric Purification of ——. S. S. Pridham. U.S. Pat. 735,817, Aug. 11, 1903. XVIII. B., page 1011.

Vulcanisation ; [Electrical] Process of ——. W. H. Roberts. U.S Pat. 736,336, August 11, 1903. XIII. C., page 1007.

French Patents.

Electrode ; A New Kind of Positive ——. Accumulatorenfabrik Aktienges., Germany. Fr. Pat. 328,527, Jan. 15, 1903.

In preparing the positive plates for cells of the Planté type, the spongy lead on the surface of the plate is allowed to soak (or may be formed) in a solution of a salt such as zinc sulphate. So produced, the plates possess the capacity desired even after the first charge.—W. G. M.

Accumulators [Electrical] with Enclosed Oxides; Employment of Ammonium Sulph-hydrate in the Preparation of the Active Material for ——. H. Fredet, France. Fr. Pat. 328,856, Jan. 27, 1903.

The oxide of lead mixture for the plates of the accumulator are worked up with ammonium sulph-hydrate, whereby various insoluble lead compounds are formed. These are decomposed in the electrolyte and sulphur is set free. The resulting paste is more tenacious, and has a higher specific gravity than the untreated material.—W. G. M.

Accumulators, Electrical; Plastic Electrolyte of Pasty Consistency for ——. W. Peto and W. T. Cadett, England. Fr. Pat. 329,376, Feb. 14, 1903.

A paste of lead sulphate and sulphuric acid in the proportion, say, of 455 grms. of finely precipitated sulphate with 120 grms. of (1·2 sp. gr.) acid is substituted for the ordinary liquid electrolyte. It must not be too viscous, or cavities will be formed by "gassing."—W. G. M.

Generation of Electricity by means of Combustible Gases; Method for the ——. J. H. Reid. Fr. Pat. 329,110, Feb. 5, 1903.

See Eng. Pat. 1670 of 1903; this Journal, 1903, 803.
—T. F. B.

White Lead; New Electrolytic Process for the Manufacture of ——. Syndicate for working the inventions of Prof. Oettle. Fr. Pat. 328,490, Jan. 14, 1903. XIII. A., page 1006.

Zinc White; Electrolytic Process for the Manufacture of ——. Syndicate for working the inventions of Prof. Oettle. Fr. Pat. 328,491, Jan. 14, 1903. XIII. A., page 1007.

Gas, Vapours, &c.; Process and Apparatus for subjecting ——, *to the Action of an Electric Discharge.* J. Schlutius. Fr. Pat. 328,609, Jan. 19, 1903.

See Eng. Pat. 2,199 of 1903; this Journal, 1903, 872.
—T. F. B.

(*B.*)—ELECTRO-METALLURGY.

United States Patents.

Metals; Electrolytic Apparatus for Recovery of ——. C. E. Baker and W. Burwell, Cleveland, Ohio. U.S. Pat. 734,499, July 28, 1903.

An electrolytic cell has a liquid cathode of a metal more volatile than the metal to be recovered; the latter is liberated from its compound by electrolysis, and thus forms an amalgam at the cathode. The amalgam or alloy is passed by suitable connections into retorts in which the volatile cathode metal is vaporised, the vapour being then passed into a condenser, and the liquid metal returned direct to the electrolytic bath.—B. N.

Nickel-plating; Process of ——. T. A. Edison, Llewellyn Park, N.J. U.S. Pat. 734,522, July 28, 1903.

Metallic nickel is deposited electrolytically on iron or steel, and the nickel-plated metal is afterwards subjected to a welding temperature in a non-oxidizing atmosphere, hydrogen gas being mentioned as a suitable one. The metal is allowed to cool below the oxidizing point before being removed from such atmosphere or gas, and the nickel is thus obtained as a firmly-adherent coating.—B. N.

French Patents.

Metals; Electrolytic Process and Apparatus for the direct Lixiviation of ——, *from their Ores and from other Metalliferous Substances, and for the Precipitation of Metals from their Solutions.* Meehwart, Coltri & Co., Italy. Fr. Pat. 328,850, Jan. 27, 1903.

The crushed ore, or calcined sulphide, is caused, either by gravitation or by mechanical means, to pass over the surface of insoluble anodes, preferably heated to facilitate the solvent action of the liberated anion. The material may be continuously introduced at one end of the anodes and removed at the other, and to accomplish this economically, the anodes may be disposed in the form of inclined planes approaching one another below. The cathode may b shaped accordingly, and a double porous partition enclosin a neutral solution may separate the electrodes. Or the anode may be hollow and capable of rotation.—W. G. M.

Fusion and Refining by Electricity; Process of ——. C. A. Keller, France. Fr. Pat. 329,013, Feb. 2, 1903.

In order to avoid the contamination of a fused bath o metal by carbon or other material from the electrodes, th two electrodes are not allowed to come in actual contac with the fused mass, but the necessary heat is obtained b causing an arc to play between each of them and the surfac of the bath.—W. G. M.

Carborundum, or Carbide of Silicon, or other Carbide produced by Electrical Means; Application of ——, *to th Manufacture of Pieces, Apparatus, Objects, Coverings and Glaze, and Conductors of Electricity capable o withstanding all Action, Thermal or Chemical.* L. E. Müller, France. Fr. Pat. 329,232, Feb. 9, 1903.

Finely-divided carborundum or other silicide is intimatel mixed with gas-carbon, tar and lampblack, with or withou soluble glass, moulded into shape and fired. For hand moulding the percentage composition recommended is:—Carborundum, 62·5; gas-carbon, 8·4; tar, 14·5; lampblack, 0·5; and soluble glass, 14·1. For pressed work the first four constituents may be used in the followin proportions respectively:—72·8, 9·8, 16·8, and 0·5 pe cent., the soluble glass being omitted.—W. G. M.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fatty Oils; Influence of Atmospheric Oxidation on th Composition and Analytical Constants of ——. H. C Sherman and M. J. Falk. J. Amer. Chem. Soc., 1903 **25**, [7], 711—716.

The authors have made experiments to determine whethe a quantitative relationship could be established between th values of oil before and after exposure to the air, so as t be able to form a conclusion of the nature of the origina oil from the results obtained with the oxidised sample.

It has been shown by Ballantyne (this Journal, 1891, 29 that exposure to sunlight lowers the iodine value an raises the specific gravity and Maumené value of oils whilst the authors have found that these changes are les dependent on sunlight than is generally supposed. The give a tabulated series of results before and after exposur for several months which confirm Ballantyne's conclusion and show that there is also a slight but irregular increase i the acidity and proportion of volatile acids present.

In the case of a sample of linseed oil, elementar analyses were also made with the following results:—

——	Linseed Oil fresh.	Linseed Oil exposed 8 months.	Linseed Oi exposed t semi-s[illegible]d
Specific gravity at 15·5° C. ..	0·934	0·966	..
Hubl value	178·0	139·4	..
Maumene figure (Mitchell) .	31·3° C.	32·8 C.	..
Free acid, as oleic, per cent..	1·33	4·45	..
Reichert-Meissl value.	0·49	2·64	..
Carbon, per cent.	75·46	73·23	69·08
Hydrogen, per cent..........	10·92	10·46	10·0[illegible]
Oxygen, per cent............	13·62	16·31	20·9[illegible]
Ratio C:H.....................	1:0·145	1:0·143	1:0·146

Hence the main result of the exposure was an increas in the amount of oxygen without appreciable change in th ratio of carbon to hydrogen.

It has been shown in a former paper (this Journal, 190 590; 1902, 624) that the heat of combustion of fatty oils i decreased by oxidation to an extent nearly proportiona though slightly greater than the increase in the specifi gravity. Further explanation of this is afforded by th results obtained with this linseed oil. The increase in th specific gravity after eight months' exposure was 3·43 p cent. on the original weight, whilst the oil absorbed 3·16 p ent. of its weight of oxygen, corresponding with a diminu-ion of 0·38 per cent. of the increased weight in "available ıydrogen." The original heat of combustion was 9,364 cals. ıer grm.; and correcting for the increase in weight this ;ives 9364 ÷ 1·0343 = 9053 cals., from which must be urther deducted 131 cals., corresponding with the decrease n weight of "available hydrogen," thus giving an estimated ıeat of combustion of 8922 cals. per grm. for the exposed ample. Taking the increase in specific gravity as a lirect measure of the oxygen absorbed, the calculated value s 8910 cals., whilst the value actually determined by ombustion was 8899 cals. per grm.

Assuming the correctness of Ballantyne's statement that he oxidation takes place without change in volume, the .ddition of the hydroxyl to the unsaturated fatty acids hould cause an increase in the specific gravity directly ıroportional to the decrease in the iodine value. Thus in he case of an olive oil, the density had increased from ·917 to 0·923 or 0·65 per cent. The iodine value of the xposed sample was 77·4, and on adding to this 0·65 × 7·46 the ratio OH:I) the corrected iodine value becomes 83·3 s against 83·8, the original iodine value actually found.

In this way the following recalculated iodine values were btained with different samples of exposed oils:—

Oil.	Sp. Gr. of Fresh Oil.	Sp. Gr. of exposed Oil.	Iodine Value of Fresh Oil.	Iodine Value after Exposure.	Recalculated Iodine Value.
ard oil.......	0·917	0·927	73·3	66·7	74·8
ottonseed I. .	0·920	0·934	102·8	92·0	103·3
„ II.	0·923	0·937	105·2	92·9	104·2
laize.........	0·924	0·935	117·2	107·0	115·9
oppyseed	0·923	0·931	125·3	117·1	123·6
eal	0·926	0·947	145·3	120·3	137·2
inseed I......	0·938	0·954	177·1	148·1	161·0
„ II., 4 months.	0·934	0·942	178·0	165·8	172·2
inseed II., 8 months.	0·934	0·966	178·0	139·4	165·0

From these results the authors conclude that in the case f non-drying and semi-drying oils, the iodine value of the riginal sample may be calculated from the original specific ravity, or from the average figure for the kind of oil under xamination, giving results within the limits of variation of ure fresh samples. In the case of highly unsaturated oils, owever, such as linseed or fish oils, the method cannot be elied upon, since in such cases there is either a direct bsorption of free oxygen, or a condensation with elimina-on of water from the hydroxyl first introduced.—C. A. M.

inseed Oil; Composition of the "Break" from ——. G. W. Thompson. J. Amer. Chem. Soc., 1903, **25**, [7], 716—719.

RESHLY-expressed linseed oil, or oil not properly prepared r varnish making, "breaks" when heated to about 0° F., and the dark gelatinous masses that appear in the l can only be removed with great difficulty. In studying is phenomenon, the author heated 2½ kilos. of linseed oil the breaking point, separated the resulting precipitate filtration, and washed it by decantation with petroleum irit. In this way 6·93 grms. (0·277 per cent. of the oil) a non-oleaginous substance was obtained, which on nition yielded 47·79 per cent. of ash, consisting of the llowing substances:—Calcium oxide, 20·96; magnesium ide, 18·54; phosphorus pentoxide, 59·85 per cent., and aces of sulphate. This ash amounted to 0·1177 per cent. the original oil, whilst the filtrate from the "break" ntained 0·0039 per cent. of ash.

Determinations of ash made on other samples of linseed l gave the following results:—

Oil.	Ash.
	Per Cent.
Fresh double-filtered raw American linseed oil..	0·1429
Do. do. do. do. ..	0·1967
Good. well settled..............................	0·0609
Best American linseed varnish oil	Trace

The ash from No. 1 sample contained the following constituents:—Calcium oxide, 0·0235; magnesium oxide, 0·0221; phosphorus pentoxide, 0·0705; potassium oxide, 0·0043; and sulphur trioxide, 0·0227 per cent. Here, as in the ash from the "break," the phosphoric acid exceeds the amount of bases, and the oxygen present in it is nearly in the proportion of 5:2 to the oxygen in the bases, closely corresponding with that required by a pyrophosphate.

An analysis of the ash of American linseed (3·112 per cent.) gave the following results:—Silica, 1·83; iron and aluminium oxides, 1·25; calcium oxide, 9·46; magnesium oxide, 18·31; potassium oxide, 26·18; sodium oxide, 1·71; sulphur trioxide, 3·96; and phosphorus pentoxide, 35·44 per cent.

The oil-cake left after the expression of the oil from the seed contained 4·899 per cent. of ash, consisting of:—Silica, 1·51; iron and aluminium oxides, 1·59; calcium oxide, 9·24; magnesium oxide, 18·52; potassium oxide, 26·14; sodium oxide, 3·59; sulphur trioxide, 3·51; and phosphorus pentoxide, 36·28 per cent. It is noteworthy that the principal base (potassium oxide) in the seed is only dissolved to a small extent by the oil, in comparison with the lime, magnesia, and phosphoric acid.

A determination of the nitrogen in a sample of linseed oil showed less than 0·01 per cent., whilst the same oil contained 0·04 per cent. of phosphorus. In the "break" from this oil, the nitrogen was less than one per cent., whilst the phosphorus amounted to 9·6 per cent., or 57 per cent. of phosphorus pentoxide calculated on the ash of the "break."

Owing to the large amount of bases present, the authors do not feel justified in calculating the phosphorus present into lecithin, nor do they consider the assumption that albuminoids are present to be in accordance with the facts. They conclude, however, that the chief cause of the "break" in linseed oil is the presence of phosphates of calcium and magnesium, possibly in combination with organic bases.—C. A. M.

Bear Fat; Characters of Authentic ——. L. F. Kebler and G. R. Pancoast. Proc. Amer. Pharm. Assoc., **50**, 363.

Bears' fat is a semi-opaque oily liquid at summer heat, but solidifies in cold weather. It has a peculiar odour and a bland taste. The sp. gr. at 15° C. is 0·913; acid value 3·93; saponification value 203·4; iodine value 80·43. It solidifies at 9° C.—J. O. B.

Stillingia Tallow [Chinese Vegetable Tallow]; Composition of ——. J. Klimont. Monatsh. f. Chem., 1903, **24**, [6], 408—412.

The author, doubting the accepted statement that this fat consists of a mixture of palmitin and olein, has made experiments with the object of isolating mixed glycerides. The fat used for the purpose was obtained from the seeds by hot expression. It dissolved completely in ether and hot alcohol, but was less soluble in cold alcohol. It had the following characteristics:—Melting point, 36·4° C.; iodine value, 27·6; saponification value, 203·5; and acid value, 14·2.

After the removal of free fatty acids the fat was extracted with acetone, and the extract filtered from the crystals that first deposited. The crystals subsequently formed melted at 32·2° C., and, after recrystallisation, at 29·2° C. On saponification and liberation of the fatty acids, the substance yielded palmitic acid (m. pt. 61·8° C.) and oleic acid with iodine value 81·3. Its elementary composition, iodine value (29·8), and saponification value (202·6), showed that it consisted of a mixed glyceride, oleo-dipalmitin, $C_3H_5(C_{16}H_{31}O_2)_2.C_{18}H_{33}O_2$. The fat also contained a very small amount of a substance of higher melting point, probably tripalmitin.—C. A. M.

Tallow; Examination of Chinese Vegetable ——. C. E. Zay and G. Musciacco. Staz. sperim. agrar. ital., **36**, 169—170. Chem. Centr., 1903, **2**, [3], 223.

The vegetable tallow examined by the authors was optically inactive and can therefore be regarded as free from stillingia oil. It had the following constants:—sp. gr. at 15° C., 0·9816; sp. gr. at 100 /15° C., 0·8600; refraction in the Zeiss refractometer, t = 46° C., 40°, t = 50° C., 38°; m. pt., 52·5° C.; solidification point, 37·7° C.; m. pt. of fatty acids, 55·0° C.; solidification point of fatty acids, 53·0° C.; acid value (mgrms. of caustic potash), 22·5; saponification value, 231·0; Wollny's value (for 5 grms.), 0·69; Hübl's iodine value, 19·0; absolute iodine value, 97·04; acetyl value, 43·5; saponification value of insoluble fatty acids, 240·1; total fatty acids, 95·3 per cent., insoluble fatty acids (Hehner), 93·45 per cent.; mean molecular weight of insoluble fatty acids, 231·4; of soluble and volatile fatty acids, 132·8.—A. S.

Rattlesnake Oil; Characters of ——. L. F. Kebler and G. R. Pancoast. Proc. Amer. Pharm. Assoc., **50**, 364.

Rattlesnake oil has the following characters:—Sp. gr. at 15° C., 0·9217; acid value, 3·57; saponification value, 210·9; iodine value, 105·58.—J. O. B.

Grease from Sheepskins; Extraction of ——. W. Eitner. XIV., page 1007.

Sesamé Oil Reaction with Stannous Chloride. P. Soltsien. XXIII., page 1017.

English Patent.

Grease or Greasy and Oily Matter; Process of Separating ——, from Raw Fish and other Material capable of Yielding the same. H. J. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 12,035, May 26, 1903.

The material is treated with water at a temperature of about 40° F. in order to congeal the grease, and then disintegrated, with or without the introduction of air under pressure, so that the congealed grease rises to the surface, whence it can be removed by means of an overflow of water or otherwise.—C. A. M.

United States Patents.

Tallow, &c.; Method of Decomposing [Saponifying] ——. F. Perrelet and K. Becker, both of Offenbach a/Main. U.S. Pat. 736,007, Aug. 11, 1903.

See Fr. Pat. 322,777 of 1902; this Journal, 1903, 372. —T. F. B.

Lubricant, and Process of Making Same. S. A. Smith, Providence, R.I. U.S. Pat. 736,162, Aug. 11, 1903.

Calcium-antimony tartrate, produced by mixing trioxide of antimony with tartaric acid and adding lime and water, is added in a finely-divided state to oil to form a lubricant. —R. A.

Artificial Wax. J. Lewy, Biebrich, Germany. U.S. Pat. 735,538, Aug. 4, 1903.

This consists of a ketone of the acetone series mixed with an excess of paraffin, ceresin, and stearin.—C. A. M.

French Patents.

Acids of the Oleic Series; Conversion of ——, into Lactones. A. A. Shukoff, Russia. Fr. Pat. 328,604, Jan. 19, 1903.

Claim is made for the process of treating the fatty acids with sulphuric acid for several hours at a temperature of not less than 60° C.—C. A. M.

Press for the Extraction of Oil and other Purposes. V. D. Anderson, U.S.A. Fr. Pat. 328,945, Jan. 30, 1903.

The body of the press consists of a perforated envelope, in which there revolves a shaft carrying a helical screw conveying blade, whilst a second shaft forming a continuation of the first is provided with separate screw blades and can be made to revolve independently. The grain, &c., introduced into the hopper is compressed in the spaces between the different screw blades until eventually the screw on the other shaft completes the expression and expels the mass through a discharge orifice which is in the form of a cylinder opening outwards.—C. A. M.

Oil; Process of Extracting ——, from Seeds and Similo Substances. V. D. Anderson, U.S.A. Fr. Pat. 328,94 Jan. 30, 1903.

The entire seed, more or less crushed, is submitted t gradually increasing pressure by means of screw conveyor within converging walls or other retarding device, whil the strongly compressed fibrous material, after forming filter bed for the exuding oil, is discharged, without th pressure in the apparatus being relaxed.—C. A. M.

Glycerin; Method of Extracting ——, from Distillatio Residues. A. Barbet, France. Addition, dated Jan. 2 1903, to Fr. Pat. 323,373, July 19, 1902.

A supplementary claim is made for the purification liquids containing the crude glycerin by means of anim charcoal or chemical agents before the osmosis (this Journa 1903, 502). Any other suitable solvent may be used i place of alcohol, and good results are obtained by the us of a solution of sulphur dioxide in alcohol.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

English Patents.

Pigments; Processes for Making ——. W. J. Arm bruster and J. Morton, St. Louis. Eng. Pat. 13,81 June 20, 1903.

See U.S. Pats. 731,152 and 731,153 of 1903; this Journ 1903, 874.—T. F. B.

Pigments; Compositions of Matter to be used for —— and the Process of Making same. W. J. Armbrust and J. Morton, both of St. Louis. Eng. Pat. 13,81 June 20, 1903.

An alkali carbonate is added to a solution containing zinc salt (other than the sulphate) and a barium salt. Th resulting precipitate of zinc and barium carbonates is use as a pigment.

The pigment may contain zinc sulphide in addition zinc and barium carbonates; this result is obtained precipitating a solution of a zinc salt with alkali carbonat and precipitating a solution of barium sulphide with alka carbonate, subsequently adding a zinc salt, and mixing th two precipitates.—T. F. B.

Paints and Colours; Manufacture and Preparation ——., W. A. Jamieson, J. N. Nicholson, and P. Nicholson (trading as Arthur and Hinshaw), Glasgo Eng. Pat. 20,413, June 18, 1903.

The finely powdered pigment is mixed with a dilute aqueo solution of gum tragasol.—M. J. S.

United States Patent.

Paint Compound. J. F. Smith, Chicago, Ill., U.S.A. U.S. Pat. 735,601, Aug. 4, 1903.

A mixture of wax, gelatin, gum, paraffin, animal matt or some of these, with dry colouring matter, is dissolved a suitable solvent or mixture of solvents, *e.g.* linseed o turpentine, alcohol, water, and spirits of ammonia. Clai is made for formulæ containing specified proportions these ingredients, and also for a paint compound in sti form prepared in an analogous manner.—C. A. M.

French Patents.

White Lead; New Electrolytic Process for the Man facture of ——. Syndicate for working the inventio of Prof. Oettli, Switzerland. Fr. Pat. 328,490, Jan. 1 1903.

A solution of sodium chloride of strength not exceedi 1 per cent. is electrolysed with electrodes of metallic le By using a current of density not exceeding 2 ampères p sq. dcm., and at a temperature of about 15° C., the o roducts are lead chloride and sodium hydroxide, which by heir reaction produce lead hydroxide with regeneration of he sodium chloride. Carbon dioxide is simultaneously assed into the cell, and the nascent lead hydroxide is thus onverted into the basic carbonate.—M. J. S.

Zinc White; Electrolytic Process for the Manufacture of ——. Syndicate for working the inventions of Prof. Oettli. Fr. Pat. 328,491, Jan. 14, 1903.

A hot solution of sodium sulphate or other alkali salt is lectrolysed with electrodes of metallic zinc. Zinc sulphate s produced at the anode, and sodium hydroxide at the athode. These react with precipitation of zinc hydroxide, nd reproduction of the original electrolyte. The zinc ydroxide is then calcined. The production of a ton of inc white, per 24 hours, requires, it is stated, 96 electric orse-power.—M. J. S.

Zinc Salts (Carbonate, Sulphide) extracted directly from Zinc Ores; Process for Adaptation of ——, *for Painting.* M. Malzac, France. Fr. Pat. 329,079, Feb. 4, 1903.

ee Fr. Pat. 325,587 of 1902; this Journal, 1903, 752. he present specification describes the plant employed for onducting the process continuously, and claims, in addition, the preparation of metallic zinc by the electrolysis of he ammoniacal solution in closed vessels.—M. J. S.

Pigment and its Manufacture. W. J. Armbruster and J. Morton. Fr. Pat. 328,806, Jan. 26, 1903.

ee U.S. Pat. 712,415 of 1903; this Journal, 1903, 307.
—T. F. B.

Pigment and its Manufacture. W. J. Armbruster and J. Morton. Fr. Pat. 328,807, Jan. 26, 1903.

ee U.S. Pat. 719,073 of 1903; this Journal, 1903, 218.
—T. F. B.

(C.)—INDIA-RUBBER, &c.

United States Patent.

ulcanisation; [Electrical] Process of ——. W. H. Roberts, Portland, Me., U.S.A. U.S. Pat. 736,336, Aug. 11, 1903.

ubber is vulcanised by heating in an air-tight vessel, at high temperature, at the same time "conveying an ectric current to the rubber."—T. F. B.

French Patents.

Caoutchouc [Rubber Substitute]; "Synthetical" ——. E. Jasset. Fr. Pat. 327,959, May 13, 1902.

ne hundred parts of coal tar are heated with 25 parts of oric (phosphoric or hydriodic) acid to the boiling point, e vapours are ignited and allowed to burn till they hibit a green colour. The mixture is then transferred a suitable receptacle, where it can be maintained at a mperature of 60° C., whilst a current of oxygen is passed rough it. After a certain time the gas is shut off, and e product is dried on a water-bath. It is said to form brown highly-elastic body, having the same empirical mposition as caoutchouc and gutta-percha, and suitable r employment as a substitute for either.—F. H. L.

Rubber; Vulcanisation of ——. C. H. Gray. Fr. Pat. 329,180, Feb. 7, 1902.

e Eng. Pat. 2939 of 1903; this Journal, 1903, 562.
—T. F. B.

IV.—TANNING; LEATHER, GLUE, SIZE.

Sheepskins; Extraction of Grease from ——. W. Eitner. Der Gerber, 1903, **29**, [692], 186—187.

e difficulty of degreasing sheepskins lies partly in the ount of grease present (sometimes from 30 to 40 per nt.), and partly in the chemical nature of the grease. ost animal fats are solid glycerides of fatty acid and ponify readily, whilst sheep grease, like wool-grease, consists largely of cholesterol and similar compounds. Since, however, the grease of sheepskins readily liquefies, a large amount can be removed by submitting the warm tanned skins to hydraulic pressure. This process never removes the grease completely, and so solvents, like hot alcohol, ether, chloroform, benzine (petroleum ether), and carbon bisulphide are resorted to.

In Buenos Ayres, where 20,000 sheep are slaughtered daily, the skins are taken over by a French Company, which removes the wool by sweating, tans some of the skins, and exports the rest, chiefly to North America. The grease is removed by extracting for 1—1½ hours in a revolving tinned iron vessel with a mixture of benzine and methyl alcohol (the latter being used to take up the natural moisture of the skins) and then quickly pressing. The fat and solvent are then separated by distillation, the latter being used again with a loss of about 30 per cent. The author suggests that some such method should be used in Germany, the skins being unhaired, fleshed, and partly bated before extraction, and points out the need of establishing fat extraction works like those in other countries. A firm in Paris, for example undertakes the work at a charge of 1—2 francs per dozen skins.
—R. L. J.

Ammonia [in Tannery Effluents]; New Method for the Determination of ——. A. Bayer. XXIII., page 1016.

English Patents.

Aqueous and Alcoholic Solutions [Glue, Gum, Tannin, &c.]; Process and Apparatus for the Rapid, Continuous, and Automatic Drying of ——, *in Vacuo.* E. Passburg, Berlin. Eng. Pat. 28,395, Dec. 23, 1902.

The solutions or liquids are sucked through a regulating cock, &c., into a vacuum chamber containing a rotary heated drum extending into the solution, the level of which can be regulated by another cock or valve. The chamber is, if necessary, provided with cooling devices, such as pipes, coils, jackets, or the like, for the purpose of reducing the temperature of the liquid approximately to the temperature at which it boils in the vacuum. The liquid is thus caused to form a continuous layer or film on the side of the drying drum, so ensuring continuous working and drying. [See also Eng. Pats. 4126 of 1901, and 12,453 of 1902; this Journal, 1902, 458, and 1903, 708.]
—R. A.

Glue and Gelatin from Bones; Manufacture of ——. H. Hilbert, Heufeld, Upper Bavaria. Eng. Pat. 13,682, June 19, 1903.

Bleaching agents, such as sulphurous acid, sulphites with an acid, hydrogen peroxide, &c., are led into the extraction vessel at the commencement of the process of extraction or during the operation.—R. L. J.

United States Patent.

Tannin Extract [Solid], and Process of making same. G. Klenk, Hamburg. U.S. Pat. 734,889, July 28, 1903.

Tan liquors, bleached and rendered soluble by addition of aluminium sulphate and sodium bisulphite, and heating in a closed vessel to 120°—130° C. (see Eng. Pat. 25,063, Dec. 9, 1901; this Journal, 1902, 1462, and U.S. Pat. 720,157, Feb. 10, 1903; this Journal, 1903, 373), are evaporated *in vacuo* until they contain about 22 per cent. of water.

This extract becomes solid on cooling, contains 68—70 per cent. of tannin, small amounts of sodium sulphate, sodium sulphite, and calcium sulphate, and dissolves in water with an acid reaction, and without precipitate at 6°—8° B., if an organic acid be added.—R. L. J.

French Patents.

Hides; Preparation [Deliming] of ——, *for Tanning.* E. Roy. Fr. Pat. 328,711, Jan. 22, 1903.

The lime, used for unhairing, forms stable organic compounds within the hide, which resist the action of acid liquors.

To decompose these, the skins, after unhairing, &c., are placed in a weak solution of a soluble caustic alkali or "caustic alkali salt" (1 part per 1,000), conveniently made by adding sodium carbonate (4 kilos.) to milk of lime (1·5 kilos. of quicklime in 1,000 litres of water) and siphoning off the resulting clear liquor.—R. L. J.

Tanning [*Rapid*]. W. Fahrion, Germany. Fr. Pat. 328,853, Jan. 27, 1903.

The process of tanning is to be considered as a chemical one, in which a salt is produced by combination between the partially oxidised hide fibre and the partially oxidised tanning substances, completed by the fixation of oxygen, upon the speed of which fixation depends the speed of tannage. (Compare this Journal, 1903, 919.)

Skins are therefore tanned in a drum into which air or ozonised air is introduced, or hydrogen peroxide is gradually added before, after, or during the tanning process. —R. L. J.

Tanning and Dyewood [*and Sugar*] *Extracts; Manufacture of* ——. A. E. Peyrusson, Second Addition, Feb. 7, 1903, to Fr. Pat. 318,523, 1902. XVI., next col.

Casein Solution. The Casein Co. of America, U.S.A. Fr. Pat. 329,338, Feb. 13, 1903.

Casein hydrochloride (1 part), obtained by precipitating casein with hydrochloric acid, is made into a solution by adding sodium phosphate, preferably tri-sodium phosphate, (0·1—0·15 part) and water (1—3 parts).—R. L. J.

XV.—MANURES, Etc.

French Patents.

Phosphatic Chalks and Clays; Treatment of ——, *to increase the Yield, and suppress the Screening Process.* N. F. Bourgeois de Mercey, France. Fr. Pat. 328,648, Jan. 20, 1903.

The washed phosphatic chalks or clays are sorted in a suitable apparatus having a fine mesh in which separation is effected between the richer particles which will not pass the mesh, and those that pass it.—E. S.

Phosphates; Process for enriching Poor ——, *with Simultaneous Production of Precipitated Calcium Sulphate.* P. de Wilde, Belgium. Addition, dated Jan. 26, 1903, to Fr. Pat. 327,669, Dec. 24, 1902; this Journal, 1903, 919.

The addition consists in replacing acetic or formic acid, claimed in the main patent as used in the enrichment of poor native calcareous phosphates, by sulphurous acid in a saturated, or half-saturated solution. The solution of calcium sulphite produced is treated by dilute sulphuric acid, and after separation of the precipitated calcium sulphate, the regenerated sulphurous acid is available for re-use. The wash waters are boiled, and the sulphurous anhydride evolved is collected.—E. S.

Manure: Preparation of ——, *by means of Bog Earth, Turf, and Analogous Substances.* P. Jörgensen, Denmark. Fr. Pat. 328,756, Jan. 21, 1903.

Earth from marshes or bogs, turf, or the like, is mixed with fæcal matters, such as may give rise to a strong fermentation, and develope ammonia from the nitrogen locked up in the turf, &c. When necessary, any acidity in the mixture is neutralised by addition of chalk, magnesia, or other basic substance.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

English Patents.

Sugar; Manufacture of ——. J. McGlashan, Cawnpore, India. Eng. Pat. 23,779, Oct. 31, 1902.

Sugar solutions in the course of manufacture are freed from invert sugar by adding to the neutralised liquor, at any convenient stage of the process, cultures of organisms which do not possess the property of inverting saccharose to any marked extent, but which are capable of fermenting invert sugar. Such organisms are *S. apiculatus*, *S. octosporu* and yeast-like torula. The liquor is treated preferably in the concentrated state at a sp. gr. of about 1·25; the proportion of invert sugar should not exceed 6 per cent. and fermentation should be complete in 4—6 days at 20°—25° C The alcohol is then removed by distillation and the liquo is defecated with lime.—J. F. B.

Soluble Starch: Manufacture of ——. C. F. Cross, London, and J. Traquair, Paisley. Eng. Pat. 9868, April 29 1902.

Starch is heated with a monocarboxylic organic acid, wit or without the presence of a dehydrating agent, such a alcohol or a concentrated solution of a neutral salt. Fo instance, starch dried at 100° C. is intimately mixed wit one third to one half of its weight of glacial acetic acid heated in a steam-jacketed vessel for 1—2 hours, free from acid, and dried. Formic or lactic acid may also b employed, preferably in presence of a dehydrating agent t prevent gelatinisation.—J. F. B.

French Patents.

Sugar; Process of Refining ——, *by means of Agitatio with Air.* A. Prince, France. Fr. Pat. 328,815, Jan. 27 1903.

Saccharine syrups are caused to crystallise by injectin or aspirating air in minute jets through the syrup in suc a manner as to produce an emulsion. The crystals ar built up under the influence of the motion, the impuritie are oxidised and collect at the top, whence they ma be skimmed off. The air may be injected cold or ma be previously heated if concentration be desired; it ma also be mixed with carbon dioxide for defecation purposes The process may be carried out by removing the slidin valve covering the discharge orifice of an ordinary vacuu pan and substituting for it a plate provided with minute perforations; air is aspirated through the syrup by the vacuu pump and steam may be supplied to the coils during th process.—J. F. B.

Sugar Extracts, Saline Solutions, &c.; Apparatus fo Evaporating ——. A. Freitag. Fr. Pat. 329,015, Feb 2 1903. I., page 988.

Sugar Juices; Process and Apparatus for the Diffusio and Extraction of ——. L. Naudet. Fr. Pat. 329,139 Feb. 6, 1903.

See U.S. Pat. 728,600 of 1903; this Journal, 1903, 754. —T. F. B.

Tanning and Dyewood [*and Sugar*] *Extracts; Manufactur of* ——. A. E. Peyrusson. Second Addition, date Feb. 7, 1903, to Fr. Pat. 318,523, Feb. 8, 1902 (See this Journal, 1902, 1462, and 1903, 219.)

The advantages, as regards colour, obtained by using th metals aluminium, tin, lead, and zinc in the extractio apparatus, are also obtained in the operation of sug extraction and preparation of other organic extracts. —R. L. J.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Biology of ——. R. D. Herzog. Zeits. physi Chem., 1903, **38**, 396; through Zeits. Spiritusind., 190 **26**, [33], 361.

I. In the course of investigations on the autodigestion yeast, 2 litres of washed fresh beer yeast received a addition of about 10 grms. of various substances. Th mixture was digested at a temperature of 38° C. for 2— weeks, or twice as long at the ordinary temperature, tolue being added when an antiseptic was required. The liqu was subsequently filtered and extracted with ether. It w found that by the activity of the yeast under the abo conditions, salicylic alcohol was converted into salicyl acid, thymol was converted into an acid melting at 187° C whilst, when cymene was present, crystals of a substan containing nitrogen were recovered from the liquid.

II. Hansen has recorded observations of the tim required for the production of ascospores by *S. Pastorian* and *S. Cerevisiæ I.* at various temperatures. Taking e rapidity with which ascospore formation occurs at the west temperatures as unity, the author has calculated om Hansen's observations the relative rapidity of ascospore rmation at each temperature, expressing the results in e form of curves. These curves showed great similarity curves showing the variations of enzyme actions with e temperature, each having a maximum point.—J. F. B.

east Cell Juice; Concentration of Expressed ——, by Freezing. J. Meisenheimer. Zeits. physiol. Chem., 1903, 523; through Zeits. Spiritusind., 1903, **26**, [34], 375.

hrens (this Journal, 1900, 678) described a method for ncentrating the expressed cell juice of yeast by exposing to a temperature of −2° C., and pouring off the liquid om the crystals of ice which separate whilst stirring. he author prefers, however, to freeze the cell juice in long rrow cylinders to solid blocks, and to thaw these slowly thout agitating the liquid. The concentrated portion of e frozen extract thaws first and collects at the bottom of e cylinder, whilst the ice floats at the top. After the hole has melted, the liquid at the top is nearly colourless, hilst that at the bottom has a deep brown colour. The p liquid is nearly pure water, and is devoid of fermenta- e properties, and the upper half can be thrown away; e lower half of the liquid has a higher fermentative power an the original juice.—J. F. B.

rmaline; Disinfection by ——, in the Brewery. F. Hayder. Woch. f. Brau., 1903, **20**, [32], 364.

he bactericidal effect of formaline is very powerful, pro- ded no great penetrating action be required. On account its deodorising properties, formaline is also useful for ercoming objectionable odours such as remain in musty llars, even after thorough cleansing, and in fermentation llars when waste yeast is lying about. For such purposes 4 per cent. solution of formaldehyde should be sprinkled om an apparatus worked by a hand-pump, and provided th an atomiser nozzle, in the cellars and passages and er the walls and casks, every other day, the doors and ndows being kept shut.

For smaller spaces a formaline vaporiser may be employed th advantage; for instance, the small room in which the rface cooler for wort is generally situated may be com etely sterilised by evaporating 800—900 grms. of formaline r 100 cubic metres capacity. The doors and windows ing tightly shut, the formaline vapours should be allowed to t for seven or eight hours; any residual smell of formaline ould be destroyed by volatilising a little ammonia in the om rather than by opening the windows.

Fumigation with formaline can also be applied to the ger casks; it is more powerful than sulphur. Brewery ensils may be sterilised by steeping them for 3—5 hours a 2—3 per cent. solution of formaldehyde.—J. F. B.

ine; Diminution of Acidity in ——, and the Fermentation Process connected therewith. W. Seifert. Zeits. landw. Vers.-Wes. Öst., **6**, 567—585. Chem. Centr., 1903, **2**, [4], 257.

he chief causes of the diminution of acidity in wine are ecial kinds of bacteria, of which the principal is an aerobic micrococcus (*M. malolacticus*). The decrease caused by the decomposition of malic acid, chiefly to lactic acid, with formation of only very small quantities volatile acids. Other acids than malic acid which occur turally in wine are not decomposed by the micrococcus. alcoholic nutrient solutions, with access of air, the icrococcus produces a slight acidity by the formation of etic acid. In nutrient media containing both malic acid d sugar, it causes an increase of acidity. The lactic acid normal sound wines is a decomposition product of malic id; its formation is connected with the decrease of idity. Yeast causes the decomposition of only a small antity of the malic acid in wine, and also produces no tic acid. Acetic bacteria decompose malic acid, but thout formation of lactic acid. The micrococcus thrives st at 25°—34 C.; below 3°—4° C. and above 37° C. it ses to grow. Its growth is strongly retarded by the presence of 9 per cent. by volume of alcohol, but it still decomposes malic acid even in presence of 12—13 per cent. of alcohol. Large amounts of lactic acid retard or prevent the decomposition. Nutrient solutions rich in alcohol and malic acid suffer only a slight reduction of acidity. The decrease of acidity appears to be small in wines poor in nitrogenous constituents, and relatively greater in wines rich in nitrogen. The diminution of acidity is only small at the completion of the fermentation, but becomes greater on keeping, except in the case of red wines, which, at the end of the fermentation, already contain a considerable quantity of lactic acid. In wines that still contain sugar, the diminution of acidity during keeping may be balanced by the simultaneous formation of acid.—A. S.

Wine; Sulphurous Acid in ——. L. Mathieu. Rev. intern. falsific., **16**, 64—70. Chem. Centr., 1903, **2**, [3]. 223.

The author reports as follows to the French Minister of Agriculture:—Sulphurous acid increases the volatile and consequently the total acidity of wine. The colouring matters of wine are only transiently altered by sulphurous acid. Sulphur dioxide forms addition compounds with the aldehydic constituents of wine, and can thus serve as a means of preventing the deterioration of flavour caused by *Mycoderma vini.* 0·3 grm. of sulphur dioxide per litre completely prevents the yeast fermentation; smaller quantities retard it. Certain kinds of yeast reduce sulphur dioxide to sulphuretted hydrogen or sulphides. Sulphurous acid when present in quantities within the permissible limits does not prevent the wine becoming "ropy" or "bitter"; it hinders somewhat the formation of mould, and protects the wine from "breaking," which is caused by a diastatic ferment. As allowable limits, the author recommends 30 mgrms. of free and 200 mgrms. of total sulphur dioxide per litre; in dessert wines, 60 and 400 mgrms. respectively.

For the determination of the total sulphurous acid, Haas' method is a reliable one: distillation in a current of carbon dioxide, oxidation by iodine solution, and precipitation as barium sulphate. For the determination of free sulphurous acid, the method of Ripper is quite unreliable, except in the case of white wines poor in tannin. The method of the author and Billon (this Journal, 1902, 1247) s, however, applicable in all cases.—A. S.

Yeast; Biological Analysis of Bottom Fermentation —— after Drying the Sample. P. Lindner. XXIII., page 1018.

Yeast; A Therapeutically Active Substance from ——. E. Roos and O. Hinsberg. XX., page 1012.

Wines, Determination of Ammonia in ——, and its Significance in the Differentiation of "Mistelles" from "Vins de Liqueur." J. Laborde. XXIII., page 1018.

Fusel Oil in Rectified Spirits; Furfural and certain Aromatic Aldehydes as Reagents for ——. A. Komarowsky. XXIII., page 1017.

English Patent.

Fermenting Operations; Automatic Cooling Apparatus for Use in connection with ——. W. von Rougemont, Wurzen, Saxony. Eng. Pat. 11,038, May 14, 1903.

In the fermenting vat is placed a thermometer provided with electrical contacts, so that when the mercury rises to any desired point, the electrical circuit is completed. The current then acts upon an electro-magnet which operates a valve in a water pipe, and admits cold water to an attemperator coil situated in the vat, until the temperature is lowered.—J. F. B.

United States Patents.

Wort; Method of Producing ——. V. Lapp, Leipzig. Germany. U.S. Pat. 734,899, July 28, 1903.

See Eng. Pat. 21,731 of 1902; this Journal, 1903, 40.
—J. F. B.

Beer: Apparatus for converting Wort into ——. C. Spindler, Jersey City, N.J. U.S. Pat. 734,985, July 28, 1903.

The apparatus consists of a closed cylindrical vessel with a hemispherical bottom, both the cylindrical portion and the bottom portion being surrounded by jackets separated from each other. An outlet for carbon dioxide with a safety valve is provided, also a yeast outlet and a yeast scoop operated from below. Means are also provided for admitting a cooling medium to the jacket surrounding the cylindrical portion of the vessel and a heating medium to the jacket round the bottom.—J. F. B.

Alcoholic Liquors; Art of Purifying ——. L. S. Highton, San Francisco, Administratrix of J. Howden, deceased. U.S. Pat. 736,098, Aug. 11, 1903.

Raw or immature spirits are freed from fusel oil by adding a small percentage of a fixed polybasic acid, "brooding" the mixture until the acid has combined with the higher alcohols to produce alkyl acids, adding a base to neutralise the alkyl acids, thus rendering them non-volatile, and finally distilling off the ethyl alcohol and flavouring esters from the fixed fusel oil derivatives.—J. F. B.

French Patents.

Beer Wort; Apparatus for the Continuous Clarification of ——. Filter u. Brautech, Masch. Fab. vorm. L. A. Enzinger, Germany. Fr. Pat. 328,486, Jan. 14, 1903.

The mash is fed through a pipe into a series of compartments arranged in the form of a circle. These compartments are provided with perforated bottoms and the whole system is caused to rotate slowly around a central axis. The mash-supply pipe being fixed, each compartment becomes filled in turn, the wort runs off and the compartments then arrive under a sparging water jet, the exhausted grains being removed continuously just before the rotation is completed. The spaces below the false bottoms of the compartments are funnel-shaped and the discharge pipes are provided with valves so that a column of liquid is alway maintained to create a suction.—J. F. B.

Wines, Spirits, Ciders, Beers, Vinegars, &c.; Substance for Clarifying ——. Soc. Clermont et Quignard, France. Fr. Pat. 329,096, Feb. 4, 1903.

A special form of gelatin is dissolved in twice its weight of water, the solution is then treated with 10 per cent. by volum of hydrochloric acid and boiled for half an hour. The solution is then neutralised hot with a solution of sodium carbonate and evaporated by boiling to a volume equal to tha of the original solution of gelatin. The solution is bottled with the addition of a few drops of ethyl acetate as an antiseptic, and is employed for "fining" wines and other liquids.—J. F. B.

Liqueurs; Manufacture of Fermented ——. J. Schneible. Fr. Pat. 328,776, Jan. 21, 1903.

See Eng. Pat. 1,428 of 1903; this Journal, 1903, 434. —T. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Nuts used as Food; Chemical Composition of —— J. B. Weems and A. W. Hess. Proc. Iowa Acad Sciences, **10**, 108—111.

The following table shows the chemical composition of certain edible nuts grown or sold in the State of Iowa:—

Name.	Refuse.	Edible Portion.	Waste in Cracking.	Edible Portion.						
				Water.	Ether Extract.	Crude Fibre.	Proteids.	Ash.	Nitrogen-free Extract.	Fuel Value per Lb.*
	Per Cent	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Calories.
Native hickory nut	68	30	2	1·20	19·38	0·69	6·15	0·66	1·92	968
Native hickory nut kernels	..	..	..	3·07	64·60	2·30	20·50	2·20	6·40	3,228
Native walnut	76	22	2	0·83	13·66	0·51	2·11	0·60	4·29	805
Native walnut kernels	..	..	..	3·80	62·10	2·30	9·60	2·70	19·50	3,158
English walnut	57	43	..	2·88	23·24	0·90	8·29	0·86	6·83	1,305
English walnut kernels	..	..	..	6·70	54·05	2·10	19·28	2·00	15·87	3,087
Almonds	40	60	..	3·12	29·52	1·76	13·74	2·10	9·76	1,682
Almond kernels	..	..	..	5·20	49·20	2·93	22·90	3·50	16·27	2,803
Filberts	65	35	..	1·23	22·33	1·12	5·18	1·05	4·09	1,118
Filbert kernels	..	..	..	3·50	63·80	3·20	14·80	3·00	11·70	3,195
Pecans	53	47	..	1·31	34·12	0·99	4·60	0·80	5·18	1,620
Pecan kernels	..	..	..	2·80	72·60	2·10	9·80	1·70	11·00	3,451
Unroasted peanuts	27	70	3	2·31	31·37	2·24	19·11	1·63	10·36	1,968
Unroasted peanut kernels	..	..	..	3·33	49·10	3·20	27·30	2·30	14·80	2,855
Roasted peanuts	30	69	1	0·62	35·33	2·07	19·18	1·65	10·50	2,043
Roasted peanut kernels	..	..	..	0·90	51·20	3·00	27·80	2·40	14·70	2,951
Chufa nuts	..	..	..	23·36	21·34	9·96	5·02	2·84	31·48	1,762

* Calculated from analytical results.

—W. P. S.

Milk; Formation of Sulphuretted Hydrogen on Boiling ——. Utz. Milch-Zeit., 1903, **32**, 354; Chem.-Zeit., 1903, **27**, [67], Rep. 204.

The author has previously detected, by means of lead paper, the presence of sulphuretted hydrogen on boiling milk, and has now confirmed the presence of this compound by a test with the reagent (ammonium molybdate and potassium thiocyanate) recommended by Ganassini (see this Journal, 1902, 1246).—A. S.

English Patent.

Fruit Juices and the like; Preservation of ——. D. Sandmann and G. Eichelbaum, Berlin. Eng. Pat. 21,294, Sept. 30, 1902.

See Fr. Pat. 325,811 of 1902; this Journal, 1903, 756. —T. F. B.

United States Patents.

Food Products from Whey; Process for Producing —— A. S. Ramage, Cleveland, Ohio. U.S. Pat. 735,148 Aug. 4, 1903.

Whey is concentrated to less than three-tenths of its volume alcohol is then added to precipitate the whey proteids which are separated and dried. The whey may be rendere slightly alkaline before concentrating, and sufficient alco may be added to precipitate a part of the lactose along w the proteids. (See also U.S. Pat. 730,703, 1903 th Journal, 1903, 811.)—W. P. S.

Food Products [from Whey]; Process for Produci ——. A. S. Ramage, Cleveland, Ohio. U.S. Pa 735,149, Aug. 4, 1903.

The process consists in adding sufficient alcohol to whey or a mixture of whey and milk, to precipitate the proteid it not the lactose, the precipitate being then collected id dried. The whey may be rendered slightly alkaline id concentrated before adding the alcohol.—W. P. S.

offee Concentrate and Process of Making Same. S. Kato, Assignor to Kato Coffee Co., Chicago. U.S Pat. 735,777, Aug. 11, 1903.

oasted and pulverised coffee beans are freed from fat, e volatile oil is removed by distillation and collected, e fibrous portion of the residue is removed by extracting c coffee with water, the extract is evaporated and anulated or pulverised, the volatile oil is then mixed th the dry extract and the product may be used as such made into tablets.—J. F. B.

emoglobin Preparations; Process of Making ——. F. Hanssen, Altona-on-the-Elbe. U.S. Pat. 736,250, Aug. 11, 1903.

e Fr. Pat. 323,277 of 1902; this Journal, 1903, 507.
—T. F. B.

French Patents.

ilk Rich in Fat; Preparation of Condensed ——. A. Sauer, Germany. Fr. Pat. 328,600, Jan. 19, 1903.

e thousand litres of milk are evaporated under reduced essure at a temperature below 50° C. until the volume is luced to 200 litres. 45 kilos of butter, previously boiled th water and filtered, are then added. The mixture is en further concentrated at the same temperature and ed into suitable closed receptacles in which it is sterilised placing in boiling water for 18 minutes.—W. P. S.

ilk Powder; Process of Making ——. Casein Company of America. Fr. Pat. 328,627, Jan 20, 1903.

e Eng. Pat. 1366 of 1903; this Journal, 1903, 507.
—T. F. B.

iscosimeter for Milk. H. Micault and P. Gailliard. Fr. Pat. 328,663, Jan. 21, 1903. XXIII., page 1015.

rying, with Absorbents, Solid or Non-solid Materials [Foodstuffs]; Process of ——, *in Vacuo.* L. A. Morel. Fr. Pat. 329,092, Feb. 4, 1902. I., page 988.

(*B.*)—SANITATION.

nmonia [in Sewage]; New Method for the Determination of ——. A. Bayer. XXIII., page 1016.

ater free from Ammonia; Preparation of ——, *for Water Analysis.* J. B. Weems, C. E. Gray, and E. C. Myers. XXIII., page 1016.

rbonic Acid in Drinking Water; Determination of ——. F. B. Forbes and G. H. Pratt. XXIII., page 1017.

English Patents.

wage and Refuse Liquor containing Organic Matter; Process for Treating [Purifying] ——. J. J. Crossfield and K. E. Markel, both of Warrington. Eng. Pat. 21,297, Sept. 30. 1902.

ecipitated calcium carbonate containing from 10 to per cent. of free calcium hydroxide, is added to the vage or other waste liquor. The calcium carbonate is it mixed with a stream of water and then run into the vage contained in suitable mixing and settling tanks. e amount of precipitant added is so regulated by the w of water, that the sewage never becomes alkaline in ction.—W. P. S.

ater; Method of Purifying —— [*Removal of Sulphates*]. H. Reisert, Cologne, Germany. Eng. Pat. 6,965, July 31, 1902.

e U.S. Pat. 713,800, 1902; this Journal, 1902, 1550.
—W. P. S.

United States Patent.

Water; Apparatus for the Electric Purification of ——. S. S. Pridham, Newark, N.J. U.S. Pat. 735,817, Aug. 11, 1903.

A tank or run-way has grooves or channels in the sides, electrodes in the tank or run-way have contact pieces extending laterally into these grooves, each contact-piece having a metal block placed within an opening in it, with a circuit-wire clamped to it and passing through the opening. Means are also provided for closing the spaces between the contact-plates. An electrode is employed, which is composed of an alloy of 95 per cent. of magnesium and 5 per cent. of aluminium.—W. G. M.

French Patents.

Water; Process for Purifying and Softening ——. Soc. C. and G. Pulinx. Fr. Pat. 327,968, May 22, 1902.

The water, after being treated with precipitating agents (calcium hydroxide and sodium carbonate) in the requisite proportions, is mixed in a tank and then passes into a settling tank provided with superposed conical baffle plates, and having at the top a filter from which the softened water is drawn off. The precipitate is removed from the conical plates by a central tube.—W. P. S.

Liquids [Water]; Process and Apparatus for the [Electrolytic] Purification of ——. C. McC. Chapman. Fr. Pat. 329,148, Feb. 6, 1903.

See Eng. Pat. 1335 of 1903; this Journal, 1903, 436.
—T. F. B.

Filter. C. McC. Chapman. Fr. Pat. 329,149, Feb. 6, 1903.

See Eng. Pat. 1336 of 1903; this Journal, 1903, 436.
—T. F. B.

(*C.*)—DISINFECTANTS.

English Patents.

Paper [Antiseptic]. M. Jorreto, Madrid. Eng. Pat. 359, Jan. 6, 1903.

See Fr. Pat. 327,752 of 1902; this Journal, 1903, 960.
—T. F. B.

Paper Pulp; Manufacture of ——. H. de M. de Ballore, Tunis. Eng. Pat. 16,568, July 25, 1902.

See Fr. Pat. 322,921 of 1902; this Journal, 1903, 437.
—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

English Patents.

Copying Papers; Manufacture of ——. J. Hawke, New Barnet. Eng. Pat. 8646. April 16, 1903.

Salts of sodium are incorporated with the paper during the process of manufacture; the presence of 3½ to 4 lb. of sodium bicarbonate in 1,000 lb. of copying paper is stated to yield good results.—J. F. B.

Pulp Stock or the like; Process of Treating ——. P. M. Justice, London. From the U.S. Fibre Stopper Co, St. Louis, U.S.A. Eng. Pat. 8983, April 21, 1903.

Paper pulp in a fluid condition is formed into a thin, continuous web by means of a cylindrical wire screen. From this the web is piled upon a wire gauze travelling band, which conveys the piled pulp between suitable guide bars and beneath press rolls, which remove the excess of water and deliver the pulp in a suitable shape and consistency for treatment in a forming machine for converting it into solid articles such as stoppers.—J. F. B.

Cellulose Esters; Manufacture of ——. A. D. Little, W. H. Walker and H. S. Mork, all of Boston, Mass. Eng. Pat. 20,660, Sept. 22, 1902.

See U.S. Pat. 709,922 of 1902; this Journal, 1902, 1345.
—T. F. B.

United States Patents.

Cork; [Caseinated]. H. Helbing, London. U.S. Pat. 734,551, July 28, 1903.

Cork stoppers are impregnated with an alkali or other soluble salt of casein, after which they may be treated with formaldehyde and dried.—A. G. L.

Plastic Compounds; Process of Producing ——. A. Luft, Lemberg, Austria Hungary. U.S. Pat. 735,278, Aug. 4, 1903.

Phenol, or one of its homologues, is boiled with formaldehyde and sulphuric acid, with or without the addition of camphor. The precipitate is treated with alkali, dissolved in a mixture of glycerin and formaldehyde, boiled, moulded, and dried. The resulting plastic mass is "for use in the arts."—T. F. B.

French Patents.

Paper Making and other Raw Materials; Milling and Mixing Machinery for ——. Addition dated Jan. 10, 1903, to Fr. Pat. 282,990 of 1898. I., page 988.

Paper Sizing and the Fixation of the Loading Material. P. Guillet de la Brosse. Fr. Pat. 328,734, Jan. 23, 1903.

Sodium or potassium silicate is added to the pulp during the operation of sizing, in quantity proportional to the amount of mineral loading. The addition of salts with an acid reaction produces a gelatinous precipitate which binds the materials of the paper together.—J. F. B.

Paper Pulp; Process of Fixing the Loading Material in ——, by means of Neutral Solutions of Casein. R. S., J. H., and F. R. Carmichael, Paris. Fr. Pat. 329,107, Feb. 5, 1903.

Powdered casein is brought into a state of apparent solution by trituration with a solution of a neutral soap. The mineral loading material is then incorporated with this mixture and the whole is added to the paper pulp in the beater. For 100 parts of casein 15 to 20 parts of soap are required, and 6 parts of casein are sufficient for the fixation of 100 parts of mineral loading. (Compare also Eng. Pat. 5,998 of 1902, and Fr. Pat. 325,036; this Journal, 1903, 211 and 625.)—J. F. B.

Plastic Substances containing Nitrocellulose; Composition and Preparation of ——. Cie. Française du Celluloid, France. Fr. Pat. 328,658, Jan. 21, 1903.

A product resembling celluloid, but said to be cheaper, is made by including casein in the composition of ordinary celluloid. 100 parts of casein are moistened with a solution of 5 parts of urea acetate in 50 parts of denatured alcohol. After 48 hours, this is thoroughly incorporated with the mixture of nitrocellulose and camphor moistened with alcohol. After a further 48 hours the mass is treated in the same way as celluloid paste. It is preferable to subject the paste to a treatment with formaldehyde to render the casein insoluble.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cerium Oxide; Purification of ——, and Separation from Thorium Oxide. N. A. Orlow. Farmaz. J., 1903, **42**, 877; Chem.-Zeit., **27**, [65], Rep. 189.

The solution is treated with sodium acetate and ammonium oxalate at the ordinary temperature. A portion of cerium oxide is reduced to protoxide in the cold and separates out, and the orange solution also turns quickly turbid, but immediately deposits a white precipitate of dioxide when treated with a few drops of sodium sulphite solution. The thorium oxide is separated by the aid of its solubility in ammonium oxalate solution, but if the operation be performed in the cold, the cerium oxide must first be converted into protoxide. This method can be used for the systematic separation of the cerite metals, by dissolving the calcined oxides in sulphuric acid and treating the cold solution with an excess of ammonium oxalate. Cerium oxide and thorium oxide pass into solution, leaving the oxides of lanthanum, praseodymium, and neodymium, and cerium protoxide as a residue. Cerium protoxide can be separated from admixture with lanthanum and didymium oxides either by the above or some other means.—C. S.

Alcohols; Conversion of Aldehydes and Ketones into —— by Catalytic Hydrogenation. P. Sabatier and J. B. Senderens. Comptes rend., 1903, **137**, [5], 301—303.

By the direct action of hydrogen gas in presence of reduced nickel, the aliphatic aldehydes and ketones are very readily converted into the corresponding alcohols; it is advantageous to maintain the temperature of the reaction slightly above the boiling point of the alcohol produced. The yield and the purity of the product make this method superior to the usual method of reduction by sodium amalgam. The catalytic action of reduced metals can be utilised in two opposite directions; for instance, reduced copper readily brings about the decomposition of alcohols into aldehydes and hydrogen, whilst nickel at a lower temperature brings about the combination of the aldehydes with hydrogen.
—J. F. B.

Yeast; A Therapeutically Active Substance from ——. E. Roos and O. Hinsberg. Münchener mediz. Wochenschr, 1903, **50**, 1196. Chem.-Zeit., 1903, **27**, [67], Rep 204.

The authors find that the therapeutically active constituent of yeast is the so-called cerolin, the neutral fat present in alcoholic extracts of yeast. (See also this Journal, 1903, 920.)—A. S.

"*Quinium*" [*Alcoholic Alkaloidal Extract of Cinchona*] E. Choay. J. Pharm. Chim., 1903, **18**, [4], 145—151.

Under the name of "quinium," Delondre and Labarraque originated a febrifuge which was less costly than quinine sulphate. They directed that the cinchona barks employed for its preparation should contain quinine and cinchonidine in the proportion of two parts of the former to one of the latter. The powdered bark was treated with half its weight of slaked lime, then extracted in a digester with 95 per cent. alcohol. The alcohol was distilled from the extract and the residue, dried and powdered, formed "quinium." Thus obtained it was a fawn-coloured, bitter, aromatic powder which contained 33 per cent. of alkaloids.

An examination of commercial "quiniums" at present on the market shows that but few approach the original preparation either in character or constituents. Many of these are deep brown or black, and of a resinoid appearance. The amount of total alkaloids in 10 specimens ranged from 89·51 to 14·25 per cent., while in 5 of them it exceeded 70 per cent. This high alkaloidal content, did not, however, indicate that the preparations were rich in quinine and cinchonidine, since it was due to the admixture of "amorphous alkaloid" obtained as a by-product in the manufacture of those alkaloids, as shown by the feeble optical activity of solutions of these "quiniums" in dilute sulphuric acid.

In order to obtain a "quinium" in which the active principles of the bark are extracted in an unaltered condition, it is proposed to substitute cold extraction with 85 per cent. alcohol for digestion with 95 per cent. alcohol as originally prescribed by Delondre and Labarraque. The mixture of bark and slaked lime is simply macerated with 85 per cent. alcohol, in a closed vessel, for from half to one hour; the liquid is then withdrawn and used to extract a second portion of bark and lime, fresh menstruum being meanwhile employed for the first portion; by this method of successive extraction, using several separate vessels, the alcohol being passed, in order, from the first to the last, a very strong alcoholic extract is obtained for distillation, while the weaker liquors are used for fresh charges of bark. The strong alcoholic extract is distilled; when nearly all the alcohol has been recovered the greater part of the alkaloids is thrown out of solution. The mass is mixed with the residue from the aqueous portion evaporated to dryness and powdered.

The quinium thus prepared has a pale yellow colour, ıd contains about 45 per cent. of total alkaloids.—J. O. B.

Opium Bases. O. Hesse. J. prakt. Chem., 1903, **68**, [4], 190—207.

'apaverine.—Several samples were purified by recrystal-sation of the acid oxalate, until it gave a colourless ılution in concentrated sulphuric acid. Most of these ımples and the salts prepared from them gave analytical 'sults corresponding closely with the formula $C_{20}H_{21}NO_4$ r papaverine. The anhydrous hydrochloride and hy-iodide melt at 210°—213° C. and at 196° C. respec-vely; the thiocyanate melted at 152° C. The alkaloid parated from the thiocyanate after repeated crystallisa-ons corresponded exactly with the formula $C_{20}H_{21}NO_4$, ıl melted at 146°—147° C. This alkaloid is readily luble in hot absolute alcohol, sparingly in cold; it is ore readily soluble in dilute alcohol, 86 parts of 97 per nt. alcohol dissolve 1 part of papaverine at 15° C. Its ılourless solutions in concentrated sulphuric acid become olet when strongly heated.

Pseudopapaverine.—Some of the samples of "papa-rine" purified in the same way contained a slightly gher percentage of carbon than the above; these samples ter repeated crystallisation had the composition rresponding to the formula $C_{21}H_{21}NO_4$. This new alkaloid, eudopapaverine, appeared to be more soluble in cold cohol than the above. All its salts correspond closely ith those of papaverine, except for the slightly higher rcentage of carbon. The only apparent characteristic fference was shown by the hydriodide, which can be ıtained (from dilute alcohol) in crystals containing 3 mols. water as well as in the anhydrous form; the hydrated salt uld not be obtained from papaverine.

Protopapaverine.—$C_{19}H_{19}NO_4$, is obtained by heating paverine hydrochloride at its melting point until frothing ases, methyl chloride being evolved; pseudopapaverine drochloride loses vinyl chloride when melted. Protopa-verine melts at about 260° C., and is sparingly soluble alcohol; its alcoholic solution gives a deep brownish-red loration with ferric chloride. It behaves towards con-ntrated sulphuric acid like papaverine; with caustic tash it yields a crystalline potassium compound.

Papaveramine.—$C_{21}H_{25}NO_6$, is the constituent of crude paverine which gives the intense violet-blue coloration th concentrated sulphuric acid. Its separation involves long series of extractions and recrystallisations of the other liquors after the papaverine or pseudopapaverine s been isolated in the form of thiocyanate. Papaveramine elts at 128°—129° C., it is very slightly soluble in water t somewhat more soluble in ammonia; it forms a very uble hydrochloride.

According to the author's experience opium yielded a papaverine" of the formula $C_{21}H_{21}NO_4$ in the seasons and about 1870, since then the composition of the papaverine" has returned to the earlier value of $_0H_{21}NO_4$; it is quite possible, however, that the pseudo" form may occur in preponderating quantity ain.—J. F. B.

yoseyamus Muticus as a source of Hyoscyamine. F. Ransom and H. J. Henderson. Pharm. J., 1903, **71**, [3380], 159.

ıE dried drug occurs in three forms: (1) as stalks from ıich most of the leaves have been removed; (2) in the m of a compressed cake consisting mostly of leaves, th small portions of leaf stalks and seed capsules; and) unripe seed capsules containing some seed. The first s found to yield, when dried, 0·498 per cent. of alkaloid, e second 0·900 per cent., the third 0·585 per cent. It is ted that the crude drug could be readily obtained in y of the above forms, although hitherto only the stalk m has reached the London drug market.—J. O. B.

ssential Oils; Refractive Index of ——. E. J. Parry. Pharm. J., 1903, **71**, [3380], 158.

E following values for the refractive index were obtained h: pure otto of rose, 1·46190, 1·46095, 1·46148, 1·46145, and 1·46208; geraniol, 1·47923, and 1·47995; Turkish geranium oil, 1·47602, 1·48055, 1·47958, and 1·47850; citronellol, 1·45718.—A. S.

Kô-Sam (Brucea Sumatrana, Roxb.) Seeds; Chemical Examination of ——. F. B. Power and F. H. Lees. Pharm. J., 1903, **71**, [3380], 183—189.

The authors find that Kô-sam seeds contain a small quantity of a hydrolytic enzyme, but no alkaloid; they contain 1·8 per cent. of tannin. The combined alcoholic and petroleum extracts of the seeds yielded the following substances: (1) A small quantity of a mixture of esters, probably of one of the butyric acids, and having the odour of the crushed seeds; (2) A very small amount of free formic acid; (3) 20 per cent. (on the weight of the seeds) of a fatty oil consisting chiefly of the glycerides of oleic, linolic, stearic, and palmitic acids, together with a saturated hydrocarbon, hentriacontane, $C_{31}H_{64}$, m. pt., 67°—68° C., and a crystalline substance, $C_{20}H_{34}O$, m. pt., 130°—133° C., $[\alpha]^{23°}_{D} = -37·7°$, allied to the cholesterols and agreeing in composition with quebrachol, cupreol, and cinchol; (4) Two bitter principles. The bitter principles are found in the aqueous layer of the residue from the steam-distillation of the combined alcoholic and petroleum extracts; the solution also contains a quantity of a reducing sugar, and a very small amount of a substance which gives a deep green colour with ferric chloride. One of the bitter principles (α) is completely extracted by chloroform from the aqueous solution and can subsequently be obtained from ether, in which it is only sparingly soluble, as a light coloured amorphous powder. The other bitter principle (β) could only be obtained as a brown extract. The authors could obtain no evidence of the presence of quassin as stated by Heckel and Schlagdenhauffen, nor of the glucosidal bitter principle, named "kosamine" by Bertrand.
—A. S.

[*Test for Moisture in Ether*] *Solubility of Picric Acid in Ether.* J. Bougault. XXIII., page 1019.

Chloral Hydrate; Iodometric Determination of ——. E. Rupp. XXIII, page 1019.

Morphine in Opium; Determination of ——, *by Dieterich's Method, and that of the British Pharmacopœia.* H. E. Matthews. XXIII, page 1019.

Strychnine; Quantitative Separation of ——, *from Quinine.* E. F. Harrison and D. Gair. XXIII., page 1019.

Ipecacuanha; Determination and Separation of the Alkaloids of ——. A. G. C. Paterson. XXIII, page 1020.

Cortex Cinchonæ; Valuation of ——. E. Beuttner. XXIII, page 1020.

Distillation and Rectification of Alcohols and the like, and Apparatus therefor. E. Guillaume, Paris. Eng. Pat. 10,929, May 13, 1903. Under Internat. Conv., June 7 1902.

See Fr. Pat. 321,871 of 1902; this Journal, 1903, 313.
—T. F. B.

United States Patents.

Carbon Tetrachloride; Process of Making ——. C. Combes, Paris. U.S. Pat. 735,948, Aug. 11, 1903.

See Eng. Pat. 25,688 of 1901; this Journal, 1902, 1169.
—T. F. B.

Cetyl Guaiacyl and Process of Making Same. M. W. Beylik, Burbank, Assignor to J. M. Sherman, Fremont, Ohio. U.S. Pat. 736,061, Aug. 11, 1903.

Sodium guaiacyl, formed by adding guaiacol to sodium ethylate, is mixed with fused spermaceti, and the mixture heated for three hours at about 83° C.; glycerin is now added to separate the cetyl-guaiacyl, which has the composition $C_{23}H_{40}O_2$. It is a divalent, monobasic alcohol, lighter than water, soluble in alcohol, ether, chloroform, &c., insoluble in water; melting point about 15° C.
—T. F. B.

French Patents.

Carbon Tetrachloride, its Preparation and Applications. Madame Paraf-Javal. Fr. Pat. 327,969, May 23, 1902.

Carbon tetrachloride, when prepared from carbon bisulphide or other sulphur compound, contains impurities which are, for many purposes, undesirable. A preliminary analysis is made of these impurities (usually sulphur compounds), followed by tentative experiments as to the best reagent for removing them. The carbon tetrachloride is heated with the chosen reagent (*e.g.*, chromates, permanganates, &c.), preferably in alkaline solution, and, when the desired result is obtained, distilled.

Carbon tetrachloride, purified in the foregoing manner, is said to be suitable for all uses to which that prepared from chloroform may be applicable.—T. F. B.

C-C-Dialkylbarbituric Acids; Process for Producing ——. E. Merck. Fr. Pat. 328,492, Jan. 14, 1903.

See Eng. Pat. 1945 of 1903; this Journal, 1903, 818.
—T. F. B.

C-C-Dialkylbarbituric Acids; Process for Manufacturing ——. E. Merck. Fr. Pat. 328,493, Jan. 14, 1903.

See Eng. Pat. 1661 of 1903; this Journal, 1903, 923.
—T. F. B.

C-C-Dialkylbarbituric Acids; Process for Manufacturing ——. E. Merck. First addition, dated Jan. 14, 1903, to Fr. Pat. 328,493, Jan. 14, 1903.

See Eng. Pat. 2054 of 1903; this Journal, 1903, 923.
—T. F. B.

Dialkylacetic Acids; Process for Producing the Ureides of ——. E. Merck. Fr. Pat. 328,494, Jan. 14, 1903.

See Eng. Pat. 1914 of 1903; this Journal, 1903, 880.
—T. F. B.

Cream of Tartar; Manufacture of ——. U. Roux, France. Fr. Pat. 328,713, Jan. 22, 1903.

The crude material is placed in a closed digester provided with a rotary stirrer; the digester is then charged with hot mother liquor, which is boiled by means of jets of direct steam, introduced in such a way as to circulate the material in a direction opposite to the rotation of the stirrer. A decolorising agent such as bone black may be added if necessary. When the solution is saturated it is passed under steam pressure through a filtering vessel where all impurities are removed. The filtered solution is finally discharged into a crystallising vat provided with suitable cooling arrangements, the cooling liquor consisting of cold mother liquor from a previous crystallisation, which is thus warmed up and returned to the digester.
—J. F. B.

Cream of Tartar; Apparatus and Process called "Excelsior," for the Extraction of ——, from Grape Marcs. J. B. Rossi and G. B. Cereseto, Italy. Fr. Pat. 328,844, Jan. 27, 1903.

The apparatus consists of a copper boiler heated by a steam coil, a perforated bucket for holding the marcs, and a reflux condenser. The boiler is charged with water, the steam from which ascends through the bucket and wets the marcs; the excess of steam ascends further to the reflux condenser, and the condensed water on its return passes through a coil where it is reheated by steam to 90°—100° C. and is thence distributed over the substance in the bucket. The extraction is continued until the water in the boiler is saturated.—J. F. B.

Vegetable Tar and Formaldehyde; Preparation of a Condensation Product from ——. K. A. Lingner, Germany. Fr. Pat. 329,971, Jan. 31, 1903.

Vegetable tar is condensed with 40 per cent. formaldehyde solution by the aid of hydrochloric or sulphuric acid. The resulting solid mass is dissolved in alkali and reprecipitated by dilute acids several times, when it is washed, dried, and powdered. The product possesses all the medicinal properties of the original tar, but has the advantage of being practically odourless.—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photography; The Beginnings of ——. A Chapter in th History of the Development of Photography with th Salts of Silver. J. Waterhouse. The Photographi Jour., 1903, **43**, [6], 159—178.
—A. S.

Chemical Brightness of Burning Magnesium, Aluminium and Phosphorus; Photometric Examination of the ——. J. M. Eder. Sitzungsber. Akad. Wiss. Wien, **112**, [2A] 249—260. Chem. Centr., 1903, **2**, [3], 177.

The author uses the term chemical brightness to signif the degree of action of light upon a sensitised plat (especially silver bromide-gelatin). The magnesium ligh is not directly suitable as a standard for exact photographi purposes, as the effect of a given quantity of magnesium i dependent upon the method of igniting, the nature of th metal (ribbon or powder), the surrounding gaseous medium and the admixture of substances capable of evolvin oxygen. In an atmosphere of oxygen, the action of burnin magnesium on silver bromide is three times greater than i air; small pieces of magnesium ribbon have a relativel smaller effect than larger pieces. Aluminium leaf burn rapidly in oxygen with strong emission of light. Phosphorus light is only photographically active to a smal degree compared with magnesium light and aluminiun light.—A. S.

Acetone as Substitute for Alkalis in Photographic Developers; Use of ——. A. L. Lumière and A. Seyewetz Monit. Scient., 1903, **17**, [740], 568.

This paper is a reply to the further arguments advance by Eichengrün against the authors' theory of the formatio of an acetone-bisulphite compound in photographic developers containing acetone, sodium bisulphite and, *e.g* quinol (hydroquinone). (See this Journal, 1896, 920, an 1903, 510.)

One of the arguments used by the authors in favour o this theory was based on the fact that, if two solution each containing the same weights of quinol and acetone but one containing sodium sulphite, be extracted with ethe the one containing sulphite yields less quinol than th other: whence the deduction that alkali, liberated by th action of acetone on sodium sulphite, had combined with portion of the quinol, thus preventing its solution in ether.

Eichengrün considers this result of no particular importance, inasmuch as acetone and quinol combine to form compound soluble in ether. To this the authors reply tha they do not see how, in such a case, the presence of sulphit could influence the amount of quinol extracted by ether.

Eichengrün also finds that a normal quinol-acetone sulphite developer, which develops in three minutes, wil after extraction with ether, have only a feeble developin power: on the other hand, a developer containing sulphit and just enough alkali to convert the quinol into its sodiu salt, has a powerful reducing power. The authors find th latter developer only a little more powerful than the forme extracted with ether, and much more feeble than th "normal" solution. They consider that this appears merel to show that the quantity of quinol used (0·43 grm.) is little greater than that which actually combines with th sodium hydroxide (0·156 grm.) before development.

From the fact that a solution containing only quino and acetone will give but a faint image after 24 hour Eichengrün concludes that acetone retards the reducin action of quinol. The authors point out that an aqueou solution of quinol gives an identical result, which show that acetone is only effective in presence of sulphite. If th acetone-bisulphite compound be added to the develope composed of quinol and acetone, reduction is accelerate (from 24 hrs. to 2 hrs.); without free acetone, developme is slower; this is explained by the fact that the additio of acetone tends to decrease the acid character of th acetone-bisulphite compound, and thus acts as a feebl alkali. This was confirmed by the fact that a solutio ontaining only sodium sulphite and quinol has the same eveloping power as that containing quinol, acetone and he acetone-bisulphite compound; while the addition of odium bisulphite decreases the reducing power of the olution.—T. F. B.

English Patents.

hotographic Plates, Films, and the like; Process for Developing ——, in Open Daylight. J. N. Ludwig, Mainz, Germany. Eng. Pat. 16,071, July 19, 1902.

ee addition of June 24, 1902, to Fr. Pat. 318,193 of 1902; is Journal, 1903, 441; also Eng. Pat. 3023 of 1902; this ournal, 1902, 639.—T. F. B.

yeing Photographic Plates. G. Selle, Brandenburg-on-the-Havel. Eng. Pat. 12,513, June 2, 1903.

hotographic plates are dyed with dyestuffs insoluble water by allowing an acid, or alkaline solution of the yestuff to penetrate the film, and then precipitating the yestuff, in the film, by means of an alkaline or acid ath.—T. F. B.

ictures [Catatype]; Reproducing ——, with the Aid of Catalysis. O. Gros and W. Ostwald, Leipzig. Eng. Pat. 13,920, June 22, 1903.

n preparing "catatype" pictures by means of hydrogen eroxide, and subsequent development with an ammoniacal olution of a manganese salt (see Eng. Pat. 22,841 of 1901; is Journal, 1903, 380), it is found that the precipitate of anganese hydroxide affects the purity of the print. To emedy this, some substance is added to the solution to revent the precipitation, *e.g.*, ammonium chloride. The olution may be composed of one part of a 25 per cent. olution of manganese sulphate, three parts of a saturated olution of ammonium chloride and one part of a saturated queous) solution of ammonia.

The picture obtained by using this solution may be toned y means of pyrogallol, gallic acid, &c.—T. F. B.

United States Patent.

hotographic Colour-filters; Process of Making ——. A. Bauermeister, Assignor to C. W. G. Aarland, both of Leipsic. U.S. Pat. 734,454, July 21, 1903.

solution of gelatin in glycerin, mixed with the ecessary colouring matter and some substance to prevent rmentation, is poured into a shallow glass trough, which is bsequently covered with a glass plate, and the whole ooled under pressure.—T. F. B.

French Patents.

ellulose; Process for Preparing New Derivatives of [for Photographic Emulsions] ——. Soc. Anon. Prod. F. Bayer & Co., France. First Addition, dated Jan. 30, 1903, to Fr. Pat. 317,007, Dec. 18, 1901.

he principal patent described the preparation of acetyl erivatives of cellulose, insoluble in alcohol. It is now und that the reaction there described (this Journal, 1902, 0), takes place in two stages, the first being the formation an acetyl derivative soluble in alcohol, and the second e further action of acetic anhydride on this latter to form e insoluble derivative.

The soluble derivative is prepared by acting on 2 kilos. cellulose with a mixture of 8 kilos. of acetic anhydride, kilos. of glacial acetic acid, and 400 grms. of concentrated lphuric acid at 20°—25° C. The whole becomes syrupy ter about 10 hours. When the precipitate obtained by lding water to a sample of the mixture is soluble in hot cohol, and only shows a very small quantity of unconverted llulose, excess of water is added to the mixture and the ecipitate filtered.

It is completely soluble in hot alcohol, the solution agulating on cooling. The solution is thus suitable for otographic emulsions, &c.

Instead of using glacial acetic acid, a portion of the lphuric acid may be replaced by other acids, such as osphoric acid, or phenol- or naphtholsulphonic acids.
—T. F. B.

Paper, Card, &c.; Process for making ——, with Partially Sensitised Surface. Erttec-Karton-Fabrik Schönecker & Co. Fr. Pat. 329,090, Feb. 4, 1903.

See Eng. Pat. 2697 of 1903; this Journal, 1903, 572.
—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Gunpowder, &c.; Determination of Sulphur in ——, by means of Hydrogen Peroxide. J. Petersen. XXIII., page 1017.

French Patents.

Explosives and Cartridges; Process for Rendering —— Impermeable. F. Timmel. Fr. Pat. 328,767, Jan. 24, 1903.

See Eng. Pat. 2592 of 1903; this Journal, 1903, 572.
—T. F. B.

Explosives; Method of Manufacture of ——. Soc. Westfälisch Anhaltische-Sprengstoff-A.-G. Fr. Pat. 329,031, Feb. 3, 1903.

The physical state of such easily oxidisable metals as are used in certain classes of explosives is said to exert an influence on the force of the explosive, and claim is made for the use of such metals in the form of so-called "laine métallique" (metal wool), instead of a state of the usual mechanical division.—G. W. McD.

Matches, which Strike on any Surface; Process of making Non-Poisonous ——. Fabrik Chem. Zündwaaren Patschkau, J. Huch. Fr. Pat. 329,166, Feb. 7, 1903.

See Eng. Pat. 4009 of 1903; this Journal, 1903, 822.
—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

French Patent.

Viscosimeter for Milk. H. Micault and P. Gaillard, France. Fr. Pat. 328,663, Jan. 21, 1903.

The apparatus consists of a reservoir of known volume having at the top a tube for allowing air to enter, and at the bottom a tube closed by a stop-cock. The viscosity of the milk under examination is compared with that of pure milk at the same temperature.—W. P. S.

INORGANIC—QUANTITATIVE.

Sodium Oxalate; Use in Volumetric Analysis of ——. S. P. L. Sörensen. Zeits. anal. Chem., 1903, **42**, [6 & 7], 333—359.

The results of further experiments on the use of sodium oxalate in the standardisation of acids are given (see this Journal, 1900, 1041). If the oxalate be carefully prepared and dried at 230° C., very accurate results can be obtained. The ignition of the oxalate must be performed over a spirit flame, and any carbon which forms must be completely burnt away. The best method of preparing pure sodium oxalate is to dissolve sodium carbonate in sufficient water to prevent the oxalate, when formed, crystallising out, then to add somewhat less than the equivalent amount of oxalic acid, concentrate the solution to one-fourth its volume, and allow to cool. The crystals are collected on a filter and washed with cold water. After drying in the water-oven, and in order to decompose any sodium bicarbonate which may have been formed, the salt is dissolved in the least possible quantity of hot water, the solution again concentrated to one-fourth and allowed to crystallise. The sodium oxalate thus obtained, is finally dissolved in hot water, and precipitated by adding alcohol little by little. The precipitate is washed with alcohol, and dried, first in the water-oven and then at 230° C. The salt is not hygroscopic, but should be re-dried at 100° C. to remove surface moisture.—W. P. S.

Gases; New Quantitative Method for Determining Dust in ——. L. Martins. Stahl u. Eisen, 1903, **23**, 735; Chem.-Zeit., 1903, **27**, [65]. Rep. 190.

Composition of Dust in Blast-Furnace Gases.—The dust from the mixing chamber of a power-gas engine at the Kladno Ironworks contained silica, 24·56; alumina, 21·31; iron, 4·40; zinc, 2·19; manganese, 0·49; lime, 29·04; magnesia, 8·83; phosphorus pentoxide, 4·49; sulphur, 0·73; chlorine, 0·73 per cent; residue soluble in water, 4 per cent.; loss on calcination 11·61 per cent.

Apparatus for Collecting the Dust.—Cotton wool is too hygroscopic and does not furnish a homogeneous filter, so the author employs a disc of filter paper, held between the rim of a metallic funnel and a metal cover fitted with a gas-effluent pipe. The funnel is provided with a gas feed pipe, and a small collector for the separation of any drops carried over by the gas; and a measuring apparatus and aspirator are also provided. The impure gas ascends through the apparatus, the dust settling as a uniform layer on the filter disc. The simplest method of determination is by incinerating the filter and attached dust in a platinum basin.—C. S.

Persulphates; Study of ——, *from the Analytical Standpoint.* D. Vitali. Boll. Chim. Farm., **42**, 273—286, 321—326. Chem. Centr. 1902, **2**, [5], 312.

Strychnine forms a crystalline persulphate—

$$(C_{21}H_{22}O_2N_2)_2H_2S_2O_8 + H_2O,$$

which occurs in microscopic needles, very slightly soluble in water (100 c.c. of water dissolve at 17° C. about 0·04 grm. of the anhydrous salt), soluble in concentrated nitric and hydrochloric acids, slightly soluble in dilute sulphuric acid. Of the organic solvents it is dissolved most readily by chloroform. This salt can be formed at a dilution of 1 in 100,000; on heating in presence of water, it decomposes into strychnine sulphate, sulphuric acid and oxygen; it can be used for the quantitative determination of persulphates.

Good results may be obtained by treating a solution of the persulphate with excess of strychnine nitrate, allowing to stand for 24 hours, filtering off the precipitate on to a small tared filter, washing with the smallest possible quantity of water and drying at 100° C. to constant weight. 1 mol. of the anhydrous strychnine salt—

$$(C_{21}H_{22}O_2N_2)_2H_2S_2O_8,$$

corresponds to 2 mols. of the persulphate. Still more accurate results are obtained if a correction be made for the slight solubility of the strychnine persulphate in water. —A. S.

Silver in Commercial Potassium Cyanide. K. Friedrich. Zeits. angew. Chem., 1903, **16**, [32], 776.

In a number of metallurgical experiments it appeared that the potassium cyanide used, yielded distinct amounts of silver. Amongst others, a sample of cyanide sold under the mark "kalium cyanatum puriss. pro analysi" was examined. Of this, 44 grms were melted under a cover of proof lead in a muffle, the bulk of the lead removed from the resulting regulus, and the residue cupelled. A distinct silver button was obtained, which, after making allowance for the amount of silver in the proof lead and the loss in refining, amounted to 12 grms. per ton. The silver content may have been derived from silver vessels used in the manufacture. —W. C. H.

Phosphorus in Steel; Rapid Determination of ——. G. Auchy. J. Amer. Chem. Soc., 1903, **25**, [7], 772—773.

One grm. of the steel is dissolved in 50 c.c. of nitric acid (sp. gr. 1·135), and the solution heated to the boiling point, mixed with a little solid potassium permanganate, and again boiled. It is next decolorised by means of sugar or ferrous sulphate, cooled, treated with 10 c.c. of strong ammonia solution, and 50 c.c. of molybdate solution, and shaken in an Erlenmeyer flask as usual. The resulting yellow precipitate is transferred, together with the liquid, to a 7-in. test tube, and, after standing for 30 minutes, is whirled in a centrifugal machine. The supernatant liquid is then poured off, and the deposit shaken with water, agai separated by centrifugal force, dissolved in standard alkal and titrated with standard acid. The deviation from th theoretical results is less than 0·001 per cent.—C. A. M.

Thallium: Electrolytic Determination of ——, *as Oxid by Anodic Precipitation.* M. E. Heiberg. Zeits. anorg Chem., **35**, 347—374. Chem. Centr., 1903, **2**, [3], 217

From sulphuric acid solution containing a few c.c. acetone, thallium can be separated at the anode in th form of an adherent deposit of the oxide, which can b readily dried and weighed. From 0·2 to 1 grm. of thallium sulphate is dissolved in 80—100 c.c. of water in a platinum crucible with a matt (dull) surface, and 2—6 c.c. of norma sulphuric acid, and 5—10 c.c. of acetone added. Th crucible serves as anode, and a platinum plate as cathod and electrolysis is effected with a current of 1·7—2·3 volt A strong evolution of gas at the anode must be avoided The current strength should be between 0·02 + 0·05, an the temperature 50°—55° C. The electrolysis is complet when 0·5 c.c. of the liquid gives no opalescence wit 3—5 c.c. of a 5 per cent. solution of potassium iodide. Th deposit is then washed with water, alcohol, and ether, an dried for 20 minutes at 160—165 C. In drying th thallium oxide, constant weight can only be attained if th combustion gases (sulphur dioxide, carbon dioxide) b excluded from the drying oven.—A. S.

Ammonia [in Sewage, Tannery Effluents, &c.]; N Method for the Determination of ——. A. Bayer Chem.-Zeit., 1903, **27**, [66], 809—810.

In sewage and organic liquids containing the decomposition products of albuminoids, any method for the estimation o ammonia, which depends upon distillation in presence of base, gives results which are considerably higher than th truth, because ammonia is produced during the distillatio by the action of the base (*e.g.* magnesia) upon the organi nitrogenous compounds. In order to avoid this error, th author has devised a method by which the ammoni actually existing as such in organic liquids is separated b precipitation in the form of ammonium magnesium phosphate. To 200 c.c. of the liquid to be analysed are adde 1—2 c.c. of fuming hydrochloric acid, two drops o phenolphthalein and a quantity of a solution of magnesium chloride (101 grms. per litre), corresponding to abou 10 times the theoretical amount; 12—15 grms. of powder crystallised disodium phosphate are then added, and th beaker is placed in a mechanical stirring apparatu Whilst stirring, and after the phospate is dissolved, norm caustic soda solution, free from carbonate, is added drop by drop until a pink colour persists. The gelatinous pre cipitate first formed changes after stirring for 15 minute into a crystalline form, and the pink colour disappear this is again restored by the addition of a few more drop of caustic solution, and the stirring is continued for anoth 15 minutes. If excess of alkali be added, the ammonium precipitate is decomposed, and the process must be repeate after re-acidification. Precipitation is complete after stirring for 30—40 minutes, and the precipitate is transferre without delay to a filter, being washed out of the beaker b means of the same filtrate; no water should be used fo washing.

The filter and precipitate are finally placed in a distillatio flask, and the ammonia is distilled off after the addition 2—3 grms. of magnesia, and a sufficient quantity of wate It is important that the precipitate be filtered off immed ately after precipitation is complete, since the quantity ammonia is liable to increase rapidly under the action bacteria. In the case of liquids, such as tannery effluent which contain nitrogenous matters in suspension, th solution to be analysed should first be clarified by shakin vigorously with a little magnesia, and then filtering. —J. F. B

Water Free from Ammonia; Preparation of ——, *f Water Analysis.* J. B. Weems, C. E. Gray, an E. C. Myers. Proc. Iowa Acad. Sciences, **10**, 112—113

Sodium peroxide is added to distilled water in the propor tion of 1 dram to each litre of water. The water is the boiled for 30 minutes or longer, when it will be free fro amonia. The time of boiling and the amount of sodium eroxide to be added depend on the quantity of ammonia hich may be present in the water. Water may also be epared free from ammonia and nitrogen as nitrates and trites, by treating it as above and distilling from a copper tort, the first portion of the distillate being rejected.

W. P. S.

rbonic Acid in Drinking Water; Determination of ——. F. B. Forbes and G. H. Pratt. J. Amer. Chem. Soc., 1903, **25**, [7], 742—756.

Pettenkofer's method, considerable errors may be roduced by slight errors in the titration with N/10 acid so small a quantity of water; the authors have therefore their experiments treated about 400 c.c. of the water h the reagents and titrated several portions of 100 c.c. the clear liquid with N/50 sulphuric acid, the usual cautions being observed.

For the separation of free from half-bound carbonic acid, water was allowed to fall drop by drop into a tube out 2·5 feet long and ⅝ inch in diameter, which was ed with gravel, and through which a current of air was irated. This removed the free acid, and the half-bound bonic acid was then determined as before.

n Seyler's method (Analyst, **22**, 312) the free carbonic l was first titrated, with phenolphthalein as indicator, and half-bound carbonic acid calculated from the fixed acid, ich was determined by Hehner's method, methyl orange ng used as indicator.

he Seyler method tends to give higher figures than tenkofer's method, but these are nearer to the true ues, as shown by the results of the boiling method and experiments on standard solutions. In seven out of 20 es, however, in which complete results by the three hods did not differ by more than 0·2 of a part, oving the free carbonic acid by aspiration in the modified tenkofer's method is shown to be sufficiently accurate. Seyler's method of titration, with phenolphthalein as cator, the end point is sometimes difficult to determine, magnesium salts do not cause disturbance as in Pettener's method. The determination of the half-bound acid alculation from the amount of fixed carbonic acid by ner's method is satisfactory, and the results, though wing a tendency to be too low, are higher than those ained by Pettenkofer's method.

reference is given to Seyler's method on account of its dity.—C. A. M.

ohur in Gunpowder, &c.; Determination of ——, by leans of Hydrogen Peroxide. J. Petersen. Zeits. anal. hem., 1903, **42**, [6 and 7], 406—417.

T method is based upon the fact that sulphides and sulphates when in alkaline solution are quantitatively verted into sulphates by hydrogen peroxide, and also sulphur, when boiled with sodium hydroxide solution, olves to form sulphide and thiosulphate. In the case of powder, about 0·75 grm. of the powdered sample is ed with 40 c.c. of 2 per cent. sodium hydroxide solution 20 minutes. After cooling slightly, about 50 c.c. of hydrogen peroxide (3 per cent. solution) are added, the mixture again boiled for 5 minutes. Hydrochloric is then added in excess, the solution is boiled for a ent, filtered and the sulphate determined in the filtrate sual. Provided that the residue on the filter is well ed, the author finds that it retains no trace of sulphate. T method is applicable to a variety of organic sulphur pounds, including potassium thiocyanate, thiophene, ard oils, etc. Finely-divided sulphur is also dissolved hot solution of sodium sulphite. From 0·5 to 0·8 of gunpowder is boiled with about 4 grms. of crystall- sodium sulphite and a little water for 15 minutes. tium nitrate is then added in excess to precipitate the ered sulphite, the solution is diluted to 100 c.c. and ed. The precipitate is washed with 300 c.c. of cold r, and the thiosulphate in the combined washings and te, titrated with N/10 iodine solution. A correction ·8 c.c. of the latter solution is made to allow for mount of strontium sulphite which goes into solution.

—W. P. S.

ORGANIC—QUALITATIVE.

Sesamé Oil Reaction with Stannous Chloride. P. Soltsien. Pharm.-Zeit., 1903, **48**, 524. Chem.-Zeit., **27**, [65], Rep., 191.

The delicacy of the reaction is impaired when the oil and reagent remain emulsified too long subsequent to agitation. This can be obviated by dissolving the oil or fat in about twice its own volume of benzene, adding the stannous chloride solution (½ vol. of the fat), shaking the whole up well, and immersing the glass in water at about 40 per cent.

—C. S.

Fusel Oil in Rectified Spirits; Furfural and certain Aromatic Aldehydes as Reagents for ——. A. Komarowsky. Chem.-Zeit., 1903, **27**, [66], 807—808.

The author has studied and improved Saglier's test for the presence of isoamyl alcohol in rectified spirits by the coloration produced by concentrated sulphuric acid in presence of furfural. The improved procedure proposed by the author is as follows:—10 c.c. of spirits are mixed with 1 c.c. of furfural solution (2 : 1,000 of alcohol) and 15 c.c. of concentrated sulphuric acid; after thorough shaking the mixture is allowed to remain without external heating until cold. The presence of isoamyl alcohol is then indicated by a rose-red coloration, more or less intense according to the quantity of that alcohol present. Spirit free from fusel oil appears grey, but the rose colour is perceptible in the presence of 0·001 per cent. of isoamyl alcohol. The preliminary elimination of acetaldehyde is not essential, but if the proportion of acetaldehyde reach 0·001 per cent., the colorations obtained are not pure; this objection is overcome by previously diluting the spirits to 50° Tralles.

Instead of furfural, salicylic aldehyde may be employed as follows: 10 c.c. of the spirit are mixed in the same manner as above with 25—30 drops of a 1 per cent. solution of salicylic aldehyde in alcohol, and 20 c.c. of sulphuric acid. The colorations with small traces of fusel oil are yellow by transmitted and red by reflected light, but when the proportion of isoamyl alcohol reaches 0·01 per cent., the yellow tint is not perceptible. Benzaldehyde and *p*-hydroxybenzaldehyde, when applied in a similar manner, also give red colorations in presence of isoamyl alcohol. As yet the above tests have merely received a qualitative application, but since the colours are constant in tint, they may form the basis of a quantitative method.—J. F. B.

ORGANIC—QUANTITATIVE.

Pyridine in Aqueous Solution; Determination of ——. M. François. Comptes rend., 1903, **137**, [5], 324—326.

The various combinations of pyridine with gold chloride are all resolved into the ordinary aurichloride $C_5H_5NHCl.AuCl_3$ when heated in presence of hydrochloric acid and gold chloride. This compound is practically insoluble in ether and can be employed for the determination of pyridine. A quantity of a solution of pyridine, in water or dilute hydrochloric acid, corresponding to not less than 0·1 grm. of the base, is measured into a beaker, 20—30 drops of hydrochloric acid are added, and then an excess of a solution of pure gold chloride. A precipitate is formed and the solution should have a strong yellow colour. The contents of the beaker are evaporated to dryness on the water bath. When all odour of hydrochloric acid has been expelled, the beaker is placed in the desiccator. The deposit is then washed rapidly with pure ether free from aldehyde, the liquors being passed through a filter, to which the precipitate is ultimately transferred and washed with ether until the filtrate is colourless. If any of the aurichloride adhere to the sides of the beaker, it is dissolved in boiling water, collected in a tared porcelain capsule, and evaporated to dryness. The filter and precipitate are then placed in the capsule and cautiously incinerated; the ash is weighed as metallic gold. In order to obtain the pyridine in a condition suitable for analysis, it is generally sufficient to distil it from an alkaline liquid with a current of steam, the point of the condenser dipping below the surface of some dilute hydrochloric acid. In the case of compounds containing mercuric iodide and pyridine, a solution of potassium iodide and caustic potash should be added before distillation.—J. F. B.

Halogens; New Process for the Determination of ——, in Organic Compounds. H. Baubigny and G. Chavanne. Bull. Soc. Chim., 1903, **29**, [15], 807.

INTO a conical flask of Bohemian glass and of 150—200 c.c. capacity, 40 c.c. of sulphuric acid (sp. gr. 1·84), and a small excess of silver nitrate, *i.e.*, 1—1·5 grm., according to the quantity of substance taken, are introduced and dissolved by warming. 4—8 grms. of potassium bichromate in powder are then added, and dissolved by shaking and heating. Cool, pour gently into a hard glass vessel containing the organic matter, and mix thoroughly. If the action does not take place in the cold, as seen by the evolution of carbon dioxide, the liquid must be heated. Finally heat to 150°—180° C. and shake thoroughly. Remove vessel from heat and shake for 4—5 minutes. Cool, add 140—150 c.c. of water, reduce by a concentrated solution of sulphurous acid, and separate out the haloid-silver compound in the usual way.—R. G. G.

Fehling's Solution; Note on the Volumetric Use of —— [Determination of Sugar]. E. F. Harrison. Brit. Pharm. Conference, Bristol, July 1903. Pharm. J., 1903, **71**, [3380], 170.

THE author has not found any of the described methods for observing the end point of titrations with Fehling's solution quite satisfactory. Good results can, however, be obtained by a method suggested by A. A. Kelly, based upon the action of cupric salts in liberating iodine from iodides. The indicator is prepared by boiling 0·05 grm. of starch with a few c.c. of water, adding 10 grms. of potassium iodide, and diluting to 100 c.c.; the solution should be prepared as required. About 0·5 or 1 c.c. is taken, acidified with about 5 or 10 drops of acetic acid, and a drop or more of the liquid which is being titrated added. So long as unreduced (cupric) copper is present, a more or less intense colour is produced, varying from red to blue. The indicator gives a distinct coloration with one drop of a 1 in 20,000 solution of copper sulphate.—A. S.

Yeast; Biological Analysis of Bottom-Fermentation ——, after Drying the Sample. P. Lindner. Woch. f. Brau., 1903, **20**, [33], 369—370.

THE determination of the extent of wild yeast infection of brewery yeast is frequently very difficult. The chief test for wild yeasts is based on their comparative readiness to form spores, but this property is by no means universally marked. Moreover no method in which sub-cultivation of the sample is necessary can give any idea of the extent of the infection. The method proposed by the author depends on the fact that when yeast is dried at low temperatures, the culture yeast is killed almost to the last cell, whilst the wild yeasts survive the process, being accustomed to it in the natural state. The sample to be tested is therefore allowed to dry on a sterile support, it is then stirred up with sterile water and mounted on a cover glass in the form of an "adhesion culture" in not too thin a layer. The culture is allowed to remain for one or two days at a temperature of about 25 C., and examined under the microscope. It will then be found that the colonies which have developed are almost entirely those of the wild yeasts, only one or two colonies of culture yeast being visible. The colonies which have survived grow at the expense of the peptonised products of the dead cells, the latter, which are easily recognisable, being pushed to the edges of the field.—J. F. B.

Wines; Determination of Ammonia in ——, and its Significance in the Differentiation of "Mistelles" from "Vins de Liqueur." J. Laborde. Comptes rend., 1903, **137**, [5], 334—336.

THE author discusses the conclusions arrived at by Gautier and Halphen (this Journal, 1903, 814) as regards the disappearance of ammonia from grape musts in the first stages of fermentation, and the existence of volatile cyclic bases in fermented liquids. The author employed the method of Müntz for the distillation of the ammonia, a he has compared this method with that employed by Gauti and Halphen of distillation with magnesia. The tw methods were found to be practically equivalent.

The author finds, however, that the quantity of ammon remaining in partially fermented musts, originally rich ammonia, may frequently exceed that present in oth musts in the unfermented state. Further, except in ve rare cases, the estimation of the ammonia by titration ga results identical with the gravimetric estimation wi platinum chloride, both in unfermented musts and fermented and diseased liquors. In the wines which t author has studied, there was no evidence of the presence volatile organic bases.

The author concludes that "vins de liqueur," even wh produced by perfectly pure fermentations, frequent contain ammoniacal nitrogen far in excess of the limit 10 mgrms. per litre prescribed by Gautier and Halphe Many Sauterne wines, essentially "vins de liqueur," w found to contain from 16 to 25 mgrms. of ammonia nitrogen.—J. F. B.

Acetic Acid and Vinegar; Detection and Determination Mineral Acid in——. P. Schidrowitz. Analyst, 19 **28**, 233.

THE author finds that if a sufficient quantity of eth alcohol be added to a solution of acetic acid, it entir prevents the reaction of the latter with methyl oran indicator; and also that if alcohol be introduced int solution of acetic acid which is coloured pink or pinkis brown with methyl orange, the colour reverts to yell Moreover he finds that the amount of a mineral acid i weak organic acid can be titrated by means of meth orange as indicator, provided the dyestuff be used in shape of papers. Colourless vinegars, for instance, can examined for mineral acid by titration with decinorm alkali in presence of methyl orange, if a volume of alcol equal to that of the liquid taken be mixed therewith, and another 1 c.c. of alcohol be added for every 3 c.c. of alk run in. Ordinary coloured vinegars are not amenable the process, for the only available decolorising agent animal charcoal, and this obstinately retains a considera proportion of the inorganic acid. Nevertheless, these be examined in a similar manner with the aid of met orange papers. Controlling tests carried out in the first upon plain water without spirit, in the second upon genu vinegar, should always be made. In the course of discussion following the paper, Allen remarked that it curious that with acetic acid it should be possible titrate a relatively weak acid by a strong indicator w the assistance of ethyl alcohol; whereas with boric a no trustworthy result could be obtained without the of glycerin, which rendered the acid sensitive to phen-phthalein, though not to methyl orange.—F. H. L.

Waters; New Method of Determining the Orga Matter in ——, especially in those containing Chlori and Bromides. C. Le Normand. Bull. Soc. Ch, 1903, **29**, [15], 810.

IN estimating, by permanganate, the organic matters i waters containing an appreciable quantity of halogens—e, sea-water, &c.—the results are too high, owing to liberation of chlorine, &c. To avoid this the follow process is suggested:—

Add 10 c.c. of a solution of potassium permanga (0·395 grm. per litre, equal to 1 mgrm. of available oxy per 10 c.c.), and 10 c.c. of a saturated solution of sod bicarbonate to 100 c.c. of the water. Boil gently for minutes, cool, and make up the volume to 100 c.c. wi distilled water. Allow to settle thoroughly and decan into one of the glasses of a Duboscq colorimeter. Into other glass put a solution containing 10 c.c. of the permanganate solution in 100 c.c. of water, and by alte the depth of the liquids, match the two tints. Then if the potassium permanganate remaining in the water at examination after boiling. p = the potassium permanga in comparison test, H_1 = depth of water in the tube, H = depth of comparison test liquid; $x = p.\frac{H}{H}$.

$= 0{\cdot}00395 \frac{H}{H_1}$; therefore permanganate used = 0·00395 − $00395 . \frac{H}{H_1}$; *i.e.*, $0{\cdot}00395\left(\frac{H_1 - H}{H_1}\right)$, and $\frac{H_1 - H}{H_1}$ = mgrms. oxygen used per 100 c.c. of water.

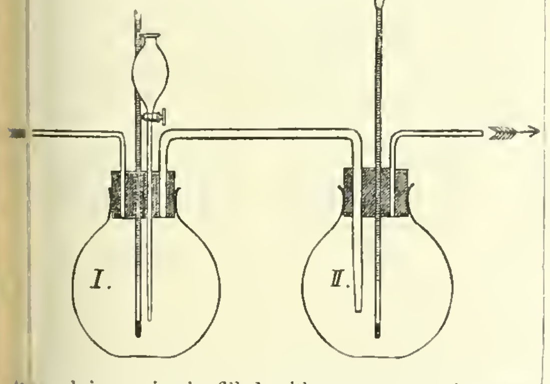
The process is said to be equally applicable to soft ters. With sea-water the manganese peroxide pre-itated is carried down by the magnesium carbonate arated on boiling, but soft waters remain turbid for ne hours. To overcome this difficulty, 1 c.c. of a urated solution of magnesium sulphate is added hefore ling.—R. G. G.

est for Moisture in Ether] Solubility of Picric Acid n Ether. J. Bougault. J. Pharm. Chim., 1903, **18**, [3], 16.

e statements found in the books as to the comparatively n solubility of picric acid in ether are only true provided solvent contain water. A sample having a sp. gr. 0·721, pared by washing ordinary ether with water and drying ver calcium chloride, dissolved 10·8 grms. of picric acid litre at 13° C. ; a second sample having a density of 25, and containing about 0·8 per cent. of water (Reg-lt and Adrian's tables), dissolved 36·8 grms.; and a d sample containing 1 per cent. of water (sp. gr. 0·726) olved 40 grms. per litre at 13° C. According to the ıor a saturated solution of picric acid in anhydrous r is sensibly devoid of colour; this peculiarity, how-, is not due to the small amount of substance in tion, for on adding a trace of water the usual deep ow colour develops. It is possible to utilise this fact basis of a test for the presence of moisture in ether; n fact, by colorimetric methods (provided the density not exceed 0·725) to estimate approximately the unt of water present. At a specific gravity of 0·725 intensity of the coloration appears to reach a maximum.
—F. H. L.

nic Acid and its Salts ; Gasometric Valuation —. M. Wegoer. Zeits. anal. Chem., 1903, **42** and 7], 427—431.

MIC acid is decomposed by concentrated sulphuric acid water and carbon monoxide. The amount of formic in sodium formate may be determined by the wing method based upon this reaction :—2 c.c. of a er cent. solution of the salt to be examined are placed e flask I., shown in the illustration. The tube of the



unnel is previously filled with water up to the tap, t the bulb of the funnel contains about 30 c.c. of ntrated sulphuric acid. The flask II. acts as a drying 40 c.c. of concentrated sulphuric acid being placed This second flask is connected to a nitrometer. removing all air from the apparatus by means of a at of carbon dioxide, the acid in the second flask being e same time heated to 180° C., the acid in the funnel owed to run on to the formate solution in I. At the f the reaction, this flask is also warmed to 180° C., arbon dioxide further passed through the apparatus to all carbon monoxide into the nitrometer. The formic is not completely decomposed in the first flask, and oisture collecting in the tube between the flasks must be driven over by the aid of a small flame. Traces of formic acid which escape with the moisture from the first flask are thus decomposed in the second. The percentage of sodium formate is found from the volume of carbon monoxide by the formula—

$$x = \frac{v\,(\beta - W) \times 0{\cdot}1251 \times 68}{760\,(1 + \alpha t) \times s \times 28},$$

in which v = the volume of carbon monoxide found ; β = barometric reading in millimetres ; W = vapour pressure of the potassium hydroxide solution in millimetres at $t°$ C. ; α = pressure coefficient of the gas ; t = temperature of the gas in degrees centigrade ; 0·001251 grm. = the weight of 1 c.c. of carbon monoxide at N.T.P. ; s = grms. of substance taken ; 68 = molecular weight of sodium formate ; and 28 = molecular weight of carbon monoxide.

Acetic acid and volatile inorganic acids do not interfere with the method, but oxalic acid, if present, must be removed previously by precipitation. If tartaric, citric, malic, or other similar acids be present, they must be separated from the formic acid by distillation. Should the sodium formate contain sodium nitrite, the nitrous acid may be destroyed by adding ammonium chloride and boiling the solution under a long reflux condenser for 1 hour, afterwards washing the condenser tube with a little water.—W. P. S.

Chloral Hydrate ; Iodometric Determination of ——. E. Rupp. Archiv der Pharm., **241**, [5], 326—328.

TWENTY-FIVE c.c. of decinormal iodine solution are run into a stoppered flask ; 2·5 c.c. of normal potassium hydroxide solution are added, followed by 10 c.c. of a 1 per cent. solution of the chloral hydrate to be examined. The mixture is allowed to stand for 5 to 10 minutes, then diluted with about 50 c.c. of water, when 5 c.c. of hydrochloric acid (sp. gr. 1·125) are added, and the uncombined iodine titrated back with decinormal thiosulphate solution. According to the equation—

$$CCl_3.COH.H_2O + 2I = 2HI + CO_2 + CHCl_3$$

each c.c. of decinormal iodine solution used is equivalent to 0·008275 grm. of chloral hydrate.—J. O. B.

Strychnine ; Quantitative Separation of ——, from Quinine. E. F. Harrison and D. Gair. Brit. Pharm. Conference, Bristol, July 1903. Pharm. J., 1903, **71**, [3380], 165.

THE authors recommend the following method, based upon the different solubility of the tartrates in solution of Rochelle salt. An amount of alkaloid containing 0·05—0·1 grm. of strychnine is dissolved in 60 c.c. of water slightly acidulated with sulphuric acid, and ammonia added so long as the precipitate formed, redissolves. 15 grms. of powdered sodium potassium tartrate are then added gradually, with stirring, followed by ammonia till the liquid is only just acid to litmus. The mixture is heated on the water-bath for about 15 minutes, allowed to stand for about two hours till quite cold, and the quinine tartrate filtered off, with the aid of the pump and washed with a solution of 15 grms. of sodium potassium tartrate in 45 c.c. of water, made just acid with sulphuric acid. The filtrate and washings are mixed, made strongly alkaline with ammonia and extracted three or four times with chloroform. The chloroform solution is washed with 10 c.c. of water containing a little ammonia, then evaporated to 4 or 5 c.c., 10 c.c. of alcohol added, and the solution evaporated to dryness. The residue is washed three times with 1 c.c. of ether, and the pure strychnine left behind is dried and weighed. If the amount of total alkaloid taken contain much more than 0·1 grm. of strychnine, the amount of water used for dissolving and the weight of Rochelle salt added are increased. Results are quoted showing the accuracy of the method.—A. S.

Morphine in Opium ; Determination of ——, by Dieterich's Method and that of the British Pharmacopœia. H. E. Matthews. Brit. Pharm. Conference, Bristol. Pharm. J., 1903, **71**, 149.

COMPARING the two methods, that of Dieterich has the advantage of requiring less opium and of being much more expeditious. It is not quite so exact as the official process, the morphine obtained by it being less pure and slightly less in quantity. For buyers of opium, the method of Dieterich should be useful on account of the rapidity with which an assay of morphine can be made, the results obtained being sufficiently accurate for commercial purposes. The details of Dieterich's process are as follows :—

Triturate 6 grms. of opium in fine powder with 6 grms. of water, dilute, wash out into a weighed flask, and make up to 54 grms. with water. Let the whole digest for 15 minutes, shaking frequently, and then filter through a folded filter, 10 cm. in diameter. Take 42 grms. of the filtrate, mix with 2 grms. of dilute ammonia (1·7 per cent. of NH_3) by rotation, not shaking, and filter through a folded filter 10 cm. in diameter. Mix 36 grms. of the filtrate in an accurately-weighed flask with 10 grms. of ethyl acetate by rotation, add 4 grms. of dilute ammonia, close the flask, and shake well for 10 minutes.

In order to separate the resulting emulsion, add immediately 10 grms. of ethyl acetate, and carefully pour off the ethereal layer as completely as possible. Again add 10 grms. of ethyl acetate and repeat the decantation. Pour the remaining liquid in the flask (leaving behind the crystals adhering to the flask) through a filter 8 cm. in diameter, and wash out the flask and filter twice with 5 c.c. of water saturated with ethyl acetate. When the flask has well drained and the filter is dry (dry at 100° C.), remove the crystals on the filter to the flask by means of a camel's-hair brush. Set the flask to dry immediately, and dry till the weight is constant.

The process is easily carried out, and is very expeditious, the whole of the operations up to the point of drying the morphine crystals occupying about an hour.—J. O. B.

Ipecacuanha; Determination and Separation of the Alkaloids of ——. A. G. C. Paterson. Pharm. J., 1903, **71**, [3379], 102.

The following is given as a simple and rapid method for the determination of emetine and cephaeline, the minute quantity of psychotrine present (0·07 per cent. as an average) being ignored :—

12 grms. of powdered ipecacuanha root are mixed with 10 c.c. of ammonia solution (or 10 c.c. of sodium carbonate solution, 1 in 3), and 120 grms. (or c.c.) of a menstruum composed of chloroform, 1 part; amyl alcohol, 1 part; ether, 3 parts.

Agitate in a stoppered bottle during one hour, then add water (10 to 15 c.c.) to aggregate the powder. Next separate 100 grms. (or c.c.) of the ethereal liquid, and evaporate to one-half if ammonia has been used. Extract the alkaloids with (1) 15 c.c. (or excess) of N/10 hydrochloric acid; (2) water, 5 c.c.; (3) 5 c.c.; (4) 5 c.c. Add excess of normal potash solution (about 2 c.c.), and wash four times with ether 15 c.c., 10 c.c., 10 c.c.. 5 c.c. reserving both aqueous and ethereal layers. Mix the ethereal solutions and wash three times with N/20 potash solution, 10 c.c., 5 c.c., 5 c.c. Then mix the N/20 potash solutions, and wash once with ether, 10 c.c. Next mix all the ethereal solutions, evaporate, weigh the residue or titrate as emetine (1 c.c. of N/10 acid = 0·0248 grm. emetine). Finally mix the aqueous solutions, acidify with hydrochloric acid, make alkaline with ammonia, and extract the alkaloid with heavy ether-chloroform (1 to 6), 20 c.c., 10 c.c., 10 c.c., 5 c.c., or till all the alkaloid is extracted. Evaporate and weigh, or titrate the residue as cephaeline (factor, 0·0234).

The titrations can be satisfactorily conducted by Bird's method, using methyl orange as indicator.—J. O. B.

Cortex Cinchonæ; Valuation of ——. E. Beuttner. Schweiz. Wochschr. Pharm., **41**, 265—271. Chem. Centr., 1903, **2**, [3], 215.

According to the author, the method of the D.A.B. IV. for the determination of the alkaloids in cinchona bark, though useful when the proportion of alkaloids is below 5·5 per cent., is quite useless when the proportion is greater, as during the three hours' maceration, alkaloids crystallise out, and consequently low results are obtained. The same is the case, although to a lesser degree, with Keller's method. The author proposes the following process :—Seven grms. of the powdered cinchona bark ar treated with 55 grms. of chloroform, 5 grms. of a 10 pe cent. solution of caustic soda added, and the mixture shaken vigorously during three hours. 85 grms. of ethe are then added, and, after well shaking, 3 grms. of powdere gum tragacanth and so much water (10—20 grms.) that by vigorous agitation the powdered bark collects in lumps The ether-chloroform solution is decanted off, and shake with 2 grms of water, a drop of a 10 per cent. solution o caustic soda, and 3 grms. of powdered gum tragacanth 100 grms. of the clear liquid are filtered through a plug o cotton-wool into a separating funnel, 15 c.c. of N/1 hydrochloric acid and 5 c.c. of water added, the mixtur shaken vigorously for some minutes, the acid liquid filtere through a small wet filter, the ether-chloroform solutio washed three times with 10 c.c. of water each time, an the washings passed through the same filter, which i finally rinsed with water. The combined filtrate an washings are titrated with N/10 caustic soda with hæma toxylin as indicator.—A. S.

Indigo Analysis: Möhlau and Zimmermann's Method E. Grandmougin. Zeits. f. Farben- und Textil-Chem 1903, [14], 275—276.

The author criticises Möhlau and Zimmermann's metho (this Journal, 1903, 967), as being too complicated and so for technical application, using too small a sample to giv useful results, and also as sometimes giving low results, th red indigo isomerides, for which a correction is made, bein sometimes absent in synthetic products. The author poin out that for technical purposes, by far the most satisfacto valuation of the indigo is obtained by dyeings against standard. If it is desired to supplement these, the perma ganate method is recommended, as it is quickly and easi carried out and gives results which are concordant with th dyeing tests.—E. F.

XXIV.—SCIENTIFIC & TECHNICAL NOTES

Radium Bromide; The Oxidising Action of the Rays fr ——, as shown by the Decomposition of Iodofor W. B. Hardy and Miss E. G. Willcock. Proc. Roy. So 1903, **72**, [480], 200—204.

The liberation of iodine from solutions of iodoform found to require oxygen and some form of radia energy.

The authors find that a solution of iodoform in chlorofor is turned deep purple by resting the containing vessel on sheet of mica covering radium bromide. The radium ra necessary for the oxidation were identified by measuri the effect of various screens on the time required produce a standard tint in 1 c.c. of a standard solution iodoform in chloroform. When the α rays were screen by aluminium, mica, &c., no difference was noticed in t time. When lead plates were included, thus stopping β rays as well, the action was much diminished, but stopped. This shows that the β and γ rays are chemica active. Röntgen rays (said to be identical with γ radi rays) showed a strong action on iodoform.—T. F. H.

Water; Evaporation of ——, in a Current of E. P. Perman. Proc. Roy. Soc, 1903, **72**, [1 72—83.

The author's experiments were undertaken in order ascertain with what accuracy the vapour pressure of wa could be calculated from the amount of water vap carried off by a current of air passed through the wa, the temperature being maintained constant. The res obtained, which are set forth in a table, show that w air is aspirated through water, it becomes saturated w aqueous vapour with great rapidity; and in the satura air so obtained, the pressure of the aqueous vapour is same as the vapour pressure of water when no other is present. The density of the aqueous vapour in mixture is normal. The results also indicate that density of saturated aqueous vapour (without admixture only very slightly (if at all) above normal at temperatu up to 90° C.—A. S.

hemical Reactions at Extremely High Temperatures. C. Zenghelis. Zeits. f. Elektrochem., 1903, **9**, [34], 698.

. temperature of about 4,000° C. was obtained by ouring aluminium powder into highly-heated Hessian rucibles, and passing a rapid current of oxygen over the luminium, which burnt violently. Part of the alumina rmed, melted and evaporated. Stout platinum foil hich was thrown into the crucible, melted and volatilised. lagnesia and chalk likewise melted and evaporated, though they partly combined with the alumina to form uminates. A large part of the oxygen was transformed to ozone. At this temperature, aluminium combines rectly with nitrogen and carbon, and burns readily in ater vapour, carbon monoxide, carbon dioxide, nitrous ide, and nitric oxide.—L. F. G.

old; Precipitation of Crystalline ——, by Formaldehyde. N. Averkieff. Zeits. anorg. Chem., **35**, 329—335. Chem. Centr., 1903, **2**, [3], 188.

he author states that none of the reducing agents herto used separates gold in the crystalline condition, r, contrary to the statement of Rose, does oxalic acid. rystalline gold is, however, separated by formaldehyde, rtially in the cold, and completely from strong acid lution in the warm. The end of the reaction is indicated the solution becoming colourless; its limit of sensitiveness being 0·005 grm. of gold per litre. The method is plicable in presence of ferric and ferrous salts, copper, timony, mercury, zinc, lead, manganese, tin, arsenic, and etals of the first and second groups, provided the solution strongly acid. Metallic platinum is separated in a similar anner to gold, but the precipitation is much less rapid. e reaction is not quite so sensitive in the case of gold omide solutions. The gold crystals precipitated, are comations of cubes and octahedra, rhombic dodecahedra, &c., 0·2—0·3 mm. size and 19·431 sp. gr.—A. S.

smuth and Potassium; New Double Oxalate of ——. F. B. Allan and J. S. De Lury. J. Amer. Chem. Soc., 1903, **25**, [7], 728—729.

boiling bismuth oxalate with a 20 per cent. solution potassium oxalate, and cooling the filtered liquid, small ite crystals were deposited, the composition of which responded with the formula $Bi_2(C_2O_4)_3 . K_2C_2O_4 . 9\frac{1}{2}H_2O$. e same salt was also obtained when 21 and 23 per cent. utions of potassium oxalate were used, the amount of C_2O_4 group in the crystals being approximately 34·56 r cent. When, however, bismuth oxalate was boiled h a saturated solution of potassium oxalate, the deposit 50° C. contained 36·1 per cent. of the group C_2O_4, whilst the ordinary temperature the deposit contained 51·9 per it. In the authors' opinion these deposits were mixtures the new double salt and potassium oxalate.—C. A. M.

smuth and Ammonium; New Double Oxalate of —— F. B. Allen and T. A. Phillips. J. Amer. Chem. Soc., 903, **25**, [7], 729—730.

4 per cent. solution of ammonium oxalate boiled under reflux condenser for 30 minutes, yielded, on cooling filtered liquid, small white crystals, which, when dried der pressure between filter paper, had a composition responding with the formula—

$$Bi_2(C_2O_4)_3 . (NH_4)_2C_2O_4 . 8H_2O.$$

is salt dissolved readily in hydrochloric acid, and was hly soluble in solutions of ammonium oxalate. By g a solution of ammonium oxalate saturated at 25° C., he preparation of the salt, the deposit obtained at 50° C. the same as before, but by cooling the solution to the inary temperature, a mixture of crystals was obtained. se were identified as the new double salt and ammonium late, and in the author's opinion the salt prepared by chay and Lensson (Annalen, **105**, 245) was a similar xture.—C. A. M.

Arsenic in Birds' Eggs; Presence of ——. G. Bertrand. Bull. Soc. Chim., 1903, **29**, [15], 790.

The author maintains in opposition to the views of A. Gautier (Comptes rend., 1900, 289), that arsenic as well as carbon, sulphur, and phosphorus, is distributed throughout all the tissues, and not localised. He has found it in the shell, the shell-skin, the white and yolk of various eggs, and gives quantities.—R. G. G.

Arsenic in the Animal Organism; Existence of ——. A. Gautier. Comptes rend., 1903, **137**, [5], 295—301.

The author's determinations of the quantities of arsenic normally existing in animal organs have been submitted to rigid critical control. All the reagents used, and especially the sulphuretted hydrogen, were purified to the highest possible extent, and a large number of determinations of the quantity of arsenic introduced by these reagents, and of the quantity lost in the course of the determinations, showed that the gain and loss practically counterbalanced each other. It is conclusively proved that arsenic exists normally in the skin and its appendages, the brain, the thyroid and thymus glands of terrestrial animals, whilst if the other organs, muscles, and blood contain any arsenic, the quantity is so small as to be outside the limits of delicacy of the test. Such determinations constitute a far more definite proof of the non-accidental presence of arsenic in living tissues than determinations carried out on marine animals which live in a medium which is essentially arsenical.—J. F. B.

Arsenic in Sea Water, &c.; Corrections to Note on ——. A. Gautier. Comptes rend., 1903, **137**, [6], 374—375.

An error has crept into this paper (this Journal, 1903, 964), through confusion of milligrammes with thousandths of a milligramme. The tables of results should be as follows:—

Water of Atlantic Ocean (Azores).

Sounding.	Depth.	As per Litre.
	Metres.	Mgrm.
S. 1394	10	0·025
„	1335	0·010
S. 1427 (t = 2·7° C.).	5943 (6 or 8 from bottom).	0·080

Common Salt and Rock Salt.

Substance.	Origin.	As per 100 grms.
		Mgrm.
Common salt, fine white	Brittany coast	0·003
„	Olonne sands	0·001
Common salt, grey cooking	Olonne sands on Atlantic	sol. 0·035 insol. 0·010 } 0·045
Common salt, "English"	Bought at Potin's	0·015
Rock salt	Stassfurt (fine specimen).	0·0025
„	St. Nicholas salt-works, near Nancy	sol. 0·009 insol. 0·005 } 0·014
„	Salt Mountain of Djebel-Amour.	0·005
Common salt, fused at red heat	Unknown	0·030
Common salt	From fissure in Vesuvius.	0·175

—J. T. D.

New Books.

Chemistry, Inorganic and Organic, with Experiments. By Charles L. Bloxam. Ninth Edition. Rewritten and Revised by John Millar Thomson, LL.D., F.R.S., and Arthur G. Bloxam. J. and A. Churchill, 7, Great Marlborough Street, London. 1903. Price 18s. nett.

8vo volume containing preface, table of contents, table of atomic weights, and 825 pages of subject-matter, with 284 engravings, followed by the alphabetical index. The general plan of the work may be traced in the following abstract of contents:—INORGANIC CHEMISTRY: I. Non-metals. II. Metals. ORGANIC CHEMISTRY: III. Hydrocarbons. IV. Alcohols. V. Aldehydes. VI. Acids. VII. Ketones. VIII. Ethers. IX. Halogen Derivatives. X. Ethereal Salts. XI. Organo-mineral Compounds. XII. Ammonia Derivatives. XIII. Cyanogen Compounds. XIV. Phenols. XV. Quinones. XVI. Carbohydrates. XVII. Glucosides. XVIII. Albuminoid Compounds. XIX. Heteronucleal Compounds. XX. Physical Properties of Organic Compounds. APPLIED ORGANIC CHEMISTRY: XXI. Distillation of Coal. XXII. Dyeing and Calico Printing. XXIII. Tanning. XXIV. Oils and Fats. XXV. Soap and Candles. XXVI. Starch. Malting. XXVII. Brewing; Wines and Spirits. XXVIII. Bread. XXIX. Tea. Coffee. Cocoa. XXX. Animal Chemistry. XXXI. Chemistry of Vegetation. XXXII. Nutrition of Animals. XXXIII. Changes after Death.

ACETYLENE. The Principles of its Generation and Use. A Practical Handbook on the Production, Purification, and Subsequent Treatment of Acetylene for the Development of Light, Heat, and Power. By F. H. LEEDS and W. J. A. BUTTERFIELD, M.A. Chas. Griffin and Co., Ltd., Exeter Street, Strand, London. 1903. Price 5s. nett.

8vo volume containing prefatory note and 259 pages of subject-matter, with 11 illustrations and the alphabetical index. The plan of the work is as follows:—I. Cost and Advantages of Acetylene Lighting. II. Physics and Chemistry of the Reaction between Carbide and Water. III. General Principles of Acetylene Generation. IV. Selection of an Acetylene Generator. V. Treatment of Acetylene after Generation. VI. Chemical and Physical Properties of Acetylene. VII. Mains and Service Pipes—Subsidiary Apparatus. VIII. Combustion of Acetylene in Luminous Burners—Their Disposition. IX. Incandescent Burners, Heating Apparatus, and Motors. Carburetted Acetylene. X. Compressed and Dissolved Acetylene. Mixtures with other Gases, &c. XI. Portable Acetylene Lamps. XII. Valuation and Analysis of Carbide.

INTRODUCTION TO THE RARER ELEMENTS. By PHILIP E. BROWNING, Ph.D., Assistant Professor of Chemistry, Yale University. First Edition. John Wiley and Sons, New York. 1903. Price 6s. 6d. nett. Chapman and Hall, Ltd., London.

8vo volume containing preface, list of journals cited, indexes to the literature of certain elements, 155 pages of subject-matter, and the alphabetical index.

ANIMAL AND VEGETABLE FIXED OILS, FATS, BUTTERS, AND WAXES. Their Preparation and Properties, and the Manufacture therefrom of Candles, Soaps, and other Products. By C. R. ALDER WRIGHT, D.Sc., B.Sc., F.R.S. Second Edition. Edited and partly re-written by C. AINSWORTH MITCHELL, B.A., Oxon.

8vo volume containing prefaces respectively to the second and first editions of this work, table of contents, list of illustrations, 154 in number, and 785 pages of subject-matter, followed by the alphabetical index. The following are the leading subjects treated of:—I. General Composition and Nature of Oils, Butters, Fats, Waxes and Allied Substances. II. Physical Properties of Oils, Fats, Waxes, &c. III. Chemical Properties of Oils, Fats, Butters, and Waxes. IV. Processes used for Extracting, Rendering, Refining, and Bleaching Oils, Fats, &c. V. Classification and Uses of Fixed Oils, Fats, Waxes, &c.; Adulterations. VI. The Candle Industry. VII. The Soap and Glycerine Industry.

Trade Report.

I.—GENERAL.

SCIENTIFIC INSTRUMENTS: U.S. CUSTOMS DECISIONS.

July 27, 1903.

The Board of General Appraisers held that galvanometer and pyrometers, imported for institutions of learning, an not for sale, were free of duty under paragraph 638 of th present Tariff Act. The same conclusion was reached i another case on the same day covering fusible metal casting in the form of spoons (intended to melt in hot water t show the fusibility of alloys), thermostats and cryoscopi thermometers. On July 31st the Board held that co densers and Bunsen burners imported as above stated wer free of duty, but sustained the assessment of duty on blow pipes, stirring-rods of glass, funnels, spoons, and forceps.
—R. W. M.

IV.—COLOURING MATTERS, Etc.

INDIGO; TRADE IN ——, AT PORT SAID.

Foreign Office Annual Series, No. 3051.

The market price for indigo has fallen since last yea The quantity imported in 1902 was 718,176 kilos., valued 158,346*l*.E., as against 740,732 kilos., valued at 224,329*l*.E in 1901, a decrease in value of 65,983*l*.E.

Since the competition of German indigo, Madras indig has, since the year 1901, fallen to 30 and 35 per cent. in value. The Suez Customs have accordingly reduced its tari for the year June 20, 1902–1903, for Madras indigo, a it is valued at from 280 milliems (5*s*. 9*d*.) to 180 millien (3*s*. 8*d*.) the kilo. The customs tariff for Bengal indigo h also been greatly reduced, from 480 milliems (10*s*. 1*d*.) t 280 milliems (5*s*. 10½*d*.) the kilo.

SULPHIDE DYESTUFFS; THE CLASSIFICATION OF —— IN THE ITALIAN CUSTOMS TARIFF.

T. Diehl. Chem. Ind., 1903, **26**, [15], 377.

The author draws attention to and criticises the classific tion of sulphide dyestuffs, in the Italian customs tariff, class 80, as "Colours in flakes, powder, or other form instead of in class 78, as "Colours derived from coal tar o other bituminous substance." The result is that sulphi dyestuffs have to pay duty at the rate of 10 fr. per 1 kilos, whereas other coal-tar dyestuffs are duty free. Th reason for this classification was that the first sulphi dyestuff, "cachou de Laval," made by Croissant a Bretonnière by heating organic matter with sodium sulphid was classified in France with "Organic substances," whi included dyewoods, resins, tannin, cellulose, casein, & The Italian Government then classified it with the miner colours, its constitution being then unknown, and a lar amount of inorganic matter being used in its manufactur and, though subsequent research showed it to be a coal-t dyestuff, and many other sulphide dyestuffs, includi "Vidal black," derived from tar products, were introduce the cachou de Laval and all the other sulphide dyestu have remained classed among the mineral colours, spite of remonstrances from Cannizzaro and others. Th author points out the contradictory nature of this classi cation, inasmuch as methylene blue, methylene green, t Primuline dyestuffs, and many other sulphur-containi dyestuffs, are all classified as "colours derived from co tar," and their connection with that class has never be disputed.—T. F. B.

VII.—ACIDS, ALKALIS, Etc.

ALKALI, &c. WORKS BILL. [No. 325.]

Ordered by the House of Commons to be printed, August 12, 1903.

MEMORANDUM.

1. A Bill to amend the Alkali, &c. Works Regulati Act, 1881, passed the House of Lords, and was read

cond time in the House of Commons in 1901, but made further progress.

2. The present Bill has been prepared to effect the objects ught to be attained by the Bill of 1901, and to bring rtain other works within the operation of the Alkali cts. At the same time the opportunity has been taken to nsolidate the existing Acts.

3. It has been thought desirable to introduce the Bill in e present Session (1903), not with a view of passing it, it so that those interested may have an opportunity of nsidering the proposals contained in it during the recess.

4. The proposed alterations in the law are printed in the ill in italics.

Part I.

Alkali Works and Alkali Waste.

1. Every alkali work shall be carried on in such manner to secure the condensation, to the satisfaction of the ief inspector, derived from his own examination, or from at of some other inspector—

(*a*) Of the muriatic acid gas evolved in such work, to the extent of ninety-five per centum, and to such an extent that in each cubic foot of air, smoke, or chimney gases, escaping from the works into the atmosphere, there is not contained more than one-fifth part of a grain of muriatic acid.

(*b*) Of the acid gases of sulphur *or of sulphur* and nitrogen which are evolved in the *manufacture of* sulphuric acid in the work *by the process applied in sulphuric acid works as defined in paragraph* 1 *of the First Schedule to this Act*, to such an extent that the total acidity of those gases in each cubic foot of *residual gases after completion of the process, and before admixture with air, smoke, or other gases*, does not exceed what is equivalent to four grains of sulphuric anhydride.

The owner of any alkali work which is carried on in ntravention of this section shall be liable to a fine not ceeding, in the case of the first offence, fifty pounds, d in the case of every subsequent offence one hundred unds.

2. In addition to the condensation of acid gases as oresaid, the owner of every alkali work shall use the best acticable means for preventing the *escape* of noxious or fensive gas *by any exit flue of any process to which this ct applies, and which is carried on* in such work, *and for eventing the discharge of such gases into the atmosphere, hether directly or by a chimney or other outlet, and* for ndering such gases harmless and inoffensive when *and here* discharged, subject to the qualification that, on the sis of the amount of acid gas per cubic foot, no objection all be taken under this section by an inspector—

"(*a*) *To any muriatic acid gas in the air, smoke, or gases discharged into the atmosphere by a chimney or other outlet where the amount of such acid gas in each cubic foot of air, smoke, or gases so discharged does not exceed the amount limited by the last preceding section;*

"(*b*) *To any acid gases of sulphur, or of sulphur and nitrogen, in the residual gases escaping by the exit flue from any process for the concentration or distillation of sulphuric acid, where the total acidity of such acid gases in each cubic foot of residual gases so escaping, after completion of any such process and before admixture with air, smoke, or other gases, does not exceed the amount limited by the last preceding section.*

"(*c*) *To any acid gases in the air, smoke, or gases discharged into the atmosphere by a chimney or other outlet receiving the residual gases from any process which is carried on in any sulphuric acid Class II. works, as defined in paragraph* (7) *of the First Schedule to this Act, where the total acidity of such acid gases, including those from the combustion of coal in each cubic foot of air, smoke, or gases so discharged, does not exceed what is equivalent to one grain and a half of sulphuric anhydride.*"

If the owner of any alkali work fails, in the opinion of e court having cognisance of the matter, to use such means, he shall be liable to a fine not exceeding, in the case of the first offence, twenty pounds, and in the case of every subsequent offence, fifty pounds, with a further sum not exceeding five pounds for every day during which any such subsequent offence has continued.

3. Every work in which acid is produced or used shall be carried on in such manner that the acid shall not come in contact with alkali waste, or with drainage therefrom, so as to cause a nuisance.

The owner of any work which is carried on in contravention of this section shall be liable to a fine not exceeding, in the case of the first offence, fifty pounds, and in the case of every subsequent offence, one hundred pounds, with a further sum not exceeding five pounds for every day during which any such subsequent offence has continued.

On the request of the owner of any such work as is mentioned in this section the sanitary authority of the district in which such work is situate shall, at the expense of such owner, provide and maintain a drain or channel for carrying off the acid produced in such work into the sea or into any river or watercourse into which such acid can be carried without contravention of the Rivers Pollution Prevention Act, 1876, *as amended by any subsequent enactment*; and the sanitary authority shall for the purpose of providing any such drain or channel have the like powers as they have for providing sewers, whether within or without their district, under the Public Health Act.

Compensation shall be made to any person for any damage sustained by him by reason of the exercise by a sanitary authority of the powers conferred by this section, and such compensation shall be deemed part of the expenses to be paid by the owner making the request to the sanitary authority under this section.

In this section the expression "work" shall include an alkali work, a work specified in the First Schedule to this Act (hereinafter referred to as a scheduled work), or any other work in which acid is produced or used; and the expression "acid" shall include any metallic compound capable of liberating sulphuretted hydrogen from alkali waste or drainage therefrom.

4. Alkali waste shall not be deposited or discharged without the best practicable means being used for effectually preventing any nuisance arising therefrom.

Any person who causes or knowingly permits any alkali waste to be deposited or discharged in contravention of this section shall be liable to a fine not exceeding, in the case of the first offence, twenty pounds, and in the case of every subsequent offence, fifty pounds, with a further sum not exceeding five pounds for every day during which any subsequent offence has continued.

5. Where alkali waste has been deposited or discharged, either before or after the commencement of this Act, and complaint is made to the chief inspector that a nuisance is occasioned thereby, the chief inspector, if satisfied of the existence of the nuisance, and that it is within the power of the owner or occupier of the land to abate it, shall serve a notice on such owner or occupier requiring him to abate the nuisance; and if such owner or occupier fails to use the best practicable and reasonably available means for the abatement thereof he shall be liable to a fine not exceeding twenty pounds, and if he does not proceed to use such means within such time as shall be limited by the court inflicting such fine then he shall be liable to a further penalty of five pounds per day from the expiration of the time so limited.

Part II.

Sulphuric Acid, Muriatic Acid, and other specified Works.

6.—(1) Every sulphuric acid work as defined in *Paragraph* (1) *of* the First Schedule to this Act shall be carried on in such manner as to secure the condensation, to the satisfaction of the chief inspector, derived from his own examination or from that of some other inspector, of the acid gases of sulphur *or of sulphur* and nitrogen which are evolved in the process of the manufacture of sulphuric acid in that work, to such an extent that the total acidity of those gases in each cubic foot of *residual gases after completion of the process, and before admixture with* air, smoke, or other gases does not exceed what is equivalent to four grains of sulphuric anhydride.

(2) *Every muriatic acid work shall be carried on in such manner as to secure the condensation to the satisfaction of the chief inspector derived from his own examination, or from that of some other inspector, of the muriatic acid gas evolved in such work, to such extent that in each cubic foot of air, smoke, or chimney gases escaping from the work into the atmosphere there is contained no more than one-fifth part of a grain of muriatic acid.*

(3) The owner of any sulphuric acid work *or of any muriatic acid work* which is carried on in contravention of this section shall be liable to a fine not exceeding, in the case of the first offence, fifty pounds, and in the case of every subsequent offence, one hundred pounds.

7. The owner of any scheduled work shall use the best practicable means for preventing the *escape* of noxious or offensive gas *by any exit flue of any process to which this Act applies, and which is carried on in such work, and for preventing the discharge of such gases into the atmosphere, whether directly or by a chimney or other outlet,* and for rendering such gases harmless and inoffensive when *and where* discharged, subject to the qualification, that *on the basis of the amount of acid gas per cubic foot* no objection shall be taken under this section by an inspector :—

(a) *To any muriatic acid gas in the air, smoke, or gases discharged into the atmosphere by a chimney or other outlet, where the amount of such acid gas in each cubic foot of air, smoke, or gases so discharged does not exceed the amount limited by the last preceding section.*

(b) *To any acid gases of sulphur or of sulphur and nitrogen, in the residual gases escaping by the exit flue from any process for the concentration or distillation of sulphuric acid, where the total acidity of such acid gases in each cubic foot of residual gases so escaping, after completion of any such process and before admixture with air, smoke, or other gases,* does not exceed the amount limited by the last preceding section.

(c) *To any acid gases in the air, smoke, or gases discharged into the atmosphere by a chimney or other outlet receiving the residual gases from any process which is carried on in any sulphuric acid (Class II.) works as defined in paragraph (7) of the First Schedule to this Act, where the total acidity of such acid gases, including those from the combustion of coal in each cubic foot of air, smoke or gases so discharged, does not exceed what is equivalent to one grain and a half of sulphuric anhydride.*

If the owner of any such work fails, in the opinion of the court having cognizance of the matter, to use such means, he shall be liable to a fine not exceeding, in the case of the first offence, twenty pounds, and in the case of every subsequent offence, fifty pounds, with a further sum not exceeding five pounds for every day during which any such subsequent offence has continued.

8. An inspector may from time to time inquire whether, in any works in which aluminous deposits are treated for the purpose of making cement, hereinafter called cement works, *or in any works in which sulphide ores (including regulus) are calcined or smelted, hereinafter called smelting works,* means can be adopted at a reasonable expense for preventing the discharge from the furnaces or chimneys of such works into the atmosphere of *any noxious or offensive* gas evolved in such works, or for rendering such gas harmless or inoffensive when discharged.

Where it appears to the Local Government Board that such means can be adopted at a reasonable expense, the Board may from time to time by order require the owners of such works to adopt the best practical means for the purpose, and may by the order limit the amount or proportion, in the case of cement works *or smelting works,* of any noxious or offensive gas, which is to be permitted to escape from such works into the chimney or into the atmosphere, and may also by the order extend to such works such provisions of this Act relating to scheduled works as they think fit.

An order made under this section shall be provisional only, and shall not be of any validity until confirmed by Parliament, but when so confirmed shall have full effect, with such modifications as may be made therein by Parli ment ; and the expression "this Act" when used in th Act shall be deemed to include an order so confirmed, far as is consistent with the tenor of that order.

The Board shall take such steps as they may think for giving notice to persons interested of the provisions any order made by them under this section before any B for confirming the same is introduced into Parliament.

An order made under this section may impose fines f a breach of its provisions of like amount *and recoverable like manner* as any fines imposed by this Act for offenc against this Act.

9. Works in which salt is produced by refining rock sa other than those where the rock salt is dissolved at t place of deposit, shall not be *deemed to be salt works specified in paragraph* (8) *of the First Schedule to th Act, or to be scheduled works for the purposes of this Act*

The Local Government Board's Provisional Order Co firmation (Salt Works) Act, 1884, *shall be repealed, a the Provisional Order thereby confirmed shall cease to ha effect.*

PART III.

(i.) *Registration of Works.*

10.—(1) An alkali work or a work to which Part II. this Act applies shall not be carried on unless it is certifi to be registered.

(2) The work shall be registered in a register contai the prescribed particulars, and the register shall be co ducted and the certificates issued in the prescribed mann

(3) The owner of an alkali work or of a work requir to be registered shall in the month of January or Februa in every year apply for a certificate of registration in t prescribed manner, and on such application and complia with the conditions as to registration the certificate shall issued, and shall be in force for one year from the first d of April following the said application.

(4) The owner of an alkali work or of a work requi to be registered erected after the commencement of t Act shall before commencing any manufacture or pro in such work apply for such certificate in the prescrib manner, and on such application and compliance with conditions as to registration the certificate shall be issu as soon as may be, and shall be in force until the ne first day of April.

There shall be charged in respect of every such certi cate, in the case of an alkali work, the duty of five poun and in the case of a work required to be registered, being an alkali work, the duty of three pounds.

(5) Written notice of any change which occurs in t ownership of a work or in the other particulars stated the register shall within one month after such change sent by the owner to *the Local Government Board,* and t register and the certificate shall be altered accordingly the prescribed manner without charge and without the is of a new certificate. If such notice is not sent as required the work shall not be deemed to be certified to registered.

(6) The owner of a work which is carried on in cont vention of this section shall be deemed guilty of an offe against this Act, and shall be liable to a fine not exceed five pounds for every day during which it is so carried o

11. An alkali work or a work *required to be registe* erected after the commencement of this Act, or which been closed for a period of twelve months, shall not registered under this Act unless the work is furnished w such appliances as at the time of registration appear to chief inspector after his own examination, or that of inspector, or in case of difference to the *Local Governm Board,* to be necessary in order to enable the work to carried on in accordance with such requirements of this as for the time being apply to such work.

12. The duties charged in respect of a certificate registration under this Act shall be stamp duties under management of the Commissioners of Inland Revenue, all the Acts relating to stamp duties, particularly th relating to forgery, fraudulent dies, and other offences connection with stamp duties, shall apply accordingly ; for the purpose of the said duties the Commissioners Inland Revenue shall issue stamped forms of certificate.

(ii.) *Inspection.*

13. The Local Government Board may, with the approval of the Treasury as to numbers and salaries or remuneration, appoint such inspectors (under whatever title they from ime to time fix) as the Board think necessary for the execution of this Act, and may assign them their duties and award them their salaries or remuneration, and shall constitute a chief inspector, and may regulate the cases and manner in which the inspectors, or any of them, are to execute and perform the powers and duties of inspectors under this Act, and may remove such inspectors.

Notice of the appointment of every such inspector shall be published in the London Gazette, and a copy of the Gazette shall be evidence of the appointment.

The salaries or remuneration of the inspectors, and such expenses of the execution of this Act as the Treasury may sanction, shall be paid out of moneys provided by Parliament.

A person holding the office of chief inspector or inspector hall not be employed in any other work except by or with he sanction of the authority appointing him to such office.

14. A person who acts or practises as a land agent, or who is engaged or interested directly or indirectly in any work to which this Act, applies, or in any patent for any process or apparatus carried on or used in any such work, or in any process or apparatus connected with the condensation of acid gases, or with the treatment of alkali waste, or with preventing the discharge into the atmosphere or rendering harmless or inoffensive any noxious or offensive gas, or otherwise with any of the matters dealt with by this Act, or who is employed in or about or in connection with any work to which this Act applies, or in any other chemical work for gain, shall be disqualified to act as an inspector under this Act.

15. For the purpose of the execution of this Act, an nspector may at all reasonable times by day and night, without giving previous notice, but so as not to interrupt he process of the manufacture, enter and inspect any work o which, *in the opinion of the Local Government Board*, this Act applies, and examine any process causing the evolution of any noxious or offensive gas, and any apparatus for condensing any such gas, or otherwise preventing the discharge hereof into the atmosphere, or for rendering any such gas harmless or inoffensive when discharged, and may ascertain he quantity of gas discharged into the atmosphere, condensed or otherwise dealt with; and may enter and inspect any place where alkali waste is treated or deposited, or where any liquid containing acid is likely to come into ontact with alkali waste; and generally may inquire into all matters and processes which tend to show compliance or non-compliance with such of the provisions of this Act as are for the time being applicable to the work or place ntered, or which seem necessary or proper for the execution of his duties under this Act.

An inspector may, but so as not to interrupt the process of the manufacture, apply any tests and make any experiments he may think proper for the purpose of the execution of his duties under this Act.

In this section the expression "acid" shall include any metallic compound capable of liberating sulphuretted hydrogen from alkali waste or drainage therefrom.

16. The owner of any *such* work shall, on the demand of the chief inspector, furnish him within a reasonable time with a plan, to be kept secret, of those parts of such work o which any process causing the evolution of any noxious or offensive gas, or any process for the condensation of such gas or preventing the discharge thereof into the atmosphere, or for rendering any such gas harmless or inoffensive when discharged, is carried on.

The owner of every such work and his agents shall render o every inspector all necessary facilities for an entry, nspection, examination and testing in pursuance of this Act.

Every owner of a work in which such facilities are not fforded to an inspector as are required by this Act, or in which an inspector is obstructed in the execution of his uty under this Act, and every person wilfully obstructing n inspector in the execution of his duty under this Act, hall be deemed guilty of an offence against this Act, and shall be liable *on summary conviction* to a fine not exceeding ten pounds.

17. The chief inspector shall, on or before the first day of March in every year make a report in writing to the Local Government Board of the proceedings of himself and of the other inspectors under this Act, who shall furnish him with a detailed account of the number of inspections of works in their districts, and the recorded escapes of acid gases from such works during the preceding year, and a copy of such report shall be laid before both Houses of Parliament.

18. If any sanitary authority or authorities apply to the central authority for an additional inspector under this Act, and undertake to pay a proportion of his salary or remuneration, not being less than one half, out of any rate or rates leviable by such authority or authorities (which undertaking such authority or authorities are hereby authorised to give and to carry into effect), the Local Government Board may (if they see fit) from time to time, with the sanction of the Treasury, appoint an additional inspector under this Act, to reside within a convenient distance of the works he is required to inspect; and such inspector shall have the same powers and be subject to the same power of removal and the same regulations and liabilities as other inspectors under this Act.

The proportion of salary or remuneration aforesaid shall be paid at the prescribed time or times into His Majesty's Exchequer, and in the case of failure on the part of any sanitary authority to pay any sum payable by them in pursuance of this section, the same may be recovered by action in any court of competent jurisdiction.

(iii.) *Special Rules.*

19. The owner of an alkali work or of a scheduled work may, with the sanction of the central authority, make, and when made, alter, add to, and repeal special rules for the guidance of his workmen who are employed in any process causing the evolution of any noxious or offensive gas, or whose duty it is to attend to the apparatus used in the condensation of that gas, or for preventing the discharge thereof into the atmosphere, or for rendering any such gas harmless and inoffensive when discharged, and may annex fines to any violation of such rules, so that the fine for any offence do not exceed two pounds.

A printed copy of the special rules in force under this section in any work shall be given by the owner of that work to every person working or employed in or about that work who is affected thereby.

Any fine incurred under this Act in respect of an offence against a special rule may be recovered summarily.

(iv.) *Procedure.*

20. In calculating the proportion of acid to a cubic foot of air, smoke, or gases, for the purpose of this Act, such air, smoke, or gases, shall be calculated at the temperature of sixty degrees of Fahrenheit's thermometer, and at a barometric pressure of thirty inches.

21. The following regulations are hereby enacted with respect to the recovery of fines for offences other than offences against a special rule:—

Every such fine shall be recovered by action in the county court having jurisdiction in the district in which the offence is alleged to have been committed:

The action shall be brought, with the sanction of the central authority, by the chief inspector, or by such other inspector as the Local Government Board may in any particular case direct, within three months after the commission of the offence, and for the purposes of such action the fine shall be deemed to be a debt due to such inspector:

The plaintiff in any action for a fine under this Act shall be presumed to be an inspector authorised under this Act to bring the action, until the contrary is proved by the defendant:

The court may, on the application of either party, appoint a person to take down in writing the evidence of the witnesses, and may award to that person such remuneration as the court thinks just; and the amount so awarded shall be deemed to be costs in the action:

If either party in any action under this Act feels aggrieved by the decision of the court in point of law, or on the merits or in respect of the admission or rejection of any evidence, he may appeal from that decision to the High Court:

The appeal shall be in the form of a special case to be agreed on by both parties or their solicitors, and if they cannot agree, to be settled by the judge of the county court on the application of the parties or their solicitors:

The court of appeal may draw any inference from the facts stated in the case that a jury might draw from facts stated by witnesses:

Subject to the provisions of this section, all the enactments, rules, and orders relating to proceedings in actions in county courts, and to enforcing judgments in county courts, and appeals from decisions of the county court judges, and to the conditions of such appeals, and to the power of the High Court on such appeals, shall apply to an action for a fine under this Act, and to an appeal from such action, in the same manner as if such action and appeal related to a matter within the ordinary jurisdiction of the court:

In Scotland, the court of the sheriff or sheriff substitute of the county in which the offence is committed shall be the county court for the purposes of this Act, and may award costs to either party, and may sentence the offender to imprisonment for any period not exceeding six months, unless the fine and costs be previously paid; and any decision or sentence of such sheriff or sheriff substitute shall be subject to review and appeal according to law.

22. In any proceeding under this Act in relation to a fine for an offence other than an offence against a special rule—

(*a*) It shall be sufficient to allege that any work is a work to which this Act applies, without more; and

(*b*) It shall be sufficient to state the name of the registered or ostensible owner of the work, or the title of the firm by which the employer of persons in such work is usually known.

A person shall not be subject to a fine under this Act for more than one offence in respect to the same work or place in respect of any one day.

Not less than twenty-one days before the hearing of any proceedings against an owner to recover a fine under this Act for failing to secure the condensation of any gas to the satisfaction of the chief inspector, or for failing to use the best practicable means as required by this Act, an inspector shall serve on the owner proceeded against a notice in writing stating, as the case requires, either the facts on which such chief inspector founds his opinion, or the means which such owner has failed to use, and the means which, in the chief inspector's opinion, would suffice, and shall produce a copy of such notice before the court having cognisance of the matter.

A person shall not be liable under this Act to an increased fine in respect of a second offence, or in respect of a third or any subsequent offence, unless a fine has been recovered within the preceding twelve months against such person for the first offence, or for the second or other offence, as the case may be.

23. All fines recovered under this Act, except in respect of offences against a special rule, shall be paid into the receipt of His Majesty's Exchequer.

24. The owner of a work in which an offence under this Act other than an offence against a special rule has been proved to have been committed shall in every case be deemed to have committed the offence, and shall be liable to pay the fine, unless he proves to the satisfaction of the court before which any proceeding is instituted to recover such fine, that he has used due diligence to comply with and to enforce the execution of this Act, and that the offence in question was committed by some agent, servant, or workman, whom he shall charge by name as the actual offender, without his knowledge, consent, or connivance; in which case such agent, servant, or workman shall be liable to pay the fine, and proceedings may be taken against him for the recovery thereof and of the costs of all proceedings which may be taken either against himself o against the owner under this Act;

Provided that it shall be lawful for the inspector to pro ceed in the first instance against the person whom b believes to be the actual offender, without first proceedin against the owner, in any case in which it is made to appea to the satisfaction of such inspector that the owner has use all due diligence to comply with and to enforce the executio of this Act, and that the offence has been committed b the person whom he may charge therewith without th knowledge, consent, or connivance of the owner, and i contravention of his orders.

25. Any notice, summons, or other document under thi Act, may be in writing or print, or partly in writing an partly in print.

Any notice, summons, or document required or authorise for the purposes of this Act to be delivered to or served o or sent to the owner of any work, may be served b delivering the same to the owner, or at his residence o works; it may also be served or sent by post; and the sam shall be deemed to be properly addressed if addressed t the registered address of an owner, or, when required t be served on or sent to the owner of any works, if addresse to the owner of the works at the works, with the additio of the proper postal address, but without naming the perso who is the owner.

26. Where it appears to any sanitary authority, on th written representation of any of their officers, or of any te inhabitants of their district, that any work (either withi or without the district) to which this Act applies, is carrie on in contravention of this Act, or that any alkali waste i deposited (either within or without the district) in contra vention of this Act, and that a nuisance is occasioned b such contravention to any of the inhabitants of thei district, such authority may complain to the centra authority, who shall make such inquiry into the matter complained of, and after the inquiry may direct suc proceedings to be taken by an inspector as they think just.

The sanitary authority complaining shall, if so require by the central authority, pay the expense of any suc inquiry, and may pay the same out of the fund or rat applicable to the general expenses of such authority.

The expression "sanitary authority" in this sectio includes as regards the *administrative county of Londo* except the City of London, *the council of any metropolita borough*, and as regards the City of London shall mean th *Common Council* of the said city.

27. Where a nuisance arising from any noxious c offensive gas or gases is wholly or partially caused by th acts or defaults of several persons, any person injured b such nuisance may proceed against any one or more of suc persons, and may recover damages from each person mad a defendant in proportion to the extent of the contributio of that defendant to the nuisance, notwithstanding that th act or default of that defendant would not separately hav caused a nuisance. This section shall not apply to an defendant who can produce a certificate from the chie inspector that in the works of that defendant the requir ments of this Act have been complied with and wer complied with when the nuisance arose.

(v.) *Definitions; Saving; Repeals.*

28. In this Act, unless the context otherwise requires,—

The expression "alkali work" means every work f the manufacture of alkali, sulphate of soda, sulphate of potash, in which muriatic acid gas evolved, and for the purpose of this definition t formation of any sulphate in the treatment of copp ores by common salt or other chlorides shall deemed to be a manufacture of sulphate of soda.

The expression "noxious or offensive gas" *for t purposes of this Act includes any of the gas following, (that is to say):—*

Muriatic acid;

Sulphuric acid;

Sulphurous acid, except that arising from t combustion of coal;

Nitric acid and other oxides of nitrogen;

Sulphuretted hydrogen;

Chlorine, and its acid compounds ;
Fluorine compounds ;
Cyanogen compounds ;
Bisulphide of carbon ;
Chloride of sulphur ;
Fumes from cement works ;
Metallic fumes containing copper, lead, antimony, arsenic, zinc, or their compounds ;
Fumes from tar works.

The expression "owner" means the lessee, occupier, or any other person carrying on any work to which this Act applies.

The expression "*best practicable means" has reference not only to methods of manufacture, but also to the structural fitness and adequacy of all apparatus employed in any process.*

The expression "prescribed" means prescribed by the Local Government Board.

The expression "central authority" means as regards England the Local Government Board, as regards Ireland the Local Government Board for Ireland, and as regards Scotland the Secretary for Scotland.

The expression "sanitary authority" means any local authority entrusted with the execution of the Public Health Act.

The expression "the Public Health Act" means, as regards England, the Public Health Act, 1875, *or in the case of London the Public Health (London) Act*, 1891 ; and as regards Scotland, the *Public Health (Scotland) Act*, 1897 ; and as regards Ireland, the Public Health (Ireland) Act, 1878, *and includes any enactment amending those Acts.*

In the application of this Act to Scotland the expression "Local Government Board" means the Secretary for Scotland.

29. Nothing in this Act shall legalise any act or default at would, but for this Act, be deemed to be a nuisance, r otherwise be contrary to law, or deprive any person ot y remedy by action, indictment, or otherwise to which he ould have been entitled if this Act had not passed.

30. The Acts specified in the Second Schedule to this ct are hereby repealed to the extent mentioned in the ird column of that Schedule.

31.—(1) This Act may be cited as the Alkali, &c. Works egulation Act, 1903.

(2) It shall come into operation *on the first day of anuary nineteen hundred and four.*

SCHEDULES.

First Schedule.

List of Works.

(1) Sulphuric acid works, that is to say, any works (not ing alkali works within the meaning of this Act) *in which e manufacture of sulphuric acid is carried on by the lead amber process, namely, the process by which sulphurous id is converted into sulphuric acid by the agency of oxides nitrogen and by the use of a lead chamber.*

(2) Chemical manure works, that is to say, any works which the manufacture of chemical manure is carried on, *d any works in which any mineral phosphate is subjected treatment involving chemical change through the application or use of any acid.*

(3) Gas liquor works, that is to say, any works (*not ing sulphate of ammonia works or muriate of ammonia ks) in which ammoniacal liquor is used in any manucturing process, and any works in which ammoniacal uor is desulphurised by the application of heat, in any ocess connected with the purification of gas.*

(4) Nitric acid works, that is to say, any works in which e manufacture of nitric acid is carried on, *and any rks in which nitric acid is recovered from oxides of rogen.*

(5) Sulphate of ammonia works and muriate of ammonia rks, that is to say, any works in which the manufacture sulphate of ammonia or of muriate of ammonia is rried on.

(6) Chlorine works, *that is to say, any works in which orine is made or used in any manufacturing process.*

(7) *Sulphuric acid (Class II.) works, that is to say, any works in which the manufacture of sulphuric acid is carried on by any process other than the lead chamber process, and any works for the concentration or distillation of sulphuric acid.*

(8) *Muriatic acid works, that is to say—*

(*a*) *Muriatic acid works, or works (not being alkali works as defined in this Act) where muriatic acid is made :*

(*b*) *Fibre separation works, or works where muriatic acid gas is used for the separation of silk or woollen fibre from vegetable fibre :*

(*c*) *Tin plate flux works, or works in which any residue or flux from tin plate works is calcined for the utilization of such residue or flux : and*

(*d*) *Salt works, or works in which the extraction of salt from brine is carried on, and in which muriatic acid gas is evolved.*

(9) *Sulphide works, that is to say, works in which sulphuretted hydrogen is evolved by the decomposition of metallic sulphides, or in which sulphuretted hydrogen is used in the production of such sulphides.*

(10) Alkali waste works, that is to say, works *in which alkali waste or the drainage therefrom is subjected to any chemical process* for the recovery of sulphur or for *the utilization of* any constituent of such waste *or drainage.*

(11) Venetian red works, that is to say, works for the manufacture of Venetian red, crocus, or polishing powder, by heating sulphate or some other salt of iron.

(12) Lead deposit works, that is to say, *works in which* the sulphate of lead deposit from sulphuric acid chambers is *dried or* smelted.

(13) *Bisulphide of carbon works, that is to say, works for the manufacture of bisulphide of carbon.*

(14) *Sulphocyanide works, that is to say, works in which the manufacture of any sulphocyanide is carried on by the reaction of bisulphide of carbon upon ammonia or any of its compounds.*

(15) *Picric acid works, that is to say, works in which nitric acid or a nitrate is used in the manufacture of picric acid.*

(16) *Paraffin oil works, that is to say, works in which crude shale oil is refined.*

(17) *Bisulphite works, that is to say, works in which sulphurous acid is used in the manufacture of acid sulphites of the alkalis or alkaline earths.*

(18) Tar works, that is to say, works where gas tar *or coal tar* is distilled or is heated in any manufacturing process.

(19) Zinc works, *that is to say*, works in which *by the application of heat*, zinc is extracted from the ore, *or from any residue containing that metal.*

Second Schedule.

Repeals.

Session and Chapter.	Short Title.	Extent of Repeal.
44 & 45 Vict. c. 37.	The Alkali, &c. Works Regulation Act, 1881.	The whole Act.
47 & 48 Vict. c. clvii.	The Provisional Order Confirmation (Salt Works) Act, 1884.	The whole Act.
55 & 56 Vict. c. 30.	The Alkali, &c. Works Regulation Act, 1892.	The whole Act

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Arsenic in Barcelona.

Foreign Office Annual Series, No. 3053.

The smelting works at Badalona, in connection with the mines, have virtually doubled their output, exporting in the first six months of 1902 1200 tons of powdered white arsenic. In this department, a "Brown's" furnace has just been put up. There are two new reverberatory furnaces, and 15 tons of arsenic can be produced daily. Five new buildings, the erection of the furnaces for lead smelting, and a 20-ton Pilz furnace are practically finished; the works and plant for the extraction of gold and silver have been commenced, and it is expected that everything will be in full working order by the end of this year.

Pyrites in Lyons.

Foreign Office Annual Series, No. 3056.

The activity of the sulphuric acid industry may be gauged by the consumption of pyrites as shown in the following table :—

—	Quantity.		
	1900.	1901.	1902.
	Tons.	Tons.	Tons.
Production of the mines of St. Bel	304,000	307,000	315,000
Export	64,000	53,000	64,000
	240,000	254,000	251,000
Import of pyrites from Spain and Portugal	157,000	205,000	171,000
Consumption	397,000	459,000	422,000

Phosphorus in Lyons.

Foreign Office Annual Series, No. 3056.

The high price of coal has also not been without its effect on the phosphorus industry. The phosphorus works in the district have indeed all diminished their output. The export fell from 135 tons, in 1901, to 89½ tons, in 1902, for yellow phosphorus, and from 68½ to 48½ tons for red phosphorus.

Fluor Spar Production of the United States.

Eng. and Mining J., Aug. 15, 1903.

There was a very large increase in the production of fluorspar in 1902 over that of 1901, says Dr. Joseph Hyde Pratt, in his report to the United States Geological Survey, which was partly due to its increased use for metallurgical purposes. The production in 1902 was 48,018 short tons, valued at 271,814 dols. Of this production 43,310 short tons, valued at 224,814 dols., are reported to have been sold in the crude state. There was an increase in price of both the crude and the ground fluorspar, the average price for the crude being 5·19 dols. per ton, an increase of 19 cents, and for the ground the price averaged 9·98 dols., an increase of 76 cents over the 1901 price. Besides the above production, there were 3,520 tons of fluorspar mined, but not put on the market.

Lithium Minerals in 1902.

Eng. and Mining J., Aug. 15, 1903.

The United States Geological Survey has in the press the report on the production of lithium minerals in 1902, which amounted to 1,870 tons, valued at 38,750 dols. at the railroad. As far as can be ascertained, the greater part of the lithium minerals mined during 1902 has not been shipped. There is an increase in the demand for these minerals from foreign chemical manufacturers.

Over a third of the lithium salts used in the United States are imported, and in 1902 these imports amounted to 21,216 lb., valued at 22,951 dols., or a little over 1 dol. per pound.

Artificial Rubies: U.S. Customs Decision.

An importation of stones invoiced as reconstructed rubies was assessed for duty at 20 per cent. *ad valorem*, under section 6 of the present Tariff Act, as "manufactured articles unenumerated." The importers claimed them to be dutiable as "precious stones advanced in condition from their natural state" at 10 per cent. *ad valorem*, under paragraph 435.

The evidence showed that they were made by combining chromium oxide and alumina. They have the same degree of hardness, specific gravity, and colour as the genuine ruby, but only one-tenth the value. Under powerful lenses concentric lines are shown, which are absent in the genuine ruby. Being substantially similar to genuine rubies in material, texture, and use, the Board of General Appraisers (July 27, 1903) sustained the contention of the importers.

The Treasury Department, however, declined to concur i this decision, and make the rubies dutiable at 10 per cen *ad valorem* as "precious stones, cut but not set," unde paragraph 445 of the Tariff Act. An appeal has therefo been ordered on the ground that the rubies in question hav been advanced from their natural condition and diffe essentially from rubies in their natural state.—R. W. M.

VIII.—GLASS, POTTERY, AND ENAMELS.

Porcelain: Manufacture of ——, in Germany.

U.S. Cons. Rep., Aug. 7, 1903.

The manufacture of porcelain has taken deep root i different parts of Germany. This is especially the case i the kingdom of Saxony, wherein the cities of Meissen an Dresden produce porcelain that is exported to almost ever country in the world. Porcelain industries on a smalle scale are also to be found in Chemnitz, Plauen, and Aue. Th Waldenburg district in Silesia is also noted for its fine grad of porcelain. In Thuringia, Bavaria, as well as in som districts on the Saar and Rhine, porcelain is manufacture in considerable quantities.

One of the most noted porcelain factories in Germany i that which is operated by the Saxon Government Meissen. It exports about 50,000 dols. worth of porcelai goods to the United States every year. There are 7 workmen employed in the factory, and it is worthy of not that this number has remained about the same during th past 150 years. Girls earn, when skillful, about 75 cents day, and the skilled workmen who can model and pai earn 2·50 dols. a day.

According to Gothein's "*Deutsche Aussenhandel,*" i 1900 Germany exported 26,643 tons of white china war and painted porcelain goods to foreign countries, valued a 9,900,800 dols. The United States is far in advance of a other countries in buying china from Germany, importi 10,463 tons, or 20 per cent. of the total exports. Gre Britain holds second place, importing only 5,722 tons.

In 1900 Germany imported from France, Austria Hungary, and Japan 766 tons of porcelain ware, valued a 309,400 dols.

Etched Glassware: U.S. Customs Decision.

July 31, 1903.

Hæmocytometers and thermometers composed in chie value of glass and etched or engraved, were decided by th Board of General Appraisers to be dutiable, not at 60 pe cent. *ad valorem*, under paragraph 100 of the present Tari Act, as "articles of glass etched," but at 45 per cen *ad valorem*, as "manufactures of glass," under paragrap 112. The grounds of this decision was that the etchin did not amount to a decoration or ornament.—R. W. M.

IX.—BUILDING MATERIALS, Etc.

Asphalt and Cement in Barcelona.

Foreign Office Annual Series, No. 3053.

During the past year a most important industry, new t this country, has been started. The Compania General d Asfaltos y Portland has been formed, the object of whic is the working of an extensive mineral zone comprisin asphalt, cement, lignite coal, and petroleum. The forc will be supplied by an important waterfall in the Rive Zlobregat. It is estimated that, at the commencement, a output of 30,000 tons of Portland cement will be effect yearly, but the plant is constructed to produce 500 barre of the highest grade cement per day. The property i situated at Pobludc Lillet, in the extreme north of th principality of Catalonia, at the foot of the Pyrenees, a 35 kiloms. from the station of Ripoll, and a great deal money has had to be spent in constructing temporary road and bridges from the mines to the nearest railway statio later on it is hoped to establish the railway line right u to the mines. The lignite coal mines, which are situated a the foot of Mount Cattleras, show important veins of miner almost vertical, and of a thickness of about 80 cm. Sample of this coal were shown at an exhibition held here durin the year, and obtained the second prize.

X.—METALLURGY.

RARE METALS; PRODUCTION OF ——, IN THE UNITED STATES.

Eng. and Mining J., Aug. 15, 1903.

According to the report to the United States Geological ırvey for 1902, the production of crude tungsten ores ring 1902 amounted to 183·5 tons, of which not more an a few tons were sold. The larger part of the proiction was from Colorado, with a smaller amount from nnecticut. No new localities were developed during 02.

Almost the entire production of commercial molybdenite ıs by the Crown Point Mining Company, of Seattle, 'ash., from their property in the western part of Chelan unty. The production amounted to about 12 tons. The lue of the ores is very erratic, the prices quoted varying om 1,500 dols. to 100 dols. per ton.

There was a marked increase in the production of anium and vanadium minerals in 1902, which, as reported the Survey, amounted to 3,110 tons, valued at ,125 dols., or 12·63 per ton. This, of course, represents e crude ore. A portion of the uranium ore was treated, ving a concentrated product of 25 tons.

STEEL INDUSTRY; THE WORLD'S ——.

A. Carnegie. Iron and Steel Institute, Presidential Address (1903).

In 1894 the total steel production of the world was ,851,000 tons. In 1902 the United States alone proıced 15,000,000 tons; Germany, 6,394,000 tons (against 2,000 tons in 1874); and Great Britain, 4,909,000 tons ompared with 643,317 tons in 1874). The total producon of 1902 was 35,000,000 tons (in 1880 it was about 000,000 tons).

Pig Iron.—The production of 1902 was 41,000,000 tons; 1874 it was 14,000,000 tons. Last year, the chief conbutors to the output were the United States, with ,000,000 tons; Britain, with 8,500,000; and Germany, th 8,400,000 tons. In 1872 and 1873 the United States oduced less than 2,900,000 tons of pig; in 1874 Great itain produced 6,054,000 tons, and Germany 1,906,000 ns.—T. F. B.

IRON ALLOYS: U.S. CUSTOMS DECISION.

July 31, 1903.

Ferrochrome, ferrotungsten, ferromolybdenum, and ferronadium were assessed for duty at 20 per cent. *ad lorem*, as "metals unwrought," under paragraph 183 of e present Tariff Act. The importers claimed that all ere dutiable at 4 dols. per ton by similitude to ferroanganese, under paragraph 122. The evidence showed at they were made in the same manner as ferromanganese d are used to harden and toughen steel. Following a cision of the United States Circuit Court on ferrochrome, e Board of General Appraisers sustained the claim of e importers as above stated.—R. W. M.

BASIC SLAG; U.S. CUSTOMS DECISION.

July 31, 1903.

Duty was assessed on basic slag at one dol. per ton, ıder paragraph 121 of the present Tariff Act, the importers iming it to be free of duty, under paragraph 569, as "a bstance used only for manure," or under paragraph 639, "phosphates." As basic slag is provided for by name, e Board of General Appraisers, affirmed the assessment duty.—R. W. M.

XI.—ELECTRO-CHEMISTRY, Etc.

ELECTRIC ACCUMULATORS; MANUFACTURE OF ——.

The Secretary of State proposes to make regulations aling with the manufacture of Electric Accumulators, in cordance with the appended draft, copies of which may obtained on application to the Factory Department, ome Office, London, or at the local offices of the Inspectors Factories; any objections with respect to the draft regulations by or on behalf of any person affected thereby must be sent to the Secretary of State. Every such objection must be in writing and must state (*a*) the draft regulations, or portions of draft regulations objected to; (*b*) the specific grounds of objection; and (*c*) the omissions, additions, or modifications asked for.

It should be understood that the regulations will be in substitution for the Special Rules for Electrical Accumulator Works made under the Factory Act of 1891, and it will be observed that they are to come into force on the 1st of October next.

DRAFT REGULATIONS.

Whereas the manufacture of electric accumulators has been certified in pursuance of Section 79 of the Factory and Workshop Act, 1901, to be dangerous.

I hereby, in pursuance of the powers conferred on me by that Act, make the following regulations, and direct that they shall apply to all factories and workshops or parts thereof in which electrical accumulators are manufactured.

In these regulations "lead process" means pasting, casting, lead burning, or any work involving contact with dry compounds of lead.

Any approval given by the Chief Inspector of Factories in pursuance of these regulations shall be given in writing, and may at any time be revoked by notice in writing signed by him.

Duties of Occupier.

1. Every room in which casting, pasting or lead burning is carried on shall contain at least 500 cb. ft. of air space for each person employed therein, and in computing this air space, no height above 14 ft. shall be taken into account.

These rooms and that in which the plates are formed, shall be capable of through ventilation. They shall be provided with windows made to open.

2. Each of the following processes shall be carried on in such manner and under such conditions as to secure effectual separation from one another and from any other process:—

(*a*) Manipulation of dry compounds of lead;
(*b*) Pasting;
(*c*) Formation, and lead burning necessarily carried on therewith;
(*d*) Melting down of old plates;

Provided that manipulation of dry compounds of lead carried on as in Regulation 5 (*b*) need not be separated from pasting.

3. The floors of the rooms in which manipulation of dry compounds of lead or pasting is carried on shall be of cement or similar impervious material, and shall be kept constantly moist while work is being done.

The floors of these rooms shall be washed with a hose pipe daily.

4. Every melting pot shall be covered with a hood and shaft so arranged as to remove the fumes and hot air from the workrooms.

Lead ashes and old plates shall be kept in receptacles specially provided for the purpose.

5. Manipulation of dry compounds of lead in the mixing of the paste or other processes, shall not be done except (*a*) in an apparatus so closed, or so arranged with an exhaust draught, as to prevent the escape of dust into the workroom: or (*b*) at a bench provided with (1) efficient exhaust draught and air guide so arranged as to draw the dust away from the worker, and (2) a grating on which each receptacle of the compound of lead in use at the time shall stand.

6. The benches at which pasting is done shall be covered with sheet lead or other impervious material, and shall have raised edges.

7. No woman, young person, or child shall be employed in the manipulation of dry compounds of lead or in pasting.

8. (*a*) A duly qualified medical practitioner (in these regulations referred to as the "Appointed Surgeon") who may be the Certifying Surgeon, shall be appointed by the occupier, such appointment unless held by the Certifying Surgeon to be subject to the approval of the Chief Inspector of Factories.

(*b*) Every person employed in a lead process shall be examined once a month by the Appointed Surgeon, who shall have power to suspend from employment in any lead process.

(*c*) No person after such suspension shall be employed in a lead process without written sanction entered in the Health Register by the Appointed Surgeon. It shall be sufficient compliance with this regulation for a written certificate to be given by the Appointed Surgeon and attached to the Health Register, such certificate to be replaced by a proper entry in the Health Register at the Appointed Surgeon's next visit.

(*d*) A Health Register in a form approved by the Chief Inspector of Factories shall be kept, and shall contain a list of all persons employed in lead processes. The Appointed Surgeon will enter in the Health Register the dates and results of his examinations of the persons employed and particulars of any directions given by him. He shall on a prescribed form furnish to the Chief Inspector of Factories on the 1st day of January in each year a list of the persons suspended by him during the previous year, the cause and duration of such suspension, and the number of examinations made.

The Health Register shall be produced at any time when required by H.M. Inspectors of Factories or by the Certifying Surgeon or by the Appointed Surgeon.

9. Overalls shall be provided for all persons employed in manipulating dry compounds of lead or in pasting.

The overalls shall be washed or renewed once every week.

10. The occupier shall provide and maintain :—

(*a*) a cloakroom in which workers can deposit clothing put off during working hours. Separate and suitable arrangements shall be made for the storage of the overalls required in Regulation 9.

(*b*) a dining room unless the factory is closed during meal hours.

11. No person shall be allowed to introduce, keep, prepare or partake of any food, drink or tobacco, in any room in which a lead process is carried on. Suitable provision shall be made for the deposit of food brought by the workers.

This regulation shall not apply to any sanitary drink provided by the occupier and approved by the Appointed Surgeon.

12. The occupier shall provide and maintain for the use of the persons employed in lead processes a lavatory, with soap, nail brushes, towels, and at least one lavatory basin for every five such persons. Each such basin shall be provided with a waste pipe, or the basins shall be placed on a trough fitted with a waste pipe. There shall be a constant supply of hot and cold water laid on to each basin.

Or, in place of basins the occupier shall provide and maintain troughs of enamel or similar smooth impervious material, in good repair, of a total length of two feet for every five persons employed, fitted with waste pipes, and without plugs, with a sufficient supply of warm water constantly available.

The lavatory shall be kept thoroughly cleansed and shall be supplied with a sufficient quantity of clean towels once every day.

13. Before each meal and before the end of the day's work, at least ten minutes, in addition to the regular meal times, shall be allowed for washing to each person who has been employed in the manipulation of dry compounds of lead or in pasting.

Provided that if the lavatory accommodation specially reserved for such persons exceeds that required by Regulation 12, the time allowance may be proportionately reduced, and that if there be one basin or two feet of trough for each such person this regulation shall not apply.

14. Sufficient bath accommodation shall be provided for all persons engaged in the manipulation of dry compounds of lead or in pasting, with hot and cold water laid on, and a sufficient supply of soap and towels.

This rule shall not apply if, in consideration of the special circumstances of any particular case, the Chief Inspector of Factories approves the use of local public baths when conveniently near, under the conditions (if any) named in such approval.

15. The floors and benches of each workroom shall be thoroughly cleansed daily, at a time when no other work is being carried on in the room.

Duties of Persons Employed.

16. All persons employed in lead processes shall present themselves at the appointed times for examination by the appointed surgeon as provided in Regulation 8.

No person after suspension shall work in a lead process in any factory or workshop in which electric accumulators are manufactured, without written sanction entered in the health register by the Appointed Surgeon.

17. Every person employed in the manipulation of dry compounds of lead or in pasting shall wear the overalls provided under Regulation 9. The overalls, when not being worn, and clothing put off during working hours, shall be deposited in the places provided under Regulation 10.

18. No person shall introduce, keep, prepare, or partake of any food, drink (other than any sanitary drink provided by the occupier and approved by the Appointed Surgeon), or tobacco in any room in which a lead process is carried on.

19. No person employed in a lead process shall leave the premises or partake of meals without previously and carefully cleaning and washing the hands.

20. Every person employed in the manipulation of dry compounds of lead or in pasting shall take a bath at least once a week.

21. No person shall in any way interfere, without the concurrence of the occupier or manager, with the means and appliances provided for the removal of the dust or fumes, and for the carrying out of these regulations.

These regulations shall come into force on the 1st day of October, 1903.

XII.—FATS, FATTY OILS, Etc.

Soap in Marseilles.

Foreign Office Annual Series, No. 3047.

The price of oil having kept constantly high during 1902, the soapmakers' profits did not compensate for the losses of 1901, but the average of sales having been considerably higher than that of the preceding year, the final result has been a fair profit; and the large firms, especially those whose working expenses are minimised by their large output, have had a fairly normal year.

The present outlook is, however, most satisfactory for the Marseilles soapmakers. The constantly low prices of oils during the first five months of 1903, and the small stock in the hands of the manufacturers, have enabled the latter to buy sufficient for their present requirements with a good margin of profit.

Candles and Soap in Lyons.

Foreign Office Annual Series, No. 3056.

The consumption of candles has again decreased by 396 tons in 1902. Raw material for candle making underwent a considerable rise in price. As regards soaps, those most generally employed for commercial uses are soap made from olive pulp and olive oil, costing 90 frs. per 100 kilos.; soap made out of common pulp used in boiling silk either in skein or after weaving, 48 frs. per 100 kilos.; soap made out of "oleine," for bleaching silk before dyeing, 45 frs. per 100 kilos., for this article there is a large demand; soap for cloth finishing composed of resin, carbonate of soda and "oleine," 100 frs. per 100 kilos.

Almond Oil.

U.S. Customs Decision.

Oil expressed from peach and apricot kernels, and known commercially as almond oil, was decided by the Board of General Appraisers, July 27, 1903, to be free of duty as "almond oil" under paragraph 626 of the Tariff Act. Duty had been assessed at 25 per cent. *ad valorem* as an "expressed oil" under paragraph 3, on the ground that the oil was not obtained from almonds, but from other material.—R. W. M.

XIII. A.—PIGMENTS, PAINTS, Etc.

Mineral Paints in the United States.

Chem. Trade J., Aug. 29, 1903.

According to the report of the United States Geological urvey, the aggregate production of mineral paints in 1902 mounted to 128,979 short tons, valued at 5,266,831 dols., s compared with 107,960 short tons, valued at 4,509,962 ols., in 1901. The percentage of increase was most pparent in the production of soapstone, which increased om 50 tons, valued at 350 dols., in 1901, to 1,100 tons, alued at 2,200 dols., in 1902.

The greatest increase in quantity was in the production f zinc white, which amounted to 56,730 short tons, valued 4,323,299 dols., in 1902, as compared with 46,500 short ns, valued at 3,720,000 dols., in 1901.

The production of metallic paint during 1902 was 18,220 ort tons, valued at 312,590 dols., as compared with 15,915 ort tons, valued at 204,937 dols. in 1901. The produc- on of mortar colours showed a decrease during 1902, the spective figures being 8,355 short tons, valued at 8,729 dols., for 1902, and 9,346 short tons, valued at 12,943 dols., for 1901.

The production of ochre, which showed a decrease, in 901, as compared with 1900, was practically the same for 902, being 16,565 short tons, valued at 145,708 dols., as ompared with 16,711 short tons, valued at 177,799 dols., 1901.

The output of Venetian red increased from 9,201 short ns, valued at 153,467 dols., in 1901, to 11,758 short tons, alued at 196,905 dols., in 1902.

In considering the variations between product and value er ton, allowance must be made for the comparatively ide range in the qualities of the materials, and for the ct that a larger production of a higher or lower priced rticle will effect a comparatively larger or smaller increase the value, as the case may be, so that the rise or fall own in the average price may be apparent only. Zinc hite and Venetian red are practically uniform in quality, ut this does not hold true with the other pigments. It is ident that the decline in value of metallic paint to 0·67 dols. per short ton in 1899, notwithstanding an creased tonnage, was due to the displacement in the arket of some higher priced paint by a cheaper article. 1900, however, the price rose to 11·27 dols., in 1901 to 2·87 dols., and in 1902 to 17·16 dols. per short ton.

The production of mineral paints during 1901 and 1902 short tons is shown in the following table :—

—	1901.		1902.	
	Quantity.	Value.	Quantity.	Value.
		Dols.		Dols.
chre	16,711	177,799	16,565	145,708
mber	759	11,326	480	11,230
enna	305	9,304	189	4,316
etallic paint	15,915	204,937	18,220	312,590
ortar colour	9,346	112,943	8,355	98,729
enetian red	9,201	153,467	11,758	196,905
inc white	46,500	3,720,000	56,730	4,323,299
apstone	50	350	1,100	2,200
late	4,865	41,211	4,071	39,401
ther colours	5,308	78,625	11,511	432,453
Totals	107,960	4,509,962	128,979	5,266,831

Lithopone: U.S. Customs Decision.

Following decisions both of the Circuit Court and the ircuit Court of Appeals, the Board of General Appraisers ug. 6, 1903, decided that the pigment known as lithopone' onsisting of 70 per cent. of barytes and 30 per cent. of inc sulphide, is dutiable at 1¼ cents per pound, under aragraph 57 of the present Tariff Act, as "sulphide of inc, white." The claim of the importers that it was utiable at 1 cent per pound, under the same paragraph, as white paint or pigment, containing zinc but not containing ad," was overruled.—R. W. M.

XIV.—TANNING; LEATHER; GLUE, Etc.

Gelatin in Sheets; Coloured ——. U.S. Customs Decision.

Gelatin sheets of different colours were assessed for duty at 15 cents per pound and 20 per cent. *ad valorem*, under paragraph 23 of the present Tariff Act. The importers claimed them to be dutiable either at 20 per cent. *ad valorem*, under section 6, as "manufactured articles unenumerated," or at 35 per cent. *ad valorem*, under paragraph 450, as "manufactures of gelatin." Following previous decisions, the Board of General Appraisers affirmed the assessment of duty August 1st.—R. W. M.

XV.—MANURES, Etc.

Manures in Lyons.

Foreign Office Annual Series, No. 3056.

The chemical manure industry was brisker in 1902. The crisis in the production of wine, both in the South of France and round Lyons, contributed in a large degree to the falling off that was observable in this industry. There has been, however, a steady demand for manure, and this has caused a rise in prices and a more active export. The export of superphosphate of lime rose from 95,000 tons, in 1901, to 130,000 tons, in 1902, whilst the import remained stationary.

Chemical manures show an export of 109,000 tons in 1902, as against 94,000 tons in 1901. Bone manure, which is an important branch of Lyons trade, shows a marked improvement.

XVI.—SUGAR, STARCH, Etc.

Beet Sugar Production of Washington, Idaho, and Oregon in 1902.

Foreign Office Annual Series, No. 3060.

The following are the statistics:—

—	Area Planted.	Beets Harvested.	Sugar Manufactured.	Average.	
				Sugar.	Purity.
	Acres.	Tons.	Lb.	Per Cent.	Per Cent.
La Grande	2,700	17,590	4,535,300	16·4	85·7
Waverley	2,000	14,600	3,676,600	16⅓	86·0
Total	4,700	32,190	8,211,900	..	..
„ 1901	3,952	24,719	5,851,000	..	..
„ 1900	..	..	8,121,506	..	..

There is no bounty on sugar in Oregon. Washington grants a bounty of ½*d*. per lb., and Idaho has passed an Act granting a bounty of ½*d*. per lb. for sugar manufactured within the State during 1903, and ¼*d*. per lb. for 1904. Average selling price, 2½*d*. per lb.

Sugar Imports into the United States.

The importations of sugar into the United States during the fiscal year ending June 30, 1903, were 5,217,077,034 pounds, exceeding those of any previous year. In 1897 the next greatest amount was imported, 4,918,905,733 pounds. Of the quantity imported in 1903, 87,000,000 pounds were beet sugar, and the balance cane. In addition to this, the domestic production was 600,000,000 pounds.

Included in the total are 226,143,508 pounds from Porto Rico, valued at 7,466,579 dols., and 771,825,420 pounds from Hawaii, valued at 25,310,684 dols. The foreign market value of the sugar imports has steadily fallen as follows:—1884, 3·6 cents; 1894, 2·9; 1901, 2·3; 1902, 1·82; 1903, 1·71.

Recent reports from Louisiana show a slight falling off in sugar production from last year, the figures being:—1902, 290,000 long tons; 1903, 275,000 long tons.

—R. W. M.

XVIII. C.—DISINFECTANTS.

SHEEP DIP.

U.S. Customs Decision Aug. 6, 1903.

The Board of General Appraisers held that a preparation of tar oils, phenols and soap, and not containing arsenic in any form, is dutiable at 20 per cent. *ad valorem*, as a "preparation of coal-tar, not a colour or dye, and not medicinal," under paragraph 15 of the present Tariff Act.
—R. W. M.

XX.—FINE CHEMICALS, Etc.

CAMPHOR IN FORMOSA.

Foreign Office Annual Series, No. 3054.

The value of camphor exported in 1902 was 387,349*l.*, as against 245,195*l.* in 1901, or a rise of nearly 58 per cent. on the total of the preceding year. In addition to this, camphor oil to the amount of 95,993*l.* was sent to Japan, being, however, 42,115*l.* less in value than the export of the same product in 1901.

The contract for the sale of camphor under the monopoly expired on March 24, 1903, but has been renewed for a further term of three years.

CAMPHOR FOREST IN FORMOSA.

U.S. Cons. Rep., Aug. 10, 1903.

A camphor forest of 50,000 acres, containing fully 120,000 trees, has been found on the island of Formosa.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 18,292. McKnight. Apparatus for condensing fumes formed in volatilisation processes. (U.S. Appl., Jun. 5, 1903.)* Aug. 24.

,, 18,569. Fidler. Removing sludge and the like from settling and similar tanks. Aug. 28.

,, 18,570. Fidler. Settling or precipitating tanks. Aug. 28.

[C.S.] 18,579 (1902). Müller. Process of and apparatus for fractional distillation. Sept. 2.

,, 20,002 (1902). Chapman. Apparatus for the evaporation of liquors. Aug. 26.

,, 20,574 (1902). Higginbottom and Lennox. Drying of wet or humid materials and means employed therein. Aug. 26.

,, 6694 (1903). Peterson. Centrifugal extracting machines. Aug. 26.

,, 14,970 (1903). Elster. Filters. Sept. 2.

,, 16,127 (1903). Thompson (Merrill). Manufacture of briquettes. Sept. 2.

II.—FUEL, GAS, AND LIGHT.

[A.] 17,969. Atterbury. Manufacture of inflammable liquids. Aug. 19.

,, 18,135. Fürstenau. Mixture for the abolition of the injurious product sulphur in the manufacture and ultimate using of foundry coke and other fuels. Aug. 22.

[A.] 18,169. Boulier. Manufacture of mantles f incandescent gas lighting. Fr. Appl., Aug. 2 1902.* Aug. 22.

,, 18,361. Hill. Manufacture of incandescent gas o like mantles. Aug. 25.

,, 18,526. Langford. Furnaces.* Aug. 27.

[C.S.] 21,861 (1902). Worsnop. Mantles for incan descent gas lighting. Sept. 2.

,, 22,092 (1902). Tully. Apparatus for manufac turing gas suitable for heating or illuminatin purposes. Sept. 2.

,, 22,767 (1902). Smith and Mollart. Solution fo strengthening mantles used in incandescent ga lighting. Aug. 26.

,, 23,544 (1902). Coppée. Coke ovens. Aug. 26.

,, 11,750 (1903). Holmes (Guldlin). Purifying coa gas so as to prevent loss of illumination durin the operation. Aug. 26.

,, 12,506 (1903). Soc. Franc. Constructions Méca niques. Gas producers. Sept. 2.

,, 15,696 (1903). Thompson (Eisenmann and Bendix) Solution for toughening incandescent mantles Aug. 26.

,, 16,164 (1903). Duff. Gas producers. Sept. 2.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 17,973. Aminoff. Dry distillation of organic sub stances. Aug. 19.

[C.S.] 20,369 (1902). Standfast. Saturators for manufac turing sulphate of ammonia. Aug. 26.

,, 21,548 (1902). Wetter (Rutgerswerke Act.-Ges. Process for deodorising tar and mineral oils Sept. 2.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 17,768. Johnson (Badische Anilin und Soda Fabrik) Manufacture of colouring matters of the acridin series. Aug. 17.

,, 17,792. Ransford (Cassella and Co.). Manufac ture of a new acetdiamidophenolsulpho acid an colouring matters therefrom. Aug. 17.

,, 17,805. Meyenberg and The Clayton Aniline Co. Ltd. Manufacture of sulphur dyestuffs. Aug. 17

,, 17,965. Newton (Bayer and Co.). Manufacture o new derivatives of the anthracene series. Aug. 19

,, 17,982. Johnson (Badische Anilin und Soda Fabrik) Oxidation of methyl groups of aromatic hydro carbons. Aug. 19.

,, 18,131. Imray (Meister, Lucius und Brüning) Manufacture of indoxyl and its homologues Aug. 21.

,, 18,283. Imray (Meister, Lucius und Brüning) Manufacture of a tetrazophenol sulphonic aci and of disazo dyestuffs therefrom. Aug. 21.

[C.S.] 18,255 (1902). Lake (Chem. Works vorm. Sandoz) Manufacture of sulpho acids of aromatic alde hydes, and of colouring matters therefrom Aug. 26.

,, 22,078 (1902). Read Holiday and Sons, Ltd Turner, Dean, and Turner. Manufacture o yellow-to-orange nitro colouring matters. Aug. 26

,, 24,427 (1902). Newton (Bayer). Manufacture o new derivatives of the anthracene series. Aug. 26

,, 25,024 (1902). Newton (Bayer). Manufacture o anthracene derivatives. Aug. 26.

,, 14,113 (1903). Imray (Soc. Chem. Industry i Basle). Manufacture of monazo dyestuffs Aug. 26.]

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 17,857. Lichtenstadt. Machines for treating fabrics to render them waterproof.* Aug. 18.

„ 17,921. Colburn. Apparatus for use in dyeing or otherwise treating fibrous substances. Aug. 19.

„ 17,939. Birtwisle. Means and process for bleaching. Aug. 19.

„ 18,611. Hoffmann. Dye vats. Aug. 28.

„ 18,675. Cadgène. Process for printing textile fabrics. Aug. 29.

[C.S.] 18,861 (1902). Evans (Bechmann). Multicolour printing machines. Sept. 2.

„ 27,258 (1902). Brandenberger. Production on fabrics of coloured effects. Sept. 2.

„ 9017 (1903). Cochius. Apparatus for manufacturing artificial threads. Aug. 26.

„ 15,207 (1903). Hussong. Apparatus for dyeing yarns. Aug. 26.

I.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 17,808. Brenner. Process of preparing wood for taking colouring matter.* Aug. 17.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 17,794. Leroyer. Manufacture of oxides of sulphur, alkali oxides, and alkaline earth oxides. Aug. 17.

„ 17,869. Ashcroft. *See under* XI.

„ 17,962. Robson. Apparatus for vaporising and condensing ammonia. Aug. 19.

„ 17,981. Johnson (Badische Anilin und Soda Fabr.). Manufacture and production of a sulphate of a higher oxide of manganese. Aug. 19.

„ 18,594. Newton (Bayer & Co.). Manufacture of nitrous anhydride and nitrites. Aug. 28.

C.S.] 20,511 (1902). Sanders. Substitute for black lead or graphite. Sept. 2.

„ 25,242 (1902). Johnson (Badische Anilin und Soda Fabr.). Manufacture of alkalis, metal oxides, or mixtures thereof, with other alkali oxides and alkali earth oxides. Sept. 2.

„ 9024 (1903). Doremus. Production of anhydrous alumina. Sept. 2.

„ 9453 (1903). Hilbert. Manufacture of sulphuric acid. Aug. 26.

„ 14,112 (1903). De Wilde. Manufacture of carbon dioxide and precipitated calcium sulphate from poor phosphates. Sept. 2.

„ 14,342 (1903). Askenasy and Mugdan. Producing and separating hydrochloric and sulphuric acids. Sept. 2.

X.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

A.] 17,812. Klefisch (Kleſsch). Manufacture of bricks from slate waste and lime.* Aug. 17.

„ 18,064. Williams. Manufacture of cement for use in repairing retorts, &c. Aug. 21.

„ 18,087—18,092. Ferrell. Fireproofing compounds and the art of making the same. Aug. 21.

„ 18,623. Canaris. Production of cement from blast furnace slag.* Aug. 29.

C.S.] 20,841 (1902). Ibotson and Meldrum. Manufacture of asbestos millboards, slates, plates, or tiles. Sept. 2.

„ 22,734 (1902). Bamber. Manufacture of Portland cement, and apparatus therefor. Aug. 26.

[C.S.] 22,805 (1902). Heise. Impregnation of wood. Aug. 26.

„ 23,061 (1902). Lonsdale. Compositions for covering steam boilers and pipes. Sept. 2.

„ 6848 (1903). Haddan (Crozier). Glazed bricks. Sept. 2.

X.—METALLURGY.

[A.] 17,781. Fischer and Ettinghausen. Elimination of sulphur from refractory gold ores. Aug. 17.

„ 17,870. Sulman and Kirkpatrick-Picard. Concentration of minerals from ores. Aug. 18.

„ 18,454. Prince and Rodgers. Process of uniting metals.* Aug. 27.

„ 18,480. The Compound Metals Co., Ltd. (Wachwitz). The welding of metals.* Aug. 27.

„ 18,589. Cattermole. Separation of the metallic constituents of ores from gangue.* Aug. 28.

„ 18,679. Sanders and Hopkins. Process of obtaining zinc by distillation. Aug. 29.

[C.S.] 21,880 (1902). Rouse. Method of consolidating iron sand into lumps for reduction in furnaces. Aug. 26.

„ 22,812 (1902). Starkey. Metal melting pots or crucibles. Aug. 26.

„ 26,089 (1902). François. Reduction of blast furnace slag and similar materials. Aug. 26.

„ 26,090 (1902). Contardo. Treatment of metallic sulphides in the electric furnace. Sept. 2.

„ 2086 (1903). Schwahn. Producing aluminium. Sept. 2.

„ 4806 (1903). Stanton. Process of treating ores. Sept. 2.

„ 6811 (1903). Campbell. Treatment of ores. Aug. 26.

„ 14,564 (1903). Boss. Metallurgical furnaces. Aug. 26.

„ 16,377 (1903). Brandenburg and Weyland. Extraction of tin from the dross, slag, and waste thereof. Sept. 2.

„ 16,453 (1903). Rübel. Alloys. Sept. 2.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 17,869. Ashcroft. Production of alkalis and chlorine by electrolysis. Aug. 18.

„ 18,010. Fiedler and Gerard. Galvanic batteries. Aug. 20.

„ 18,331. Hunt and others. *See under* XVIII. A.

„ 18,485. Wade (Rodman). Secondary or storage batteries. Aug. 27.

[C.S.] 23,426 (1902). Garcin. Electric accumulators. Aug. 26.

„ 12,194 (1903). Müller. Apparatus for producing electrolytic deposits. Sept. 2.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 18,169. Sherman. Conversion of used fats, tallows, greases, oils, &c., into an edible product. Aug. 22.

„ 18,247. Giraudet and Neuberger. Manufacture of soap and other preparations for toilet purposes. Aug. 24.

[C.S.] 15,619 (1902). Barker. Manufacture of soap stock or soap. Aug. 26.

„ 23,896 (1902). Erfurt. Emulsifying resin soap in water.

„ 14,461 (1903). Schilling and Kremer. Apparatus for the recovery of fats, and the like. Sept. 2.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

A.—*Pigments, Paints.*

[A.] 17,784. Armbruster and Morton. Processes for making pigments.* Aug. 17.

„ 17,785. Armbruster and Morton. Composition of matter to be used for pigments.* Aug. 17.

„ 17,895. Malgac. Preparations of zinc for use as paint. Aug. 18.

„ 17,956. Fischer. Manufacture of lithopone.* Aug. 19.

„ 18,053. Gillon. Vehicle for paint. Aug. 21.

[C.S.] 22,427 (1902). Gill. Emulsion for softening paints, varnishes, &c., prior to their removal from woodwork, &c. Aug. 26.

B.—*Resins, Varnishes.*

[A.] 17,780. Thompson (Bremer Linoleumwerke Delmenhorst). Manufacture of linoleum of multiple layers. Aug. 17.

„ 17,971. Seeser. Manufacture of linoleum. Aug. 19.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 17,817. Glasel. Tanning machines.* Aug. 17.

„ 18,463. Kemp-Welch. Manufacture of size and other adhesive materials. Aug. 27.

„ 18,677. Muir. Treatment of skins or hides previous to and during tanning. Aug. 29.

XV.—MANURES.

[A.] 18,423. Morris, Jenner, and Wakeley Bros. & Co., Ltd. Manufacture of manure. Aug. 26.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 18,044. Krivanek. Manufacture of sugar. Aug. 20.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 17,975. Sleeman. Treatment of grain for the production of malt. Aug. 19.

„ 18,443. Ramsden. Preparing barley for brewing. Aug. 27.

[C.S.] 20,365 (1902). Wreede and Offerson. Removing bitterness from, regenerating and imparting an aroma to brewers' yeast for converting it into baking yeast. Aug. 26.

„ 21,481 (1902). Robinson. Means for preserving beer and other beverages, and for facilitating the drawing off of such liquids from casks, &c. Sept. 2.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—*Foods.*

[A.] 18,169. Sherman. *See under* XII.

„ 18,334. Hunt, Aston, Rose, and Howard. The electrical treatment of milk for the separation of cream. Aug. 25.

„ 18,428. Boult (Rücker and Pickée). Preservatives and the method of applying the same to foodstuffs, &c. Aug. 26.

[C.S.] 14,006 (1903). Alsop. Treatment of flour to purify it and increase its nutritive qualities. Aug. 26.

B.—*Sanitation; Water Purification.*

[A.] 18,394. Court. Apparatus for disinfecting sewers and extracting and destroying sewer gas from the same. Aug. 26.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 18,030. Farwell. Paper-making machines. (U.S. Appl., Aug. 20, 1902.)* Aug. 20.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 18,245. Newton (Bayer and Co.). Manufacture of a pharmaceutical compound. Aug. 24.

„ 18,246. Newton (Bayer and Co.). Manufacture of pyrimidine derivatives. Aug. 24.

„ 18,279. Ellis (Chem. Fabr. Heyden A.-G.). Manufacture of a new chemical body. Aug. 24.

[C.S.] 21,904 (1902). Dunbar. New serum and its preparation. Sept. 2.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 18,057. Wheeler. Photographic and process printing. Aug. 21.

„ 18,059. Searle and Goodall. Development of photographic plates or films. Aug. 21.

„ 18,370. Bloxham (Neue Photographische Ges., A.G.). Reproduction of pictures by the aid of catalysis. Aug. 25.

[C.S.] 27,177 (1902). Miethe and Traube. Manufacture of panchromatic dry plates for photographic purposes. Sept. 2.

XXII.—EXPLOSIVES, MATCHES, Etc.

[C.S.] 24,633 (1902). Wetter (Westfälisch Anhaltische Sprengstoff A.-G.). Priming compositions for percussion caps and detonators. Sept. 2.

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I.—PLANT, APPARATUS, AND MACHINERY.

English Patent.

Saturating Air or Gases with other Vapours [Carburetting, &c.] to Different Degrees of Saturation: Process of ——, and Apparatus therefor. H. L. Godden, London. Eng. Pat. 14,939, July 6, 1903.

The saturating vessel is divided by a horizontal diaphragm into two compartments, the lower of which is in communication with the upper by means of a central vertical pipe. A second vertical pipe, having a longitudinal slot, extends centrally through the upper compartment, and terminates in a conical extension like an inverted funnel, in the lower compartment. This latter pipe is surrounded by a close-fitting tube having a spiral slot, which, where it crosses the slot in the central pipe, forms a small outlet for the air or gases. The degree of saturation is regulated by rotating the tube around the central pipe, so as to adjust the height of the outlet. The air or gas may be heated before introduction, or the apparatus itself may be heated. —R. A.

United States Patent.

Condensing Fumes Formed in Volatilisation Processes; Apparatus for ——. R. McKnight, Philadelphia, Pa. U.S. Pat. 737,003, Aug. 25, 1903.

The fume pipe and the water-supply pipe are led concentrically into the lower central part of a rotating bowl, which is provided with means for agitating and breaking up the water. The bowl is in communication with a surrounding trough, through an annular opening between the bowl and a stationary cover, the cover being supported out of contact with the bowl. (Compare U.S. Pats. 693,982, 696,469, and 727,184; this Journal, 1902, 411 and 619; 1903, 701.)—R. A.

French Patents.

Distilling and Rectifying Columns; Arrangement of Plates for ——. E. Guillaume. First Addition, dated Feb. 12, 1903, to Fr. Pat. 320,850, May 2, 1902 (this Journal, 1903, 136).

See U.S. Pat. 732,548 of 1903; this Journal, 1903, 859. —T. F. B.

Extraction of Liquids; Process for the Continuous ——. W. Pfleiderer. Fr. Pat. 329,755, Feb. 26, 1903.

The liquid to be extracted runs continuously into a vertical cylindrical vessel, into the lower part of which the vapours of the extracting liquid are blown. A stirrer ensures thorough mixing, and the liquid emulsion formed, flows into a separating vessel, from which the separated liquids are drawn off by separate pipes. The solvent is recovered from the extract by distillation in a separate vessel. Any vapours which are given off during the extraction are condensed in a cooling worm, the liquid being conducted through a pipe into the lower part of the separating vessel, where a perforated plate breaks it up into small bubbles, which rise through the liquid to be extracted, and complete the extraction.—L. F. G.

Separation of Mixtures of Gases greatly differing in Condensability; Process and Apparatus for the ——, by Liquefaction. Soc. pour l'Exploitation des Procédés Georges Claude. Fr. Pat. 329,839, Feb. 28, 1803.

After a preliminary separation, the mixture is cooled in the evaporating apparatus so far below the boiling point as to reduce to the desired degree the tension of the liquefiable constituent, such cooling being effected by the expansion of hydrogen with external work in a machine in connection with a temperature-exchanger. If the constituent of the mixture, which can only be liquefied with great difficulty, be hydrogen, special arrangements are provided, involving the use of a supplementary exchanger. The hydrogen expansion motor is lubricated with light petroleum (petroleum ether). Reference is made to Fr. Pat. 328,245, Jan. 3, 1903; this Journal, 1903, 950. Compare also Fr. Pats. 296,211 of 1900 (Add. to); 322,107, 322,702, 324,097, 324,460, and 324,460 (Add. to), all of 1902; this Journal, 1903, 298, 288, 365, 485, 554, and 796, respectively.—E. S.

Filter-Press: Use of the ——, for the Retention of Dust Generated or carried away in vacuo. P. A. Taupenot. First Addition, dated March 4, 1903, to Fr. Pat. 327,338 of Dec. 15, 1902.

The claim is for an arrangement of three cocks, one being a three-way cock, by which the vacuum is destroyed when the cloths of the filter-press need cleaning, and air forced in from the delivery pipe of the pump producing the vacuum. The compressed air thus blown in removes all dust from the filter-press cloths.—L. F. G.

Cartridges of Compressed Gas; Arrangements for Closing and Opening ——. C. Caille. Fr. Pat. 330,105, March 10, 1903.

A metal stopper is screwed into a socket of the cartridge, at the bottom of which socket is the exit channel for the compressed gas in the cartridge. The stopper has vertical grooves at its sides, and when screwed down, hermetically closes the exit channel. The cartridge is placed inside a vessel, which may contain the liquid to be aerated, or may serve as a gas-holder. Through the top of this vessel a rod passes air-tight, carrying a hand-wheel at its upper end, and provided with a square cavity at its lower end, into which the square head of the metal stopper fits. By turning the hand-wheel the stopper is unscrewed, and lifted from the exit channel of the cartridge, allowing the gas to escape through its lateral grooves. By turning the hand-wheel the other way the cartridge can be again hermetically closed.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

Water-Gas; Contribution to the Thermodynamics of ——. O. Hahn. Zeits. physik. Chem., **44**, 513—547. Chem Centr., 1903, **2**, [9], 510.

From the results of experiments at a constant temperatur with mixtures containing varying proportions of carbo dioxide and hydrogen, the author finds that the law of mas action can be applied for the reaction:—

$$CO_2 + H_2 = CO + H_2O.$$

The value of the equilibrium-constant K $\left(= \frac{CO.H_2O}{CO_2.H_2} \right.$ is 0·534 at 686° C., 0·840 at 786°, 1·197 at 886°, 1·571 at 986°, 1·62 at 1,005°, 1·96 at 1,086°, 2·12 at 1,205° an 2·49 at 1,405° C. Up to 1,100° C. the constant may b expressed by the formula: $\log K = -\frac{2232}{T} - 0{\cdot}08463$ lo T $- 0{\cdot}0002203\,T + 2{\cdot}5084$.—A. S.

Acetylene; Origin of the Usual Impurities in ——. L. M Bullier and L. Maquenne. Acetylen in Wissenschaft u Ind., 1903, **6**, 145.

The compounds of phosphorus which are always found a impurities in crude acetylene made from calcium carbide owe their origin to the calcium phosphide in the latte material. The authors find that this phosphide, and th analogous calcium sulphide, only occur in carbide when i is made (as it almost invariably is) by a "basic" proces i.e., when the charge fed into the electric furnace contain an excess of lime. If the carbide were prepared by a "acid" method, *viz.*, with carbon in excess, it would no be contaminated with phosphide or sulphide of calcium The white haze which is eventually produced whe acetylene containing phosphine is burnt in a closed roo consists of ammonium phosphate. Ammonia in acetylen is known to be an objectionable impurity. An addition reason for removing it at an early stage of the ga manufacture is found in the fact that if it enters into purifier containing material intended to extract phosphoru the gaseous ammonia reacts with that material, and s diminishes the capacity of the vessel to remove phosphin According to the authors, the source of the sulphur i acetylene is not yet known. The sulphuretted hydroge was formerly said to come from calcium monosulphide he carbide ; but this compound, though decomposed by cids, is unattacked by water. The sulphur has also been ttributed to the decomposition of aluminium sulphide, ut recent experiments by the authors do not support this iew. At present it would seem that the sulphur exists n calcium carbide as a triple compound of carbon, sulphur, nd calcium, which is decomposed by water, yielding ulphuretted hydrogen. A mechanical impurity of con- iderable practical importance in ordinary crude acetylene s lime-dust from the gas generator. This is extremely ifficult to remove, resisting even a water washer, and eing still visible in the non-luminous acetylene flame if he gas has been passed through tubes containing wool oistened with sulphuric or hydrochloric acid. The me-dust deposits at the burner orifices, and gradually ecreases their effective diameter.

The chemical and mechanical purifying processes uggested by the authors for the removal of the above- entioned impurities are given in Eng. Pats. 15,261 and 5,262, 1902 ; this Journal, 1902, 1388.—F. H. L.

Electro-Endosmose ; Technical Application of ——. Drying Peat.] Count von Schwerin. XI. A., page 1053.

Cyanogen Compounds ; Determination and Separation of ——, and their Impurities. W. Feld. XXIII., page 1068.

English Patents.

oal Products from Mining Operations ; Utilisation of Waste ——. [Fuel Briquettes.] D. Janks, J. Kiss, and K. Stirling. Eng. Pat. 12,776, June 6, 1903. III., page 1040.

oking Ovens ; Impts. in ——. H. H. Lake. From L. Z. Leiter, Washington. Eng. Pat. 7466, March 31, 1903.

OR the production of high-grade coke from sulphurous al, the latter in the form of a fine powder is fed into a ehive coking-oven, into the coking-chamber of which r is blown through openings arranged in the wall, and lined tangentially to it, thereby producing a circum- ential blast of air in the chamber. The openings are lined upwards, so that the air is also carried to the of the oven, and over the charge of coal, and com- ngles with the evolved gases, thus ensuring perfect com- stion. The openings are connected with an air-supply e carried round the outside of the oven.

The bottom of the oven is provided with an air-supply mber formed by placing a perforated flooring on the of the solid bottom of the oven. The coal is stacked this perforated flooring, which is provided with a mber of slits through which air is blown from the air- ply chamber into the coking-chamber. These slits rease in width from the point of entry of the air-supply e into the air-supply chamber, thus ensuring an even tribution of air into the coking-chamber. Beneath the -supply chamber is another chamber provided with tical partitions. Through this chamber the hot gases wn from the top of the coking-chamber are led by a , and forced to take a circuitous path by the vertical titions, thereby heating up the lower layer of coal in coking-chamber to a high temperature. To desul- rise the coal, ammonium or sodium chloride is mixed h it, or a solution of one of these salts is sprayed on.
—L. F. G.

naces of Gas Retort Settings ; Impts. connected with ——. C. Jeffrey, Ware, and W. P. Gibbons, Lower ormal. Eng. Pat. 19,597, Sept. 8, 1902.

OOD is fixed at a convenient distance above the furnace r, and is provided with passages connected with the te-gas flues, so that the steam and sulphurous fumes be carried away from the subway or cellar of the retort ing.—A. S.

urating Air or other Gases with other Vapours Corburetting, &c.] to Different Degrees of Saturation ; rocess of ——, and Apparatus therefor. H. L. Godden. ng. Pat. 14,939, July 6, 1902. I., page 1038.

Gas for Motive Power Purposes ; Producing ——. B. H. Thwaite, London. Eng. Pat. 16,986, July 31, 1902.

Apparatus is described for making a generator gas containing not more than 8 per cent. of hydrogen and not more than 2 per cent. of hydrocarbons, and having its proportion of combustible constituents sufficiently small to allow them, when mixed with the necessary quantity of air, to be compressed to a pressure of 75 lb. per square inch, without liability to premature ignition. The plant consists of three vertical vessels arranged side by side, the first being the generator, the second a mechanical scrubber for the gas, and the third a tubular regenerator in which the air blast is warmed at the expense of the gas. From this recuperator the gas passes to a rising holder, the bell of which is coupled to mechanism that controls the blast of air. The generator is constructed on lines resembling a blast-furnace or cupola ; it can be fed with fuel, or the slag run off, without interrupting the operation. In order to prevent the formation of clinker and to produce fusible slags, the original fuel (coke) is mixed with a suitable proportion of some fluxing agent, such as limestone, silica, or a little iron ore.—F. H. L.

Gas for Heating and Illuminating Purposes ; Manufacture of ——. J. F. Stacey and T. E. Matthews, both of Nashville, Tenn., U.S.A. Eng. Pat. 2267, Jan. 30, 1903.

See U.S. Pat. 718,884 of 1903 ; this Journal, 1903, 205.
—T. F. B.

Gas ; Apparatus for Manufacturing ——. C. W. Turner, Brooklyn, U.S.A. Eng. Pat. 9573, April 28, 1903.

Oil and water are separately vaporised in superimposed heated coils, and the vapours are mixed and superheated in similar coils. The heating burners are furnished with gas from the coils. The gas produced passes through a separating tank, for the removal of condensible liquids, before entering the gas-holder.—H. B.

Heating Gases free from Hydrocarbons ; Method of Producing ——, from Gas-containing Fuel in Gas Producers, and Appliances therefor. C. D. Abel, London. From Gasmotoren Fabrik Deutz, Köln-Deutz, Germany. Eng. Pat. 13,748, June 19, 1903.

The fuel is heated in a gas-producer, the gas discharge from which is at a point intermediate between the upper and lower ends of the column of fuel, the latter being supported on a fire-grate at the bottom and left open at the top. Any tarry or other volatile matters distilling from the fresh fuel in the upper part of the producer are thus drawn down through such a depth of incandescent fuel that a non-illuminating gas results. An annular water-evaporating chamber may be arranged so as to take up heat from the escaping hot gases and from the lower part of the upper column of fuel, the water vapour generated being passed up through the fire-grate.—H. B.

Coal-Gas ; Method of and Apparatus for Purifying ——, so as to Prevent Loss of Illuminants during the Operation. E. D. Holmes, Huddersfield. From O. N. Guldlin, Fort Wayne, Ind. Eng. Pat. 11,750, May 22, 1903.

See U.S. Pat. 731,412 of 1903 ; this Journal, 1903, 861.
—T. F. B.

Gas-Purifier Waste ; Revivifying ——. P. Jensen, London. From F. V. L. Hiorth, Christiania. Eng. Pat. 13,202, June 12, 1903.

The claim is for a continuous process for revivifying spent oxide, by which the material is loaded into a number of small cars or baskets that are introduced through a door into a tall chamber, where a current of warm air or oxygen is constantly maintained. Inside the chamber is disposed an endless belt, running in a vertical direction, and fitted with hooks that catch each basket, first elevating it to the top of the chamber, and then lowering it to the base on the other side, where a discharging door is provided. The system of cars moves at a slow rate, so that by the time any basket has arrived at the second door its contents have been revivified by oxidation.—F. H. L.

UNITED STATES PATENTS.

Gas Producer. J. S. and F. L. Daniels, Stroud. U.S. Pat. 738,004, Sept. 1, 1903.

SEE Eng. Pat. 7613 of 1902; this Journal, 1903, 900. —T. F. B.

Gases; Centrifugal Apparatus for Purifying ——. H. A. Humphrey, London. U.S. Pat. 737,932, Sept. 1, 1903.

SEE Eng. Pat. 22,131 of 1901; this Journal, 1902, 1322. —T. F. B.

FRENCH PATENTS.

Carbonaceous Substances [Briquettes]; Process for the Manufacture of——, from Tar or Tarry and Bituminous Materials, or from Petrol Residues, Grease, and Stearine. F. Ritter von Dahmen. Fr. Pat. 329,452, Feb. 17, 1903.

A MIXTURE of tar (not pitch) with some of the above-named materials is mixed with some bulky substance, such as sawdust, cork dust, or coal dust, into a paste, formed into briquettes, and heated in a coking-oven to a high temperature. The gases given off are used to heat the ovens. Suitable mixtures are: 80 parts of tar, 10 parts of powdered peat, and 10 parts of sawdust; or 85 parts of "mazut," 10 parts of powdered peat, and 5 parts of coal dust.—L. F. G.

Coal Briquettes; Manufacture of ——, to be used as Fuel or for the Manufacture of Coke, by means of Oxidised Hydrocarbons. Soc. Anon. des Combustibles Industriels. Fr. Pat. 329,527, Feb. 18, 1903.

ANY hydrocarbon residues, such as mazut, shale-tar, gas-tar, &c., are dried, and submitted to the action of a current of ozone or chlorine peroxide. Oxidation rapidly takes place, and is continued till the mass thickens; or, if the briquettes are to be made into coke, till the mass solidifies. The mass now possesses the property of being saponified by alkalis, and is used as agglutinant for making briquettes. In making the briquettes, 1 to 3 per cent. of freshly-slaked lime is added to the powdered coal, and this fed, simultaneously with the oxidised tar, into a mixer, the proportion of oxidised tar being usually 6 to 12 per cent. After mixing, the mass is pressed into moulds, it being occasionally necessary to add 2 per cent. of resin. The briquettes can be coked in coking-ovens.—L. F. G.

Briquettes; Manufacture of ——. W. N. Toft. Fr. Pat. 329,736, Feb. 26, 1903.

A FIBROUS paste made from manioc roots, forming a valuable cement, is mixed in the proportion of 0·4 to 2·0 part per 100 with powdered coal, lignite, peat, wood-charcoal, coke, &c., and the mixture submitted to the simultaneous action of heat, moisture, and pressure. The briquettes thus formed are dried, and are then ready for use. With the cement referred to, the briquettes are said to be free from all the faults of ordinary briquette fuel. It is sometimes necessary to add a small proportion of pitch, resin, or hydrocarbons to the mass before submitting it to the above process.—L. F. G.

Coke Oven. L. Z. Leiter. Fr. Pat. 329,814, Feb. 28, 1903.

SEE Eng. Pat. 7466, March 31, 1903, above.—A. S.

Blast-Furnace Gases; Process and Apparatus for Purifying ——. Soc. Eicher Huttenverein Metz et Cie. Fr. Pat. 329,806, Feb. 27, 1903.

SEE Eng. Pat. 4851 of 1903; this Journal, 1903, 789. —H. B.

Gas Analysis; Apparatus for ——. N. V. O. Bolikowska (*née* Blot). Fr. Pat. 329,533, Feb. 19, 1903. XXIII., page 1065.

Electrodes of Arc Lamps; Method of Manufacturing ——. M. Lilienfeld. Fr. Pat. 329,483, Feb. 17, 1903.

SEE Eng. Pat. 3698 of 1903; this Journal, 1903, 691. —T. F. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

Petroleum Products; Improving the Colour of ——. K. Charitschkoff. Pet. Rev. and Min. News, 1903, [233], 149.

FROM trials made on the decolorisation of petroleu products by sulphuric acid, the author deduces the concl sion that in order to decolorise in arithmetical progressi the amount of acid necessary must be increased in g metrical progression.

The tests were performed with the Dubosc colorimet the brown glass tint being adopted as a standard, and 1 gr of each petroleum product examined was dissolved 100 grms. of petroleum spirit ("ligroin") of sp. gr. 0·7 on which the acid has no action. The results are expres in mm., indicating the thickness of stratum of the t liquid required to match the standard tint:—Grosny ma (sp. gr. 0·924), 2·7 mm.; Grosny lubricating oil (sp. 0·940), 2·6; Baku mazut (sp. gr. 0·901), 7·6; Ba goudron, 4·85; and Grosny pitch, 1·9 mm. From the figures it follows that 1 per cent. of Grosny pitch will form in solution as above the same depth of colour as 2·5 cent. of Baku goudron, 1·4 per cent. of Grosny mazut, 4 per cent. of Baku mazut.

The results of treating the same solutions with 1 and 10 per cent. of sulphuric acid respectively are giv below:—

Acid.	Grosny Mazut.	Baku Mazut.	Goudron.	I h.
Per Cent.	mm.	mm.	mm.	mm.
1	1·9	2·1	0·4	9·
5	3·25	3·2	0·5	19·7
10	4·35	4·45	0·76	20·7

The original colour depth of the solution being 0·7 m it follows, in the case of Baku mazut, that the decolori tion effected by 5 per cent. of acid is equal to a diminut of 2·5 mm., whilst with 10 per cent. the additional red tion is only 1·25 mm., a result confirming the deduct mentioned above.—C. S.

ENGLISH PATENTS.

Lignites, Hard Coal, Peat, Wood, and the like; Pro for Distilling ——. L. Zechmeister, Munich. Eng. 22,381, Oct. 14, 1902.

SEE Fr. Pat. 326,326 of 1902; this Journal, 1903, 791. —T. F.

Coal Products from Mining Operations; Utilisation Waste ——. D. Janko, J. Kiss, and K. Stirling, all Györ, Hungary. Eng. Pat. 12,776, June 6, 1903.

THE refuse matter (technically known as "burrow") coal mining is subjected to a process of coking by distillation, whereby light and heavy hydrocarbons obtained, which may be collected and used separately. gas consisting mainly of sulphuretted hydrogen is evolved, which is burned, and oxidised with nitric aci form sulphuric acid. The coke-like residue from distillation is treated with sulphuric acid or the like decompose the contained sulphides, and is then prefer formed or worked into briquettes for use as fuel.—R.

Lubricating Properties of Liquids; Apparatus for De mining the ——. K. Wilkins. Eng. Pat. 20,3 Sept. 26, 1902. XXIII., page 1065.

UNITED STATES PATENTS.

Wood-Distilling Apparatus. C. M. Palmer, Palmer N.C. U.S. Pat. 737,461, Aug. 25, 1903.

A RETORT is provided at its top with a pipe for remo the light vapours, the lighter portion of which passes condenser, and the heavier portion to a vapour-separa drum, into which the heavy vapours are also introduced means of a pipe in the wall of the retort considerably b he top. The separating drum is provided with an upper utlet for the lighter vapours, a lower one for the heavy apours, and a creosote pipe in its base, the distillate being hus collected in four fractions.—T. F. B.

yroligneous Acids; Mechanism for the Reduction of ——. W. S. Brandt, Binghamton, N.Y. U.S. Pat. 737,067, Aug. 25, 1903.

HE retorts are arranged in such a manner that any one of em may be removed or replaced without interfering with e operation of the rest of the battery.—T. F. B.

etroleum; Deodorising or Purifying ——. F. Berg, Warrensville, Ohio. U.S. Pat. 736,479, Aug. 18, 1903.

HE oil is treated with alkali for several hours at a tempe-ture considerably above 212° F. (275°—300° F.), in a osed vessel, having an outlet at the top for the escape of r and gases. Approximately the whole of the condensable pours arising from the mixture of oil and alkali are ndensed within the upper end of the vessel. The oil is peatedly converted from the liquid state to the condition vapour, and *vice versa*, by passing heated air under essure upwards through it.—C. S.

etroleum; Apparatus for Deodorising or Purifying ——. F. Berg, Warrensville, Ohio. U.S. Pat. 736,480, Aug. 18, 1903.

IE apparatus comprises a tank; a diaphragm dividing the me into an upper and lower chamber; means for heating e upper chamber; means for supplying water to the ttom of the upper chamber and removing the surplus an overflow pipe; pipes leading up from the lower amber into the upper one; two manifolds arranged on posite sides in the upper part of the lower chamber and nnected by means of parallel pipe sections; a pipe or nduit connecting the bottom of the upper chamber with e central part of one of the manifolds; a pipe connecting c central part of the other manifold with the overflow e; transverse bars interposed between the parallel pipe tions and the diaphragm; crossbeams supported by the k and upholding the parallel pipe sections, and a com-essed air reservoir outside the tank, and provided with ans for heating the air supply and discharging the same o the tank.—C. S.

French Patent.

r, Tar Oils, or Mineral Oils; Distillation of ——. Rütgerswerke A.-G. Fr. Pat. 329,574, Feb. 20, 1903.

E tar or oil is subjected to a preliminary drying or tillation, in order to remove some of the water, thus venting the frothing in the ultimate distillation and rtening the operation. (See also this Journal, 1903, .)—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

trobenzene; Influence of the Material of the Cathode on he Reduction of ——. W. Löb and R. Moore. XI. A., age 1053.

luction Processes; Kinetics of —— H. Goldschmidt. XXIV., page 1070.

ctro-Endosmose; Technical Application of —— [*Separ-ting the Water from Alizarin Paste*]. Count von chwerin. XI. A., page 1053.

English Patents.

our Lakes; Manufacture of New ——. O. Imray. rom Meister, Lucius und Brüning. Eng. Pat. 23,830, ct. 31, 1902. XIII. A., page 1055.

ouring Matter [*Sulphide Dyestuff*] *Directly Dyeing otton; Manufacture of a Sulphurised* ——. C. D. bel, London. From Actien-Ges. für Anilin Fabrikation, erlin. Eng. Pat. 23,437, Oct. 27, 1902.

Fr. Pat. 325,639 of 1902; this Journal, 190., 792. —. F. B.

Anthracene Series; Manufacture and Production of New Derivatives [*Dyestuffs*] *of the* ——. H. E. Newton, London. From the Farbenfabr. vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 24,427, Nov. 7, 1902.

See Fr. Pat. 326,122 of 1902; this Journal, 1903, 792. —T. F. B.

Anthracene Derivatives [*α-Hydroxyanthraquinone Sulphonic Acids*]; *Manufacture and Production of* ——. H. E. Newton, London. From the Farbenfabr. vorm. F. Bayer and Co., Elberfeld. Eng. Pat. 25,024, Nov. 14, 1902.

See Fr. Pat. 326,204 of 1902; this Journal, 1903, 792. —T. F. B.

Laundry-Blue; Effervescent ——. C. A. Allison, London. From W. C. Pope, St. Louis, U.S.A. Eng. Pat. 15,739, July 16. 1903.

Six lb. 2 oz. of Soluble Blue are mixed with 3 lb. of oxalic acid. One part of this mixture is incorporated with an equal part of a mixture consisting of 13 lb. 2 oz. of sodium bicarbonate, 4 lb. 11 oz. of tartaric acid and 6 lb. 11 oz of citric acid. The product is heated and pressed into tablets.—W. P. S.

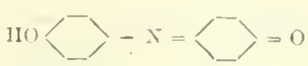
United States Patents.

Sulphur Dye [*Sulphide Dyestuff*]; *Blue* ——, *and Process of Making Same.* R. Gley, Assignor to Actien-Ges für Anilin Fabrikation, Berlin. U.S. Pat. 736,380, Aug. 18, 1903.

See Fr. Pat. 325,639 of 1902; this Journal, 1903, 792. —T. F. B.

Sulphur Dye [*Sulphide Dyestuff*]; *Indigo-Blue* ——, *and Process of Making Same.* O. Kaltwasser and M. Gaumer, Assignors to Actien-Ges. für Anilin Fabrikation, Berlin. U.S. Pat. 736,403, Aug. 18, 1903.

The indophenol—



is boiled, in aqueous solution, with an alkali sulphide (1 mol.) and sulphur (at least 4 mols.).

The resulting dyestuff is insoluble in water, but soluble in alkali hydroxides with a dull greenish-blue colour, soluble in alkali sulphides with a blue colour, and in warm concentrated sulphuric acid with a violet colour. On unmordanted cotton it produces dull greenish-blue shades, converted into very fast indigo-blue shades by subsequent oxidation.—T. F. B.

Indoxyl and Indigo Preparations; Process of Making ——. W. Hentschel, Assignor to Chem. Fab. von Heyden Actien-Ges., Radebeul. U.S. Pat. 737,836, Sept. 1, 1903.

See Eng. Pat. 14,049 of 1902; this Journal, 1902, 1181. —T. F. B.

French Patents.

Aldehydes; Manufacture of ——. A. Foelsing. Fr. Pat. 329,522, Feb. 18, 1903.

Aldehydes are produced when the alkali derivatives of formaldehyde react with the halogen derivatives of hydrocarbons.

o-Nitrobenzaldehyde is prepared by boiling o-nitrochlorobenzene, in alcoholic solution, with the sodium derivative of formaldehyde (NaCHO). Similarly, when three molecules of sodium formaldehyde react with chloroform, a trialdehyde, $HC.(CHO)_3$, is formed.—T. F. B.

Azo-Dyestuffs Directly Dyeing Wool; Production of Black Primary ——. Oesinger et Cie. Fr. Pat. 327,988, June 12, 1902.

Aminonaphtholdisulphonic acids 1.8.3.6; 1.8.4.6; 1.8.3.5 or 1.8.2.4 are combined with two molecules of a diazotised primary amine, first in acid, and then in alkaline solution, one or both of these primary amines being halogenated. Black dyestuffs of great intensity are so obtained which give dyeings closely resembling those produced by logwood, very fast to alkalis and to light.—E. F.

Sulphur Dyestuffs [*Sulphide Dyestuffs*] ; *Production of Yellow* ——. Actien - Ges. für Anilinfabrikation. Fr. Pat. 329,481, Feb. 17, 1903.

Nitro - diacetyl - *p* - phenylenediamine or nitro - diacetyl - *m* - phenylenediamine 1.2.4 is heated to a high temperature with sulphur, or heated under pressure with an aqueous alkali polysulphide solution. The products dye unmordanted cotton in very vivid yellow shades which are rendered faster, without much change in the shade, by subsequent treatment with copper or chromium salts.
—E. F.

Monoazo Dyestuff [*Azo - Dyestuffs*] ; *Production of Mordant* ——. Actien - Ges. für Anilinfabrikation. Fr. Pat. 329,721, Feb. 25, 1903.

Amino-*p*-cresotinic acid ($NH_2.OH.COOH.CH_3 = 1.2.3.5$) is diazotised and combined with 1.8-aminonaphthol - 4 - sulphonic acid in alkaline solution. The product dyes chrome-mordanted wool in intense bluish-black shades of remarkable fastness to fulling, light, and boiling water.
—E. F.

Colouring Matter [*Azo - Dyestuffs*] ; *New* ——. Soc. Anon. Prod. F. Bayer and Co. Fr. Pat. 329,866, March 2, 1903.

2 - Chloro - 4 - aminoacetanilide, obtained by reducing the corresponding nitro compound, is diazotised and coupled with 1 . 8 - dihydroxynaphthalene - 3 . 6 - disulphonic acid (chromotrope acid). The acetyl group is subsequently removed by saponification.

The dyestuff can also be prepared by coupling the diazo derivative of *m*-chloro-*p*-nitraniline with chromotrope acid and subsequently reducing. (See also U.S. Pat. 731,460 ; this Journal, 1903, 862.)

The dyestuff gives fast bluish-violet shades on wool from no acid bath.—T. F. B.

Plant Tissues ; Process of Extraction, by Disintegration, of the Essential Constituents [*Colouring Matters*] *of* ——. J. H. F. Cresp. Fr. Pat. 329,523, Feb. 18, 1903. XX., page 1063.

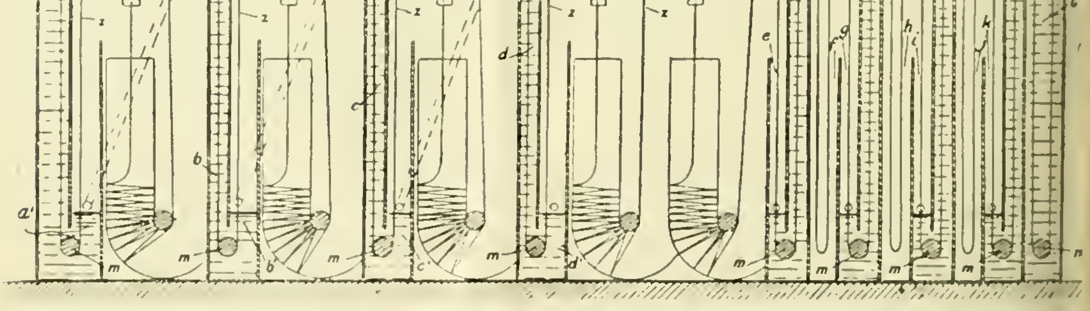
Leather ; Manufacture of ——, *by Means of Colouring Matters*. P. D. Zacharias. Fr. Pat. 329,708, Feb. 25, 1903. XIV., page 1056.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Bleaching of Textile Fabrics ; Continuous ——. M. Mu tadas Y Rovira. Rev. Gen. Mat. Col., 1903, 7, [81 257—260.

This apparatus is said to combine the advantages of tl two methods of bleaching at present in use, namely, tl method of using high pressures in autoclaves as in tl apparatus of Mather and Platt, and the continuous syste as used in the apparatus of Welter and of Rigamoı and Taglíani. The operations of treating with boilı caustic soda, steaming, and final washing, are carried oı in a methodical manner, the solution of caustic in the fir operation and the water for the final washing both travellir in the opposite direction to the fabric to be treated.

The apparatus is shown in sectional elevation in tl accompanying figure. The rectangular case is dividı by partitions, which are attached alternately to the upp and lower horizontal walls, so as to form a series of coı municating vessels closed by liquid seals, the latter on tl left containing the solution of caustic and on the right watı In *p* the steam is under a pressure of $1\frac{1}{2}$ atmospheres, in under 2 atmospheres, and so on to the central chamber the pressures being maintained by columns of liquid in t seals, each about 5 metres in height. The fabric enters the left and leaves the apparatus on the right. A stroı solution of caustic soda is introduced into d^1, overflo from *d* into c^1, and after circulating through the seals the left finally leaves by the overflow pipe in *a*. Wat enters at *l*, is forced from the bottom of *k* to the top of and after circulating through the seals on the right, fina leaves *e* by a suitable overflow pipe. The fabric fall i receptacles, provided in *p*, p^1, p^{11} and *q*, so as to prok the action of the steam on the material.



The following advantages are claimed for this form apparatus over those of Welter and of Rigamouti Tagliani :—

1. There is a gradual instead of an abrupt change fr the outside temperature to that of the central chamber *q*

2. The fabric first enters a nearly exhausted solution that the facing is unattacked by the alkali.

3. In other forms it is necessary during the final ope tions to add alkali, so as to overcome the retarding act of the accumulating impurities. This loss is prevented the present form, the alkali being nearly exhausted wh

the material leaves the apparatus, and in *d* the fabric is immersed in a pure and strong solution.

4. The intermittent immersion in alkali and steaming gradually opens the pores of the fibres; after each immersion the fabric is squeezed, thus eliminating the soap so that the conditions for saponification are better in the next seal.

5. The intermittent immersion and steaming renders more difficult the formation of oxy-cellulose.

6. The higher temperature in the central chamber brings about a more ready saponification of the impurities.

7. The methodical washing and intermittent steaming eliminates all products of saponification, and the fabrics may be immediately chlorinated without further washing.

8. The arrangement of the chambers in series permits of a light construction of apparatus which may be easily strengthened if necessary. Arguments are also brought forward to show that the method effects a considerable economy in labour and chemicals over other processes.
—B. N.

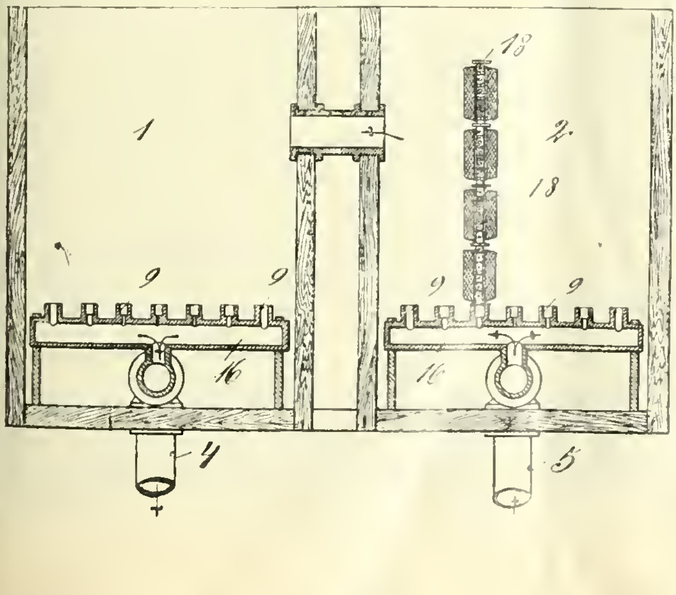
English Patents.

Mercerising Machines [for Cotton Skeins]. A. J. Boult, London. From R. E. Chevolleau, Paris. Eng. Pat. 20,672, Sept. 22, 1902.

See Fr. Pat. 324,848 of 1902; this Journal, 1903, 625.
—T. F. B.

Textile Materials; Apparatus for Treating ——, with Liquids, for Dyeing, Bleaching and other Purposes. J. Wetter, London. From A. Holle and Co., Germany. Eng. Pat. 18,756, Aug. 26, 1902.

The object of the invention is to produce a simple and thorough circulation of dye liquor, bleaching liquid, or wash water, through suitable receptacles. Instead of providing each vessel with a separate pump, two vessels, 1 and 2, are placed in communication through one or more overflow pipes, and these vessels are connected with an ordinary suction and force pump by the two suction and discharge pipes, 4 and 5. With this arrangement the liquid may be caused to flow from 4 into 5, and from 2 into 1, or in the reverse direction. To provide uniform distribution of the liquids, and therefore uniform dyeing or bleaching, the distributing pipes, 16, are provided with outlets which are larger or nearer together in proportion to their increasing distance from the point of inlet of the liquid in the distributing pipe. The vertical core tube, 18, is made in sections, the lowest section fitting into a socket, 9, in the tube, 16, and each of the other sections has, in the middle of its length, a flange which is situated between two bobbins, with the exception of the last section, which terminates in a flange. This arrangement preserves the shape of the paper tubes of the bobbins. Each core tube, 18, is perforated in a similar manner to the distributing pipe, 16, to ensure uniform distribution of liquid over the material.
—B. N.



Cleaning; Methods of Dry ——, and Apparatus therefor. L. E. Barbe, Paris. Eng. Pat. 17,397, Aug. 7, 1902.

See addition to Fr. Pat. 321,542 of 1902; this Journal, 1903, 794.—T. F. B.

Cotton Yarns and Fabrics; Process for Decreasing the Inflammability of ——. C. A. Burghardt, Manchester, and J. T. Reid, Royton. Eng. Pat. 21,848, Oct. 8, 1902.

A precipitate of aluminium silicate is produced in the material by treatment with a solution of sodium silicate (15° T.), drying, and then immersing in a solution of sodium aluminate (32° T.), and drying. The material may be finished with a 10 per cent. solution of magnesium sulphate, or with a 2·5 per cent. solution of ammonium carbonate and washing to remove the sodium carbonate, or the two finishing processes may be combined.—T. F. B.

United States Patents.

Fibrous or Filamentary Material [Artificial Horsehair]. C. N. Holmes, London, U.S. Pat. 737,256, Aug. 25, 1903.

See Eng. Pat. 1379 of 1902; this Journal, 1903, 415.
—T. F. B.

Mercerising; Apparatus for Use in ——. J. R. Ecob, Laurence, Mass. U.S. Pat. 737,374, Aug. 25, 1903.

A series of tangent rolls geared together and driven directly is provided below the working level of the liquid in a suitable mercerising receptacle, and arranged so that the material is led between these rolls, and around the peripheries of the same, the friction of the surface of the rolls with the surface of the material enabling the latter to resist the tendency to contract. One or more receptacles may be used and one or more upright series of rolls in each receptacle, but each series is arranged in tangent connection with its adjacent series. Thus, in the case of two receptacles, each with two upright series of rolls, the first series is connected to the second by an intermediate tangent roll below, and the second series is connected with the first series in the second receptacle by an upper tangent roll outside the liquid, these being so arranged that the rolls form a continuous support for the material in its travel and thus prevent any tendency to contract.—B. N.

Glutinous Substances [Calcium Alginate] from Seaweed; Process of Extracting ——. A. Krefting, Christiania, Assignor to E. Herrmann, Paris. U.S. Pat. 737,421, Aug. 25, 1903.

See Eng. Pat. 7913 of 1903; this Journal, 1903, 793.
—T. F. B.

French Patents.

Wool; Process of Scouring and Bleaching ——. J. A. Regraffe and P. F. Poujol. Fr. Pat. 329,928, March 3, 1903.

Wool is subjected to the action of a hot solution containing sodium peroxide and magnesium sulphate; when it is free from grease, sulphuric acid is added till the bath is neutral, and the oxygen thus liberated effects the bleaching.

Wool, which has been previously scoured, is bleached in a bath containing "sodium peroxide, sulphuric acid, magnesia, and ammonia."—T. F. B.

Mercerising Cotton in Skins; Apparatus for ——, applicable also to Dyeing, Bleaching, Drying or otherwise Treating Threads or other Fibrous Substances by Similar Processes. T. Pratt. Fr. Pat. 329,541, Feb. 19, 1903.

See Eng. Pat. 23,181 of 1901; this Journal, 1903, 116.—T. F. B.

Cotton and Silk Fabrics; Process of Dyeing Mixed ——, with Sulphide Dyestuffs. Actienges. fur Anilin Fabrikation. Fr. Pat. 329,122, Feb. 16, 1903.

A dye-bath is made up, as strong as possible, of Sulphur-Black T-extra (or other sulphide dyestuff) and an equal weight of sodium sulphide, with the addition of 12 grms. of dextrin and 30 grms. of sodium chloride for every litre of solution.

The cotton and silk mixture is dyed in this bath for an hour, at 40° C., and then boiled in a soap solution. The result is that the cotton threads are dyed, whilst the silk threads remain white.—T. F. B.

Dyeing with Sulphide Dyestuffs: Process of ——. Soc. Anon. Prod. F. Bayer & Cie. Fr. Pat. 329,432, Feb. 16, 1903.

Alkali bisulphides or polysulphides are added to the dye-bath to remedy the uneven results usually obtained with sulphide dyestuffs.

The process may consist of dyeing the goods in a boiling bath containing sodium bisulphide, 10 kilos.; dyestuff, 15 kilos.; sodium sulphide, 10 kilos.; and crystallised sodium sulphate, 25 kilos., in 1800 litres of water.

—T. F. B.

Dyeing Threads in Apparatus under Pressure; A New Process for ——. L. Détré. Fr. Pat. 329,896, March 7, 1903.

In this invention the threads are first prepared in a suitable form for dyeing by winding them upon large cylindrical bobbins, such, for instance, as Alexander bobbins, but the mandrels of these are constructed of paper, glass, ebonite, &c., in place of wood, so as not to stain the threads. A hollow vertical support, made in the form of a triangular prism standing on one of its triangular ends, has cases fixed to each of its sides. The bottoms of the cases are perforated to allow of circulation of the dye-liquor from the interior of the hollow support and over the bobbins which are slipped into the cases. The bottom of the hollow vertical support ends in a tube connected to any suitable arrangement for circulating the mordant, dye, &c., and the support with the bobbins in position is fixed in an apparatus for dyeing under pressure.

—B. N.

Printing on Vegetable Tissues; Process of ——, for Producing Variegated Effects in One or More Colours. H. Schmid. Fr. Pat. 329,747, Feb. 26, 1903.

A design is first printed on the textile fabric with one or more thickened dyestuffs, and afterwards a second design is printed with the aid of one or more mordants so as to fix the colour and produce the variegated effects in certain places. For instance, alizarin may be used as the dyestuff, and chromium acetate or salts of aluminium as the mordants. Subsequent steaming is used to thoroughly fix the colour. The unfixed dye may be removed by washing and soaping, and thus leave the surface of the material in these places white. The process is reversible, the mordant in this case being used before the dye. Chemicals of suitable composition, which produce by their interaction insoluble colours or bodies capable of contributing to the decoration of the stuff, may also be used to bring about similar effects.

—B. N.

Printing in Several Colours; Machines for ——. The Printing Arts Co., Ltd., W. Black, and F. H. Mowbray. Fr. Pat. 329,793, Feb. 27, 1903.

See Eng. Pat. 17,174 of 1902; this Journal, 1903, 905.

—T. F. B.

Painting on Velvet; Process of ——. A. L. Tolmer and A. A. Rochereau. Fr. Pat. 329,851, March 2, 1903.

A white paint, diluted with collodion and ether, is first applied to the velvet or other stuff to act as a foundation; the paint may thus be made to adhere to this groundwork, and, if the latter is sufficiently thick, the colours are obtained with a brighter hue. When the first application is dry, the colours are applied, and finally the back of the velvet is passed backwards and forwards over a sharp edge, so as to restore the suppleness of the material.—B. N.

Printing Shaded or Blended Designs on Textile Fabrics Process for ——. Soc. Lyonnaise de Teinture, Impression, Apprêt et Gaufrage. Fr. Pat. 329,903, March 6 1903.

The claim is for a process for printing shaded or blende designs on textile fabrics by means of engraved cylinders The colour, shaded and prepared in the usual manner, i taken over the chase by means of a transporting roller o felt, the latter being brought periodically into contact wit the roller for supplying the colour to the engraved cylinder.

—B. N.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Leather Dyeing: Formic Acid in ——. M. C. Lamb. J Soc. of Dyers and Colourists, 1903, **19**, [9], 251—252.

Formic acid is recommended for use in dyeing leather instead of sulphuric and other mineral acids (see Society o Arts' Report on Leather for Bookbinding; this Journal 1902, 128, and 1901, 819).

The amount of formic acid which produces the maximu colouring effect can be used without risk of injury; as general rule it appears to be about twice the weight (as 4 per cent. solution) of concentrated sulphuric acid necessary Acetic and lactic acids have much less tinctorial effect tha formic acid. Test specimens are supplied with the pape showing that formic acid (4 parts of 40 per cent.) produces a deeper shade from "Fast Red A," and from "Aci Green" than sulphuric acid (2 parts), whilst lactic acid (8 parts) gives a paler shade than either of the other two. As a clearing agent, *i.e.*, for use before dyeing to remov iron stains and lighten the colour of the leather, sulphuric acid is most effective. ½ per cent. solution removed iro stains at once, whilst 20 per cent. formic acid failed t do so, and acetic, lactic, tartaric, and citric acids wer equally unsuccessful. Hydrochloric and oxalic acids remove stains readily, but have an injurious effect on th leather. Machine shaved goods are particularly liable to iron stains and require clearing, but, since the ultimate mischief caused by even minute quantities of sulphuric acid has been so clearly proved (Society of Arts' Report, *loc. cit.*) it would seem that the only way to avoid sulphuric acid is to use picked hand-shaved skins for light shades, and dye all machine-shaved or stained skins in dark colours only.—R. L. J.

United States Patent.

Floor Coverings, &c.; Method of Printing or Colouring ——. A. F. Lundeberg, Stockholm. U.S. Pat. 737,945, Sept. 1, 1903.

See Eng. Pat. 9707 of 1902; this Journal, 1903, 739.

—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Persulphuric Acid; Rate of Conversion of ——, int Caro's Acid, and the Composition of the latter. M. Mugdan. Zeits. Elektrochem., 1903, **9**, [35], 719—721.

The author confirms the view of Armstrong and Lowry (this Journal, 1902, 913) that $H_2S_2O_9$ is the most probable formula for Caro's acid. (See also this Journal, 1901, 578; 1902, 343.)—A. S.

Potassium Chlorate; Decomposition of ——, and some Observations on the Decomposition of Sodium Chlorate and Sodium Perchlorate. J Scobai. Zeits. physik. Chem., **44**, 319—347. Chem. Centr., 1903, **2**, [7], 415.

The author finds that at no stage in the decomposition of potassium chlorate is a state of equilibrium reached, but that two reactions proceed simultaneously. The chief reaction is at 395° C.: $4KClO_3 = KCl + 3KClO_4$; the secondary reaction, which occurs even at lower temperatures, is expressed by the equation $KClO_3 = KCl + 3O$. Pure potassium perchlorate is not notably decomposed below 411° C. Sodium chlorate decomposes in a similar manner to potassium chlorate. Sodium perchlorate, like other perchlorates, yields chlorate, chloride, and oxygen when decomposed. Potassium nitrate does not decompose at 410° C., nor does it act upon potassium chloride or potassium perchlorate at this temperature.—A. S.

Cuprammonium Compounds. Bouzat. Ann. Chim. Phys., **29**, [7], 305—383. (Chem. Centr., 1903, **2**, [7], 417. (See also this Journal, 1902, 932, 970, 1158.)

The author has prepared a number of crystallised cuprammonium salts. The compound $CuCl_2.5NH_3.\frac{3}{2}H_2O$ is prepared by cooling an ammoniacal solution of cupric chloride to − 15° C., or by passing ammonia gas into the solution at 0° C.; it forms small dark blue crystals, soluble in water. In presence of a large quantity of water, cupric hydroxide separates. On heating, the compound $CuCl_2.2NH_3$ is formed. On standing over caustic potash in an atmosphere of ammonia, the salt loses 1 mol. of water, forming the compound $CuCl_2.5NH_3.\frac{1}{2}H_2O$.

The salt $CuCl_2.4NH_3.2H_2O$ is produced by allowing an ammoniacal solution of cupric chloride to evaporate at the ordinary temperature in an atmosphere of ammonia, or by treating a concentrated, hot, ammoniacal solution of cupric chloride with alcohol, and allowing to cool. It forms dark blue crystals and has properties similar to the abovementioned compound.

The salt $CuCl_2.2NH_3.\frac{1}{2}H_2O$ is obtained by heating an ammoniacal solution of cupric chloride to 50° C., and then incompletely precipitating with hot alcohol. It forms bluish-green microscopic crystals smelling faintly of ammonia. Like the corresponding anhydrous salt, it is decomposed by water.

The cuprammonium sulphate $CuSO_4.4NH_3.\frac{3}{2}H_2O$ can be prepared by allowing an ammoniacal solution of copper sulphate to evaporate over lime; by precipitating such a solution with alcohol; by allowing a similar hot concentrated solution to cool; or by passing ammonia into such a solution. It has similar properties to the chloride, $CuCl_2.4NH_3.\frac{3}{2}H_2O$.

The author has determined the thermo-chemical relations of these salts, and also of the two double salts—

$$CuSO_4.(NH_4)_2SO_4.6H_2O \text{ and } CuCl_2.2NH_4Cl.2H_2O.$$

—A. S.

Phosphorus; Reactions between Copper and Yellow ——. W. Straub. Zeits. anorg. Chem., 1903, **35**, 460.

When phosphorus and copper are left together in water, even some distance apart or with a permeable diaphragm between them, the water around the phosphorus becomes black and opaque and then dark-reddish, owing to the growth in it of exceedingly delicate feathery crystals of copper. With very rigid exclusion of air these effects are not observed, whilst access of air is necessary for the progress of the change. Withdrawn from the phosphorus and exposed to the air, the opaque black liquid soon becomes clear and colourless. The experiments have made it pretty certain that both the phosphorus and the copper are oxidised by the air; that thus, through diffusion, acid copper phosphate soluble in water, is continuously formed; that near to the phosphorus this is changed into black copper phosphide and phosphoric acid; and that the copper phosphide is continuously changed by air into phosphoric acid and copper.

In the well-known action of phosphorus upon a solution of copper sulphate, whereby some of the phosphorus becomes dissolved as phosphoric acid, and the rest of it gets coated with copper phosphide and copper itself, the same series of changes obviously takes place, except that oxidation by the air is replaced by more rapid oxidation by the copper sulphate, its sulphuric acid being left in solution along with the phosphoric acid.—A. S.

Sulphuric Acid; Determination of ——, by Means of Benzidine. F. Raschig. XXIII., page 1066.

Cyanogen Compounds; Determination and Separation of ——, and their Impurities. W. Feld. XXIII., page 1068.

English Patents.

Sulphuric Acid; Apparatus for the Manufacture of ——. R. Evers, Foerde, Germany. Eng. Pat. 17,316, Aug. 6, 1902.

See Fr. Pat. 323,397 of 1902; this Journal, 1903, 195.

—T. F. B.

Coal Waste Products from Mining Operations; Utilisation [Production of Sulphuric Acid] of ——. D. Janko, J. Kiss, and K. Stirling. Eng. Pat. 12,776, June 6, 1903. III., page 1040.

Caustic Soda and Sodium Hypochlorite; Production of ——, by Electrolysis. F. Ferrand, Manchester. Eng. Pat. 19,774, Sept. 10, 1902.

Sodium hydroxide and hypochlorite are produced from sodium chloride by continuously running a solution of the latter through a closed tank containing a lead (or the like) cathode, and an anode consisting of discs or plates of carbon (or the like) surrounded by the cathode. In the apparatus shown, the lead cathode forms the shell of the horizontal cylinder receiving the saline solution. The carbon plates are threaded upon a conducting axial rod or tube within, which, if desired, may serve for the introduction of the solution.—E. S.

Cyanides; Manufacture of ——, from Sulphocyanides. J. Tcherniac, Freiburg, Germany. Eng. Pat. 17,976, Aug. 15, 1902.

A solution of a thiocyanate (sulphocyanide) mixed with dilute nitric acid is heated, and a current of air is passed through the mixture, slightly in excess of the proportion required by the equation $HSCN + O_3 = HCN + SO_3$. The gases are led through a tower, in which any nitric oxide present is removed by a stream of water or of dilute nitric acid; and are then, after passage over anhydrous sodium sulphate, led over sodium carbonate or hydroxide, heated to about 150° C., to form a cyanide, nearly free from cyanate.—E. S.

Air; Apparatus for Separating ——, into its Constituent Gases. H. Dumars, Glenridge, New Jersey, U.S.A. Eng. Pat. 11,126, May 15, 1903.

Two liquid-air vessels are used, each of which communicates below with a liquid-oxygen receptacle common to both, and is provided with a compressed-air condensing pipe within it, the vessels being enclosed by an insulating vacuum chamber. A double counter-current interchanger consists of one high-pressure air incoming pipe connected with and delivering to the two condensing pipes within the liquid-air vessels, and of two low-pressure outgoing pipes, one of which encloses the incoming high-pressure pipe, and the other is enclosed by the same. The nitrogen vaporising from the liquid air is collected apart, and when the proper proportion of this has been taken off (about four-fifths), the residual oxygen is allowed to run into the oxygen tank.

In one form of apparatus the compressed air, after being cooled in the water-cooler, is used in an expansion engine before delivery to the interchanger.—E. S.

United States Patents.

Sulphuric Anhydride; [Contact] Process of Making ——. E. Raynaud, Spy, and L. Pierron, Jette-St.-Pierre, Belgium. U.S. Pat. 736,876, Aug. 18, 1903.

See Eng. Pat. 16,254 of 1900; this Journal, 1901, 42.

—T. F. B.

Sulphuric Acid; Absorber for the Manufacture of ——. J. B. F. Herreshoff, Assignor to General Chemical Co., both of New York. U.S. Pat. 737,233, Aug. 25, 1903.

The absorber comprises a receptacle, having an inlet for the gas to be absorbed, with a funnel-shaped enlargement extending downwardly, and an annular perforated plate extending outwardly from the lower edge of the enlargement with a rim depending from the outer edge of the plate. There is an outlet for maintaining the level of the liquid above the plate, so that the latter is kept immersed.

A gas-distributing device is connected with the inlet, and located below the level of the liquid; and tubes for admitting a diluting agent at the lower part of the liquid have their discharge ends directed inwardly. A cooling device is arranged above the perforated plate.—E. S.

Electrolytic Decomposition of Saline Solutions. A. B. Larcher, Assignor to The Penobscot Chem. Fibre Co. U.S. Pat. 736,982, Aug. 25, 1902. XI. A., page 1054.

FRENCH PATENT.

Aluminium Sulphate or similar Substances; Calcining [Drying] ——. A. E. Cammer. Fr. Pat. 320,055, March 7, 1903.

SEE Eng. Pat. 4820 of 1903; this Journal, 1903, 907.
—T. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Production of Easily Fusible ——, without the Use of Lead or Boric Acid. E. Orton, jun. Trans. Amer. Ceram. Soc., 1903, **5**, 305—337.

STARTING with common lime-soda glass, which was found to require too high a temperature, the author succeeded, by decreasing the proportion of silica from 2·5 to 2·0 molecules, increasing the alkali from 0·5 to 0·6 molecule, employing 0·3 molecule each of potash and soda instead of 0·6 of either alone, and by partly or wholly replacing lime by magnesia, baryta, or zinc oxide, in producing a large variety of glasses which soften at about 650° C. and melt at 750° C., whilst Cremer cones 010 melt from 875 to 925° C., and common window glass requires a temperature of 1155° C. The defect of swelling, possessed by the Cremer cones, is also exhibited by the above glasses, and if the cause cannot be overcome their value for use as cones will be considerably impaired. Another point still left unsettled is whether any of the glasses are less volatile than the Cremer frit, under protracted exposure to heat, and investigations into the cause of this swelling, point to absorption of sulphur trioxide, which is taken up in large proportion by the Seger frit, the lime and the barium glasses, whereas zinc glasses, magnesia glasses, and glasses containing both zinc and magnesium are less liable to absorb injurious quantities of sulphur.—C.S.

Clay; Influence of Magnesia on ——. A. E. Hottinger. Trans. Amer. Ceram. Soc., 1903, **5**, 130—133.

OWING to the fact that the melting and vitrifying points of clays containing magnesia are further apart than in clays containing lime, the former can be made into vitreous ware without great care in burning, and the ware will retain its shape even when the walls are extremely long and thin. Furthermore, such clays give dense bodies at comparatively low temperatures.

To study the advantages of magnesia in porcelain mixtures, trials were made with lime and magnesia, and with dolomite containing 50·28 per cent. of calcium carbonate and 40 per cent. of magnesium carbonate, in conjunction with Berlin porcelain body consisting of: clay substance, 55; felspar, 21·2; and quartz, 23·5 per cent. The mixtures were as follows, the table also giving the absorption when fired at the temperature of cone 1 and cone 5 respectively:—

No.	Mixture.	Absorption.	
		Cone 1.	Cone 5.
1	Porcelain body 100, whiting 10	26·2	24·9
2	" " 100, " 5	22·0	11·8
3	" " 100, dolomite 10	20·2	12·4
4	" " 100, " 5	19·1	10·8
5	" " 100, magnesite 10	18·8	9·9
6	" " 100, " 5	13·2	6·0
..	Porcelain body without addition	22·5	14·4

No. 6 proved the best, being a very hard, close body, resisting the action of a hard steel point. The dolomite mixtures were superior to those containing whiting, but inferior to the magnesite mixture.

That magnesia will not give the same result as a equivalent amount of lime was shewn by taking a cone mixture, consisting of: felspar, 0·3; calcium carbonat 0·7; kaolin, 9·2; quartz, 1·8; replacing the lime b an equivalent of magnesia, and firing the mixture at cone temperature, whereupon it was found that the lime mixtur vitrified while the magnesia mixture remained porou When fired at cone 5 the magnesia mixture vitrified, bu without any sign of melting.

Interesting results were obtained with a "shale" (vitrifie ware) containing: silica, 62·66; alumina, 21·26; ferri oxide, 3·50; lime, 0·92; magnesia, 0·51, alkalis, 4·60 percentage of loss by ignition, 6·44. These results ar given below:—

No.	Mixture.	Absorption.			
		Cone 05.	Cone 1.	Cone 3.	Cone 5.
1	Shale 100, whiting 25	21·9	Melted.		
2	Shale 100, whiting 12½............ .	20·4	Vitrified	Melted.	
3	Shale 100, magnesite 21	32·8	7·3	Vitrified.	Shape retained
4	Shale 100, magnesite 10½	28·1	0·32	"	Slightly swelled.
5	Shale 100, dolomite 22...............	22·4	11·5	Partially melted.	Melted.
6	Shale 100, dolomite 11...............	17·7	12·1	Blistered	"
..	Shale without additions............	12·0	0·78	..	..

No. 4 was practically vitrified at cone 1, and did no show signs of softening until cone 5, when it swelled slightly The dolomite mixtures did not fulfil expectations, showing less range in melting and vitrification points than those containing lime, being still very porous at cone 1, but losing shape and partly melting at cone 3.—C. S.

"Matt" (Pottery) Glaze; Development of ——. C. F. Binns. Trans. Amer. Ceram. Soc., 1993, **5**, 50—57.

THE author's researches were based on the fact that the best texture surface on certain copper-green glazes was exhibited by such as contained 0·35 of alumina; and the results showed that this proportion is also the most favourable for colourless matt glazes, the best effects being furnished with mixtures containing such bases as the following: lead oxide, 0·5; lime, 0·1—0·2; baryta, 0·1—0·2; zinc oxide, 0—0·2; potassium oxide, 0—0·1.

A dead matt, giving a crocodile-skin effect, was furnished by lead oxide, 0·575; lime, 0·170; potassium oxide, 0·135; zinc oxide, 0·120; together with 0·35 of alumina and 1·60 of silica. A bright crystal glaze was obtained with lead oxide, 0·575; lime, 0·200; zinc oxide, 0·225; a beautiful texture matt with lead oxide, 0·575; lime, 0·200; zinc oxide, 0·132; potassium oxide, 0·96; and a matt with lead oxide, 0·575; lime, 0·200; potassium oxide, 0·225, the proportions of alumina and silica being the same throughout.

In examining the influence of silica it was found that a good matt was obtained with 1·2, whilst 2·5 gave a brighter surface and increased mobility, and the best intermediate contained 1·95. This influence points to the probability of the matt texture being due to the particles of alumina which have been rejected by the glaze composition, but are combined when an extra amount of silica is used. As regards barium, its use enables the alumina to be reduced in amount; but it does not seem reliable in the raw state, though it might behave more favourably if fritted. Lead seems to be indispensable, though an excess is injurious; and zinc, potash, and lime are all desirable constituents of matt glazes.—C. S.

Ceramic Colours; Underglaze ——. E. C. Stover. Trans. Amer. Ceram. Soc, 1903, **5**, 115—119.

THE trials were made with the oxides of copper, cobalt, nickel, uranium, manganese, chromium, and iron, and also with a prepared chrome-tin pink, all being used with two reducing mixtures; one a spinel prepared according to ae Seger formula, and the other a Corfield flux compound f flint, 500; pearl ash, 100; white lead, 50; whiting 50; nd nitre, 50 parts.

The best results were obtained under glazes of the ollowing composition: Lime, 0·6; zinc oxide, 0·1; potash, oda, or lead oxide, 0·3; alumina, 0·22; and silica, 2·00; ese glazes being fired at cone 6, whilst for cone 8 the roportions of alumina and silica were modified to 0·26 nd 2·90 respectively. Two other glazes, fired at both emperatures, also gave good results, namely (1) potash, ·3; lime, 0·7; alumina, 0·5; silica, 4·0; and boric acid, ·0; (2) lime, 0·48; potash, 0·19; zinc oxide, 0·13; lead xide, 0·20; alumina, 0·26; silica, 2·68; boric acid, 0·30. his last is the formula for what is known as Trenton laze. In all cases the colours were better with the flux ian with the "spinel," and little difference was found in ials made with the colours applied over the glaze. The ference is that the proper way to control colour and ade is to adopt the most suitable flux or hardening ibstance and to regulate the tints by the proportions of xides and the mixture adopted. Greater uniformity of lour seems to be obtainable by using the oxides as derglaze colours than by calcining them to frit as a nstituent of stained glaze.—C. S.

Glazes (Stoneware); Studies on "White Bristol" ——. . C. Purdy. Trans. Amer. Ceram. Soc., 1903, **5**, 136—165.

He author's formula for white Bristol glaze, namely: tash, 0·5; zinc oxide, 0·4; lime, 0·1; alumina, 0·55; ica, 3·30; and borax, 0·01—gave unsatisfactory results practice, owing to defective physical properties, which used the glaze to crawl badly, and scale off in large tches when handled. In experiments made to remedy e trouble, the following formulæ gave the best results:—

Potash.	Lime.	Zinc Oxide.	Alumina.	Silica.
0·405	0·194	0·405	0·505	2·845
0·450	0·150	0·400	0·600	3·250
0·370	0·230	0·400	0·500	2·900
0.375	0·225	0·400	0·500	3·125

The results prove, in comparison with the first formula, that high a proportion as 0·55 equivalent of alumina can be ed, but that chemical and physical reasons preclude the use so high an equivalent of felspar; hence the equivalent potash must be reduced. In fact the high percentage of spar was found to be the cause of the crawling of the st-named glaze, and the resulting difficulties were not unterbalanced by the increased fusibility. For cone 7 istol glaze, the use of 0·4 felspar gives a more fusible xture in presence of 0·5 alumina than would 0·5 spar.

With regard to the influence of alumina on fusibility, this not always in direct proportion to the amount of alumina ployed, but rather depends on the degree of reaction curring between the ingredients, on the readiness of the uminiferous ingredients to fuse, on the readiness with ich the most fusible element will become a liquid in ich the other ingredients are more readily brought into mbination, and on the physical condition of the ingredients emselves. Seger found that greater fusibility was imparted mixtures of 1·0 equivalent of felspar with 1·0, 2·0, and 0 equivalents of calcium carbonate by adding a further 5—1·0 of felspar. An explanation of this is to be ight in the behaviour of clay when burnt just to the ge of dehydration—namely, that it will react with lime to nish a puzzolane cement, thus indicating sufficient tivity on the part of the resulting anhydrous aluminium cate to combine with lime at a lower heat. Bleininger s shown that clay becomes ready for chemical activity at ower temperature than felspar when lime is present.

In the case of Bristol glazes containing no clay, the dition of felspar increases the fusibility; but a greater luence is exerted in this direction by additions of clay, ecially in presence of lime, thus showing that it is the ction between the two most refractory ingredients, clay l calcium carbonate, that lowers the fusing point of the whole. Owing to this reaction, glazes containing 0·45—0·55 equivalent of alumina are the most fusible of any, provided the felspar does not exceed 0·4 equivalent; and this property brings the said glazes within the required range of fusibility of the average stoneware potter.

The first glaze in the foregoing table furnished a beautiful white Bristol glaze at cone 4 when fired on a green stoneware body in a majolica biscuit kiln, heated by gas, the temperature being raised as rapidly as possible in 48 hours. The same glaze gave excellent results when burned for 20 hours at cone 2 in the glost fire; but when tried in a stoneware kiln, where the temperature was raised slowly with coal, it needed cone 7 to furnish a good bright glaze. The time taken to mature the body and glaze has a direct influence on the quality, especially when the content of zinc is between 9·25 and 15 per cent. of the total weight. The more prolonged the firing after fusion begins, the brighter the glaze, since a larger proportion of the zinc in suspension is dissolved and combined.

The ratio of alumina to silica in these glazes is governed by physical as well as chemical limitations, for while silica exerts a softening effect and helps to bring more zinc into solution, it, like felspar, produces physical difficulties counterbalancing these advantages. The most favourable alumina : silica ratio is 1 : 5 to 1 : 7.

Experiments were made to show the relative effect, in various mixtures, of the increase of felspar at the expense of the calcium carbonate. The results were plotted in curves, which show that the most fusible glazes can be obtained with 0·3—0·4 equivalent of felspar, the higher limit giving the greatest fusibility, but that beyond this point any further increase renders clay glaze more refractory. Where the ratio between potash and alumina is 1:1, the fusibility is increased by adding felspar, in the absence of clay; but the lower the equivalent of felspar the higher can the potash-alumina ratio be without the fusing point of clayless glaze being attained. A glaze with 0·8 equivalent of clay, 0·4 of lime, and 0·2 of felspar or potash, is as fusible as one containing 0·5 of felspar and 0·1 of lime, with only 0·3 of added clay, owing to the action of the lime on the latter ingredient.

The most successful and economical glaze tried has the following formula: potash, 0·4; lime, 0·2; zinc oxide, 0·4; alumina, 0·56; silica, 3·08; and is recommended for stoneware at cones 6—7. For higher temperatures the alumina and silica could be increased, keeping the ratio 1 : 1·55, or diminished for lower temperatures, still preserving the same ratio and not allowing the alumina to fall below 0·48.—C. S.

French Patent.

Ceramic Products; Manufacture of ——, and Preparation of the Clay, Silicious Compounds, and Minerals therefor. Fr. Pat. 329,779, Feb. 27, 1903.

See U.S. Pat. 722,791 of 1903; this Journal, 1903, 496.
—T. F. B.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Asphalt Industry; Recent Developments of the ——. W. H. Delano. Proc. Inst. Civil Eng., 1902—1903, **152**, [2], 3—13.

The author has found that the best results for asphalt roadways, are obtained by placing a layer of asphalt 20 mm. ($\frac{3}{4}$ in.) thick on a 4-in. bed of concrete composed of washed flint pebbles, river sand, and best Portland cement, gauged 4, 3, and 1. Any cavities in the concrete revealed by a smooth edge are filled up with mortar composed of 3 parts of sand and 1 of cement. In summer, five days should be allowed for setting, in winter seven days. For liquid-asphalt footpaths, hydraulic-lime concrete may be used, with a mortar floating. Instead of laying the asphalt powder hot (in which case the surface of the concrete must be dry), it may be laid cold, by mixing it with petroleum spirit and a solution of india-rubber. Slabs of asphalt wear well where there is little traffic, and require no costly plant on the spot. They are laid in wet Portland-cement mortar on a concrete bed, cement being poured into the joints, and afterwards swept off with sawdust.

Asphalt has been found to protect buildings, bridges, breakwaters, &c., exceedingly well from the action of water. As any water condensed remains unabsorbed, however, flour, cement, &c., must be kept off asphalt floors by means of wooden frames.

The author specially emphasises the high value of asphalt foundations for arresting vibration—as in the case of steam-hammers, tunnels, iron bridges, heavy ordnance, &c. It is also very useful in protecting iron turrets from gun and shell fire, as it is not pulverised like concrete, but only torn asunder.

A test for asphalt is mentioned, which consists in heating a piece on an iron plate. The asphalt should fall to pieces. —A. G. L.

Sandstone, Artificial, or Sand Brick; Contributions to the Manufacture of ——. S. V. Peppel. Trans. Amer. Ceram. Soc., 1903, **5**, 168—217.

The author believes that good brick can be produced by the processes patented by F. Barber, C. Heinzerling, T. Boas, W. Olschewskey, O. H. Anderson, H. E. Brown, P. J. Prior, and W. Schwarz respectively, and that the value of each resides in its ability to reduce the cost of production rather than in any advantage in causing the chemical reaction in hardening. The difference in the cost of producing brick by the last five of these processes would, it is said, not exceed 1*s.* 6*d.* per 1,000, and the difference in the prime cost of the plant is also relatively small. A well-equipped plant with a capacity of 20,000 bricks per 10—12 hours' day would cost about 4,000*l.*—5,000*l.* in America, and the cost of production would be from 10*s.* to 15*s.* per 1,000, whilst the selling price ranges, it is said, from 32*s.* to 60*s.* per 1,000.—C. S.

Brick; A Method for Making Enamelled ——. L. E. Barringer. Trans. Amer. Ceram. Soc., 1903, **5**, 256—280.

The body used was Lower Mercer clay containing: silica, free, 24·20, combined, 34·66; alumina, 27·96; ferric oxide, 1·40; lime, 0·51; magnesia, 0·64; alkalis, 2·73; and water of combination, 8·82 per cent.; and this clay burned to a hard, dense, pale buff body at cone 8. The glaze, which was applied to the soft-burned bricks, unsaleable to builders, had the formula—0·3 potash, 0·6 lime, 0·1 zinc oxide (1·0 RO), 0·4 alumina, and 3·825 silica, and was selected as the best of 26 mixtures tried. The white engobe selected for application between the body and the glaze was composed of China clay, 50·0; flint, 30·0; and felspar, 20·0 per cent.; the formula being—0·156 potash, 1·0 alumina, and 4·80 silica; this proving the best out of four mixtures. To increase the tenacity of adherence between the engobe and the body, the former received an addition of 5 per cent. of sodium carbonate, dissolved in a minimum of water, after the engobe had been made up to the proper thickness.

A few coloured engobes were prepared, the best and cheapest blue being obtained by adding a solution of cobalt chloride to the engobe, the latter being sufficiently alkaline to ensure precipitation and uniform coloration throughout the mass. Iron colours can also be obtained by the same method. A dark sage-green was produced by adding 13 parts of raw chromic oxide to 87 parts of engobe; a satisfactory pink, by means of Seger's pink stain (8—10 per cent.); and a fairly good brown with 12 parts of commercial manganese (manganese dioxide, 81·01 per cent.; ferric oxide, 5·73 per cent.) and 88 of engobe. In an attempt to produce copper-greens, it was found that the copper volatilised at the edges of the brick, leaving a white edging, and on breaking a brick it was noticed that the copper had left the engobe entirely and settled in the glaze.

In applying the engobe and glaze by dipping, the most convenient density was found to be 45° and 50° B. respectively, and the bricks were fired in small rectangular down-draught kilns without saggars. Of the colours mentioned above, blue and manganese iron-brown are the easiest to burn, the colouring agents acting as fluxes and giving uniform shades. Chrome-green and chrome-tin-pink, however, require fully matured glazes, and must be fired in the hottest parts of the kiln.

To test the durability of the bricks, a number of them were laid to form the top courses in a stack of one of the kilns, and though exposed to extreme fluctuations of temperature for an entire winter, remained entirely free from cracking.

A plant for manufacturing such enamelled brick is also described in the paper.—C. S.

Cements; Recent Investigations in ——. A. V. Bleininger. Trans. Amer. Ceram. Soc., 1903, **5**, 74—101.

After reviewing the work done by various investigators since 1857, the author reports on his own researches, conducted for the Ohio Geological Survey. When clay substance is heated with amorphous calcium carbonate, the lime commences to act soon after the liberation of carbon dioxide has begun, and the clay is completely decomposed at about 850° C. The attack on free quartz begins at about 950° C., but free silica that will not pass through a 120—150-mesh sieve is unaffected at temperatures up to 1,350° C. Felspathic minerals are attacked almost as readily as clay. The action of crystalline calcium carbonate is more sluggish than the amorphous form, especially below 1100° C.

Chemical Activity of Calcium Oxide.—This was examined by grinding calcium carbonate intimately together with flint in a wet ball mill, to furnish a mixture of the formula $0·25CaO : SiO_2$, which was then burnt at 800—1,350° C., the intermediate temperatures rising by 100 to 1,200° C. The amount of silica rendered soluble increased from 5·94 per cent. at 800° C. to 22·73 per cent. at 1,350° C. There is an intimate connection between the progress of this reaction and the evolution of heat due to the hydration of the lime, very little heat being disengaged by calcium silicates or those of magnesia. The calorimetric hydration values, however, merely indicate certain general tendencies in the lime and magnesium series, and cannot be used as a basis of exact calculations of chemical composition, unless special precautions be taken to minimise error, the risk of which increases with the basicity of the mixture.

Physical Analysis of Cement.—In examining American cements for evidence of careless manufacture, use was made of the following modification of the Whitney method of physical analysis:—5 grms. of the dried raw cement mixture are made into a thin paste with water, and washed through sieves of 80, 120, and 130 meshes per inch in succession, the residue in each case being dried and weighed. The portion passing through the finest sieve is made up with water to 200 c.c. in a 250 c.c. beaker, where it is stirred for one minute, left to settle for an equal time, and the supernatant liquid carefully siphoned off. This operation is repeated until the liquid is clear, whereupon the residue is dried and weighed. The washings are next concentrated to 200 c.c., stirred as before, left to settle for three minutes, and syphoned off, this treatment also being repeated till the supernatant liquid is clear. The residue in this case is dried and weighed, and the washings are put through a third treatment, wherein the period allowed for repose is increased to nine minutes, the final sediment being dried and weighed. These operations furnish three grades of sediment of less size than the grains retained by the 200-mesh sieve, namely, 0·0088—0·0004 in. (for quartz), 0·0016—0·0002 in., and 0·0011—0·00014 in., respectively. The same method was applied to burnt and ground Portland cement, though in their case alcohol redistilled over caustic lime was used.

Function of Chemical Composition with regard to Hydraulicity of Cements.—In one series of tests in this connection, use was made of synthetical Roman cements, burnt at 900°, 1,000°, and 1,100° C. respectively. The clay was introduced in two ways; first as kaolin with 46·4 per cent. of silica, 39·7 per cent. of alumina, and 13·9 per cent. of moisture; secondly as a mixture of kaolin and flint, containing 70 per cent. of silica, 22·21 per cent. of alumina, and 7·7 of moisture. In the one case the ratio silica : alumina was 1·17:1, and in the other, 1:1·69. The lime used was best whiting, and the whole after being ground wet in a porcelain ball mill r six hours, was heated for two hours at the tem-erature specified. In the other series, with American itural cements, a natural dolomitic limestone from Ohio as used to replace the lime molecule by the double olecule of magnesium-calcium carbonate in equivalent roportion. The results of the first series are held to dicate that the temperatures employed were too low to ing out the full hydraulicity of the mixtures: and that olin is less efficient than the kaolin-flint mixture. In e second series a narrow temperature range of hydraulic tivity is indicated; and the breaking down of the silicates ems to be due to the two rates of hydration of magnesia d lime.

An extension of the same trials to Portland cement ows that the best cements are produced from clays rich silica, provided the lime ratio is suitable and the grinding d burning have been properly performed. In many ses benefit is derived from the addition of free silica sandstone, the stone being first calcined in a kiln, enched while hot, and added in a ground condition, to ercome the difficulty experienced in grinding quartz hen enveloped by particles of clay. Vitrification and the haviour of poor cements can often be improved by adding small quantity of iron ore; and the greater part of the on in rotary-kiln clinker is in the condition of ferric oxide, twithstanding that the colour is black.—C. S.

lectro - Endosmose: Technical Application of —— *[Drying Wet Clay]*. Count von Schwerin. XI. A., page 1053.

ENGLISH PATENT.

'ood; Impregnation of —— *[with Tar-Oils]*. O. Heise, Berlin. Eng. Pat. 22,805, Oct. 20, 1902.

r Fr. Pat. 325,486 of 1902; this Journal, 1903, 698. —T. F. B.

UNITED STATES PATENT.

reproofing Wood; Process of —— A. M. Pierce, Brooklyn, Assignor to B. L. Gilbert and W. H. Peddle, New York. U.S. Pat. 737,468, Aug. 25, 1903.

E Eng. Pat. 14,522 of 1903; this Journal, 1903, 998. —R. A.

FRENCH PATENTS.

'ood; Method of Impregnating ——, *with Tar-Oil.* O. Heise. First Addition, dated Feb. 26, 1903, to Fr. Pat. 325,486, Oct. 21, 1902.

STEAD of impregnating wood with oil under pressure, lutions of salts or a mixture of a salt solution with an tiseptic body may be used. The treatment with steam der pressure may be replaced by treatment with super-ated steam or with hot gas under pressure, or with a xture of the two.—A. G. L.

ricks; New Composition for Light ——. A. Marsault. Fr. Pat. 329,500, Feb. 18, 1903.

IE bricks consist chiefly of one of two minerals, having e composition 92 to 96 per cent. of silica and 8 to 4 per nt. of alumina, and 82 to 86 per cent. of silica and 18 to per cent alumina, respectively. The first is used for king very hard bricks capable of withstanding great essures and elevated temperatures, the second for par-ions, filling up, &c. The powdered mineral is mixed th 5 to 25 per cent. of bran, sawdust, bark, &c., the xture moistened, and moulded in a press. The bricks tained are allowed to dry in the air and burnt as usual. —A. G. L.

tificial Stone; Process and Apparatus for Making ——. E. Eaton. Fr. Pat. 329,671, Feb. 24, 1903.

E Eng. Pat. 2372 of 1903; this Journal, 1903, 698. —T. F. B.

icon, Carbon, and Oxygen in Chemical Combination; Compounds [Refractory Material] containing ——, *and their Manufacture.* The Acheson Co. Fr. Pat. 329,778, Feb. 27, 1903.

E Eng. Pat. 3629 of 1903 and U.S. Pat. 722,792 of 1903; s Journal, 1903, 743 and 500 respectively.—T. F. B.

Refractory Material obtained without Roasting. H. Estève. Fr. Pat. 329,802, Feb. 27, 1903.

A REFRACTORY material is produced by treating in a mould or press a mixture of clay (10 parts), plumbago (50 parts), "ash of charcoal" (20 parts), sulphate of copper or of iron (4 parts), and ferric oxide (16 parts), with sufficient water to form a plastic mass.—A. S.

Asphalt and Bitumen; Composition of ——, *for Paving and other Purposes.* H. D. Blake. Fr. Pat. 329,993, March 6, 1903.

THE composition consists of 10 parts of natural bitumen, 40 parts of fine sand, powdered chalk or similar substance, and 50 parts of mineral asphalt.—A. G. L.

X.—METALLURGY.

Steel; The Heat Treatment of ——. W. Campbell. Iron and Steel Inst., Sept. 1903.

THE author's experiments with a steel containing 0·50 per cent. of carbon, 0·98 per cent. of manganese, 0·094 per cent. of silicon, 0·098 per cent. of phosphorus, and 0·08 per cent. of sulphur, led him to the following conclusions:—The structure of the steel used, depended upon the two constituents present, namely, ferrite and pearlite. The pearlite will show the finest structure when the steel has been heated to just above Ac_1, or when it has been transformed into martensite. Heating to temperatures above this point will cause a coarser structure. Above Ac_1, the ferrite begins to diminish in size, owing to its being dissolved in the martensite. This process continues until the whole of the ferrite is dissolved, when the change, Ac_{2-3}, is complete. The finest structure of the whole alloy occurs when these two changes balance, apparently at a point just below that where Ac_{2-3} is complete. The best finishing temperature is one such that the bars leave the rolls as near Ac_{2-3} as possible.—A. S.

Steel Rails; Sorbitic ——. J. E. Stead and A. W. Richards. Iron and Steel Inst., Sept. 1903.

THE usual method for the production of sorbite, which may be regarded as pearlite which has not been able to separate into ferrite and cementite by reason of lack of time, or from some other cause, and which confers upon steel greater tenacity and toughness, has been to reheat the steel and quench in oil, or to quench completely in water and reheat to dull redness. The authors avoid reheating, but quench the heads of the steel rails, as soon as they are sawn to length, so that a point below Ar_1 is reached, and thus allow the residual heat in the rails to do the tempering. It is found that by this method, although the elongation is decreased, the contraction of area remains practically the same. The authors believe that by specially treating steel rails in the manner described, their life will be increased from 25 to 50 per cent., and they state that pearlite should be replaced by sorbite in all structural steels which have to be subjected to friction, percussion, or vibration when in use.—A. S.

Steel Rails high in Manganese; Notes on the Heat Treatment of ——. J. S. Lloyd. Iron and Steel Inst., Sept. 1903.

THE author finds that at the ordinary normal heat suitable for rolling ingots, steel containing 0·46 per cent. of carbon and 1·33 per cent. of manganese is made exceedingly brittle, if it is not further treated, but allowed to cool on the mill floor. Slow cooling in the furnace after heating for 18 hours at 950° C. makes the material about twice as ductile as it was in the original rail, but the tenacity is considerably reduced. Heating to the rolling temperature causes an enormous development in the size of the grains, but these are broken up by heating to 950° C. and subsequent slow cooling, the structure obtained being twice as fine as that of the normal rail.—A. S.

Steel; Restoration of Dangerously Crystalline ——, *by Heat Treatment.* J. E. Stead and A. W. Richards. Iron and Steel Inst., Sept. 1903.

WHEN steel is heated at a high temperature, causing it to be brittle, a microscopic examination shows a great development in the size of the crystalline grains. The temperature necessary to cause such deterioration is only a little above that to which steel is commonly heated previous to rolling or forging. Reheating to about 870° C. is found, in nearly all cases, to restore to it the original structure. Indeed, the results tend to show that a short reheating to about 900° C. makes the steel better than it was originally, especially in the case of high carbon steels.

Forgings of unequal section are preferably heated to 850°—900° C. and cooled in air, oil, &c., being finally annealed in a furnace at a dull red heat to remove the stresses produced by rapid cooling.—T. F. B.

Steel; Diffusion of Sulphide through ——. E. D. Campbell. Iron and Steel Inst., Sept. 1903.

FURTHER experiments are described which show that iron is permeable to sulphides when heated above 1200° C. (See this Journal, 1896, 906, and 1897, 801.)

The asbestos covering which enclosed the iron tubes used in the experiments was found to be converted into a hard greenish-black scale, containing amounts of sulphur varying from 0·31 to 0·57 per cent. and iron 17·25 to 26·13 per cent. When, instead of using oxysulphide of iron alone, nickel sulphide (Ni_4S_3) was also introduced into the tubes, the diffusion took place just the same.
—T. F. B.

Iron; Influence of Silicon on ——. T. Baker. Iron and Steel Inst., Sept. 1903.

THE author prepared a series of iron-silicon alloys containing from 1 to 11 per cent. of silicon, and only traces of other elements, and studied their microstructure and mechanical and physical properties. It was found that the addition of silicon to iron increases the elastic limit and tenacity, but reduces the ductility. If the alloy be well annealed, the loss of ductility is not very considerable until the amount of silicon reaches 3 per cent., after which it becomes very great, the ductility being almost *nil* with 4 per cent. of silicon. The alloys gradually increase in hardness with the addition of silicon.

The effects of heat treatment on the alloys are shown in a series of cooling curves. The addition of 1·2 per cent. of silicon to iron entirely eliminates AR_3 and lowers the temperature at which AR_2 occurs to 733° C. Further additions of silicon lower AR_2 to a still greater extent, as is shown in the following table :—

Silicon per Cent.	Temperature at which Ar_2 occurs.	Displacement.	Displacement per 1 per Cent. of Silicon.
0·02	740 C.	..	..
1·03	733 C.	7°	6·8°
1·94	725 C.	15°	7·7°
2·99	713 C.	27°	9·3°
4·50	703 C.	37	8·2°
4·89	694 C.	46	9·4°
7·47	678 C.	62	8·3°

Eight photomicrographs showing the microstructure o the various alloys are included in the paper.

With regard to the magnetic properties of the alloys the permeability for low magnetic fields increases wit increasing additions of silicon, and the coercive force an hysteresis loss decrease.—A. S.

Iron and Tungsten; Alloys of ——. R. A. Hadfield. Iron and Steel Inst., Sept. 1903.

THE author prepared and examined a series of iron-tungsten alloys, containing from 0·10 to 16·18 per cent. of tungsten, and (with the exception of carbon, in the alloys containin 7·47 per cent. or more of tungsten) only small percentage of other elements. As in the case of iron-nickel and iron-chromium alloys (this Journal, 1892, 910; 1900, 150), th addition of silicon or aluminium was necessary to obtai sound alloys.

Cast Alloys.—With increasing proportions of tungste the toughness of the alloys diminished and the hardnes increased. No zone of brittleness—followed, on furthe addition of the alloying metal, by a return to toughness—was observed, as was the case with iron-manganese an iron-nickel alloys (this Journal, 1888, 211; 1900, 150) The magnetic susceptibility of the alloys is not diminishe by increasing amounts of tungsten.

Forged Alloys.—The peculiar "silky" fracture regarde as characteristic of tungsten steels, was only observed whe the carbon exceeded 1¼ per cent.: it appears to be cause by the presence of carbon in combination with tungsten Unannealed alloys containing up to 1·49 per cent. o tungsten showed a certain amount of ductility, but th toughness rapidly diminished with higher amounts o tungsten. The ductility is considerably increased by annealing. The elastic limit of unannealed alloys, containin up to 1·49 per cent. of tungsten, is only slightly higher tha

Mark of Specimen.	Analysis.			Unannealed Test Bars. Load in Tons per Sq. Inch.				Annealed Test Bars. Load in Tons per Sq. Inch.				Forged Compression Tests (Unannealed Material). Load in Tons per Sq. Inch.		Cast Bending Strips.		Forged Bending Strips.		Corrosion Tests on Forged Materials by immersion in 50 per Cent. Sulphuric Acid for 21 Days.	
	C.	Mn.	W.	Elastic Limit.	Breaking Load.	Elongation.	Reduction of Area.	Elastic Limit.	Breaking Load.	Elongation.	Reduction of Area.	Elastic Limit.	Shortening per Cent. by 100 tons.	Unannealed.	Annealed.	Unannealed.	Annealed.	Loss in Grammes.	Loss.
				Tons.	Tons.	Per Cent.	Per Cent.	Tons.	Tons.	Per Cent.	Per Cent.	Tons.	Per Cent.	Bent to	Bent to	Bent to	Bent to		Per Cent.
A	0·13	0·22	0·10	20	25	35	60	14	22	43	65	..	..	56°	105	Double	Double	..	
B	0·15	0·22	0·20	22	27	40	60	16	22	46	66	30	52	64°	Double	"	"	3·055	5
C	0·15	0·29	0·40	24	31	33	59	18	25	39	60	30	50	31°	158	"	"	..	..
D	0·13	0·18	0·35	20	27	37	58	16	23	45	69	..	..	51°	Double	"	"	..	..
E	0·21	0·18	0·81	29	32	35	63	18	26	57	53	..	..	31°	"	"	"	..	..
F	0·22	0·18	1·20	25	32	25	49	17	27	37	54	..	..	53°	"	"	"	..	.
G	0·21	0·25	1·49	20	34	26	46	19	28	37	54	30	48	18°	"	"	"	2·102	3
H	0·28	0·28	3·40	31	41	29	51	23	34	34	53	40	39	23°	.	110°	"	1·392	2
I	0·38	0·29	7·47	37	63	14	18	21	40	25	38	49	22	6°	41	84	"	2·797	4
J	0·46	0·28	8·33	45	64	2	2	25	42	23	32	..	..	6	32	45	"	..	..
K	0·63	0·25	10·56	55	80	5	4	28	48	10	10	..	..	6°	28	10	"	..	..
L	0·76	0·28	15·65	Too hard to machine.				27	57	3	2	50	9	3	10°	5	168°	3·920	6
M	0·78	0·27	16·18	50*	Broke short at 55.	¼	¾	27	43	1	¾	70	2	2°	6°	3°	95°	3·574	5

* Bar measured up to 50 tons, but no set observed.

in steel containing similar amounts of carbon; but with higher proportions of tungsten, a considerable increase was observed, owing, in great measure, to the "self-hardening" effect of iron-tungsten alloys on cooling during the forging process. The annealed alloys have a comparatively low elastic limit, the effect of tungsten in this respect being quite different from that of nickel, chromium, or manganese. The tenacity of the unannealed alloys increases with the proportion of tungsten, but this is probably due rather to hammer-hardening or self-hardening, than to the presence of tungsten. The tenacity of the annealed alloys is comparatively low. Annealing considerably increases both the elongation and reduction of area of iron-tungsten alloys. The results of the compression tests confirmed the fact indicated by tensile and other tests, that tungsten does not, when the amount of carbon is comparatively low, greatly stiffen or harden iron.

The chief results of the various tests are shown in the accompanying table, page 1050.

The addition of tungsten, like that of manganese, chromium, &c., to iron, greatly hinders or prohibits the welding together of specimens.

The magnetic qualities of iron-tungsten alloys have been previously investigated (this Journal, 1900, 911).

The effect of heat treatment on the alloys is shown in a series of curves prepared by Osmond, who states that:—

(1) If the temperature does not exceed 850° C., the curves do not sensibly differ from those of steel without tungsten.

(2) If the temperature reaches about 1040° C., AR_1 is very sharply lowered; AR_3 and AR_2 are not altered.

(3) When the temperature reaches 1300° C., AR_3 and AR_2 are also lowered, and tend to rejoin AR_1.

(4) Under certain conditions AR_1 appears to divide into two portions.

The author finally discusses the properties of self-hardening steels (this Journal, 1903, 300, 422).—A. S.

Metallic Oxides; Reduction of ——, in a Current of Hydrogen. F. Glaser. Zeits. anorg. Chem., **36**, 1—35. Chem. Centr., 1903, **2**, [8], 482.

Silver oxide is reduced to silver suboxide at 34° C., and to metallic silver at 63° C. Yellow mercury oxide begins to lose oxygen at 75° C., red oxide at 91° C., and crystalline red oxide at 140° C. Copper oxide prepared from the nitrate is converted into metallic copper at 150° C., "powdered" copper oxide, on the other hand, only at 194° C. Lead peroxide yields lead oxide at 194° C., greyish-green suboxide at 211° C., and metallic lead at 235° C. Cadmium oxide was reduced to metal by heating in a current of hydrogen for three hours at 290°—300° C. A nickel compound of the composition, $Ni_2O_7H_4$, obtained by precipitating a nickel salt with an alkali hypochlorite, lost one atom of oxygen at 50° C., and by further heating at 109°—112° C., was converted into nickelous hydroxide, $Ni(OH)_2$. The latter when heated in the air, at 255°—300° C., formed nickel monoxide, which when heated at 230° C. in hydrogen, was converted into black nickel suboxide, Ni_2O, and at 500° C. into metallic nickel. Cobalt sesquioxide when heated in a current of hydrogen gives the protosesquioxide, Co_3O_4 at 194° C., the monoxide at 207° C., and metallic cobalt at 500° C. From ferric oxide there are formed the magnetic oxide, Fe_3O_4, at 298° C., ferrous oxide at 305° C., and metallic iron at 495°—500° C. Manganese peroxide is reduced to the sesquioxide at 183° C., to the oxide, Mn_3O_4, at 230° C., to manganous oxide at 296° C., nd to metallic manganese above 1200° C. Zinc oxide is cted upon slowly by hydrogen at 454° C. The author proposes to make use of the reduction of metallic oxides by hydrogen for the quantitative determination of different xides in mixtures,- for example, in mixtures of copper xide with the oxides of zinc, iron, nickel and silver.

—A. S.

Sulphur in Iron and Steel; Apparatus for the Determination of ——. A. Kleine. XXIII., page 1064.

Lead and Silver; Determination of ——, by the Dry Method, in Ores containing Copper and Antimony. E. Prost and E. Lecocq. XXIII., page 1066.

Arsenic; Determination of ——, in Ores and Metallurgical By-products. E. Prost and E. von Winiwarter. XXIII., page 1066.

English Patents.

Steel from Chromic Pig Iron; Method of Manufacturing ——. C. M. Leitch, London. From O. Massenez, Wiesbaden. Eng. Pat. 26,980, Dec. 6, 1902.

See Fr. Pat. 329,132 of 1902; this Journal, 1903, 1002.

—T. F. B.

Ores; [Magnetic] Treatment of ——. H. F. Campbell, Melrose, Mass. Eng. Pat. 6811, March 24, 1903.

See U.S. Pats. 723,362 and 723,363 of 1903; this Journal, 1903, 558.—T. F. B.

Metal Castings or Alloys; Process of Manufacturing Homogeneous ——. C. A. Jensen, London. From H. Goldschmidt and W. Mathesius, Essen-on-the-Ruhr, Germany. Eng. Pat. 22,294, Oct. 14, 1902.

See U.S. Pat. 733,957, July 21, 1903; this Journal 1903, 953.—E. S.

Precious Metals; Recovery of ——. H. L. Sulman and H. F. Kirkpatrick-Picard, London. Eng. Pat. 27,360, Dec. 11, 1902.

The pulped ores, mixed with a liquid solvent for the precious metals, are passed upwards into an apparatus consisting of concentric, inverted, conical, or similar vessels, having amalgamated surfaces, the narrow intervening spaces being filled with a descending body of mercury, kept continuously charged with an amalgam of sodium or other electropositive metal. The process is also applicable to the recovery of precious metals from solutions that have been removed by previous filtration from ores or slimes under treatment. The mercury may be continuously charged with sodium in a connected apparatus by electrolysis. Compare Eng. Pat. 7157, April 4, 1901; and U.S. Pat. 708,504, Sept. 2, 1902; this Journal 1902, 1081 and 1234.

—E. S.

Precious Metals: Extraction of ——, from their Ores. J. B. De Alzugaray, Shortlands, Kent. Eng. Pat. 17,709, Aug. 12, 1902.

The finely-divided ore is mechanically agitated in a vessel containing solution of a cyanide, into which a gaseous oxidising mixture, consisting of a gaseous halogen, with a halogen acid, or combined with oxygen, or ozonised air, steam, &c., is blown. Or the ore may be agitated in water, and the gaseous mixture blown in may carry with it a gaseous cyanogen compound. The present invention is stated to be widely different from the bromocyanide process by the use of an acidified oxidiser, so that a bromocyanide is not produced. After some hours treatment, the precious metals are recovered from the separated solution by any suitable process. Compare U.S. Pat. 701,002, 1902, and Eng. Pat. 15,541, 1901; this Journal, 1902, 863 and 1140; also U.S. Pat. 724,076, March 31, 1903; and Eng. Pat. 17,322, Aug. 6, 1902; this Journal, 1903, 558 and 913.

—E. S.

Fine Ores, Granulated Ores, or Sand Ores; Process of Preparing ——, for Moulding them into Briquettes and Making them Fit for Use in the Blast Furnace. W. Huffelmann, Duisburg, Germany. Eng. Pat. 10,648, May 11, 1903.

The fine ores are mixed with dust of coke or charcoal, and are completely dried by heat in a suitable apparatus; molten tar is then added to the hot mixture, and the mass is moulded into briquettes under high pressure. In some cases the briquettes are baked at a bright red heat before storing.—E. S.

Aluminium; Manufacture and Method of Applying a Special Solder for Joining ——. C. McArthur, Aberdeen. Eng. Pat. 28,605, Dec. 27, 1902.

To form the solder, ammonium chloride and heavy magnesium carbonate are successively stirred into molten zinc and block tin is then stirred in, all these being in stated proportions. The manner of using the solder is described.

—E. S.

Soldering Composition; A Liquid ——. J. Callmann and R. Bormann, Berlin. Eng. Pat. 13,557, June 17, 1903.

The composition consists of finely-powdered tin or an equivalent alloy, worked into a paste with a deoxidising agent, such as zinc chloride, and a thickening substance, such as cellulose. The paste is applied with a brush, and the soldering is effected by applying a flame to the joined prepared surfaces.—E. S.

United States Patents.

Nickel-Iron Alloys; Process of Making ——, *direct from Ores.* N. V. Hybinette, Bayonne, N.J., Assignor to International Nickel Co., N.J. U.S. Pat. 736,400, Aug. 18, 1903.

Ores composed mainly of iron, nickel, and copper sulphides, are roasted with salt, the material being heated to a temperature at which iron and nickel chlorides will be decomposed. The cooled mass, after copper chloride has been leached out, is employed directly in the production of nickel-steel.—E. S.

Rebellious or Refractory Ores [of Precious Metals]; Treating ——. A. M. Beam, Denver, Col., Assignor to the Beam Converting Furnace Co., Col. U.S. Pat. 737,059, Aug. 25, 1903.

The finely-powdered ores, mixed with an "oxidising flux," such as a mixture of "carbon, sodium chloride, sodium nitrate, and silica," are heated in a closed muffle to from 250° to 500° F., with exclusion of air, until the sulphides are partially oxidised to sulphates without ignition of the sulphur; heated air is then admitted, a "low heat" being preserved, to complete the oxidation of the sulphides into sulphates "without causing cementation or coating of the ore particles with residuum of sulphur, and to leave the gold and precious metals in a free and amalgamable condition." The ore is then mixed with water, and submitted to amalgamation, the concentrates being again subjected to the process.—E. S.

Zinc and Copper; Treating Ores for the Recovery of ——. A. M. Beam, Denver, Col., Assignor to the Beam Converting Furnace Co., Col. U.S. Pat. 737,060, Aug. 25, 1903.

The powdered ores, mixed with an oxidising flux, are gently heated in a closed muffle with exclusion of air, and later, with admission of heated air, the process being so conducted as to promote the formation of sulphates, without ignition of the sulphur, as described in the preceding abstract. The converted ores are then leached with water, and the metals are precipitated from the solution.—E. S.

Precious Metals; Process of Recovering —— *[from Refractory Ores].* A. M. Beam, Denver, Col., Assignor to the Beam Converting Furnace Co., Col. U.S. Pat. 737,061, Aug. 25, 1903.

The ores, after oxidation of their sulphides to sulphates by the treatment described in the two preceding abstracts, are reground and are then subjected to amalgamation.—E. S.

Gold and other Metals; Apparatus for Extracting ——, *from Ores.* E. L. V. Naillen, San Francisco, Cal. U.S. Pat. 737,533, Aug. 25, 1903.

An airtight concentrating tank, consisting of two cone-shaped sections united at their greatest diameter by flanges, is fitted centrally within a settling tank, the inlet to which is in communication with the outlet at the top of the concentrating tank. An intermediate strip projecting outwardly is secured between the flanges mentioned and supports a perforated diaphragm dividing the settling tank into two sections. The settling tank has a number of compartments in its upper section, connected to the outlet to the inner tank, and its lower section is connected to a precipitating box. A convex-concave valve is disposed transversely in the concentrating tank, controlled by a vertical hollow stem passing through the top, and operates, when closed, to separate the tank into an upper and a lower chamber, and, when open, serves as a spreader or distributor. The inlet pipe entering at the bottom, for the "current of ore," is connected to the valve, and is supplied from an elevated ore reservoir and a pressure cylinder. To the inlet is also connected an injector consisting of a cone adjusted within a suitable socket coupling.—E. S.

French Patents.

Steel, Cast-Iron, &c.; Rapid Process of Cementing ——. J. Lecarme. Fr. Pat. 327,984, June 6, 1902.

The active material used to effect the cementation of iron and steel surfaces is an intimate mixture of powdered charcoal with an equal part of a concentrated aqueous solution of potassium cyanide, for which, in some cases, potassium ferrocyanide may be partially or entirely substituted. This mixture may be formed into a paste with gelatin, dextrin, or the like. Also, any one of these mixtures may be combined with a salt or oxide of nickel, chromium, manganese, tungsten, molybdenum, &c., in order to obtain a superficial layer in cementation, of diverse qualities, according to the nature of the salt or oxide employed.—E. S.

Soft Steel, Iron, Semi-Hard Steel, Cast Steel, Cast Iron, and Malleable Iron; Process of Industrial Cementation and Tempering of ——. J. Lecarme. First Addition, dated Oct. 10, 1902, to Fr. Pat. 327,984 of June 6, 1902.

The carbon and cyanide compound described in the main patent (see preceding abstract) is mixed with "traces" of arsenious oxide, and is worked up to a paste with boiled linseed oil and turpentine. The arsenic may be replaced by a metalloid, such as red phosphorus or sulphur. By the use of such a compound in cementing steel, &c., surfaces of special qualities are obtained. Also, iron or steel may be "cemented" (in the sense of forming a superficial alloy) by use of a "carbon-chrome-silicium" compound, or by other combinations of carbon prepared in the manner described. —E. S.

Metals [Fused] or other Fused Bodies; Treating ——, *with Sodium or with Alkaline Compounds.* P. L. Hulin. Fr. Pat. 327,982, June 4, 1902.

Molten metals, such as cast iron, steel, copper, or nickel, are purified by injecting into them from above, vertically or obliquely, a thin, thread-like stream of molten sodium under great pressure, in such manner that the sodium may be diffused in small particles throughout the liquid mass. The sodium is contained in a closed cylindrical vessel, contracted above and below, and is forced through a pipe with a fine bore, closed at the bottom by a plug of fusible metal, which melts on immersion in the molten metal, permitting outrush of the molten sodium. Instead of using compressed gas to force out the sodium, a volatile liquid, such as benzene, may be introduced into the containing vessel, so that, on applying heat to melt the sodium, the vaporising of the liquid may give the required pressure. Instead of sodium, certain fusible alkaline bodies may be introduced. The process is also claimed for the production of alloys of sodium with other metals, and also in the production of alloys otherwise difficult to obtain, the process in this case consisting in projecting the fine stream of molten sodium through a fused layer of a reducible compound of one of the metals required for the alloy, such layer floating on the surface of the principal metal intended to receive the metal set free by the sodium.—E. S.

Furnaces; Reverberatory ——. W. E. Moore. Fr. Pat 329,675, Feb. 24, 1903.

See Eng. Pat. 4335 of 1903; this Journal, 1903, 800. —T. F. B.

Fumes [from Sulphide Ores in Blast Furnaces]; Recovering and Treating Certain ——. The Cadmium and Zinc Ores Products Syndicate, Ltd. Fr. Pat. 329,733, Feb. 25, 1903.

See Eng. Pat. 16,723, July 28, 1902; this Journal, 1903, 870. Compare also Fr. Pat. 321,062, Aug. 6, 1902; this Journal, 1903, 499.—E. S.

Copper from Minerals; Extraction of ——. G. D. van Arsdale. Fr. Pat. 329,838, Feb. 28, 1903.

ee U.S. Pat. 723,949 of 1903; this Journal, 1903, 558.
—T. F. B.

Lycopodium; Manufacturing a Substitute for —— [*Metallurgical Application*]. M. Kalb and Max Helbig. Fr. Pat. 329,944, March 4, 1903.

ee Eng. Pat. 7838, April 4, 1903; this Journal, 1903, 001.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

lectro-Endosmose; Technical Application of ——. Count von Schwerin. Zeits. f. Elektrochem., 1903, **9**, [36], 739—741.

he author finds that the removal of water from such bstances as wet peat, alizarin-paste, fine moist clay, which industrially impossible at a reasonable cost by evaporaon or filtration, can be cheaply effected by making use of e fact that when an electric current is passed through em, the solid particles migrate towards the anode, or drive e water towards the cathode. In the experiment described, e peat was contained in a wooden box with a bottom of rong brass netting, which formed the cathode. The anode as a lead plate. When connection was made, water reamed out from the bottom of the box. The author lculates that a quantity of peat so dried will by its comstion furnish electrical energy sufficient to dry five times weight of similar peat. Similar experiments shewed at fine clay suspended in water gathered upon the anode hen the current passed, leaving the liquid quite clear.
—J. T. D.

used Lead Chloride; Electrolysis of ——, *with regard to the Relation between Current-Density and Yield.* A. Appelberg. Zeits. anorg. Chem, **36**, 36—75. Chem. Centr. 1903, **2**, [8], 479.

an addition to the work of Helfenstein and Auerbach is Journal, 1900, 670; and 1901, 1001), the author has died the electrolysis of fused lead chloride when a small M F. is used. In a V-tube, decreasing current-density accompanied by a reduction of the yield of lead. This luction is less evident at higher current-strengths, but reases with decreasing current-density. The author culates from his results that at about 0·02 ampère, the paration of lead is balanced by the losses due to volatiliion and residual current; practically the limit is attained 0·05 ampère. The corresponding minimum E.M.F. is 6 volt. With higher current-densities, the polarisation approximately constant at 1·25 volts. Contrary to lfenstein's results, the author finds that the course of ctrolysis is the same in a cylindrical trough as in a tube. If, instead of lead chloride alone, the eutectic xture of lead chloride and potassium chloride (solidify- at about 430° C.) be used as electrolyte, no nebulæ metallic lead are produced, the melt remains clear, l the current-yield increases nearly to the amount icated by Faraday's law. Similar results are obtained h a mixture of lead chloride and sodium chloride. enz has constructed the formula: $a = 100 - \frac{k}{i_n}$, in ch a is the current-yield (per cent.), k and n are two stants, and i is the strength of current.—A. S.

hnical Organic Chemistry; Importance of Electrohemistry in ——. M. Buchner. Zeits. f. Elektrochem., 903, **9**, [36], 728—731.

ganic substances are in many cases non-conductors, or ecomposed by the current, yield complex products not nce of value. Electrolytic processes, however, in which or other of the products of electrolysis of an inorganic stance is used to react on an organic substance, are oming more frequent (chlorination of acetic acid, or lation of phthalimide to anthranilic acid at the anode he electrolysis of sodium chloride; electrolytic oxidation of chromic sulphate to chromic acid in alizarin preparation, &c.). Such reactions possess the advantage over the separate preparation and application of chlorinating or oxidising substances that there are no waste products; and, moreover, while the product at one electrode is being used for such purposes, the other may at the same time yield a valuable substance. The most important organic electrolytic processes hitherto are reduction processes, by which amines, aminophenols, and hydrazo compounds are produced. A striking instance of the combination of chemical and electrical methods is found in the reduction of nitrobenzene. By placing in the cathode cell a small quantity of tin (iron, lead, or copper), reduction in acid solution occurs with rapidity, the tin being alternately dissolved in effecting the reduction, and re-deposited on the cathode. Haber has similarly found that the addition of copper-powder in the cathode cell causes the reduction of nitro-compounds in alkaline solution to amines, and prevents the formation of intermediate azoxy-, azo-, and hydrazo compounds. This reaction affords a use for the otherwise superfluous hydrogen evolved at the cathode in the electrolytic chlorine industry; the German annual production of 50,000 tons of electrolytic bleach implies formation of 500 tons of hydrogen, capable of producing 9,000 tons of aniline by this process, which would at the same time effect a considerable saving of energy.—J. T. D.

Nitrobenzene; Influence of the Material of the Cathode on the Reduction of ——. W. Löb and R. Moore. Zeits. f. Elektrochem., 1903, **9**, [36], 753—754.

In the electrolytic reduction of nitrobenzene suspended in aqueous sodium hydroxide solution, cathodes of platinum, mercury, or nickel yield azoxybenzene; of lead, tin, or zinc, azobenzene; of copper, especially in presence of copper powder, aniline. The authors have measured for each cathode its potential against sodium hydroxide solution alone, and against the same solution in presence of nitrobenzene; the difference between these they call the depolarisation-value of the nitrobenzene. In the case of platinum and of most of the other metals the depolarisation-value decreases as the current-strength increases; in the case of copper, it shows periodic variations, alternately rising and falling as the current-strength increases. This latter phenomenon is due to the fact that while nitrobenzene is slowly reduced by copper, phenylhydroxylamine (the product of one stage of the reduction) is reduced very rapidly; and the alternate deposition of copper from solution during the slow formation of phenylhydroxylamine, and its solution during the reduction of the latter after it has reached a certain concentration, involves alternate decrease and increase of the osmotic pressure of the copper ions, and consequent increase and decrease of the depolarisation-value. The specific action of each metal, including any catalytic effect, translates itself into potential difference; so that by artificially maintaining the same potential (not cathode-potential, but depolarisation-value) the same yield of the same product can be always obtained.—J. T. D.

Point of Neutralisation; Fixing of the ——, *by Conductivity Measurements.* F. W. Küster and M. Grüters. XXIII., page 1065.

English Patents.

Electric Cells; Primary and Secondary ——. G. Harrison, London. From M. Buffa, Milan. Eng. Pat. 10,703, May 11, 1903.

Soap is used as the electrolyte in the construction of primary and secondary electric cells, but preferably mixed with the oxides or salts (such as carbonates or chlorides) of the alkali metals or ammonium. To avoid evaporation or efflorescence, a thin layer of paraffin or other insulating substance is used to cover the soap. The electrodes are zinc (negative) and iron, the latter being covered with a strong oxidising agent such as "peroxide of copper, manganese, lead, etc.," to prevent polarisation. In a soap accumulator, a viscous amalgam of zinc or cadmium is used as an electrode in an insulating basin or in an iron basin connected direct to the negative terminal, the amalgam being covered with layers of the electrolyte and the oxidising agent, and finally with the positive electrode. A column of basins, suitably secured, may be connected in series or in multiple.—B. N.

Titanous Sulphate [*Titanous Sodium Sulphate*]; [*Electrolytic*] *Production of a New* ——. P. Spence and Sons, Ltd., and H. Spence, both of Manchester. Eng. Pat. 18,108, Aug. 18, 1902.

See Fr. Pat. 324,205 of 1902; this Journal, 1903, 628.
—T. F. B.

Caustic Soda and Sodium Hypochlorite; Production of ——, *by Electrolysis.* F. Ferrand. Eng. Pat. 19,774, Sept. 10, 1902. VII., page 1045.

United States Patents.

Electrolytic Apparatus. L. P. Burrows, Washington. U.S. Pat. 737,554, Aug. 25, 1903.

In this apparatus the electrolyte is continually passing in an unbroken stream from the dissolving vessel, containing the anode, through one or more filters into a receiving trough, and finally from the latter into one or more depositing vessels, each containing a cathode. Metallic conductors may be arranged so as to put the contents of the dissolving vessel, filters, receiving trough, and depositing vessels into electrical communication, so as to provide a circuit from anode to cathode through the stream of liquid flowing from one vessel to another. The anode may also be so constructed that it can be rotated.—B. N.

Electrolytic Decomposition of Saline Solutions. A. B. Larchar, Oldtown, Me., Assignor to the Penobscot Chemical Fibre Co., Maine. U.S. Pat. 736,982, Aug. 25, 1903.

The apparatus consists of an outer vessel, anode, cathode, and diaphragm, suitably supported. The level of the liquid inside and outside of the diaphragm is controlled so as to maintain the immersion of the cathode. The latter is constructed of a series of gratings united at their edges so as to form a vertical polygonal enclosure for the diaphragm, the enclosure having an imperforate bottom. A method of construction of the cathode is described in which the series of gratings form a vertical lamellar enclosure, whereby the liquid is divided into thin films which flow horizontally away from the diaphragm to the body of liquid outside the cathode.—B. N.

French Patents.

Electrolyte for Accumulator Plates. E. Sandhagen and J. Lürgen. Fr. Pat. 330,024, March 7, 1903.

See Eng. Pat. 19,713 of 1902; this Journal, 1903, 34.
—T. F. B.

Electrodes for Electrolysis. The General Electrolytic Parent Co., Ltd. Fr. Pat. 330,003, March 6, 1903.

Anodes, composed partly of carbon, are constructed so as to offer little resistance to the passage of the current, and so that worn-out parts may be easily replaced. The conducting bar consists of two thin narrow metal plates, each bent so as to form in its length half circles, and so that when the two pieces are rivetted together, face to face, round apertures are formed, or a single bar with apertures may be cast. Carbon pencils are sealed into these apertures with lead or other easily-fusible metal, and to ensure better contact the pencils may be grooved or perforated. The pencils project equally on both sides of the bar. The latter, the lead, and a part of the pencils are insulated with pitch, &c., and finally covered with Portland cement. The pencils fit tightly and exactly, so as to form water-tight joints, into plates of gas carbon acting as the material for conveying the current into the electrolyte. The ends of the pencils may project, or not, through the carbon plates, but exposed parts of the pencils are insulated from the action of the electrolyte. The carbon pencils and plates have the same rate of expansion, and therefore good contact is ensured when the electrodes become heated.—B. N.

Secondary Electrodes for Electrolysis. The United Alkali Co., Ltd. Fr. Pat. 330,016, March 6, 1903.

The invention refers to secondary electrodes, used more particularly in the manufacture of chlorates, in which the anode is of platinum wire or foil, or an alloy of platinum, and the cathode of a less expensive material, such as iron or carbon in the form of rod, sheet, wire, or trellis work. Metallic connection is made between the electrodes by passing the extremities of the anode round a supporting insulating plate of glass, slate, or porcelain, or by passing the connecting wires through any suitable gaps in the insulating plate, the gaps being afterwards sealed with insulating material. Various simple methods of connecting the electrodes are described; thus the extremities of the anode wire may pass through holes or grooves in the cathode, or may be tied to the cathode, or interlaced if trellis work is used for the cathode.—B. N.

(*B.*)—ELECTRO-METALLURGY.

English Patents.

Electric Furnaces; Treating Materials by Radiated or Reflected Heat in ——. F. W. Howorth, London. From Trollhättans Elektriska Kraftaktiebolag, Stockholm. Eng. Pat. 9932, May 1, 1903.

This is an improvement on Fr. Pat. 325,895 (see this Journal, 1903, 748). The material is fed through an opening in the wall of the furnace and at the back of the stack, instead of from the top of the furnace as in the above-mentioned patent. Pistons or rotating screw conveyors, working in cylinders fed from hoppers, push forward the material at approximately the same rate as that at which the material on the front slope of the stack is being consumed or removed by the heating action of the arc. The operations are carried on in a uniform and continuous manner, and the charge is not thrown about the furnace as when the cold material is fed on to the hot front of the stack. The distance of the inclined surface of the material from the arc may also be regulated and kept constant, excessive violence in the action being thus prevented.—B. N.

Nickel Plating; Process of ——. T. A. Edison, Llewelly Park, N.J. Eng. Pat. 15,037, July 7, 1903.

See U.S. Pat. 734,522; this Journal, 1903, 1004.—B. N.

United States Patents.

Zincing Objects by Electrolysis; Process of ——. I Szirmay, Assignor to L. von Kollerich, both of Budapest U.S. Pat. 736,565, Aug. 18, 1903.

See Eng. Pat. 19,659 of 1900; this Journal, 1901, 1003.
—T. F. B.

Zinc; Process of Extracting ——, *from its Ore* C. G. P. De Laval, Stockholm. U.S. Pat. 736,611 Aug. 18, 1903.

The ore of zinc or other volatilisable metal (which may b mixed with carbon) is charged into an electric furnace i such manner as to form on its bottom a pile or stack slopi by gravity opposite to a source of electric heat. The pil of ore is continuous into the shaft into which the ore charged. As the ore melts on its sloping face, it flows in a depressed part of the furnace, whence the slag may withdrawn, a fresh surface of the ore being continuall exposed to the radiant heat. The volatilised zinc and th gases generated have exit by a separate outlet for co densation. Unroasted zinc ore may be combined with ir ore, and the mixture be treated in the manner describe Compare U.S. Pat. 729,614, June 2, 1903; this Journa 1903, 805.—E. S.

French Patent.

Furnace; Electric ——. P. Girod. Fr. Pat. 329,822, Feb. 28, 1903.

The electrodes are constructed of agglomerated graphit and are disposed concentrically round the crucible, ma of graphite or other refractory material, in such a way to leave an annular space between the electrodes and th crucible, and spaces between the electrodes which a arranged alternately positive and negative. These spaces are filled with refractory material, such as powdered graphite mixed with silica, magnesia, &c., so as to decrease the conductivity of the material, or mixed with iron or other metallic filings so as to increase the conductivity. This mass, owing to the resistance it offers to the passage of the current, is brought to incandescence and so heats the crucible. It is claimed that the furnace is a very economical one and easily manipulated, and further the electrodea are not consumed.—B. N.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Skunk Oil; Characters of Authentic ——. L. F. Kebler and G. R. Pancoast. Proc. Amer. Pharm. Assoc., **50**, 366.

The genuine fat of *Mephitis varians* removed from the animal by one of the authors had the following characters. Sp. gr., 0·9166; acid value, 31; saponification value, 206. The acid value of this specimen was probably a little high, due to slight decomposition of the animal. The properly prepared oil is yellowish in colour, odourless, and of a bland taste; occasionally a deposit of stearin forms on the bottom of the containing vessel. All commercial oils examined have the peculiar unpleasant odour of the animal. These oils vary in sp. gr. from 0·9120 to 0·9218; acid value, 2·85 to 8·8; saponification value, 199 to 207·57. A specimen of doubtful purity had the following characters:—sp. gr. 0·9234; acid value, 18·9; saponification value, 220·12.—J. O. B.

English Patents.

Lubricating Properties of Liquids; Apparatus for Determining the ——. K. Wilkens. Eng. Pat. 20,998, Sept. 26, 1902. XXIII., page 1065.

Soap Stock or Soap; Manufacture of ——. J. Barker, Liverpool. Eng. Pat. 15,619, July 14, 1902.

The process consists in mixing 70 lb. of refined mineral oil, 30 lb. of cocoanut oil, 50 lb. of "alkali" (60° Tw.), and 200 lb. of water, then adding 5 to 10 lb. of flint sand and forcing air and steam through the mixture.—W. P. S.

French Patent.

Glycerin and Fatty Acids; Manufacture of ——. E. Rost, Germany. Fr. Pat. 329,532, Feb. 19, 1903.

Fats or oils are decomposed by steam under pressure, the aponification being aided by the addition of finely-divided netals or metallic oxides such as zinc oxide. After 2½ ours the mixture is withdrawn from the autoclave and llowed to separate, the fatty portion being returned nd the saponification completed. The glycerin solution btained is employed in the saponification of a second harge of material.—W. P. S.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

yanogen Compounds [Prussian Blue]; Determination and Separation of ——, *and their Impurities.* W. Feld. XXIII., page 1068.

English Patents.

olour Lakes; Manufacture of New ——. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 23,830, Oct. 31, 1902.

akes prepared from the azo dyestuff made by coupling azotised o-aminobenzoic acid with "R salt" (sodium salt β-naphtholdisulphonic acid R), are very fast to light, and most as brilliant as eosin lakes.

The dyestuff is added to a suspension (or paste) of rium sulphate, and a solution of barium chloride added; a solution of the dyestuff and sodium sulphate, in water, precipitated by addition of barium chloride solution. —T. F. B.

Pigments; Processes for Making ——. W. J. Armbruster and J. Morton, St. Louis, Miss. Eng. Pat. 13,102, June 11, 1903.

Processes are claimed which consist of the successive or simultaneous precipitation of zinc hydroxide and barium sulphate from solutions of zinc salts, other than the sulphate, by means of barium hydroxide, with or without other barium salts, and the sulphate of an alkali or other metal, such as aluminium. Compare Eng. Pat. 6521, 1903; this Journal, 1903, 807.—M. J. S.

Paint; An Improved Damp-proof ——. W. B. Robinson, Middlesbrough. Eng. Pat. 10,280, May 6, 1903.

The mixture claimed consists of boiled linseed oil, mastic cement, and red oxide of iron, with or without other colouring matters.—M. J. S.

Paints and Pigments; Manufacture of ——. C. Bollé, Manchester. From N. Hirschfeld, Berlin. Eng. Pat. 14,385, June 29, 1903.

As a diluent for pigments intended for work in which a cheap material is required, the use of ash, such as that of peat or lignite, is claimed. The ash is riddled, elutriated, and dried. Its density and covering power may be increased by mixing it whilst damp with two or three per cent. of lead or zinc acetate and lightly calcining the mixture. —M. J. S.

United States Patents.

Pigment, and Process of Making same. W. J. Armbruster and J. Morton, St. Louis. U.S. Pat. 737,055, Aug. 25, 1903.

A pigment, consisting of a mixture of barium sulphate, zinc sulphide and zinc carbonate, is made by adding an alkali carbonate to a solution of zinc sulphate, adding barium sulphide and then a further quantity of zinc sulphate. —T. F. B.

Pigments; Process of Making ——. W. J. Armbruster and J. Morton, St. Louis. U.S. Pat. 737,056, Aug. 25, 1903.

A solution containing barium hydroxide (with or without barium nitrate) and zinc nitrate is precipitated with an alkali sulphate and an alkali carbonate.—T. F. B.

French Patents.

Pigment [Barium Carbonate and Zinc Hydroxide] and its Manufacture. W. J. Armbruster and J. Morton. Fr. Pat. 329,676, Feb. 24, 1903.

See U.S. Pat. 7855 of 1903; this Journal, 1903, 562. —T. F. B.

Pigments [Barium Sulphate and Zinc Hydroxide]; Manufacture of ——. W. J. Armbruster and J. Morton. Fr. Pat. 329,677, Feb. 24, 1903.

See U.S. Pat. 724,235 of 1903; this Journal, 1903, 562. —T. F. B.

Pigments; Cheap ——, *with Chlorite Basis.* O. L. Demidoff. Fr. Pat. 11,038, March 3, 1903.

The employment of *chlorite*, either in its natural state or calcined, as a diluent for pigments is claimed. The mineral is used either in the raw, powdered condition, when it has a greenish-grey tint; or after being calcined, when it becomes yellow.—M. J. S.

Leather; Manufacture of ——, *by means of Colouring Matters.* P. D. Zacharias. Fr. Pat. 329,708, Feb. 25, 1902. XIV., page 1056.

(*B.*)—RESINS, VARNISHES.

United States Patent.

Soluble Oil [for Varnish]; Process of Converting Solidified Oils into a ——. A. Kronstein, Karlsruhe. U.S. Pat. 737,249, Aug. 25, 1903.

See Eng. Pat. 1387 of 1901; this Journal, 1902, 264. —T. F. B.

FRENCH PATENT.

Resinous Substances; Synthetic Preparation of ——. E. R. L. Blumer. Fr. Pat. 329,982, March 5, 1903.

See Eng. Pat. 12,880 of 1902; this Journal, 1903, 705.
—T. F. B.

(C.)—INDIA-RUBBER, &c.

Low-Grade Rubber. C. O. Weber. India-Rubber J., 1903, **26**, [4], 172.

In discussing the relative values of paste rubber and Pontianac, it is pointed out that, whereas paste rubber is apparently superior, especially in physical properties, it contains in the dry state only 20 per cent. of rubber-like substance, whilst dry Pontianac rubber contains 33 per cent. The inferiority of the Pontianac rubber is due to the brittle character of the resinous matter contained in it, and the author points out that this objection can be removed by warming dry Pontianac rubber in mineral oil; this converts the resins to a semi-liquid condition, thus rendering the rubber even superior to paste rubber.—T. F. B.

FRENCH PATENT.

Rubber; Vulcanisation of ——. Soc. Geoffroy et Delore. Fr. Pat. 329,519, Feb. 18, 1903.

The articles that are to be vulcanised are brought into a vessel which can be closed, and the air therein is displaced by steam. Gaseous ammonia is next introduced, 500 grms. being sufficient for every 100 kilos. of rubber, and the temperature is maintained at 140° C. for 40 or 50 minutes by means of a steam coil. Finally a cock is opened, the surplus gas is absorbed in sulphuric or hydrochloric acid, and the goods are taken out. Alternatively, substances which on heating yield gaseous ammonia may be put into the autoclave, or mixed with the rubber.—F. H. L.

XIV.—TANNING; LEATHER, GLUE, SIZE.

ENGLISH PATENT.

Book-Cloth, Leather-Cloth, and the like; Manufacture of ——. J. A. Sackville, Manchester. Eng Pat. 18,022, Aug. 16, 1902.

Viscose (10 parts) is dissolved in water (90 parts), and mineral filling agents, such as china clay, and suitable pigments are thoroughly mixed with the solution, which is then padded into the fabric in a suitable padding machine, and overlaid with a coating of viscose only. The whole is then steamed or fixed in a bath of acetic acid, washed, and dried.—R. L. J.

UNITED STATES PATENT.

Leather; Manufacture of Artificial ——. G. Gautier, Paris. U.S. Pat. 736,957, Aug. 23, 1903.

See Eng. Pat. 19,249 of 1901; this Journal, 1902, 1405.
—T. F. B.

FRENCH PATENTS.

Skins; Treatment of ——. S. K. Felton, jun. Fr. Pat. 329,656, Feb. 23, 1903.

See U.S. Pat. 721,553 of 1903; this Journal, 1903, 429.
—T. F. B.

Leather; Manufacture of ——, *by means of Colouring Matters.* P. D. Zacharias. Fr. Pat. 329,708, Feb. 25, 1903.

Leather is made by simply dyeing the skins, prepared as if for tanning, with aniline dyestuffs such as magenta, Bismarck brown, methyl violet, tartrazine &c., with colour lakes, with Prussian blue, or, in the case of white leather, with zinc salts such as the chloride. From 0·2 to 3 parts of colouring matter per hundred of moist hide are added in the course of 2½—3 hours; the "tanning" process takes 4—24 hours, and is completed by fixing or neutralising as required.—R. L. J.

Leather, Raw Hide, Ivory, &c.; Substitute for ——. C Marter, J. Hanbury, and C. S. Gardner. Fr. Pat. 329,816 Feb. 28, 1903.

Leather or raw hide, preferably scraps and cuttings, are placed in a disintegrator, the resulting powder is boiled o steamed to a pasty mass, which may then be bleached, o mixed with pigments, with salt and alum, with zinc sulphate with a solution of gum-lac, or with such materials as finely-divided cork, according to the special nature of the materi to be imitated, and then strongly compressed in a moul and dried.—R. L. J.

Gelatin [*and Glue*]; *Extraction of* ——, *from Bones* H. Hilbert and the Bayerische A.-G. f. Chem. u. Land wirths.-Chem. Fabrik. First Addition, dated Feb. 2 1903, to Fr. Pat. 324,432, Aug. 20, 1902 (this Journal 1903, 563).

Mechanical details are now given of a plant for expedi tiously extracting bone meal and bleaching the produc according to the original patent. See also Eng. Pat. 18,042 Aug. 16, 1902; this Journal, 1902, 1405; and Eng. Pat 13,682 of 1903; this Journal, 1903, 1007.—R. L. J.

Gelatin [*and Glue*]; *Extraction of* ——, *from Bones* H. Hilbert and the Bayerische A.-G. f. Chem. u. Lands wirths.-Chem. Fabrik. Second Addition, dated March 4 1903, to Fr. Pat. 324,432, Aug. 20, 1902. See precedin abstract.

The new claims are for extraction under pressure and a temperatures above 100° C., the use of chlorides other tha common salt, and the use of hydrochloric acid in the plan designed for the purpose.—R. L. J.

Plates [*or Sheets*]; *Process and Apparatus for makin* ——, *from Hot Liquids which Solidify or Coagulate whe Cool.* F. and E. Fischer. Fr. Pat. 329,630, Feb. 23 1903.

See Eng. Pat. 3774 of 1903; this Journal, 1903, 807.
—T. F. B.

Horn [*Whalebone, &c.*]; *Manufacture of Substitute fo* ——, *from Raw Hide.* E. Jetter. Fr. Pat. 330,00 March 6, 1903.

Raw hide, prepared as for tanning, is soaked for about tw days in a solution (about 5 per cent.) of glue, gelatin, o fish glue, rendered very fluid by long heating or addition o acid, and then dried. It is then immersed for 36 hours i very dilute aluminium chloride solution or other tannin agent, dried and pressed. It may also, before or after thi treatment, be loaded with nitrocellulose by soaking it i collodion dissolved in glacial acetic acid.—R. L. J.

XV.—MANURES, Etc.

UNITED STATES PATENT.

Phosphoric Acid in Natural Phosphates; Process o Rendering ——, *soluble in Citric Acid.* G. Hoyermann Hanover. U.S. Pat. 736,730, Aug. 18, 1903.

See Eng. Pat. 11,873 of 1902; this Journal, 1902, 1146.
—T. F. B.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar in International Commerce; Determination of the Value of Grainy and Crystal ——. Strohmer. Zeits Ver. Deutsch. Zucker-Ind., 1903, **53**, [569], 613—635.

The determination of the value of sugars in grains an crystals in the altered relations of the whole sugar industr through the Brussels Convention may well engage th attention of the international commission for uniform methods of sugar analysis. Such sugars are at presen sold only by sample and external appearance.

It frequently happens that sugars outwardly perfectl satisfactory are unsuitable for the purpose for which the are used, and chemical analysis only can decide on thei value.

A number of the usual trade samples of these sugar collected throughout Austria-Hungary were examined. Th water varied from 0·01 to 0·69, direct polarisation 99·10 to 99·95, ash 0·01 to 0·10, organic non-sugar 0·02 to 0·29, nett rendement 99·00 to 99·90 per cent., copper precipitated by Herzfeld's method, 18 to 59 mgrms.

The variations are apparently independent of the size of grain and external appearance, but not without importance as regards the intended use of the sugar, whether for refining, direct consumption as food, or raw material for preparing foodstuffs and delicacies. In the latter case the taste and smell are greatly influenced by the organic non-sugar; the taste is also affected by the ash, consisting as it does largely of alkalis.

For the preparation of condensed milk and infants' milk the invert sugar present should be a minimum.

To test the suitability of the sugars for making sweets and refined sugar, the tendency to caramelise and produce bitter products was examined. To 10 grms. of sugar, 5 c.c. of water are added, and the mass heated in boiling water for 15 minutes, and then in a bath of 40 per cent. solution of calcium chloride for 30 minutes at 110° C., and immediately cooled. Sugars that give yellow syrups by this test are unsuitable for refining or making sweets. There is no striking feature of analysis which indicates this liability o change, but there should be less than 0·1 per cent. of nvert sugar present.

The designation of sugars as grainy or crystals is arbitrary and often contradictory, and it is desirable that a nomenclature should be chosen dependent on the size of grain.—L. J. de W.

Beetroot Juice: *Purification of* ——. Stutzer. Zeits Ver. Deutsch. Zucker.-Ind., 1903, **53**, [570], 736—742.

ANALYSES continued throughout the whole of the season show that by diffusion, separation, saturation, and boiling, it s principally organic substances that are removed, inorganic salts being only eliminated in very small amounts.

The newest processes for the purification of juice, those of Lehmkuhl, Berkefeld, and Wagner, are all based on the principle of removing albuminoids by an acid or an acid alt.

The author heated raw juice to 100° C., added 5 grms. of gnited and thoroughly washed kieselguhr, and obtained an additional 0·52 grm. of precipitate.

The same juice (100 grms.) was heated to 85° C. and ·1 per cent. of aluminium sulphate added; 0·53 grm. of precipitate was obtained. 100 grms. of the same juice heated to 85° C. with 5 c.c. of a solution of phosphoric acid 10 per cent. of P_2O_5) gave 0·54 grm. of precipitate.

An addition of 2 c.c. of a saturated aqueous solution of sulphurous acid gave 0·53 grm. of precipitate.

The differences being so slight in all these trials, it is concluded that the albumin is completely precipitated by heating the juice without any addition.

If the juice remains 10 minutes at 90° C. in contact with sulphate of alumina, 0·40 per cent. of invert sugar is formed; by addition of phosphoric acid under the same conditions, ·62 per cent. of invent sugar is formed, sulphurous acid only producing a minimum inversion.—L. J. de W.

Beetroot Juice [*Sugar*]; *Purification by Silicates.* A. Rümpler. Zeits. Vereins Deutsch. Zucker-Ind., 1903, **53**, [571], 798—809.

N explanation of the purification of beetroot juice in Harm's process by the addition of silicates containing uncombined silica, the author refers to the exchange of potash for calcium by silicates of the zeolite group.

The author recommends an artificial silicate made by mixing cement with kieselguhr and ochre, allowing it to harden with water, and then breaking it up and sifting. As in the case of animal charcoal, the sugar liquor is passed through the cistern containing the grains, from below upwards.

Raw beetroot juice and separation juice cannot be economically treated, but prepared juice gave the best esults with Harm's process.

Although the filtration of molasses by this method is conomically unsound, the author used molasses to illustrate he purification possible.

The molasses was diluted with about an equal volume of water, and passed through four cylinders of prepared silicate. The first portion running off showed a loss of 11·06 per cent. of dry solids, 28 per cent. of non-sugar, 40·1 of ash, 92·25 of potash, 24·04 of nitrogen precipitable by phosphotungstic acid, and 11·24 per cent. of non-precipitable nitrogen. The purity was increased 7·53 per cent., and the lime 3·558 parts per 100 of sugar. The increase of lime being less than the equivalent of potash removed shows that some of the organic acids formed insoluble lime salts. The diminution of the nitrogen is attributed to bases (betaine, &c.) being removed in the same manner as potash.

The molasses used had stood a long time, and showed no trace of crystallisation. The filtered molasses, after being concentrated, crystallised in a few weeks to a massecuite.

After use, the silicate may be revivified without removal from the cistern by washing with lime-water.—L. J. de W.

Molasses; Preparation of Glutamic Acid from Residual Lyes of ——. K. Andrlik. Zeits. Zuckerind. Böhmen, 1903, **27**, [10, 11], 665—667.

FROM the author's analyses, it appears that 50 per cent. of the total nitrogen of the waste lyes from the desaccharification of molasses exists in the form of amino-acids. He has succeeded in obtaining therefrom an easily crystallisable acid, identified as glutamic acid. As a yield of acid equal to 7 per cent. or more on the dry solids of the molasses lye may be obtained without difficulty, it is now possible to prepare the acid in quantity.

After removing potash and setting the amino-acid free by a stronger acid, it is separated by crystallisation from alcohol.—L. J. de W.

Acacia Substitute; An ——. E. G. Eberle. Amer. Pharm. Assoc., Aug. 1903; Chem. and Druggist, 1903, **63**, [1230], 377.

THE author states that the gum of the "Mesquite tree" of Texas forms a possible substitute for gum acacia. The gum occurs in tears, and in its sp. gr., solubility, and behaviour to nitric acid is nearly identical with gum acacia, but it differs from the latter in that its aqueous solution is not precipitated by lead subacetate, ferric salts, or borax.—A. S.

Reducing Sugars; Comparison of the Centrifugal and other Methods for the Gravimetric Determination of ——. F. Ducháček. XXIII., page 1069.

ENGLISH PATENTS.

Beet, Cane, and other Sugars; Manufacture and Refining of ——. S. Stein and C. J. Crosfield, Liverpool. Eng. Pat. 7998, April 7, 1903.

RAW sugar juices which have been first treated with carbon dioxide, or are in an acid state, are treated with barium peroxide, and with an acid such as phosphoric acid, and then filtered. Raw sugar to be refined is dissolved in water, brought to a certain degree of acidity by the addition of phosphoric acid, an aluminous compound such as aluminium sulphate is added, then tannic acid and sodium thiosulphate, the liquor is filtered, and the filtrate is treated with hydrogen peroxide and a "phosphoric compound."—J. F. B.

FRENCH PATENTS.

Plant Tissues; Process of Extraction, by Disintegration, of the Essential Constituents [*Sugar*] *of* ——. J. H. E. Cresp. Fr. Pat. 329,523, Feb. 18, 1903. XX., page 1063.

Saccharine Juices; Purification of ——, *by a Process termed "Sulphocarbonation."* J. Weisberg. First Addition, dated Feb. 23, 1903, to Fr. Pat. 318,049, Jan. 24, 1902 (this Journal, 1902, 1406).

IN order to apply the process of "sulphocarbonation" in factories which perform the first and second carbonations on the continuous system, the filtered juice from the first carbonation is fed into special heaters, provided with stirring blades. It is there treated with sulphur dioxide, and then with the indicated proportion of lime. The reheated juice then passes to the ordinary vessels for the continuous second carbonation, the alkaline reaction is reduced to the specified point, and the juice is finally heated to boiling and filtered. —J. F. B.

Centrifugal Machines; Means for Collecting Separately the [Saccharine] Liquors of Different Composition draining off from ——. H. Winter. Fr. Pat. 329,768, Feb. 27, 1903.

Between the drum and the outer casing of the centrifugal machine are placed two or more envelopes of thin metal, the ends of which do not meet but overlap to a slight extent, one envelope being fixed, and the others movable. By means of handles on the upper edge of the casing, the movable envelope may be made to slide in a slightly spiral course, so that it is situated at will either in front of or behind the fixed envelope. Each envelope has a separate collecting and discharge channel; the envelopes may be constructed in several pieces in order to restrict the distance through which each piece has to slide.—J. F. B.

Saccharine Juices or other Matters from Plants, Roots, &c.; Extraction and Utilisation of ——. A. Montupet. Fr. Pat. 329,947, March 4, 1903.

All kinds of vegetable matters, such as plants, roots, legumes, fruits, flowers, leaves, &c., from which a juice or other principle is to be extracted, are reduced to a suitable state of division, and packed in baskets, which are arranged in tiers in a suitable receptacle. The matters to be treated are then subjected to digestion with steam saturated with moisture, or are digested with the saturated vapour of any other suitable solvent. The liquor which runs off is collected, and the solid matters, softened by the digestion, are subjected to high pressure in order to obtain the remainder of the extract.—J. F. B.

Saccharine Juices and Syrups; Purification of ——. Soc. Agricole d'Exploitation des Etablissements J. Jaluzot et Cie. Fr. Pat. 330,067, March 9, 1903.

Saccharine juices are clarified and decolorised by the precipitation of alumina *in situ*. For instance, barium aluminate is added to the juice, and decomposed by sulphurous acid, or aluminium sulphate may be decomposed by the addition of baryta.—J. F. B.

Calcium Sucrate; Process and Apparatus for Precipitating and Purifying ——. C. Steffen. Fr. Pat. 330,073, March 9, 1903.

The crystallisation of saccharine syrups is interrupted before the quotient of purity falls to 70 (preferably at 75), the crystals are separated, and the molasses are then diluted with water to such an extent that the proportion of non-sugar is below 2 per cent. (preferably 1·7 per cent.). The diluted molasses are then treated in a precipitating vessel with lime in such a manner as to obtain the maximum precipitation of calcium sucrate. The sludge is then forced by means of a pump into filter-presses, the capacity of which is exactly regulated to contain the whole of the charge of sucrate, so that as the compartments get filled up, the cakes are subjected to a continuously increasing pressure; the calcium sucrate is not washed.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Starch Granules of Raw and Malted Barley; Action of Diastase on the ——. A. R. Ling. Brit. Assoc. Report, 1903, Advance Sheet.

The whole of the published data referring to the hydrolysis of starch by diastase have been derived from the study of the action of the enzyme on potato-starch paste. The starches of barley and other cereals differ from that of the potato in being readily attacked by a solution of diastase in the ungelatinised condition.

The author has carried out a series of mashes with barley and malt starch of various origin, the starch being mixed with the diastase preparation in the dry state and mashed with water at different temperatures for two hours. The following table illustrates the results obtained :—

Starch employed.	Mashing Temperature.	$[\alpha]_{D3·93}$.	$R^*_{3·93}$.
	°C.	°	Per cent.
Barley, 1899 sample ...	60	140·8	88·7
" " " ...	65·5	143·4	88·2
" " " ...	71	145·1	80·6
" 1902 sample ...	60	150·7	84·2
" " " ...	65·5	152·3	79·0
" " " ...	71	163·8	77·8
Kilned malt sample...	60	150·9	81·4
" "	65·5	156·1	80·6
" " " ..	71	161·3	67·2
Low-dried malt	60	151·6	85·3
" "	65·5	152·5	83·3
" " "	71	165·7	63·6
Barley starch (paste).	65·5	168·6	62·4
Potato starch (paste) .	60	154·5	81·8
" " " .	65·5	155·6	71·5
" " " .	71	167·1	55·3

* The symbol R denotes the percentage of apparent maltose determined by the cupric reduction method, on the dissolved matter in solution. The symbols $[\alpha]_{D\,3·93}$ and $R_{3·93}$ indicate that the total solids have been calculated from the specific gravity of the solution by the divisor 3·93.

The very great differences between the constants yielded by the starch mashes and the starch paste conversions are apparent. It is also to be noted that the starches from different barleys give different constants, and the author hopes to continue his work in this direction. He concludes that in the process of mashing, conducted in breweries, the starch granules are dissolved directly by the diastase and are not gelatinised prior to hydrolysis, as it is usually stated they are. It is probable that the products formed in these starch mashes are different from those resulting from the hydrolysis of starch paste; and it is hoped that a study of the former may yield results of importance, both theoretically and practically.

Potato-starch Paste; Action of Malt Diastase on ——. B. F. Davis and A. R. Ling. Brit. Assoc. Report, 1903, Advance Sheet.

In a previous paper (this Journal, 1902, 1088) it was shown that when malt diastase is heated in aqueous solution above the temperature at which the activity of the enzyme is at its optimum, namely 55° C., the reaction with potato-starch paste at about 55° is not only slower, but different products are formed; thus *d*-glucose can be readily isolated from them after the reaction has been allowed to proceed for several hours. Special experiments, employing the same quantity of diastase which had not been heated in solution above 55°, showed that in this case, *d*-glucose is not formed either from starch paste, or from maltose, nor is any *d*-glucose formed by the action of preheated diastase on maltose. It therefore appears that the production of this sugar is connected with the preheating of the hydrolytic agent in solution above 55°. As a result of a very large number of new experiments, the authors have arrived at the following conclusions :—

The effect of heating a solution of diastase as above indicated is to weaken its action and also to produce an alteration in the enzyme molecule, which alteration is, moreover, a permanent one, for the diastase retains its altered properties when reprecipitated from its solution by alcohol and allowed to act on starch paste at or below 55° C. The alteration of the diastase is assumed from the fact of the production, before a temperature of 60° is reached, of *d*-glucose when it acts on starch paste, and appears to commence when a solution of the enzyme is heated below 60°; although, judging from the small amount of *d*-glucose formed by its action, the change is not complete at the last-named temperature. As the temperature of preheating the solution is increased, the amount of *d*-glucose it is capable of producing also increases, the maximum amount being obtained by the action of diastase which has been preheated in solution at 68° to 70° for from 15 to 30 minutes. Above this temperature the destruction of the enzyme is so rapid that a much larger proportion of it has to be employed to attain the stage of the reaction at which *d*-glucose appears. Still *d*-glucose is ormed by diastase *which has been restricted* at tempera-ires up to 78°, and probably above this. It has been bserved in all cases that when the maximum amount of -glucose has been formed, the solution is afterwards kept t the temperature of hydrolysis, usually 55°, the sugar just ientioned diminishes in amount, and the occurrence of iis apparent condensing action of the enzyme may robably explain the failure in several cases to detect -glucose among the products of hydrolysis (compare the ollowing abstract). The maximum amount of *d*-glucose ormed in any case does not exceed about 12 per cent. of ie total hydrolytic products.

Potato-starch Paste ; Action of Malt Diastase on ——. A. R. Ling. Brit. Assoc. Report, 1903, Advance Sheet

ROWN and Millar have shown that the so-called stable extrin—one of the products of the hydrolysis of potato-arch paste by diastase—is converted by the further action diastase into a mixture of about equal parts of *d*-glucose id maltose. The observation of Davis and Ling (last ostract) that no *d*-glucose is formed when *unrestricted* astase acts on starch paste, stands in apparent antithesis this. However, the author has confirmed the result of rown and Miller, and has found further that other isolated oducts of diastatic action yield a proportion of *d*-glucose hen submitted to the further action of *unrestricted* astase; thus the maltodextrin *a*, of Ling and Baker, ien treated in 3 per cent. solution with an active eparation of diastase at 55° C. for 140 hours, gave the nstants $[\alpha]_{D3\cdot93}$ 127·6°, $R_{3\cdot93}$ 105·6, corresponding proximately with maltose 90 per cent., *d*-glucose 10 per nt. The presence of 10·5 per cent. of *d*-glucose in the oduct was proved by weighing the phenylglucosazone rmed under standard conditions. Taking into account e fact that potato-starch paste is never completely nverted into maltose, although the final product has e constants of that sugar, and that a substance is vays present which is identical with the isomaltose of J. Lintner (the *simple* dextrin of Ling and Baker, and e dextrinose of Syniewski) which when isolated and bmitted to the action of diastase yields *d*-glucose, the thor suggests that the reason no *d*-glucose can be tected among the products of the action of unrestricted istase on starch paste is that that sugar is immediately odensed by the action of the enzyme-forming dextrinose. hen, however, diastase is preheated, its condensing action weakened, and the *d*-glucose formed can be isolated. tempts to condense *d*-glucose or mixtures of it with ltose have not been successful.

ewing ; Experiments on the Use of Sugar in ——. P. Petit. Ann. de la Brass., 1903, **6**, [14], 316—321.

E experience of English brewers having proved the lity of invert sugar, the author devoted his attention to employment of sucrose in brewing. His conclusions to the effect that this sugar, added to the mash in copper, is completely inverted during top or bottom mentation, at temperatures between the limits of 14° l 9° C. Futhermore, that the beer from wort containing to 15 per cent. of crystalline sugar (referred to the l weight of the raw materials), furnishes a higher nuation, and a more energetic and prolonged secondary mentation, being in addition lighter and more brilliant, better condition and with superior keeping qualities, free m sediment and from yeasty haze. After four gene-ons in worts containing 13 per cent. of added crystalline ar, the yeast does not degenerate, either as regards ogen absorption, inverting power or yield. The pro-tion of nitrogen eliminated from the wort is greater in sence of sugar.—C. S.

mentation ; Formation of Large Bubbles during —— O. Kleinke. Woch. f. Brau., 1903, **20**, [35], 398.

NY explanations have been offered as to the cause of formation of large bubbles at the top of fermenting t. especially towards the end of the process. The hor suggests a further possible cause, as the result of ie investigations on the fermentation of pure solutions invert sugar. He noticed that fermentation started normally, but that after about 120 hours, large bubbles began to be formed; this formation corresponded in point of time to the period at which the rate of attenuation was greatest. The author thinks that the material of which the walls of the bubbles is composed may be derived from the mucus coating of the yeast cells. He assumes that in the absence of assimilable nitrogenous matters in the liquid, the enzymes of the yeast attack certain reserve materials stored in the mucus coating. These reserve materials cannot be replaced from the constituents of the liquid, and the exhausted mucus is consequently thrown off. It is suggested that the presence of this matter on the surface of the liquid offers a resistance to the escape of the carbon dioxide, and consequently large bubbles are produced.—J. F. B.

Beer ; Means for Accelerating the Fermentation and Maturing of ——. L. Nathan. Woch. f. Brau., 1903, **20**, [35], 395—398.

THE author's experiments prove that the well known favourable effect of aëration upon the rapidity of fermentation, and the crop of yeast is due solely to the agitation thereby produced. An equal stimulating effect is obtained by simple agitation of a suitable nature without the use of air. According to the author's process (see this Journal, 1902, 491) sterilised worts are fermented in closed enamelled-iron vessels provided with a special form of "rouser." Air is not admitted, and consequently the carbon dioxide can be collected in a comparatively pure state. Carbon dioxide is an excellent vehicle for the removal of the peculiar flavour of immature beer, and the removal of the carbon dioxide during fermentation with agitation plays an important part in the subsequent maturing process. With the author's process higher fermentation temperatures may be employed, if desirable, without the fear of infection. If full-bodied beers be desired, rousing during fermentation is performed less energetically and at intervals; the crop of yeast is then restricted and more of the possible yeast foods are left in the beer. If beers with less body and a higher crop of yeast be desired, rousing may be more frequent or even continuous. According to the course adopted, fermentation is complete in from three to six days. In order to accelerate the maturing, fermentation is conducted under a partial vacuum, the carbon dioxide being collected, purified, and liquefied, subsequently returned to the finished beer. After the fermented beer has been separated from the yeast, a current of purified carbon dioxide is pumped through the beer, until it has removed, by a process of scrubbing, all those volatile matters which cause the flavour of immature beer. The flavour of the beer is undoubtedly improved by contact with residual yeast; it is advantageous, therefore, to leave a certain proportion of yeast in the beer during the process of scrubbing with carbon dioxide, and to rouse the liquid continuously during the operation.—J. F. B.

American Wines ; Chemical Composition of ——. H. W. Wiley. U.S. Department of Agriculture, Bureau of Chemistry, Bulletin No. 72, 1903. 22—24.

Alcohol.—The percentage of alcohol in dry wines is equal to the standards adopted for European wines. The ratio of alcohol to extract, the sum of the alcohol expressed in grms. per litre, and the total acidity in grms. per 100 c.c., conform to the ratios adopted in France for wines to which neither alcohol or water has been added.

Glycerin.—The glycerin : alcohol ratio appears to be "somewhat lower" than that of European wines. Of 38 samples of dry wine, 29 contained more than 6 grms. of glycerin per 100 grms. of alcohol. The minimum ratio was 5·7 : 100. From the varying glycerin content of the sweet wines, it is probable that differences exist in the vineyards as regards the extent of fermentation before fortification.

Extract.—The percentage of extract is up to the European standard. In the case of red wines, the author suggests that a higher minimum limit than is fixed in other countries might be adopted for American wines. The "extract, less total acids," and the undetermined extract (extract less the sum of the glycerin, ash, sugars, and fixed acids) is the same in the white wines as in European wines. In the red wines the extract is higher, varying from 0·6 to 1·37 grms. per 100 c.c.

Acidity.—The percentage of acids in the samples was similar to the products of other wine-producing countries. All dry red wines contained over 0·45 grm of acids (calculated as tartaric) per 100 c.c. Of 15 samples of dry white wine one contained less than 0·45 grm., and three less than 0·5 grm. of total acids per 100 c.c. With a few exceptions, the samples were found not to contain more than 0·9 grm. of total acids per 100 c.c. In 38 samples of dry wine, 28 contained between 0·5 and 0·7 grm. of total acid per 100 c.c.; five contained an excessive amount of volatile acids. From other figures which are given in the original it would appear that a slightly higher percentage of volatile acids should be allowed in American wines than in the wines from other countries. Of the 38 samples of dry wines, four contained more than one part of volatile acid to four parts of total acids, and nine more than one part of volatile acid to five of total acids. Several of the sweet wines contained an excessive amount of volatile acids.

Sugars.—The amount of sugar found in the dry wines is materially lower than formerly. The author is of opinion that this confirms the inference drawn from the decrease of volatile acids and increase of glycerin, that the methods of fermentation are improving.

Potassium Sulphate.—The largest amount of potassium sulphate found was 0·13 grm. per 100 c.c.

Sulphurous Acid.—In 15 samples of white wines five exceeded the Swiss limit of 8 mgrms. of total sulphurous acid per 100 c.c.

Preservatives and Colouring Matter.—No preservative was detected, except in one instance, when benzoic acid was found. Boric acid, which often occurs naturally in wines, was found in varying quantities. One sample was coloured with a coal-tar product.—J. L. B.

Wine; Manufacture of ——, in California. H. Lachman, U.S. Department of Agriculture, Bureau of Chemistry. Bulletin No. 72, 1903, 25—40.

Fermentation.—The grapes are crushed between corrugated rollers, so as not to crush the seeds, but only break the skins. The stems are usually removed by a "stemmer," and the seeds, skins, pulp, and juice are run along chutes into the fermenting tanks until these are two-thirds full. The must generally registers about 22° of sugar at a temperature of 70° F. Fermentation will stop at 90° F. The temperature is taken three times a day, and the sugar calculated from the density of the must. The must loses 6° of sugar the first day, and the same quantity for the second and third days, 4° is lost on the fourth day, and by the fifth to the seventh the sugar disappears. At this stage the juice is drawn off the pomace. Uniformly ripened bunches go through fermentation without trouble, whilst those with green or half dried grapes produce a spasmodic fermentation. Under such conditions there is often 1° to 4° of sugar left, a lactic fermentation ensues, and the product is useful only for distilling. With regard to the size of the fermenting vessel, the author is of opinion that the tanks should not exceed 5 ft. in height, 12 ft. in diameter, and a capacity of 5,000 gallons. The pomace rises to the top during fermentation, and to keep it cool it is continually pushed beneath the surface by punching rods. Frequently juice is pumped over the pomace once a day to keep the mass constantly fermenting, and at the same time to extract the tannin and colouring matter from the skins and seeds. The main object is to continue fermentation until the wine is dry. When the carbon dioxide has left the wine, it is drawn off into clean closed tanks or casks for storing.

White grapes are generally crushed without "stemming," and after six hours the juice is drawn off and pumped into small oak casks until about two-thirds full. After the first five or six days, the scum formed is drawn off and fresh juice added. When the violent fermentation has ceased, the casks are filled close to the bung, and a fermenting bung, which is generally a piece of block tin pipe in the form of a goose neck, is attached to the cask, through which the gas passes into a bottle of water.

The control of temperature in both the fermenting an storage cellar is essential. In the fermenting room i should be between 70°—80° F. In the cellar new wines may be stored for the first year at 60°—70° F. and after that at 60 F. Light in the cellar is objectionable, as it has a tendency to change the colour of the wine.

After the wine has become dry it begins to clear. Thi depends greatly on the place where it is stored, and also o the condition of the weather. In cold and clear weathe the precipitation proceeds much more quickly. Befor the lees begin to rise, the wine is drawn off from th sediment into thoroughly cleaned casks. The first racking takes place from six to 10 weeks after the win is made, and the second from February to April. Th wines are again racked before the hot weather begin Wines that have been blended are allowed to rest for thre months, when they are put through a filtering apparatu and drawn into oval casks of from 1,000 to 4,000 gallon capacity.

Clarification.—Gelatin and the whites of fresh egg are used for clarifying red wines. From ½ to 1 lb. i added per 1,000 gallons according to the age and clearnes of the wine. The fining material is soaked in water an beaten into a froth. It is then poured into a tub of abou 20 gallons capacity, containing from five to ten gallons o the wine to be fined, and again frothed. After this it i poured into the cask to be fined and thoroughly mixed b agitation.

For clarifying white wines Russian isinglass is used, solution of 7½ lbs. of this material being made in 50 gallon of wine. One half gallon beaten to a froth is used pe 1,000 gallons of wine. After the addition of the finin matter the casks are filled to the bung and the shrinkag made up by adding fresh wine. The wine is left to fin for 20 to 30 days.

Ports are made by fermenting the juice down to abou 6° to 10° of sugar and fortifying it up to 20 per cent. o alcohol. Sherries are fermented down to 4° of suga and fortifying to about 20 to 21 per cent. of alcohol The wine is then "baked" in the sun in casks rangin from 50 to 160 gallons in a glass house. The temperatur rises as high as 140° F. which is maintained at nigh by the aid of a furnace. Malaga type wines are produce by boiling the must from a very sweet grape, thus producing a heavy bodied wine, which is then either "baked in the sun or heated in the oven for a time. Tokay wine are made by allowing the grapes to shrivel on the vin and fortifying the wine obtained up to 20 per cent. o alcohol. The grapes selected contain acid, and are mostl of the muscat varieties. Sparkling wines can also b produced in California.—J. L. B.

Wine; Pasteurising New ——. U. Gayon. Rev. de Vitic 1903, [495]; Ann. de la Brasserie., 6, [13], 303—307.

The results of the author's experiments, extending over number of years, tend to demonstrate that, contrary to th generally-received opinion, the pasteurisation of new wine by heating at 60° C., does not produce stagnation, the win continuing to clarify, purge, develop, and mature in normal manner. In practice, this operation would preser the great advantage of reducing and simplifying the operations preceding the bottling of the wine, obviating th necessity for frequent rackings and consequent loss i volume, the result being an increased yield, coupled wit lessened expense and the perfect conservation of the liqu

—C. S.

Plastered Wines; Inversion-Speed of Cane-Sugar dissolved in ——. G. Magnanini. Zeits. f. Elektroch 1903, 9, [36], 751—752.

The existence in plastered wines of normal or of aci potassium sulphate, produced by reaction of potassiu tartrate upon the calcium sulphate, has long been matter debate, the acid salt being much more injurious to th consumer than the normal salt. The author finds th sugar dissolved in the wine is inverted by plastered win at no higher speed than by natural wines, and infers th acid sulphate cannot be present in plastered wines.

—J. T. D.

Molasses Distillery ; Sulphur in a ——. K. Andrlik and V. Stanek. Zeits. Vereins deutsch. Zuckerind., 1903, **53**, [571] 831—835.

The authors examined the amount of sulphur in a molasses listillery to account for the high conteut of sulphates in the rude potash. The total sulphur reckoned as SO_3 on 100 arts of the ash in the various stages was as follows :—The original molasses 2·31, the thin wash or slops 7·24, he concentrated wash 11·18, fresh potash 8·63.

It thus appears that the sulphur increases from the nolasses to the thickened wash and falls again in the otash. The increase is due to the sulphuric acid added or acidification before fermentation, and the absorption of ulphur from the heating gases during concentration of the wash. Part of the sulphur escapes during the incineration as gas, possibly sulphuretted hydrogen or carbon bisulphide.
—L. J. de W.

Malt ; Determination of Pre-existing Sugors in ——. E. D. Mason. Zeits. ges. Brauw., 1903, **26**, [28], 457—463.

'o preclude diastatic activity during the operation, the uthor recommends that 20 grms. of the finely-crushed nalt should be boiled for half an hour in a covered beaker, vith sufficient 90 per cent. alcohol to cover the substance. The alcohol is then allowed to evaporate, the liquid being tirred awhile to prevent spurting, and the malt is dried at 12° F. in the oven for half an hour. To prepare the test olution, the substance is shaken up for half an hour with 50 c.c. of cold water in a 250 c.c. flask, made up to the nark with water, next shaken up with a little precipitated luminium hydroxide, and filtered. The reducing sugars re determined, as dextrose, by boiling 25 c.c. of the filtrate r two minutes with 60 c.c. of Fehling solution and an qual volume of water. The results are calculated to 00 grms. of malt by multiplication with the factor 9·44 ncluding an allowance of 14 per cent. for the volume of he crushed malt), and deducting the amount of unfermen-table reducing substance from the total.

For the saccharose determination, 75 c.c. of the filtrate e inverted with 4 c.c. of N/2 hydrochloric acid, then made to 100 c.c. and determined also as dextrose calculating upon 100 grms. of malt, the previous result is deducted om this total, and the remainder multiplied by 0·95. This tter number represents the saccharose in the malt.

The unfermentable reducing substance is found by con-ntrating 75 c.c. of filtrate to about 15 c.c., fermenting is with ½ grm. of yeast for 42 hours at 28° C., and making the liquid to 50 c.c., wherein after filtration the reduction estimated as dextrose, referred to 100 grms. of malt, and ducted from the results of the first test.

Formation of Sugars during the Malting Process.—In is investigation, a sample of barley was tested for invert gar, dextrose, levulose, and unfermentable reducing bstances. The results were negative, though a reduction rresponding to 1·92 per cent. of saccharose was obtained ter inversion. Tests with germinated malt, however, dicated that the unfermentable reducing substances, the ducing sugar and part of the saccharose are formed ring germination. Kilning the malt in a damp state rnishes a higher proportion of sugars and unfermentable sidue than is obtained when the malt has been dried forehand. The effect of kilning is to raise the proportion saccharose (probably by retrogression of the reducing gar), and lessen the amount of reducing sugar.—C. S.

nmoniacal Nitrogen in "Mistelles" and Wines ; De-mination of ——. A. Desmoulière. XXIII., page 1067.

English Patents.

ast ; Process and Apparatus for Preserving ——. V. H. Wyers, Upton Park, Essex. Eng. Pat. 10,729, May 9, 1902.

AST is skimmed and forced under a pressure of air into a er-press ; if desired, the yeast may be washed in the ss by means of weak alkaline solutions or water. The ssed cakes are then broken up and spread upon gauze trays which are placed on trolleys. The trolleys are then run into a drying chamber, and the yeast is dried by means of a current of dry, filtered air drawn through the drying chamber, and having a temperature between 60° and 100° F. according to the power of resistance of the yeast. The dried yeast is finally sealed up for storage. All precautions are taken to avoid contamination with bacteria.—J. F. B.

Grain ; Process and Apparatus for Germinating ——, *under Pressure in Closed Receptacles.* V. Lapp, Leipzig, Germany. Eng. Pat. 10,426, May 7, 1903.

See Fr. Pat. 326,114 ; this Journal, 1903, 756.
—J. F. B.

Malt ; Treatment of ——, *for Alcoholic Fermentation.* C. J. Somlo, Temesvar, Hungary. Eng. Pat. 11,325, May 18, 1903.

Malt is subjected to antiseptic treatment with gaseous antiseptics or antiseptic solutions ; or it may be sterilised by being exposed for short periods to the action of high temperatures with subsequent rapid cooling. The malt is then washed with water as free from bacteria as possible with the help of filtered compressed air ; the material is finally treated in a steeping and grinding apparatus so constructed as to be capable of being sterilised.—J. F. B.

Alcoholic Liquors ; Purifying Raw or Immature ——. H. Sefton-Jones, London. From Mrs. L. S. Highton, San Francisco. Eng. Pat. 20,228, Sept. 16, 1902.

See U.S. Pat. 736,098 ; this Journal, 1903, 1010.
—J. F. B.

United States Patent.

Yeast ; Preparation of ——. G. Jacquemin, Malzeville, France. U.S. Pat. 736,401, Aug. 18, 1903.

See Eng. Pat. 9221 of 1901 ; this Journal, 1901, 786.
—T. F. B.

Yeast ; Preparing ——. G. Jacquemin, Malzeville, France. U.S. Pat. 736,402, Aug. 18, 1903.

See Fr. Pat. 322,381 of 1902 ; this Journal, 1903, 375.
—T. F. B.

French Patents.

Malt Meal ; Mill for Grinding ——. F. Album. Fr. Pat. 329,935, March 4, 1903.

Malt is ground between a pair of fluted rollers travelling at a differential speed in the ratio of 1 : 1·5 to 1 : 3 ; the malt flour is then separated from the grist and husks by passing over a sifting device. The grist is next separated from the husks by means of a second coarser sieve, and is reduced to flour by a second pair of rollers more finely fluted than the first pair, also travelling at a great differential speed. Finally the milled products are mixed together as desired.—J. F. B.

Alcohol and Yeast ; Production of ——, *from Molasses, Beetroots, and all Amylaceous Materials.* J. Effront. First addition, dated Feb. 23, 1903, to Fr. Pat. 324,124, August 30, 1902.

The solution of resins, &c., added to the wash before fermentation (see Eng. Pat. 19,354 ; this Journal, 1903, 223) may be replaced by an alkaline extract of spent hops. One part of spent hops is mixed with one part by weight of a solution of caustic potash containing 40 grms. per litre, and the mixture is maintained at 100° C. The resulting mixture, or the filtered extract, is then added to the wash in the proportion of 30—50 grms. per 100 litres.
—J. F. B.

Wines, Ciders, Beers, &c. ; Preservation of ——, *in Casks on Draught.* J. B. Brissaud. Fr. Pat. 329,965, March 5, 1903.

In order to preserve fermented liquors stored in casks on draught, a hydrostatic spigot with a caoutchouc bung is inserted in the bung-hole ; this spigot comprises a vessel containing a solution of potassium metabisulphite, so that the air entering at every draught is charged with sulphurous acid. As an additional security a layer of a neutral hydrocarbon oil is provided on the surface of the liquor in the cask.—J. F. B.

Tartars and Lees of Wine; Enrichment of ——, by Mechanical Means. L. F. David. First addition, dated Feb. 17, 1903, to Fr. Pat. 319,575, March 13, 1902 (this Journal, 1902, 1547).

In the original patent the use of levigating apparatus, including settling trenches ("labyrinthes"), was claimed for the treatment of crude tartar sludges. It is now found, however, that such trenches cannot be employed for this purpose, and that portion of the claim is abandoned.
—J. F. B.

Alcoholic or other Vapours; Concentration and Purification of ——. F. Calmant. Fr. Pat. 329,771, Feb. 27, 1903.

A number of caps with indented edges are superposed one over the other above the vapour orifice of each plate of a distilling or rectifying plate column. In this way the vapours ascending under the first cap have to pass beneath the indented edges of each of the caps before escaping to the next compartment.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

English Patents.

Milk Powder; Manufacture of ——. M. Ekenberg, Göteberg, Sweden. Eng. Pat. 17,486, Aug. 8, 1902.

The composition of the milk is, in the first place, so regulated that it contains a sufficient quantity of mineral matter of the kind most suitable for yielding a good milk powder. This is done by adding calcium salts, *e.g.*, the citrate or phosphate in quantity up to 0·1 per cent. of the milk treated. Mono- or di-potassium phosphate is added, according to whether the milk is acid or alkaline in reaction to litmus paper. From 0·1 to 0·2 per cent. of non-crystalline sugar is also added, and the evaporation to dryness is carried out at a temperature below 75° C. (See also this Journal, 1903, 158 and 878.)—W. P. S.

Meat in a Raw Condition; Preservation of ——. H. H. Lake, London. From Dr. Emmerich's Fleisch-Konservierungs-Ges., Munich. Eng. Pat. 18,138, Aug. 18, 1902.

The "initial portions" of the larger vessels (arteries, veins, and absorbent vessels) are swilled and flushed with a liquid adapted to prevent "germination," such as acetic acid and the like.—A. S.

Flour; Process of Treating ——, to Purify the same and Increase the Nutritive Qualities thereof.—J. N. Alsop, Owensboro, Kentucky, U.S.A. Eng. Pat. 14,006, June 23, 1903.

The flour is subjected to the action of gaseous bodies produced by the action of the flaming or disruptive discharge of electricity on air. It is claimed that the process decreases the quantity of carbohydrates in the flour and increases the proteids.—W. P. S.

French Patents.

Milk Extract resembling Meat Extract; Process for Making ——. X. Binder. Fr. Pat. 329,706, Feb. 25, 1903.

The proteids obtained from skimmed milk are peptonised by the action of sulphuric acid and heat. The acid is then neutralised with calcium carbonate and the solution is filtered. After adding the mineral matters obtained from the whey (the lactose having been separated by crystallisation) and a little hydrogen peroxide as a preservative, the whole is concentrated at a temperature below 50° C. Potassium di-hydrogen phosphate may also be added.
—W. P. S.

Foods or other Organic Substances; Process for Preserving ——. L. Maussion and A. Montupet. Fr. Pat 329,946, March 4, 1903.

The substances are treated in a closed vessel first wit steam and then with alcohol vapour containing a littl essence of bitter almonds, benzaldehyde, or the like. Afte treatment the substances may be packed in tins containin hot oil, or a hot solution of gelatin, the tins being the closed up, and their contents sterilised as usual. (See als this Journal, 1903, 435.)—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

French Patent.

Sewage; Purification of ——. A. J. Pottier. Firs addition, dated Feb. 20, 1903, to Fr. Pat. 328,306, Jan. 6 1903.

The lime is added to the sewage in the solid state, fro 250 to 400 grms. of calcium hydroxide being used fo each cubic metre of liquid. The whole is well mixed. (Se also this Journal, 1903, 960.)—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

French Patents.

Resin Soap [Size]; Process for Emulsifying ——, *Water.* M. Erfurt, Straupitz, Silesia. Eng. Pat. 23,89 Nov. 1, 1902.

See Fr. Pat. 325,901 of 1902; this Journal, 1903, 757.
—T. F. B.

Paper Pulp; Strainers for ——. H. Carrière. Fr. Pat. 329,445, Feb. 20, 1903.

Plane or cylindrical strainers for paper pulp are co structed of a number of parallel strips of metal or wires triangular or other suitable section. At several points the length of these wires are transverse bars of sto material, as for instance steel, coated with a non-oxidisab metal such as copper or tin. Each of the strainer wires twisted once round the stout transverse bars and, at t points where they are twisted, the original circular secti of the wires is preserved, so that at these places the wir are in contact with each other, whilst between these poin a narrow slit intervenes between each pair of wires.
—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Ether for Anæsthetic Purposes; Examination of ——. W. Wobbe. XXIII., page 1067.

Phenacetin Test. G. M. Beringer. XXIII., page 1067

Hermophenyl [Sodium Mercuriodisulphophenate]; Reactions of. E. Barral. XXIII., page 1067.

Abrastol [Asaprol]; New Colour Reactions of ——. E. Barral. XXIII., page 1068.

Nux Vomica; Determination of Alkaloids in ——. W. A. Puckner. XXIII., page 1069.

English Patent.

Pharmaceutical Compounds [from Methylene Citric Aci Manufacture and Production of ——. H. E. Newt London. From the Farbenfabr. vorm. F. Bayer and C Elberfeld. Eng. Pat. 23,988, Nov. 3, 1902.

See U.S. Pat. 715,239 of 1902; this Journal, 1903, 43.
—T. F. B.

United States Patents.

Formaldehyde Compound. R. Lepetit, Susa, Italy. U.S. Pat. 736,529, Aug. 18, 1903.

By the action of formaldehyde on hæmatoxylin solutions, in presence of acid, a fine reddish-brown powder is obtained. This substance has astringent and antiseptic properties, is nsoluble in water, soluble in dilute alkalis, alcohol, acetone, or glycerin, but insoluble in chloroform.—T. F. B.

Pyroligneous [Acetic] Acid; Process for obtaining Pure ——. G. Glock, Berlin. U.S. Pat. 736,959, Aug. 25, 1903.

See Eng. Pat. 28,595 of 1902; this Journal, 1903, 291. —T. F. B.

Chlorides of Carbon; Process of Producing ——. F. J. Malchaske, Assignor to C. H. Lyon, Chicago. U.S. Pat. 737,123, Aug. 25, 1903.

A mixture of carbon (coke), an alkali chloride, and silica, when heated, produces carbon chlorides. Carbon tetrahloride is formed by heating together one part of coke, our parts of sodium chloride, and two parts of silica.

If sulphur be added to the mixture, a mixture of sulphur hlorides and carbon chlorides is obtained.—T. F. B.

French Patents.

Hydrazine and its Derivatives; Production of ——. P. Schestakoff. Fr. Pat. 329,430, Feb. 16, 1903.

Urea, and its derivatives formed by substitution in the mino groups, react with hypochlorites or hypobromites, n the cold, forming hydrazine and its derivatives, carbon ioxide being eliminated.

60 grms. of urea, dissolved in a little water, are mixed, at 0° C., with 1400 c.c. of sodium hypochlorite solution containing 50 grms. of available chlorine per litre). 00 grms. of benzaldehyde are now added, and the mixture heated for some time at 80°—90° C. On cooling, benaldehyde hydrazone separates and is subsequently decomposed by acid.—T. F. B.

Alcohol, $C_{10}H_{18}O$, having a Rose-like Perfume; Preparation of an ——, *and Synthetic Floral Perfumes with this Alcohol.* Soc. Heine et Cie. Fr. Pat. 329,529, Feb. 19, 1903.

The unsaturated terpene alcohols $C_{10}H_{18}O$, which have boiling points between 195° and 200° C., and which give citral on xidation with chromic acid mixture (*e.g.*, linalool, nerolol, c.), or geraniol, or the unsaturated hydrocarbons of the composition $C_{10}H_{16}$ which, on hydration, are converted into nalool (*e.g.*, myrcene), are treated with glacial acetic acid nd sulphuric acid, or with acetic anhydride. The resulting product is saponified and then rectified. The alcohol thus obtained is treated with phthalic anhydride (or the anhydride of some other dibasic acid), the ester is saponified, eparated from geraniol by anhydrous calcium chloride, and he resulting alcohol purified by fractionation. It has the composition $C_{10}H_{18}O$, and has a powerful rose-like perfume. has a sp. gr. of 0·882 at 15° C., boiling point 226° C. at mospheric pressure, and is optically inactive (or very ebly dextrorotatory). It differs from geraniol in not forming a compound with calcium chloride which is insoluble in etroleum ether. Its solutions in water, alcohol, or other olvent, with or without geraniol and other essences, contitute useful perfumes.—T. F. B.

lant Tissues; Process of Extraction, by Disintegration, of the Essential Constituents [Essences, Alkaloids] of ——. J. H. E. Cresp. Fr. Pat. 329,523, Feb. 18, 1903.

The plants or parts of the same (flowers, fruits, leaves, alks, roots, &c.) are first ground in a vessel with a hard ubstance so as to thoroughly disintegrate the vegetable ells, the grinding materials and their degree of fineness ing varied according to the qualities of the plant ubstance. The paste obtained is afterwards treated with a solvent (alcohol, ether, &c.), the nature of which depends on the solubility of the substance to be extracted. The preliminary grinding assists the subsequent extraction of the fruit essence, alkaloid, sugar, colouring matter, &c., and less of the solvent is required.—B. N.

Saccharine Juices or other Matters from Plants, Roots, &c.; Extraction and Utilisation of ——. A. Montupet. Fr. Pat. 329,947, March 4, 1903. XVI., page 1058.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Colour Photography; Improvements in Direct ——. R. Neuhauss. Phot. Rundschau, 1903, **17**, 149. Chem.-Zeit., 1903, **27**, [67], Rep. 212. (See also this Journal, 1903, 759.)

As hydrogen peroxide has not proved quite satisfactory with gelatin, the author now provides the plates covered with the gelatin-colour mixture with the oxygen necessary for bleaching, by immersing them, immediately before exposure, in a bath of ether and hydrogen peroxide for at least five minutes. The gelatin-colour mixture is prepared in the following manner:—10 parts of soft emulsion gelatin (Eder's) are dissolved in 100 parts of water, and then there are added, with continual stirring, solutions of methylene blue (0·1 to 50 of distilled water), 6 parts; auramine (0·1 to 50 of alcohol), 1·5 parts; and erythrosin (0·25 to 50 of distilled water), 3 parts. The mixture is filtered. The plates need not be used immediately after drying, but may be kept as long as desired.

The author has observed that in some cases, copied plates may be further developed by a bath of lukewarm water, especially if the colour mixture contain Miethe's ethyl red. The formation of a dyestuff by the action of light is also interesting. Several dyestuffs, especially blue ones, lose their colour, even in the dark, when treated with an aqueous solution of gelatin, containing a small quantity of ammonium persulphate. If the milk-glass plate coated with such a mixture be then withdrawn, and, after drying, the ammonium persulphate washed out, and the wet plate exposed, the colour is regenerated, the effect being most pronounced when the light to which the plate is exposed, has a colour complementary to that of the dyestuff produced. If the plate be dried before exposure, no dyestuff is produced, but the colour appears immediately if the exposed plate be immersed in lukewarm water.—A. S.

English Patents.

Sensitive Emulsions for Photographic Purposes; Processes for Making ——. A. Cobenzl, Bingen-on-the-Rhine. Eng. Pat. 20,069, Sept. 13, 1902.

See U.S. Pat. 718,312 of 1903; this Journal, 1903, 164. —T. F. B.

Photographic Pictures on Fabrics, Skins, Leather, Wood, or the like; Mediums for Use in Producing ——, *and Processes for making same.* A. Cobenzl, Bingen, and A. H. Mies, jun., Burg Wineck, Germany. Eng. Pat. 20,141, Sept. 15, 1902.

The fabric is impregnated with a solution of soluble starch (or other starch which is rendered insoluble on heating), dried so as to render the starch insoluble, and finally sensitised.—T. F. B.

Intaglio-Plates; Production of Photo-engraved ——. D. Cameron-Swan, London. Eng. Pat. 21,018, Sept. 26, 1902.

A positive on glass, celluloid, or other transparent material is made from the picture or object; a sensitised metal plate is exposed, first under this positive, and then under a ruled, dotted or grained semi-transparent screen, and developed. It is then etched in any manner. The sensitive plate may, before exposure, be coated with a granular deposit of bitumen, resin, &c., sufficiently for the rendering of modifications of light and shade.—T. F. B.

United States Patents.

Developing Photographic Pictures; Process of ——. F. Fischer and H. Guntrum, Elberfeld, Assignors to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 736,374, Aug. 18, 1903.

(Meta-)amino-o-hydroxybenzylsulphonic acid (see U.S. Pat. 729,054 of 1903; this Journal, 1903, 881) is claimed as a photographic developer, together with a sulphite as preservative, and an alkali carbonate as accelerator. —T. F. B.

French Patents.

Chemical Substances [Photographic Developer M-amino-o-hydroxybenzyl Sulphonic Acid]; Manufacture of New ——. Soc. Anon. Prod. F. Bayer and Co. First Addition, dated Feb. 11, 1903, to Fr. Pat. 311,778, June 14, 1901.

See U.S. Pats. 729,054 and 736,374 of 1903; this Journal, 1903, 881 and above.—T. F. B.

Photographic Plates; Developing ——, in Daylight. J. W. F. Scheffer and H. J. Bocage. Fr. Pat. 329,477, Feb. 17, 1903.

See Eng. Pat. 3877 of 1903; this Journal, 1903, 649. —T. F. B.

Photographic Printing; Impts. in ——. E. S. Shepherd and O. M. Bartlett. Fr. Pat. 329,526, Feb. 18, 1903.

See U.S. Pat. 728,310 of 1903; this Journal, 1903, 760. —T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Potassium Chlorate; Decomposition of ——, and some Observations on the Decomposition of Sodium Chlorate and Sodium Perchlorate. J. Scobai. VII., page 1044.

French Patents.

Explosives, Celluloid, &c.; Manufacture of ——. [Recovery of Acetone.] R. Robertson and W. Rintoul. Fr. Pat. 329,540, Feb. 19, 1903.

See Eng. Pat. 25,994 of 1901; this Journal, 1903, 441. —T. F. B.

Explosives; Manufacture of ——. C. E. Bichel. First Addition, dated March 6, 1903, to Fr. Pat. 327,868, Dec. 22, 1902.

In the case of explosives for use in dangerous mines the direct addition of the chlorides of the alkalis and alkaline earths or such a chlorinated organic derivative as sodium trichloracetate, is said to produce a margin of safety as satisfactory as that originally claimed for ammonium chloride and an equivalent quantity of sodium and potassium nitrates. The following is an example of the composition:—nitroglycerin (22 per cent.), guncotton (0·6 per cent.), sodium chloride (11 per cent.), wood meal (0·6 per cent.), gelatin (8 per cent.), ammonium nitrate (57·8 per cent.). (See also this Journal, 1903, 710, 963.) —G. W. McD.

Friction Primer for the Ignition of all Varieties of Fuzes employed in the Explosive Industry. A. Engl. Fr. Pat. 330,066, March 9, 1903.

The device consists of a tube closed at one end with a friction head of a composition similar to a match head. A layer of fulminate composition is placed in contact with the friction head and the tube is filled to any desired height with a slow burning composition. Another layer of fulminate composition is then added and the fuze inserted and fixed in the open end.—G. W. McD.

Fireworks; Product for and Method of Manufacture of ——. S. Salas. Fr. Pat. 329,636, Feb. 23, 1903.

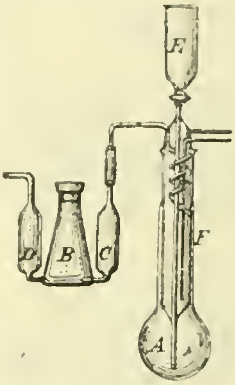
A paste is claimed consisting of water (100 parts), gum arabic (65 parts), magnesia (50 parts), whiting (10 parts), colouring matter (25 parts), phosphorus (30 parts), potassium chlorate (35 parts), which is used for toy fireworks of various descriptions, for the purpose of producing successive and repeated explosions.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Sulphur in Iron and Steel; Apparatus for the Determination of ——. A. Kleine. Stahl u. Eisen, **23**, 780—781 Chem. Centr., 1903, **2**, [8], 522.

The author has modified his apparatus for the determination of carbon in iron and steel (this Journal, 1902, 1097), so that it can be used also for the determination of sulphur. It is claimed that by keeping the ground-glass connections cool, the danger of the apparatus bursting open is avoided. 10 grms. of steel or 5 grms. of pig-iron are placed in the flask A (see figure), and 100 c.c. of water and 70 grms. o concentrated hydrochloric acid added through the tap-funne E. The gases evolved, after being cooled by their passag through the condenser F, pass into the absorption flask containing 50 c.c. of an ammoniacal cadmium solutio (20 grms. of cadmium sulphate, 400 c.c. of water, and 600 c.c. of ammonia solutio of sp. gr. 0·96). The absorbing solution is first introduce into B, and then, by blowin into C, is forced into D unti it rises to a height of 30—3 mm. in the latter. When th iron or steel is completely dissolved, the liquid in B is filtered, the paper and precipitate of cadmium sulphid treated with dilute hydrochloric acid (850 c.c. of water t 300 c.c. of concentrated acid) and starch solution, an titrated with iodine solution (7·928 grms. of iodine and 25 grms. of potassium iodide per litre; 1 c.c. = 1 mgrm. o sulphur).—A. S.



Electrolytic [Mixing] Apparatus. F. Mollwo Perkin. Electrochemist and Metall., 1903, **3**, [14], 22—27.

The author describes, with illustrations, simple forms o electrodes, fixed and rotating, for use in electro-chemica analysis.

Fixed Electrodes.—The anode is made of iridium platinum wire, and is bent in such a manner (see Fig. 1 that when placed in position, a uniform current density is obtained on all parts of the cathode. The distanc between the two sides of the anode is 2·5 cm., so that it wil be 1·25 cm. distant from either side of the cathode. Th

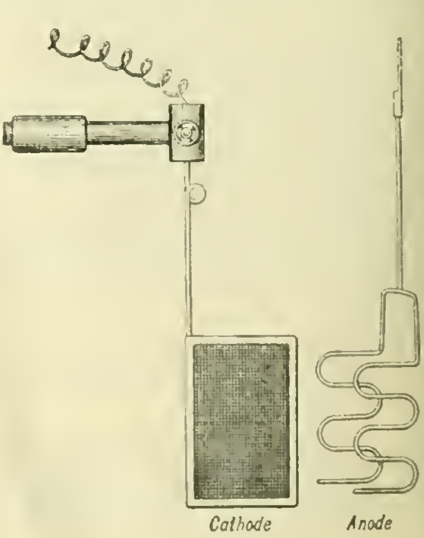


Fig. 1.

thode is made of platinum gauze, which is held rigid means of a platinum-iridium (10 per cent. of iridium) ame, 6 cm. high and 4·3 cm. wide. The frame, which is nghened by means of a sand blast, has a stout piece of dium-platinum wire, 7·5 cm. long, welded on to it. with a op, 2·5 cm. from the end, for hanging the electrode on the lance. The total cathode surface is 50·4 sq. cm., or approximately ½ sq. dcm. In many cases sheet platinum may be used in place of platinum gauze, but for metallic deposits which have a tendency to exfoliate, such as bismuth and antimony, the gauze is more satisfactory, and it is also better for mercury and for peroxide deposits. The weight of the cathode when made of sheet platinum should be about 14·5 grms., and when made of gauze (not finer than 50—60 meshes per sq. cm.) about 15 grms.

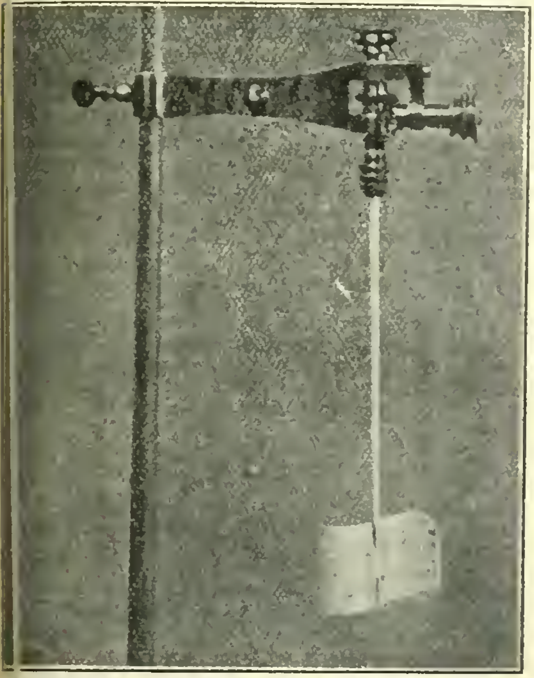


Fig. 2.

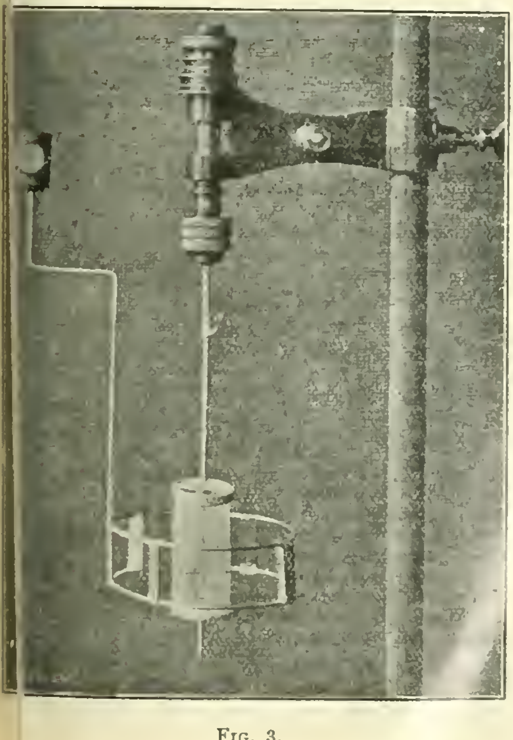


Fig. 3.

These electrodes are cheaper than basins or cylinders and are more easily manipulated when electrolytic separations are being carried out.

Rotating Electrodes.—Fig. 2 shows a form of rotating electrode which can be driven either from a horizontal or vertical pulley and may also be used for working several apparatus in series. A spindle passes through a hole in the gun-metal supporting arm, and carries a small chuck (such as is used for fixing small drills on a lathe), in which the rod of the electrode is held. The grooved pulley, which is fastened on to the upper end of the spindle, bears on the top of the gun-metal arm, which is ground smooth. The parts should only be slightly lubricated, the best lubricant being a mixture of graphite and vaseline.

The author has made satisfactory rotating lead electrodes by drawing a thin lead pipe, to which the vanes for mixing the electrolyte are attached by "burning," over a steel rod of the same diameter as the bore of the pipe, leaving above the top of the pipe a portion of the rod about 1 in. long, to be inserted into the chuck. The lead pipe is burned at both ends to prevent the electrolyte from running between it and the steel core.

Fig. 3 shows a rotating cathode and stationary anode for electrolytic depositions. The cathode is a small cylinder of platinum gauze with an available surface of about 25 sq. cm. The anode is in the form of a double circle of stout platinum wire, and has four small baffles placed at intervals round it, to prevent the electrolyte from rotating with the cathode.

—A. S.

English Patent.

Lubricating Properties of Liquids; Apparatus for Determining the ——. K. Wilkens, Berlin. Eng. Pat. 20,998, Sept. 26, 1902.

Several forms of the apparatus are described, all being characterised by the fact that the lubricant is set in motion by a mechanically driven fan and forced into an upright tube fixed tangentially to the vessel containing the fan. The lubricating power is calculated from height of rise, velocity of the fan, and the temperature.—W. P. S.

French Patent.

Gas Analysis; Apparatus for ——. N. V. O. Bolikowska (*née* Blot). Fr. Pat. 329,533, Feb. 19, 1903.

A compact apparatus for gas volumetric analysis of the usual type, in which the gas is moved backwards and forwards through the absorbing vessel by means of a cylinder and piston. The cylinder is disposed vertically, and its piston is pressed downwards by the action of a spring coiled round the rod. The upper part of the rod is screwed, and passes through the cover of the pump, which serves as a nut. Above the cover, and attached to the rod, is a disc divided radially into 100 equal parts, against which disc is a fixed pointer. If then the measuring vessel of the apparatus is filled (at atmospheric pressure) in such a way that the pointer indicates 100, after the gas has been pumped into and back out of the absorption tube till, at atmospheric pressure, the measuring vessel is once again full, the pointer shows a smaller number on the disc, the loss being the proportion in the gas of the constituent which has been removed.—F. H. L.

INORGANIC—QUANTITATIVE.

Neutralisation Point; Fixing the ——, *by Conductivity Measurements.* F. W. Küster and M. Grüters. Zeits. anorg. Chem., 35, 454—459. Chem. Centr., 1903, 2, [6], 321.

In the determination of the point of neutralisation of easily decomposable organic acids containing halogens, Küster made use of conductivity measurements, on the ground that, in caustic soda solution, the conductivity would diminish as the rapidly moving hydroxyl ions were replaced by the slowly moving complicated anions of the acid, whereas when the concentration increased by saturation with the slowly dissolving acid, the conductivity would also gradually increase. Since the ordinary indicators never fix the exact point of neutralisation, it appears desirable to make use of conductivity measurements for this purpose. In the titration of N/1-caustic soda solution with N/1-hydrochloric acid, the point of minimum conductivity lies almost exactly halfway between the points of neutralisation indicated by phenolphthalein and methyl orange; whilst in the titration of baryta water, it almost coincides with the colour change of phenolphthalein. The method is especially suitable if the colour of the liquid or turbidity hinders the use of indicators.

The results of some experiments with methyl orange, (1) with distilled water, and (2) with solutions containing chlorides, show that the amount of acid required to effect the colour change is proportional to the volume of the liquid, and increases with the amount of chloride present.
—A. S.

Sulphuric Acid; Determination of ——, by Means of Benzidine. F. Raschig. Zeits. angew. Chem., 1903, **16**, [34], 818—823. (See this Journal, 1903, 883.)

The author gives the following details for working, as the poor results lately published by Müller (this Journal, 1903, 925) arise from his not having attended to these details, and especially from his having used too much wash-water. The benzidine solution is prepared by grinding 40 grms. of benzidine with 40 c.c. of water, bringing the mixture, with about 750 c.c. of water, into a litre flask, adding 50 c.c. of concentrated hydrochloric acid, shaking, and making up to the mark. The solution is filtered if necessary, and for use is diluted twentyfold; 150 c.c. of the dilute solution precipitate about 0·1 grm. of sulphuric acid. The solution to be precipitated is poured into the benzidine solution with continual shaking, and is filtered. A funnel of about 200 c.c. capacity is used, with a Witt's porcelain filter-plate of 40 mm. upper diameter, which is covered by two 46 mm. filters; the filters are wetted and drained on the pump, and the 3 mm. annulus is pressed down to a sort of welt by means of a bent glass rod With such a filter the finest precipitates can be filtered on the pump, and can be so thoroughly drained from liquid that hardly any washing is required. (Experiments to test this point showed that when precipitating 10 c.c. of normal sulphuric acid, the error, without any washing at all, was only 0·5 per cent. of the whole, while washing with about 5 c.c. of water reduced this to 0·05 per cent. The wash-water under these circumstances dissolves about 8 mgrms. of benzidine sulphate per 100 c.c.) The precipitate is brought upon the filter, rinsed out completely by means of small quantities of the filtrate, and, immediately after disappearance of the liquid, is washed by 5—10 c.c. of water, the washing being once repeated. The funnel is now removed from the filter-flask, a 50—60 mm. watch glass placed in it, and the whole inverted, so that filter-plate and filter fall into the watch glass. The filter is now carefully removed and dropped into a 125 c.c. conical flask with 30 mm. neck, the filter-plate and watch glass are rinsed into the flask with not more than 25 c.c. of water, the flask is corked and violently shaken until precipitate and paper are completely broken up and no knots of precipitate remain (great care must be taken that this is done thoroughly), and the liquid is titrated with N/10 sodium hydroxide and phenolphthalein, the titration being begun at 50° C. and finished at 100° C., so that any carbon dioxide present may not affect the indicator.

The method is quick and accurate, provided too much wash water be not used. In the presence of organic matters, however, the precipitation is retarded; instead of 150 c.c., 300 c.c. of the precipitant should be used per 0·1 grm. of sulphuric acid, and the precipitate should stand for some hours before filtration. In all cases, the filtrate should be tested by barium chloride solution. Free acid (hydrochloric more than nitric) interferes with the precipitation; the solution should therefore be as nearly as possible neutralised before precipitation. The chief objection to the method is that it is inaccurate in presence of ferric salts. If ferric salt be present, and the ratio Fe:S be not greater than 1:1 accurate results can be obtained by reducing the iron b hydrazine hydrochloride (about 3 parts of the hydrazin salt to 2 parts of iron; any nitric acid must be removed b evaporation before reduction); but with a larger proportio of iron the larger amount of hydrazine salt required itse interferes with the process. For pyrites, the author give the following process:—Oxidise 0·8 grm. of the finely powdered pyrites by *aqua regia* in a conical flask; evaporat to dryness on a sandbath; boil for five minutes with 50 c. of 1 per cent. hydrazine hydrochloride solution; dilute 250 c.c. without filtration, and pour 50 c.c. into 400 c.c. the benzidine solution. After five minutes, filter, was with not more than 20 c.c. of water, and titrate; the numbe of c.c. of N/10 alkali gives the percentage of sulphur.
—J. T. D.

Copper; Volumetric Determination of ——, by means Potassium Xanthate. B. Oddo. Atti R. Accad. d Lincei Roma, **12**, [5], 435—439. Chem. Centr., 190 **2**, [6], 395.

Potassium xanthate gives with solutions of copper salts brownish-black precipitate (1), which is soon converted in a flocculent yellow compound (2). The reactions whi take place are shown in the following equations:—

$$2SC(OC_2H_5)SK + CuSO_4 =$$
$$Cu[SC(OC_2H_5)S\cdot]_2(1) + K_2SO_4.$$
$$2Cu[SC(OC_2H_5)S\cdot]_2 =$$
$$2SC(OC_2H_5)SCu(2) + [SC(OC_2H_5)S\cdot]_2.$$

The author makes use of the formation of the yel compound for the volumetric determination of copp employing as indicator, *s*-diphenylcarbazide, which accor ing to Cazeneuve (this Journal, 1900, 1007, 1040) forn with copper salts, copper-diphenylcarbazone, which, reason of its violet colour, allows of the recognition copper at a dilution of 1:100,000. In the determinati of copper, an excess of a standard solution of potass xanthate is added to the copper solution, the solution diphenylcarbazide added, and the excess of potass xanthate titrated with a N/10 solution of copper sulpha till a brick-red colour (formed by the mixture of the vio colour due to the indicator and the yellow due to the cupr xanthate) is produced. The potassium xanthate solut is standardised before use by titration with N/10 copp sulphate solution and *s*-diphenylcarbazide. The latter prepared by heating together 1 mol. of urea and 2 mols. phenylhydrazine on the oil-bath at 150° C.; it crystalli from alcohol and water in the form of a nearly wh powder, m. pt., 168°—169° C. It is used in the form o cold saturated solution in 85 per cent. alcohol, about 2 being added for every 2—3 degrms. of copper salt.—A

Lead and Silver; Determination of ——, by the I Method in Ores containing Copper and Antimony. Prost and E. Lecocq. Bull. Assoc. Belge des Chi, 1903, **17**, [5—6], 205—210.

The presence of copper in a lead ore does not appear have any unfavourable influence on the result of the s determination by fusion and cupellation, provided the p portion of copper in the lead to be cupelled does not exce 5 per cent., beyond which limit cupellation is no long possible. Antimony, however, even when in small amou has a highly variable influence on the results of the si determination, and may give rise to serious errors, e though the proportion be less than 1 per cent. He when the percentage of antimony is more than a few te of 1 per cent., the scorification method is preferable for silver determination.—C. S.

Arsenic; Determination of ——, in Ores and Metallurgi By-products. E. Prost and E. von Winiwarter. B Assoc. Belge des Chim., 1903, **17**, [5—6], 199—205.

The authors find that the method recommended by A. va de Casteele is as accurate as the older methods, and ar simpler and quicker. 1 grm. of the substance is tre with 10 c.c. of fuming nitric acid for some time in the d.

the mixture being then evaporated to near dryness, treated with 10 c.c. of concentrated sulphuric acid, and heated until white fumes are disengaged. The residue, taken up with water, is filtered when cold, and the filtrate is treated with 5 grms. of tartaric acid, neutralised with ammonia, and precipitated with magnesia mixture. The volume of the filtrate and arsenate washings is made up to 300 c.c.; and, for purposes of calcination, the precipitated arsenate is separated from the filter after desiccation, the residual adherent particles being dissolved in a few drops of nitric acid, evaporated, united with the main precipitate, and calcined with the usual precautions.—C. S.

Ammoniacal Nitrogen in "Mistelles" and Wines; Determination of ——. A. Desmoulière. J. Pharm. Chim., 1903, **18**, [5], 203—206.

Attention is drawn to the method proposed by Gautier and Halphen for distinguishing between "*mistelle*" wines and "*vins de liqueur*," by the determination of the ammonium salts present (see this Journal, 1903, 814). Gautier and Halphen treated the wine with lead acetate, distilled the filtrate with magnesia, and separated the ammonia from the other volatile bases by means of platinum chloride. The author proposes an alternative method for he determination of ammonia in wines, which is accurate n the presence of other nitrogenous bases. 300—500 c.c. of the wine are placed in a flask with a few drops of oil to prevent frothing and an excess of freshly calcined magnesia. The flask is connected by means of a bent tube with a receiver in the form of a deep test-tube enlarged in ts upper part to a bulb. The glass tube dips beneath he surface of about 50 c.c. of sulphuric acid (10 per cent.) ontained in the bottom of the receiver. The receiver is kept cool by a current of water, and is connected with a acuum pump. The flask is gently heated in a water bath, nd the whole apparatus is exhausted by the pump. The istillation is effected at a temperature not exceeding 35° C., nd is stopped when at least one-half of the wine has een distilled. The sulphuric acid in the receiver is then distilled with caustic soda, the distillate is collected in N/5 cid, and the ammonia is titrated in presence of litmus.
—J. F. B.

ORGANIC—QUALITATIVE.

Thiocyanic Acid; New Methods for the Detection of ——. D. Ganassini. Boll. Chim. Farm., **42**, 417—423; Chem. Centr., 1903, **2**, [7], 466.

Olera has proposed a method based on the fact that potassium thiocyanate liberates iodine from iodic acid. According to the author, the reaction proceeds according o the following equation:—

$$5KCNS + 7HIO_3 = 5KHSO_4 + 5CNI + I_2 + H_2O.$$

n making the test, the solution containing the thiocyanic cid or its alkali salt is neutralised with caustic potash, vaporated on the water-bath, nearly to dryness, and 1—2 rops of the solution poured into about 10 drops of a oncentrated aqueous solution of iodic acid.

The following tests may also be used for the detection thiocyanogen compounds:—

1. A small quantity of solid potassium thiocyanate eated with a drop of alcohol containing a trace of cobalt trate gives a blue coloration.

2. A small quantity of potassium thiocyanate, preferably lid, when treated with a trace of ammonium molybdate, idified with hydrochloric acid, and exposed to sulphuretted ydrogen, gives a violet coloration.

3. The thiocyanate is treated with a trace of lead peroxide and a drop of acetic acid. The main reaction which curs is represented by the equation—

$$3PbO_2 + KCNS + 5CH_3COOH =$$
$$PbSO_4 + C_2H_3O_2K + 2Pb(C_2H_3O_2)_2 + HCN + 2H_2O.$$

he hydrocyanic acid formed can be detected by means of e Prussian blue reaction.

4. Thiocyanates may be detected by the formation of ulphuretted hydrogen on successive treatment with alkalis and acid. The reactions are as follows, (1) or (2) according to whether the first treatment is with alkali or with acid:—

$$(1)\ KCNS + KOH + H_2O = CO(OK)SK + NH_3;$$
$$\text{and } CO(OH)SH = H_2S + CO_2.$$
$$(2)\ HCNS + HCl + H_2O = NH_4Cl + COS;$$
$$\text{and } COS + H_2O = H_2S + CO_2.$$

5. If to a small quantity of the solid thiocyanate, 1—2 drops of a filtered solution of minium in an aqueous 15 per cent. solution of tartaric acid be added, the mixture carefully evaporated to dryness, and the white residue treated with a drop of a concentrated solution of caustic potash, blackening is observed, owing to the formation of lead sulphide.

6. Potassium thiocyanate gives with mercury cyanide a double compound which shows a characteristic crystalline form under the microscope.—A. S.

Ether for Anæsthetic Purposes; Examination of ——. W. Wobbe. Apoth.-Zeit., **18**, 458—459, 465—467, 487—490; Chem. Centr., 1903, **2**, [7], 458.

According to the author, pure ether for anæsthetic purposes should answer the following requirements. (1) The sp. gr. at 15° C. should be between 0·718 and 0·720. (2) The boiling point should be between 34° and 35° C. (3) The ether should be completely indifferent to Nessler's reagent—absence of vinyl alcohol, and aldehyde. (4) 20 c.c. of the ether when shaken with 5 c.c. of alkaline silver nitrate solution (8 grms. of silver nitrate dissolved in 20 grms. of water, plus 30 grms. of ammonia solution of sp. gr. 0·923 and 10 grms. of 30 per cent. caustic soda solution) should give no reaction—absence of aldehyde. (5) If 20 c.c. of the ether be shaken with 5 c.c. of a freshly-prepared potassium ferricyanide-ferric chloride solution (two drops of a solution of ferric chloride free from acid and of sp. gr. 1·280—1·282, diluted to about 90 c.c., a freshly-prepared potassium ferricyanide solution added drop by drop till the liquid acquires a "wine-yellow" colour, and the whole made up to 100 c.c.), the aqueous liquid, in the dark, should acquire neither a green nor a blue colour —absence of hydrogen peroxide. (6) If 20 c.c. of the ether be shaken with 5 c.c. of a potassium iodide-phenolphthalein solution (a mixture of equal parts of a 50 per cent. solution of potassium iodide and a 1 per cent. solution of phenolphthalein), the latter should not be reddened—absence of hydrogen peroxide and ethyl peroxide. (7) 20 c.c. of the ether allowed to evaporate should leave no residue. (8) If 20 c.c. of the ether be allowed to evaporate after the addition of 5 c.c. of water, the residue should not redden nor bleach litmus paper. (9) The vapour of the ether should react alkaline to litmus paper. The presence of water in the ether can be best detected by means of metallic sodium or cobalt paper. Alcohol can be detected by the iodoform or rosaniline-acetate test, or by Lassar-Cohn's method (oxidation of the alcohol extracted by means of water, to aldehyde and detection of the latter by Nessler's reagent).—A. S.

Phenacetin Test. G. M. Beringer. Amer. Pharm. Assoc., Aug., 1903. Chem. and Druggist, 1903, **63**, [1230], 377.

0·1 grm. of the phenacetin is boiled with 3 c.c. of a 50 per cent. solution of sodium hydroxide for one minute, then cooled and shaken with 5 c.c. of sodium hypochlorite solution. If the sample be pure, a clear yellow liquid is obtained, but if acetanilide be present, a purple-red or brownish-red turbidity or precipitate is produced.—A. S.

Hermophenyl [Sodium Mercuriodisulphophenate]; Reactions of ——. E. Barral. J. Pharm. Chim., 1903, **18**, 207—208.

Hermophenyl, $C_6H_3.O.Hg(SO_3Na)_2$, is an amorphous, white powder, soluble in water to the extent of 22 per cent., insoluble in alcohol and possessing a saline, non-metallic taste. It contains 40 per cent. of mercury, the reactions of which are completely masked, caustic soda and sulphides giving no precipitates. It is decomposed by boiling hydrochloric acid and by heating with ammonium sulphide. Ferric chloride produces a violet coloration. The following additional reactions are described.

Concentrated *sulphuric acid* is not coloured in the cold but on warming, a yellow to orange coloration is produced.

Berg's reagent is coloured amethyst red in the cold, changing on heating to reddish orange with a brown precipitate.

Froehde's reagent (see below) on heating is coloured yellow, changing to orange-yellow, brown-yellow, brown, and finally amethyst red.

Sodium persulphate gives a slight pink coloration in the cold, the liquid turning yellow on heating. The addition of caustic soda to the cold solution produces a yellow precipitate of mercuric oxide.

Mandelin's reagent (sulphovanadic acid) gives deep indigo streaks when the powdered substance is dissolved in it, the liquid becoming dark greenish blue. On heating, the intensity of the colour decreases; it changes to emerald green near the boiling point.

Sulphuric acid and *formaldehyde* produce on heating a very intense red-brown coloration.—J. F. B.

Abrastol [*Asaprol*], $[C_{10}H_6(\overset{\beta}{O}H)SO_3]_2Ca$; *New Colour Reactions of* ——. E. Barral. J. Pharm. Chim., 1903, **18**, [5], 206—207.

The author describes the following new reactions:—

Ymounier's reagent gives a brownish precipitate with a yellow solution.

Berg's reagent produces a blue coloration in the cold, gradually turning yellow on boiling.

Froehde's reagent is coloured a blackish yellow-brown. On adding a few drops of formol and sulphuric acid to a little abrastol, a fine green fluorescence is developed, which is destroyed on dilution with water.

(*Froehde's reagent* consists of a freshly prepared solution of 0·01 grm. of sodium molybdate in 1 c.c. of concentrated sulphuric acid.)

Sodium persulphate produces, on warming, a greenish-yellow coloration, changing to greenish-brown, and later to orange-brown.

Sulphomolybdic reagent gives, on warming, a greenish-yellow coloration, changing to dirty blue, and subsequently to deep blue.—J. F. B.

ORGANIC—QUANTITATIVE.

Cyanogen Compounds; Determination and Separation of ——, *and their Impurities.* W. Feld. J. f. Gasbeleucht., **46**, [29], 561—567; [30], 603—606; [31], 629—632; [32], 642—645; [33], 660—666.

A series of processes is proposed, based upon the principle of converting the cyanogen compounds into cyanide, distilling off the hydrocyanic acid into caustic soda solution, and titrating with silver nitrate.

1. *Alkali Cyanides.*—If cyanides of the alkalis, ammonium, or the alkaline earths are distilled with solutions of certain neutral salts, preferably magnesium chloride or lead nitrate, the cyanogen is expelled quantitatively as hydrocyanic acid; thus:—(1) $MgCl_2 + 2KCN + 2H_2O = Mg(OH)_2 + 2KCl + 2HCN$; (2) $Pb(NO_3)_2 + 2KCN + 2H_2O = Pb(OH)_2 + 2KNO_3 + 2HCN$. If sulphide is present in the solution to be distilled, lead nitrate should be used, to avoid the evolution of sulphuretted hydrogen which occurs when magnesium chloride is employed. In analysing a pure alkali cyanide, 0·25 to 0·5 grm. of the substance, dissolved in 80—100 c.c. of water, is distilled with 5—30 c.c. of 3 N magnesium chloride solution for about 15—20 minutes, the exit tube of the condenser dipping into 25 c.c. of N/1 caustic soda solution. The whole apparatus should be gas-tight, and should be placed in a good draught chamber. To the liquid containing the distillate there is added about 5 c.c. of a 4 per cent. solution of potassium iodide, and the cyanide is then titrated by means of N/10 silver nitrate solution. The results are accurate and are not influenced by the presence of ferrocyanides, thiocyanates, or (if lead nitrate be used in the distillation) sulphides.

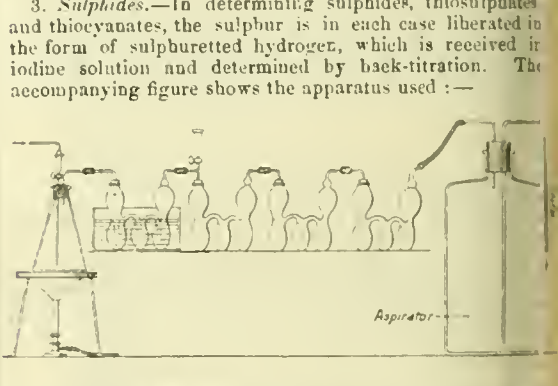
2. *Iron-cyanogen Compounds.*—Ferrocyanides and ferricyanides are first boiled in alkaline solution with mercuric chloride, whereby mercuric cyanide is formed, and the latter is then decomposed with sulphuric or hydrochloric acid, the hydrocyanic acid liberated being distilled off and titrated as mentioned above. The solution of mercuric chloride employed is mixed previously with magnesium chloride in the proportion of 1 mol. of mercuric chloride to 3—4 mols. of magnesium chloride. From such a solution no mercuric oxide, but merely magnesium hydroxide, is precipitated on mixing with the alkaline liquid. The reaction, in the case of potassium ferrocyanide for example, is as follows:—

$$2K_4FeCy_6 + 8HgCl_2 + 3Mg(OH)_2 =$$
$$6HgCy_2 + Hg_2Cl_2 + Fe_2(OH)_6 + 3MgCl_2 + 8KCl.$$

In analysing pure, soluble salts, 0·3—0·5 grm. of the substance is dissolved in 100—150 c.c. of water, 10 c.c. of N caustic soda are added, and to the boiling solution 15 c.c. of 3 N magnesium chloride solution are added very slowly to avoid the formation of clots of magnesium hydroxide. To the boiling mixture about 100 c.c. of boiling N/10 mercuric chloride solution are added, and the whole is boiled for 5—15 minutes. The liquid is then distilled with the addition of 30 c.c. of 4 N hydrochloric or sulphuric acid, the hydrocyanic acid being collected in caustic soda solution and titrated as above described. Any metallic mercury that may be present in the distillate is without influence on the titration.

Insoluble pure salts, such as Prussian blue, are decomposed by rubbing 0·5 grm into a cream with 4—5 c.c. of 8 N caustic soda solution, adding 150 c.c. of water, and boiling; 30 c.c. of 3 N magnesium chloride solution are next added, and the process then proceeds as prescribed for the soluble salts.

3. *Sulphides.*—In determining sulphides, thiosulphates and thiocyanates, the sulphur is in each case liberated in the form of sulphuretted hydrogen, which is received in iodine solution and determined by back-titration. The accompanying figure shows the apparatus used:—



The distilling flask is connected to a supply of carbo dioxide and to a series of bulbs, the first set of which i empty, and serves to condense the distilled water, th second and third containing N/10 iodine-potassium iodid solution, and the fourth containing N/10 thiosulphat solution. Air is swept out of the apparatus by means carbon dioxide before the distillation begins, and a curren of the gas is maintained during the operation.

In the case of sulphides, magnesium chloride is used f expelling the sulphuretted hydrogen, by direct distillatio the reaction proceeding as follows:—

$$2NH_4SH + MgCl_2 + CO_2 + H_2O =$$
$$2NH_4Cl + MgCO_3 + 2H_2S.$$

Other sulphur compounds are not attacked by magnesiu chloride. If cyanide be present, hydrocyanic acid liberated, and in this case it is only necessary to add to th iodine solution in each set of bulbs about 2·5 c.c. of 4 hydrochloric acid, to prevent the formation of iodi cyanide. At the end of the distillation the excess of iodi is titrated directly by thiosulphate solution, with starch indicator.

4. *Thiosulphates and Thiocyanates.*—If these salts distilled with strong hydrochloric acid in presence of alun

ium, the sulphur is expelled quantitatively as sulphuretted ydrogen, in accordance with the equations :—

$$(1)\ 3KCNS + 4Al + 18HCl =$$
$$3KCl + 2Al_2Cl_6 + 3NH_4Cl + 3C + 3H_2S.$$

$$(2)\ 3Na_2S_2O_3 + 8Al + 30HCl =$$
$$4Al_2Cl_6 + 6NaCl + 9H_2O + 6H_2S.$$

'he apparatus used is that shown in the figure. Six small oils of sheet aluminium, made of strips about 20 cm. long nd 0·5 cm. broad, are placed in the flask along with the subtance under examination and about 100—120 c.c. of water. nto the boiling solution 20 c.c. of 4N hydrochloric acid re run, and after the violent evolution of hydrogen has eased, further quantities of acid are added, until no further ecolorisation of the iodine solution occurs. A gentle ream of carbon dioxide is maintained during the distiltion. The excess of iodine is then titrated. If both iosulphate and thiocyanate are present, the latter must be etermined as below, and the thiosulphate found by fference.

If a thiosulphate be boiled with a solution of mercuric hloride, rendered alkaline by means of magnesia, the thiolphate is completely decomposed, as follows :—$Na_2S_2O_3 +$ $gCl_2 + MgO = HgS + 2NaCl + MgSO_4$. Under these contions thiocyanates are unaffected. In analysing a mixture f thiosulphate and thiocyanate, therefore, the substance is oiled for about 10 minutes with the mercuric chloride—agnesium chloride solution referred to at (2) above, to hich some magnesia has been added. After cooling, the quid is diluted to a definite volume, filtered through a dry ter, and an aliquot portion of the filtrate, which contains e thiocyanate alone, is distilled with hydrochloric acid in esence of aluminium, as already described.

5. *Influence of Sulphur, Cyanogen, and Iron Compounds the Determination of Ferrocyanide.*—In determining rrocyanide by distillation (see (2) above) in presence of lphides and thiosulphates, the iodine solution becomes ightly turbid, on account of the presence of free sulphur, d can with difficulty be titrated with silver solution. This ouble is overcome by agitating the iodine solution with ad carbonate, filtering, and titrating an aliquot part of the trate. In presence of thiocyanate, the results are much o low if hydrochloric acid is used for the distillation, but c results are accurate when sulphuric acid is employed. lkali cyanides are without prejudicial effect ; by distilling e mixture first with magnesium chloride solution alone, the anide may be accurately determined, and the ferroanide in the residue can then be determined by distillan after conversion into mercuric cyanide. In analysing soluble compounds—such as Prussian blue—which require he decomposed first with caustic alkali, serious discrepcies occur if free cyanide, sulphide, thiosulphate, and rous compounds are present, as the cyanide, in presence the alkali, is converted more or less into thiocyanate and rocyanide. In such cases the free cyanide may be minated by evaporation to dryness with magnesium loride solution prior to the extraction with caustic alkali, a preferable plan is to convert it all with certainty into rocyanide by treating the substance with a solution of a rous salt before extracting with caustic alkali.

6. *Analysis of Crude Cyanide Materials.*—Free *alkali anide* is determined by distillation with lead nitrate lution, as at (1) above. Should any sulphur find its way o the iodine solution, it is removed by means of lead bonate, as at (5). In determining the *soluble ironnoyen compounds*, these must not be extracted by boiling digesting with warm water; even pure cold water should t be used. By extracting in the cold with a solution of gnesium chloride, all the soluble cyanogen compounds obtained without the risk of interaction with the sulphur, , present, and the liquid can be readily filtered. It is n boiled with the addition of about 0·5 grm. of magnesia, decompose free cyanides and sulphides, and, after the dual addition of caustic soda solution, it is boiled with rcuric chloride solution and distilled with sulphuric acid, at (2) above. The *sulphide* is determined by direct tillation with magnesium chloride, as at (3) above; the residue from the distillation is then divided, and the *thiosulphate* and *thiocyanate* are determined as at (4). In determining the *insoluble iron cyanogen compounds*, in Prussian blue, for example, the method of extraction is of the greatest importance. The author finds that the methods hitherto in use are quite unreliable, since on warming Prussian blue with caustic alkali solution in presence of sulphur compounds, a loss of ferrocyanide, through formation of thiocyanate, occurs. A short extraction with caustic alkali in the cold, however, does not lead to the production of thiocyanate. The method of procedure depends upon whether the alkali cyanide is first to be eliminated or is to be included in the analysis. In the former case, from 0·5 to 2 grms. of the substance are rubbed down finely with 1 c.c. of 3N magnesium chloride solution and 2 c.c. of water, and the mixture is dried on the water-bath to expel the hydrocyanic acid. The residue, when perfectly cold, is rubbed into a cream with 5 c.c. of 8N caustic soda solution for a few minutes ; about 10 c.c. of the magnesium chloride solution are slowly added with continuous stirring, and the liquid is transferred to the distilling flask ; 20 c.c. more magnesium chloride solution are added, the whole is diluted to 150—200 c.c., and is boiled for five minutes. To the boiling solution 100 c.c. of boiling decinormal mercuric chloride solution are added, and, after 5—10 minutes' boiling, the liquid is distilled with the addition of 30 c.c. of 4N sulphuric acid, the titration being carried out as before. In determining the total cyanogen content, inclusive of the free cyanide, 0·5—2 grms. of the substance are rubbed down finely with 1 c.c. of normal ferrous sulphate solution and 5 c.c. of 8N sodium hydroxide solution ; the analysis then proceeds exactly as described above.—H. B.

Sugar in International Commerce; Determination of the Value of Grainy and Crystal ——. Strohmer. XVI., page 1056.

Sugars; Comparison of the Centrifugal and other Methods for the Gravimetric Determination of Reducing ——. F. Ducháček. Zeits. Zuckerind. Böhmen, 1903, **27**, [10, 11], 678—687.

A critical study was made of the various methods of separating precipitated cuprous oxide by filtration in Soxhlet tubes and Gooch crucibles, and by the more recent centrifugal method.

The crucible method and the centrifugal are clearly superior, but the latter is simpler and quicker, and allows of several simultaneous determinations being made. Moreover, ordinary Fehling solution may be used, and consequently the usual tables suffice. The cracking of the tubes is avoided. The difficult filtration is replaced by simple centrifugalising. The loss of weight after the analysis is easily and readily determined, and loss of cuprous oxide is impossible.—L. J. de W.

Malt; Determination of Pre-existing Sugars in ——. E. D. Mason. XVII., page 1061.

Nux Vomica; Determination of Alkaloids in ——. W. A. Puckner. Amer. Pharm. Assoc., Aug. 1903. Chem. and Druggist, 1903, **63**, [1230], 378.

The author uses a modification of Keller's method. 5 grms. of the powdered drug are shaken occasionally during one hour with 40 c.c. of ether, 10 c.c. of chloroform and 2 c.c. of ammonia-water. The mixture is then placed in a small percolator and when the menstruum has passed through, the drug is packed down and exhausted with a further 50 c.c. of the chloroform-ether mixture. The solution containing the alkaloids is extracted with three successive portions of 10 c.c. of N-sulphuric acid, and the acid solution, after the addition of a drop of cochineal test solution, is rendered alkaline with ammonia water and extracted with three successive portions of 10 c.c. of chloroform. The chloroform solution is evaporated and the alkaloidal residue titrated with N/10 acid, with cochineal as indicator. In four determinations the amount of acid required was 3·31, 3·49, 3·41, and 3·49 c.c. respectively.

The author states that the aliquot-part method also gives correct results, apparently through a compensation of errors,

but care must be taken to add the exact volume of the one of ether, chloroform, alcohol, ammonia, and water, and to avoid all evaporation when removing the aliquot part.
—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Reduction Processes; Kinetics of ——. H. Goldschmidt. Zeits. f. Elektrochem., 1903, 9, [36], 725—726.

In the reduction of nitro compounds by hydrogen sulphide in presence of hydrosulphides, the reaction speed is proportional to the concentration of the nitro compound and of the hydrosulphuryl ions. The concentration of the hydrogen sulphide has but little influence. The reaction does not consist, however (in the case of *m*-nitrobenzenesulphonic acid or of *m*-nitrobenzoic acid, on which it has been worked out), in a direct transformation of nitro into amino compound. If hydrogen sulphide be continually passed through the liquid, derivatives of phenylhydroxylamine are formed—$R.NO_2 + 2H_2S = R.NHOH + H_2O + 2S$—and amino compounds are only produced when the hydrogen sulphide concentration sinks so far that hydroxyl ions are present in considerable quantity.

In the reduction of nitro compounds by stannous chloride, the reaction speed is proportional to the concentrations of nitro compound, stannous chloride, and hydrochloric acid. The ratio to the stannous chloride concentration indicates that the reaction $RNO_2 + SnCl_2 + 2HCl = RNO + SnCl_4 + H_2O$ occurs with measurable speed, and that the nitroso compound is then reduced with infinite speed to amino compound. Direct reaction of nitroso compounds with stannous chloride confirms this view, which, moreover, indicates analogy between the purely chemical and the electrolytic reduction. The proportionality to the hydrochloric acid concentration shows that stannous ions are not the active substance: a view borne out by the fact that the same reaction occurs with 7½-fold greater speed if stannous bromide and hydrobromic acid be substituted for the corresponding chlorine compounds (a fact of practical importance). The author considers that the active substance is the complex tin chloride $SnCl_3H$ which S. W. Young has found to be present in hydrochloric acid solutions of stannous chloride. Among the substances on which the stannous chloride reduction was worked out, those with orthosubstituted nitro groups were most rapidly reduced.—J. T. D.

ERRATUM.

This Journal, 1903, 1021, col. 1, line 15 from bottom, after "*reflux condenser*" add the words "*with bismuth oxalate.*"

Trade Report.

I.—GENERAL.

ENGLISH PATENTS IN THE COLONIES.

J. E. Evans Jackson and Co. Chem. News, Sept. 1903.

It is probable that the majority of British inventors and patentees are aware of the introduction of an Australian Federal Patents Bill by the Commonweath of Australia. The Bill was presented and read on the 26th day of June last, and will probably become law in the Commonwealth by the beginning of next year. It contains one provision of such far-reaching consequence that too much prominence cannot, it is thought, be given to it. The provision referred to is contained in section 83, as follows —

"Every patent shall be granted subject to the following conditions :—

"(*a*) That the patentee or some person authorised by him shall within five years after the date thereof commence, and after such commencement continuously carry on, in Australia, the construction, manufacture, or working of the invention patented in such a manner that any person desiring to use it may obtain it or the use of it at a reasonable price; and

"(*b*) that the patentee shall not after four years from th date of the patent import the invention or cause it to be imported into Australia."

Thus it follows that an English manufacturer who obtain a patent for his product in the Australian Commonwealt must actually manufacture on the spot and refrain fron exporting the same from this country after a period of fou years or lose his patent.

Attention is also drawn to the Canadian Patent Law which was amended by the Act of August 13th, 1903, an which provides that the patentee or his representative mus within two years commence and continuously carry on h Canada the construction or manufacture of his inventio If, after the expiration of twelve months from the grant o a patent, the patentee or his representative imports int Canada the invention for which the patent is granted, th patent shall be void.

These provisions are so widely different from the pro visions in the mother country, and are likely to affect s seriously the position of British patentees, that no excuse i necessary for drawing attention to the same.

ALGERIA; EXPORT TRADE OF ——, IN 1902.

Foreign Office Annual Series, No. 3071.

Articles.	Quantity.	Value.	Remarks.
	Galls.	£	
Wine, ordinary	5,843,486	2,124,906	Principally to France
„ alcohol made	305,470	166,631	„ „
	Cwts.		
Chemical products, total	85,287	3,564	
Dyes and tannins, total	192,991	44,120	
Gold, silver, and copper, total	..	6,320	
	Tons.		
Metals, total	762,853	360,703	
Iron ore	574,575	195,355	Principally to Un Kingdom and Ho land.
Lead	4,138	26,488	
Zinc	40,546	99,206	Principally to Belgiun
Copper ore	963	4,931	
	Cwts.		
Oils and vegetable extracts, total	122,896	204,812	
Olive oil	88,979	125,298	To France principal (Britanny for sa dines), and al Germany, Tunis, an Malta.
	Tons.		
Stones, earth, and combustible minerals, total	317,408	199,290	
Phosphates, natural	270,102	486,183	Principally to th United Kingdom.
Cork wood	14,865	297,317	To France, Russ Austria - Hunga and Germany.

AUSTRIA-HUNGARY; TRADE OF ——.

Foreign Office Annual Series, No. 3073.

The following table shows the value of some articles of import into Hungary during the years 1901 and 1902 :—

Articles.	1901.	1902.
	£	£
Beer	47,706	11,83
Wine	791,682	775,8
Spirits	105,926	91,9
Coal	3,755,173	3,612,5
Coke	718,689	690,23
Ore	392,439	407,44
Minerals	563,032	528,71
Dyeing and tanning materials	922,513	909,06
Gums and resins	519,267	551,18
Indiarubber	366,160	381,58
Iron, crude	401,928	182,0
Chemical auxiliaries	1,118,342	831,0
Paper and paper goods	1,126,962	1,144,01
Indiarubber goods	311,698	306,6
Leather and leather goods	2,050,038	1,880,2
Iron goods	938,227	914,70
Machinery and apparatus	1,761,209	1,849,41
Chemical products	1,003,511	1,106,18

The following table shows the value of some articles of export from Hungary during the years 1901–02.

Articles.	1901.	1902.
	£	£
Sugar	7,361,206	5,541,490
Hides and skins	1,626,120	1,897,756
Beer	547,573	566,868
Wine	323,680	375,989
Spirits	214,585	141,307
Brown coal	3,385,184	2,943,692
Black „	575,021	506,939
Coke	446,333	327,991
Ore	385,151	394,337
Minerals	565,416	596,381
Dyeing and tanning materials	722,785	715,699
Iron, crude	91,793	163,071
Chemical auxiliaries	464,336	485,579
Paper	1,033,779	1,143,114
„ goods	246,599	271,470
ndiarubber goods	348,814	379,566
Leather	350,689	399,759
„ goods	2,114,700	2,072,469
Glass and glassware	2,048,145	2,065,226
Porcelain	534,299	536,174
Machinery and apparatus	450,132	574,231
Chemical products	734,934	860,526
Matches	184,866	123,549

Great Britain contributed to the import as follows:—

Articles.	1901.	1902.
	£	£
Grease and tallow	78,884	57,585
Oils	18,010	57,479
Mineral oil	425	514
oap and candles	2,039	2,127
Dyeing and tanning materials	17,372	16,114
Chemical substances	64,197	38,242
„ products	58,762	56,732
Gums and resins	23,583	44,692
Matches and gunpowder	652	745
Medicine and perfumery	8,459	8,937

The portion of the export from Austria-Hungary coming
the United Kingdom was:—

Articles.	1901.	1902.
	£	£
ugar	3,214,776	2,246,062
ineral oil	1,599	3,613
oap and candles	232	536
inerals	6,031	7,034
yeing and tanning materials	116,330	122,039
hemical substances	15,078	21,266
„ products	84,087	106,286
ums and resins	4,085	4,990
atches	232	536

Philosophical and Scientific Articles for Institutions, under the Present American Tariff Act.

The Treasury Department has prepared a circular rearding the free entry of scientific preparations and pparatus designed for use in institutions. The regulations rescribe an oath on entry, stating that the articles are for e *bona fide* use of the iustitution and not for sale.

Officers of Customs are expected to construc the law in liberal a manner as is consistent with its language and e rulings of the Board of General Appraisers, and to solve all reasonable doubts in favour of the importer, earing in mind that many articles not strictly scientific character, such as sextants, theodolites, &c., may be sed in teaching or illustrating scientific principles.

The rule of principal intended use is to be followed. he articles should, however, have either some scientific r philosophical character to be admitted free of duty. ottles and boxes containing philosophical and scientific preparations are, however, held to be free of duty. Chemical eparations, such as absolute alcohol, used chiefly in the boratory, are held to be scientific preparations.

A hospital having a school of instruction is not entitled import philosophical instruments free of duty, as such an institution is not established solely for educational purposes.

The Treasury Department holds that the various scientific bureaus of the Government, including the Smithsonian Institution, the Naval Observatory, the Naval Academy, and the State Boards of Health, are entitled to import scientific articles free of duty. An instance of the manner of application of the law can be seen in the case of a magic lantern, which is not free of duty when imported for use in exhibitions before a Sunday school, but is free if imported for a Sunday school and to be and remain the property of a church.

A list of articles which have been the subject of decisions by the Board of General Appraisers and the courts is given. It is not to be considered as an absolute guide, as many of the articles held to be non-scientific in character would be properly classed as scientific if used in the class room in scientific teaching, and hence entitled to free entry.

—R. W. M.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Shoddy Waste: U.S. Customs Decision.

Bd. of Trade J., Sept. 3, 1903.

The waste and refuse of shoddy used in woollen manufactures, imported for use in the manufacture of a fertiliser, is not entitled to free entry under paragraph 569 of the tariff as a "manure," but is dutiable under paragraph 362 at the rate of 20 cents per lb.

VII.—ACIDS, ALKALIS, Etc.

Potash; German Production of ——.

U.S. Cons. Reps. No. 1727, *Aug.* 19, 1903.

The German potash-producing industry has attained considerable importance within a comparatively short time. Over 210,000,000 marks are invested in Germany in this industry. The number of workmen employed in this industry in the Empire is about 30,000, and the value of the product nearly 58,000,000 marks.

The consumption of kainite, inclusive of hard salt (hartsalz) and sylvanite, increased from 175,000 tons in 1890 to 825,000 tons in 1902. On each 100 hectares (247 acres) of arable land, 391 kilos. of potash were used in 1902, while only 71 kilos. were used in 1890.

VIII.—GLASS, POTTERY, AND ENAMELS.

Window-Glass Manufacture in Germany.

U.S. Cons. Reps., No. 1737, *Aug.* 31, 1903.

The production of the six factories which form the union of Rhenish window glass manufacturers amounted in 1900, 1901, and 1902 to 28,333,598, 27,189,702, and 26,488,026 sq. ft., respectively. Thus the production shows a steady decrease, and the decrease in the quantities sold is larger still. Of the total sales in 1902 only 1,262,696 sq. ft. went abroad, against 4,448,528 sq. ft. in 1901. During the latter part of 1902 the decreased demand was more pronounced, and the prices, owing to a strong competition on the part of the Saxon, Bavarian, and Silesian works, had to be reduced from month to month. The result was that the inland prices which had already been reduced considerably in 1901 underwent in 1902 a further reduction of nearly 30 per cent. The export trade in 1902 yielded unsatisfactory results; there was a limited demand at prices which were barely sufficient to pay the costs of manufacture, which were kept up by the abnormally high prices of fuel.

The prospects of 1903 are by no means favourable; the demand during the first months remained very small, and as there is nothing in view which would justify the hope of an improvement in the near future, it is not unlikely that further reductions in the production will become necessary. Manufacturers are still in hopes that the reduction of freight rates to Switzerland and to Antwerp, which has been petitioned for during the last few years, may be finally granted. This would help them to compete on about even terms with the Belgian manufacturers of window glass.

BOHEMIAN PORCELAIN AND GLASSWARE.

U.S. Cons. Reps., No. 1730, *Aug.* 22, 1903.

The porcelain and glass industries are among the most important in Bohemia, but there are no statistics respecting their output and general export. The export to the United States, however, is very considerable. There are in Bohemia 43 factories manufacturing porcelain and china in different varieties and qualities, employing together about 7000 workmen. There are also about 100 glass works, employing about 12,000 workmen and varying largely in class of work. Both these industries are in a fairly prosperous condition, with normal demand for their output. Most of the principal porcelain works are in the neighbourhood of Carlsbad, where there are also several glass factories.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

PLASTER OF PARIS IN HUNGARY.

U.S. Cons. Reps., No. 1734, *Aug.* 27, 1903.

The annual consumption of plaster of Paris in Hungary is estimated at 3000 carloads. There are five Hungarian factories working, but only at half their capacity. The plaster is very widely used for building and sculptural purposes. The gypsum is imported into Hungary mainly from Austria, with small quantities from Germany, France, Italy, and Great Britain, in the order given. The exports are five times larger than the imports and go to Austria, Bulgaria, Roumania, Servia, and European Turkey.

X.—METALLURGY.

THE JAPANESE METAL TRADE.

Eng. and Mining J., Aug. 29, 1903.

Since the Chinese-Japanese war there has been increasing industrial activity in Japan. Credit is due to the Government for its progressive spirit in sending highly educated people to the leading commercial countries to investigate the prosperous industries, and subsequently in adopting many of the newly-acquired ideas. Recent statistics show that the imports of iron and steel at Kobé and Osaka in 1902, chiefly from Great Britain and Germany, were valued at 849,461*l.*, among the more important articles being 20,197 tons of pig iron, 21,838 tons of bar and rod iron, 14,468 tons of rails, and 11,733 tons of nails. There has also been imported 101 tons of nickel, 37,091*l.* worth of lead, 117,751*l.* of zinc, and 43,948*l.* of tin. In 1902 the exports of refined copper amounted to 9900 tons, valued at 532,385*l.*, part of which has come to the United States, where the metal is valued for its gold and silver content. Exports of other metals, including manufactures of copper, were valued at 202,023*l.*

CALIFORNIAN MERCURY.

Chem. and Druggist, Sept. 12, 1903.

The mercury industry in California during 1902 has continued to show a slight improvement, in so far that there appears a desire to reopen a few more of the old mines, and that capital is being invested in these undertakings. The old mines appear to hold their own, some, like the New Idria, with a steadily increasing output. During the twelve months ended June, 1903, the total exports of mercury from the United States amounted to 1,415,464 lb., against 740,500 lb. in 1901–2 and 716,569 lb. in 1900–1.

FERRO-CHROME AND OTHER FERRO ALLOYS. U.S. CUSTOMS DECISION.

The Treasury Department has ordered an appeal from the recent decision of the Board of General Appraisers, holding ferro-chrome, ferro-tungsten, ferro-molybdenum, and ferro-vanadium dutiable at 4 dols. a ton under paragraph 122 of the present Tariff Act by similitude to ferromanganese. A recent decision of the Circuit Court of Appeals held that similar merchandise was dutiable at 20 per cent. *ad valorem*, as "metals unwrought," under paragraph 183, and the Department directs that this rate be applied to all of the above-mentioned alloys.—R. W. M.

XVII.—BREWING, WINES, SPIRITS, Etc.

BREWING INDUSTRY OF AUSTRIA.

U.S. Cons. Reps., No. 1730, *Aug.* 22, 1903.

Production.—From 1855 to 1873 the production of beer in Austria had risen from about 133,000,000 to about 337,000,000 galls. In that year a reaction took place in consequence of which the production up to 1880 fell to about 278,000,000 galls. Since 1880 the growth of the brewing industry (which turned out 555,812,680 galls. in 1902) was not further interrupted until the last brewing season, which shows the remarkable decrease of 12,581,685 galls.

Tax.—The revenue derived from the beer tax in Austria amounted in 1901–2 to 74,645,651 crowns (3,110,236*l.* against 76,075,000 crowns (3,169,791*l.*) in 1900–1. The new provincial beer tax of 1·70 crowns per hectolitre (2*s.* 3½*d.* per brl.) came into operation in 1903. The proceeds from this tax in Bohemia will not go into the Government treasury, but will be applied to the long-promised increase of the salaries of public teachers. In this connection it may be mentioned that since last year the Erhard Schaup checking apparatus has been adopted. The automatic control of this apparatus has great advantages over the previous methods of checking the beer production

XVIII.—DISINFECTANTS.

CATTLE AND SHEEP DIP — SARNOL: U.S. CUSTOMS DECISION.

Aug. 29, 1903.

The Board of General Appraisers held that a mixture of coal-tar oils, petroleum products, and arsenic compounds, was free of duty as "sheep-dip" under paragraph 657 of the Tariff Act, and not at 25 per cent. *ad valorem* as a "chemical compound" under paragraph 3. The fact that the article was used on cattle other than sheep was held not to differentiate it from the varieties of antiseptic washes for sheep containing arsenic, which are unsuitable for general disinfecting purposes owing to their poisonous character.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, a asterisk is affixed. The dates given are (i) in the case of Applica tions for Patents, the dates of application, and (ii) in the case o Complete Specifications Accepted, those of the Official Journal in which acceptances of the Complete Specifications are advertised

Complete Specifications thus advertised as accepted are open t inspection at the Patent Office immediately, and to oppositio within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 18,718. Gallagher. Means for indicating a rise i temperature. Aug. 31.

„ 18,751. Mather. Crucible filling or chargin apparatus.* Aug. 31.

„ 18,869. Gerhardt. Distillation apparatus.* Sept. 1

[C.S.] 20,303 (1902). Lewicki. Method of revivifyin filtering materials. Sept. 9.

II.—FUEL, GAS, AND LIGHT.

[A.] 19,180. Postlethwaite. Apparatus for combustio in analytical work.* Sept. 7.

„ 19,220. Wesselsky. Apparatus for generating g from small and dust coal. Sept. 7.

„ 19,142. Kunwald. Method of manufacturing acety lene. Sept. 9.

„ 19,523. Wilson. Gas-producing furnaces. Sept. 1

[C.S.] 20,826 (1902). McNally. Material for use i purifying acetylene gas. Sept. 16.

C.S.] 23,986 (1902). Hirsch. Toughening compound for the manufacture of incandescent gas mantles. Sept. 16.

" 25,958 (1902). Lake (Gasmesserfabr. Mainz, Elster and Co.). Apparatus for testing illuminating gas. Sept. 9.

" 13,918 (1903). Hamfeldt and Tesch. Blast furnaces. Sept. 9.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 18,924. Read Holliday and Sons, Turner, Dean, and Turner. Manufacture of colouring matters. Sept. 2.

" 19,370. Ransford (Cassella and Co.). Production of acetylalkylamidophenol, of acetylalkylamidoamidophenol sulphonic acids, and of azo dyestuffs therefrom. Sept. 8.

C.S.] 22,534 (1902). Read Holliday and Sons, Turner, Dean, and Turner. Manufacture of intermediate compounds and colouring matters containing sulphur. Sept. 9.

" 22,823 (1902). Imray (Meister, Lucius und Brüning). Manufacture of sulphurised dyestuffs. Sept. 9.

" 23,418 (1902). Ransford (Cassella and Co.). Manufacture of oxychlorphenylamidotolylamine, and sulphur colours therefrom. Sept. 9.

" 23,514 (1902). Read Holliday and Sons, Turner, Dean, and Turner. Manufacture of colouring matters. Sept. 9.

" 23,967 (1902). Shillito (Aniline Colour and Extract Works, formerly J. R. Geigy). Sulphur dyestuffs. Sept. 9.

" 23,993 (1902). Imray (Meister, Lucius und Brüning). Manufacture of azo dyestuffs. Sept. 9.

" 23,994 (1902). Abel (Act.-Ges. f. Anilinfabr.). Manufacture of products of the indophenol series. Sept. 9.

" 24,255 (1902). Johnson (Badische Anilin und Soda Fabrik). Manufacture of organic acyl bodies. Sept. 16.

" 24,461 (1902). Imray (Fab. Prod. Chim. Thann et Mulhouse). Manufacture of aromatic nitrites. Sept. 9.

" 2991 (1903). Bang (Dahl and Co.). Dyestuffs obtained by combining diazo compounds with acetyl- and formyl-para-amidophenols and their derivatives. Sept. 9.

V.—PREPARING, BLEACHING, DYEING, RINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

A.] 18,795. Young and Waddell. Producing a spot effect on linen, cotton, and hemp yarns and cloth. Sept. 1.

" 18,946. Mennvveg and Mennvveg. Dyeing fabrics. Sept. 2.

" 19,571. Walton. Dyeing, ageing, and developing aniline black on cotton goods. Sept. 11.

.S.] 19,222 (1902). Longley and Longley. Manufacture of dyed wadding in one continual process. Sept. 9.

" 23,579 (1902). Printing Arts Co., Ltd., Mowbray and Black. Means for multicolour printing. Sept. 16.

" 24,377 (1902). Calico Printers' Association, Ltd., Blair and Lindsay. Calico-printing machines. Sept. 16.

VII.—ACIDS, ALKALIS, SALTS, ETC.

A.] 18,958. Hannay. *See under* XI.

" 18,997. Margosches and Ditz. Manufacture of chlorine. Sept. 3.

" 19,168. Ellis (Chem. Fab. Heyden, A.-G.). Manufacture of colloidal salts of heavy metals. Sept. 5.

" 19,242. Delbear. Manufacture of caustic soda.* Sept. 7.

[A.] 19,267. Bergmann. Production of dicalcium phosphate. Sept. 7.

" 19,505. Hardingham (Soc. Minere e Fonderie d'Antimonio). Production of oxysulphide of antimony. Sept. 10.

[C.S.] 19,986 (1902). Hansen. Producing carbonate of soda. Sept. 9.

" 20,053 (1902). Lévy and Helbronner. Separation of gases from their mixtures, especially oxygen and nitrogen from air, and apparatus therefor. Sept. 16.

" 9142 (1903). Leslie. Apparatus for the manufacture or recovery and purification of carbonic acid. Sept. 16.

" 10,508 (1903). Lütjens. Plant for use in the manufacture of superphosphate. Sept. 16.

VIII.—POTTERY, GLASS, AND ENAMELS.

[C.S.] 24,610 (1902). Meth. Process for etching glass. Sept. 16.

" 15,854 (1903). Imray (St. Louis Plate Glass Co.). Method of making plate glass. Sept. 9.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 18,736. Joseph. Cement. (U.S. Appl., Aug. 30, 1902.)* Aug. 31.

" 18,798. Fedden. Method of equalising the temperature within brick kilns. Sept. 1.

" 18,884. Davies. Brick kilns. Sept. 2.

" 19,016. Gresly. Manufacture of hydraulic cements. (Belgian Appl., Jan. 28, 1903.)* Sept. 3.

" 19,376. Moore. Kilns for drying and burning bricks, &c. Sept. 8.

[C.S.] 15,176 (1902). Knox and Helps. Producers and kilns for burning bricks, terra-cotta, &c. Sept. 16.

" 20,878 (1902). Quinn. Manufacture of artificial stone or similar substances. Sept. 9.

" 25,429 (1902). Kirkpatrick. Manufacture of bricks and compositions capable of withstanding very high temperatures. Sept. 9.

" 12,095 (1903). Perkiewicz. Manufacture of bricks. Sept. 9.

" 17,061 (1903). Wilson. Brick kilns. Sept. 16.

X.—METALLURGY.

[A.] 18,763. Savelsberg, Wannschaff, and Allgem. Elektro-Metall. G. m. b. H. Extraction of heavy metals by means of chlorine. Aug. 31.

" 19,109. Phillips and Pickering. Extraction of gold from auriferous slimes and kaolinised materials. Sept. 5.

" 19,196. Parker. Production of sodium and potassium. Sept. 7.

" 19,291. Parker. *See under* XI.

" 19,353. Lake (Santilippo). Ore-roasting furnaces.* Sept. 8.

" 19,366. Abel (Siemens and Halske A.-G.). Reducing metallic compounds and fusing metals, especially nickel and iron, in the electric furnace. Sept. 8.

" 19,504. Montby, Trézel, and Coppée. Aluminium alloy.* Sept. 10.

" 19,597. Alzugaray. Extraction of metals from their ores. Sept. 11.

[C.S.] 19,351 (1902). Malden and Malden. Process of agglomerating finely-divided ores. Sept. 9.

" 22,860 (1902). Thomas and Co., Thomas, and Lones. Treating water used for pickling metal plates. Sept. 16.

" 24,236 (1902). Bronn. Process for obtaining metallic sulphides in electric furnaces. Sept. 16.

" 13,877 (1903). Herreshoff. Ore-roasting furnaces. Sept. 16.

[C.S.] 16,639 (1903). Goyder and Laughton. Separation of minerals and extraction of some of them as concentrates. Sept. 16.

„ 16,848 (1903). Propfe. Pulverising and cleaning minerals. Sept. 16.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 18,958. Hannay. Electrolytic manufacture of caustic soda and other products. Sept. 2.

„ 19,291. Parker. Electric extraction of sodium, potassium, and the alkaline metals. Sept. 8.

„ 19,368. Parkes. Electro-deposition of copper. Sept. 8.

[C.S.] 19,368 (1902). Hargreaves. Electrodes for electrolytic purposes. Sept. 9.

„ 24,330 (1902). Elmore. Apparatus for the generation and application of electric currents for electrolysis. Sept. 16.

„ 25,442 (1902). Imhoff and United Alkali Co., Ltd. Secondary electrodes for electrolytic apparatus, especially intended for use in the manufacture of chlorates. Sept. 16.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 19,013. Majert. Process for refining castor oil. Sept. 3.

„ 19,163. Defavrie. Composition for the manufacture of phonographic cylinders, &c. Sept. 5.

„ 19,407. Bedford and Bedford. Purification and deodorisation of oils, spirits, and fatty substances. Sept. 9.

[C.S.] 14,518 (1903). Lewink. Apparatus for bleaching and condensing vegetable oil. Sept. 16.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 19,537. Armbruster and Morton. Processes of making pigments.* Sept. 10.

„ 19,538. Armbruster and Morton. Processes of making pigments.* Sept. 10.

[C.S.] 21,692 (1902). Hatmaker (Ruston). Casein coating and paint compositions. Sept. 16.

B.—Resins, Varnishes.

[A.] 18,714. Horst. Manufacture of linoleum.* Aug. 31.

„ 19,233. Clausen. Linoleum-like material. (Appl. in Denmark, Oct. 22, 1902.)* Sept. 7.

C.—India-rubber, &c.

[A.] 19,192. Weber. Utilisation of low grades of india-rubber and gutta-percha and their resinous constituents. Sept. 7.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 19,017. Foelsing. Manufacture of albumen from fish. Sept. 3.

„ 19,050. Kemp-Welch. Size or adhesive cement for cold-water paint. Sept. 4.

„ 19,361. Thompson (Act.-Ges. für Chem. Industrie). Process for producing bleached substances containing albumen. Sept. 8.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 19,499. Calico Printers' Association, Ltd., Browning and Barlow. Method of and apparatus for producing soluble starch and dextrine. Sept. 10.

„ 19,645. Monti. *See under* XVII.

[C.S.] 14,182 (1903). Miller, Huether, Hough, McNeill, and Fisher. Process and apparatus for making sugar. Sept. 9.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 19,274. Burlin. Treatment of brewers' waste products and production therefrom of useful products, and apparatus therefor. Sept. 7.

„ 19,407. Bedford and Bedford. *See under* XII.

„ 19,472. Henry. Apparatus for assisting the aerating of grain for malting, distilling, &c., during the steeping process. Sept. 10.

„ 19,645. Monti. Treatment of wine, must, beer, beetroot juice, &c., and apparatus therefor. (Fr. Appl., Sept. 12, 1902.)* Sept. 11.

[C.S.] 11,526 (1903). Douglas. Apparatus for manufacturing vinegar. Sept. 9.

„ 11,749 (1903). Lapp. Process for softening grain. Sept. 9.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[C.S.] 21,617 (1902). Hatmaker (Just). Drying and preserving milk. Sept. 16.

„ 12,555 (1903). Bendixen. Sterilisation of milk Sept. 9.

B.—Sanitation; Water Purification.

[A.] 19,470. Bond. Material for use in the filtration o water. Sept. 10.

„ 19,599. Adams and Springborn. System for th purification of sewage and other fluids. Sept. 11

C.—Disinfectants.

[A] 19,596. Alzugaray. Manufacture of disinfectant and antiseptics. Sept. 11.

[C.S.] 23,460 (1902). Mills (Soc. Anon. Prod. Chim Spéciaux). Solid soluble antiseptic. Sept. 16.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 19,541. Harrison (Vellumoid Paper Co.). Manu facture of waterproof paper and the like. Sept. 1

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„ 19,446. Descamps. Manufacture of products fro compounds having an aldehydic function or thei analogues. (Fr. Appl., Feb. 23, 1903.)* Sept.

[C.S.] 19,804 (1902). Woltereck. Production of hydr cyanic acid. Sept. 16.

„ 20,922 (1902). Lake (Fabr. Chem. Praep. Dr. R Sthamer). Production of radio-active metalli coating. Sept. 9.

„ 27,524 (1902). Smith. Medicinal preparation Sept. 16.

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[C.S.] 24,231 (1902). Shepherd and Bartlett. Pho graphic printing. Sept. 16.

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[A.] 19,438. Lundholm. Explosives. Sept. 9.

[C.S.] 23,846 (1902). Bichel. Manufacture of explosive Sept. 9.

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1899. Atteaux, F. E., 176, Purchase Street, Boston, Mass U.S.A., Chemical Manufacturer.

Death.

Dick, Alexander, 41, Lee Road, Blackheath, S.E. Sept. 1
Hantke, Dr. Ernst, 646, Broadway, Milwaukee, Wi U.S.A. Sept. 13.
Weightman, A. T, 11, Chepstow Road, Croydon.

Obituary.

THOMAS FLETCHER, F.C.S.

FORMERLY A MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY.

ON Sunday, September 20th, in his 64th year, Mr. Thomas Fletcher, the inventor of the Fletcher's gas-furnaces, gas-burners, &c., died after a protracted illness, at his residence at Grappenhall, near Warrington. He was the chairman and one of the managing directors of the firm of Fletcher, Russell, and Co., Ltd. Thomas Fletcher was originally trained for the medical profession, but turned his attention to dentistry. It was the need for some ready method of fusing the metals used in dental operations that led to the invention of the various gas-furnaces with which his name is so intimately associated. He retired from dental practice about 1872, and extended his experiments to the production of appliances for use in chemical and physical laboratories. Mr. Fletcher was the author of "Dental Metallurgy" and "Coal-gas as a Fuel." Amongst various papers of interest, in 1888 he read one before the Liverpoo Section of this Society entitled "A New Commercia Application of Oxygen," and another before the Society of Arts, in 1884, on "Coal-gas as a Labour-saving Agen in the Mechanical Trades."

BARNARD SIMPSON PROCTOR, F.I.C.

ORIGINAL MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY; PRESIDENT OF THE NEWCASTLE CHEMICAL SOCIETY IN 1883, WHEN AMALGAMATED AS ITS NEWCASTLE SECTION WITH THE SOCIETY OF CHEMICAL INDUSTRY; ALSO THE FIRST CHAIRMAN OF THAT SECTION.

Mr. B. S. PROCTOR, a most distinguished and honoured member of the pharmaceutical profession for more than half a century, died at Westbury-on-Trym, near Bristol, on September 22nd, aged 76 years. He was the head of the firm of Proctor, Son, and Clague, of Newcastle-on-Tyne. He had also been a member of the Board of Examiners, and of the Council of the Pharmaceutical Society, and a lecturer on pharmacy in the College of Medicine of Durham University.

The best appreciation of Mr. Proctor's scientific worth may probably be gleaned by a perusal of his admirable address as first Chairman of the Newcastle Section of the Society of Chemical Industry (this Journal, 1883, 396—402). He was an original member of this Society, but resigned his membership in 1894.

Mr. B. S. Proctor was the son of the late Mr. William Proctor, Pharmaceutical Chemist, of Newcastle-on-Tyne, and formed the fifth of a generation of chemists. After 1853 he entered into partnership with his father in his business, which was founded in 1758, and they traded as W. Proctor and Son. When Mr. T. M. Clague was taken into partnership, the title of the firm was modified as "Proctor, Son, and Clague." Mr. B. S. Proctor retired on December 31, 1897, and went to reside at Bradford-on-Avon, where he remained until last year, when he removed to Westbury-on-Trym. Mrs. Proctor was a niece of Michael Faraday, and her two sons have followed their illustrious relative, and their father's life-long friend, Dr. J. W. Swan, in the pursuit of electrical science.

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-PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENTS.

ifying, Sterilising or Ageing Liquids; Apparatus for Electrically] ——. R. C. Turner, Columbus, Ohio. ng. Pat. 12,191, May 28, 1903. Under Internat. Conv., ay 29, 1902.

o or more separate vessels having spouts, are arranged s as to discharge from one into the other, the liquid fl ing into each vessel through a metallic insulated funnel, w ch is fixed so that the bottom of its stem is above t level of liquid in the vessel below. Each funnel a as an electrode in the electrolytic cell below it. a the circuit is complete when the unbroken stream of li id covers a horizontal metal plate acting as the other e trode. The latter is attached to a vertical conducting r insulated with a tube of porcelain or other non-con- d ting material. The cells are connected in parallel. It is tated that the liquid, as it flows from the funnels, is s ected to a higher degree of electric action and also to th action of the air.—B. N.

ctional Distillation; Process of and Apparatus for ——. . H. Müller, Mülheim-on-the-Rhine. Eng. Pat. 18,579, ug. 23, 1902.

S addition to Fr. Pat. 316,753 of 1901; this Journal, 1 3, 410.—T. F. B.

Evaporation of [*Crystallisable*] *Liquors; Apparatus for the* ——. A. Chapman, Liverpool. Eng. Pat. 20,902, Sept. 12, 1902.

A CHAMBER is attached to the bottom of a vacuum pan, both being filled with solution, and in connection with the vacuum pump. The crystals separating out in the vacuum pan, fall into this chamber, and when a sufficient quantity has accumulated, communication is cut off between the two by means of a valve. The chamber is provided with a tapering bottom and a pipe for draining away the mother-liquor. Inside the chamber is a cylindrical vessel without a bottom, and with perforated sides. This is closed below by fitting upon a perforated plate resting on the tapering bottom of the outer vessel. When air is let into the chamber (the vacuum pan being disconnected) the mother-liquor is drained off, the tapering bottom and perforated plate are then swung away by a suitable pivot arrangement, and the discharge of the accumulated crystals is thus effected. To recharge the apparatus it is closed, exhausted by the vacuum pump, and refilled with solution. Communication between the chamber and the vacuum pan, which has been working uninterruptedly, is then again established.—L. F. G.

Centrifugal Extracting Machines. H A. Peterson, Honolulu, Hawaii. Eng. Pat. 6694, March 23, 1903. Under Internat. Conv., March 24, 1902.

WITHIN a cylindrical drum with perforated sides, a second cylindrical drum is placed, concentric with the first and secured by struts, an annular space being thus formed between the two drums. The bottom of the inner drum has the shape of a plate forming a truncated cone, with a hole in the centre. This hollow cone communicates with the annular space above described, and the mass to be extracted, is fed into it through a pipe. The liquid expelled by the centrifugal force passes through the sugar or other solid material, and through a cloth surrounding the inner drum, and through the perforations of the outer drum into a vessel surrounding it, and is then drawn off. Water can be supplied to the inner drum by a pipe, in order to wash the mass to be extracted. An annular perforated air-chamber may also be provided around the top of the inner drum; the air supplied to this chamber is forced through its perforations, and expels any liquid remaining in the mass to be extracted. —L. F. G.

French Patents.

Apparatus for the Treatment, Purification, and Separation [by Use of Fans] of Chemical Substances. J. Lühne. Fr. Pat. 330,322, March 17, 1903.

The apparatus can be used for any chemical process, *e.g.*, for the separation of naphthalene, the absorption of cyanogen and ammonia, and for the removal of sulphuretted hydrogen from gas. It is made up of any number of elements, each consisting of two revolving fans placed inside a cylinder, open at the top and bottom, and which can be fitted to the next element or closed by a cover. The fans have radial corrugated divisions, those of the first conducting the materials supplied, towards the centre, and those of the second conveying them to the circumference. The substance to be purified, together with the purifier, is fed in by injectors, sets the fans in revolution, and is made to take a circuitous path from the periphery to the centre, and again to the periphery, in each element. Pipes and channels are provided for drawing off the purified substance and the purifier. The revolving fans can be gently heated if necessary.—L. F. G.

Evaporating Apparatus for Liquids. H. Deininger and H. André. Fr. Pat. 330,642, March 27, 1903.

See Eng. Pat. 6847 of 1903; this Journal, 1903, 787. —T. F. B.

Distillation, Separation, and Extraction, in a Closed Vessel, of Volatile Liquids, or of Liquids contained in Solids; Apparatus for the ——. R. Voiry and Soc. J. de la Fresnaye et Cie. Fr. Pat. 330,649, March 27, 1903.

The process can be used for the distillation of petroleum, for the extraction of vegetable oils from seeds, of mineral oils from waste, for the extraction of tallow, &c. The substance to be treated is contained in a closed vessel, to the bottom of which, air, heated to a certain temperature by passing through a heater, is forced in by a pump. The air, together with the vapours distilling off, is drawn back into the suction chamber of the pump, passing on its way through a refrigerator, in which the volatile matter distilled off, is condensed. The pump then forces the air through its delivery-pipe again into the heater and into the distilling vessel.—L. F. G.

Liquids or Solids; Process for Obtaining ——, in a Dry Porous State, so as to be Readily, Rapidly, and Completely Soluble. Cie. Maggi. Fr. Pat. 330,691, March 28, 1903.

The liquid or solid is made into a paste, and impregnated with air or some inert gas at a low temperature, and whilst kneading. The pasty mass thus becomes filled with bubbles of the gas employed. It is then dried at a low temperature *in vacuo*; it thus swells up, and the resulting dry powder is very porous and readily soluble. The process is adapted for the desiccation of animal, vegetable, and chemical substances. To dry milk by this process, sugar, cocoa, or coffee extract is first added to it.—L. F. G.

Leakages in Pipes and Vessels Containing Chemicals; Means for Locating ——. E. Karrer. Fr. Pat. 330,792, March 31, 1903.

The pipes or vessels are covered with a material to which a chemical substance is added as indicator, the latter changing in colour when the contents of the pipes or vess escape. Suitable substances are phenolphthalein for a monia, and Congo Red for acids.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

Briquette Industry in France. E. Loze. Eng. and Mini J., 1903, **76**, [8], 277.

The manufacture of briquettes is useful in the working coal seams of inferior quality, where the waste may amou to 15 or 18 per cent. The advantages of briquetting t slack are the improvement of the fuel, and the conferri on it a better form for transportation, storage, &c. It estimated that a ton of briquettes occupies about 18 cb. whilst a ton of coal occupies about 36 cb. ft.

In France, semi-coking coals, with from 12 to 20 p cent. of volatile matter, are chiefly employed for maki briquettes. Very poor coals produce briquettes which bu slowly and with difficulty, and, in burning, rapidly fall powder. Lignite cannot be satisfactorily used alone; should be used in a mixture of, for example, anthraci with 10 per cent. of lignite and 8·5 per cent. of coal-t Peat is also used with a mixture of anthracite and tar.

Various substances have been suggested as bindi agents (see Fr. Pat. 329,736; this Journal, 1903, 104 but the only practicable one is said to be coal-tar, "dry coal-tar being the best form. "Dry" coal-tar is describ as a black solid at the ordinary temperature, which do not soil the hands, and which, when heated in water 75° C., can be drawn out in thin threads from 12 to 20 i in length, without breaking. It yields 45—52 per cent. very hard, swollen coke, and, at the most, 0·5 per cent. ash.—A. S.

Cyanogen Recovery by Knublauch's Wet Process. W. Jorissen and J. Rutten. J. f. Gasbeleucht., 1903, 4 [35], 716—719.

The modification of Knublauch's process for the recove of the cyanogen, which is in use in the gasworks at t Hague, has already been described (this Journal, 190 1277). The authors have investigated the reactions whi occur. The partly oxidised ferrous carbonate made use is half basic, $FeCO_3.Fe(OH)_2$. The cyanide precipita it produces, contains, besides iron sulphide and Prussi blue, ammonium ferroferricyanide and potassium fer ferricyanide, ascertained to be $(NH_4)_2FeFe(CN)_6$ a $K_2FeFe(CN)_6$ respectively.

According to Feld (this Journal, 1903, 16) the cyano recovery must be preceded by absorption of the ammon otherwise a loss of cyanogen occurs through formation thiocyanate (sulphocyanide). At the Hague works, ho ever, although the ammonia is not removed beforehand, thiocyanate has been found, notwithstanding that the sa liquors have been used for a year. Only about 2 per ce of the cyanogen in the gas escapes unrecovered.—H. B.

Lighting Power of Combustible Gases in the Incandescen Burner; Variations in ——. E. Sainte-Claire Devil J. Gas Lighting, 1903, **83**, 499—501 and 617—619.

Since the illuminating power of an incandescence bur depends essentially upon the temperature of the mantle, has been supposed that the temperature of the flame, a not the calorific value of the gas, is the main factor the light-production. The author, however, concludes t the lighting power of a gas is a function of its calor value. Numerous experiments were made with coal-gas of various degrees of richness, which were burned (the sa size of burner and mantle being used in each case) und such conditions of gas- and air-consumption as to show maximum efficiency. The calorific power of the g number of calories produced during the test, total illumin ing power, illuminating power per 100 litres of gas co sumed, and illuminating power per 1,000 calories produc were observed. The variations in the yield of light 1,000 calories were in each case trifling, as compared w those in the lighting power per 100 litres. For examp in one series of tests with seven grades of coal-gas, norm

Pa gas being taken as unity, the heat evolved during the te varied from 0·80 in the case of the poorest gas to 1·65 wi the richest; the yield of light per 100 litres varied fr 0·81 with the poorest to 1·53 with the richest; wh eas the yield of light per 1,000 calories varied from 1· with the poorest to 0·93 with the richest. Allowing fo hotometric difficulties, therefore, it may be concluded th for a given quantity of heat obtained by the combustion of oal-gases, the quantity of light emitted is the same. Th author believes that this generalisation may be extended to ater-gas, &c., when a burner suitable for comparative te has been found.

may well be that for the same expenditure of heat, a bu er for non-luminous gas may give more light than one fo rdinary gas; but in such a case the anomaly lies in the bu er and not in the quality of the gas. The non-luminous bu er would utilise the gas better.

r testing the illuminating value of mantles, the author su ests that a mantle of standard dimensions, composition, au node of manufacture should be adopted, its luminosity be taken as unity, and that the gas used should be coal-ga f medium quality having a heating power of 4,900 to 5, calories per cubic metre. The standard mantle and th ne to be tested should be mounted on two burners, ea supplied with air and gas through separate meters. Th standard mantle having been set to the gas-consump-tic required to give exactly 600 calories per hour, the air su ly should be adjusted to give the maximum luminosity. W the other mantle the same luminosity should now be pr uced, at the smallest possible rate of gas-consumption, an he rate should then be noted. The relative values of th mantles would then be inversely as the ratio of tho ra of consumption.—H. B.

M *tles; Loss of Illuminating Power of ——, while* *rning.* A. H. White and M. E. Mueller. J. Gas ghting, 1903, **83**, 504—508.

Th authors have studied the deterioration of incandescence ma les whilst burning, with a view to ascertaining the ca s of the diminution of illuminating power. Mantles of Ai rican and German origin were used, and the tests ex ded over several hundred hours. The following co usions are arrived at:—

e physical changes occurring in well-made mantles are relatively unimportant, the greatest cause of the det ioration being the loss of cerium oxide, which slowly vo lises in the intense heat. The loss of cerium oxide is rel vely greater than that of thorium oxide, as was ascer-tai l by analysing both the deposits in the lamp chimneys an he portion of the mantle which had been exposed to the ottest part of the flame. Mantles containing originally mo than 1 per cent. of cerium oxide increase in lighting effi ncy until the cerium content of the hot zone has dro ed to about 1 per cent., from which point onwards the deteriorate. The rate of deterioration of commercial ma les varies greatly, but the important factor is the loss of ium oxide. Some mantle manufacturers are able to ve greatly lessen the rate of loss of cerium oxide, and thus pr ice mantles retaining their efficiency for long periods. Th one mantle of German origin, containing 1·27 per ce of ceria, increased slightly in lighting power for over 1,0 hours. The alteration of the heating power of the ga vith its consequent effect on the temperature of the ma e, is the most important factor in causing fluctuations of uminating power from day to day. The amount of mo ure in the atmosphere also exercises an appreciable inf ence, an increase of humidity causing a fall in lighting po r.—H. B.

Co *on Monoxide; Determination of ——.* C. R. C. Tichborne. XXIII., page 1104.

S *hur in Lighting Gas; Relation of ——, to Air* *itiation.* J. S. Haldane. XVIII. B., page 1099.

C *bide and Acetylene; Sampling and Analysis of ——.* H. Gall. XXIII., page 1106.

English Patents.

Briquettes; Manufacture of ——. W. P. Thompson, Liverpool. From F. B. Merrill, New York. Eng. Pat. 16,127, July 21, 1903.

To about 85 parts of coal-tar or pitch are added about 5 parts of ferrous sulphate, dissolved in, say, 10 parts of water, and the mixture is distilled until a temperature of about 570° F. is reached. The residue when cold is finely powdered, and mixed with granular coal or the like which has been well moistened with water at about 100° F., and the mixture is heated to a point just short of causing the distillation or decomposition of the binding material. The mass is then formed into briquettes. Any granular materials, such as iron ore, magnetic sand, &c., may be made into durable briquettes by means of the above binding material. —H. B.

Coke Ovens; Impts. in ——. E. Coppée, Brussels. Eng. Pat. 23,544, Oct. 28, 1902.

In the arrangement of ovens described in Eng. Pat. 16,154 of 1899 (this Journal, 1900, 653), improvements are claimed relating to the arrangement of the gas and air passages, and of air injectors, for the purpose of ensuring a greater uniformity of temperature throughout the ovens, and a m perfect regulation of the gas and air.—H. B.

Gas Suitable for Heating and Illuminating Purposes Apparatus for the Manufacture or Production of ——. C. B. Tully, Sligo. Eng. Pat. 22,092, Oct. 10, 1902.

The air-blower and the exhauster of a water-gas plant are adapted to be driven from separate apparatus under the control of a single lever, and the blast main, the gas main, and the snift pipe are provided with automatically operating non-return valves, the arrangement being such that by simply moving the lever into one position or another, all the necessary adjustments for either the blow-up period, the make period, or the complete stoppage of the plant, may be effected.—H. B.

Gas Producers. Soc. Franc. de Constructions Mécaniques (Anciens Etablissements Cail), Paris. Eng. Pat. 12,506, June 2, 1903. Under Internat. Conv., July 11, 1902.

To prevent the formation of clinker and thus to permit the use of coal which yields a fusible residue, the air for combustion within the producer is diluted with gas considerably in excess of what the air can burn, this gas being taken from the top of the same, or another, producer. This dilution lowers the temperature of combustion. The required quantity of water or steam may also be introduced along with the mixture of gas and air.—H. B.

Mantles for Incandescent Gas Lighting. C. H. Worsnop, Halifax. Eng. Pat. 21,861, Oct. 8, 1902.

To improve the colour of the light emitted by mantles, they are made in the usual manner from a solution containing: thorium salts, 100 parts; cerium salts, 2·75; strontium salts, 1·25; and "soluble silicate of zirconium," 1·0 part.—H. B.

Mantles; Liquid or Solution for Toughening or Stiffening Incandescent ——. W. P. Thompson, Liverpool. From R. Eisenmann and J. Bendix, Berlin. Eng. Pat. 15,696, July 15, 1903.

Nitrocotton (about 10 parts) is dissolved in glacial acetic acid (about 65 parts) which contains acetone (about 15 parts), and to this solution alcohol (about 250 parts of 95 per cent. strength) is added, and the whole is agitated vigorously for some time. Suitable substances, such as camphor or castor oil, may be added.—H. B.

United States Patents.

Coke-Oven; Regenerative ——. H. Koppers, Carnap, Germany. U.S. Pat. 738,918, Sept. 15, 1903.

See Eng. Pat. 23,278 of 1901; this Journal, 1902, 762. —T. F. B.

Gas; Process of Purifying ——. E. Burschell, Landau, Germany. U.S. Pat. 737,579, Sept. 1, 1903.

Gas is freed from sulphuretted hydrogen by passing it through a solution containing a copper salt and an iron salt. —T. F. B.

Gas; Process of Manufacturing ——. H. S. Elworthy, Assignor to E. H. Williamson, London. U.S. Pat. 738,303, Sept. 8, 1903.

See Eng. Pat. 12,461 of 1902; this Journal, 1903, 900. —T. F. B.

French Patents.

Briquettes of Coal, Coke, &c., and their Process of Manufacture. P. V. Parsy. Fr. Pat. 328,010, June 28, 1902.

Powdered coal, coke, or other combustible is mixed with Portland cement, lime, or the like, to form a plastic mass, which, on setting, produces hard, durable briquettes, the ash of which can be used directly for making mortar. —H. B.

Non-fatty Residuum of Olives; New Process for the Utilisation of —— *[as Fuel]*. W. Guerrero de Smirnoff. Fr. Pat. 330,579, March 25, 1903. XII., page 1095.

Gas in Coke-Ovens; Distribution of ——. F. J. Collin. Fr. Pat. 330,754, March 31, 1903.

Below the vertical heating passages are arranged two separate series of horizontal or slightly inclined gas and air tuyères, alongside and above one another, the uppermost tuyères being the shortest and those at the foot the longest, so that the gas and air are distributed equally throughout the combustion chamber. Vertical channels are provided within the vertical heating passages, so that the gaseous products from the gas and air, which burn in the latter, are led down to passages at the base of the furnace.—H. B.

Burner for Heavy Oils and Other Combustible Liquids. J. J. Pelous. Fr. Pat. 330,476, March 21, 1903.

A jet, directed upwards, to which the oil is supplied, is provided with a central needle for cleaning the orifice should the latter become closed up. Surrounding the jet is an annular orifice, through which steam is blown; it carries the oil, on issuing from the jet, up through a burner tube, along with a sufficient supply of air for the combustion. The upper end of the burner tube is enclosed in a perforated cup, closed at the top by a dome-shaped cover, against which the mixture of oil, steam, and air strikes, the burning mixture issuing through the perforations in the cup. The steam-supply pipe makes one or two turns round the top of the cup and then passes down to the annular orifice referred to above, so that the steam is highly heated and is said to be decomposed into hydrogen and oxygen when the burner is fully in action.—H. B.

Gas for Heating, Lighting, Motive Power, &c.; Process and Apparatus for the Production and Carburetting of ——. J. Lühne. Fr. Pat. 330,323, March 17, 1903.

Within an outer generator, in which the solid or liquid combustible is gasified, a readily removable generator containing lime, pumice stone, &c., is arranged concentrically; it serves for fixing the gases produced in the outer generator, and prevents the escape of tar. The gases pass from the inner generator through a carburetter.—H. B.

Gas; Removal of Sulphuretted Hydrogen from ——, *with Simultaneous Production of Sulphur.* E. Burschell, Fr. Pat. 330,441, March 20, 1903.

See U.S. Pat. 737,579 of 1903; preceding these.—T. F. B.

Calcium Carbide Briquettes. G. Hensemberger. Fr. Pat. 330,409, March 18, 1903.

Calcium carbide is heated to the temperature at which sugar (or any similar saccharine substance) melts, and it is then incorporated with the molten material by mechanical means. The mixture is compressed into suitable shapes, and the briquettes are impregnated with any vegetable or mineral oil or (liquefied) grease. For still further prote tion against injury or deterioration, the briquettes may l coated with paraffin wax or the like, with a solution gelatin or of caoutchouc, or with varnish.—F. H. L.

Acetylene; Process of Purifying ——. A. Landriset. Fr. Pat. 330,180, March 12, 1903.

Fifty parts of bleaching powder, 25 parts of slaked lim magnesia, or sodium carbonate, and 25 parts of crush pumice stone are mixed together with sufficient water form a paste, and the whole is dried at a moderate temper ture. This is to be used, under the name of "carbolite (this Journal, 1899, 23), as a solid purifying reagent f acetylene. Alternatively a mixed solution of sodium hyp chlorite and sodium hydroxide or carbonate may be us for the wet treatment of the gas.—F. H. L.

Fibres, Threads, and Fabrics for the Manufacture of I candescence Mantles; Process for Preparing the — A. H. Chénier. Fr. Pat. 330,283, March 16, 1903.

The threads, &c., are first mercerised and then impregnat with a concentrated solution of salts of thorium a cerium, after which they are denitrified if necessary, a made into mantles as usual.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Petroleum and Asphalt; Investigation of Saghalien — Petr. Rev. and Min. News, 9, [237], 230.

Samples of Saghalien crude oil, examined in the laborato of the Imperial Russian Technical Society, were da brown in colour, transparent in thin layers, and free fro light fractions boiling below 120° C. Fractional distil tion furnished the following results:—Distillate up 270° C. (sp. gr. 0·8562), 28·2 per cent. by volume; 27 —300 C. (sp. gr. 0·880), 15·9 per cent.; 300°—360 (sp. gr. 0·8977), 8·9 per cent.; residuum (sp. gr. 0·99 35·1 per cent.

The oil occurs near Alexandrovsk, where it oozes out the surface, and the entire district is covered with a thi deposit of natural asphalt. Owing to the absence of li distillates (lost by evaporation), the crude oil is suitable f liquid fuel.

The asphalt rock is brittle, contains shell incrustatio and is heavier than water. It consists of bituminous su stances soluble in ether, 75 per cent.; insoluble matte 24·6 per cent.; ash, 0·5 per cent.; or a larger percenta of the first-named constituents than either Trinidad (per cent.) or Syrian asphalt pitch (44 per cent.). T sulphur content is only 0·80—0·85 per cent. The asph has a high melting point, incipient softening only occurr at 160° C., whereas natural bitumen melts at 135°—150° Though too brittle to use alone for paving, it is consider that this asphalt rock might be profitably incorporated, f that purpose, with the oil found in the same vicinity.—

Coal Tar and Oils; Testing of ——, *and an Improve Still.* H. W. Jayne. XXIII., page 1106.

English Patents.

Saturators for the Manufacture of Sulphate of Ammon Construction of ——. T. S. Standfast, Southampt Eng. Pat. 20,369, Sept. 18, 1902.

The joints of the lead tank of the saturator are welded electricity. The outside framing of the saturator is designed that it may be easily removed when necessary. —T. F. B.

Tar and Mineral Oils; Process for Deodorising — J. Wetter, London. From Rutgerswerk-Actienge Berlin. Eng. Pat. 21,548, Oct. 3, 1902.

See Fr. Pat. 324,958 of 1902; this Journal, 1903, 621. —T. F. B.

United States Patents.

Coal-Tar Compositions and Pitches; Manufacture of ——. F. J. Warren, Newton, Mass. U.S. Pat. 738,966, Sept. 15, 1903.

See Fr. Pat. 320,828 of 1902; this Journal, 1903, 139.
—T. F. B.

Petroleum; Process of Desulphurising Crude ——. A. W. Burwell and L. O. Sherman, Cleveland. U.S. Pat. 738,656, Sept. 8, 1903.

The portion of the petroleum distillate containing water is ejected, and the remainder is passed over finely-divided, ry iron oxide and an alkaline-earth oxide, maintained at low temperature, but sufficient to prevent condensation of he vapours.—T. F. B.

French Patents.

Fireproof Composition called "Goudron de Syracuse." G. Mahieux. F. Pat. 330,608, March 26, 1903.

Coal tar is heated and a mixture of finely-divided alum, sbestos, and borax, or boric acid, is added, the whole eing stirred until thoroughly mixed. The mixture is pplied hot to the articles to be coated. For electric ables, &c., the ingredients are mixed in the proportions of 0 to 65 parts by weight of tar, 8 to 4 of alum, 20 to 5 of oric acid, and 12 to 6 of borax, no asbestos being added; while for tarpaulin, awnings, &c., the following composition s used: 40 to 50 parts of tar, 38 to 30 of boric acid, 20 o 12 of borax, 2 to 8 of alum, with or without the addition f 5 to 8 parts of asbestos.—A. G. L.

IV.—COLOURING MATTERS AND DYESTUFFS.

ndigo; A Compound of Formaldehyde with ——. G. Heller. Zeits. f. Farben- u. Textil-Chem., 1903, 2, [17], 329—332.

The compound is obtained by reacting with formaldehyde n phenylglycincarboxylic acid, purifying the product by eans of its methyl ether, and melting this with potassium ydroxide. The indoxyl derivative so obtained is converted nto the corresponding indigo on blowing air through its olutions. The product has a greener and darker colour han ordinary indigo, does not sublime, and is decomposed n heating, without melting. It is insoluble in all indifferent ndigo solvents, also in nitrobenzene, pyridine, dimethylniline, and anthraquinone. It is slightly soluble in boiling lacial acetic acid, particularly if a little sulphuric acid be dded. It is not so easily sulphonated as ordinary indigo, nd the sulphonic acids formed, only dye wool very weak hades.—E. F.

Yellow Dyestuffs; Absorbing and Sensitising Power of some ——, *in the Extreme Violet and Ultra-Violet.* E. Valenta. XXI., page 1101.

English Patents.

Sulpho Acids of Aromatic Aldehydes; Manufacture of ——, *and Production of Colouring Matters therefrom* [*Triphenylmethane Dyestuffs*]. H. H. Lake. From Chem. Works, formerly Sandoz, Basle, Switzerland. Eng. Pat. 18,255, Aug. 19, 1902.

Aromatic hydrocarbons, with a lateral methyl group or roups, are first treated with fuming sulphuric acid to orm the sulphonic acids, and these are oxidised with manganese peroxide, preferably the regenerated compound, and nhydrous sulphuric acid containing 25 per cent. of sulphuric anhydride. By heating the sulphonic acids of aromatic ldehydes thus obtained, with diethyl or dimethyl or ethylenzylaniline and sulphuric acid containing 30 per cent. of ulphuric anhydride for 48 hours at 100° C., leuco-malachitereen-sulphonic acids may be obtained. To obtain dyestuffs rom the methylbenzaldehyde disulphonic acid, the leucoisulphonic acid, prepared as above from diethyl aniline, is issolved in water, rendered slightly alkaline with soda-lye, and then oxidised with a 30 per cent. paste of peroxide of lead at 0° C. Acetic acid is slowly added, and, after stirring for one hour, the lead is precipitated with Glauber's salt, the excess of acetic acid neutralised with lime, and the filtered solution evaporated to obtain the dyestuff, or the latter is precipitated with Glauber's salt. The dyestuff dyes wool in an acid-bath pure blue shades fast to alkalis.—B. N.

Nitro Colouring Matters; Manufacture of Yellow to Orange ——. Read Holliday and Sons, Ltd., Jos. Turner, H. Dean, and Jas. Turner, Huddersfield. Eng. Pat. 22,078, Oct. 10, 1902.

The nitration of the condensation products of sulphonic acids of the aromatic amines with 1.2.4-dinitrochlorobenzene yields dyestuffs which give yellow to orange shades on animal fibres.

The product (dinitrodiphenylamine sulphonic acid) obtained by condensing sodium sulphanilate with 1.2.4-dinitrochlorobenzene, in presence of sodium acetate in boiling aqueous solution, dyes animal fibres bright yellow. This compound is nitrated by heating one part with three parts of water and three parts of nitric acid (40 B.) for 3—4 hours at 70° C. The nitro compound thus obtained, dyes silk and wool greenish-yellow from an acid bath. If the temperature of nitration be raised to 90° C. or above, an almost insoluble nitro compound is obtained, which dyes a deep orange shade.—T. F. B.

Sulphurised Dyestuffs [*Sulphide Dyestuffs*]; *Manufacture of* ——. O. Imray, London. From The Farbwerke vorm Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 22,823, Oct. 20, 1902.

See U.S. Pat. 728,623 of 1903; this Journal, 1903, 737.
—T. F. B.

Oxychlorophenyl-amidotolylamine; Manufacture of ——, *and Sulphur Colours therefrom* [*Sulphide Dyestuffs*]. R. B. Ransford, Norwood. From L. Cassella and Co., Frankfort-on-Maine. Eng. Pat. 23,418, Oct. 27, 1902.

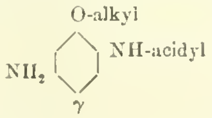
See Addition to Fr. Pat. 317,219 of 1901; this Journal, 1903, 792.—T. F. B.

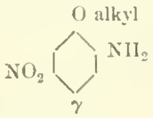
Indophenol Series; Manufacture of Products of the ——. C. D. Abel, London. From Actien-Ges. für Anilinfabrikation, Berlin. Eng. Pat. 23,994, Nov. 3, 1902.

See Fr. Pat. 326,088 of 1902; this Journal, 1903, 792.
—T. F. B.

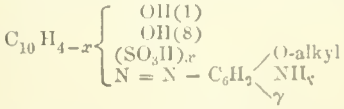
Mono-azo Dyestuffs; Manufacture of New ——. O. Imray. From the Soc. of Chem. Ind., Basle, Switzerland. Eng. Pat. 14,113, June 24, 1903.

An ether of an acidyldiaminophenol or an ether of a nitroaminophenol of the following general formulæ—





in which γ may be hydrogen, an alkyl radicle, a halogen, an alkyloxy radicle or a sulphonic group—is diazotised in the usual manner and poured into a solution of a peridihydroxynaphthalene-monosulphonic acid or a peridihydroxynaphthalene-polysulphonic acid, with or without a solution of sodium acetate or sodium carbonate. The red-blue dyestuff thus obtained may be treated with a saponifying or reducing agent, such as caustic soda or caustic soda and sodium sulphide, the mixture neutralised with hydrochloric acid, and the dyestuff precipitated with common salt. The dyestuffs thus prepared have the general formula—



$$C_{10}H_{4-x}\left\{\begin{array}{l}\quad OH(1)\\ \quad OH(8)\\ (SO_3H)_x\\ N = N - C_6H_2\begin{array}{l}\diagup O\text{-alkyl}\\ \;\; NH_2\\ \diagdown \gamma\end{array}\end{array}\right.$$

in which γ has the same significance as before, and they dye wool in an acid-bath pure blue tints fast to light and alkalis.

By heating them, suspended or dissolved in alcohol, with an alkylising agent and sodium acetate under pressure, they may be converted into alkylamino-azo dyestuffs with a greener tint, the dyestuff being precipitated with common salt after distilling off the alcohol and neutralising with sodium carbonate.—B. N.

UNITED STATES PATENTS.

Azo Dye; Violet-Red ——, and Process of Making Same. F. Schmidt, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Hoechst-on-the-Maine. U.S. Pat. 737,967, Sept. 1, 1903.

NAPHTHALENE-2.1-diazo oxide 5.7-disulphonic acid, obtained by treating the diazonium compound of β-naphthylamine trisulphonic acid [2.1.5.7] with alkali carbonates, when coupled with β-naphthol, gives a violet-red azo dyestuff, which gives, when dyed on wool and subsequently treated with chromic acid, fast black shades.—T. F. B.

Azo Dye; Red Mordant ——. O. Ernst and F. Scholl, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Hoechst-on-the-Maine. U.S. Pat. 739,069, Sept. 15, 1903.

SEE addition to Fr. Pat. 305,491 of 1901; this Journal, 1902, 169.—T. F. B.

Sulphur Dye [Sulphide Dyestuff]; Yellow ——, and Process of Making Same. R. Gley, Assignor to Act.-Ges. für Anilin Fabrikation, Berlin. U.S. Pat. 738,027, Sept. 1, 1903.

VOLATILE aromatic amines, which do not yield sulphide dyestuffs when heated alone with sulphur, are heated with a mixture of sulphur and nitrodiacetylaminobenzenes. The resulting dyestuffs are yellowish-brown substances, soluble in concentrated sulphuric acid with a brown colour, and in hot sodium sulphide solution with a yellow colour. This latter solution dyes cotton yellow shades.—T. F. B.

Anthracene Dyes, and Process of Making the Same. M. H. Isler, Germany, Assignor to the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 738,614, Sept. 8, 1903.

DYESTUFFS of the anthracene series are obtained by treating the sulpho-methylene derivative of diamino-anthraquinone with a halogenising agent. These also yield dyestuffs by melting the resulting halogen derivatives with an aromatic amine; and blue to blue-green dyestuffs may be further obtained by sulphonating these products. By dissolving in water or ethyl alcohol, a blue to blue green solution is obtained, and the aqueous solution dyes wool, unmordanted or chrome-mordanted, blue to blue-green shades. By using *p*-toluidine as the aromatic amine, the sulphonated product yields a blue-green to blue solution with water, and this dyes wool, unmordanted or chrome mordanted, blue-green shades. This sulphonated compound dissolves in aniline and alcohol, yielding blue-green to blue solutions; in concentrated sulphuric acid yields a "violet-red to bluish-red" solution, and in concentrated sulphuric acid containing boric acid, a green to blue-green solution.—B. N.

Anthracene Dye. R. Bohn, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 739,145, Sept. 15, 1903.

SEE Eng. Pat. 24,354 of 1901; this Journal, 1902, 910.
—T. F. B.

Nitro Compounds; Process of Reducing ——. M. Buchner, Assignor to C. F. Boehringer und Soehne, Mannheim-Waldhof. U.S. Pat. 738,404, Sept. 8, 1903.

SEE Fr. Pat. 313,599 of 1901; this Journal, 1902, 169.
—T. F. B.

Effervescent Laundry Blueing. W. C. Pope, St. Louis. U.S. Pat. 738,481, Sept. 8, 1903.

SEE Eng. Pat. 15,739 of 1903; this Journal, 1903, 1041.
—T. F. B.

FRENCH PATENTS.

Dyestuffs [Azo Dyestuffs] from the Dialkyl Ethers of Monoacetylparadiamidohydroquinone; Manufacture of Substantive Secondary ——. Cie. Parisienne Coul. d'Aniline. Fr. Pat. 328,020, July 4, 1902.

SEE Eng. Pat. 14,576 of 1902; this Journal, 1903, 791.
—T. F. B.

Mono-azo Mordant Dyestuff; Production of ——. Actien-Ges. f. Anilin-Fabrikation. First Addition, dated March 17, 1903, to Fr. Pat. 329,724 of Feb. 25, 1903.

THE original patent describes the preparation of a mono-azo dyestuff by combining the diazo compound from aminocresotinic acid ($OH.COOH.CH_3.NH_2 = 1.2.4.6$) with 1.8-aminonaphthol-4-sulphonic acid in alkaline solution. A dyestuff giving slightly redder shades when directly dyed and brighter dyeings on chrome-mordanted goods is obtained if the above-mentioned components are combined in acid solution. It has also been found that the aminonaphtholsulphonic acid may be replaced by 1.8-aminonaphthol-5-sulphonic acid or by the disulphonic acids 3.5.2.4 and 1.8.6.4 in alkaline or acid solution. The dyestuffs dye chrome-mordanted wool evenly in intense black shades.
—E. F.

Leucoindophenols; Manufacture of Coloured Products resulting from the Condensation of Nitroso-oxy Compounds with Aromatic Amines, and of ——, derived therefrom. Soc. pour l'Ind. Chim. à Basle. Fr. Pat. 330,388, March 18, 1903.

SEE Eng. Pat. 7025 of 1903; this Journal, 1903, 861.
—E. F.

Basic Dyestuffs from Formylated Compounds; Preparation of ——. Les Fabriques de Couleurs d'Aniline et d'extraits ci-devant J. R. Geigy. Fr. Pat. 330,487, March 21, 1903.

FORMYLATED derivatives of *m*-diamines, with or without admixture with *m*-diamines themselves, are heated to a high temperature with ammonium salts or salts of organic bases, with or without the presence of a diluent. The ammonia or organic base seems to take no part in the reaction. The products are orange-yellow basic dyestuffs.
—E. F.

o-Nitrobenzaldehyde; Production of ——. A. Foelsing. Fr. Pat. 330,524, March 23, 1903.

CHLOROBENZENE is sulphonated, nitrated, and the sulphonic acid group eliminated by heating with dilute sulphuric acid. In the *o*-chloronitrobenzene so obtained, the chlorine atom is replaced by a methyl group in the usual manner. The two last operations may be conducted in the reverse order. The *o*-nitrotoluene so obtained is converted into *o*-nitrobenzalchloride, and this into *o*-nitrobenzaldehyde.—E. F.

Osmose with Alcohol; Apparatus and Process for ——, to be used for the Purification of Alkaloids, Glucosides, Wood Extracts, Colours, Glycerin, and other Substances readily Soluble in Alcohol. E. A. Barbet. Fr. Pat. 330,939, April 1, 1903. XX., page 1101.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mordants for Obtaining Solid Shades with Artificial Alizarin; Properties and Preparation of Various Metallic ——. F. J. G. Beltzer. Monit. Scient., 1903, **47**, [739], 461—475; [741], 647—654.

THE subject is treated under the headings and subheadings:—(A) Mordants for Turkey-red: (1) alums and aluminium mordants; (2) tin mordants. (B) Mordants for Alizarin Garnets and Blues. (C) Mordants for Alizarin Violets and Lilacs.—A *zobenzenetrimethylammonium Hydroxide as a Dyestuff.* D. Vorländer. Zeits. angew. Chem., 1903, **26**, [35], 840—842.

ɪᴇ author states that most of the so-called basic dyestuffs minoazo dyestuffs, aminodiphenyl- and aminotriphenyl- thane derivatives, &c.) have only extremely weak basic perties, and that consequently, theories of the dyeing ocess, based upon the effect of such basic properties, not be considered reliable. He has made dyeing periments with azobenzenetrimethylammonium hydrox- , $C_6H_5.N{:}N(1).C_6H_4.N(CH_3)_3.OH(4)$, which is shown conductivity measurements to be almost as strong a base caustic potash or soda. The salts of this base, will not, general, dye wool or silk. The free base becomes fixed the fibre to a small extent, but the colour is readily noved by water containing dissolved carbon dioxide and dilute acetic, hydrochloric or sulphuric acid. These ults show that the dyeing properties of the basic dye- ffs are not due to their basic properties. The author isiders that these properties are due to the power of monia derivatives and of other unsaturated compounds forming addition products. According to this view dyeing of wool (or silk) by so-called basic dyestuffs omatic ammonia derivatives) depends upon a normal lition reaction between the carboxyl compounds of the ol and the ammonia derivative; and the dyeing by acid stuffs is due to an addition reaction between sulphonic, boxylic or phenol-hydroxyl groups of the dyestuff and amino compounds of the wool. The course of such ition reactions is dependent upon the nature and masses the two components, upon the solvent, the temperature, presence of catalytic agents (acids or alkalis), the ibility of the addition product formed, and, where one the components is a solid, upon adsorption processes, , so that it would appear to be extremely difficult to cover any definite relation between dyeing power and stitution, in dyestuffs.—A. S.

ing Process; Contribution to the Theory of the ——.)yeing Properties of Cellulose. L. Michaelis. Pflügers rch., **97**, 634—640. Chem. Centr., 1903, **2**, [9], 607.

ilter paper be touched with a weak alcoholic solution he compound formed by the union of Methylene Blue eosin acid, a blue spot is produced surrounded by ed circle, this being due, according to the author's eriments, to the fact that the filter paper first takes up the hylene Blue from the compound and then, afterwards, eosin. Eosin acid dissolves in benzene, toluene, xylene, chloroform to a light-yellow solution, which, however, n dropped on to filter paper, produces an intense red . The solution of eosin acid in methyl or ethyl alcohol acetone, which is red with yellow fluorescence, also luces a red spot on filter paper, but without fluorescence. go Red diluted with acetic acid is blue in very weak ous solution, but colours filter-paper red. The reddish- n solution of Nile Blue base in benzene, toluene, xylene, r or chloroform produces an intense blue stain on filter- r.—A.S.

Reserves under Indigo Printing. G. Tagliani. s. f. Farben- u. Textil-Chem., 1903, **2**, [17], 333—334.

ᴛᴇ reserves are obtained with thickened copper, zinc, ad salts. Yellow reserves are formed by printing with and copper salts, or with copper salts and a dyestuff h is stable to both alkalis and acids, such as Diphenyl- soïn 3 G. Orange reserves are obtained in a similar ner. The fabric is first treated with glucose, the ves printed on, padded with alkaline indigo, steamed, ed, and treated with warm sulphuric acid.—E. F.

English Patents.

ads; Apparatus for Manufacturing Artificial ——. Cochius, Dueren, Prussia. Eng. Pat. 9017, April 21, 03.

liquid is forced horizontally through a number of ing-nozzles, placed in a wall of a long trough which ins the coagulating liquid. As the threads reach the er end of the trough, they are united into a single thread. The cocks for controlling the supply of liquid to the forming-nozzles can all be regulated by a single movement.—T. F. B.

Dyeing Yarns; Apparatus Employed in ——. J. Hussong, Camden, N.J. Eng. Pat. 15,207, July 9, 1903.

The yarn is carried on a number of sticks supported horizontally on a frame, which can be so adjusted that the lower ends of the yarn rest upon a false bottom in the dye-vat, thus relieving the sticks of a portion of the weight of the yarn. A device is provided to facilitate the turning of the sticks.—T. F. B.

Colour Effects on Fabrics; Production of ——, and Fabrics having Colour Effects Produced thereon. E. Brandenberger, Vosges, France. Eng. Pat. 27,258, Dec. 10, 1902.

The fabric is printed with "greasy" colours, *e.g.*, colours mixed with boiled linseed oil, with or without addition glass or metallic powders, by means of an ordinary embossing machine. This process is claimed to produce 15 to 200 separate lines per cm. on the fabric, causing it to "bear a resemblance to silk; and shot, iridescent, colour changing, or moiré effects are at the same time produced."
—T. F. B.

Printing Cylinders for Multi-Colour Printing. J. Wojciechowski, Warsaw, Poland. Eng. Pat. 13,477, June 16, 1903.

A modification of the apparatus for printing simultaneously in different colours as described in Eng. Pat. 26,281 (see this Journal, 1903, 552). The printing cylinder serves as a fixed cliché for the colour most used, and has apertures through which automatically movable clichés project, printing each a different colour. Each cliché is provided with a ledge projecting on both sides under the cylinder jacket, the projecting ends of the ledge being pressed radially outwards by springs. Each colour roller carries a pair of discs which fit into grooves in the ledge carrying the corresponding cliché, so that the latter bears against the roller and receives its colour. When a cliché arrives at a colour roller, not provided with its own colour, the discs, instead of finding the grooves, depress the ledge inwards so that the cliché does not come in contact with the colour roller. The cylinder carrying the paper is provided with two discs, and these depress each cliché, as it arrives, until its surface is level with that of the main printing cylinder, and both surfaces therefore come in contact with the paper.—B. N.

French Patents.

Textiles; Machines for Treating —— in Air, by Acids or other Reagents, to Bleach, Dye, Mercerise, Scour, or otherwise Treat them. C. L. Jackson and E. W. Hunt. Fr. Pat. 331,012, April 7, 1903.

See Eng. Pat. 7872 of 1903; this Journal, 1903, 904.
—T. F. B.

Dyeing; Method of ——. Soc. C. Garnier et Cie. and A. Boyeux. Fr. Pat. 328,013, July 1, 1902.

A method is described of dyeing the extremities of the nap of fabrics, or the raised portions of embossed fabrics. The fabric passes over a base and is partially printed by friction with a colour cylinder which revolves in the opposite direction to that in which the fabric travels. (See also Eng. Pat. 26,928 of 1902, this Journal, 1903, 948.)
—T. F. B.

Dyeing Apparatus. Vacuum Dyeing Machine Co. Fr. Pat. 330,259, March 14, 1903.

See U.S. Pat. 723,795 of 1903; this Journal, 1903, 551..
—T. F. B.

Multicoloured or Shaded Dyeing; Method of ——, called "Spectralographe." Stückfärberei Zurich. Third Addition, dated April 6, 1903, to Fr. Pat. 274,791, Feb. 7, 1898.

The fabric is first printed with some mastic, and the colour is then applied in the form of powder; the mastic is subsequently removed by washing in benzene. The colour does not adhere to the parts which contain the mastic.—T. F. B.

Printing on Cotton with Indigo and Alizarin or other Mordant Dyestuff; Simultaneous ——. Badische Anilin und Sodafabrik. Fr. Pat. 330,159, March 11, 1903.

The fabric, after a preliminary immersion in a solution of glucose and Turkey red oil, is printed, in the usual way, with an indigo-alizarin mixture (or a mixture of indigo with any other mordant dyestuff). It is then dried and steamed for about 45 seconds to fix the indigo. After a washing and air treatment, the alizarin is developed by a second steaming for an hour. The process is completed by a rinsing and light soaping.—T. F. B.

Printing, Shaded or Blended Designs on Textile Fabries. Soc. Lyonnaise de Teinture, Impression, Appret et Gaufrage. First Addition, dated March 18, 1903, to Fr. Pat. 329,903, March 6, 1903. (See this Journal, 1903, 1044.)

The invention relates to an arrangement for mechanically supplying the colour to the engraved printing cylinder. Each of a number of troughs containing the colour is supplied with a revolving disc which carries the colour to the felted cylinder, or series of cylinders, which, in turn, carries it on to the engraved cylinder.—T. F. B.

Textiles; Apparatus for Treating ——, with Air or other Fluid. C. E. Wild. Fr. Pat. 330,899, April 4, 1903.

See U.S. Pat. 726,207 of 1903; this Journal, 1903, 624.
T. F. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Cancelling Inks and Other Stamping Inks; Methods for the Valuation of ——. E. E. Ewell. XXIII., page 1106.

English Patent.

Printing Surfaces; Manufacture of ——, and their Application to Printing Processes. G. S. Christie, Carlton, Nottingham. Eng. Pat. 19,007, Aug. 29, 1902.

A paste consisting of "magnesium chlorate," potassium borate and glycerin is mixed with chalk, potassium carbonate, manganese borate, calcium hydroxide, oxalic acid and burnt sienna, and the whole passed through a fine sieve. When applied to a textile backing, and dried at 50°—60° C., it is pliable and forms a suitable substitute for lithographic stone.—T. F. B.

French Patents.

Dyeing Leather with Sulphide Dyestuffs; Process of ——. Manuf. Lyonnaise Mat. Colorantes. First Addition, dated March 30, 1903, to Fr. Pat. 322,605, June 28, 1902. (See this Journal, 1903, 363.)

The tannin or tannic acid used, as described in the principal patent (see Eng. Pat. 24,697 of 1901, this Journal, 1902, 1453), is replaced by other substances having tanning properties, such as extracts of oak bark, quebracho, campeachy, divi-divi, sumac, gambier, &c.

The glucose may also be replaced by formaldehyde.
—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Chamber Process [Sulphuric Acid]; Forced Draught and Atomised Water in the ——. F. Benker and E. Hartmann. Zeits. angew. Chem., 1903, **16**, [36], 861—869.

The author gives a historical account of the various means adopted to overcome the irregular action of the chimney-draught and thus regulate the whole of the chamber-process, up to the period when the fan was introduced (compare this Journal, 1902, 1026; 1903, 92 and 296). The first object of the fan is to control the process and enable it to be regulated; but it also makes it possible to obtain a stronger draught than the chimney produces, and thus, i the same chamber-space, a larger volume of gases can l dealt with in a given time. The authors consider th the best place for the fan is at the end of the systen for there it is exposed only to cold and dry gases. I there are, as is now usual, two Gay-Lussac towers, the fa should be placed between them; if only one, either betwee the last chamber and the tower, or behind the tower. I the last case, it is well to follow the fan with a Lung Rohrmann tower to complete the absorption of acid gase The best fans are built of hard lead; they make from 3 to 700 revolutions per minute, absorb ½—1 h.p., and wi pass from 1,000—8,000 cb. m. (say 40,000—300,000 cb. ft per hour.

At the more rapid rate of working made possible by the fa the temperature of the chambers rises considerably, and mea must be taken to lower this to the temperature of maximu speed of reaction. Among the various methods proposed effect this, the authors consider the best and most economic to be the introduction into the chambers of water in t form of fine spray, instead of steam. According to Lung sulphur dioxide (64 grms.) reacts with water (72 grm in the chamber to form sulphuric acid of a compositi represented by the approximate formula H_2SO_4 + 3H The heat evolved in this reaction is represented 65,500 calories. If the water be added as high-pressu steam at 120° C., and the acid leave the chamber 60° C., the steam adds 41,976 calories, or there is total evolution of 107,476 calories. If, however, t water be added as liquid spray at 15° C. it will abso 3,240 calories, or the total evolution will be 62,260, 60 p cent. of the former amount. These figures may ne modification if a stronger acid be made in the chambe or with the variation of winter or summer temperatu and it may not be possible to substitute spray entirely f steam and keep the temperature up to the minimu (60°—65° C.) needed for the best working of the proce It will be very rarely possible with the present slow ra of working the chambers; but the more intense reacti which occurs when the fan is used at its full power w enable advantage to be taken of the economy introduc by the spray. The authors assume Abraham's theory, t the gases in the chamber have a rotary circulation at rig angles to the length of the chamber, moving downward the walls, and upwards near the middle of the cross-sectio and they consider that the chambers should not be mo than 6—6·5 m. wide for 10 m. of height. In this way t up-currents from the circulation in each half of the cro section practically coincide; and if the spray be th introduced at intervals along the middle line of the top the chamber, its fall through the internal space is checked this upward current, and the whole of the water evapora before it reaches the floor. The atomisers are made iridio-platinum, so as to avoid wear through corrosion, a the water is driven out horizontally through a narrow orifi against a small platinum plate. The water is filtered bef it enters the distributing service, but each atomiser is a furnished with a small filter. The atomisers are mount on ½-in. lead pipe, and are easily removed for cleani The water is supplied under 3—4 atmospheres' pressure means of a small feed-pump and air pressure reserv which may be driven by the same source of power drives the fan. A number of instances are given fr actual work, showing that, without altering the pyri burners, an increase of 15—30 per cent. in the yield of a is achieved by the introduction of the fan and spray; wh if the burner-plant be increased so as to keep pace with increased working-power of the chambers under the n conditions, the increase of yield may be 50 to 80, or ev 100 per cent. The authors summarise the advantage the introduction of fan and spray as follows:—(1) Proc much more regular, and less dependent on the good will attention of the workman. (2) Yield increased by 15— per cent. without increased consumption of nitre; instead of increased yield, wear and tear on part only the existing installation, and saving in coal and ni (3) Economy in fuel. (4) Less corrosion of lead, in s of increased production, because of the lower temperat (5) Lessened cost of acid in the items of interest on capi and depreciation.—J. T. D.

Alkali and Bleaching Powder by the Electrolysis of Fused Common Salt; The Acker Process for ——. Report of Commission on Science and Arts. J. Franklin Inst., 1903, **156**, [3], 221—224.

According to the present report, the Acker process (this Journal, 1900, 47; 1901, 1219), compared with the wet electrolytic processes, possesses the following advantages: (1) its directness: (2) the very heavy current sent through each pot (as much through one Acker pot as through 15 Castner cells); (3) the avoidance of evaporation; (4) the absence of water solutions, requiring special pumps and a complicated circulating system; (5) the absence of mercury in its use. The disadvantages mentioned are: (1) the larger power requirement—6·75 volts in place of 4·5, or about 50 per cent. more; (2) the rapid destruction of apparatus; (3) the rapid destruction of anodes; (4) the more arduous work of the pot-men. Attention is drawn o the fact that improvements are still possible in the working, particularly with regard to disadvantages (3) and (4). Of the total energy of current used, 54 per cent. is usefully applied in the decomposition, 9 per cent. is utilised n melting the salt, and 37 per cent. is radiated from the apparatus.—B. N.

Hypochlorites; Hydrolysis of ——. Duyk. Bull. de l'Assoc. Belge. des Chim., **17**, 165—168. Chem. Centr., 1903, **2**, [9], 546.

A chloride of lime solution containing 0·02162 grm. of available chlorine per 10 c.c. was found to contain 0·002485 grm. of free hypochlorous acid and 0·0110 grm. of free base calculated as calcium oxide. After addition of 100 c.c. of water, the amounts of free hypochlorous acid and free lime were 0·008697 grm. and 0·0137 grm., and after the addition of a further 100 c.c. of water, 0·01629 grm. and 0·0140 grm. respectively. Similar results were obtained with solutions of sodium hypochlorite.—A. S.

Sulphuric Acid; Titration of ——, *by means of Benzidine Hydrochloride.* W. J. Müller and K. Dürkes. XXIII., page 1104.

Sulphuric Acid; Determination of ——, *in Presence of Zinc.* A. Thiel. XXIII., page 1104.

Phosphoric Acid; Conditions of Reaction of ——, *with Ammonium Molybdate.* C. Reichard. XXIII., page 1103.

Mercury and Hydrocyanic Acid; Volumetric Determination of ——. L. W. Andrews. XXIII., page 1104.

Chlorides, Bromides, and Iodides; Method for the Detection of ——. S. Benedict and J. F. Shell. XXIII., page 1103.

Ozone; Determination of ——, *in Technical Work.* O. Brunck. XXIII., page 1105.

English Patents.

ulphuric Acid; Manufacture of ——. H. Hilbert, Heufeld, Germany. Eng. Pat. 9453, April 27, 1903.

A pyrites roasting furnace is provided with a shaft below or reception of the roasted pyrites which is to serve as ontact material. There is a door between the furnace and he shaft, which latter is narrowed near the bottom, and scharges into a relatively large closed chamber. The ulphurous gases with excess of air pass from the upper art of the furnace to the constricted part of the shaft, and avel upwards through the mass of hot roasted ore to a de outlet, communicating with lead chambers in which e further treatment of the sulphuric anhydride or acid roduced may be conducted. The shaft is provided in its upper part with means for distributing over the roasted yrites a spray of sulphuric acid.—E. S.

ydrochloric and Sulphuric Acids; Producing and Separating ——. P. Askenasy and M. Mugdan, Nuremberg, Germany. Eng. Pat. 14,342, June 27, 1903.

Hlorine, sulphur dioxide, and water are continuously fed to a tower adapted to secure contact between the gases, e products being hydrochloric and sulphuric acids, and as the latter attains a certain strength, the hydrochloric acid is distilled off as a gas, and is collected by suitable means. The process for simultaneously producing the two acids may be controlled by electrical testing of the diluted acid mixture. When it is desired that the hydrochloric acid shall be practically free from sulphuric acid, an excess of chlorine is used, which surplus is removed before the absorption of the hydrochloric acid by bringing the gases into contact with suitable reducing substances.—E. S.

Alkali Metal Oxides, or Mixtures thereof with other Alkali Oxides or Alkali Earth Oxides, or both; Manufacture of ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 25,242, Nov. 17, 1902.

See First Addition to Fr. Pat. 328,793 of 1902; this Journal, 1903, 796.—T. F. B.

Alumina; Process for the Production of Anhydrous ——. C. A. Doremus, New York. Eng. Pat. 9024, April 21, 1903.

See U.S. Pat. 725,683 of 1903; this Journal, 1903, 627.
—T. F. B.

Saturator for the Manufacture of Sulphate of Ammonia; Construction of ——. T. S. Standfast. Eng. Pat. 20,369, Sept. 18, 1902. III., page 1080.

Carbon Dioxide and Precipitated Calcium Sulphate from Poor Phosphates; Manufacture of ——. P. de Wilde, Brussels. Eng. Pat. 14,112, June 24, 1903. Under Internat. Conv., March 5, 1903.

The phosphate is calcined at a dark red heat (to destroy organic matter without decomposing the calcium carbonate), and is then treated with dilute hydrochloric or nitric acid, the carbon dioxide evolved being collected. Dicalcium phosphate is then precipitated from the liquor by milk of lime, and to the filtrate, sulphuric acid is added to throw down hydrated calcium sulphate. The hydrochloric or nitric acid thus recovered is ready for re-use.—E. S.

Dicalcium Phosphate and Precipitated Calcium Sulphate; Manufacture of ——, *and the Regeneration of the Hydrochloric or Nitric Acid used therein.* P. de Wilde, Brussels. Eng. Pat. 14,194, June 25, 1903.

Calcium phosphates of any kind, after being calcined at a dark red heat, are dissolved in hydrochloric or nitric acid of sp. gr. 1·045 to 1·060, and from the solution dicalcium phosphate is precipitated by slaked lime or chalk, and is separated by filter-pressing. To the filtrate, sulphuric acid of sp. gr. 1·650 or more is added, and the hydrated calcium sulphate formed is filter-pressed, with recovery of the hydrochloric or nitric acid originally used of at least an equal specific gravity. Reference is made to Eng. Pat. 14,112, 1903 (see preceding abstract). Compare also Fr. Pat. 327,669, Dec. 24, 1902; and Addition to the same of date Jan. 26, 1903; this Journal, 1903, 918 and 1008.
—E. S.

Black Lead or Graphite; Substitute for ——. S. E. Sanders, West Bromwich. Eng. Pat. 20,511, Sept. 20, 1902.

Galvanisers' refuse, or skimmings from molten metal, is subjected to slow boiling, in which process adhering metal falls to the bottom, and is removed, and by further heating the acid is evaporated. The product is ground, and after adding a liquid, it is formed into cakes and consolidated by heat. In some cases, wax or tallow is incorporated with the product instead of a liquid.—E. S.

United States Patents.

Sulphuric Acid; Process of Making ——. J. B. F. Herreshoff, Assignor to General Chemical Co., both of New York. U.S. Pat. 737,625, Sept. 1, 1903.

Liquid sulphuric acid and gaseous sulphuric anhydride are caused to travel in opposite directions in contact with each other, and the resulting strong acid is separated into two portions, one of which is the final product, whilst the other is diluted and cooled, and transferred to the last stage of the process, the variations in the level of the collected product being utilised to control the relative amounts of the two portions taken from the strong acid. See also the next abstract.—E. S.

Sulphuric Acid; Apparatus for Manufacturing ——. P. B. F. Herreshoff, Assignor to General Chemical Co., both of New York. U.S. Pat. 737,626, Sept. 1, 1903.

The apparatus consists, essentially, of an absorber having an inlet to admit sulphuric acid, and another inlet to admit gaseous sulphuric anhydride; a receiving tank, divided into compartments, one of which receives the overflow from the other, into which the absorption product (the strong acid) is discharged; a regulator tank connected with the overflow compartment; a cooler interposed between the receiving and the regulator tanks with means for diluting the portion overflowing into the latter tank; a valve by means of which a portion of the absorption product may be withdrawn from the receiving tank without passing to the regulator tank, which valve is governed by the variations in the level of the liquid in the regulator tank; and a device for conveying the liquid from the regulator tank back to the absorber. See the preceding abstract, and compare U.S. Pats. 719,332–3, Jan. 27, and 722,981, March 17, 1903; this Journal, 1903, 212 and 494.—E. S.

Caustic Soda and Barium Sulphate; Producing ——. C. B. Jacobs, East Orange, N.J., Assignor to the United Barium Co., Jersey City, N.J. U.S. Pat. 737,740, Sept. 1, 1903.

Solution of barium hydroxide is treated with sodium sulphate to obtain caustic soda and barium sulphate. The sodium sulphate is obtained by passing into solution of sodium chloride, in the presence of oxygen, the sulphur dioxide produced by furnacing native barium sulphate with carbon. The resulting mixture of barium oxide and sulphide is treated with water to obtain barium hydroxide solution for application as described.—E. S.

Gases Containing Sulphurous Acid; Process of Purifying —— [*for Sulphuric Acid Manufacture.*] H. Rabe, St. Petersburg. U.S. Pat. 739,108, Sept. 15, 1903.

See Eng. Pat. 3327 of 1901; this Journal, 1902, 407.
—T. F. B.

Zinc and Chromium Hydrates; Process of Making ——. I. L. Roberts, Brooklyn, Assignor to the Roberts' Battery Co., New York. U.S. Pat. 738,239, Sept. 8, 1903.

Calcium chloride is added to a solution of zinc and chromium sulphates; the chromium hydroxide that falls as a precipitate, is separated; and calcium hydroxide is added to the filtrate to throw down zinc hydroxide.—E. S.

French Patents.

Sulphuric Anhydride; Process and Apparatus for the Manufacture of ——. W. C. Ferguson. Fr. Pat. 330,521, Mar. 23, 1903.

See U.S. Pats. 723,595–6, March 24, 1903; this Journal, 1903, 495.—E. S.

Metal Silicides; Applications of —— [*Concentration of Sulphuric Acid*]. A. Jouve. Fr. Pat. 330,666, March 28, 1903.

Metallic silicides, simple or complex, are proposed for use in the construction of apparatus for melting, &c., or for the distillation or condensation of acids, and a variety of other applications. Ferrosilicon is especially recommended for apparatus used in the manufacture or concentration of sulphuric acid.—E. S.

Caustic Soda or Potash, Chlorine, and Hydrochloric Acid; Manufacture of —— *by Electrolysis.* J. Heibling. Fr. Pat. 330,807, April 4, 1903.

A solution of salt is electrolysed, using a platinum or carbon electrode attached to the negative source of supply, and an electrode, of finely-divided or porous silver or salt of silver which will produce the chloride, attached to the positive source. The silver electrode may be produced by electro-deposition or by mechanical compression, and may be surrounded by a protecting sheath. Hydrogen is liberated at the negative, and silver oxide formed at the positive electrode. The silver oxide reacts with the salt and water of the solution forming silver chloride and caustic soda. When the salt is entirely decomposed, the bath is emptied, recharged with fresh salt, and the current reversed. The liberated hydrogen now attacks the silver chloride, reforming metallic silver and generating hydrochloric acid. By suitably warming the liquid, the acid may be distilled, or, by avoiding distillation, the acid is electrolysed, liberating chlorine which may be collected in the usual manner.—B. N.

Copper Sulphate and Caustic Alkalis; Manufacture of ——, *by the Electrolysis of Alkali Chlorides.* H. M. Granier. Fr. Pat. 330,963, April 6, 1903.

The invention relates to a process for fixing the chlorine liberated in the electrolysis of alkali chlorides, so as to prevent the formation of hypochlorites, oxides of chlorine, &c., which destroy the anodes and diaphragms. The outer vessel has guides for supporting frames, each of the latter carrying two diaphragms, thus forming a series of positive compartments. The anodes are of copper or of an alloy of copper, and a solution of an alkali chloride saturated with copper chloride, is circulated through the positive compartments. The cathodes, of iron or other material, are immersed in a circulating solution of an alkali chloride, and the caustic alkali formed is extracted as usual. The anodes of copper combine with the chlorine, forming a white precipitate of cuprous chloride, and this is allowed to settle in suitable vessels, washed, and treated with concentrated sulphuric acid so as to form copper sulphate and hydrochloric acid.—B. N.

Caustic Soda and Potash, Carbonates of Sodium and Potassium, &c.; Production of ——, *by Means of a Special Electrolyser and of Compressed Air.* Soc. Savon Frères et Cie. Fr. Pat. 330,924, April 7, 1903.

A solution of salt, or concentrated sea water, is caused to circulate from an upper vessel through a special electrolyser and into a lower vessel, the solution being raised again by compressed air and the circulation continued until the liquid is converted into a solution of caustic soda. The special electrolyser consists of a wood vessel coated internally, first with juice of garlic, and then, when dry, with a creamy mixture of linseed oil, powdered asbestos, and india-rubber. It is claimed that this gives an insulating coating which resists water, alkali, chlorine, and the effects of heat. The negative electrode consists of a vertical tube of lead-antimony alloy (hard lead or anti friction metal) terminating at its lower end in a horizontal perforated ring. Surrounding the vertical tube is a glass tube, and both are coated internally with the above mixture. About 20 discs of hard lead, separated by insulating rings, are slipped over the glass tube, and above the last disc, and insulated from it, is placed a long cylinder of hard lead, closed at the lower end and acting as the positive electrode. The discs and lower end of cylinder are perforated to pass the liquid, and the surface of the cylinder has larger openings to allow the liberated chlorine to escape. The solution overflows from the electrolyser so as to keep only the lower part of the cylinder immersed in the liquid. Compressed air, driven through the hollow negative electrode, is heated by the liquid, and thus rapidly carries off the chlorine through suitable openings at the top of the electrolyser. For conversion into carbonate, the caustic as it leaves the electrolyser meets carbon dioxide injected into the exit tube, and liquid and gas are sprayed through a rose into a separate chamber so as to thoroughly mix them and bring about combination.—B. N.

Aluminous Ores and Alum; Treating ——. Soc. Romana Solfati. Fr. Pat. 330,280, March 16, 1903.

Aluminium chloride or nitrate solution, which may contain potassium chloride, is treated with calcium carbonate to precipitate aluminium hydroxide in a finely divided state, leaving calcium and potassium chlorides or nitrates in solution. To this solution, freed from the precipitate, aluminium sulphate and the double sulphate of aluminium and potassium is added, to precipitate calcium sulphate and regenerate the double chloride of aluminium and potassium. These processes are repeated, successively or alternately, in order to obtain solutions of the double chloride or nitrate of aluminium and potassium continually richer in the potassium, so as to obtain crystallisation of the same without evaporation. Several modifications of the processes are described.—E. S.

Hydrocyanic Acid and Cyanides; Manufacture of ——, by Means of Sulphocyanides. J. Tcherniac. Fr. Pat. 330,308, March 16, 1903.

See Eng. Pat. 17,976, Aug. 15, 1902; this Journal, 1903, 1045.—E. S.

Barium Oxide and Cyanides; Producing ——, by Aid of Capsules. W. Feld. Fr. Pat. 330,672, March 28, 1903.

The invention relates to the most advantageous form and manner of packing, in the furnace of capsules intended to contain a mixture of barium carbonate or sulphate with coal dust, for the production of barium oxide; or mixture of carbon and an alkali or alkaline-earth sulphate, with the object of subsequently transforming the product of reduction into a cyanide or thiocyanate. The preferred form of capsule is a long oval in vertical cross-section, the walls being thicker at the ends. The capsules are so packed upright in the furnace, from hearth to roof, that the gases of combustion may envelope them. Compare Eng. Pat. 24,904, Dec. 6, 1901; this Journal, 1902, 1553.—E. S.

Gaseous Mixtures [Air]; Process and Apparatus for Separating ——, into their Constituents. R. J. Lévy. Fr. Pat. 330,258, March 14, 1903.

The first separation is effected under pressure to obtain liquefied air rich in oxygen and a gas rich in nitrogen. The incompletely separated part of the gas is then reliquefied by expansion (with or without external work), in order to complete the rectification. The production of the gaseous current required for the rectification and the vaporisation of the oxygen by the liquefaction of a corresponding quantity of air are claimed.

The apparatus includes the combination of the rectifying column under pressure with a vaporiser of oxygen; and disposition of means for expansion, with means for removing from the column the products of the reliquefaction; and an exchanger in which already expanded gas cools the gas about to be expanded. Compare Eng. Pat. 5,615, July 26, 1902; and Fr. Pats. 328,770, Jan. 24, and 28,984, Jan. 31, 1903; this Journal, 1903, 995 and 996.
—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

late Glass; [Electrical] Manufacture of ——. O. Imray, London. From St. Louis Plate Glass Co., St. Louis. Eng. Pat. 15,854, July 17, 1903.

ee U.S. Pat. 734,125 of 1903; this Journal, 1903, 951.
—T. F. B.

English Patents.

lass Composition for use in Sharpening Knives and other Articles; Process for, and the Manufacture of a ——. O. Blank and E. Friedberg, both of Lemberg, Galicia. Eng. Pat. 16,070, July 21, 1903.

nd, lime, sodium carbonate, and charcoal, or coke, are ixed together, with or without the addition of lead oxide other colouring agent, and heated to about 1000° C. um arabic and linseed oil are then added till the mass sumes a thick consistency, after which it is formed into abs and cooled like ordinary glass. When cold, the inding surfaces of the slabs are smoothed, preferably with umice stone.—A. G. L.

les, Bricks, and other Articles of Earthenware; Manufacture of Glazed ——, and Apparatus therefor. C. Dressler, Marlow. Eng. Pat. 22,840, Oct. 20, 1902.

e surfaces of the articles to be glazed are coated whilst the biscuit form, with a substance, *e.g.*, a silicate solution, which will be absorbed by the article, and will produce an even and non-porous surface thereon. A white slip, composed preferably of 5 parts of blue ball clay, 40 of ground white pitcher, 4 of red lead, 15 of ground glass, 3 of flint, 2 of borax, and 1 of sodium carbonate, is next applied, after which a coating of glaze or enamel is given, and the article fired.

The apparatus for applying the soluble silicate and the slip to the articles, consists essentially of an inclined support, over which the tiles, &c. are pushed, a distributing pipe and brushes arranged above the support, and a receptacle arranged above the inclined support, and in advance of the distributing pipe; this receptacle is provided at the bottom with exit openings, and at the rear with a transverse sheet, and side pieces of a material, such as leather or india-rubber, so as to form, with the tiles against which they press, a lower receptacle for the silicate solution or slip supplied from the upper receptacle. A travelling band or conveyor on to which the coated tiles fall, and from which they are removed when dry, is also provided.—A. G. L.

French Patents.

Ceramic Products variously obtained, by Means of Powders more or less Wet; Method of Enamelling and Decorating in the Press ——. J. P. R. de Blottefière. Fr. Pat. 330,566, March 24, 1903.

Into a suitable press are introduced slips of paper coated with more or less moist powders consisting of the enamelling composition, the slips of paper being cut so as to correspond in shape with the surfaces it is intended to enamel. The articles are then introduced, and pressure applied, causing the water to be squeezed out and the compositions to adhere to the articles.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Portland Cement and Blast-Furnace Slag. H. Seger and E. Cramer. Chem.-Zeit., 1903, **27**, [72], 879.

The authors have investigated the statement made at the Fifth International Congress of Applied Chemistry, that it was not possible by chemical means to determine the percentage composition of a mixture of blast-furnace slag and Portland cement. Their experiments show that these two bodies possess distinct differences in respect to capacity for absorbing water, and solubility in water. Weighed quantities of six samples of Portland cement and three samples of blast-furnace slag were boiled for three hours with water, and the insoluble residue filtered off, washed with hot water, dried at 110°—120° C., and the water of hydration determined in a portion of the dry residue. The mean value obtained for the Portland cements was 11·46 per cent., and for the slags 0·78 per cent.

For the solubility in water, about 1 to 1½ grms. of the sample were thoroughly shaken with freshly boiled and cooled distilled water, and the undissolved residue filtered off, after three hours, on a filter, washed with cold water and dried. The filter and residue were then incinerated, the ash heated to redness, and weighed. In the case of the cements, the mean values for the residue and the loss were 62·85 and 37·15 per cent., while the corresponding values for blast-furnace slags were 97·68 and 2·33 per cent., showing a marked difference in solubility in the two bodies.—W. C. H.

Petroleum and Asphalt; Investigations of Saghalien ——. III., page 1080.

English Patents.

Stone, Artificial, or similar Substances; Manufacture of ——. J. C. Quinn, Liverpool. Eng. Pat. 20,878, Sept. 25, 1902.

About 800 kilos. of slate dust are mixed to a stiff paste with water; 180 kilos. of quicklime are mixed in a pug mill with enough water to form a magma of creamy consistency, and allowed to stand until the lime is completely hydrated;

the lime is then thoroughly mixed with the slate dust, after which 135 kilos. of metasilicic acid are added, and the whole again thoroughly mixed. The metasilicic acid is prepared by pouring a solution of sodium silicate into excess of hydrochloric acid, stirring with a mechanical stirrer until the precipitate becomes crystalline, and washing the precipitate, preferably in a centrifugal filter. Slabs or tiles are formed from this mixture by applying a pressure of one or two tons per sq. in., and leaving the articles to harden from one to six weeks. The hardening process may be expedited by steeping the articles in water containing an alkali silicate, or exposing them to the action of steam.—A. G. L.

Bricks and Compositions capable of withstanding very High Temperatures, and for Use in Steel and other Furnaces; Manufacture of ——. J. E. Kirkpatrick, Taunton. Eng. Pat. 25,429, Nov. 19, 1902.

See U.S. Pat. 735,528 of 1903; this Journal, 1903, 998.
—T. F. B.

Slabs, Tiles, Sheets and other Forms of a Material similar to Marble, Ceramic Ware, and the like; Manufacture of ——. J. O. Klimsch, A. Beschorner, C. A. Wels, and J. V. Ruston, all of Vienna. Eng. Pat. 25,850, Nov. 24, 1902.

A saturated solution of magnesium chloride is mixed with waste products such as bone meal, beet residues, lyes, bran, peat, or cellulose, if necessary with the addition of a binding material such as flour or resin. This mixture is then mingled with powdered burnt magnesite, and, if necessary, a pigment, after which the material is allowed to dry and solidify between smooth or patterned slabs or plates. It may also, whilst semi-liquid, be applied as a coating to brickwork, &c., being kept in position during the drying by plates as above. Filaments of wood or metal, or wire-netting, may also be incorporated with the mass whilst in the plastic state.—A. G. L.

Glazed Bricks. H. J. Haddan, London. From A. O. Crozier, Wilmington. Eng. Pat. 6848, March 24, 1903.

See U.S. Pat. 723,279 of 1903; this Journal, 1903, 497.
—T. F. B.

Bricks; Manufacture of ——. M. Perkiewicz, Ludwigsberg, Germany. Eng. Pat. 12,095, May 27, 1903.

The bricks are protected from discoloration during the drying and burning by a coating of a paste consisting of 180 to 200 kilos. of water, 11 of gelatin, and 11 of flour. Aluminium sulphate or alum is also added if the clay used contains no aluminium sulphate. In preparing the mixture, the gelatin and flour are first mixed separately with water. The flour paste may either be used hot or else allowed to stand for one or two days until it has fermented, and employed cold.

The paste is either applied by hand or by means of a specially constructed distributing chamber, into which it is fed from a perforated inverted Y-tube. The chamber is placed above the column of brick as the latter emerges from the press, and distributes the paste over it from a leather strip.—A. G. L.

Asbestos Millboards, Slates, Plates, or Tiles; Manufacture of ——. T. H. Ibbotson, East Greenwich, and R. Meldrum, Blackheath. Eng. Pat. 20,841, Sept. 24, 1903.

Asbestos fibre, from $\frac{1}{8}$ in. to 2 in. long (100 lb.), is thoroughly mixed in a beating machine with magnesium chloride solution, of sp. gr. 1·25—1·5 (250 to 500 galls.). Finely-divided magnesium oxide (50—150 lb.), which should weigh at least 25 lb. to the bushel, is then added, and the mixing continued. The pulp obtained is filtered, and the comparatively dry residue left on the filter-bed is subjected to a pressure of 200 to 300 lb. per sq. in., in a hydraulic press, and allowed to dry in the air. The hard slabs obtained, are next washed with water to remove soluble salts, immersed in a 20 per cent. sodium or potassium silicate solution, and either air-dried directly, or first washed with water and then air-dried. An alternative method consists in heating up the fibre and magnesium oxide with water instead of magnesium chloride solution, and afterwards immersing the slabs for 15 minutes in magnesium chloride solution and air-drying, before acting on them with the silicate solution.—A. G. L.

Portland Cement; Manufacture of ——, *and Apparatu therefor.* H. K. G. Bamber, Greenhithe. Eng. Pat 22,734, Oct. 18, 1902.

The more speedy evaporation of the water in the slurry, a well as the absorption of heat from, and cleansing of, th gases escaping from a rotary kiln is effected by deliverin the slurry in an atomised condition into the kiln. Th slurry is either forced through a tube, preferably wate jacketed, at the end of which is a spreading nozzle, or els the slurry as it comes from the tube, may meet one or mor jets of air or may be projected from a nozzle against a spreader.—A. G. L.

Blast-Furnace Slag and other similar Materials; Reduction of —— [*for Cement, Bricks, &c.*]. V. Francois Bouillon, Belgium. Eng. Pat. 26,089, Nov. 26, 1902.

Liquid slag is run from a blast furnace through a channel or to a distributor capable of being inclined at different angles and thence on to apparatus formed by beaters mounted on rapidly revolving horizontal shaft. The beaters strike th liquid slag violently against jets of water coming in the opposite direction under pressure, from holes formed in th sides and back of a basin located below the beaters, out o which the particles are washed by a stream of water. Rapi cooling of the separated particles of the slag, fitting them for application in the making of cement, is thus effected The apparatus is also claimed for the powdering of tin, zinc and other similar materials.—E. S.

United States Patents.

Stones; Process of Making Artificial ——. F. Jürschina Stockholm. U.S. Pat. 738,200, Sept. 8, 1903.

See Eng. Pat. 25,222 of 1902; this Journal, 1903, 299.
—T. F. B.

Cement; Manufacture of ——. W. A. O. Wuth, Pitts burg, Assignor to International Cement Co., New Jerse U.S. Pat. 738,388, Sept. 8, 1903.

Limestone is treated with a solution of sodium nitrate o other salt which will evolve oxygen at a high temperatur and, after grinding, is mixed with powdered blast-furnac slag, and burnt.—A. G. L.

Cement; Manufacture of ——. W. A. O. Wuth, Pitts burg, Pa., Assignor to International Cement Co., New Jersey. U.S. Pat. 738,389, Sept. 8, 1903.

A lime-bearing agent, such as limestone, blast-furnac slag, and a salt, such as sodium nitrate, which will evolv oxygen at a high temperature, are mixed together an burnt. Any two of the bodies may be mixed togeth separately before the third is added, and the materials ma be dry or not.—A. G. L.

Cement Kiln. S. R. Malone, Assignor to J. E. Ledbette both of Quanah, Tex. U.S. Pat. 739,196, Sept. 15, 1903

Twin ovens are arranged side by side in a horizontal plan one of them, which may be longer than the other, having feed hopper at one end. At the other end there is a tubula connection, in which a thermometer may be placed, com municating with one end of the second oven, the other en of which is provided with an exit spout. Means may als be provided whereby the material in transit between th two ovens may be tested; and the first oven may have steam-exit spout at its communicating end. The furnac for heating the ovens is constructed with an inner longitu dinal wall and two inner transverse walls, a centrall located smoke-stack, and openings in the walls providin combustion passages to the stack.—A. G. L.

French Patents.

arble and all kinds of Onyx; Process for the Manufacture of Imitation ——. H. Vasseur. Fr. Pat. 328,002, June 23, 1902.

IE objects to be made, are fashioned in alabaster and ated to 100° to 130° C, superheated steam being used or t, according to the action to be produced. This heating nders some portions of the alabaster more porous than ners, the porous parts taking up more colouring matter in the others in the next operation, which consists in acing the object in a hot or cold bath containing a colour- matter. In the case of onyx, the objects are next eated with ice-cold water containing alumina and a small antity of ammonia. The hardening is then effected by ntly heating the pieces and plunging them into a solution ntaining potassium aluminate, ferrous sulphate, and rbon dioxide, after which they are polished as usual.
—A. G. L.

ood; Process of Impregnating —— [with Sugar]. W. Powell. Fr. Pat. 330,671, March 28, 1903.

E Eng. Pat. 11,235 of 1902; this Journal, 1903, 697.
—T. F. B.

ment Mortar; Process for Preserving the Binding Properties of Prepared ——. Y. H. Magens. Fr. Pat. 330,393, March 18, 1903.

E process consists in cooling the prepared mortar to out 0° C., keeping it at this temperature during the nsport or warehousing, and allowing it to regain the rmal temperature just before use.—A. G. L.

X.—METALLURGY.

st Iron, Cast Steel, and Forgings free from Pores and Cavities; Preparation of ——, *by means of Thermite.* W. Mathesius. Stahl und Eisen, 1903, **23**, 925; Chem.-Zeit., 1903, **27**, [73], Rep. 233. (See also this Journal, 903, 870.)

R cast iron, thermite containing a little titanium oxide made use of, and the metal obtained is fine-grained, free m holes, and capable of taking a high polish. Since nium has the property of combining with nitrogen at temperature of molten cast iron, it becomes possible to metal treated in this way for the manufacture of plates olutely free from bubbles, since the titanium unites with nitrogen of the air bubbles. The proportion of thermite ployed is $\frac{1}{4}$ to $\frac{1}{8}$ per cent. of the weight of iron. Similar ults are obtained when thermite is employed in the nufacture of cast steel and forgings.—T. H. P.

osphor-Iron and Phosphor-Manganese; Application f ——. Stahl u. Eisen, 1903, **23**, 909; Chem.-Zeit., 903, **27**, [71], Rep. 219.

SIC low-carbon Siemens-Martin steel is frequently unable for making tin-plate, because of its softness and e of welding. The Sharon steel-works add to the ladle, er addition of ferromanganese, a regulated quantity of sphor-iron (phosphorus, 17 to 26 per cent.). The sphor-iron dissolves readily and completely, and the sphorus-content of the steel can be very nicely regued. But instead of employing phosphor-iron and ferroganese, to economise the heat of the metal-bath, the empt was made to employ ferromanganese directly. Acdingly, direct additions of phosphor-manganese (65 per t. of Mn; 25 of P; 7 of Fe; 2 of C, and 1 per cent. of Si) e successfully tried. It was produced in the blast-furnace n manganese ores and apatite with fluxes, and its use ected considerable economy as compared with the former hod. The result of the addition was a reduction of the te plates from 28 to 5 per cent. The material, rich hosphorus, can be rolled at a low temperature, and, the es have a hard and bright surface, are more easily ckled" for tinning, and require 8 to 10 per cent. less for the plating than the ordinary steel plates referred to ve.—J. T. D.

Puddling Furnaces; Some New ——. G. Kroupa. Oesterr. Zeits. Berg- und Hüttenw., 1903, **51**, 441; Chem.-Zeit., 1903, **27**, [73], Rep. 233.

The idea of making the production of welded iron again capable of competing with the other methods of manufacture has not yet been given up, and the present paper contains a description of two improved American puddling furnaces. The principle of one of these, constructed by W. Kent, is to give to the furnace a shape which allows of the preliminary heating of the pig-iron and at the same time prevents access of cold air to the charge. The hearth is of the usual form, and the preliminary heating takes place in an inclined, two-limbed, angular channel in which the pig-iron meets the hot waste gases. In the other construction, that of J. P. Roë, the real furnace is surrounded by iron plate and has a water-cooled bottom; whilst in the middle of the hearth on both sides are pivot-chambers which serve as heating chambers, and about these oscillatory motion takes place. Puddle slag from another puddling furnace is first introduced, 1,350—1,800 kilos. of liquid pig-iron then run in, and later the oxidising material (scale, roller slag, or iron ore) is added. The furnace makes 2—3 oscillations, and for a charge of 1,600 kilos. the operation lasts 30—56 minutes. The balls are emptied from the furnace direct into a movable ball-squeezing machine. The yield should be equal to the amount of pig-iron taken.
—T. H. P.

Blast Furnaces; Explosions caused by the Hanging of the Charge in ——. O. Simmersbach and A. Nath. Stahl und Eisen, 1903, **23**, 922; Chem.-Zeit., 1903, **27**, [73], Rep. 233.

Simmersbach criticises the suggestion made by Schilling that these explosions are due to the evolution of gas by the reaction: $CO_2 + C = 2CO$, taking place between the carbon dioxide present and the finely-divided carbon introduced into the upper part of the furnace. He instances the working of an anthracite blast furnace, in which the whole of the interior, from the mouth to the hearth, is charged with fine anthracite powder, despite which there is no danger of explosion, but only of choking.

Like Simmersbach, Nath also considers the principal cause of these more and more frequently recurring explosions to be the increasing employment of fine ores. But he considers that the gas rushing upward becomes compressed in the interior of the furnace, and that thereby air is sucked in and so an explosive mixture formed, this being ignited either by the hot furnace-walls or by particles of the charge. He therefore recommends, as a means of prevention of such explosions, the employment of a vessel like a gasometer on the gas mains so that the pressure may be equalised.—T. H. P.

Blast-Furnace Slag; Vaporisation of ——. B. Osann. Stahl und Eisen, 1903, **23**, 870; Chem.-Zeit., 1903, **27**, [71], Rep. 219.

The author attributes the occasional poor combustion of blast-furnace gases to the presence in them of exceedingly fine dust, which does not subside, and which he considers to have condensed from the gaseous state, and to be in fact sublimed slag. The dust contains but little lime, more silica and magnesia. As evidence of the volatilisation of the slag, the author quotes Cramer, according to whom rock crystal, kaolin, and sand give off vapour at about 2000° C. Magnesia is the most easily volatilised of the constituents of the slag; then follow the alkalis, ferric oxide, lime, silica, alumina. Hilgenstock has confirmed the volatilisation of slag by direct observation; other authors consider that carbides, silicon chloride, or silicon sulphide are formed, and are afterwards decomposed by water vapour.—J. T. D.

Alloys; Influence of the Casting Temperature on the Properties of ——. P. Longmuir. Iron and Steel Inst., Aug. 1903.

Specimens (in no case of less than 50 lb. weight) of gun-metal, yellow and red brass, Muntz metal, cast iron and malleable iron were prepared under normal foundry conditions, and from these alloys three sets of bars were cast at different temperatures, *viz.* (1) at a very high temperature, (2) at a temperature which, in the author's opinion, represented a fair casting heat, and (3) at the lowest temperature at which the alloy would flow. In all cases the castings poured at the fair casting heat had greater tenacity, extensibility, and contraction of area than those poured at the higher and lower temperatures. The gun-metal and Muntz metal alloys cast at the lower temperature were superior, with regard to mechanical properties, to the high temperature alloys of the same series. The yellow and red brass alloys cast at the low temperature were mechanically inferior to the high-temperature ones. The influence exerted upon malleable iron by the initial casting temperature was not destroyed by severe annealing. The influence of the casting temperature was especially marked in the gun-metal and red brass alloys.

With regard to the microstructure of the alloys, it was found that high temperatures favour a large though not well-developed type of crystallisation, whilst at the low temperatures the type of crystallisation is more distinct, the crystal junctions being very sharply defined, and, apparently, forming routes along which fracture readily travels. In the alloys poured at the fair casting heat, the type of crystallisation is still distinct, but is marked by the manner in which the crystals are interlocked.

In discussing the practical application of the results obtained, the author points out that the most suitable casting temperature is determined by a variety of causes, namely, the external and internal form, variations in the thickness of the section especially, abrupt changes from thin to thick metal, &c. The temperature at which the metal enters the mould is influenced by the rate of pouring, the form of runner and gate, and the distance travelled by the metal before entering the mould. In judging as to the best temperature for casting, much assistance may be derived from a comparison of the mechanical properties of the cold casting with the appearance of the metal as it left the ladle, and also from the appearance of the "runner heads."—A. S.

Magnesium; Action of Metallic ——, on Aqueous Solutions. C. F. Roberts and L. Brown. J. Amer. Chem. Soc., 1903, **25**, [8], 801—809.

Magnesium was found to have no action on boiled distilled water which had been cooled out of contact with air. The hydrogen equivalent of magnesium was obtained from solutions of the chlorides of sodium, potassium, magnesium, calcium, barium, and strontium; also from magnesium sulphate. Magnesium chloride solution had the most rapid action on the metal, followed by barium, strontium, calcium, sodium, and potassium chlorides in the order named, the time for complete reaction varying, with about 0·05 grm. of magnesium and N/10 solutions of the salt, between 24 and 48 hours. Magnesium sulphate solution took four weeks, but sodium and potassium sulphates were very feeble in action, and were not persevered with. Solutions of hydrochloric and sulphuric acids, in which the acid corresponded to only a small proportion of the magnesium, also gave the full hydrogen equivalent, the period of reaction being less than for the sulphates, but greater than that required for the chloride solutions.
—T. F. B.

Crystalline Solids; Surface Flow in ——, under Mechanical Disturbance. G. T. Beilby. XXIV., page 1107.

Thin Films of Metals; Effects of Heat and of Solvents on ——. G. T. Beilby. XXIV., page 1108.

English Patents.

Iron Sand; Consolidating ——, into Lumps for Reduction in Furnaces. T. Rouse, London. Eng. Pat. 21,880, Oct. 8, 1902.

Iron sand or powdered iron ore or waste is slightly moistened by a very dilute solution of ammonium chloride, and after mixing with about 7 per cent. of its weight of quicklime, is again moistened with a dilute solution of sodium silicate. The mixture is then moulded, and the blocks are "hardened" in a heating chamber to whi steam is admitted. In preparing the mixture, suitab chemicals, earth, fuel, flux, metal or slag may be added.
—E. S.

Aluminium; Methods of Producing ——. H. F. Schwahn, St. Louis. Eng. Pat. 2086, Jan. 28, 1903.

See U.S. Pat. 719,698 of 1903; this Journal, 1903, 302.
—T. F. B.

Alloys [Aluminium-Copper-Cadmium]. W. Rübel, Berlin. Eng. Pat. 16,453, July 25, 1903.

The alloy may consist of 4 parts of copper, 2·5 parts cadmium, and of 93·5 parts of aluminium. Or, witho giving a brittle alloy, the percentages may be, of copp 6; of cadmium, 3·5; and of aluminium, 90·5. The all is stated to be adapted for casting. Compare U.S. P 697,544, April 15, 1902; this Journal, 1902, 710.—E. S.

Ores; Treating ——. C. W. Stanton, Mobile, U.S.A. Eng. Pat. 4806, March 2, 1903.

The ore is first heated, but below the point of fusion, in retort, a pipe from which conducts the volatile matters to worm immersed in a cooling liquid, the worm having a co tinuation into the lower part of a second receptacle on lower level, into which it opens underneath water, th forming a water-seal. The ore is afterwards transferr to a closed smelting furnace having a similar water-se in which furnace provision is made for withdrawing molten metal and dross.—E. S.

Tin; Extraction of ——, from the Dross, Slag, and Wa thereof. H. Brandenburg and A. Weyland, Kempen-o the-Rhine, Germany. Eng. Pat. 16,377, July 24, 1903

The powdered dross is mixed with water, and treated wi a mixture of 1 part of hydrochloric acid with 2 parts, volume, of sulphuric acid, no extraneous heating bei needed; and the tin dissolved is separated from the filter solution by known means. Sodium chloride may repla hydrochloric acid in the process; or the sulphuric acid m be replaced by sodium bisulphate, in which case, the mixtu will need to be heated. Compare Eng. Pat. 21,424, Oct. 2 1901; this Journal, 1902, 976.—E. S.

Metallurgical Furnaces. M. P. Bosse, San Franci California. Eng. Pat. 14,564, June 30, 1903.

See U.S. Pats. 732,263 to 732,269, inclusive, of June 1903; this Journal, 1903, 914.—E. S.

Blast-Furnace Slag and other similar Materials; Red tion of ——. V. Francois. Eng. Pat. 26,089, 19 IX., page 1088.

United States Patents.

Ores; Apparatus for Reducing and Concentrating — O. B. Dawson, Caldwell, N.J. U.S. Pat. 738,0 Sept. 1, 1903.

The ore is continuously delivered from a hopper having inclined prolongation into the mouth of the upper end of slightly inclined rotating reducing chamber, traversing combustion chamber throughout its length, and passing at lower end through the wall of a concentrating chaml immediately below the smoke stack. A perforated p passes axially through the reducing chamber (with wh it rotates) nearly to the end, connected externally to a sou of a reducing gas, such as hydrogen. Gases of combu enter the reducing chamber at its upper end, and, ming with the reducing gas passing through the perforation the enclosed pipe, issue into the smoke stack at its lo end. As the ore falls from the outlet of the reduc chamber into the concentrating chamber, it is exposed such a temperature as to fuse the matrix with concentrat of the metallic globules, provision for withdrawing which made.—E. S.

Minerals; Process of Reducing ——. O. B. Daws Caldwell, N.J. U.S. Pat. 738,007, Sept. 1, 1903.

The ores, without addition of any flux, are subjec with exclusion of air, to a continuously applied external to about the degree of the beginning of incandescence" in he presence of excess of hydrogen, the ores then passing nto a "practically air-tight chamber" for subjection to a till higher degree of heat, in order to concentrate the metal n the gangue to globules, shot-like masses or nuggets. ee the preceding abstract.—E. S.

recious Metals; Extraction of ——, from their Ores. J. B. de Alzugaray, Assignor to the Baxeres Gold Extraction Co., London. U.S. Pat. 738,758, Sept. 15, 1903.

ee Eng. Pat. 17,709 of 1902; this Journal, 1903, 1051.
—T. F. B.

French Patents.

lalleable Iron and Steel; Manufacture of ——, and Apparatus therefor. F. E. Young. Fr. Pat. 331,007, April 7, 1903.

ee U.S. Pat. 724,770 of 1903; this Journal, 1903, 557.
—T. F. B.

teel Plate; Welding ——, with Plates of Aluminium or other Metals. M. Dünkelsbühler and H. Wachwitz. Fr. Pat. 330,185, March 12, 1903.

ee Eng. Pat. 20,657, Oct. 15, 1901; this Journal, 1902, 6.—E. S.

on Sponge; Process and Apparatus for the Transformation into ——, of a Mixture of Iron Ore with Powdered Carbon. G. Gröndal. Fr. Pat. 330,763, March 31, 1903.

mixture of the powdered iron ore with carbon is fed to the mouth of a relatively tall vertical furnace, so that descends automatically by gravity through the interstices tween series of horizontal pipes traversing the furnace m top to bottom. The pipes, communicating with the nals or chambers in the walls, and where needful, through rforations with intervening spaces, are adapted to convey mixture of combustible gas with air to the heating zone of e furnace, and also to deliver to the lower part of the rnace, either the said gas, or air separately, which gas or serves to cool the descending charge of iron sponge med in the hotter zone, and is itself heated for combustion, to support combustion, higher up. The necessary aptations to either method are shown and described, as ll as many details. Compare Eng. Pat. 18,429, Sept. 14, 01; this Journal, 1902, 1081.—E. S.

older. K. Küppers. Fr. Pat. 330,377, March 18, 1903.

e alloy is composed of lead, tin, antimony and zinc, the d usually predominating. The zinc may vary from 0·01 0·2 per cent., the antimony from 0·1 to 14 per cent., and tin may reach to 60 per cent. The proportion of tin y be greater or less than that of the antimony.—E. S.

ad Sulphide Ores; Treatment of ——, Preparatory to Subsequent Procedure. F. C. Frölich. Fr. Pat. 330,442, March 20, 1903.

e finely-powdered galena is mixed with suitable fluxes, l is made up with water or other liquid into briquettes, ich are heated in an apparatus in which compressed air lrawn or forced through the charge, to desulphurise the and agglomerate it for subsequent fusion. The heat uired for the roasting is mainly produced by combustion the sulphur in the ore. See also U.S. Pat. 692,008, . 28, 1902; this Journal, 1903, 351.—E. S.

ngsten and Lead Alloy; Manufacture of Metal Objects m a ——. E. Polte. Fr. Pat. 330,944, April 6, 1903.

Eng. Pat. 7855 of 1903; this Journal, 1903, 801.
—T. F. B.

minium and its Alloys; Product for Soldering ——. . Fortun and E. Semprun. Fr. Pat. 330,609, March 26, 903.

Eng. Pat. 7016 of 1903; this Journal, 1903, 801.
—T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Tetravalent Lead Compounds. K. Elbs and R. Nübling. Zeits. Elektrochem., 1903, 9, [38], 776—782.

The authors give the results of a series of attempts to electrolytically prepare compounds of tetravalent lead, using hydrochloric, hydriodic, chromic, phosphoric, and hydrofluosilicic acids as electrolytes. Among the various compounds prepared are the following:—Lead dichloride and tetrachloride; ammonium plumbic chloride, pyridine plumbic chloride, and quinoline plumbic chloride; lead bibromide and quinoline-plumbic bromide; a pyridine iodoplumbic compound, $(C_5H_5NH)_2PbI_6$, and also—

$$2C_5H_5NHI.PbI_2.$$

Also the following quinoline compounds: $(C_9H_7NH)_2PbI_6$ and $C_9H_7NHI_2.PbI_2.I_2$.

A process for lead refining already exists in America, based on the ready solubility of a lead anode in hydrofluosilicic acid, and the quantitative deposition of lead on the cathode, and the author's experiments indicate that such a process should give good results.—J. T. D.

Alkali and Bleaching Powder; the Acker Process for ——, by the Electrolysis of Fused Common Salt. VII., page 1085.

English Patents.

Purifying, Sterilising, or Ageing Liquids; Apparatus for [Electrically] ——. R. C. Turner. Eng. Pat. 12,191, May 28, 1903. I., page 1077.

Accumulators; Impts. in Electric ——. L. Garcin, Asnières, France. Eng. Pat. 23,426, Oct. 27, 1902.

The positive plates are connected to a bar and terminal in the upper part of the vessel, and the negative plates to a bar in the lower part, so that the currents enter at the top of one frame and emerge from the bottom of a frame of opposite nomenclature. A plate, placed at each end or in any convenient position, and with solid strips of metal for increasing the conductivity, returns the current to a terminal in the upper part of the accumulator. The plates are cast in a grid-like form, and each is made in two pieces placed face to face and suitably connected, the bars being deeply bevelled internally so as to grip the blocks or lozenges of active material. These are further retained in position by a grating of small intermediate bars, also with bevelled edges, which press against the active material, and the current is thus distributed over the whole surface of the blocks.—B. N.

United States Patents.

Active Material and Electrodes for Storage Batteries, and Products thereof; Process of Producing ——. O. P. Fritchle, Denver, Col. U.S. Pat. 738,313, Sept. 8, 1903.

Active material for lead storage batteries is prepared by subjecting or showering finely-divided lead, granulated lead, or molten lead sprayed by a blast, to or into a solution containing chlorine, compounds yielding chlorine, or hydrochloric acid (dilute or strong), and, after heating, compressing the treated lead into a coherent porous mass, or the lead may be showered directly into a hot dilute solution of hydrochloric acid. Electrodes may be prepared by applying granulated lead to a support, afterwards cleansing and compressing as above, or the granulated lead may be showered through a hot cleansing solution on to a support and then compressed. The process, the material produced by the process, and electrodes made from the material are claimed.—B. N.

Active Material and Electrodes for Storage Batteries; Process of Producing ——, and Products thereof. O. P. Fritchle, Denver, Col. U.S. Pat. 738,427, Sept. 8, 1903.

Similar claims are made to those in U.S Pat. 738,313 (see above), but in this patent the claims are widened so as to include any cleansing solution.—B. N.

Active Material and Electrodes for Storage Batteries; Apparatus for Producing ——. O. P. Fritchle, Denver, Col. U.S. Pat. 738,314, Sept. 8, 1903.

This refers to the apparatus used for producing the active material and electrodes for lead storage batteries referred to in U.S. Pats. 738,313, 738,427 (see above). The apparatus consists of a vessel containing the cleansing solution, and an arrangement is provided for heating the vessel and its contents. A device is described for holding the finely-divided material and for showering it into the liquid, the device consisting of a plate with a number of apertures and a slide in contact with one surface of the plate, so as to allow the material to be gradually showered into the liquid by the withdrawal of the slide. A receiver is immersed in the liquid in the outer vessel, but supported above the bottom of the latter, so as to receive the shower of material. This receiver has a perforated bottom and a horizontal slot extending through its side and near to its base, with a closing device for the slot. It thus forms an arrangement for holding an electrode-support on to which the active material is showered, and provides a means for compressing the material while it is in the liquid. The various parts of the apparatus are constructed of material resisting the action of hydrochloric acid.—B. N.

Battery; Reversible Galvanic ——. E. W. Jungner, Sweden. U.S. Pat. 738,110, Sept. 1, 1903.

A reversible galvanic cell containing an alkaline or other suitable electrolyte, and electrodes consisting of active masses of metallic oxides or hydroxides of different metals, which are insoluble in the electrolyte under all conditions of working. Thus, one electrode may be an oxide or hydroxide of iron, and the other an oxide or hydroxide of another metal, such as manganese. During the charging, the material of one electrode takes up oxygen or the hydroxyl group, the second electrode being simultaneously reduced by the withdrawal of a corresponding amount of oxygen or hydroxyl, and on discharging, these reactions are reversed. —B. N.

Cell; Galvanic ——. L. Fiedler, London, Assignor to G. Pearson, Ilford. U.S. Pat. 738,718, Sept. 8, 1903.

The positive electrode has an active surface of lead peroxide in a rectangular tube-like form, the latter electrode being in connection with a series of plates having active surfaces of cyanide of zinc and mercury within the positive electrode. These are immersed in an electrolyte containing sodium silicate, sulphuric acid, and mercuric sulphate. The outer vessel is of insulating material, and has internally a layer of insulating material for supporting and insulating the electrodes from one another at their lower ends. The upper part of the vessel is closed by two layers of insulating material, separated so as to form an intervening gas space filled with granular material. Vent pipes connect the inside of the cell with the gas space, and the latter with the outside atmosphere.—B. N.

Cell; Galvanic ——. L. Fiedler, London, Assignor to G. Pearson, Ilford. U.S. Pat. 738,719, Sept. 8, 1903.

This patent refers to the construction of the negative-pole electrodes used in the cell described in U.S. Pat. 738,719 (see above). The process of construction and the electrode are claimed. The electrode is prepared by electro-depositing a "cyanid zinc" amalgam on a suitable support, as for instance on zinc. This is done by making the electrode the cathode in an electrolytic cell containing the following electrolyte:—zinc sulphate, 1,000 grms; mercuric sulphate, 50 grms., potassium cyanide, 10 grms., made up with water to a density of 30° B.—B. N.

Electrolytic Process. A. Brichaux, Brussels, Assignor t the Solvay Process Co., Syracuse, N.Y. U.S. Pat 738,094, Sept. 1, 1903.

The solution of the chloride or other salt which is to b submitted to electrolysis is maintained in two layers b the introduction of a quantity of salt into the lower laye thus giving it a greater density. The lower layer is i electrical contact with the cathode, and the upper layer i in electrical contact with the lower and with the anode. —B. N.

French Patents.

Battery of High Voltage, Easily Regenerated, and no Working with Open Circuit; A Constant —— E. Commelin and R. Viau. Fr. Pat. 330,376, March 18 1903.

A liquid-tight ebonite or celluloid box contains a 10 pe cent. solution of sulphuric acid, and in this is immerse a positive electrode of lead peroxide. The latter ma consist of one or more plates connected by a strip of th same material, and attached to a suitable connection outsid the battery. Cadmium, granulated or in small pieces, act as the negative pole, and is introduced only at the time c sale or beginning of working, through an opening in th lid into suitably-suspended perforated lead baskets. modification is described which increases the capacity of th battery, and in this the outer box is made of lead-antimou alloy with two parallel perforated lead strips fitting int suitable grooves so as to divide the box into an inner com partment, which receives two positive plates of lead peroxid and two outer compartments for carrying the cadmiun The battery is charged from a dynamo so as to peroxidi the positive plates and then sealed.—B. N.

Poles, Electrodes or Electrolytic Apparatus; Impts. ——. G. J. Atkins. Fr. Pat. 330,819, April 2, 1903.

This invention applies more particularly to electrolyt cells having a cylindrical cathode of lead, platinum, other suitable material, and an anode of carbon. Th outer wood vessel forms a semicircular trough, on th bottom of which rests a sheet of lead, the edges of th latter being connected to the sources of electric supply. bed of finely-powdered carbon, mixed with non-oxidisab mineral oil or other suitable semi-liquid substance, suppor the carbon anode and separates it from the metallic shee the parts of the latter not in contact with the mixture bei varnished. The anode consists of blocks of mould carbon or gas carbon disposed concentrically with th metallic sheet. The blocks are saturated with an oxid able oil, such as linseed oil, or other suitable liquid semi-liquid substance, or the oil may be previously mix with powdered carbon—for instance, lampblack. Th anode is thus impermeable to the electrolyte; its disi tegration is prevented and its conductivity at the same tim is increased. The intervening layer of carbon and prevents access of the electrolyte to the metallic sheet, b allows of an easy passage of electricity.—B. N.

Spongy Lead [for Electric Accumulators]; Manufactu of ——. J. H. Mercadier. Fr. Pat. 331,006, April 1903.

To molten lead, beginning to become pasty by cooling, powdered metallic oxide, such as litharge, zinc oxide, or like, is dusted in with constant agitation. A highly poro mass of lead is thus obtained, which may be moulded any required form, and is adapted for use in electri accumulators, and for other applications.—E. S.

Fireproof Composition [for Electric Cables], call "Goudron de Syracuse." G. Mahieux. Fr. Pat. 330,6 March 26, 1903. III., page 1081.

Caustic Soda, or Potash, Chlorine, and Hydrochloric Ac Manufacture of ——, by Electrolysis. J. Heibling. Pat. 330,807, April 4, 1903. VII., page 1086.

austic Soda and Potash, Carbonates of Sodium and Potassium, &c.; Production of ——, by means of a Special Electrolyser and of Compressed Air. Soc. Savon Frères et Cie. Fr. Pat. 330,924, April 7, 1903. VII., page 1086.

opper Sulphate and Caustic Alkali; Manufacture of ——, by the Electrolysis of Alkali Chlorides. H. M. Granier. Fr. Pat. 330,963, April 6, 1903. VII., page 1086.

(B.)—ELECTRO-METALLURGY.

Aluminium Alloys; Electrical Conductivity of Certain ——, as affected by Exposure to London Atmosphere. E. Wilson. Brit. Assoc., 1903. Electrician, 1903, [1322], 898.

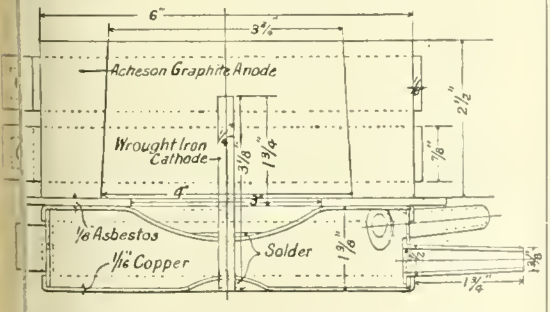
The effects of another year's exposure on the light aluminium alloys of which an account has been previously given (this Journal, 1902, 1283) are shown in the following table:—

No. of Specimen.	Analysis.						Specific Resistance in 10^{-6} Ohm. at 15° C. before Exposure in 1901.	Percentage Variation of Electrical Resistance at 15° C.			Breaking Load in Lb. per Sq. In. of Cross-Section.
	Si.	Fe.	Cu.	Ni.	Mn.	Zn.		During 1901–2, taken on Value in 1901.	During 1902–3, taken on Value in 1902.	During 1901–3, taken on Value in 1901.	
16	0·31	0·37	0·11	..	..	..	2·92	1·04	0·65	1·69	26,600
4	0·38	0·25	0·16	..	..	..	2·88	1·86	1·10	2·98	25,700
13	0·38	0·25	1·58	..	..	..	3·34	3·49	1·79	5·33	39,000
14	0·40	0·31	1·86	..	..	..	3·25	5·24	1·52	6·84	40,600
15	0·40	0·49	2·61	..	..	..	3·34	7·20	2·77	10·15	43,500
1	0·38	0·22	0·17	..	..	0·62	2·86	3·54	1·05	4·62	28,100
2	0·43	0·28	0·30	..	..	1·20	2·94	2·67	3·09	5·84	30,500
5	0·43	0·39	0·09	..	..	2·04	3·07	2·33	1·14	3·50	26,000
7	0·37	0·25	0·05	0·75	..	..	3·05	1·22	0·73	1·96	29,700
8	0·35	0·29	0·09	1·19	..	..	3·24	2·10	0·11	2·22	33,700
20	0·37	1·10	0·06	2·25	..	..	3·18	1·55	0·23	1·78	38,600
24	0·35	1·16	0·09	..	..	..	2·97	0·765	0·76	1·53	31,300
3	0·37	0·28	0·59	..	..	0·59	3·06	2·52	0·82	3·36	30,500
6	0·39	0·31	0·63	..	..	1·20	3·12	2·02	0·12	2·14	30,900
17	0·35	0·53	0·10	0·83	..	0·90	3·03	0·63	0·50	1·13	31,700
12	0·31	0·59	0·19	1·09	..	0·73	3·33	1·26	1·02	2·24	31,700
18	0·43	0·40	0·21	1·13	..	1·94	3·24	2·29	1·07	3·38	34,500
19	0·35	0·29	0·11	2·01	..	1·77	3·26	2·60	0·81	3·43	56,200
11	0·39	0·56	0·24	2·31	..	0·38	3·48	1·95	0·425	2·38	34,500
22	0·37	0·43	1·08	1·29	..	..	3·41	− 1·42	3·96	2·48	45,900
21	0·39	2·57	0·10	1·39	..	..	3·24	− 0·97	3·28	2·27	42,200
10	0·32	0·54	0·02	..	0·05	..	3·09	0·783	0·31	1·09	29,200
9	0·31	0·35	0·03	..	0·35	..	3·30	1·94	− 0·55	1·39	30,500
23	0·44	0·56	0·09	..	1·78	..	3·49	2·34	0·00	2·34	35,300
ommercial luminium.	0·14	0·31	..	..	..	..	2·76	Not exposed	2·70	..	28,200

—A. S.

cium; Electrolytic Production of ——. J. H. Goodwin. J. Amer. Chem. Soc., 1903, **25**, [8], 873—876.

e furnace employed consists of a vertical wrought iron ode fastened in electrical contact with a copper water-ket, which serves as a cooler and also as a base for the ace. The anode is separated from this base by an estos ring, and is made by boring out a 2·5-in. disc n a 6-in. Acheson graphite electrode. This also conites the walls of the furnace, connection being made by ns of wrought iron bands clamped round it.



layer of powdered lime ½ in. thick is spread on the b of the furnace, the water-jacket is filled and the curre is switched on. Fused calcium chloride is now poured in the furnace, contact being assisted by placing a carbon ro against the side of the anode. The resistance should be djusted so as to give a current of 103 ampères, and the te erature should be kept at 950° C. The calcium is removed from the surface of the melt, from time to time, by means of an iron spoon. Specimens made in this manner from calcite showed 94·80 per cent. of calcium, 4·46 per cent. of magnesium and 1·03 per cent. of iron.

—T. F. B.

English Patents.

Metallic Sulphides; Treatment of ——, in the Electric Furnace. R. C. Contardo, Sèvres, France. Eng. Pat. 26,090, Nov. 26, 1902.

Metallic sulphides are fitted for smelting by radiant heat in an arc electric furnace, by being mixed with oxidisable and scorifiable substances, such, for instance, as manganese dioxide or sodium nitrate. Previous roasting of the sulphides is thus rendered unnecessary. Compare Eng. Pat. 4576, March 4, 1901; and U.S. Pat. 705,651, July 29, 1902; this Journal, 1902, 261 and 1083.—E. S.

Electrolytic Deposits; Apparatus for the Production of ——. E. Müller, Charlottenburg. Eng. Pat. 12,194, May 28, 1903.

The cathode in this apparatus is made of some substance which takes electrolytic deposits with difficulty (*e.g.*, aluminium), and is preferably of cylindrical form, surrounding the anode, which is of the same metal as that contained in the electrolyte, and which is surrounded by a porous, non-conducting covering, in order to prevent short circuits.

—T. F. B.

United States Patents.

Telluride Ores of Gold and Silver; Process of Treating ——. C. E. Baker and A. W. Burwell, Cleveland, Ohio. U.S. Pat. 739,138, Sept. 15, 1903.

The process consists in treating ores of gold and silver containing a base metal and tellurium with chlorine, so as to form the chlorides of the base metal, tellurium, and silver. The chlorine may be used dry, and brought into contact with the ore previously heated and dried. The chlorides of the base metal and tellurium are then separated from the other metals or metallic compounds for the purpose of recovering the gold and silver, and by electrolysing the solution of the chloride of the base metal, the latter and free chlorine are also obtained.—B. N.

Metals; Electrolytic Process of Recovering ——, from their Compounds. C. E. Baker and A. W. Burwell, Cleveland, Ohio. U.S. Pat. 739,139, Sept. 15, 1903.

The apparatus is the same as that described in U.S. Pat. 731,499 (see this Journal, 1903, 1004). Claims are made for (1) the process of extracting metals from their compounds, with continuous recovery of the volatile metal forming the cathode; (2) the process of extracting sodium by electrolysis of an aqueous solution of its chloride, with continuous recovery of the mercury forming the cathode; and (3) the separate distillation of different portions of the resulting amalgam, with continuous recovery of the volatile metal of the cathode.—B. N.

Metals Dissolved in Mercury; Apparatus for Oxidising ——. C. E. Baker and A. W. Burwell, Cleveland, Ohio. U.S. Pat. 739,140, Sept. 15, 1903.

The apparatus comprises a vessel through which the amalgam is passed, the outlet being lower than the inlet on the opposite side. The oxidising electrolyte is circulated in the reverse direction, the inlet being immediately over the surface of the amalgam and the outlet on the opposite side at the upper surface of the electrolyte. Pieces of roughened carbon are arranged so as to be in contact with the amalgam and the electrolyte, and these pieces have secondary roughened surfaces capable of coming into direct electrical connection with the amalgam; thus the secondary surface may contain iron capable of being wetted by or amalgamated with mercury.—B. N.

French Patents.

Aluminium; Electrolytic Manufacture of ——. G. Gin. Fr. Pat. 330,481, March 21, 1903.

See Eng. Pat. 961 of 1903; this Journal, 1903, 805.
—T. F. B.

Zinc or other Volatile Metals; Electro-Chemical Treatment of the Minerals of ——, for the Extraction of the Metals which they contain. A. Salguès. Fr. Pat. 330,665, March 28, 1903.

This invention relates to an electric furnace rendered tight by the cooling of its external parts; the vapours are thus condensed and leakages stopped. A metal plate, kept cool in any suitable manner, covers the furnace, and the electrodes pass through eyelets in this cold plate with sufficient play. Over the eyelets and fitting closely to the electrodes are disposed plates of asbestos board, which are bound to the cold plate by strips of metal. The vapours condense in contact with the cold plate, and the solid formed fills up the cavity between the plate and the electrode. The openings in the plate for charging and emptying, are similarly rendered tight by loose tiles placed over the openings. A maximum of power is obtained from the furnace, without exceeding the limits of density of the current, by making these two electrodes movable, and working them in series with a fixed electrode at the bottom of the furnace. The movable electrodes may be arranged vertically or in an oblique position. The furnace is provided above with a chamber into which the vapours pass, and the formation of crusts and obstructions is prevented by introducing into this chamber the cooled inert gas leaving the columns of condensation, thus inducing rapid cooling, and causing the metal to be deposited in a powdery form. The inert gas is brought back into the chamber by means of a suitable ventilator. At the extremities of the columns of condensation, floating bags are arranged in a tower, and these serve to retain the last traces of metallic dust, and, by remaining constantly filled with inert gas, they prevent the entrance of air into the condensing columns. If, through any cause, there is a diminution of pressure inside the furnace or condensing columns, these bags collapse in a bellows-like manner, and deliver their gaseous contents into the condenser. The latter may be arranged as vertical or inclined tubes, so as to be emptied by the action of gravity, or endless screws or travelling chains may be used for the same purpose.—B. N.

Sodium; Manufacture of ——. The Cassel Gold Extracting Co., Ltd. Fr. Pat. 330,987, April 7, 1903.

A porous diaphragm, of alumina or aluminate of soda, alone or mixed, or other material not acted upon by the electrolyte or products of electrolysis, is used to separate the electrolyte surrounding the anode and cathode respectively, and thus separate the products when fused caustic soda is electrolysed. The water and oxygen disengaged at the anode are thus prevented from attacking the liberated sodium, and the yield is considerably augmented. The apparatus is rendered more efficient still by a current of ai or other suitable gas, which is passed through or above the electrolyte in the anode compartment, so as to carry off the water, in the form of vapour, as quickly as it is produced.
—B. N.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Fats; Hydrolysis of ——, by Means of Steapsin. J Lewkowitsch and J. J. R. Macleod. Proc. Roy. Soc 1903, **72**, 31—34.

It was stated by Lewkowitsch in a previous communicatio (this Journal, 1903, 67) that in a series of experiments t determine the action of lipase on cotton-seed oil, the amoun of hydrolysis effected did not exceed 3 per cent. Exper ments have now been made on similar lines with steapsi acting upon cotton-seed oil and lard. The solutions of th enzyme were prepared by triturating 200 grms. of fre ox or pig pancreas with twice its volume of water. In th two first preparations the extract was preserved by means mercuric chloride or thymol, and incubated at 37° C. A this was found to weaken or destroy the steatolytic actio probably through the action of the trypsin on the steapsi incubation was omitted in the other two preparation These were also only filtered through muslin, for it w found that steapsin was retained by filter-paper.

In the experiments 100 grms. of cotton-seed oil or la were triturated with measured quantities (10 to 80 c.c.) the extract, and the emulsion kept in stoppered bottles the ordinary temperature, care being taken to prevent t mixture separating into two layers. After a few days t effect of hydrolysis was to be seen in the hardening of t mass through the liberation of fatty acids. In each ca the amount of hydrolysis was measured by determini the quantity of free fatty acids in terms of oleic acid.

In typical experiments with cotton-seed oil, the hydroly after four days ranged from 22·9 to 32·8 per cent. in t case of one steapsin preparation and from 31 to 37 per ce in the case of another. After another seven days t proportion of free fatty acid in the two highest cases alo had increased to 46·3 and 44·3 per cent. respectively. T greatest amounts of hydrolysis observed were 86·7 and 8 per cent. after 56 days. In the case of one of the steap mixtures the amount of hydrolysis increased with amount of steapsin added, but this correspondence was observed with another steapsin preparation. The additi of dilute acid or alkali to the mixtures did not appear exert any decisive influence on the action of the enzyme.

Lard was hydrolysed much more slowly than cotton-s oil, only about one-third of the amount of free fatty ac being liberated in the same time. In this case the additi of caustic soda (1 c.c. of N/10 solution) appeared promote hydrolysis at first, but subsequently to retard it

The authors conclude, from the results of their exp- ments, that steapsin does not effect the reversible reac shown by certain other enzymes.—C. A. M.

Olive Oil from Morocco. C. Ahrens and P. Hett. Zeits. öffentl. Chem., 1903, **9**, 284. Chem.-Zeit., 1903, **27**, [75], Rep. 241.

ALL the samples of olive oil from Morocco examined by he authors had iodine values varying between 89·6 and 1·8, but in no case could any of the usual adulterants—esamé oil, arachis oil, &c.—be detected. In order to letermine whether the high iodine value was characteristic f olive oil from Morocco, two different kinds of ripe olives, lack and green, were procured, and the oil extracted by neans of a hand-press. The oil from the green olives was f a greenish-yellow colour, and showed, in two determinaions, the iodine values 87 and 87·45. The oil from the lack olives was of a pure yellow colour, and, in three eterminations, showed the iodine values 91·54, 91·70, and 1·40. Both oils gave normal figures for specific gravity nd saponification value. The oils had fairly high acid alues—8·20 and 11·56.—A. S.

inseed Oil; Oxidation of ——. [*Preliminary Report.*] F. L. Dunlap and F. D. Shenk. J. Amer. Chem. Soc., 1903, **25**, [8], 826—836.

INSEED oil was oxidised by aspirating air through its olutions both in petroleum spirit and in benzene. The ample used was a pure boiled oil containing lead and nanganese as driers. It gave the following values:—odine value, 176·6 and 176·9; acid value (mgrms. of otassium hydroxide), 4·00; saponification value, 180·6 nd 183·0. 100 grms. of the oil were dissolved in 1 litre of etroleum spirit (boiling below 90° C.).

The oxidation product was completely formed in about 0 days. Two distinct layers of solid product separated—a ark-coloured and a light-coloured one. These were washed nd examined separately. Each weighed about 60 grms. he iodine value of the dark portion (A) was 54·2, and f the lighter portion (B) 26·7 and 28·5.

These two portions were extracted with ether. The luble portion from A weighed 20 grms., and from B 0 grms.

The extracts gave the following numbers:—From A, dine value, 54·2 and 54·9; acid value, 64·5 and 64·7; ponification value, 251·7 and 258·0. From B, iodine lue, 42·1 and 42·2; acid value, 66·5 and 67·0; saponication value, 237·2 and 239·1.

The portion of B insoluble in ether was extracted with loroform, and was soluble to the extent of 28 grms. out 31 grms., the residue being of the consistency of rubber. he chloroform extract had an iodine value of 32·2 and ·9, and saponification value, 321·1 and 322·3. The part A insoluble in ether had an iodine value, 32·5 and 34·8.

The free fatty acids from B had the following conants:—

From	Iodine Value.	Acid Value.	Saponification Value.
her-soluble portion	51·8—52·9	231·2	268·9
her-insoluble portion.....	43·4—45·9	265·2	307 and 309

In benzene solution oxidation was slower, a month being quired to complete oxidation. Apparently only one solid oduct was obtained; this had an iodine value of 22·0 and ·7. The portion soluble in ether had the iodine value, ·4; saponification value, 330·0; acid value, 98·2 and 1·1. The portion insoluble in ether (78 per cent.) had line value 24·2.

After filtering off the solid portion, after oxidation, the had an iodine value of 35, the lowest obtained being 31. —T. F. B.

Fat; New Method for the Determination of ——. C. Lehmann. XXIII., page 1106.

Fat; New Method for the Determination of ——. W. Völtz. XXIII., page 1106.

ENGLISH PATENT.

Fats and the like; Apparatus for the Recovery of —— [from Liquids]. R. Schilling and C. Kremer, Frankfort-on-Maine. Eng. Pat. 14,461, June 29, 1903.

A CYLINDRICAL vessel, open at the bottom, is provided with a concentric and smaller cylinder, fitted with a conical cover, on which the water containing the fat falls, passing then through a sieve (which fills the space between the two cylinders), and then on to an inclined projection, on the outer vessel, which collects the fat. (See also Eng. Pat. 14,603 of 1891, and Addition to Fr. Pat. 312,786; this Journal, 1902, 917, and 1903, 428, respectively.)—T. F. B.

FRENCH PATENTS.

Fish Oils: Production of Inodorous Tallow Substitute from ——. G. L. Sandberg. Fr. Pat. 329,256, Feb. 10, 1903.

THIS patent supplements Fr. Pat. 317,540 of 1902 (this Journal, 1902, 1403). By treating the fatty acids from the oils with not less than 25 per cent. of sulphuric acid of 66° Bé. at 12° to 20° C., and keeping the temperature of the mixture at 25°—40° C., solid derivatives are obtained which, when washed and decomposed with steam, melt at 20°—24° C. By raising the temperature during the reaction to 60°—70° C., the product has a higher melting point, but contains more anhydrides, which may be converted into fatty acids by treatment with steam in an autoclave. Claim is also made for the conversion of unsaturated fatty acids into solid odourless products by treatment with sulphuric and nitrous acids at a low temperature (30°—35° C.), —C. A. M.

Oils; Manufacture of Modified [Bacterially Oxidised] ——, and their Preparation for Industrial Applications. E. Meusel. Fr. Pat. 330,389, March 18, 1903.

SEE Eng. Pat. 7410 of 1903; this Journal, 1903, 874. —T. F. B.

Fat Extraction; Apparatus for ——. M. Jacques and P. Bernard, France. Fr. Pat. 330,434, March 20, 1903.

ONE or more extraction vessels are suitably connected by pipes and cocks with one or more stills, condensers, and reservoirs for the recovered solvent. The fatty material having been placed in one of the extractors, through a manhole, is covered with the solvent, which is forced into the vessel from the reservoir. After digestion, the liquid is drawn off through a strainer at the bottom of the extractor into the still, where it is heated by a steam coil, the solvent being distilled through the condenser into the reservoir, and the recovered oil is then drawn off from the still.—L. A.

Non-fatty Residuum of Olives; New Process for the Utilisation of the ——. W. Guerrero de Smirnoff. Fr. Pat. 330,579, March 25, 1903.

THE residues from olives, left after the whole of the oil has been extracted by pressure and by solvents, are thoroughly dried and riddled, by which means are obtained 75 to 80 per cent. of broken shell from the kernels and 25 to 30 per cent. of dried pulp. The shell is carbonised in retorts, yielding a porous charcoal and the usual products of the distillation of wood. The dried pulp, rich in nitrogen, potash, and phosphoric acid, is either utilised as manure, or is mixed with the tar from the distillation of the shells and formed into briquettes for fuel.—L. A.

Soap Leys containing Glycerin; Apparatus for the Concentration of Waste ——. M. M. Sause. Fr. Pat. 330,140, March 11, 1903.

THE apparatus comprises two concentric cylindrical vessels, the outer of which is fixed horizontally on pillars and contains the liquid to be evaporated. The inner vessel, which is heated internally by steam, evaporates the liquid, and, being kept in rotation and completely immersed, does not become encrusted by the salt which crystallises out. This salt falls into hoppers in the lower side of the outer vessel, and is withdrawn at intervals. The steam formed by evaporation is aspirated from the top of the vessel, and may be passed into the inner cylinder of another similar apparatus.—L. A.

Soap; Process for the Manufacture of ——. J. Barker. Fr. Pat. 330,840, April 2, 1903.

See Eng. Pat. 15,619 of 1902; this Journal, 1903, 1055.
—A. S.

Osmose with Alcohol; Apparatus and Process for ——, *to be used for the Purification of Alkaloids, Glucosides, Wood Extracts, Colours, Glycerin, and other Substances readily Soluble in Alcohol.* E. A. Barbet. Fr. Pat. 330,939, April 1, 1903. XX., page 1101.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

United States Patent.

Paint, and Process of Making Same. J. E. Kollinger, Munich. U.S. Pat. 738,456, Sept. 8, 1903.

The colouring matter is added to a mixture of mineral oil, melted tallow, a vegetable oil, resin, saponified resin, and turpentine.—T. F. B.

French Patents.

Pigments; Manufacture of ——. G. G. M. Hardingham. Fr. Pat. 330,224, March 13, 1903.

Antimony oxysulphide, produced by the "dry" process of volatilising antimony sulphide in a regulated stream of air, and removing the acid from the sublimed product, is used as the body of the pigment.—T. F. B.

Pigments [Zinc Hydroxide and Barium Sulphate]; Process of Making ——. W. J. Armbruster and J. Morton. Fr. Pat. 330,513, March 23, 1903.

See U.S. Pat. 726,239 of 1903; this Journal, 1903, 640.
—T. F. B.

(*B.*)—RESINS, VARNISHES.

English Patent.

Surface Finishes [Varnish]; Composition for Removing ——. W. C. Fairweather, Glasgow. Eng. Pat. 16,060, July 21, 1903.

A mixture of paraffin wax (45 lb.), benzol (135 galls.), and acetone (137 galls.).—T. F. B.

United States Patent.

Turpentine; Apparatus for the Manufacture of ——. C. W. Billinger and C. F. Hallock, Moultrie, Ga. U.S. Pat. 737,994, Sept. 1, 1903.

The retorts stand on a platform separating the upper chamber of the oven from the fire-box below. The latter is provided with an air-draught into its upper part, an opening in the bridge wall, and an opening between the platform and the rear wall of the oven. The products of combustion thus circulate, from the fire-box below, round the retorts, and leave the oven by a suitable outlet in the upper chamber. Steam pipes lead into the lower ends of the retorts, and discharge pipes, for the products of distillation, lead from the upper ends of the retorts, which project above the top of the oven. The retorts are furnished internally with perforated partitions below the upper discharge pipes; the latter lead below the level of liquid contained in a separator, which is provided with an upper opening for filling and an outlet for discharging at or near the bottom. The separator is connected at its upper end with a suitable condenser by means of a pipe.
—B. N.

(*C.*)—INDIA-RUBBER.

French Patent.

Vulcanisation of Rubber Boots or Similar Articles; Process for the ——. A. Cockburn. Fr. Pat. 330,449, March 21, 1903.

See Eng. Pat, 17,637 of 1902; this Journal, 1903, 875.
—T. F. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

United States Patent.

Glue and Gelatin; Manufacture of ——. H. Weiss, Hilchenbach, Germany. U.S. Pat. 738,709, Sept. 8, 1903.

Leather waste is successively extracted with acids and with alkalis, neutralised, washed, and boiled in the usua mauner.—R. L. J.

French Patents.

Osmose with Alcohol; Apparatus and Process for ——, *t be used in the Purification of Alkaloids, Glucosides Wood Extracts, Colours, Glycerin, and other Substance readily Soluble in Alcohol.* E. A. Barbet. Fr. Pat 330,939, April 1, 1903. XX., page 1101.

Casein-Glue; Improved ——. W. A. Hall. Fr. Pat. 330,304 March 16, 1903.

A strong and penetrating glue, resistant towards moisture is made by mixing 50—60 parts of dry casein, 20 parts o sodium phosphate, 10 parts of sodium sulphite, and 20—3 parts of dry lime, quick or slaked.—J. F. B.

Glutinous Material from Seaweed; Extraction of ——, *b a Continuous Process.* E. Herrmann. First Additio dated March 26, 1903, to Fr. Pat. 320,656, April 17, 190 See this Journal, 1903, 152.

The alkali is recovered by passing carbon dioxide into t solution at an elevated temperature (40°—70° C.), or und pressure.—R. L. J.

XV.—MANURES, Etc.

Phosphates; Process for Making Available ——. C. Dempwolf, jan. J. Amer. Chem. Soc., 1903, **25**, [8 818—825.

Twenty grms. of ground rock and 20 grms. of nitre cal were mixed to a thin paste with water. After standing fo weeks, with constant agitation, the available phosphate w found to constitute 55·43 per cent. of the total phospha present; all the available phosphate was soluble in wat and amounted to 6·89 per cent. of the product (calculat as P_2O_5), the total amount of phosphoric anhydride bei 12·43 per cent.—T. F. B.

French Patents.

Distillery Vinasses or Waste Waters from Sugar Factori Preparation of a Dry Nitrogenous Product [Fertilis from ——. A. E. Vasseux. Fr. Pat. 330,423, March 1903. XVII., page 1099.

Non-fatty Residium of Olives; New Process for Utilisation of ——, *[as Manure].* W. Guerrero Smirooff. Fr. Pat. 330,579, March 25, 1903. X page 1095.

XVI.—SUGAR, STARCH, GUM, Etc.

English Patent.

[Crystallisable] Liquors; Apparatus for Evaporatio ——. A. Chapman. Eng. Pat. 20,002, 1902. I., p 1077.

United States Patents.

Saccharine Juices; Process of Defecating ——. J. Hignette, Paris. U.S. Pat. 738,328, Sept. 8, 1903.

See Eng. Pat. 28,589 of 1897; this Journal, 1899, 156.
—T. F.

Sugar Juices; Process of Purifying and Concentra ——. J. A. Besson, Caen. U.S. Pat. 738,398, Sep 1903.

See Addition to Fr. Pat. 308,384 of 1901; this Jou 1902, 1545.—T. F. B.

Carbon of Great Decolorising Power [Sugar Purification]; Process of Obtaining ——. R. Ostrejko, Satkuny, Russia. U.S. Pat. 739,104, Sept. 15, 1903.

See Addition to Fr. Pat. 304,807 of 1900; this Journal, 1902, 58.—T. F. B.

French Patents.

Vacuum Pans [Sugar Manufacture]; Double Heating Arrangement and Agitator for ——. J. L. ter Hall. Fr. Pat. 330,188, March 12, 1903.

Two steam drums, entirely separate from each other and perforated by a large number of vertical tubes, are placed one near the bottom and the other about the middle of a vertical cylindrical vacuum pan. Above the upper steam drum is situated a mechanical stirrer carried by a central vertical shaft and constructed of slanting arms fixed to elliptical rings. When the first charge of liquor is admitted o the pan, the lower steam drum only is used; but as the eight of the charge increases, the second drum is also eated, and at the same time the mechanical stirrer is set n motion.—J. F. B.

ugar Juices; Apparatus for Accelerating the Carbonation of ——, also applicable for Mixing any Gas with a Liquid. P. Collignon. Fr. Pat. 330,311, March 20, 1903.

N the outside of the tank containing the liquid there is xed near the bottom a wide horizontal pipe, bent in the rm of a D, both ends being in connection with the tank, such a way that it constitutes a sort of external by-pass. current of gas is introduced by means of a pipe at one the bends of the wide pipe, and this, acting on the inciple of a steam-injector, sets up a constant circulation the liquid in the tank through the bent pipe. In this ay the liquid is brought into intimate contact with the s, the efficiency of the treatment being increased by the sertion of a number of conical baffles in the path of the uid in the pipe.—J. F. B.

ccharine Juices and other Matters; Extraction and Utilisation of —— from Plants, Roots, &c. A. Montupet. First Addition, dated April 1, 1903, to Fr. Pat. 329,947, March 4, 1903 (this Journal, 1903, 1058).

the cooking of decorticated and comminuted materials by saturated vapour of any suitable liquid, access to all parts the material is ensured by arranging inside the boiler a forated rotary pipe or receptacle provided with any mber of side branches, the vapour being introduced ide the perforated arrangement and diffusing outwards o the surrounding material.—J. F. B.

ccharine Juices and any other Materials; Extraction nd Utilisation of ——. A. Montupet. Fr. Pat. 330,817, April 1, 1903.

E materials are reduced to a suitable condition by rasp-slicing, or other means, and charged into a vessel in ch they are boiled with or without pressure, with the oduction of any suitable extracting liquid. The liquid hen withdrawn, and the boiled material is subjected to ssure to remove the liquid still remaining in it. The ing vessel may have a cylindrical form with a central forated pipe carrying perforated arms, the liquid being oduced into this pipe, whence it is distributed equally to parts of the surrounding material.—J. F. B.

illery Vinasses or Waste Waters from Sugar Factories; reparation of a Dry Nitrogenous Product [Fertiliser] om ——. A. E. Vasseux. Fr. Pat. 330,423, March 20, 03. XVII., page 1099.

tarch, Meal, &c.; Purification of ——. A. Verley. Fr. Pat. 330,914, April 4, 1902.

ROGENOUS matters and other impurities are eliminated crude starch and meals by suspending the material in r to form a milk of about 12° B. and agitating it with able proportion of a hypochlorite of an alkali or other . For instance, sodium hypochlorite, containing 45 ees of active chlorine, may be employed in the proportion of 1·5 to 4·5 per cent. of the weight of the starch. After several hours' treatment, the starch is separated and thoroughly washed by decantation.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Oxydases; Chemical Nature of ——. K. Aso. Bull. College of Agric., Tokio, **5**, 481—489. Chem. Centr., 1903, **2**, [11], 674.

From the results of a series of experiments on the behaviour of oxydases and peroxydases, the author concludes that the view of Kastle and Loewenhart (this Journal, 1902, 196) that these bodies are organic peroxides, is very improbable. The blue coloration of potassium iodide and starch solution by vegetable juices does not always proceed parallel with the blue coloration of guaiacum tincture; therefore the liberation of iodine must be caused by other bodies than those which cause the blue coloration of guaiacum tincture. In one instance the liberation of iodine was proved to be caused by the presence of traces of nitrites.—A. S.

Yeast; Observations on the Period of Vitality of Dried ——. H. Will. Zeits. ges. Brauw., 1903, [3]; Zeits. Spiritusind., 1903, **26**, [36], 391.

Out of a large number of samples of yeast preserved in 1886, only two contained living cells after 16 years. One of these, preserved in wood charcoal, was found to be damaged owing to a hole in the tin box in which it was sealed; the other, preserved in asbestos, was found perfectly dry when opened; the living cells present, however, belonged entirely to the class of wild yeasts. Further studies on the preservation of yeast have convinced the author that the percentage of moisture in the preserve plays a very important part, as do also the method and rapidity with which the moisture of the yeast has been removed. As regards the percentage of moisture, there appears to be a critical point, lying between 20 and 15 per cent. If the moisture is diminished below this point, the vitality and fermentative properties decrease with extreme rapidity. A very fine subdivision of the yeast without any admixture is not favourable to the vitality of the yeast. Moreover, yeast dried without any admixture and broken up into fair-sized lumps requires a protective agent, which is furnished by the outermost highly dried layers, consisting chiefly of dead or enfeebled cells. Suitable substances mixed with the yeast exert a similar protective influence.—J. F. B.

Respiration Coefficients of Various Yeasts, in Roll Cultures on Different Nitrogenous Media. E. Wosnessensky and E. Elisseeff. Centralbl. Bakteriol., 1903 [II.], **10**, 629; Chem.-Zeit., 1903, **27**, [73], Rep. 228.

The yeasts examined by the author were: (1) *Saccharomyces cerevisiæ* I Hansen, (2) *Schizosaccharomyces Pombe*, and (3) *Saccharomyces Ludwigii*. The basis of the different nutrient media was Laurent's solution containing 10 per cent. of saccharose and the necessary quantity of gelatin, the nitrogenous food added, being peptone (1 per cent.), ammonium phosphate (0·47 per cent.), or potassium nitrate (0·72 per cent.). The roll cultures were prepared in test-tubes, which were sealed by means of mercury over which was a little sterilised water, and the gas in the tubes was examined from time to time. With yeasts (1) and (3) the respiration coefficient was mostly higher, and was not appreciably influenced by the nitrogenous matter present; for the culture (3) the co-efficient was always smaller, especially with the medium containing ammonia. From this it is concluded that alcoholic fermentation took place in (1) and (3), in spite of the ready access of air allowed by roll cultures, but that with the yeast (2), this was the case only to a very slight extent or not at all.—T. H. P.

Malt; Moisture in Stored ——. J. Fries. Zeits. ges. Brauw., 1903, **26**, [31], 553—554.

The samples examined, 10 in number, originally contained 1½—2 per cent. of moisture, and had been stored in bins under different conditions. It was found that, even after six months' storage, the moisture in the upper layers—the part most exposed to air—did not exceed 8—10 per cent

At 8 inches below the surface the moisture in no case exceeded 5 per cent., and was not higher than 1 per cent. above the original proportion at a depth of 20 inches from the surface. The absorption of moisture is apparently greatest at the commencement of storage, the maximum percentage being obtained within the first two months. When malt is stored in bins, no artificial covering is necessary to exclude moisture, the superficial stratum itself affording sufficient protection against the permeation of moisture into the bulk; when, however, the malt is spread in shallow heaps on a granary floor, a covering of sacks is advantageous in preventing slackness. It is desirable to allow the malt from the kiln to cool down before placing it in the bins, or it will fail to absorb the necessary small proportion of moisture.—C. S.

Must [*Wine*]; *Sterilised* ——, *and Selected Yeasts.* E. Kayser. Rev. Viticul., 1903 [502]; Ann. de la Brasserie, **6**, [15], 340—342.

RECENT experiments have demonstrated the possibility of sterilising wine must in large quantities without excluding air, the boiled flavour of pasteurisation being obviated by keeping the temperature below 68—70° C. By this treatment it becomes possible to transport the must to any distance, or to keep it for improving an inferior quality or until more favourable conditions of fermentation can be secured.

The choice of selecting a yeast or mixture of yeasts for fermenting sterilised wine must is a question of some difficulty, in view of the number of causes that may combine to modify the progress of fermentation, and it is highly desirable that experiments should be conducted with several yeasts in each separate wine district. In any event, the yeast must be added in sufficient quantity and in vigorous condition; and for this purpose the selected yeast should first be grown in wine "foots," in order to stimulate it and prepare it for the main task.

In the author's experiments, a sample of Aramon (Bordeaux) must was sterilised, kept for eight months, and then divided into portions of 10—30 litres, fermented with Champagne, Chablis, Sauterne, and Rhine-wine yeasts respectively, bottled and stored for a year. The portions fermented with Chablis yeast were declared by experts to greatly resemble Chablis, and the Sauterne yeast gave a very agreeable wine, the yeast appearing to suit southern must. Part of the bouquet produced is therefore certainly due to the yeast, whilst another portion may be ascribed to the essential oils, perhaps to glucosides or substances of a still less definite character, more or less completely transformed by the yeast; finally another portion is derived from the ethers and aldehydic products resulting from the gradual oxidation of certain principles. The part due to the ethers increases in a very gradual manner and is a function of time. These experiments establish the fact that certain yeasts possess the property of developing bouquet in a greater degree than others, more especially in certain kinds of must. —C. S.

Amyl Alcohol of Fermentation. A. Kailan. Monatsh. f. Chem., 1903, **24**, [7], 533—567.

THE author has examined several samples of fusel oil, including commercial amyl alcohol free from pyridine, and amyl alcohols from molasses spirit, corn spirit, and potato spirit, in order to test the accuracy of a statement by Bemont (this Journal, 1902, 182) that fusel oil consists mainly of methylethylcarbincarbinol, which, on account of its low optical rotation, must be present as a mixture of the dextro and lævo modifications. After determining the physical characters of the different samples, the author converted them into the corresponding valeric acids, prepared the silver salts of the latter, and submitted the solutions of the silver salts to a series of fractional crystallisations. The solubility of silver isopropylacetate is about 0·2 per cent., whilst that of silver methylethylacetate is about 0·8—0·9 per cent. The results proved that Bemont's conclusions are quite wrong; the fusel oil from molasses spirit was found to contain about 50 per cent. of isopropylcarbincarbinol, all the other samples of fusel oil contained over 75 per cent. of this alcohol. The balance in each case was made up of *l*-methylethylcarbincarbinol, the dextro modification being absent. The proportions of the two constituents, calculated from the solubilities of the various fractions of the silver salts, confirmed the approximate validity of Marckwald's law that the proportion of active amyl alcohol (*l*-methylethylcarbincarbinol) in fusel oil may be calculated from the rotatory power.—J. F. B.

Concentration of Solutions [*Wines*] *by Freezing; Commercial Application of* ——, *and the Production of Cold by the Action of Concentrated Solutions on Ice.* G. Monti. Zeits. f. Elektrochem., 1903, **9**, [37], 765—766.

THE dilute solution, *e.g.*, wine, solutions containing glycerin, &c., is frozen in a vertical column at a temperature of $2t + 2$ (t being the melting point (always less than 0° C.) of the original solution); the lower part of the column is then isolated, and the ice in the upper part allowed to melt. It trickles through the ice in the lower part of the column, and washes out all the substances deposited between the crystals of pure ice, the pure concentrated solution is drawn off at the bottom, and pure ice remains behind. The dilute solution obtained towards the end of this process is used to trickle down a fresh column of frozen solution, at the bottom of which it emerges as pure concentrated solution. The dilute solution next obtained, is again used.

For each metric ton of water thus removed by freezing, 72 kilos. of coals are required, as against 120 kilos. of coal which would be required to evaporate the water. The process is worked *in vacuo*.

The concentration should not be carried too far, and only good wine used in the process. The oxygen liberated during the freezing, improves and matures the wine. The bouquet, colour, and alkaloids of the wine pass completely into the concentrated solution.—L. F. G.

Resinated Wine; Greek ——. A. K. Dambergis. Oesterr. Chem.-Zeit., **6**, 316; Chem. Centr., 1903, **2**, [8], 529.

GREEK resinated wine is prepared by adding "4—6 per cent." of the resin of the sea pine (*Pinus Halepensis*), with or without calcium sulphate, to the grape must. The amount of the resin originally present in the wine is small (0·005—0·015 per cent.), but the latter has a very agreeable, characteristic aroma. The resin yielded the following figures on analysis:—Colophony, 78·57 per cent.; oil of turpentine, 17·04 per cent.; loss at 100° C., 14·04 per cent.; ash, 0·14 per cent.; acid value, 149; saponification (hot) value, 155. The oil of turpentine obtained from it had the sp. gr. at 15° C., 0·8672; polarisation in 200 mm. tube (Wild), + 73·4°; b. pt., 155°—157° C.; iodine value, 357. Genuine white and red resinated wines, free from calcium sulphate, gave the following figures on analysis:—Sp. gr. at 15° C., 0·9935—0·9956; alcohol, 10·69—10·77 per cent. by weight; extract, 2·40—2·77; sugar, 0·133—0·210; glycerin, 1·143—0·981; resin, 0·005—0·004; colouring and tannic matters, 0·007—0·056; ash, 0·174—0·238; sulphuric anhydride, 0·011—0·012; phosphoric anhydride, 0·014—0·015; total acid, 0·535—0·538; volatile acid, 0·036—0·031; polarisation in a 200 mm. tube (Wild), + 0·08°.—A. S.

Lactic Acid, a Constituent of the Volatile Acids of Wine. A. Partheil and W. Hübner. XXIII., page 1106.

ENGLISH PATENT.

Brewers' Yeast; Process and Apparatus for Removing Bitterness from, Regenerating, and Imparting an Aroma to ——, *with the Object of Converting the same into Bakers' Yeast.* F. Wrede and H. Offersen. Eng. Pat. 20,365, Sept. 18, 1902. XVIII. A., page 1099.

Purifying, Sterilising, or Ageing Liquids; Apparatus for [*Electrically*] ——. R. C. Turner. Eng. Pat. 12,191, 1903. I., page 1077.

UNITED STATES PATENT.

Fining [*Isinglass*]. A. E. Berry, Assignor to A. Boake Roberts & Co., Ltd., Stratford. U.S. Pat. 738,151, Sept. 8, 1903.

SEE Eng. Pat. 18,874 of 1901; this Journal, 1902, 1343. —T. F. B.

French Patents.

Brewing; Process and Apparatus for ——. Soc. Fiévet Frères et Boone. Fr. Pat. 331,022, April 8, 1903.

HE apparatus consists of a horizontal cylindrical sacchari-ier or mash tun and two filtering vats. The saccharifier s a closed vessel, heated externally, containing two parallel otatory agitators, the bottom of the horizontal cylinder ieing formed in the shape of a double semicircle, so that he rotary agitators are equidistant from the lower walls of he vessel at all points. The filtering vessels are cylindrical n form, each is closed with a lid; they are provided vith perforated filtering bottoms, and contain each a ertical central shaft. The shaft inside the vessel takes the orm of a fork, between the arms of which is a sliding boss arrying stirrer arms fitted with rakes. By a special nechanism the rake-arms move up or down to any desired eight or depth, and can be rotated at will in either irection.—J. F. B.

istillery Vinasses, or Waste Waters from Sugar Factories; Preparation of a Dry Nitrogenous Product [Fertiliser] from ——. A. E. Vasseux. Fr. Pat. 330,423, March 20, 1903.

HE waste liquors from distilleries or sugar factories are vaporated to a density of 38°—40° B., and then absorbed y means of peat-moss, a proportion of the latter of about 0 per cent. of the weight of the vinasse being required. he mixture is then dried in stoves and reduced to powder. he product may be used as a fertiliser or subjected to dry istillation.—J. F. B.

ream of Tartar; Extraction of White Refined ——, from Marcs, before and after Distillation. G. Ciapetti. Fr. Pat. 330,951, April 6, 1903.

RAPE marcs are charged into a series of diffusion vessels rranged in battery, the alcohol is driven off by the lmission of steam, and the residue is then treated stematically with an aqueous solution of sulphurous acid nder pressure. The sulphurous acid reacts with the potas-um bitartrate to form tartaric acid and potassium bisul-ite, both of which are readily soluble; at the same time e solution is decolorised. After the liquid has traversed e whole battery, it is filtered and heated to 80° C., at hich temperature sulphur dioxide is expelled, and white eam of tartar separates out on cooling. The process is qually applicable for the extraction of calcium tartrate om the marcs of "plastered" wines.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

English Patents.

Coffee; Production of Extract of ——, and Apparatus erefor. E. Shaw, London. Eng. Pat. 16,590, July 25, 1902.

REEN or roasted coffee berries are digested for about minutes at a temperature of about 370° F. with water, the proportion of 100 parts of berries to 150 parts of ter, with the addition of a little salt and burnt sugar; e mass is cooled in a closed vessel to below 70° F.; the rries are separated, and again boiled at a somewhat lower mperature for half an hour with twice their original eight of water. The second extract is separated from e berries, concentrated and mixed with the first extract. e digestion chamber is charged and emptied by means rotary plugs containing pockets. The extracted berries y be crushed and subjected to pressure in order to obtain e whole of the liquid absorbed by them.—J. F. B.

ewers' Yeast; Process and Apparatus for Removing Bitterness from, Regenerating and Imparting an Aroma to ——, with the Object of Converting the same into Bakers' Yeast. F. Wrede, Flensburg, and H. Offersen, Altona, Germany. Eng. Pat. 20,365, Sept. 18, 1902.

EWERS' yeast is washed and strained and then agitated a special vessel by means of a current of air impregnated with alkali, *e.g.* ammonia. The insoluble impurities rise to the top and are run off together with the liquid and light yeast after the bulk of the yeast has settled. The settled yeast is acidified and separated from the liquid. It is then subjected to a process of regeneration by fermentation in a fostering liquid consisting of an acidified saccharine wort prepared from glucose, molasses or malt-sprouts, which imparts to the yeast an agreeable aroma.—J. F. B.

French Patents.

Preservation of Organic Substances; Process and Apparatus for the ——. Tariebos Syndicate, Ltd. Fr. Pat. 330,478, March 21, 1903.

This invention is based upon the principle that by enveloping organic substances with gases similar to those which are produced by their decomposition, the process of corruption is arrested. In practice, the substances are placed in a closed chamber, the air in which is displaced by a suitable dried gas or mixture of gas and vapour. This gas is then caused to circulate, by the action of a pump, which withdraws it from the chamber, passes it through a dessicator, then through a heater or cooler which maintains the temperature constant, and finally returns it to the chamber through a governor which maintains a constant pressure. Thus to preserve fruits and vegetables, an atmosphere of carbon dioxide containing 0·2 per cent. of alcohol vapour at a temperature of 13° C. and a pressure of 25 mm. of water has been found most suitable; whilst for meat the temperature should be 4° to 5° C., with the same pressure, and the velocity should be sufficient to circulate the atmosphere of the chamber once every hour.—L. A.

Cacao Paste; Process and Apparatus for the Manufacture of ——, with Cacao Beans containing Fat. F. E. F. Neumann. Fr. Pat. 330,616, March 26, 1903.

The cacao beans and the pulp produced from them are caused to pass in a heated condition between pairs of rollers with rugose surfaces fixed one above another, and the paste is preferably conveyed from the lower set of rollers by another roller rotating in an opposite direction.—L. A.

Liquids or Solids [Milk]; Process for Obtaining ——, in a Dry, Porous State, so as to be Readily, Rapidly, and Completely Soluble. Cte. Maggi. Fr. Pat. 330,691, March 28, 1903. I., page 1078.

Margarine; Preparation of ——. Holländische Margarine-Werke, Jurgens, und Prinzen Ges. m. beschr. H. Fr. Pat. 330,904, April 4, 1903.

See Eng. Pat. 8099 of 1903; this Journal, 1903, 815.
—T. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Sulphur in Lighting Gas; Relation of ——, to Air Vitiation. J. S. Haldane. J. Gas Lighting, 1903, **83**, [2103], 564.

The results of the author's experiments lead him to the conclusion that the unpleasantness of air vitiated by the products of combustion of lighting gas is due to the presence of sulphur in the gas, and varies in proportion to the amount of sulphur. Gas which is purified from carbon bisulphide is stated to be greatly superior, from the hygienic standpoint, to gas which is only purified from sulphuretted hydrogen.—A. S.

Sewage; Distribution of ——, on Bacteria Beds. J. C. Thresh and M. Priest. Engineering, Aug. 21, 1903, 267.

The authors conclude from the results of a large number of observations, that the effluents from beds on which the sewage is distributed at regular and very frequent intervals by various forms of sprinklers or sprays, are of a much higher degree of purity and contain more dissolved oxygen than effluents from contact beds. The results obtained in three typical cases are shown in the following table. No. 1 is a septic tank and single contact bed installation. No 2 is an installation including a detritus tank or open septic tank and primary and secondary beds. No. 3 is an installation on the sprinkler system.

Impurities removed.	No. 1.	No. 2.	No. 3.
	Per Cent.	Per Cent.	Per Cent.
Suspended matter..........	85·0	95·5	95·0
Free ammonia..............	72·0	76·0	99·5
Organic ammonia...........	72·5	93·0	93·0
Nitrification............	Slight	Marked	Practically complete.

—A. S.

Chlorine; New Method for the Determination of ——, in connection with the Purification of Effluents by Means of Chloride of Lime. R. Schultz. XXIII., page 1105.

(C.)—DISINFECTANTS.

French Patent.

Allyl Methylal-isothiocyanate; Preparation of ——. P. L. Piot. Fr. Pat. 330,988, April 7, 1903.

A current of formaldehyde (gas) is passed through a mixture of glycerin (1 kilo.) and allylisothiocyanate, $C_3H_5.S.C⋮N$ (5 grms.), heated to about 190° C., until the weight of the whole is 1400 grms. When cool the liquid is filtered, the product consisting of "methylal-isothiocyanate," $C_3H_5O.S.CH_2CN$.

The compound is used as an antiseptic.—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

English Patent.

Paper; Drying or Treating ——. H. H. Lake, London. From W. M. Barber, Somerville, Mass., U.S.A. Eng. Pat. 4055, Feb. 20, 1903.

Paper, tub-sized in the web, is first treated on both sides with currents of cool air at a temperature between 40° and 70° F. in order to set the size; it is then subjected to currents of hot dry air at from 80° to 130° F. in order to dry it. The apparatus used is similar to that described in Eng. Pat. 445 of 1902 (this Journal, 1902, 1193).—J. F. B.

United States Patent.

Plastic Composition [Acetyl Cellulose and Camphor]. A. Eichengrun and T. Becker, Assignors to the Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 738,533, Sept. 8, 1903.

See Eng. Pat. 26,075 of 1901; this Journal, 1902, 1467.
T. F. B.

French Patent.

Cellulose Compounds; Manufacture of Articles from ——. L. Lederer. Fr. Pat. 330,714, March 30, 1903.

Cellulose esters are shaped into threads, ribbons, films, tubes, &c by discharging thick solutions of them through suitably shaped orifices into liquids which dissolve out the solvent without dissolving the cellulose compounds. For instance, a solution of cellulose acetate in acetic acid or phenol is discharged into alcohol and the precipitated product is subsequently dried.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Acetylguaiacol; Nitration of ——. F. Reverdin and P. Crepieux. Bull. Soc. Chim., 1903, **29**, [16], 876—878.

The *toluene p-sulphonic ester* of *guaiacol*, when nitrated at the temperature of the water-bath, yields a mono-nitro-derivative, which is converted on saponification into the *mononitroguaiacol* melting at 105° C., to which Rube has assigned the constitution, $C_6H_3.OH.OCH_3.NO_2$ [1.2.4], the *acetyl* derivative of which melts at 101° C.

Acetylguaiacol when nitrated in the cold yields a *dinitroguaiacol*, m. pt. 122° C., the acetyl group being displaced. But when acetylguaiacol is nitrated at the temperature of the water bath, the acetyl group resists, and the *mononitroacetylguaiacol* melting at 101° C. is produced, yielding on saponification the *nitroguaiacol* melting at 105° C. The above nitrations were effected with a mixture of fuming nitric acid and glacial acetic acid.—J. F. B.

d-Pinene and Terpin Hydrate; Some Reactions of ——. A. Denaro and G. Scarlata. Gaz. chim. ital., **33**, [1], 393—401. Chem. Centr. 1903, **2**, [9], 571.

By adding *d*-pinene gradually to acetone or monochloro-acetone in presence of aluminium chloride, the mixture being cooled by means of ice, the authors obtained a colourless oil, b. pt., 290° C., of the composition, $C_{10}H_{16}O$. By acting with iodine upon *d*-pinene, and subsequently heating on the water-bath with sodium ethylate, the tetra-iodo derivative, $C_{10}H_{14}I_4$, first produced is converted into a tri-iodo-ethoxypinene, $C_{10}H_{14}I_3O.C_2H_6$.

For the preparation of terpinol, instead of the usual method with dilute sulphuric acid, the authors recommend treating 100 grms. of terpin hydrate with a solution of 20 grms. of zinc chloride in 10 grms. of water, and distilling the mixture with steam. By acting with hydriodic acid on terpin hydrate and treating the mixture with caustic potash, terpenylic acid, $C_6H_6(OH)_2(COOH)(CH_3)$, m. pt. 89° C., is apparently produced. By the action of monochloroacetone on terpin hydrate, terpinol, b. pt. 168° C., and cajeputol, $C_{10}H_{18}O$, b. pt. 174° C., are formed.—A. S.

Nerol. H. v. Soden and W. Treff. Chem.-Zeit., 1903, **27**, [74], 897.

Nerol, $C_{10}H_{18}O$, is a colourless, optically inactive oil, with an odour of roses, sp. gr. at 15° C. is 0·8813. It boils at 226°—227° C. (755 mm.) and at 125° C. (25 mm.). Nerol combines with 4 atoms of bromine.

Nerytdiphenylurethane. $(C_6H_5)_2N.COOC_{10}H_{17}$, crystallises from alcohol in colourless glistening needles of m. pt. 52°—53° C.—L. F. G.

Acacia Flowers; Essential Oil of ——. H. Walbaum. J. prakt. Chem., 1903, **68**, [5—6], 235—250.

The flowers of certain trees of the acacia species yield perfumes known by the name of "*Cassie.*" The products appear in commerce in the form of pomades, prepared by the process of maceration with fats, and of solid extracts obtained by means of volatile solvents. "Cassie Romaine" is obtained from the flowers of *Acacia Cavenia*, whilst true cassie is extracted from those of *Acacia Farnesiana*. The essential oil may be isolated from the plant waxes and paraffins of the commercial extracts by distillation with steam and extraction of the distillate by means of ether, after saturation with salt. By treatment with dilute alkali, the crude oil may be separated into three portions—phenols non-phenols, and salicylic acid. The last is doubtless mainly produced by the saponifying action of the alkali upon methyl salicylate, which is widely distributed in this class of plants.

Cassie Romaine.—Examination of the oil distilled from the solid extracts of *Acacia Cavenia* revealed the presence of the following constituents: Eugenol, 40—50 per cent.; *methyl salicylate*, 8 per cent.; non-phenols, 52—42 per cent. From the last-named bodies were isolated and characterised benzyl alcohol (about 20 per cent.); benzaldehyde, geraniol, anisic aldehyde, and the methylic ester of eugenol, whilst linalool, decyl aldehyde, and a violet ketone (ionone) were probably also present; methyl anthranilate was absent.

Oil of Acacia Farnesiana differed principally from the above oil in containing no eugenol; the other constituents, so far as they have been studied, appear to be similar.
—J. F. B.

Formaldehyde; Determination of ——, in Solution. G. Lemme. XXIII., page 1107.

Turpentine Oil of the Landes; Examination of the ——. M. Vèzes. XXIII., page 1106.

Colocynth Pulp; Determination of Oil in —— E. Dowzard. XXIII., page 1107.

United States Patents.

Vaccine, and Process of Preparing Same. La Fayette R. Parsons, Detroit. U.S. Pat. 737,656, Sept. 1, 1903.

The vaccine material from animals inoculated with small-)ox vaccine is mixed with trichlorotertiary butyl alcohol)r its solutions, and the mixture allowed to stand for not ess than four hours.—T. F. B.

Perfumes and Disinfectants; Process of Making ——. J. Bardin, Brussels. U.S. Pat. 738,274, Sept. 8, 1903.

See Fr. Pat. 326,243 of 1902; this Journal, 1903, 816. —T. F. B.

French Patents.

Pinene Hydrochloride; Production of Pure ——. Chem. Fabr. Uerdingen Lienau and Co. Fr. Pat. 328,009, June 27, 1902.

'he impurities of crude pinene hydrochloride are saponified y treatment, at 80°—100° C., with water or dilute solutions f acids or alkalis, of such strength as not to sensibly ecompose the pinene hydrochloride itself. The fatty npurities are then resinified, for instance, by treatment, at 0°—100° C., with a solution of sulphuric acid of sp. gr. 1·5. he product is finally purified by sublimation, under reduced ressure, at a temperature not exceeding 100° C.—T. F. B.

Solutions of Substances Soluble with Difficulty; Rapid Preparation of Dilute ——. Soc. Kopp and Joseph. Fr. Pat. 330,564, March 24, 1903.

'he substances, such as tar, naphthol, ichthyol, menthol, thereal oils, &c., are dissolved in a suitable solvent, and ome neutral salt, such as calcium chloride, added to icrease the density of the solution. This solution is then oured into the requisite large quantity of water, in which sinks, and diffuses in all directions, producing a clear olution without any stirring. If the solvent used is an cid, such as acetic, some sodium carbonate is dissolved in ie water, and the solution which is poured in while diffusing, berates carbon dioxide gas, which effectually stirs the quid.—L. F. G.

Encaustic; Antiseptic ——, called "L'Alsacienne," containing Formaldehyde. H. Bauer. Fr. Pat. 330,747, March 31, 1903.

'he claim is for the use of formaldehyde in encaustics of ll kinds. 1 kilo. of the wax is mixed with about 10 grms. f formaldehyde, preferably dissolved in a little alcohol. —T. F. B.

Osmose with Alcohol; Apparatus and Process for ——, to be used for the Purification of Alkaloids, Glucosides, Wood Extracts, Colours, Glycerin, and other Substances, readily Soluble in Alcohol. E. A. Barbet. Fr. Pat. 330,939, April 1, 1903.

he osmose apparatus is constructed of iron frames, placed orizontally, and paper is fixed between, upon iron wires, retched across the frames. The upper frame is closed by n iron cover, which screws down and tightens up the joints etween all the frames. To stretch fresh paper, the cover is nscrewed, and simultaneously lifted from the top frame, lowing sufficient room for the necessary manipulations. lass gauge pipes are provided so that the movements of ie liquids can be watched, and the feed and exit pipes are arranged as to enable the direction of flow of the liquids be reversed, if so desired.

The process can be used for the extraction of narcotic kaloids, cinchona alkaloids, theïne, caffeïne, theobromine, c., from plants; of tannin, gallic acid, and various glucodes, from tanning woods; of perfume from fats; and for e extraction of dye-woods, &c. It can also be used to tract small quantities of substances which are soluble in cohol, from coal- or wood-tar, which formerly could only effected by distillation. To carry out the process, the ants are treated with warm water or steam, and the mplex solution thus obtained is treated in the osmose paratus with alcohol. On evaporating the alcohol, the re substances are obtained—L. F. G.

Cream of Tartar; Extraction of White, Refined ——, from Marcs, before and after Distillation. G. Ciapetti. Fr. Pat. 330,951, April 6, 1903. XVII., page 1099.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Yellow Dyestuffs; Absorbing and Sensitising Power of some ——, in the Extreme Violet and Ultra-Violet. E. Valenta. Phot. Korr., 1903, **40**, 483; Chem.-Zeit., 1903, **27**, [73], Rep. 236.

By means of a Rowland's concave grating the absorptions and sensitising actions of titan yellow, thiazole yellow, nitrophenine, acridine yellow, cotton yellow, canary yellow, and nitrosodimethylaniline have been investigated. The sensitising action of the first three of these dyestuffs must be regarded as relatively slight. Acridine yellow, cotton yellow, and canary yellow possess sharp absorption bands in the blue-violet and ultra-violet parts of the spectrum; canary yellow and cotton yellow have, in the violet and ultra-violet regions, a sensitising action on dry plates. An aqueous solution of nitrosodimethylaniline (1:7500) in a layer 10 mm. thick exerts a powerful absorption on rays from $\lambda = 496$ to $\lambda = 386$ $\mu\mu$, and allows to pass through all rays from $\lambda = 386$ to the extreme ultra-violet. A similar behaviour is exhibited by triaminoazobenzene, $NH_2.C_6H_4.N:N.C_6H_3(NH_2)_2$, a solution of which absorbs green, blue-green, blue, and violet light, but allows to pass through all other rays down to $\lambda = 320$ $\mu\mu$, and, if the illumination be continued, all down to the ultra-violet. A layer, 10 mm. thick, of a solution of Acid Yellow, of the strength 1:10,000, is transparent to green and blue down to $\lambda = 466$ $\mu\mu$, and absorbs from there onwards to a band in the ultra-violet; the maximum transparency in the ultra-violet is at $\lambda = 330$ $\mu\mu$.—T. H. P.

Silver Bromide Gelatin; Diminution of the Sensitiveness of ——, by Hydrogen Peroxide, and the Recovery of the Sensitiveness. Lüppo-Cramer. Phot. Korr., 1903, **40**, 491; Chem.-Zeit., 1903, **27**, [73], Rep. 236.

If 3 per cent. hydrogen peroxide solution be allowed to act for 20 hours on an unexposed dry plate, the opalescent deposit at first formed disappears again, as also does the original (chemical) deposit of the emulsion. In this way a diminution in the sensitiveness takes place, and this varies in degree with the nature of the plate. It might be supposed that this change is due to the destruction of the silver-germ, but that this is not the case is shown, firstly, by the fact that apparently absolutely clear (nucleus-free) silver chloride plates undergo diminution in sensitiveness, and, secondly, by a further considerable decrease produced by further treatment with hydrogen peroxide of plates in which the original deposit has been already destroyed. Attempts were made to re-inoculate such plates with the silver nucleus by treatment with 1 per cent. silver nitrate solution, so as to restore them to their hypothetical sensitiveness. Plates treated in this way showed, however, no increase in sensitiveness, although a deposit was formed in them the intensity of which corresponded with their degree of sensitiveness.

In the experiments here described, the grain of the silver bromide remained apparently unaltered in size, and hence in its power of absorbing light. The diminution in sensitiveness cannot be well explained merely by the loss of the reduction-nuclei, since, in the attempts at restoration, new nuclei were not formed. The author is of opinion that in the maturing of silver bromide, special modifications must be formed, for the better comprehension of which data are as yet lacking.—T. H. P.

Organic Developers; Influence of Alkalis on the Rate of Developing of ——. M. Gurewitsch. J. russ. phys.-chem. Ges., **35**, 498–513; Chem. Centr., 1903, **2**, [8], 490.

Organic developers are generally used in admixture with sodium sulphite and an alkali. Pyrocatechin (catechol) and adurol, however, act with equal rapidity in the absence of sodium sulphite, and the author made use of this fact in order to determine the influence of alkalis on the rate of development. From the results of his experiments he concludes that the maximum rate of development is attained when the amount of alkali required for the formation of phenolates,—*i.e.*, the substitution of metal in the hydroxyl groups—is present. Amines which are soluble in water act in a similar manner to the alkalis. Caustic soda acts as a stronger base than caustic potash, but potassium carbonate is stronger than sodium carbonate Trisodium phosphate is a weak base; the amines are strong ones. With an equal concentration of alkali, ortho compounds develop more rapidly than para compounds; a carboxyl or sulphonic group diminishes, whilst an amino group increases the rate of development. The effect of introducing a halogen varies according to the nature of the alkali present.—A. S.

Restraining and Developing Power: Relation between ——. Lüppo-Cramer. Atel. des Phot., 1903, **10**, 124; Chem.-Zeit., 1903, **27**, [73], Rep. 236.

A SYSTEMATIC series of experiments carried out by the author yielded the following results. With all developers which can be readily restrained, an increase of the rapidity by the addition of a larger proportion of alkali is accompanied by a diminution in its capability of being restrained. On comparing metol with quinol (hydroquinone) it was found that if the detail-producing power of the metol be strongly diminished, for instance, by omitting the alkali, the developer becomes readily restrainable, but if alkali be added so as to make the reducing power approximately equal to that of the quinol-soda, the metol developer is no longer affected by bromide. The capability of being restrained is hence partly a specific property of the developing substance. The author finds further that the supposed great susceptibility of ferrous oxalate and pyrogallol to the action of restraining agents is, in reality, less than that of catechol, which latter is much more readily amenable to the action of bromides than quinol or glycin.

—T. H. P.

Maturing; Theory of ——. Lüppo-Cramer. Phot Korr., 1903, **40**, 493; Chem.-Zeit., 1903, **27**, [73], Rep. 236.

IN order to test the accuracy of the view that the maturing process, in so far as it causes an increase in the sensitiveness, consists partly of an incipient reduction of the silver bromide nucleus, and that the nucleus produced by such reduction represents the latent deposit, the author has studied microscopically the blackening of exposed and unexposed dry plates. He finds that the blackening which conditions the deposit is not caused by the different sizes of the reduced granules, but that the deposit develops in the same time and with the same sized granules in both cases, although the exposed granules are much more sparingly distributed. It is hence confirmed that the chemical deposit is only an accident of the maturing process, with which its formation mostly proceeds simultaneously, but that it is not necessarily connected with, nor the cause of, the increased sensitiveness. The author not only confirms the observation that, during the ripening process, silver bromide passes partially into the crystalline form, but shows that, with many coarse-grained, highly-sensitised plates, the silver bromide is entirely crystalline. From his results the author concludes that the first action of light on the ripened silver bromide is not a chemical but a physical one, and consists perhaps of a breaking down or disgregation of the crystalline bromide, to which the amorphous form does not lend itself.—T. H. P.

ENGLISH PATENT.

Panchromatic Dry Plates for Photographic Purposes; Manufacture and Production of ——. A. Mieth and A. Traube, both of Charlottenburg, Berlin. Eng. Pat. 27,177, Dec. 9, 1902.

SEE U.S. Pat. 724,311 of 1903; this Journal, 1903, 572.

—T. F. B.

FRENCH PATENTS.

Agar-Agar; Strong Solutions of —— [*for Photographic Films, &c.*]. M. Maetschke. Fr. Pat. 330,595, March 25, 1903.

CLEAR, limpid solutions of agar-agar of 10 per cent. strength (instead of only 1 or 2 per cent.) are obtained by digesting it under pressure in water containing small quantities of organic acids (not more than 1·5 per cent. on the weight of dry agar). For example, dry agar-agar (60 grms.) previously soaked in water for 10—12 hours and then squeezed, citric acid (0·4—0·5 grm.), and water (up to 1,000 grms.) are digested in an autoclave heated on a water-bath for 30 minutes and then filtered through paper in a hot filter with or without increased pressure.

—R. L. J.

Photographs in Colour and Photo-Mechanical Prints; Process for Obtaining ——. A. A. Gurtner. Fr. Pat. April 6, 1902.

SEE U.S. Pat. 730,454 of 1903; this Journal, 1903, 820.

—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives; Standard Regulations for the Preparation of Lead Cylinders, and their Use for Drawn up the Relative Strength of ——. Drawn up by the Fifth Internat. Congress of Appl. Chem., Berlin. Chem.-Zeit., 1903, **27**, [74], 898.

THE apparatus to be used consists of a cylinder of lead (Fig. 1), 200 mm. in height and 200 mm. in diameter. In its axis is a bore-hole, 125 mm. deep and 25 mm. in diameter. The lead used must be pure and soft, and the cylinders used in a series of tests must be cast from the same melt. A suitable mould for casting is shown in Fig. 2. To warm the charging hole of the mould, a red-hot iron ring is put round it.

Process.—The lead cylinders must be allowed to cool till they have attained a uniform temperature of 15° to 20° C. throughout. 10 grms. of the explosive are formed into a cartridge 25 mm. in diameter (dimensions shown in illustrations), by wrapping in tinfoil, weighing 80 to 100 grms. per square metre. A detonator with a charge of 2 grms., to be fired electrically, is placed in the midst of the explosive.

The cartridge is placed in the bore-hole with the help of a wooden stick, and gently pressed against the bottom, the firing wires being kept in central position. The bore-hole is then filled with dry quartz sand, which must pass through a sieve of 144 meshes to the sq. cm., the wires being 0·35 mm. in diameter. The sand is filled in evenly any excess being levelled off. The charge thus prepared, is then fired electrically. The lead cylinder is then inverted and any residues removed with a brush. The number of c.c. of water required to fill the cavity in excess of the original volume of the bore-hole, is a measure of the strength of the explosive.

FIG. 1.

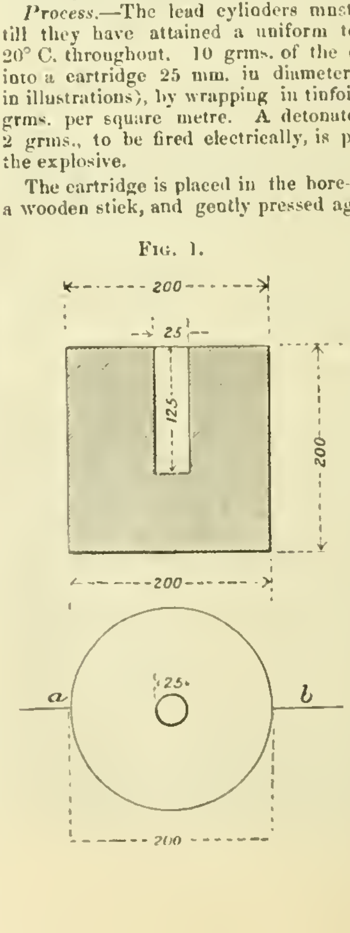
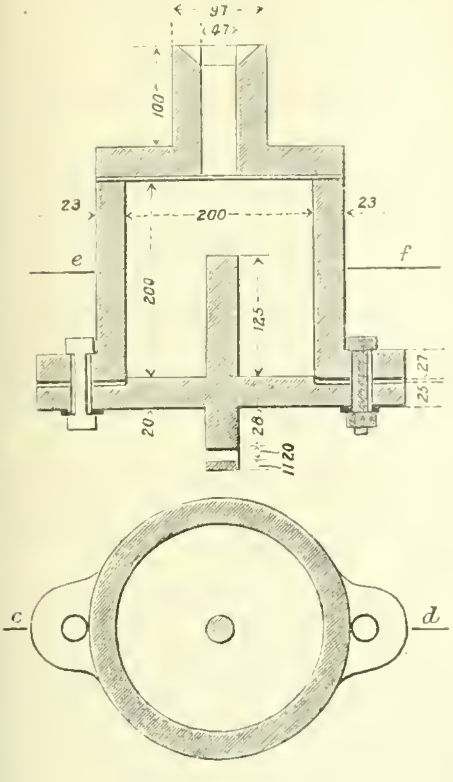


Fig. 2.



Results.—(1) The resnlts thus obtained are only comparable if made with the same class of high explosives. If here are great differences in the rates of the development f the pressure exerted by various explosives, the results re not comparable. (2) A result is to be the mean of at east three experiments. (3) The accuracy of the method lepends on (*a*) the uniform temperature of the lead ylinder, which should be 15°—20° C; (*b*) on the niformity of the quartz sand; (c) on the uniformity of he measurements.—L. F. G.

English Patents.

xplosives; Manufacture of ——. C. E. Bichel, Hamburg. Eng. Pat. 23,846, Oct. 31, 1902.

ee Fr. Pat. 325,507 of 1902; this Journal, 1903, 710.
—T. F. B.

riming Compositions for Percussion Caps and Detonators. J. Wetter, London. From Westfälisch-Anhaltische Sprengstoff-Akt.-Ges., Berlin. Eng. Pat. 24,633, Nov. 10, 1902.

ee Fr. Pat. 326,055 of 1902; this Journal, 1903, 760.
—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUALITATIVE.

hlorides, Bromides, and Iodides; Method for the Separation of ——. S. Benedict and J. F. Snell. J. Amer. Chem. Soc., 1903, **25**, [8], 809—814.

he separation depends on the fact that the whole of the odine and bromine may be expelled from a solution of he halogen salts, without appreciable loss of chlorine, by oiling with nitric acid of suitable strength (about 5 N).

The process is as follows:—A neutral N/10 solution f potassium iodate is added to the neutral solution, and he whole is acidified with acetic acid; coloration indicates he presence of an iodide, confirmed by means of carbon bisulphide. If an iodide be present, more iodate solution is added in small quantities (the solution being boiled between each addition) until no further coloration is produced. About one-half the volume of dilute nitric acid is now added to the solution. Coloration indicates the presence of bromide. The solution is boiled till colourless, 1 or 2 c.c. of N/5 potassium iodide solution are added, and the solution boiled again till colourless. This reduces the excess of iodate present, while the nitric acid destroys the iodide. Concentrated nitric acid is now added (to prevent precipitation of silver iodate), and then silver nitrate solution, when chlorides give a precipitate of silver chloride. If a thiocyanate be present, the iodide must be tested for, in a small portion of solution, in presence of sodium acetate. If other acid radicles be present, the halogens are precipitated as silver salts, which are reduced with zinc and sulphuric acid, and the solution neutralised, filtered, and treated as described above.

By this method the authors have detected chlorine in mixtures of 0·5 c.c. of N/100 sodium chloride solution with 20 c.c. of N/8 solutions of potassium bromide or iodide.
—T. F. B.

Tin; Note on the Effect of Combined Carbon in Iron on the Test for ——. R. B. Riggs and E. S. Merriam. J. Amer. Chem. Soc., 1903, **25**, [8], 876

Iron which contains considerable quantities of combined carbon should not be used to reduce tin compounds for the mercuric chloride test.

Blank tests showed that, when 0·2 per cent. of combined carbon was present, the solution of the iron in hydrochloric acid gave a perceptible cloudy appearance with mercuric chloride in a few seconds; this cloudiness was found to be essentially mercurous chloride, apparently formed by the hydrocarbons produced from the action of acid on the iron carbides.

It is stated that, if the iron gives more than a faint odour of hydrocarbons with acid, it will give a precipitate with mercuric chloride.—T. F. B.

Phosphoric Acid; Conditions of Reaction of ——, *with Ammonium Molybdate.* C. Reichard. Chem.-Zeit., 1903, **27**, [68], 833—835.

According to Seligsohn the yellow molybdic precipitate contains 30 times more molybdic acid than phosphorus pentoxide, and the amount of molybdic solution added for precipitation ought to contain at least that excess of molybdenum trioxide. According to the results of the author's experiments, however, an excess of at least 200 times of ammonium molybdate in a 4 per cent. solution must be used to detect with certainty phosphorus pentoxide in a solution of $\frac{1}{50}$ per cent. strength, after acidification with nitric acid. Hydrochloric acid has a strong restrictive influence. Thus on adding 1—2 c.c. of hydrochloric acid solution containing 0·025 grm. of acid to 1 c.c. of a sodium phosphate solution (containing 0·000186 grm. of phosphorus pentoxide) and 1 c.c. of a 4 per cent. solution of ammonium molybdate, no precipitate is formed, although this amount of acid will not completely dissolve the yellow precipitate when once formed in neutral liquids. When free hydrochloric acid is present, the reaction may still be obtained by first neutralising the liquid with either ammonia or caustic alkali, and then adding nitric acid.

By the addition of ammonium nitrate the molybdate reaction is rendered extremely sensitive, so that on adding 1 c.c. of a saturated solution of that salt to 1 c.c. of the phosphate solution and 1 c.c. of the 4 per cent. molybdate solution acidified with nitric acid, it is possible to detect a tenth of the amount of phosphorus pentoxide present even without heating.

Tartaric acid has a restrictive influence, and prevents the formation of any precipitate when added in the proportion of 0·1 grm. in 1 c.c. of water to the solutions of the strength given above. By neutralising the free tartaric acid with ammonia and then acidifying with nitric acid, the phosphoric acid is precipitated apparently quantitatively, but this is not the case after neutralisation with caustic alkalis. Moreover, the addition of 0·1—0·2 grm. of potassium sodium tartrate completely prevents the formation of the precipitate under the conditions described above.

In like manner citric acid in the proportion of 0·07 grm. or less absolutely prevents the precipitation of 0·000186 grm. of phosphorus pentoxide, even after warming the liquid and allowing it to stand for several days. Neutralisation with either ammonia or caustic alkali does not prevent this. Thus only when small quantities (0·02—0·05 grm.) of citric acid are neutralised with ammonia is even a faint yellow coloration obtained.

Oxalic acid and ammonium oxalate in the proportion of 0·1 grm. also completely prevent any precipitation under the conditions of the other experiments.—C. A. M.

INORGANIC—QUANTITATIVE.

Carbon Monoxide; Determination of ——. C. R. C. Tichborne. J. Gas Lighting, 1903, **83**, [2101], 431.

The author gives the following method for the preparation of the hydrochloric acid solution of cuprous chloride used in the determination of carbon monoxide, *e.g.*, in water-gas. 34 grms. of crystallised cuprous chloride, 50 grms. of water, 150 grms. of hydrochloric acid, and 25 grms. of copper foil in strips ¼ in. wide and 3 ins. long, are placed in an 8-oz. stoppered bottle, the stopper is tied down, and the bottle inverted and kept in a warm place. In about three days a colourless solution is obtained, which will remain unaltered for several months.—A. S.

Sulphuric Acid; Titration of ——, *with Benzidine Hydrochloride.* W. J. Müller and K. Dürkes. Zeits. anal. Chem., 1903, **42**, [8], 477—492.

A systematic series of experiments has been made by the authors to test the reliability of the method previously described (this Journal, 1903, 883, 925) under widely varying conditions.

Benzidine hydrochloride is hydrolysed in water, yielding an acid solution, but it does not dissolve completely, owing to the liberated benzidine base being only sparingly soluble. By the addition of hydrochloric acid the hydrolysis is checked and the salt kept in solution, but by adding sodium hydroxide to this solution the benzidine base is precipitated. On adding sulphuric acid to such an acid solution, benzidine sulphate is precipitated, and the filtrate has the same degree of acidity as before :—

$$C_{12}H_8(NH_2)_2.2HCl + H_2SO_4 =$$
$$C_{12}H_8(NH_2)_2.H_2SO_4 + 2HCl.$$

Similarly, on adding to the solution an alkali sulphate, an alkali chloride is left in solution, and the amount of combined sulphuric acid precipitated can be calculated from the residual acidity of the filtrate. Hence the method requires the presence of a neutral salt in the solution—a condition that can be ensured by neutralising the liquid with sodium hydroxide. It is thus possible to determine first the total acidity by titration, and then the sulphuric acid by precipitation with benzidine hydrochloride.

The following method of preparing this salt in a pure condition is described :—The benzidine base is dissolved in dilute hydrochloric acid, the solution filtered if required, and the hydrochloride precipitated by the addition of strong hydrochloric acid. The precipitate is purified by solution in dilute hydrochloric acid and reprecipitation with strong acid, the process being repeated several times. Finally, 25 grms. are dissolved in a litre of water with the aid of 30 c.c. of hydrochloric acid of sp. gr. 1·05, whilst for the precipitation of small quantities of sulphuric acid, a solution containing about 7 grms. per litre is employed. The maximum solubility of the hydrochloride is 30 grms. per litre.

In the test determinations known quantities of sulphuric acid were exactly neutralised with sodium hydroxide solution (with phenolphthaleïn as indicator), thus yielding standard solutions of sodium sulphate. These were heated to the boiling point, treated with a definite excess of the standard benzidine hydrochloride solution, again brought to the boiling point, and then left to cool. It was found that by making the precipitation from a hot solution the amount of benzidine hydrochloride mechanically carried down was reduced to a minimum. When cold, the solutions were diluted to a definite volume (*e.g.*, 250 c.c.), shaken, and filtered. The first portion of the filtrate was rejected and an aliquot part of the remainder (*e.g.*, 200 c.c.) titrated back with standard sodium hydroxide solution.

Any considerable excess of the reagent employed, should be avoided.—C. A. M.

Sulphuric Acid in Presence of Zinc; Determination o ——. A. Thiel. Zeits. anorg. Chem., **36**, 84—87 Chem. Centr., 1903, **2**, [8], 523.

The author attributes the error which occurs in the determination of sulphuric acid, when zinc ions are present in the solution, to the formation of complex combinations of sulphate ions and zinc ions. The following method is stated to give correct results. To the solution containing sulphuric acid and zinc, ammonia is gradually added till all the zinc is precipitated and the liquid just reddens phenolphthaleïn. The sulphuric acid is then precipitated with hot barium chloride solution, hydrochloric acid added till the solution reddens methyl orange, and the barium sulphate filtered off.—A. S.

Mercury and Hydrocyanic Acid; Volumetric Determination of ——. L. W. Andrews. Amer. Chem. J., 1903, **30**, [3], 187—193.

The method is based on the fact that hydrocyanic acid is neutral to certain indicators, such as methyl orange, *p*-nitrophenol, and even litmus. When treated with mercuric chloride, however, free hydrochloric acid is produced, according to the equation $HgCl_2 + 2HCN = Hg(CN)_2 + 2HCl$.

Determination of Hydrocyanic Acid and Cyanides.—The solution is diluted until it contains about 1 per cent. of hydrocyanic acid, and two drops of a saturated aqueous solution of *p*-nitrophenol are added. The solution is then exactly neutralised by the addition of decinormal hydrochloric acid or caustic potash until the yellow colour is just on the turning point. Excess of a 4 per cent. solution of mercuric choride (15—20 c.c.) also exactly neutral is then added and the mixture is allowed to remain for one hour; the hydrochloric acid liberated by the reaction is then titrated.

Determination of Mercury.—An approximately normal solution of hydrocyanic acid is prepared by dissolving 68—80 grms. of potassium cyanide in half a litre of water, with the addition of 5 grms of barium chloride to precipitate the carbonates. To the filtrate 10 c.c. of nitrophenol solution are added, the solution is exactly neutralised by means of acid, and made up to 1 litre. The mercury to be determined must be in the form of mercuric chloride; if it be in the form of nitrate an excess of sodium chloride must be added; organic acids must be absent. The solution is made exactly neutral to nitrophenol and then mixed with an excess of the neutral hydrocyanic acid solution, the liberated hydrochloric acid being titrated after one hour.
—J. F. B.

Manganese in Presence of Iron; Determination of —— G. v. Knorre. Zeits. angew. Chem., 1903, **16**, [38], 905—911. (See also this Journal, 1902, 72.)

A quantity of pure manganese salt containing about 0·12 grm. of manganese is boiled for six minutes with 50 c.c. of a solution of persulphate containing about 60 grms. per litre, and the precipitate filtered and washed. This precipitate is dissolved in a known volume of ferrous sulphate solution of known titre, and the amount oxidised determined by titrating the excess with permanganate. The results agree with those obtained by igniting the precipitate and weighing the manganese protosesquioxide produced, so that the precipitate is composed of manganese dioxide. This is not the case, however, if the precipitation be carried out in alkaline solution.

In presence of iron, certain precautions are necessary. The solution should be effected, preferably, with sulphuric acid. In presence of small amounts of manganese (0·5—1·0 per cent.), the degree of acidity is important, too little acid causing the precipitation of basic ferric salts, difficult of filtration, whilst too much hinders the precipitation of the manganese. To 250—350 c.c. of liquid should be added about 20 c.c. of sulphuric acid of sp. gr. 1·18; or, the solution should be as nearly as possible neutralised, ccess of persulphate (3—4 grms. per grm. of iron) lded, the liquid made up to about 300 c.c., the requisite iantity of acid added, and the solution boiled. With nall quantities of manganese the boiling should be con- ued for 20 minutes. In the analyses shown (nickel steel ntaining 0·45 per cent. of manganese, and commercial rrous sulphate containing 0·017 per cent.), the true co- ficient for conversion of iron into manganese, 0·491, was ed; but in some cases the results are too low, and the efficient 0·5008, obtained by comparison with a pure anganese salt (see former paper, *loc. cit.*) must be used.

With manganese alone in solution, the precipitate can be ssolved in the liquid, without filtration, in excess of drogen peroxide, and the excess of peroxide titrated by rmanganate. In presence of iron, zinc, cadmium, nickel, copper, however, the results by this method were always too high. The author now finds, however, that accurate sults are obtainable if the boiling be long continued, so as ensure complete decomposition of the excess of persul- ate. The following points must be attended to:—1. The id solution must be boiled for at least 15—20 minutes ter adding persulphate. 2. The liquid must be thoroughly oled before adding the hydrogen peroxide. 3. Not too eat an excess of hydrogen peroxide should be used. The titration with permanganate should be carried out mediately after the solution of the precitate in the roxide is complete.—J. T. D.

etals; Titration of ——, by Means of Iodic Acid.

. Rupp. Arch. der Pharm., 1903, **241**, [6], 435—444.

oic acid gives insoluble precipitates with the salts of tain of the heavy metals, and these precipitates, which of a crystalline nature and can be readily filtered, may employed for the indirect determination of the metals. e precipitating reagent consists of a 2 per cent solution potassium iodate, purified by repeated filtration from the ces of barium iodate always present in the commercial t. The value of the reagent is determined by mixing c. of the solution in a glass-stoppered Erlenmeyer flask h 1—2 grms. of potassium iodide and 10 c.c. of dilute phuric acid, in presence of about 50 c.c. of water. After nding for about five minutes, the iodine liberated is ated with N/10 thiosulphate solution. For the determina- n of the metals an excess of the iodate solution is added the solution of metallic salt in the presence of acid, the xture is allowed to remain for a sufficient length of time, n made up to a known volume, filtered, and the excess iodate is titrated in an aliquot part of the filtrate. In case of barium and lead, precipitation must be effected presence of acetic acid, and any mineral acid should be moved by the addition of sodium acetate. Mercuric, rcurous, and silver salts should be precipitated in sence of nitric acid. Conversely the method may be plied for the determination of iodates by precipitation h standardised silver nitrate solution and titration with 10 thiocyanate solution.—J. F. B.

Ozone in Technical Work; Determination of ——.

Brunck. Zeits. angew. Chem., 1903, **16**, [37], 894—897.

e only method available for technical work is the titra- n of the iodine set free by ozone from potassium iodide. e author found some time ago (this Journal, 1900, 776 l 1146) that much more iodine was liberated by the e amount of ozone from an acidified than from a tral solution of iodide; he had, however, no means of ertaining which was the correct amount, and assumed t the acidified solution would be the more likely, as ng free from complications arising through the liberation alkali. More recently, Ladenburg and Quasig have ised a method for determining ozone, by comparing weight of a given volume of ozonised air or oxygen h that of an equal volume of air or oxygen containing ozone (this Journal, 1901, 749). This method, though too elaborate for technical work, affords a means of ecking the iodine method; and Ladenburg and Quasig, ose results the author has confirmed, have found that y when ozonised air is led into a neutral solution of assium iodide is the theoretical amount of iodine liberated a an acid solution the amount is about 50 per cent. excess.

In carrying out the determination, the author uses a conical flask of about 600 c.c. capacity, the hollow stopper of which is furnished with a funnel holding about 25 c.c. and roughly graduated, and an entry-tube for the gas; both of these are provided with stop-cocks, and both reach nearly to the bottom of the flask. A hole in the hollow stopper can be brought by rotation opposite to a short tube sealed on the neck of the flask, thus giving an exit-tube which can be opened or closed at will. All the ground portions must fit tight without any lubricant; or if lubricant be required, strong sulphuric acid must be used. The capacity of the flask having been determined once for all, the apparatus is connected (without the use of rubber or other organic substance) with the source of gas, and the gas driven or aspirated through till the air is completely displaced. The funnel is filled to a mark with N/5 potassium iodide solution, the stop-cock opened, and the stopper rotated so as to allow the iodide solution to enter the flask (the volume of gas thus displaced is of course allowed for in the calculations). After shaking, the funnel and tubes are rinsed into the flask, N/10 sulphuric acid equivalent in amount to the potassium iodide solution is added, and the liberated iodine is titrated with N/100 sodium thiosulphate solution, using starch as indicator. A stronger thiosulphate solution should not be used; if the ozone content be very high, the whole should be rinsed into a measuring flask, diluted to the mark, and an aliquot portion used for titration. The author has shown that time is without influence on the end-result of the action between ozone and potassium iodide; identical results were obtained whether the iodide was added to the gas in the way just described, or whether the flask-full of gas was slowly bubbled through potassium iodide solution in Drechsel flasks.

With an acidified solution of potassium iodide the amount of iodine liberated depends on and increases with the concentration of the iodide solution, as Brodie long since showed; but with any given concentration, identical results, proportional to the amount of ozone present, are obtained in successive titrations, and no hydrogen peroxide is formed (for the blue colour does not slowly return after decolorising with thiosulphate). Thus Ladenburg's suggested explanation of the reaction ($4O_3 + 10HI + H_2O = 5I_2 + H_2O_2 + 5H_2O + 3O_2$) cannot be correct, nor can it be a case of catalytic action. The author suggests that at the moment of decomposition of the ozone molecule ($O_3 = O + O_2$) the O_2 formed, in a kind of "nascent condition," is more active than afterwards, and is capable of reacting on the potassium iodide.—J. T. D.

Chlorine; Modified Method for the Determination of ——, in connection with the Purification of Effluents by means of Chloride of Lime.

R. Schultz. Zeits. angew. Chem., 1903, **26**, [35], 833—840.

In the purification of waste waters by means of chloride of lime, the process is usually followed by means of bacteriological tests. Since, however, a bacteriological test occupies at least 48 hours, the author sought to replace such tests by a chemical method, based on the fact that if the water contain a certain proportion of active chlorine, it may be regarded as free from disease germs. The following modification of Wagner's method for the determination of available chlorine in hypochlorites was found to give good results:—100 c.c. of the water, after purification by means of chloride of lime, are treated with 5 c.c. of 5 per cent. potassium iodide solution and 2 c.c. of acetic acid of sp. gr. 1·064, and titrated first with a solution of sodium thiosulphate of which 1 c.c. = 0·0005 grm. of chlorine, till the solution has only a faint yellow colour, and then, after the addition of 1 c.c. of a 1 per cent. solution of soluble starch, with a solution of thiosulphate, of which 1 c.c. = 0·0001 grm. of chlorine, till the blue colour disappears. This modification gives lower but more correct results than Wagner's original method, in which hydrochloric acid is used instead of acetic acid, as in the latter process impurities contained both in the water and in the chloride of lime interfere.—A. S.

Portland Cement and Blast Furnace Slag. H. Seger and E. Cramer. IX., page 1087.

ORGANIC—QUANTITATIVE.

Carbide and Acetylene; Sampling and Analysis of ——. H. Gall. Zeits. f. Electrochem., 1903, **9**, [37], 772—773.

The methods of analysis for carbide and acetylene were fixed by a commission at the Fourth International Congress of Applied Chemistry in Paris, in conformity with the recommendations of a commission constituted by the German Acetylene Society.

To determine sulphur in carbide the latter is decomposed with an excess of water; the sulphur remains in solution, and can be determined as barium sulphate. On an average one finds 6600 grams of sulphur per metric ton of commercial carbide.

To determine phosphorus in carbide, the latter is thrown into molten sodium nitrate at a red heat. The mass is then dissolved in water, treated with nitric acid, and the phosphoric acid determined by the molybdate method. The phosphorus contained in anthracite and in the electrodes used in the manufacture of carbide is determined by a similar method. Commercial carbide contains upwards of 648 grms. of phosphorus per ton. This phosphorus arises from the raw materials, of which the lime contained 390—260 grms. of phosphorus per ton, the electrodes 310 grms. per ton, and the anthracite 33 grms. per ton.—L. F. G.

Coal Tar and Oils; Testing of ——, *and an Improved Still.* H. W. Jayne. J. Amer. Chem. Soc., 1903, **25**, [8], 814—818.

The author recommends the use of a beaker-shaped, copper experimental still, with a heavy rim round the top, to which a brass lid is clamped. The condenser consists of a glass tube immersed in an open copper trough, which can be heated when necessary. The tar is heated by a ring burner, which surrounds the still, and which is adjusted so that the flame strikes about the top of the contents of the still; this is said to prevent foaming. If the contents of the still continue to boil over, the author prefers, when making water determinations, to dilute the tar with a liquid having a boiling point slightly higher than that of water (*e.g.*, toluene).—T. F. B.

Cancelling Inks and other Stamping Inks; Methods for the Valuation of ——. E. E. Ewell. U.S. Dept. of Agric., Bureau of Chemistry, Circular No. 12, 1903.

The methods employed for the investigation of (*a*) inks made with an oil base; (*b*) rubber-stamp inks; and (*c*) cancelling and other stamping inks, are described. Minute details are given relating to (1) the preparation and care of the sample; (2) the determination of matter volatile at ordinary temperatures; (3) the determination of relative penetrating power; (4) the sedimentation test; (5) the determination of lampblack and other constituents; (6) the determination of ash; (7) the resistance of pigments and dyestuffs to light and reagents.—A. S.

Fat; New Method for the Determination of ——. C. Lehmann. Pflügers Arch., **97**, 419—420. Chem. Centr., 1903, **2**, [7], 468.

In order to obtain intimate contact between the solvent and the substance containing fat, the author performs the extraction in so-called small ball-mills, *i.e.*, flasks filled to from $\frac{3}{4}$ to $\frac{4}{5}$ of their capacity with porcelain balls of 12—15 mm. diameter.—A. S.

Fat; New Method for the Determination of ——. W. Völtz. Pflügers Arch., **97**, 606—633; Chem. Centr., 1903, **2**, [9], 603.

The author has made a series of experiments with the "ball-mill" method of Lehmann for the determination of fat (see preceding abstract). The results obtained by this method in the determination of fat in yeast, linseed-cake, bread, &c., agreed with those obtained by the Soxhlet and Dormeyer methods.—A. S.

Turpentine; Examination of Oil of ——. M. Vèzes. Bull. Soc. Chim., 1903, **29**, [16], 896—901.

Two hundred and fifty c.c. of the sample of oil of turpentine are submitted to fractional distillation, 4 fractions of 50 c.c. each being collected, and a residue o 50 c.c. being left in the flask. If it be assumed (as i practically the case) that none of the adulterants hav the same boiling point as the pure oil (152°—160 C.) the central fraction No. 3 may be regarded as pure tur pentine, Nos. 1 and 5 representing the concentrated ligh and heavy adulterants. The refractive indices of th three fractions Nos. 1, 3, and 5, are then observed at th same temperature, 25° C., and for the same ray of light The differences $n_3 - n_1 = \delta$ and $n_5 - n_3 = \Delta$ are the calculated.

Normal Adulterants.—Oil of turpentine may contai quantities of rosin oil and rosin (colophony) up to a certai limit, owing to the process of manufacture, without fraudu lent intent; it remains, therefore, only to determine th permissible limits of these impurities. Both rosin an rosin oil have the same effect upon the refractive indices neither of them distil over with the earlier fractions, and th value of δ therefore remains the same as for the pure oi On the other hand, the value of Δ increases with the pro portion of these impurities; experiments have shown tha the percentage of the normal adulterants, X, is expressed b the equation $\Delta = 0\cdot0032 + 0\cdot0037\ X$. The rosin is deter mined by titration in alcoholic solution with alcoholi potash, in presence of phenolphthalein: if A = mgrms. o caustic potash required by 1 c.c. of the oil, then C (th percentage of rosin) $= \frac{A}{1\cdot7}$ and R (the percentage of rosi oil) $= X - C$. For genuine oils of turpentine from th Landes, X should not exceed 2·5 per cent., correspondin with a value for Δ of 0·0125; the maximum value of should not exceed 1. Values above these are to be regarde as the result of adulteration.

Abnormal Adulterants.—The number of bodies whic can be economically used for the fraudulent adulteration o oil of turpentine is very small.

Petroleum oil does not affect the value n_3, but the value of both δ and Δ are affected, and the determination of th normal adulterants from the value of Δ is not possible i the presence of petroleum. The percentage of petroleum, P is found by the expression $\delta = 0\cdot0007 + 0\cdot0902\ P$.

White spirit or shale oil is extensively employed for th adulteration of turpentine; it contains a greater proportio of more volatile constituents than petroleum; its percentage W, is calculated from $\delta = 0\cdot0007 + 0\cdot0008\ W$.

Light petroleum spirit is still more volatile than th above; its percentage, E, is found by $\delta = 0\cdot0007 + 0\cdot0025\ E$.

Benzene appears almost entirely in the earlier fraction the refractive index of which is increased, δ having negative value The percentage of benzene, B, is found b the expression $\delta = 0\cdot0007 - 0\cdot0009\ B$.

Carbon bisulphide has a still greater effect than benzene the percentage, S, is expressed by $\delta = 0\cdot0007 - 0\cdot0046\ S$

All the abnormal adulterants affect the earlier fraction and the nature of the adulteration can generally be guesse by an examination of the first few drops of the distillat For a genuine oil the value of δ should lie between th limits of 0·000 and 0·001, and the sample should not begi to distil below a temperature of 150° C.—J. F. B.

Lactic Acid, a Constituent of the Volatile Acids of Win A. Partheil and W. Hübner. Arch. der Pharm., 190 **241**, [6], 421—435.

Lactic acid is a normal constituent of wine, from which may be separated, together with acetic and other acid by extraction with ether. Methods have been propose for the separation of the volatile acids from the ethere extract by distillation with steam, the lactic acid bein determined in the residue. But the authors prove th serious errors are involved in any such methods, owing t the fact that lactic acid is more or less volatile with stea In fact it is shown that lactic acid in concentrated solutio may be distilled quantitatively by means of superheate steam. The above observations led to the conclusio subsequently confirmed by direct experiments, that th distillate obtained in the determination of the volatile acidit of wine by the official methods, contains notable quantiti of lactic acid, and that the results obtained by titratio nust be too high. Consequently a method is required for he quantitative determination of lactic acid in presence of cetic acid. The method proposed by the authors is based n the fact that lactic acid is decomposed by concentrated ulphuric acid with evolution of carbon monoxide, according o the equation: $C_3H_6O_3 = CH_3COH + H_2O + CO$.

The mixture containing lactic acid is heated on the water-ath for half-an-hour with excess of baryta water, evapo-ated to a small bulk and then transferred to a small istillation flask. The liquid is evaporated to complete ryness under vacuum at a moderate temperature. After ooling, a stoppered funnel is fitted to the neck of the flask, hilst the distillation tube is connected with a gas burette ontaining caustic potash solution. A few c.c. of con-entrated sulphuric acid are introduced into the flask by eans of the funnel, and the levels are adjusted. The ontents of the flask are then heated carefully until the volution of gas ceases, and the gas is washed with caustic otash solution and measured; 1 c.c. of carbon monoxide 0° C. and 760 mm. corresponds to 0·00402 grm. of lactic cid.

Determinations of the lactic acid present in the distillate om the determination of the volatile acidity of wines by e official method, showed that the greater portion of the ctic acid was present in the anhydride form, and, there-re, without effect upon the direct titration; but it was und that these distillates still contained sufficient free etic acid to cause an error in the titrations equivalent to ore than 0·01 grm. of acetic acid per 100 c.c. of wine. —J. F. B.

Formaldehyde in Solutions; Determination of ——. G. Lemme. Chem.-Zeit., 1903, **27**, [74], 896.

hen formaldehyde acts on a neutral solution of sodium lphite, caustic soda and the bisulphite compound of rmaldehyde are formed. 100 c.c. of a solution of 250 grms. sodium sulphite ($Na_2SO_3 + 7H_2O$) in 750 grms. of water, e neutralised with a few drops of a solution of sodium ulphite, phenolphthaleïn being used as indicator. 5 c.c. the solution of formaldehyde to be examined, are then ded, producing a red coloration. The caustic soda med, is estimated by titrating with N/1-sulphuric acid, till solution is colourless. The final reaction is not well fined, two determinations may differ by from $\frac{1}{10}$ to $\frac{2}{10}$ c.c., t as 5 c.c. of a 40 per cent. solution of formaldehyde uire nearly 70 c.c. of N/1 acid, the error is inappreciable. ch c.c. of N/1 acid corresponds to 0·03 grm. of formalde-de.—L. F. G.

locynth Pulp; Determination of Oil in ——. E. Dowzard. Pharm. J., 1903, **71**, [3386], 400.

order to ensure the absence of seeds from colocynth p, the B.P. requirement is that the latter should only ld a trace of fixed oil to ether. The author points , however, that pure colocynth pulp, free from seeds, tains about 3 per cent. of matter soluble in ether, sisting mainly of colocynthin, the active principle of the p. The best solvent is petroleum ether (redistilled), ich readily dissolves the oil, but in which colocynthin nsoluble. In seven samples of colocynthin pulp, the ount of matter soluble in petroleum ether varied between 2 and 1·33 per cent. The author suggests that 2 per t. of oil might be the maximum amount allowed in ocynth pulp.—A. S.

XIV.—SCIENTIFIC & TECHNICAL NOTES.

idising Action of Certain Metallic Salts; Increase of e ——, *in the Presence of Basic Substances, especially egetable Bases.* E. Schaer. Arch. der Pharm., 1903, **41**, [6], 401—409.

 author communicates further details as to the "tivifying" influence of basic substances upon oxida-s by means of dilute solutions of cupric, mercuric, and er salts (see also this Journal, 1902, 1102). Amongst oxidation reactions studied were those of guaiacum n, pyrogallol, aloïn, indigo (on warming), and *p*-pheny-diamine. These bodies are either not oxidised at or only slowly by the salts of the above metals, but when certain organic or inorganic bases are added, oxidation takes place readily, generally in the cold. Certain alkaloids, such as atropine, codeïne, coniine, morphine, veratrine, and quinine possess this property strongly, but they do not all of them influence the salts of all three of the above metals. Morphine and strychnine were inactive towards mercuric acetate; caffeïne, antipyrine, acetanilide, and phenacetin had no influence in presence of cupric and mercuric salts, but "activified" solutions of silver salts; glucosides and certain indifferent nitrogenous organic substances were in all cases without influence. Other organic bases such as aniline, quinoline, &c., had a strong "activifying" influence. Inorganic bases, such as the alkaline earths and most salts with an alkaline reaction, also possessed this influence. —J. F. B.

Acetylene and Hydride of Alkali-Metal; Influence of Traces of Water on the Reaction between ——. H. Moissan. Comptes rend., 1903, **137**, [11], 463—466.

Absolutely dry acetylene has no action on potassium hydride below 42° C., at or above which temperature, however, vigorous reaction occurs. A mere trace of water is sufficient to bring about reaction at much lower temperatures. The author considers that the water merely starts the action locally, and that the heat of reaction, raising neighbouring portions of the hydride to 42° C., causes the reaction to spread. (Compare this Journal, 1903, 494 and 865.)—J. T. D.

Mercurous Sulphide. C. Baskerville. J. Amer. Chem. Soc., 1903, **25**, [8], 799.

After mercury (10 grms.) had remained in contact with pure sulphuric acid (50 grms., 99·65 per cent.), in a closed vessel, at the ordinary temperature, for over five years, a considerable quantity of sulphur dioxide resulted, and the mercury was covered with flakes of which about 0·2 grm. was separated, and, upon analysis, proved to be mercurous sulphide contaminated with a small quantity of sulphur. The dark brown substance obtained, turned white on heating, and subsequently melted to a dark orange-brown liquid, which changed to a white solid on cooling.—J. F. B.

Crystalline Solids; Surface Flow in ——, *under Mechanical Disturbance.* G. T. Beilby. Proc. Roy. Soc., 1903, **72**, [481], 218—225.

In a previous communication (this Journal, 1901, 992), the author has shown that the effect of mechanical treatment of metals by cutting tools or by polishing agents is to produce a surface layer or film, the structure and appearance of which are distinct from those of the undisturbed substance below. Further experiments have now been made with a piece of pure crystalline antimony, which was filed smooth with a very fine file, and then polished, first with the finest emery paper, and finally with washleather sprinkled with the finest rouge. Photographs taken at various stages showed that in the polishing with emery, the ridges and furrows left by the file were smoothed and rounded whilst the smaller pits were gradually losing their angularity and assuming a rounded form. The further polishing with rouge resulted in the metal spreading across the ridges left by the emery, like a viscous paste, sometimes filling the furrows and sometimes bridging them over; in some cases the lines of the furrows could be traced by a row of holes in the covering film. On removing the surface film by etching, the ridges and furrows left by the emery again became perceptible, showing that these had been covered over, not levelled down or removed. In experiments with a piece of Iceland spar, similar effects, caused by stroking, were observed even more distinctly.

The author states that in the experiments with the piece of antimony, apparently the file carries with it a certain proportion of metal, but also leaves behind in the furrows and on the ridges a smooth covering film, which has flowed at the moment when the moving point with its burden of accumulated metal passed over it. With the emery grains there is less ploughing action, and the proportion of metal which adheres to the polishing agent is much greater, and the flowing action is more pronounced; whilst in the polishing with rouge, the particles of the latter seem to have the power of seizing the surface so as to set the molecules gliding without actually removing much metal. In this latter stage the conditions of the liquid state are to a certain extent fulfilled, and the forms assumed by the surface are determined, as in a viscous liquid, by surface tension.

From the results of experiments with various metals, it appears probable that an accurate method of comparing the hardness and malleability of metals might be based on the behaviour of minute particles during their flow under uniform conditions of pressure.—A. S.

Thin Films of Metals; Effects of Heat and of Solvents on ——. G. T. Beilby. Proc. Roy. Soc., 1903, **72**, [481], 226—235.

Faraday, in 1857 (Phil. Trans., 1857, 145), showed that leaves and films of gold and silver supported on glass were changed by heating at a temperature much below the melting point of the metal, from moderate translucence to clear transparence and from high metallic reflecting power to comparative deadness. The author's experiments on surface films on metals in their more massive forms (this Journal, 1901, 992), and on translucent films supported on glass, show that both aggregation and film formation play a part in the production of transparency, when metal leaves and films are heated, but that an intrinsic transparence also exists, altogether apart from these phenomena. All mechanical disturbance of the surface by polishing or burnishing tends to diminish transparence and to increase the reflecting power. Further experiments have shown that at a temperature much below the melting point, sufficient freedom is conferred on the molecules of the surface film by the heating, to enable them to behave as the molecules of the liquid metal would do, and to arrange themselves, under the influence of surface tension, either in films or in drop-like or granular forms. Tests of the electric conductivity of films of gold and silver on glass or mica showed thet the general result of heating these films to temperatures above 300° C. was ultimately to increase their resistance from relatively small values (0·2 – 50 ohms) up to very high values, sometimes reaching thousands of megohms.

The author concludes from the results of his experiments that a freely-suspended aggregate of solid molecules will take the spherical form it its surface is sufficiently large compared with its mass, and that external crystalline form is only produced when the mass becomes large enough to permit the crystallic force to overpower surface tension. At the surface of a solid the crystallic force is apparently controlled and kept in check, sometimes actually overpowered, by surface tension, although in the body of the metal the equally balanced molecular attractions do not effectually oppose the crystallic. According to this view, the oily drops of calcium carbonate which appear as a first stage in the development of crystals, may be aggregates of solid molecules under the control of surface tension. Metals slowly deposited from solution and solids separated directly from the gaseous state, *e.g.*, lampblack or magnesium oxide, tend to aggregate in the granular form.
—A. S.

Benzene; Action of Nascent Acetylene on ——, *in presence of Aluminium Chloride.* E. Parone. L'Orosi, **25**, 148—153. Chem. Centr., 1903, **2**, [11], 662.

On the top of a column of water, 1 cm. high, 50 grms. of crystallised benzene (b. pt. 80°—81° C.) were added, then calcium carbide was carefully introduced so that it remained in contact with the benzene, and finally, after the appearance of the first bubbles of acetylene, anhydrous aluminium chloride was added. After several days, in the course of which the water, aluminium chloride, and calcium carbide were frequently renewed, the upper oily layer was washed several times with water, filtered, and fractionally distilled with lime. In the distillate, ethylbenzene, styrol, C_8H_8, dibenzyl, $C_{14}H_{14}$, and anthracene were detected, together with unaltered benzene.—A. S.

Lactose; Multirotation of ——. C. S. Hudson. Zeits. physik. Chem., **44**, 487—494. Chem. Centr., 1903, **2**, [9], 557.

The author considers that the most probable explanation of the multirotation of lactose is that a condition of equilibrium is gradually attained in the solution between the lactose hydrate, $C_{12}H_{24}O_{12}$, and the lactose lactone, $C_{12}H_{22}O_{11}$. Identical solutions are eventually obtained whether the hydrate or the lactone be employed. The author has calculated the value of the reaction-constant, K, *i.e.*, the ratio between the quantity of the lactone to that of the hydrate in equilibrium, and finds it to be 11·4 : 7·1. The value for the optical rotation of the lactone, corresponding with this constant, would be 34°, and values between 35° and 39° were experimentally found with freshly prepared solutions. The fact that the velocity constant for the increase of rotation of the lactone is equal to the velocity constants for the decrease of rotation of the hydrate, is also in accord with the author's theory.—A. S.

British Association for the Advancement of Science; Presidential Address. Southport, 1903.

In his address Sir Norman Lockyer discussed the influence of brain power on history, and stated that a relative decline in national wealth derived from industries must follow a relative neglect of scientific education; and that unless we obtain a more general attention to the objects of science, and a removal of any disadvantages of a public kind which impede its progress, we shall suffer in competition with other communities in which science is more generally utilised for the purposes of the national life. As a proof that it is not only our industrial classes, but also those employed in the State service, who are suffering from want of the scientific spirit, Sir N. Lockyer cited the report of the Royal Commission on the War in South Africa, and the account given by Mr. Ivan Levinstein in an address to the Society of Chemical Industry (this Journal, 1903, 846) of what drastic steps had to be taken by Chambers of Commerce, and a quarter of a million of working men to get the Patent Law Amendment Act into proper shape in spite of all the advisors and officials of the Board of Trade. The nation itself is a gigantic workshop, and the more our rulers and legislators, administrators, and executive officers possess the scientific spirit, the more the rule of thumb is replaced in the State service by scientific methods, the more able shall we be to compete successfully with other countries along all lines of national as well as of commercial activity.

Our industries are suffering because trade no longer follows the flag, but because trade follows the brains, and our manufacturers are too apt to be careless in securing them. What we need is an organisation of men of science, and all interested in science, similar to those which prove so effective in other branches of human activity. Further, to compete on equal grounds with other nations, we require more universities; better endowment of all existing ones; more professors, and better pay; and much lower fees for students. After discussing the cost of the new universities required, and describing what other nations have done in this respect, Sir Norman Lockyer pointed out the political importance of research, and concluded by advocating the formation of a national scientific council to aid the state in facing the new problems constantly arising.—A. S.

Address to the Chemical Section of the British Association, Southport, 1903. W. N. Hartley. Chem. News, 1903, **88**, [2286], 141—145; [2287], 151—157.

The address referred mainly to work connected with th emission and absorption of rays of measurable wave-length

Absorption Spectra.—Most of the results bearing upon the relation between the absorption spectra and chemical constitution of organic substances, have been obtained by means of observations extending into the ultra-violet region of the spectrum. Organic compounds may be divided by means of their absorption spectra into three main groups:—(1) substances constructed on an open chain of carbon atoms; (2) substances so constructed that the carbon atoms form a closed chain, either homocyclic or hetero-cyclic, *e.g.*, hydro-aromatic compounds, furfuran, thiophen &c.; (3) cyclic compounds constituted on the type o benzene, naphthalene, pyridine, &c. Isomerides of *o*-, *m*- or *p*-positions in aromatic substances yield spectra with th absorption bands differing in position, in width, and i intensity. Sterio-isomers give identical spectra. Th examination of the absorption spectra of tautomeric com

›ounds and their derivatives has shown that (1) it is mprobable that such compounds contain a "wandering" tom of hydrogen; (2) if, in solutions of tautomeric comounds, two substances, of enolic and ketonic forms, are ›oth present, one so greatly preponderates over the other, hat no trace of any but the one compound can be detected; 3) some compounds change spontaneously from one form o another, and this change sets in very quickly after the ubstance has been dissolved; (4) some compounds change rom one form to another under the influence of different eagents.

Alkaloids give spectra of two kinds, those which do not nd those which do exhibit absorption bands, the difference eing dependent upon the constitution of the nucleus of the ompound. The difference between strychnine and brucine said to be simply that the latter contains two methyl roups; but according to the absorption curves of the two ompounds, it is probable that strychnine is a pyridine erivative, and brucine a derivative of tetrahydroquinoline, an addition product of quinoline of the same character.

Emission Spectra.—One of the chief results of the exmination of the emission spectra of inorganic compounds that, in accordance with the periodic law, the spectra of efinite groups of elements are similarly constituted. The sults, indeed, indicate that not only are the atoms of ›mplex constitution, but groups of elements with similar emical and physical properties, the atomic weights of hich differ by fixed, definite values, are composed of the me kind of matter in different states of condensation, as known to be the case in different members of the same ›mologous series of organic compounds. Marshall Watts is shown that a relationship exists between the lines in e spectra of some elements and the squares of their atomic eights; and it is now possible, from the evidence afforded the spectra of elements, to determine atomic weights, in any instances, as accurately as by specific heat or vapournsity determinations. The study of flame spectra at high mperatures has found practical application (see this Jourl, 1901, 993). By studying the spectra of the flames ring the Bessemer "blow," gallium was proved to be present Cleveland iron ore. The steel made from that ore conned 1 part per 30,000 of gallium, and is thus richer in that ement than any other substance from which it has been tracted. A. de Gramont has described a method of taining spectra of metals and metalloids by means of a ark, and there is a possibility of utilising this method for e quantitative determination of carbon, sulphur, and osphorus in iron and steel during the process of nufacture.

Reference was also made to the remarkable properties of rays produced by radium. These rays are able to netrate the clothing, celluloid, gutta-percha, glass, and rious metals, and they also possess remarkable physiogical properties, producing blisters and ulcerations in the sh which are difficult to heal.—A. S.

PRIZE

'OR A DENATURING AGENT FOR SPIRITS OFFERED BY THE RUSSIAN FINANCE DEPARTMENT.

Zeits. f. Spiritusind., 1903, **26**, [36], 389.

A prize of 50,000 roubles is offered by the Russian vernment for a denaturing agent which fully satisfies undermentioned conditions. The competition is open foreigners.

The denaturing agent must not interfere with the value the spirit for technical purposes. It must contain no lies which can give rise to caustic, corroding products, ., sulphur, phosphorus, arsenic, halogens. The deured spirit, when evaporated or burnt, must not leave ind any solid metallic, or organic residue, which might harmful to the wicks of lamps or to the metal parts of tors. The denaturing agent must possess no poisonous perties. It must make the spirit absolutely undrinke, but it must not evolve unpleasant or irritating odours ich would make the spirit objectionable or dangerous in inary use. It must be cheap and powerful, so that it be used in comparatively small proportions. The aturing agent must be of such a nature that it can be readily detected by suitable tests. The process of separating the spirit from the denaturing agent must be difficult and so costly as to be unprofitable. The proportion of renatured spirit recoverable by any practical means must be very small, the main bulk remaining undrinkable and containing the denaturing agent in recognisable form. Descriptions, explanations, and samples of 10 kilos., with particulars of cost, must reach the head office for indirect taxes and liquor excise by July 1st, 1905.—J. F. B.

New Books.

AUSGEWÄHLTE METHODEN DER ANALYTISCHEN CHEMIE. Von Prof Dr. A. CLASSEN, Director der Laboratorien für anorganische Chemie und Elektrochemie der königl. technischen Hochschule zu Aachen. Zweiter Band. Unter Mitwirkung von H. Cloeren. Mit 133 Abbildungen und zwei Spectraltafeln. Friedrich Vieweg und Sohn, Braunschweig, Germany. 1903. Price M. 20.

FOR notice of the first volume of this work, see this Journal, 1901, 293.

This, the second volume, is similar in style to the first volume, and contains 794 pages of subject-matter, with indexes of authors and subjects. It contains 133 illustrations, and deals with the following leading subjects of inorganic chemical analysis:—I. Oxygen. II. Ozone. III. Hydrogen. IV. Hydrogen Peroxide. V. Sulphur. VI. Chlorine. VII. Bromine. VIII. Iodine. IX. Fluorine. X. Nitrogen. XI. Explosives. XII. Argon. XIII. Helium. XIV. Phosphorus. XV. Boron. XVI. Silicon. XVII. Carbon. XVIII. Carbon monoxide. XIX. Carbon Dioxide. XX. Percarbonates. XXI. Hydrocyanic Acid. XXII. Elementary Analysis of Organic Compounds. APPENDIX, containing articles on the Quantitative determination of Ozone; the Iodometric determination of Tellurous Acid (Norris and Fay), and the determination of Phosphorus in Iron.

JAHRBUCH DER CHEMIE. Bericht über die wichtigsten Fortschritte der reinen und angewandten Chemie, unter Mitwirkung von H. Beckurts, C. A. Bischoff, M. Delbrück, O. Doeltz, J. M. Eder, P. Friedländer, C. Häussermann, A. Herzfeld, F. W. Küster, W. Küster, J. Lewkowitsch, A. Morgen, F. Quincke, A. Werner. Herausgegeben von RICHARD MEYER. XII. Jahrgang, 1902. Friedrich Vieweg und Sohn, Braunschweig, Germany. 1903. Price M. 15.

THIS Year-Book of Chemistry contains 508 pages of subject-matter, and indexes of authors and subjects. It comprises the following branches, which are under the care of the following authorities:—I. Physical Chemistry (F. W. Küster). II. Inorganic Chemistry (A. Werner and P. Pfeiffer). III. Organic Chemistry (C. A. Bischoff). IV. Physiological Chemistry (F. W. Küster). V. Pharmaceutical Chemistry (H. Beckurts). VI. Chemistry of Foodstuffs (H. Beckurts). VII. Agricultural Chemistry (A. Morgen and W. Zielstorff). VIII. Metallurgy (O. Doeltz). IX. Fuels and Explosives (C. Häussermann). X. Inorganic Chemical Technology (F. Quincke). XI. Technology of the Carbohydrates (A. Herzfeld and O. Schreteld). XII. Fermentation Industries (M. Delbrück and O. Mohr). XIII. Technology of the Fats and Petroleums (J. Lewkowitsch). XIV. Chemistry of the Tars and Dyestuffs (i) (Richard Meyer). XV. Chemistry of the Tars and Dyestuffs (ii) (P. Friedländer). XVI. Chemical Technology of the Textile Fibres (P. Friedländer). XVII. Photography (J. M. Eder and E. Valenta) Also the GENERAL REGISTER for the JAHRGÄNGE 1891 — 1900 (Bande 1 bis 10), Bearbeitet von W. Weichelt. 1903. Price M. 11.

THE METALLURGY OF ZINC AND CADMIUM. By WALTER RENTON INGALLS. First Edition. The Engineering and Mining Journal, 261, Broadway, New York; and 20, Bucklersbury, London. 1903. Price 6·00 dols., or 25s. net.

8vo volume, containing 688 pages of subject-matter, illustrated by 403 engravings. The leading subjects treated of are as follows:—I. Zinc and its Ores. II. Calcination of

Calamine. III. Blende Roasting. IV. Roasting Furnaces. V. Utilisation of the Sulphurous Gases. VI. General Principles of Zinc Distillation. VII. Retort and Condenser Manufacture. VIII. Fuel and Systems of Combustion. IX. Chimneys, Heat Recuperation, and Furnace Design. X. Types of Distillation Furnaces. XI. Practice in Distillation. XII. Losses in Distillation. XIII. Refining Impure Zinc and Composition of Commercial Spelter. XIV. Cadmium and its Recovery. XV. Cost of Producing Zinc. XVI. Design and Construction of Smelting Works. XVII. Examples from Practice. XVIII. Proposals to Smelt Zinc Ore in the Blast Furnace. XIX. Manufacture of Zinc-White, Zinc-Grey, Zinc Chloride, and Zinc Sulphate.

PRACTICAL ELECTRO-CHEMISTRY. By BERTRAM BLOUNT, F.I.C., F.C.S., Consulting Chemist to the Crown Agents for the Colonies, &c. Second Impression. Archibald Constable and Co., Ltd., Westminster, London. The Macmillan Company, New York. 1903. Price 15*s*. net.

8vo volume containing preface, 368 pages of subject-matter, and index of subjects. The text is illustrated with 46 engravings, &c. The following are the leading themes treated of in this work:—I. General Principles. II. Winning and Refining of Metals by Electrolytic Means in Aqueous Solutions. III. Winning and Refining Metals in Igneous Solution. IV. Winning and Refining Metals and their Alloys in the Electric Furnace—Carbides, Borides, and Silicides. V. Electro-Deposition. VI. Alkali, Chlorine, and their Products. VII. Electrolytic Manufacture of Organic Compounds and Fine Chemicals. VIII. Power.

INTRODUCTION TO METALLURGICAL CHEMISTRY. For Technical Students. By J. H. STANSBIE, B.Sc., a Lecturer in the Birmingham Municipal Technical School. Simpkin, Marshall, Hamilton, Kent, and Co., Ltd., London. John Wright and Co., Bristol. 1903. Price 4*s*. 6*d*. net.

SMALL 8vo volume, containing 197 pages of subject-matter and an alphabetical index of subjects. There are 46 illustrations. An elementary text-book for students preparing for a study of the special subject.

METHOD OF DETERMINING THE CONSTITUENTS OF CAST IRON. A Compilation of the Methods now in Use in Iron Laboratories in America. Prepared for the Metallurgical Section of the American Foundrymen's Association by HERBERT E. FIELD, Secretary of the Section. (Reprinted from the Journal of the American Foundrymen's Association, Vol. XI. [II.]) New York. 1903.

8vo pamphlet containing 199 pages of subject-matter, and comprising the following items:—I. Introduction. Standard Methods. II. Silicon. III. Sulphur. IV. Phosphorus. V. Manganese. VI. Total Carbon. VII. Graphitic Carbon. VIII. Combined Carbon.

BRITISH AND FOREIGN TRADE AND INDUSTRY. Memoranda, Statistical Tables, and Charts. [Cd. 1761.] Price 3*s*. 6*d*.

THE Memoranda, Statistical Tables, and Charts contained in this return have been prepared in the Commercial, Labour, and Statistical Department of the Board of Trade, in order to provide material that may help in the consideration of certain questions of fiscal policy to which public attention is at present prominently directed.

The Memoranda deal with a number of topics having an important bearing on the position of the trade of the United Kingdom and the principal commercial countries, and on the industrial conditions prevailing therein, so far as light can be thrown on these matters by official statistics and information.

Trade Report.

I.—GENERAL.

PERU; CHEMICAL IMPORTS OF ——.

Chemist and Druggist, Sept. 19, 1903.

The following figures represent the imports of drugs anc chemical products into Peru from 1898 to 1902. They ar interesting as showing that Germany, the United States Italy, and Belgium are increasing their trade in these lines while the United Kingdom, which formerly stood at the top has been outstripped by Germany:—

——	1898.	1899.	1900.	1901.	1902.
	£	£	£	£	£
United Kingdom	41,514	38,922	30,327	40,383	28,075
Germany	13,988	21,273	20,506	23,296	29,146
U.S.A.	6,693	9,218	12,146	16,221	16,820
France	5,818	9,129	13,182	12,052	11,742
Italy	3,963	4,308	3,997	5,174	6,224
Belgium..............	716	2,381	2,817	3,057	5,261
China	1,171	1,663	9,071	2,667	2,276
Chili	778	1,814	203	417	2,050
Spain................	266	127	178	267	353
Other countries	5,063	3,906	4,728	238	2,612

As regards the total import trade of Peru, the Unitec Kingdom stands pre-eminent, her share of the three millio odd pounds' worth imported last year being well over one with third—viz., 1,113,000*l*. The United States is secon with 591,000*l*., and Germany third with 517,000*l*.

TRANSVAAL; TRADE OF THE —— (SIX MONTHS).

Bd. of Trade J., Sept. 24, 1903.

The following tables, showing the value of some article imported into and exported from the Transvaal in the si months ended June 1903, as compared with the corres ponding period of 1902, are compiled from official figure received at the Board of Trade from the Director o Customs, Pretoria:—

Imports.

Articles.	Six Months ended June 1902.	Six Months ended June 1903.
Metals and manufactures (includes agricultural implements, bicycles, hardware, iron and steel manufactures, cutlery, machinery, &c.)	£ 961,000	£ 2,432,000
Leather and manufactures (includes saddlery and boots and shoes)	206,000	482,000
Beverages (includes ale, spirits, wine, and mineral waters)	164,000	404,000
Drugs and chemicals	159,000	296,000
Groceries and oilmen's stores (includes oils and paints)	115,000	232,000
Soap and candles..........................	70,000	141,000
Jewellery and plated ware (includes clocks and watches)	68,000	103,000
Total of all imports................	4,218,000	11,415,000

Of the total value of merchandise imported into th Transvaal during the first six months of 1903, 4,704,000*l* worth were sent *viâ* Cape Colony, 4,873,000*l*. worth *vi* Natal, and 1,838,000*l*. worth *viâ* Delagoa Bay.

Exports.

Articles.	Six Months ended June 1902.	Six Months ended June 1903.
	£	£
Gold....................................	2,790,000	5,580,000
Coal....................................	49,000	57,000
Wool	1,000	19,000
Total of all exports	2,852,000	5,709,000

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Spirit; Carriage Coastwise of ——.

Bd. of Trade J., Sept. 24, 1903.

An official notice has been issued by the Marine Department of the Board of Trade relative to the carriage coastwise of petroleum spirit. This notice calls attention to the pecial precautions necessary, and also gives a list of rules vhich it is advisable should be observed.

Oil Production of U.S.A. in 1902.

Bd. of Trade J., Sept. 9, 1903.

According to "Bradstreets" (New York) of 29th Aug., ie preliminary report of the United States Geological urvey gives the total oil production of that country, for 902, as 80,894,590 barrels, valued at 69,610,348 dols. This the largest quantity ever known in the history of the ountry. The production for 1901 was 69,389,184 barrels, alue 66,417,385 dols. The increase comes almost entirely om Texas and California.

Petroleum; Heating Value of ——.

Eng. and Mining J., Sept. 12, 1903.

Experiments made in the chemical laboratory of the niversity of California have demonstrated that the heating dlue of Californian petroleum is between 10,000 and 11,000 dlories, averaging about 10,500 calories. The best coals the Pacific Coast average 7,000 to 8,000 calories; the nal steam coals, much less. Comparing the cost of oil 1.25 dols. to 1.50 dols. per barrel with the cost of coal the basis of the theoretical heating values, a ton of oil ould be worth 6 dols. to 8 dols., against coal at 8 dols. to dols. The actual difference is very much greater than is, since there is much less waste in oil heating. Numerous periments made under boilers have shown that 4 to 4·5 rrels of oil are equivalent to one ton of good coal, ierefore coal cannot compete with petroleum unless its st be reduced to between 4 dols. and 5 dols. per ton. l is selling now in San Francisco at less than 70 c. per rrel.

Asphalt Exports of Sicily.

Foreign Office Annual Series, No. 3080.

The asphalt exported during 1902 from Sicily amounted 57,222 tons, and went to the following countries:—iited Kingdom, 10,660 tons; Germany, 26,150; United tes, 6,440; France, 5,370; Netherlands, 4,350; Austriangary, 1,750; Continental Italy, 480; Egypt, 400; umania, 100; miscellaneous, 1,522 tons.

IV.—COLOURING MATTERS, Etc.

estuffs and Colouring Matters; Imports of —— in Bohemia.

Foreign Office Annual Series, No. 3075.

Year.	Quantity.	Value.
	Tons.	£
1897	5,612	242,750
1898	5,391	231,417
1899	3,668	216,958
1900	4,806	163,875
1901	4,495	180,541
1902	4,278	135,041

ural indigo fell from 532 tons, worth 208,333*l*., in 1897, 327 tons, worth 106,708*l*., in 1902, whereas synthetic igo imported from Germany rose during this period 1 209 tons, worth 82,083*l*., to 1019 tons, worth 331,208*l*.

English Colour Industries and German Competition.

F. Evershed. Brit. Assoc. Advance Proofs, 1903.

he exceptional progress of Germany in the coal-tar istries, much more rapid than her general industrial progress, has given the impression that the English dyestuffs trade is not only much smaller and less profitable, both of which are true, but is actually disappearing. The statement is sometimes enlarged from dyes to colour, and even to chemicals generally. The facts are that our annual export of chemicals increased from 7,639,000*l*. in 1880–4 to 8,829,000*l*. in 1897—1901 and 9,587,000*l*. in 1902. Germany's export is greater, but only in proportion to her larger population. Her annual rate of increase, however, is greater than ours. Our annual export of painters' colours and materials increased from 1,256,000*l*. in 1880–4 to 1,836,000*l*. in 1897—1901. The figures for coal-tar dyes, averaging 231,000*l*. in 1882—1902, show a decline since the beginning of the period, but the trade has apparently been stationary in value for the last five years. The figures, however, are untrustworthy, owing to many sources of error. Translated from values to quantities they show a large increase. Prices have fallen 40 per cent. in the last decade. The German annual export has grown from 2,500,000*l*. in 1882–8 to over 4,000,000*l*. in 1896—1902. The loss we have sustained by allowing Germany to appropriate the bulk of the coal-tar industries, estimated to produce 10,000,000*l*. annually, must be placed at a fraction of that sum, representing the difference between it and the annual value now being produced by the English labour and capital which would have been diverted to the production of dyes, scents, and medicines. Similarly, the annual loss to India by the threatened destruction of her indigo industry by Germany would be the difference between the value of Indian indigo—3,000,000*l*.—and the value of sugar and oil, which would be produced on the same lands with the same labour. The loss in that case, as in the other, is much less than commonly supposed. (See also this Journal, 1903, 398—404.)

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Flax in Ireland; Production of ——.

Bd. of Trade J., Sept. 24, 1903.

The 35th Annual Report of the Flax Supply Association for the Improvement of the Culture of Flax in Ireland relating to the year 1902 states that the flax acreage of 1902 has fallen away by 10 per cent., and, although the yield of fibre per acre was very little short of the exceptionally large yield of the 1901 crop, the decrease in the supply of home-grown fibre (amounting to 1822 tons) is deplorable. Still it is somewhat consolatory to notice that the yield per acre of the 1902 crop exceeded that of all other years since 1855, excepting only 1901, slightly surpassing the bumper crop of 1864, thus showing that the land under flax last year is far from being "flaxed out." The quality of fibre of the 1902 crop was quite an average one, although not equal to that of 1901, which excelled in strength and in yield from the hackle, the crops of very many preceding years.

For the last four years flax had been one of the best paying crops to most cultivators.

The following table shows the acreage under cultivation, and the production of flax in Ireland for each of the last five years:—

Year.	Acreage.	Production.	Yield per Acre.
	Acres.	Tons.	Stones.
1898	34,489	6,281	29·14
1899	34,989	6,743	30·83
1900	47,451	9,479	31·96
1901	55,442	12,797	36·93
1902	49,742	10,975	35·30

VII.—ACIDS, ALKALIS, Etc.

Ammonium Sulphate; German ——.

Chem. and Druggist, Sept. 19, 1903.

The report of the German Ammonia Syndicate of Bochum for 1902 states that the year has throughout been signalised by favourable conditions in the production and disposal of ammonium sulphate, being in marked contrast in this respect to the preceding year. English competition, especially active during the first half of 1902, was lessened by a continued advance of prices. Though the total imports into Germany were practically the same as in 1901—44,250 tons against 44,400, of which 32,000 and 33,000 respectively were from Great Britain—the syndicate was able to work off its production, inclusive of 9000 tons of old stock. "If these results," says the report, "are due in the first place to our firmness in maintaining prices, they are also partly due to the increasing appreciation of ammonium sulphate as a manure, and of its value to agriculture, in which it is taking the place hitherto occupied by Chilian saltpetre." The total production of the syndicated works in 1902 was 57,000 tons, and was considerably influenced during much of the period by the limitation of coke production. The production of ammoniacal liquor increased considerably, being 18,559 tons in 1902, as compared with 9519 tons in 1901. The report states that the total production of the world in ammonium sulphate is about 135,000 tons in Germany, 222,000 in England, 40,000 in France, 38,000 in Holland, Belgium, &c., 45,000 in other European countries, 65,000 in the United States. The syndicate's efforts to open new markets for ammonium sulphate were continued during the year, including extensive experimental work in connection with viticulture. The Eintracht-Tiefbau Colliery Company, of Steele-Ruhr, the Minister Achenbach Works, and the Harpen Mining Company have joined the syndicate during the year.

Chemicals in Bohemia.

Foreign Office Annual Series, No. 3075.

The manufacture of chemicals is largely carried on throughout Bohemia, and the trade with the United Kingdom has increased from 1504 tons, worth 49,333*l*., in 1897 to 4076 tons, worth 130,000*l*, in 1902; the imports from the United Kingdom during this period also increased from 551 tons, worth 50,750*l*., to 823 tons, worth 59,967*l*.

Sulphur Production of Sicily.

Foreign Office Annual Series, No. 3080.

The following statement shows the condition of the sulphur trade of Sicily during 1902 as compared with 1901:—

——	1901.	1902.
	Tons.	Tons.
Sulphur exported from Sicily............	475,000	481,228
Stock in hand on December 31...........	242,438	329,836

VIII.—GLASS, POTTERY, AND ENAMELS.

Glass and China Production of Bohemia.

Foreign Office Annual Series, No. 3075.

The value of glass and glassware exported from Bohemia in 1902 was 1,942,917*l*., but has decreased since 1900 by 254,291*l*. The trade with the United Kingdom was 346,292*l*. in 1902, a falling off on the previous year of 70,375*l*.

The export of china and porcelain rose from 684,000*l*. in 1897 to 812,375*l*. in 1902. The value exported to the United Kingdom in 1902 was 79,250*l*., a decrease on 1901 of 11,333*l*., but an increase on 1897 of 42,750*l*. (See also this Journal, 1903, 1072.)

Porcelain Pipes for Waterworks.

U.S. Cons. Reps., No. 1746, *Sept.* 1, 1903.

The Meissen China Factory in Saxony, is making porcelain water-pipes. These pipes are very thin, and glazed, and are imbedded in iron pipes, the space between the two substances being filled up with cement. China pipes, with the average diameter of ordinary water pipes, will cost about 3000 marks per mile; if produced in large quantities, their price could probably be reduced.

X.—METALLURGY.

Chrome Iron Ore; Production of ——, in the United States in 1902.

Iron Age, Aug. 27, 1903.

The annual report of the United States Geological Survey on the production of chrome iron ore in 1902 shows an output of 315 short tons, valued at 4567 dols., as compared with 368 tons, valued at 5790 dols., in 1901. California was the only State to produce any chrome ore in 1902.

Copper Production in the United States in 1902.

Iron Age, Aug. 27, 1903.

The report of the survey on the production of copper in 1902 states that, as compared with 268,782 long tons in 1901, the total production of copper last year was 294,423 tons, of which the Lake Superior district produced 76,165 tons, or 25·9 per cent.; Montana, 128,975 tons, or 43·8 per cent.; and Arizona, 53,547 tons, or 18·2 per cent. This is an increase in the total production of 25,641 tons, or nearly 10 per cent. as compared with 1901.

Tungsten, Molybdenum, Uranium, and Vanadium in the United States; Production of ——.

Iron Age, Aug. 13, 1903.

The report of the United States Geological Survey upon the production of tungsten, molybdenum, uranium, and vanadium for 1902 gives the production of crude tungsten ores in the United States during 1902 as 183½ tons, of which not more than a few tons were sold. In 1901 the production amounted to 179 tons of concentrated ore valued at 27,720 dols. The larger part of the production of 1902 was from Colorado, with a smaller amount from Connecticut. There were no new localities developed during 1902, and all the production was from the old deposits.

Molybdenum.—With the exception of a few tons mined for experimental purposes, the entire production of commercial molybdenite was by a mining company of Seattle, Washington, from their property in the western part of Chelan County. This production amounted to about 12 tons, approximately the same as that of 1901, but none of the product was shipped in 1902. The value of these molybdenum ores is very erratic, the highest price quoted being 1500 dols. per ton and the lowest 100 dols. It is very probable that, with any constant demand for these ores, they would be furnished in quantity at a price varying from 100 dols. to 200 dols. per ton for a 50 to 55 per cent. ore.

Uranium and Vanadium.—There was a marked increase in the production of uranium and vanadium minerals in 1902, which, as reported to the survey, amounted to 3810 tons, valued at 48,125 dols., or 12·63 dols. per ton. This, of course, represents the crude ore. In 1901 the production was 375 tons of crude ore. A portion of the uranium ore was treated, giving a concentrated product of 25 tons, which was valued at 8000 dols. or 320 dols. per ton. What percentage of uranium oxide this concentrated ore contained is not known. The crude vanadium ore, of which there were 3000 tons produced, contained from 2·5—4 per cent. of vanadium oxide, and the crude uranium ore from 2·5 to 5 per cent. of uranium oxide. All of this production was not sold in 1902.

Mercury Production of U.S.A. in 1902.

Bd. of Trade J., Sept. 17, 1903.

The production of mercury amounted to 34,451 flasks o 76½ lb. each, valued at 1,500,412 dols., as compared wit 29,727 flasks, valued at 1,382,305 dols. in 1901. Californi contributed the greater part of the output, amounting t 29,190 flasks, as compared with 26,720 flasks in 1901 Texas reported 5252 flasks, as compared with 2932 flask in 1901. Oregon, which furnished 75 flasks in 1901 reported no production during 1902, the mercury minin operations in that State being limited to development work.

XVI.—SUGAR, STARCH, Etc.

SUGAR RÉGIME IN FRANCE; NEW ——.

U.S. Cons. Reps., No. 1749, *Sept.* 15, 1903.

On September 1, 1903, the new law removing nearly 60 r cent. of the Customs and internal revenue tax on sugar me into effect. In 1887 the tax on French sugar, whether ported from the colonies or manufactured at home, was ed at 58 frs. per 100 kilos. plus 6·75 frs. additional on gar imported from other countries than France and her ssessions. In 1897 this tax was maintained and exporters sugar were granted an export bounty of about 10 frs. per 0 kilos. on all French sugar exported to foreign countries. e new law reduces the customs and internal-revenue tax m 58 frs. to 24·1 frs. per 100 kilos., and also suppresses export bounty.

The current retail price for white cut loaf in France at esent is 1·05 francs per kilo.; for white granulated sugar, od quality, 1 franc per kilo. On and after September 1 is understood that white cut loaf will be generally reduced m 1·05 francs to 65 centimes per kilo., and white anulated from 1 franc to 60 centimes per kilo. The eaper sugars will be correspondingly reduced. One of e results already announced for September 1 will be the luction of 20 centimes per kilo. on the price of chocolate, ich is one of the most important staples of the country. e manufacturers of French sweet biscuits have also nounced a reduction of 5 centimes per pound. Owing to high price of sugar, France has heretofore imported from gland a very considerable percentage of her fruit preves. One result of the new law will probably be the gely increased manufacture of products of this nature in ance and consequent loss to British exports.

SUGAR PRODUCTION OF GERMANY.

Bd. of Trade J., Sept 24, 1903.

The *Reichsanzeiger* for Sept. 14 publishes statistics of production of sugar in Germany during the 13 nths from Aug. 1, 1902, to Aug. 31, 1903. As a ult of new regulations in regard to sugar taxation in rmany, the sugar campaign which formerly ran from g. 1 of each year to July 31 of the following, will, from s year onwards, commence with Sept. 1 and run to g. 31. During the 13 months from Aug. 1, 1902, to g. 31, 1903, 11,255,958 metric tons of raw beets were d, whilst 1,511,995 metric tons of raw and 1,449,600 tric tons of refined sugar were produced, the total out- expressed in terms of raw sugar being calculated at 74,462 metric tons. During the corresponding 13 nths of 1901-1902, 16,012,867 metric tons of raw beets e used, and 2,042,035 metric tons of raw and 1,433,542 tric tons of refined sugar produced.

NEW SACCHARINE PLANT.

U.S. Cons. Reps., No. 1748, *Sept* 14, 1903.

The *Technical Review* of Berlin states that a plant has ently been found in South America which contains a siderable quantity of saccharine matter, is not fermente, and possesses an unusually strong saccharine taste. e plant is of the same species as the German Kunigunkraut (*Eupatorium cannabinum*), is herbaceous, from o 12 ins. high. Its botanical name is *Eupatorium andium.* According to experiments made at the Agritural Institute at Asuncion, this plant is said to yield a stance which is from 20 to 30 times as sweet as ordinary e or beet sugar.

XVII.—BREWING, WINES, SPIRITS, Etc.

COHOL; DUTY-FREE ——, FOR SCIENTIFIC RESEARCH.

ir H. E. Roscoe.—Brit. Assoc. Advance Proofs, 1903.

ir Henry Roscoe reported that the Government had de a small concession in the matter, but it applied only he common 96 per cent. alcohol. Pure, or "absolute," ohol was not made by manufacturers in this country, because of the heavy duties on the materials involved. There were many chemicals required by the chemist in the manufacture of which large quantities of pure alcohol were needed. The alcohol formed no part of the finished drug, in which it did not appear, yet the manufacturer had to pay the heavy duty on the alcohol he used for manufacturing. Crude alcohol in the form of methylated spirit might be used for all sorts of trade and domestic purposes, but the pure alcohol needed by the scientific worker, or that consumed in large quantities in preparing his materials, must pay the same duty as the liqueur brandy sipped by the *bon vivant* after his feast. This was not only a gross imposition on scientific education and research, but drove our schools and colleges to Germany for drugs in the making of which pure alcohol was needed.

XVIII. B.—SANITATION.

SHEEP DIPS, &c.; CARRIAGE OF ——.

Bd. of Trade J., Sept. 24, 1903.

The attention of the Board of Trade has been called to the dangers which may arise from packages of sheep dip and similar preparations containing poison being so stowed on board ship as to become damaged, and to cause their contents to escape, and mix with articles used for human food, which may also form part of the cargo of the vessel.

It is very important that all such packages, boxes, or cases intended for export should be marked on the outside with the word "Poison," in letters at least as conspicuous as the address, so that shipowners who carry these goods may know the nature of the contents of the packages they are dealing with, and stow them accordingly.

XIX.—PAPER, PASTEBOARD, Etc.

CARBON PAPERS; CARRIAGE OF ——, ON BOARD SHIP.

Bd. of Trade J., Sept. 24, 1903.

A further notice has been issued stating that carbon papers, containing, as they do, fatty substances and finely-divided carbon, or compounds of carbon, are liable, under certain conditions, to some risk of spontaneous ignition.

If a limited number of sheets is packed in air-tight tins within a suitable case, no objection need be raised to their carriage as general cargo.

If carried in any quantity, and not packed in such tins, they should be carried as deck cargo only.

XX.—FINE CHEMICALS, Etc.

SICILIAN PRODUCTS.

Foreign Office Annual Series, No. 3080.

Among the articles exported from Sicily last year were the following, the bracketed figures being the exports for 1901: Olive oil, 1906 tons (1360); essential oils, principally lemon, bergamot, and orange, 425 tons (302 tons); tartaric acid, 25 tons (1½ tons); citric acid, 27 tons (79 tons); wine-lees, 6003 tons (4700 tons); calcium citrate, 2260 tons (870 tons); concentrated lemon-juice, 2200 tons (1,741 tons). From Palermo the following articles were exported last year, compared with the years 1900–1901:—

——	1900.	1901.	1902.
	Tons.	Tons.	Tons
Essential oils	58	72	52
Olive oil	745	2,174	2,470
Tartar	..	1,538	1,842
Citrate of lime	540	446	627
Orange peel	..	69	101
Lemon juice	757	498	896
Sulphur	13,616	13,803	6,486

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 19,962. Meyer (Meyer and Arbuckle). Means of evaporation for the concentration of saccharine, syrups, brine, or other fluid.* Sept. 16.
„ 19,964. Schwarzhaupt. Liquid diffuser.* Sept. 16.
„ 19,993. Greiner. Evaporating and boiling down apparatus. Sept. 16.
„ 20,049. Howorth (Eyde and Birkeland). Method of producing powerful chemical reactions in gases or gas mixtures, and apparatus therefor.* Sept. 17.
„ 20,126. Heneke. Evaporating and drying materials. Sept. 18.
„ 20,163. Bloxam (Dillau). Treatment of liquids with ozonised air or other gaseous ozone mixtures. Sept. 18.
„ 20,370. Schmidt. Process and apparatus to draw off oily fluids.* Sept. 22.
„ 20,653. Lillie. Evaporating tubes for evaporators.* Sept. 25.
„ 20,777. McNeil and McNeil. Evaporating or concentrating apparatus. Sept. 28.
„ 20,795. Blasberg. Refining apparatus.* Sept. 28.
[C.S.] 21,650 (1902). Field. Manufacture of acid-proof vessels, &c. Oct. 7.
„ 23,665 (1902). Ingham, Laugton, and Ingham. Continuous kiln. Sept. 23.
„ 26,836 (1902). Foster. Apparatus for evaporating liquids. Sept. 30.
„ 27,473 (1902). Bamber. Centrifugal separators. Oct. 7.
„ 4537 (1903). Mark. Apparatus for subjecting materials to the action of gases. Sept. 30.
„ 18,292 (1903). MeKnight. Apparatus for condensing fumes formed in volatilisation processes. Sept. 30.

II.—FUEL, GAS, AND LIGHT.

[A.] 19,929. Catier. Generators for power gases.* Sept. 16.
„ 20,265. Dunlop. Gas producing plant. Sept. 21.
„ 20,313. Wedekind and Pörschke. Production of a porous, hard electrode mass, insoluble in alkalis, from metallic oxides or metallic powders.* Sept. 21.
„ 20,315. Strenge. Furnace for making coke from peat, &c. Sept. 21.
„ 20,330. Pooley and Poulson. Apparatus for enriching coal gas or other gas. Sept. 22.
„ 20,412. Elworthy and Williamson. Manufacture of gas for illuminating, heating, and power purposes. Sept. 22.
„ 20,420. Ekenberg. Manufacture of fuel from peat, waste wood, coal substances, &c.* Sept. 22.
„ 20,556. Lake (Ges. f. Flüssige Gase, R. Pictet & Co.). Method for increasing the intensity of incandescent light. Sept. 24.
„ 20,570. South. Manufacture of combustible gas. Sept. 24.
„ 20,574. Wilson. Gas producing furnaces. Sept. 24.
„ 20,677. Holmes. Apparatus for extracting tar from illuminating gas. Sept. 25.
„ 20,678. Cerasoli. Gas producers. Sept. 25.
20,831. McLean and Paterson. Treatment of peat. Sept. 28.
[A.] 20,850. Cerasoli. Gas producers. Sept. 28.
„ 20,868. Tweedale and Smalley. Apparatus fo cooling and purifying producer gases. Sept. 29.
„ 20,941. Midgley. Furnaces. Sept. 29.
„ 21,149. Crossley and Rigby. Gas producers Oct. 2.
„ 21,221. Joyner. Intensifying the incandescen mantle light. Oct. 3.
„ 21,300. Birkbeck (Shedlock). Artificial fuel an the manufacture thereof. Oct. 3.
[C.S.] 14,077 (1902). Whitfield. Gas producers. Sept. 30
„ 22,282 (1902). Fowler and Medley. Apparatu for cleansing gas from producers, blast furnaces and coke ovens. Sept. 23.
„ 24,371 (1902). Clay. Manufacture of water gas Oct. 7.
„ 25,057 (1902). Siemens. Regenerative gas reheating furnaces. Oct. 7.
„ 25,319 (1902). Dowson. Manufacture of generato gas, and apparatus used therewith. Oct. 7.
„ 26,195 (1902). Schill and Lane. Purification o gas. Sept. 30.
„ 26,709 (1902). Wilson. Gas producers. Sept. 23
„ 27,416 (1902). Grice and Dewey. Means fo intensifying the illumination of incandescen mantles. Oct. 7.
„ 27,917 (1902). Schill. Apparatus for washing and similarly treating gas. Sept. 23.
„ 12,477 (1903). Maréchal and Barrière. Gas producers. Sept. 23.
„ 14,305 (1903). Boult (Seydel). Cupola furnaces Sept. 23.
„ 16,263 (1903). George. Gas producers. Sept. 30

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[C.S.] 21,145 (1902). Wetter (Rütgerswerke A.-G.) Deodorisation of tar and mineral oils. Oct. 7.
„ 13,837 (1903). Wegelin. Manufacturing soot o lampblack from tar and other carbonaceou substances. Sept. 30.
„ 16,641 (1903). Catchpole and Catchpole. Purification of naphthalene and anthracene. Sept. 23

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 19,973. Johnson (Kalle and Co.). Manufacture o colouring matters containing sulphur and o intermediate products. Sept. 16.
„ 20,151. Johnson (Badische Anilin und Soda Fabrik) Manufacture of anthracene colouring matters Sept. 18.
„ 21,019. Cosway and The United Alkali Co., Ltd Manufacture and production of black colourin matters. Sept. 30.
[C.S.] 22,824 (1902). Imray (Meister, Lucius und Brüning). Manufacture of a sulphurised dyestuf Sept. 23.
„ 23,831 (1902). Imray (Meister, Lucius und Brüning). Manufacture of a red azo dyestuf Sept. 23.
„ 24,869 (1902). Meyenberg, Lévy, and Clayton Aniline Co. Manufacture of aromatic bases. Sept. 2
„ 25,851 (1902). Imray (Meister, Lucius und Brüning. Manufacture of bluish black sulphurise dyestuffs. Sept. 30.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 20,476. Maseelli. Dyeing apparatus. Sept. 23.
„ 20,589. Young and Waddell. Method of preparing flax and tow for spinning. Sept. 24.
„ 20,925. Thompsou (Wegmann and Co.). Metho of and apparatus for dyeing cotton and the lik Sept. 29.
„ 20,942. De Naeyer. Dyeing vats. [Belgian Appl Oct. 7, 1902.]* Sept. 29.

[A.] 20,959. De Naeyer. Apparatus for dyeing, bleaching, and mercerising textile materials. [Belgian Appl., Dec. 31, 1902.]* Sept. 30.
„ 21,252. Coventry. Process of sizing or weighting yarn. Oct. 3.
[C.S.] 21,097 (1902). Hildyard. Multicolour printing. Sept. 30.
„ 23,580 (1902). Printing Art Co., Black and Mowbray. Means for multicolour printing. Sept. 30.
„ 25,990 (1902). Colburn and Colburn. Machines for scouring or washing wool, &c. Oct. 7.
„ 17,608 (1903). Hardcastle. Machinery for treating cloth or yarn with liquors, gases, or vapours in motion. Oct. 7.
„ 18,675 (1903). Cadgène. Process for printing textile fabrics. Oct. 7.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 20,324. Ransford (Cassella and Co.). Production of two-coloured effects upon straw or mixed straw and chip plaits. Sept. 21.
[C.S.] 17,808 (1903). Brenner. Preparing wood for taking colouring matter. Sept. 30.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 20,038. Lee. Manufacture of cyanide of potassium. Sept. 17.
„ 20,069. Davis. Manufacture of alkaline prussiates. Sept. 17.
„ 20,497. Kowalski and Moscicki. *See under* XI.
„ 20,655. Evans (Elektrochemische Werke). *See under* XI.
„ 20,797. Woltereck. Production of ammonia. Sept. 28.
„ 21,122. Jaubert. Preparation of oxygen. [French Appl., Oct. 27, 1902.]* Oct. 1.
„ 21,154. Macnab (Griffin and Hart). Process for the production of chemical compounds. Oct. 2.
[C.S.] 18,015 (1902). Thwaite and Denny. Producing zinc oxide. Sept. 23.
„ 20,657 (1902). Casper (Comba). Recovery of copper from solutions containing it. Sept. 23.
„ 21,120 (1902). Pictet Syndicate, Ltd. Method of producing liquid air. Sept. 30.
„ 25,683 (1902). Spence and P. Spence and Sons. Manufacture of compounds of alumina. Sept. 30.
„ 26,916 (1902). Winsloe and Hart. Apparatus for the manufacture of sulphuric acid by the chamber process. Oct. 7.
„ 36 (1903). Grossmann and Grossmann's Cyanide Patents Syndicate. Manufacture of cyanides and the recovery of bye-products. Sept. 30.
„ 15,752 (1903). Schilling and Kremer. Mode of continuously extracting ammonia from the sewerage waters of towns. Sept. 23.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 19,718. Johnson. Liquid or medium for mixing with colours used in decorating ceramic ware. Sept. 14.
„ 20,679. Arbogast. Methods of manufacturing glassware. [U.S. Appl., Sept. 30, 1902.]* Sept. 25.
„ 21,063. Ellis. Duplicated kilns for burning pottery, glass, &c., the smoke being destroyed. Oct. 1.
[C.S.] 20,495 (1902). Courmont. Imitation ceramic ware. Sept. 30.
„ 20,586 (1902). Goebel. Firing kilns for porcelain and the like. Sept. 23.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 19,784. Kroll. Preservation of timber. Sept. 14.
„ 20,028. Sadler. Brick kilns. Sept. 17.
„ 20,080. Delphin. Manufacture of artificial stone made largely from slow-setting plastic or semi-plastic materials. Sept. 17.
[A.] 20,141. Booth and Crosland. Furnaces or kilns suitable for calcining limestone, &c. Sept. 18.
„ 20,262. Lauder and Ferguson. Imitation building stone. Sept. 21.
„ 20,421. Hewett (Patent Artistic Stone Co.). Manufacture of artificial stone. Sept. 22.
[C.S.] 22,717 (1902). Putnam. Composition to be mixed with or applied to cement and the like. Sept. 23.
„ 22,735 (1902). Bamber. Manufacture of Portland cement. Sept. 23.
„ 22,898 (1902). Hollings and Hollings. Refractory material. Oct 7.
„ 25,221 (1902). Engels. Production of fireproof materials. Sept. 23.
„ 17,812 (1903). Klefisch (Klefisch). Manufacture of bricks from slate waste and lime. Sept. 23.
„ 18,284 (1903). Mershon. Refractory articles of manufacture. Oct. 7.

X.—METALLURGY.

[A.] 19,783. Delprat. Extracting zinc and other sulphides from their ores.* Sept. 14.
„ 19,924. Simpson (Simpson). Retort for distilling or treating zinc and other ores. Sept. 16.
„ 19,984. Price. Furnaces, especially for the separation of gold or other precious metals from waste, &c. Sept. 16.
„ 20,001. Cowper-Coles, Sterne, and the Cowper-Coles Inventions Development Co., Ltd. Process for rendering silver untarnishable. Sept. 17.
„ 20,285. Blackmore. Machine for separating ores and other minerals by electro-magnets. Sept. 21.
„ 20,288. Brookes (Berliner Blechemballage Fabr. Gerson). Producing coloured impressions on metal plates. Sept. 21.
„ 20,419. Sulman and Kirkpatrick-Picard. Separation of minerals from ores and gangue. Sept. 22.
„ 20,709. Hilpert and Pauli. Producing a bright metallic coating on paper, leather, &c. Sept. 26.
„ 20,758. Sörensen. Process for hardening aluminium. Sept. 26.
„ 20,785. Heye. Improving and hardening steel and iron. Sept. 28.
„ 21,187. Carson and Ogle. Treatment of zinc and other ores. Oct. 2.
„ 21,220. Cowper-Coles. Recovering copper from its alloys. Oct. 3.
„ 21,287. Dejey. Engraving and etching metal. Oct. 3.
„ 21,299. Garrard and Ferranti. Removal of scale from iron and similar metals. Oct. 3.
[C.S.] 20,084 (1902). Evans (Elektrochemische Werke). Production of metallic calcium. Sept. 23
„ 21,391 (1902). Conein. Process of treating matts and raw metals in reverberatory furnaces. Sept. 23.
„ 23,644 (1902). Just, Jenkins, and Frith. Manufacture of a new metallic alloy or metal. Oct. 7.
„ 24,248 (1902). Talbot. Manufacture of steel or ingot iron. Sept. 23.
„ 26,280 (1902). Marks (Delprat). Extraction of zinc and other sulphides from their ores. Oct. 7.
„ 26,466 (1902). Conein. Treatment of matts and raw metals in metallurgical hearth furnaces. Oct. 7.
„ 17,434 (1903). Mills (Bradley). Reduction of iron and other metals from their ores. Oct. 7.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 20,497. Kowalski and Moscicki. Plant for producing nitric products by electric discharges in gaseous mixtures.* Sept. 23.
„ 20,655. Evans (Elektrochemische Werke). Electrolytic production of alkaline earth metals, more especially calcium. Sept. 25.
„ 20,685. Simm and Denny. Electrical resistance furnaces. Sept. 26.

[A.] 20,889. Kellner. Process and apparatus for the electrolysis of chlorides of the alkalies.* Sept. 29.

„ 21,104. Blackman and Warren. Electrolyte for batteries and method of preparing the ingredients for same. Oct. 1.

[C.S.] 19,999 (1902). Fiedler and Puchmüller. Secondary battery elements. Sept. 23.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[C.S.] 25,492 (1902). Blake. Apparatus for testing the lubricating power of oils, greases, and other lubricants. Sept. 23.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES, INDIA-RUBBER, Etc.

A.—*Pigments, Paints.*

[C.S.] 22,663 (1902). Oliphant and Elworthy. Process and apparatus for the manufacture of white lead. Sept. 30.

„ 17,784 (1903). Armbruster and Morton. Processes of making pigments. Oct. 7.

„ 17,785 (1903). Armbruster and Morton. Compositions of matter to be used for pigments, and process of making the same. Oct. 7.

B.—*Resins, Varnishes.*

[A.] 21,020. Johnson (Foelsing). Treatment of products containing gums and resins for the separation and obtainment of the gums and resins therefrom. Sept. 30.

[C.S.] 18,714 (1903). Horst. Manufacture of linoleum. Oct. 7.

C.—*India-rubber, &c.*

[A.] 19,884. Panzetta and Frost. Vulcanising apparatus. Sept. 15.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 20,063. Horn. Preparation of a clear solution of casein. Sept. 17.

[C.S.] 16,038 (1902). Parsons. Tanning. Sept. 30.

„ 20,318 (1902). Bierich. Manufacture of meal from raw horn, &c., suitable for the production of a homogeneous horn substance. Sept. 23.

„ 7492 (1903). Magnus. Leather, and process of treating the same. Oct. 7.

„ 17,817 (1903). Glasel. Tanning machines. Sept. 23.

XV.—MANURES.

[C.S.] 20,679 (1902). Metcalfe. Manufacture of manures from waste animal materials. Sept. 30.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 19,962. Meyer (Meyer and Arbuckle). *See under* I.

[C.S.] 15,274 (1903). Whiteman (Synd. Exploitation Brev. Hlavati). Extraction of the crystallisable sugar in saccharine liquids obtained from beetroot or sugar cane. Sept. 30.

XVII.—BREWING, WINES, SPIRITS, Etc.

[C.S.] 25,438 (1902). Scott. Purification of spirit. Sept. 30.

„ 14,839 (1903). Lapp. Process of coating metallic fermenting vats and storage vessels for beer. Sept. 23.

„ 15,935 (1903). Kubessa. Brewing process. Sept. 13.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—*Foods.*

[A.] 20,630. Roewer. Butyrometers. Sept. 25.

B.—*Sanitation; Water Purification.*

[A.] 19,916. Woodall. Water purifying apparatus. Sept. 15.

[A.] 20,021. Turner. Treatment of trade effluents. Sept 17.

„ 20,025. Cowie. Bacterial bed system of treating effluents containing matter in suspension. Sept. 17.

„ 20,711. Stiff. Bacteria and filter beds. Sept. 26.

„ 20,832. McLean and Paterson. Treatment of sewage. Sept. 28.

[C.S.] 26,756 (1902). Candy. Preparation of materials for use in filter or bacterial beds. Oct. 7.

„ 15,792 (1903). Schilling and Kremer. *See under* VII.

C.—*Disinfectants.*

[A.] 19,837. Kösters. Forming solutions of antiseptics which are otherwise insoluble or not easily soluble. Sept. 15.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 21,030. Viscose Syndicate, Ltd., and Cross. Method of refining or purifying viscose.* Sept. 30.

[C.S.] 20,575 (1902). Camara and Egaña. Extracting cellulose from sugar cane trash, pulp, or residues and similar products, for making pulp for paper, pasteboard, &c. Sept. 30.

„ 24,542 (1902). Kellner. Manufacture of cellulose. Sept. 23.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 19,895. Johnson (Deutsche Gold und Silber Scheideanstalt vorm. Roessler). Manufacture of prussic acid. Sept. 15.

„ 20,223. Thompson (Möller and Linsert). Products of condensation from dioxybenzenes with formaldehyde and ammonia.* Sept. 19.

[C.S.] 26,271 (1902). Imray (Meister, Lucius und Brüning). Manufacture of substitution products of 4-amido-2.3-dimethyl-1-phenyl-5-pyrazolones and homologues thereof. Sept. 23.

„ 26,362 (1902). Wetter. (Heine and Co.). Manufacture or recovery of terpene alcohols and the manufacture of perfumes. Oct. 7.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 19,975. Joly. Production of photographs, &c. in colours. Sept. 16.

„ 20,106. Rowlands and Gooch. Colour photography. Sept. 18.

„ 20,325. Zimmermann (Chem. Fab. auf Actien, vorm. Schering). Photographic paper. Sept. 21.

„ 20,434. Hill and Young. Reproduction of copies of drawings. Sept. 23.

[C.S.] 25,243 (1902). Sandell Films and Plates, Ltd., and Smalley. Photographic films. Sept. 23.

„ 25,244 (1902). Starnes. Photographic printing process. Sept. 23.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 19,717. Mooney. Wax matches or vestas. Sept. 14.

„ 19,817. Nicholas. Explosives. Sept. 14.

„ 20,216. Bielenfeldt. Explosives or blasting compositions. Sept. 19.

„ 20,965. Curtis and others. Explosives. Sept. 30.

„ 20,999. Luck. Manufacture of explosives. Sept. 30.

[C.S.] 22,895 (1902). Markl. Safety match or like igniting composition. Sept. 30.

„ 25,540 (1902). Wetter (Westfälisch-Anhalt. Sprengstoff-A.-G.). Explosives. Sept. 30.

„ 26,802 (1902). Dreany. Explosives for blasting purposes. Sept. 23.

„ 26,891 (1902). Johnson (Chem. Fabr. Griesheim Elektron). Igniting compositions for matches Oct. 7.

„ 17,946 (1903). Sachs. Safety fuses. Sept. 30.

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SESSION 1903—1904.

Monday, Nov. 2:—
Prof. W. R. Hodgkinson. "Application of X Rays to the Examination of Safety Fuses," by C. Napier Hake.
Mr. W. Muir. "New Chemically Active Variety of Red Phosphorus, and its Use in the Manufacture of Matches," by Drs. Marquart and Schulz.
Mr. F. Bale. "New Compound of Phosphorus for the Manufacture of Matches."
Prof. V. H. Veley, F.R.S., and Mr. J. J. Manley. "Densities of Concentrated Nitric Acid at Different Temperatures."
Messrs. S. S. Brame and Wallace A. Cowan. "Comparison of Different Types of Calorimeters."

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Friday, Nov. 6. Chairman's Address: "Municipal Chemistry."

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SESSION 1903—1904.

Monday, Nov. 2:—
F. W. Branson. "Some Properties of Radium Salts."
W. Ackroyd. "Colour Changes effected by Radium Rays."
T. Fairley. "Certain Reactions of Radium Salts."

Notices.

SUBSCRIPTIONS FOR 1904.

Foreign and Colonial Members are reminded that the bscription of 25*s*. for 1904, payable on January 1st next, ould be sent in good time to the Hon. Treasurer (Mr. muel Hall), in order to ensure continuity in the receipt of e Society's Journal. Any changes of address to appear the new List of Members now in course of preparation ould reach the General Secretary not later than January th, 1904.

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Members who contemplate attending the next General eting, in New York, are requested to communicate with General Secretary as soon as possible, in order that table travelling arrangements may be made.

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A es, W. J., P.O. Box 187, Pernambuco, Brazil, Sugar Expert.

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nan, A. H., 34, Bridge Avenue, Hammersmith, W., Chemist.

n, Dr. Herb. W., Leith Technical College, Leith, N.B., Lecturer in Chemistry.

ard, Fred. a., Messrs. Bever and Wolf, 46, Vicar Lane, Bradford, Yorks, Aniline Colour Importers.

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Obituary.

ERNST HANTKE, PH.D.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTRY, THE AMERICAN CHEMICAL SOCIETY, AND THE VEREIN DEUTSCHER CHEMIKER, &c.

ERNST HANTKE was born June 10th, 1863, in Guhrau, Silesia. After successfully passing through his student career, he later on held positions under Loewig of Breslau, Birnbaum of Carlsruhe, and Jacobsen of Rostock. He then became assistant to Dr. Delbrück, and to him he owed a special training in the chemistry and technology of fermentation. Later still he became chemist in several large German breweries, distilleries, and yeast factories. Hantke then emigrated to America, and finally settled in Chicago, where he became instructor in the American Brewing Academy. He afterwards removed to Milwaukee, accepting a post there as brewer's technologist with the Val Blatz Brewing Co. Moving on later still to Broadway, Milwaukee, in 1896, and taking two rooms, he commenced professional business as a teacher, his institute being known as "Hantke's Brewing School." From the small beginning referred to, this school became widely known and recognised, and was at length incorporated as the "Industrial Chemical Institute of Milwaukee." Dr. Hantke published a handbook of brewing, besides many scientific and technical articles. He was just preparing to give his entire time and attention to literary work, when death intervened. Hantke had, however, already commenced a paper (Sept. 1901), in which to communicate to the public the results of his experiments, and it was entitled "Letters on Brewing." He was also a co-worker in the new "Encyclopædia Americana." It is perhaps seldom that a man can in less than eight years show so good a record for himself and the institute he founded single-handed, and thus it was perhaps no wonder that the strain proved too great for him. He had decided at length to take a long rest so soon as the next course at his institute had commenced; — this determination was but too literally realised. He died Sept. 13th, 1903.

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I.—PLANT, APPARATUS, AND MACHINERY.

English Patent.

Filtering Materials; Revivification of ——. T. Lewicki, Warsaw. Eng. Pat. 20,303, Sept. 17, 1902.

The invention relates to a process for revivifying filtering materials, such as bone black or charcoal or other porous materials, by fermentation. If aerobic organisms, such as bacteria, yeasts, &c., are used, air must be admitted during fermentation. The filtering material is then washed and sterilised with superheated steam.—L. F. G.

United States Patent.

Separator; Centrifugal Liquid ——. G. Rennerfelt, Brooklyn, Assignor to Kochkum, jun., and Ohlsson, New York. U.S. Pat. 739,927, Sept. 29, 1903.

The bowl of the centrifugal separator is attached by laterally and vertically yielding means to a rigid driving shaft supported by end or thrust bearings. The yielding attachment may take the form of a spiral spring.—J. F. B.

French Patents.

Rectifying Columns. N. Bogoïavlensky and M. Kroupovess. Fr. Pat. 331,038, April 8, 1903.

See Eng. Pat. 8602 of 1903; this Journal, 1903, 899.
—T. F. B.

Separators; Centrifugal ——. T. S. Patterson. Fr. Pat. 331,549, April 28, 1903.

See U.S. Pat. 731,215 of 1903; this Journal, 1903, 859.
—T. F. B.

II.—FUEL, GAS, AND LIGHT.

Cerous Salts; Autoxidation of ——. E. Baur. Ber., 1903, **36**, [12], 3038—3041.

Engler (this Journal, 1903, 969) having found that in the oxidation of cerous salts, an atom of cerium takes, in the limit, one atom of oxygen, whilst the author had found that two atoms of cerium take up three atoms of oxygen, the author has carefully repeated his experiments, shaking the solution of cerous salt by mechanical means in a flask containing air, and measuring the volume of oxygen finally absorbed. The results completely confirm his former conclusions.

Engler has suggested that the high luminosity of the Welsbach mantle is due to acceleration of combustion through the cerium oxide, which acts as a carrier of oxygen. It is, however, clear, from the work of Le Chatelier and Boudouard, and of Nernst and Bose, that this high luminosity is due really to the peculiar selective radiation of the thoria-cerium oxide mixture. In this connection measurements of the infra-red radiation are much to be desired.
—J. T. D.

English Patents.

Gas from Gas Producers, Blast Furnaces, and Coke Ovens; Apparatus for Cleansing ——. C. H. Fowler, and E. A. Medley, Huyton, Lancs. Eng. Pat. 22,282, Oct. 14, 1902.

A vertical chamber is divided into several compartments by means of dished transverse partitions, which have holes in their centres. Centrally through the chamber, and passing through these holes, is a vertical shaft, bearing, midway between each partition, a flat horizontal disc of less diameter than the chamber itself; this shaft is made to revolve rapidly. Water enters at the top of the chamber, falls on to the uppermost disc, is whirled off by centrifugal action, and descends as spray to the outer edges of the topmost partition. It runs down the inclined plane of the latter, and falls through the central hole on to the second disc, where the cycle of operations repeats itself. The gas to be freed from dust and tar preferably enters the chamber at the base.—F. H. L.

Gas Producers. A. Wilson, Doxey, Staffordshire. Eng. Pat. 26,709, Dec. 3, 1902.

A water-bottom gas producer is provided at its base with an air tuyère, taking the form of an inverted V-shaped tube, which extends right across it. Air enters this tuyere at one end, and escapes from its open bottom. At opposite sides of the tuyère are segmental grates extending upwards, through which air also enters from a suitable conduit. This arrangement is claimed to distribute the air (and steam) more uniformly amongst the fuel than has hitherto been done. At the upper portion of the producer is a similarly formed V-shaped tube extending right across the apparatus, into which the gas passes, whence it travels to an annular flue round the top of the producer, which is connected with the gas leading main. The lower tube is carried on metal girders, and the upper one on an arch of refractory material.—F. H. L.

Gas Producers. L. Maréchal and P. Barriere, Paris.
Eng. Pat. 12,477, June 2, 1903.

The claim is for a semi-water gas producer which raises its own steam, and is joined to a regenerator in which the air supply is warmed by the sensible heat of the gas made. The lowest part of the producer contains a U-shaped boiler fitted at its upper edges with jets, whence steam impinges on the glowing fuel. The middle part is a parallel chamber with numerous tuyères, admitting air from an annular chamber, into which the air enters from the regenerator. The upper part is a jacketed cast-iron structure having the shape of a double truncated cone. The cover of the whole is a flat plate bearing the charging orifice and a water-sealed inspection door, through which a poking bar can be introduced into the producer when required. The top plate also carries a layer of water, which eventually overflows down a pipe leading to the base of the jacket abovementioned. This it fills, and again overflows down a pipe communicating with the bottom of the boiler lying in the hearth. The gas leaves the producer through a main near the top, and enters a chamber in the regenerator, from which it is distributed through a number of webbed pipes arranged in parallel series. These pipes are prolonged above the top of the vessel, and are provided with caps to allow of cleaning; some of them are open at the base, and dip into water in a well, to permit tar, &c. to run off. The air enters into the body of the regenerator, and is forced to travel in a circuitous direction by means of baffle plates.
—F. H. L.

Gas; Apparatus for Testing Illuminating ——. Gasmesserfabrik Mainz Elster and Co. Eng. Pat. 25,958, Nov. 25, 1902. XXIII., page 1148.

Acetylene Gas: Material for Use in Purifying ——. J. McNally, Cookstown, Tyrone Co., Ireland. Eng. Pat. 20,826, Sept. 24, 1902.

Peat-moss litter is soaked in a saturated aqueous solution of copper sulphate. This is used in any suitable purifying vessel, such as that described in Eng. Pat. 2001, 1902; this Journal, 1902, 1388. When employed in this manner, the uppermost tray in the purifier should bear a layer of dry moss litter in order to intercept any moisture or acid vapours.—F. H. L.

Incandescent Gas Mantles; Toughening Compounds for, and the Manufacture of ——. J. Hirsch, Berlin. Eng. Pat. 23,986, Nov. 3, 1902.

See Fr. Pat. 324,718 of 1902; this Journal, 1903, 620.
—T. F. B.

United States Patent.

Gas-Producer. A. M. Gow, Edgewood, Pa., Assignor to G. Westinghouse, Pittsburg. U.S. Pat. 739,305, Sept. 22, 1903.

In a gas-making chamber are provided a fixed table of larger diameter, located below the gas-making chamber and supporting the body of fuel, a fixed tuyère for the admission of air and steam, located centrally in the gas-making chamber, a hub surrounding the tuyère, and connected by suitable gearing with an external source of power, and capable of being rotated in either direction, and an ash-poker connected with the hub, and having its opposite sides of similar curvature, the ash-poker lying in a plane parallel to the face of the fixed table.—J. F. B.

French Patents.

Briquettes; Manufacture of —— from Coke-Dust, Anthracite, Lignite, Peat, or Charcoal. B. Desouches, M. Desouches, and A. Gratlin. Fr. Pat. 331,031, April 8, 1903.

Ninety to ninety-three parts of coke dust, lignite, &c., are mixed with 7 to 8 parts of a combustible agglutinant composed of: 2 parts of resin, 1·5 parts of a mixture of dried tar, freed from anthracene products, to which one quarter of its weight of Landes resin is added, $\frac{3}{4}$ to 1 part of sodium nitrate, and 3·5 parts of petroleum residues, these latter being carefully distilled, and superheating avoided.—L. F. G.

Briquettes; Manufacture of Carbon ——. A. Waddell. Fr. Pat. 331,776, May 6, 1903.

See Eng. Pat. 9505 of 1903; this Journal, 1903, 943.
—T. F. B.

Carbonising Peat, Oil, Wood, &c.; Process of ——, or of Manufacturing Coke. M. Ekenberg. Fr. Pat. 331,720, May 4, 1903.

The carbonaceous matter is heated with water (*e.g.*, peat should contain 80—95 per cent.) to 150°—250° C., in such a manner that the water cannot evaporate, thus avoiding loss of heat and the formation of gaseous products. (Peat should itself contain 80—95 per cent. of water, and would therefore require no extra addition.)—T. F. B.

Combustible Liquids; Apparatus for the Vaporisation of ——. Claudel and Co., Ltd. Fr. Pat. 331,372, April 20, 1903.

The invention relates to an apparatus for the volatilisation of petroleum, alcohols, &c., to be used as illuminants or for motive power. In order to avoid the condensation of the vapours on coming in contact with the admixed air, or the deposition of carbon which usually occurs through superheating, the combustible liquid is mixed with the hot waste gases from a gas engine, a blast furnace, or lime-kiln, and then heated to ensure complete volatilisation. The carbon dioxide in the admixed gases combines with any carbon that is set free to form carbon monoxide, while any water vapour present produces carbon monoxide and hydrogen. The vaporiser consists of a pump to deliver the combustible liquid, a chamber in which it is mixed with the hot gases, and a heating chamber, the sides of which are provided with metal flanges. By filling the heating chamber with coke, the gas can be further enriched by the carbon monoxide thus produced from the carbon dioxide.—L. F. G.

Gas; Apparatus for Manufacturing —— [from Water and Hydrocarbons]. C. W. Turner. Fr. Pat. 331,568, April 28, 1903.

See Eng. Pat. 9573 of 1903; this Journal, 1903, 1039.
—T. F. B.

Gases, Mixed, of Various Calorific Powers; Manufacture of ——. Soc. pour l'Exploitation des Procédés de Production de Gaz Industriels. Fr. Pat. 331,613, April 30, 1903.

The coal is distilled till the greater part of the gases has been given off, and half-finished coke is left behind. This coke is then transferred to water-gas retorts, and converted into water-gas by any of the usual processes. The gases thus produced can be mixed in any desired proportion.

The process offers special advantages if the water-gas is led into the retorts during distillation, as it then sweeps out all the hydrocarbons before they undergo decomposition, formation of graphite being thus prevented. In the water-gas retorts it is advantageous to blow in the steam at the top, withdrawing the gases at the bottom of the charge, any hydrocarbons still remaining in the half-finished coke being thus extracted. Should it be desired to reduce the calorific power of the gas, it is mixed with the carbon dioxide obtained in the Dellwik-Fleischer process, any carbon monoxide still left in this gas being utilised.
—L. F. G.

Incandescent Gas Mantles. G. Buhlmann.
Fr. Pat. 331,155, April 11, 1903.

The mantle is made of one continuous piece by applying to a properly shaped form a paste of cellulose, starch, or similar substance which, of itself, leaves no ash on incineration. The paste is mixed with the necessary quantity of luminiferous oxides, and is spread over the form by a dipping or painting process, the skin being finally dried and "burnt off."—F. H. L.

Electrically Conducting Materials [*Arc-Lamp Electrodes*]; *Manufacture of* ——. E. Sander. First Addition, dated April 9, 1903, to Fr. Pat. 297,561, Feb. 24, 1900.

The fused and powdered mixture of oxides, &c., made according to the main patent (see Eng. Pat. 3731 of 1900; this Journal, 1900, 450), is mixed with tar, treacle or the like, in such proportions that after the whole has been dried and calcined at 1,000° to 1,400° C., the amount of the oxide mixture present shall not exceed 30 per cent. If desired, part of the carbonaceous matter derived from the tar may be replaced by powdered charcoal. As the electrodes so manufactured give a tinted light, up to 5 per cent. of vanadium oxide may be incorporated with the composition (in the form of ammonium vanadate), which addition renders the light perfectly white. The electrodes are moulded by pressure into the desired shapes in the usual way, while the composition is plastic from the presence of the undecomposed organic matter.—F. H. L.

Arc Lamps; Caps for the Carbons of ——. L. E. Muller. Fr. Pat. 331,676, May 1, 1903.

The inventor proposes to place round the point of one or both of the carbons of an electric arc lamp, a short sleeve, which rests against the carbon on three internal ribs only, and which projects a short distance beyond the end of each electrode. The caps are composed of magnesia, 32 per cent.; lime, 65 per cent.; and cerium oxide, 3 per cent. They are raised to incandescence by the heat of the arc, and are claimed to increase the illuminating power of the lamp. When two caps are employed, the arc is entirely surrounded by them, and they form the only luminous source. They are either kept in position by moving mechanism, or are so arranged that they automatically slip down the lower rod as it is worn away by the current. —F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

English Patent.

Lubricating Power of Oils, Greases, and other Lubricants; Apparatus for Testing the ——. H. V. Blake. Eng. Pat. 25,492, Nov. 20, 1902. XXIII., page 1148.

United States Patent.

Still for Petroleum Oil or Fluid Hydrocarbons. W. Ryder and J. A. Qualey, Philadelphia, Assignors to J. J. O'Donohue, New York. U.S. Pat. 739,757, Sept. 22, 1903.

A still fitted with furnace tubes through which the products of combustion coming from the fire are passed. The end plates of the still are curved inwardly, and the furnace tubes are bent longitudinally, so that the joints may not be broken by the expansion and contraction of the apparatus. —F. H. L.

French Patent.

Ammonia from Gaseous Products of Dry Distillation; Extraction of ——. Soc. Franz. Brunck. Fr. Pat. 331,077, April 9, 1903.

See Eng. Pat. 8287 of 1903; this Journal, 1903, 795. —T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Fluorescence and Chemical Constitution. R. Meyer. Ber., 1903, **36**, [12], 2967—2970.

The author has already suggested (this Journal, 1898, 448) that the fluorescence of organic compounds is to be attributed to the presence of certain "fluorophoric" (for explanations and examples, see *loc. cit.*) groups of atoms in the molecule. These fluorophores are usually cyclic groups, but the fluorescence only becomes evident when the fluorophoric group is between two other dense atomic complexes, particularly between two benzene nuclei. Fluorescence occurs both with coloured and with colourless substances, and consequently fluorophoric and chromophoric groups are not identical. The view that fluorescence is the beginning of colour is not supported by a consideration of the constitution of fluorescing substances.

The author discusses Hewitt's theory (Zeits. physik. Chem., 1900, **34**, 1; and this Journal, 1903, 127) of the constitution of fluorescing compounds, and, as an addition to it, suggests that for the occurrence of fluorescence, the presence of a fluorophoric group is essential as well as symmetrical tautomerism.

Fluorescence amongst coumarin compounds is also discussed.—J. McC.

Isatin, Indigo, and Anthranil; Benzoylation of ——. G. Heller. Ber., 1903, **36**, [12], 2762—2766.

Isatin is benzoylated by heating 2 grms. with 10 grms of benzoyl chloride in a sealed tube for two hours at 170° C. The product is washed with water and sodium carbonate solution, and crystallised from toluene. The compound formed, which is identical with benzoylpseudoisatin, melts at 206° C.

For the benzoylation of indigo, 13 grms. are suspended in 60—70 grms. of pyridine, and 15 grms. of benzoyl chloride are added. The mixture is heated on the water-bath, then cooled, and a further quantity of 15 grms. of benzoyl chloride is added. The mixture is then heated until complete solution takes place. After cooling, the mass is washed with water, then with dilute hydrochloric acid, and finally with sodium carbonate solution. The product is purified by dissolving in acetone and, after filtration, precipitating with water. During the reaction, reduction takes place, so that tetrabenzoyl-indigo-white is produced; it crystallises in colourless needles, and melts at 217°—218° C. It is soluble in benzene, pyridine, and ether, but insoluble in petroleum ether. Alcoholic alkali causes it to turn blue, and, on dilution with water, indigo is deposited. It is soluble in concentrated sulphuric acid and in glacial acetic acid.

Anthranil is benzoylated by heating with five times its weight of benzoyl chloride at 140°—150° C.—J. McC.

Nitrosophenol Dyestuffs. H. Decker and B. Solonina. Ber., 1903, **36**, [12], 2886—2894. (Compare this Journal, 1902, 1274.)

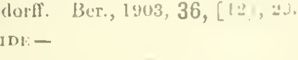
It has been proved that the oxonium salt, $C_{24}H_{25}N_3O_9$, obtained from thymol ethyl ether and fuming nitric acid, contains two ethoxy groups, and by titration it has been found that it contains 2 mols. of nitric acid; it may, therefore, be represented by the formula $C_{20}H_{23}NO(OC_2H_5)_2, 2HNO_3$. Its melting point is 79° C., and not 62°—63° C., as previously stated.

The methyl ether of thymol when similarly treated with nitric acid, does not give crystals, but on reduction of the product, colourless crystals of dimethylthymolylamine hydrochloride are formed.

The results of further experiments lead the authors to conclude that, with respect to colour reactions of phenols with nitrous acid in concentrated sulphuric acid, (1) phenols with the para position unoccupied give, in the first place, nitrosophenols, then quinonephenolimides, which are soluble in concentrated sulphuric acid with a blue colour, and on dilution of the solution the colour changes to violet or red, and on addition of alkali, the characteristic blue alkali salt is formed; (2) the reaction is hindered by the presence of a larger group in the ortho position with respect to the *p*-hydrogen atom. Acid groups (CO_2H, NO_2) in any position may also hinder the action.—J. McC.

Chrysazin and Hystazarin; Some Derivatives of ——. H. Schrobsdorff. Ber., 1903, **36**, [12], 2936—2940.

Chrysazinamide—



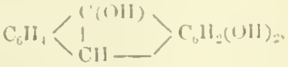
$$HO.C_6H_3\begin{matrix}\diagup CO \diagdown \\ \diagdown CO \diagup\end{matrix}C_6H_4.NH_2,$$

is obtained by heating chrysazin paste, saturated at 0° C with ammonia, for five hours at 145° C. in a sealed tube

When its hot alcoholic solution is treated with nitrous acid, erythro-hydroxyanthraquinone is produced, which forms dark red needles melting at 189°—190° C.

With bromine, chrysazin gives an orange-yellow-coloured dibromo-compound, and an orange-red coloured tetrabromo compound; the former melts at 210°—213° C., and the latter at 295° C., and neither can be used as a dyestuff with the ordinary mordants. When the dibromo derivative is fused with caustic potash, dihydroxychrysazin, $C_{14}H_6O_2(OH)_4$, is formed; this can be sublimed *in vacuo*, and forms dark red needles which melt at 217° C. In dilute alkalis and in concentrated sulphuric acid it is soluble with a carmine-red colour. Ordinary mordants are intensely coloured by it. Its calcium and barium salts are violet. Tetra-acetyl-dihydroxychrysazin, $C_{14}H_4O_2(O.C_2H_3O)_4$, forms light yellow needles which melt at 195° C.

2:3-*Dihydroxyanthranol*—

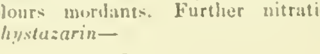


$$C_6H_4\left\langle\begin{matrix}C(OH)\\|\\CH\end{matrix}\right\rangle C_6H_2(OH)_2,$$

is formed when hystazarine in ammonia solution, is warmed with zinc dust. It is obtained in yellow-brown needles melting at 282° C. It dissolves in alkali or ammonia with a yellow colour, and the solution exhibits a greenish fluorescence. Its triacetyl derivative forms white needles, and melts at 163°—164° C.

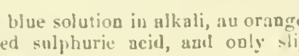
Dibromohystazarin, $C_{14}H_4Br_2O_2(OH)_2$, obtained by heating hystazarin and bromine in a sealed tube at 150° C., melts at 127°—129° C. It is soluble in alkali with a violet colour, and in concentrated sulphuric acid with an orange-red colour. It colours ordinary mordants fairly well.

When hystazarin is nitrated in sulphuric acid with 1 mol. of nitric acid, 1-*nitrohystazarin*—



$$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle C_6H(NO_2)(OH)_2,$$

is formed. It is obtained in yellow crystals, and only slightly colours mordants. Further nitration leads to 1:4-*dinitrohystazarin*—



$$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle C_6(NO_2)_2(OH)_2,$$

which gives a blue solution in alkali, an orange-red solution in concentrated sulphuric acid, and only slightly colours mordants.—J. McC.

Chrysazin Derivatives. F. Wöbling. Ber., 1903, **36**, [12], 2941—2942.

CHRYSAZIN gives a monopotassium salt, $C_{14}H_7O_4K$, when it is dissolved in a little hot dilute caustic potash solution. The salt forms orange-red needles, which become violet by loss of water when heated at 100° C.

Potassium chrysazin-disulphonate—

$$C_{14}H_4O_2(OH)_2(SO_3K)_2,$$

is formed when 1 part of chrysazin and 6 parts of sulphuric acid containing 20 per cent. of anhydride, are warmed, then poured into 100 parts of water, and boiled with 50 parts of a hot saturated solution of potassium chloride. It only slightly colours ordinary mordants, but gives deeper colours with Scheurer's mordants. When fused with alkali it gives *dihydroxychrysazin*—

$$C_{14}H_4O_2(OH)_4,$$

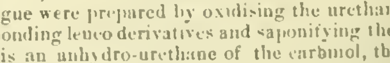
which is soluble in alkali with a blue colour. It melts at 292° C., and intensely colours ordinary mordants. Its acetyl product forms yellow needles melting at 238°—240° C. This dihydroxychrysazin is, therefore, isomeric, and not identical with that described by Schrobsdorff (preceding abstract).—J. McC.

Protocatechuic Aldehyde Dyestuffs. C. Liebermann. Ber., 1903, **36**, 2913—2929.

IN a former article (this Journal, 1902, 965) the author showed that, in distinction to the ordinary dyestuffs of the Benzaldehyde Green group, dyestuffs prepared in an analogous manner from protocatechuic aldehyde (*o*-*o*-dihydroxybenzaldehyde) dye strongly on ordinary metallic oxide mordants. In the present article it is shown that in these cases the condensation takes place in a normal manner, and that these mordant-dyeing dyestuffs are *o*-*o*-dihydroxy derivatives of the corresponding compounds of the Benzaldehyde Green series. The presence of the free hydroxyl groups changes the shade from green to blue, and the author proposes to call the dyestuff from protocatechuic aldehyde and dimethylaniline Protocatechuic Aldehyde Blue, or more shortly, Proto-blue. Both the mordant-dyeing properties and the blue shade are dependent on the presence of the free hydroxyl groups. The corresponding dyestuffs in which these groups are acetylated or benzoylated are green, and do not possess mordant-dyeing properties. They are, however, rather unstable, saponifying with great readiness, even in a dye-bath. The condensation product of protocatechuic aldehyde with dimethyl-*m*-aminophenol yields, according to the method of oxidation, either a red fluorescent Rosamine dyestuff or a red, non-fluorescent tetrahydroxylated dyestuff, which contains no pyrone ring. These products also dye on metallic oxide mordants, but in their case no radical change in the shade is produced through the influence of the two *o*-hydroxyl groups. By the oxidation of the tetra-acetyl leuco compound of acetylated Proto-red, a green dyestuff is obtained.—E. F.

Triphenylmethane Derivatives, and Oxidation Products of the same, obtained from Tetramethyldiaminodiphenyl carbinol and m-Ethoxybenzoic Acid, its Amide, Methylamide, and Dimethylamide. P. Fritsch. Annalen, 1903, **329**, [1], 66—81.

THE product obtained with *m*-ethoxybenzoic acid yields on oxidation the corresponding lactone without coloration of the liquid. This is readily reduced to the leuco derivative with zinc-dust and acetic acid. The products obtained from the acid amide and methyl-amide yield, on oxidation, green liquids, which are not reduced by zinc-dust and acetic acid, and from which the corresponding lactams can be isolated after neutralisation with alkali carbonates. The product obtained from the dimethylamide yields a green solution on oxidation, from which caustic alkali precipitates the colour-base—



$$C_2H_5O.C_6H_3\left\langle\begin{matrix}C(OH):[C_6H_4.N(CH_3)_2]_2\\CO.N(CH_3)_2\end{matrix}\right.$$

This dyes wool in similar shades to Brilliant Green, and is readily reduced by zinc dust and acetic acid to the leuco compound. The author shows that in the formation of these compounds condensation takes place in the *p*-position to the ethoxy group.—E. F.

Dibenzalacetone and Triphenylmethane. A. von Baeyer and V. Villiger. Ber., 1903, **36**, 2774—2796. (See also this Journal, 1902, 607, 1326.)

A HEXANITRO derivative of triphenylmethane is described, which yields a triaminotrinitrotriphenylmethane on partial reduction. Attempts to obtain tri-*o*-aminotriphenylcarbinol from this compound, or by other means, failed. On the other hand, *o*-Aminomalachite Green and a methylated homologue were prepared by oxidising the urethanes of the corresponding leuco derivatives and saponifying the product, which is an anhydro-urethane of the carbinol, there being internal elimination of 1 mol. of water. *o*-Aminomalachite Green and its homologues are colourless crystalline compounds yielding blue salts and dyeing in pure blue shades. The products obtained from them by acetylation, which are anhydro-acetyl compounds, 1 mol. of water being eliminated, dye in shades differing little from those produced by Malachite Green. The authors also describe derivatives and de-methylation ("Entmethylirung") products of phenyl-dianisyl- und diphenylanisyl-carbinol, and an anhydride of *p*-aminotriphenyl carbinol, which is a colourless crystalline substance which immediately forms salts of the mother substance with mineral acids.—E. F.

Aniline Manufacture; Some By-products of ——. F. B. Ahrens and W. Blümel. Ber., 1903, **36**, 2713—2716.

THE authors examined a neutral oil of fragrant smell obtained from the *échappes* of the "dry" distillation of aniline, by washing them with hydrochloric acid. They separated it into an aromatic and a fatty portion. The aromatic substances consisted mainly of chlorobenzene, accompanied by more highly chlorinated derivatives of benzene and iodobenzene. The fatty substances consisted of a mixture of methyl-α-methylbutylketone, $CH_3.CO.CH(CH_3)C_3H_7$, and ethylpropylketone, $C_2H_5.CO.C_3H_7$.—E. F.

Alkyl ; Determination of ——. H. Decker. XXIII., page 1152.

English Patents.

Intermediate Compounds and Colouring Matters therefrom containing Sulphur [Sulphide Dyestuffs] ; Manufacture of ——. Read Holliday and Sons, Ltd., Jos. Turner, H. Dean, and Jas. Turner, Huddersfield. Eng. Pat. 22,534, Oct. 16, 1902.

Dyestuffs of various shades are obtained by heating with sodium sulphide and sulphur certain aminoazo compounds. These are obtained by combining the diazosulphonic acids from aniline, toluidine, xylidine, α- and β-naphthylamine, aminophenols, aminonaphthols, and aminosalicylic acids, or the diazo compounds from unsulphonated aminophenols and aminosalicylic acids, with α-naphthylamine. Intermediate products are obtained by the action of 1.2.4-dinitrochlorobenzene on the above-mentioned aminoazo compounds in presence of sodium acetate. These also produce sulphide dyestuffs on melting with sodium sulphide and sulphur, with or without admixture with *p*-aminophenol, *p*-aminosalicylic acid, dinitro-oxydiphenylamine, picramic acid, or the sulphonic acids of these compounds.—E. F.

Colouring Matters [Thiobenzenyl Dyestuffs] ; Manufacture of ——. Read Holliday and Sons, Ltd., Jos. Turner, H. Dean, and Jas. Turner, Huddersfield. Eng. Pat. 23,514, Oct. 28, 1902.

Dyestuffs dyeing in yellow shades on animal and vegetable fibres are produced by condensing one or two molecules of 1.2.4-dinitrochlorobenzene with one molecule of dehydrothio-*p*-toluidine sulphonic acid, or of primuline, by boiling in aqueous solution in presence of sodium carbonate or acetate. The dinitrochlorobenzene may be replaced by *p*-nitrochlorobenzene or its sulphonic acids. In this case the reaction must be performed in closed vessels at about 160° C.—E. F.

Sulphurised Dyestuff [Sulphide Dyestuff] ; Manufacture of a New ——. O. Imray. From Farb. vorm. Meister, Lucius und Brüning, Höchst a/M., Germany. Eng. Pat. 22,824, Oct. 20, 1902.

The product (indophenol) obtained by oxidising *p*-phenylenediamine with phenol is heated with an alkali polysulphide. If the melt is heated to about 125° C., a dyestuff giving bluish-black shades is obtained. By heating to above 130° C., the product obtained, dyes in greener shades. Both these products differ from that obtained on treating *p*-amino-*p*-hydroxydiphenylamine (leuco-indophenol) in a similar manner (see U.S. Pat. 710,766, 1902 ; this Journal, 1902, 1328), this latter product dyeing in bright blue shades.—E. F.

Azo Dyestuff ; Manufacture of a Red ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 23,831, Oct. 31, 1902.

See U.S. Pat. 733,280 of 1903 ; this Journal, 1903, 946.
—T. F. B.

Azo Dyestuffs ; Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 23,993, Nov. 3, 1902.

See U.S. Pat. 737,967 of 1903 ; this Journal, 1903, 1082.
—T. F. B.

Sulphur [Sulphide] Dyestuffs. T. R. Shillito, London. From the Aniline Colour and Extract Works, formerly J. R. Geigy, Basle. Eng. Pat. 23,967, Nov. 3, 1902.

See Second and Third Additions to Fr. Pat. 306,655 of 1900 ; this Journal, 1903, 490 and 792. The dyestuffs obtained by melting mono- or diformyl-*m*-toluylenediamine with *m*-toluylenediamine, or *m*-phenylenediamine, or their derivatives, and sulphur are also claimed.—T. F. B.

Nitriles, Aromatic ; Manufacture of ——. O. Imray. From Fabriques de Prods. Chimiques de Thann et de Mulhouse, Thann, Alsace, Germany. Eng. Pat. 24,161, Nov. 7, 1902.

von Miller and Ploechl (Ber., 25, 2028) obtained phenylglycin from aniline, formaldehyde, and anhydrous hydrocyanic acid. The most convenient modification of this process hitherto used, consists in the employment of aqueous hydrocyanic acid, which has certain disadvantages. The patentees employ a solution of hydrocyanic acid in an organic solvent, such as ether, alcohol, or acetone. For instance, aniline and formaldehyde are mixed with an alcoholic hydrocyanic acid solution. When the reaction is complete, the alcohol is distilled off, finally *in vacuo*. The nitrile of phenylglycin is left as an oil, which speedily solidifies.—E. F.

Bases, Aromatic [Paranitraniline] ; Manufacture of ——. A. Meyenberg, R. J. Lévy, and the Clayton Aniline Co., Ltd., Manchester. Eng. Pat. 21,869, Nov. 12, 1902.

p-Nitraniline is obtained by heating *p*-nitrochlorobenzene with aqueous ammonia under pressure. The reaction may be continued until the conversion into *p*-nitraniline is complete, or residual *p*-chloronitrobenzene may be removed by distilling it over with steam. *o*-Nitraniline is obtained from *o*-chloronitrobenzene in a similar manner. *p*-Nitraniline is also obtained by heating *p*-chloronitrobenzene sulphonic acid with aqueous ammonia under pressure and boiling the resulting *p*-nitraniline-sulphonic acid with dilute mineral acid. If in this latter operation dilute sulphuric acid is used, the *p*-nitraniline can be isolated in the form of its sulphate, $[C_6H_4(NO_2.)NH_2]H_2SO_4$.—E. F.

Dyestuffs [Azo Dyestuffs] obtained by the Combination of Diazo Compounds with Acetyl- and Formyl-para-amidophenols and their Derivatives, and Processes for the Production of the same. A. Bang, Leeds. From Dahl and Co., Barmen. Eng. Pat. 2991, Feb. 9, 1903.

It is found that acetyl- or formyl-*p*-aminophenol, unlike *p*-aminophenol, will combine with diazonium compounds, giving dyestuffs which, on subsequent treatment (on the fibre) with bichromate, give shades very fast to milling and light.

The diazonium compounds used are those from diazotised α-naphthylamine, the naphthylamine monosulphonic acids 1.4, 1.5, 1.6, 1.7, 2.5, 2.6, 2.7, and 2·8 ; also diazotised α-naphthylaminedisulphonic acids 1.4.6 and 1.4.7. The acetyl- or formyl-*p*-aminophenol may be replaced by their chloro derivatives, or by their sulphonic acids, or by the corresponding amino-*o*-cresol derivatives.

The dyestuffs thus obtained all give yellow, orange, and brown shades on wool from an acid bath ; on treatment with bichromate, the lighter shades are neutral reddish- or bluish-grey, and the darker ones reddish- or bluish-black.
—T. F. B.

United States Patents.

Azo Dye ; Reddish-Brown ——. E. Münch, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhine, Germany. U.S. Pat. 737,445, Aug. 25, 1903.

Diazotised anthranilic acid is combined with one molecule of *p*-cresol in presence of excess of sodium carbonate. The resulting dyestuff produces dyeings on animal fibres which are converted on chroming into reddish-brown shades of great fastness.—E. F.

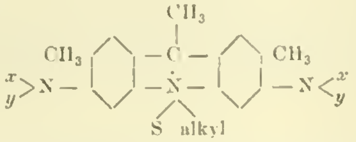
Red Dye [Pyrone Dyestuffs]. O. Nastvogel, Assignor to Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 738,227, Sept. 8, 1903.

One molecule of benzaldehyde or of a benzaldehyde in which one or two hydrogen atoms are replaced by halogens, methyl- or amino-groups, is condensed with two molecules of *o*-monoalkylamino-*p*-cresol (CH_3 : NHR : OH = 1:2:4). Water is split off from the resulting triphenylmethane derivative, and the pyrone compound produced oxidised to form the dyestuff. The products show fluorescence in alcoholic solution, and dye tannin-mordanted cotton, silk,

or wool in red shades. The dyestuff from *o*-chlorobenzaldehyde and o-methylamino-*p*-cresol is specially claimed.
—E. F.

Acridinium Dye [*Acridine Dyestuffs*]; *Yellow* ——, *and Process of Making Same.* O. Sohst, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine. U.S. Pat. 739,117, Sept. 15, 1903.

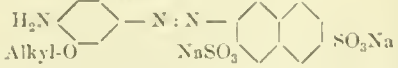
Yellow to orange-yellow dyestuffs, having the general formula—



where S is an acid radicle, and *x* and *y* hydrogen or alkyl groups, are prepared by heating the leuco compounds of amino-acridine dyestuffs with dilute hydrochloric acid and alcohol to a high temperature, and oxidising the resulting products. The dyestuffs thus produced are easily soluble in water, giving orange-yellow solutions, and soluble in concentrated sulphuric acid to a yellow solution, with a greenish-yellow fluorescence. Yellow to orange-yellow shades are obtained on cotton treated with tannin.—T. F. B.

Monazo Dye [*Azo Dyestuffs*], *and Process of Making Same.* O. Sohst, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine. U.S. Pat. 739,118, Sept. 15, 1903.

Azo dyestuffs having the general formula—



are obtained by diazotising monoacetyl-*p*-diaminohydroquinone dialkyl ethers, and coupling with chromotrope acid, the acetyl group being subsequently eliminated in the usual manner.

The dyestuffs are soluble in water and sulphuric acid, and give pure blue shades on wool.—T. F. B.

French Patents.

Monoazo Dyestuffs [*Azo Dyestuffs*]; *Production of Mordant* ——. Actienges. f. Anilinfabrikation. Fr. Pat. 331,121, April 11, 1903.

The dyestuffs are derived from 1-hydroxy-2-diazo-4-aminobenzene, its carboxylic or sulphonic acids, or its chloro- or nitro-derivatives, and are remarkable for their fastness to fulling and to boiling water, when dyed on chrome-mordanted wool. They are obtained either by coupling 1-hydroxy-2-diazo-4-nitrobenzene or its derivatives with another component, and reducing the product, for instance, with sodium sulphide, or by coupling 1-hydroxy-2-diazo-4-acetaminobenzene or its derivatives, with another component, and eliminating the acetyl group. The product derived from 1-hydroxy-2-diazo-4-aminobenzene-6-sulphonic acid and β-naphthol dyes wool in violet-red shades, which change to a deep fast black on chroming.—E. F.

Disazo Dyestuffs [*Azo Dyestuffs*]; *Production of Primary* ——. La Raison commerciale: Kalle et Cie. Fr. Pat. 331,375, April 20, 1903.

Aminonaphthol disulphonic acids K or H, or aminonaphthol-sulphonic acid S, are combined in alkaline solution with diazotised *p*-nitraniline, and the dyestuff so obtained is reduced with a weakly alkaline reducing agent, such as sodium sulphide or glucose in alkaline solution. Derivatives of diazotised *p*-phenylenediamine (introduced into the hydroxylated nucleus of the naphthalene derivative) are so obtained, which differ from the original dyestuffs by possessing greater dyeing power and a greener shade. The product obtained in this way from aminonaphtholdisulphonic acid K dyes wool from an acid bath in greenish-black shades, fast to washing and to light.—E. F.

Dyestuff [*Nitro-Dyestuff*]; *Production of a Yellow* ——. Read Holliday and Sons, Ltd. Fr. Pat. 331,399, Apri 21, 1903.

m-Dinitrodiphenylamine-*p*-sulphonic acid is nitrated by means of nitric acid in aqueous solution. A brilliant yellow product is so obtained, readily soluble in hot water, dyeing wool, silk, and jute in greenish-yellow shades, fast to light.
—E. F.

Derivatives of Anthraquinone [*Anthracene Dyestuffs*] *Production of New* ——. Soc. Anon. des Prods. F. Bayer and Co. Fr. Pat. 331,616, April 30, 1903.

Quinizarine is heated to about 120° C. with aqueous solutions of the salts of weak acids, such as carbonates, phosphates, acetates, or borates; for example, sodium carbonate. Two products are so obtained, partly as such, partly as leuco compounds, which are readily oxidised by a current of air in boiling aqueous solution. Product "A" is soluble with difficulty in water in the form of its sodium salt, whereas product "B" is almost insoluble, and can be filtered off. "B" can be prepared from "A" by subjecting it to more energetic treatment. At low temperatures "A" is the main product.—E. F.

Saturator with Sprays, to be used for the Aeration of Wines, Brandies, &c., and Oxidation of Dye Solutions, &c. J. L. Planeur. Fr. Pat. 331,092, April 14, 1903. XVII., page 1144.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Dyeing Process; The ——. A. Binz and G. Schroeter. Ber., 1903, **36**, 3008–3014. (See also Ber., 1902, **35**, 4225.)

The authors came to the conclusion that dyeings which can be obtained with azobenzene sulphonic and carboxylic acids, with *m*-aminoazobenzenes, and with quarternary ammonium bases of the azo group, may be considered as cases of normal salt-formation; and that dyeings obtained with *o*- and *p*-aminoazobenzenes, and with most o- and *p*-oxyazo compounds, do not depend on salt-formation, or only partially so. They base their conclusions on the fact that acid dyestuffs of the first group do not dye on wool in neutral or alkaline solution, whereas acid dyestuffs of the second class are not prevented from dyeing by presence of alkali. On the other hand, basic dyestuffs of the first class, are, in distinction to those of the second class, prevented from dyeing by the presence of acids. They also point out that dyestuffs of the second class may be considered to have an *o*- or *p*-quinonoid constitution, and think dyeings with real substantive dyestuffs may be considered as a condensation of the "desmotropo-quinonoid" nucleus with the molecule of the fibre.—E. F.

Azo Compounds, Alkylated ——: *A Contribution to the Theory of Dyeing.* R. Meyer and J. Maier. Ber., 1903, **36**, 2970—2978.

The authors show that it is not necessary for a dyestuff to have free hydroxyl or amino groups. On reinvestigation they find that Chrysophenine and Diamine Gold Yellow are not monoethyl but diethyl derivatives of the combinations of phenol with tetrazostilbenedisulphonic acid and tetrazonaphthalenedisulphonic acid respectively. These substantive dyestuffs must therefore owe their affinity to the fibre to the sulphonic groups which they contain. They owe their fastness to alkali to the ethyl groups, the corresponding non-alkylated dyestuffs being extremely sensitive to alkali. Comparative dyeings were carried out with azobenzene-sulphonic acid, oxyazobenzene-sulphonic acid and ethoxyazobenzene-sulphonic acid. The differences in these dyeings were only slight, but these dyestuffs have far less affinity for the fibre than Chrysophenine and Diamine Gold Yellow. This must be attributed to the fact that the latter contain both the chromophoric and the sulphonic groups twice, and also have double the number of benzene nuclei.
—E. F.

English Patents.

Wadding, Dyed in one Continual Process; Complete Manufacture of ——. H. and W. Longley, Marple Bridge. Eng. Pat. 19,222, Sept. 2, 1902.

Instead of dyeing the raw material, the cotton is dyed by passing it direct from the carding machine, through rollers, on to an endless carrying cloth immersed in the dye liquor, the latter containing also a solution of alum, and the whole maintained at a temperature of 160° F., so as to restore the necessary fulness of the material. The carrying cloth passes round rollers, so as to make the material traverse the dye vat, and the dyed wadding is then pressed inside the tank squeezed, partially dried in a steam-heated chamber, finished, and dried in one continuous process.
—B. N.

Printing Yarn used in the Manufacture of Carpets, Plush- or Pile-Goods for Upholstery, and Similar Fabrics; Automatic Colour-printing Machines for ——. P. Jensen, London. From J. Maemecke, Berlin. Eng. Pat. 17,169, Aug. 2, 1902.

An automatic colour-printing machine is described for printing all the various colours in a single journey of the printing carriage, in a manner similar to that described in Fr. Pat. 329,390 (see this Journal, 1903, 994). The carriage is moved automatically, step by step, along the yarn, the length of each step corresponding to the double pile length of the goods to be manufactured. The carriage has as many colouring devices as there are colours, and is also provided with levers which engage with rows of tumblers, the number in each row being also equal to the number of colours. The tumblers are controlled by a Jacquard machine, and when, after the forward movement of the carriage, a raised tumbler engages with a lever, the latter brings into action its own colouring device, the colour of which is to be printed in that particular position of the carriage. The construction of the printing device, the carriage movement gear, the printing carriage, and the automatic colour-printing machine are each separately claimed.—B. N.

rinting Machines; Calico- ——. The Calico Printers' Association, Ltd., Manchester, and J. Blair and T. Lindsay, both of Lennoxtown. Eng. Pat. 24,377, Nov. 7, 1902.

An improvement on Eng. Pat. 23,986, 1895, in which haded, clouded, or like effects are obtained by leading the abric away from the main printing bowl and guiding it nto printing contact with engraved rollers out of contact vith the bowl. In the present invention the guide rollers re mounted in movable bearings, so that by means of a avelling tappet chain, star wheel, and lever, the guide ollers receive an intermittent oscillating movement, and the abric is thus brought into or taken out of contact with e engraved rollers away from the printing bowl. Novel ffects are in this way obtained on scarves, loin cloths, &c., which a transverse border or other intermittent printing required. A modification is described in which the uide rollers may be stationary, and have on their surfaces pattern, or be fluted, corrugated, or spaced, so that the nsion of the cloth in contact with the printing rollers ay be altered intermittently and thus produce novel fects.—B. N.

United States Patent.

ercerising; Apparatus for ——. R. Boral and A. Kymer, Middleton, Manchester, Assignors to the Windsor Co., New York. U.S. Pat. 739,580, Sept. 22, 1903.

he claims are for a series of revolving rollers, with which e fabric remains in continuous contact, from the moment leaves the squeezing rollers, until it reaches the end of c series, where it is sprayed with water.—T. F. B.

French Patents.

bres, Long, for Spinning, and a Substance suitable for Tanning Purposes; Process for Converting Willow Shoots simultaneously into ——. L. von Ordody. Fr. Pat. 331,468, April 24, 1903.

ter the bark has been removed from willow shoots, viously softened with boiling water, the fibrous layer is removed, and may be used for tanning. The remainder is macerated with water, boiled with a 3—4 per cent. solution of alkali, together with an "emulsion of petroleum and lime," washed, treated with dilute acetic acid, washed and dried. The long fibres thus obtained are suitable for spinning.—T. F. B.

Threads, Artificial; Apparatus for Producing ——. F. Cochius. Fr. Pat. 331,104, April 21, 1903.

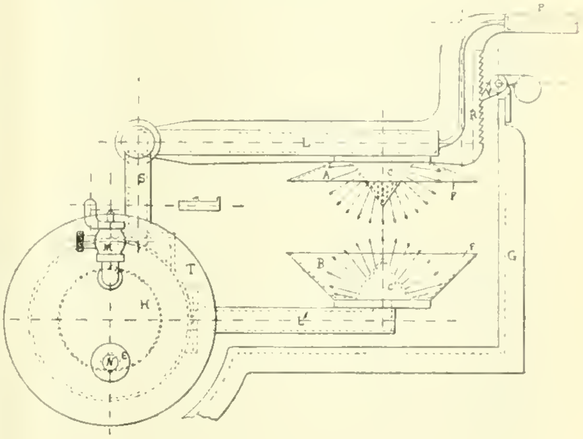
See Eng. Pat. 9017 of 1903; this Journal, 1903, 1083.
—T. F. B.

Bleaching Flax, Hemp, Cotton, Jute, Ramie, Straw, &c.; Process of ——. L. C. P. Jardin. Fr. Pat. 331,574, April 28, 1903.

After scouring, the fibre is treated with a dilute solution of nitric acid (say 5 c.c. of commercial nitric acid to the litre), previous to bleaching. This treatment obviates the necessity for the long exposure to air and sun.—T. F. B.

Mordanting, Dyeing, and Washing Textiles on Bobbins; Apparatus for ——, *without Disturbing or Measuring the Bobbins.* L. Erhart. Fr. Pat. 331,285, April 20, 1903.

The apparatus consists essentially of a cylindrical vessel T, connected, by pipes L and L′, with the perforated cones C and C′. The upper portion of the apparatus is raised, by the handle P, and the lower end of the bobbin is placed on the lower cone, C′; the upper portion is now lowered, so that the upper cone fits in the upper end of the bobbin, and is pressed into position, being held by the catch and slot, V, R.



The vessel T is then filled with the liquid, which is heated if necessary, and which is pumped through L and L′, and sprayed over the fabric by means of the perforated cones, thus ensuring even treatment of the whole of the fabric. The complete machine is made up of a number of such arrangements connected with the same liquid reservoir.
—T. F. B.

Indigo; Dyeing with Natural or Artificial ——, *on Textiles, Fabrics, Threads, Skeins, &c., of Cotton, Wool, Silk, or Mixtures.* H. Muller. Fr. Pat. 331,260, April 16, 1903.

See Eng. Pat. 9532 of 1903; this Journal, 1903, 993.
—T. F. B.

Fabrics; Process for Making ——, *Impervious [Waterproof].* J. H. F. Schrader. Fr. Pat. 331,602, April 30, 1903.

The fabric is coated with a mixture of linseed oil, 65 parts; soap, 16¼ parts; glycerin, 12[illegible] parts; and zinc sulphate, 6¼ parts.—T. F. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Printing; Means for Multi-Colour ——. The Printing Arts Co., Ltd., F. H. Mowbray, and W. Black, all of London. Eng. Pats. 23,579 and 23,580, Oct. 28, 1902.

This invention relates to means for printing, in several colours at one operation, upon hard material, such as metal, wood, glass, china, &c. Around the periphery of a cylinder are arranged an elastic collecting member and the hard part-design members, each of the latter being supplied with its own colour only, from suitable inking sets worked by cams from the main cylinder. Auxiliary transfer members, of wood or metal covered with rubber, and in gear with the main cylinder, are arranged so that each comes into contact with its corresponding hard part-design member and receives the part-design. All the auxiliary transfer members contact with the collecting member, and the latter imparts the whole design to the material to be printed. Modifications are described with a number of collecting members arranged as separate rollers, so that the material to be printed may receive two or more coatings of colour, or the collecting members may be arranged on separate cylinders together with the hard part-design members, a flat reciprocating bed, provided with grippers, supporting the material, so that the latter encounters each of the collecting members in turn.—B. N.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid Manufacture; Contact Process of —— *; or, Theory of Industrial Processes.* G. Bodländer and K. Köppen. Zeits. Elektrochem., 1903, **9**, [28], 559—568; [39], 787—794.

The equilibrium in the reversible reaction $2SO_2 + O_2 \rightleftarrows 2SO_3$ is given by the equation—

$$\frac{(SO_2)^2.(O_2)}{(SO_3)^2} = K.$$

Thus the production of SO_3 is favoured, or the complete conversion of SO_2 into SO_3 is approached, by increasing the oxygen-concentration. The reaction-speed is influenced similarly by the concentrations of the various reacting bodies; but while the equilibrium depends only on the relative concentrations, the speed of reaction depends on the absolute concentrations; and increase of oxygen-concentration, for example, may, by virtue of decreasing the absolute concentration of SO_2, retard the reaction more than it accelerates it, by virtue of increasing its own concentration. Since, at the temperatures of the authors' experiments, no dissociation of SO_3 occurs, the speed of the reaction is proportional to $(SO_2)^2.(O_2)$; and the authors have calculated the relative values of this speed for two initial mixtures of sulphur dioxide and air ($11\ SO_2$, $5{\cdot}5\ O_2$, $83{\cdot}5\ N_2$ and $5{\cdot}5\ SO_2$, $11{\cdot}875\ O_2$, $82{\cdot}625\ N_2$) after varying amounts of the sulphur dioxide have been converted. The following table gives the figures:—

Percentage converted.	$\frac{1}{K}.\frac{dx}{dt}.$	
	"Theoretical" Burner Gas.	Gas with twice the Amount of Air required.
0	665·8	359·2
10	493·2	288·6
20	352·3	226·3
30	240·0	172·0
40	153·7	125·2
50	90·4	86·7
60	47·1	54·8
70	25·5	30·6
80	6·1	13·7
90	0·75	3·3
95	0·102	0·85

Clearly, if the initial assumption on which the speed is calculated be correct, the dilution with extra air retards the reaction at first, while it is rapid, but greatly accelerates it in the later stages, when it is slower; so that on the whole the 95 per cent. conversion will be reached more rapidly with the excess of air than in the case of the "theoretical" gas.

The authors have then investigated experimentally the question as to whether this is in reality a trimolecular reaction (for many cases are known in which the reaction is really of a lower order than theory indicates). They enclosed known mixtures in a tube heated to known temperatures in presence of a catalytic substance, and measured the diminution of pressure at constant volume from time to time. (It was found that platinised asbestos would not answer, for the asbestos was attacked by, and of course destroyed some of, the sulphur trioxide produced. This destruction of the asbestos probably accounts for the many proposals to use on the industrial scale other substances as foundations for the platinum. Eventually platinum gauze, tightly rolled to fill the tube, was adopted as catalyst.) The results, with the "theoretical" mixture, and at temperatures of 182°, 218°, 302°, and 341° C., showed that the values of K were much more nearly constant when calculated on the basis of a trimolecular $[(SO_2)^2.(O_2)]$ than on that of a bimolecular $[(SO_2).(O_2)]$ reaction. The experiments also showed clearly the increase of speed with rise of temperature, indicating an increase about 1·4-fold per 10° C. rise. Experiments were next made, using the theoretical mixture of sulphur dioxide and oxygen diluted with varying amounts of nitrogen. The absolute speeds of reaction were diminished, as was to be expected, but the relative speeds were unaltered, *i.e.*, the amount of conversion in, say, 10 minutes, bore in every series the same relation to the amount in three hours. These experiments also showed, however, that the concentration of the sulphuric anhydride formed also influenced the speed of reaction (retarding it as it increased), though the reaction at these low temperatures is not reversible, as the sulphuric anhydride does not dissociate. Experiments with excess of sulphur dioxide and with excess of oxygen were also undertaken, and served to confirm the correctness of the theory, when allowance is made for the fact, brought out by the experiments with nitrogen-dilution that each of these gases acts not only in the direction of increasing the concentration of one acting constituent, but also in the direction of decreasing those of the rest.

It is shown by the experiments, then, that excess of oxygen hastens the completion of the oxidation of the sulphur dioxide, so that, though it slows it at first, it effect on the whole an economy of time, and hence of space and of contact-substance.

When platinum is used as a contact-substance, the spee of reaction is great enough for practical use at temperatur well below that of incipient dissociation of SO_3; but wit other contact-substances, sufficient speed of reaction ca only be attained at temperatures at which the dissociation pressure of SO_3 has notable values. With these substances then, the dissociation-pressure, as well as the speed o reaction, must be taken into account in choosing the mos suitable temperature for working. No doubt the influenc of temperature, pressure, dilution, excess of reacting sub stances, &c., will be similar for all contact-substances, bu the absolute values of the speed of reaction will vary wit the substance. The point of equilibrium, however, wil be independent of the nature of the contact-substan Knietsch (this Journal, 1902, 172 and 343) has given th temperatures at which various percentages of sulphur dioxid are converted into sulphur trioxide—96 per cent., 500 80, 600°; 58, 700°; 35, 800°; 15, 900°; 0 per cent., 1,000 —starting from a mixture of $7SO_2$, $10O_2$, $83N_2$ at atmo spheric pressure, and Brode has calculated from these th compositions of other mixtures in equilibrium at the temperatures.

But Knietsch determined his dissociation-constants b a method in which the gases streamed through a tube—method which leaves it open to doubt whether the speed the gases was, on the one hand, slow enough over th contact-substance for equilibrium to be attained, and, on th other hand, quick enough over the cooler parts of th apparatus for it to be maintained. Accordingly the authors have made a set of experiments by a manometric method. The gases were heated by an electric furnace in a tube of quartz containing the platinum gauze used as contact-substance, and connected by a long capillary, filled with air, to a manometer, on which changes of pressure at constant volume could be read. The tube was kept at the desired temperature till equilibrium was established, then very slowly cooled to 410° C.—a temperature at which no undissociated SO_3 remains. A companion tube, similar in all respects, save that it contained only air, gave the diminution in pressure due to the fall in temperature; the greater diminution in the reaction-tube was of course due to the re-formation of the dissociated SO_3. (It was found that these experiments could not be carried above 650° C., owing to absorption of oxygen by the platinum at higher temperatures.) From the results were calculated first the values of K.

The agreement of the figures, showing that the value of K is independent of dilution with nitrogen, or of the stoïchiometric relation of SO_2 to O_2, is very satisfactory, when the small total difference of pressure, and hence the great effect of a small error, is considered. Interpolation from the figures obtained, gives the values of K, at 500° and 600° C., as $1{\cdot}92 \times 10^{-6}$ and $8{\cdot}56 \times 10^{-5}$, while from Knietsch's curves the corresponding values are $2{\cdot}0 \times 10^{-6}$ and $6{\cdot}5 \times 10^{-5}$, a very close agreement.

Finally, by interpolation, the constants for various mixtures at various temperatures, and hence the equilibrium-compositions at these temperatures, have been calculated. In the following table the results are shown, the form adopted being to give the temperatures at which, with the given mixtures, definite percentages of the total possible amount of SO_3 will be formed when equilibrium is established :—

Composition of Original Mixture.		Yield of SO_3.						
SO_2	O_2	98 %	96 %	94 %	92 %	90 %	80 %	60 %
At atmospheric pressure.								
66·6	33·3	425?	476	497	520	538	597	668
11·69	5·85	378?	423	452	473	489	543	553
10·0	8·04	450	483	503	518	531	576	635
8·0	10·62	467	505	518	537	548	592	648
7·0	10·0	467	504	518	535	547	590	647
6·0	13·23	477	513	530	545	557	602	658
4·0	15·81	483	521	539	554	565	611	666
2·0	18·45	488	527	543	558	570	615	671
At 10 atmospheres pressure.								
11·69	5·85	428	477	504	527	543	605	680
10·0	8·04	503	538	558	576	589	639	703

The table shows that with the theoretical mixture of SO_2 and O_2, the yield is higher at a given temperature than with the "theoretical" burner-gas with 11·69 per cent. of SO_2, but that the addition of excess air to this latter raises the temperature for a given yield, or increases the yield at a given temperature. As the higher temperature increases the reaction-speed, the addition of air is doubly advantageous. Though the dilution with nitrogen reduces the reaction-speed, yet this disadvantage is more than counterbalanced by the advantages of working at the higher temperature. If the "theoretical" burner-gas be diluted with an equal volume of air, then (for 96 per cent. yield) we can raise the temperature by 90°, and thus increase the speed of reaction to $(1{\cdot}4)^9$ or, 20-fold. Even were the dilution made with nitrogen alone, the retardation to one-half would still mean a tenfold increase; and the accelerating effect of the surplus oxygen is still to be added to that. As the dilution goes further, however, its effect is relatively less. Dilution from 6 per cent. to 2 per cent. of SO_2, for example, raises the temperature for 96 per cent. by 14° only, and thus increases the speed 1·6-fold, while the dilution reduces it to one-third : on the whole, a retardation to about half, though the excess of oxygen will raise this somewhat. It is seen from the last two lines of the table, that the effect of pressure is favourable to the reaction; but while with the "theoretical" burner-gas the addition of very little excess oxygen produces much more result than considerable increase of pressure, when there is excess oxygen in the gas, the effect of increase of pressure is very considerable. As increase of pressure also raises the speed of reaction, the use of high pressures on the industrial scale still seems a possibility for the future.—J. T. D.

Aluminium, Beryllium, and Indium Hydroxides; Solubility of ——, in Ammonia and Amines. C. Renz. Ber., 1903, **36**, [12], 2751—2755.

Freshly precipitated aluminium hydroxide is perceptibly soluble in ammonia, but after filtration and washing, it becomes practically insoluble. From barium aluminate, by careful decomposition with ammonium sulphate and filtration, a solution is obtained from which acids precipitate a notable amount of alumina, which, when dried, is not horny, and dissolves in acids less readily than that precipitated in the ordinary way from aluminium salts. Aluminium hydroxide dissolves easily in the mono- and diamines of methyl and ethyl, even in presence of their hydrochlorides.

Beryllium hydroxide is quite insoluble in these amines, as well as in ammonia. Beryllium can be easily and completely separated from aluminium by precipitating their salts with ethylamine in excess, thus redissolving the aluminium hydroxide.

Indium hydroxide behaves towards amines very much as ferric hydroxide does, so that indium cannot in this way be separated from iron. With 33 per cent. dimethylamine, freshly precipitated indium hydroxide gives a turbid liquid which cannot be filtered clear, and leaves on evaporation and ignition a slight residue of indium oxide. In presence of hydrochloride of the amine no indium is dissolved, and the filtrate is quite clear.—J. T. D.

Aluminium Sulphate and Sulphuric Acid; A Compound of ——. E. Baud. Comptes rend., 1903, **137**, [13], 492—494.

The white crystalline substance obtained on heating bauxite with sulphuric acid diluted with an equal volume of water was found to be produced also by substituting pure alumina for bauxite, also by heating aluminium sulphate with 75 per cent. sulphuric acid, or with pure sulphuric acid to 110°—120° C.

The crystalline mass was pressed, washed with acetone and then with ether, and dried. The product was found to correspond with the formula $Al_2O_3, 4SO_3, 4H_2O$; it is with difficulty soluble in water.—P. F. B.

Lead Sulphate; Action of Tartaric Acid and its Salts on ——. C. Reichard. Chem.-Zeit., 1903, **27**, 921—925 and 943—944.

From his experiments on the action of tartrates on lead sulphate, the author draws the following conclusions. When lead sulphate, suspended in a little water, is treated with neutral ammonium tartrate, it dissolves, with the formation of lead oxide, sulphuric acid, and a residue of lead sulphate. The sulphuric acid forms, with lead oxide and lead sulphate, a double compound of a basic nature. The production of lead oxide is accounted for by the ammonia of the ammonium tartrate, acid ammonium tartrate being formed, which unites with the basic lead sulphate to give a neutral solution. Neutral sodium tartrate and sodium potassium tartrate are without solvent action on lead sulphate, but the addition of ammonia, or the substitution of the same for the sodium or potassium in the double salt, causes solution to take place.—W. P. S.

Sulphuric Acid; New Method of Determining ——. R. Silberberger. XXIII., page 1149.

Sulphides, Sulphites, Sulphates, and Thiosulphates; Method for the Detection of ——. L. Dobbin. XXIII., page 1148.

English Patents.

Hydrocyanic Acid; Process for Producing ——. H. C. Woltereck, London. Eng. Pat. 19,804, Sept. 10, 1902.

Perfectly dry ammonia and a "volatilised or gaseous carbon compound," also perfectly dry, are passed together with hydrogen in equal volumes over a strongly heated catalytic agent, such as platinised pumice. One volume of ammonia and two volumes of water-gas make a convenient mixture. The hydrogen cyanide produced is preferably absorbed in an alkaline solution.—J. F. B.

Carbonic Acid Gas; Apparatus for the Manufacture or Recovery and Purification of ——. J. Leslie, Belfast, Ireland. Eng. Pat. 9142, April 22, 1903.

The carbon dioxide, produced by burning coke or the like in a closed stove, passes to a water scrubber, and then through a series of coolers, in which the gas, after cooling, is bubbled through cold water, and thus purified. It is then pumped, under pressure, into a second absorber, jacketed like that first mentioned, nearly filled with an alkali carbonate solution, and when this is saturated, bicarbonate being formed, the hot gases from the stove are directed through the absorber jacket, whereby pure carbon dioxide is evolved, and is conducted to a gasometer. The two absorbers are thus used alternately. In charging bottles of liquid with the gas, a special apparatus is used to avoid loss of gas in "snifting," and consequent diminished pressure within the vessel.—E. S.

Sodium Carbonate; Producing ——. N. P. Hansen, Copenhagen. Eng. Pat. 19,986, Sept. 12, 1902.

In the manufacture of sodium carbonate by the ammonia process, the sodium bicarbonate intermediately produced is immediately combined with sodium hydroxide in proportion to form sodium carbonate.—E. S.

Ammonia from the Sewerage Waters of Towns; Extracting ——. R. Schilling and C. Kremer. Eng. Pat. 15,752, July 16, 1903. XVIII. B., page 1145.

Metallic Sulphides; Obtaining ——, in Electric Furnaces. I. J. Broun, Matrei, Austria. Eng. Pat. 24,236, Nov. 5, 1902.

A metallic sulphate is mixed with carbon, and heated in an electric furnace to obtain the corresponding sulphide. If an acid sulphate is used, it is mixed with a chloride of the same base and with carbon, and arrangements are made for collecting the hydrochloric acid gas evolved on heating.
—E. S.

Minerals; Pulverising and Cleaning ——. G. C. Propfe, Hamburg, Germany. Eng. Pat. 16,848, July 31, 1903.

Minerals which crackle on being heated, and particularly fluorspar and barium sulphate, are heated to redness, but without melting, to cause them to crumble. By sifting the disintegrated mineral it is separated from the foreign matter remaining in lumps.—E. S.

Gases from their Mixtures, especially Oxygen and Nitrogen from Atmospheric Air, and Apparatus therefor; Separation of ——. R. J. Lévy and A. Helbronner, Manchester. Eng. Pat. 20,053, Sept. 13, 1902.

See Fr. Pats. 328,770, 328,984, and 330,258 of 1903; this Journal, 1903, 966 and 1087 respectively.—T. F. B.

United States Patents.

Sodium Peroxide; Producing ——. C. E. Baker and A. W. Burwell, Cleveland, Ohio. U.S. Pat. 739,375, Sept. 22, 1903.

Melted sodium is brought into contact with air or other "gaseous oxidising agent" in excess, to produce sodium peroxide.—E. S.

Alumina and By-Products; Process of Making ——. L. R. Keogh, Hamilton, Canada. U.S. Pat. 740,364, Sept. 29, 1903.

Aluminium sulphate containing iron sulphate as an impurity, is mixed with sodium chloride, water, and carbon, and the mixture is heated to redness in contact with steam. The product, containing sodium aluminate and iron sulphide, is lixiviated, sodium sulphate is crystallised out from the solution, from which, afterwards, "the sodium aluminate and iron sulphide are precipitated." Sodium carbonate is stated to be recovered from the solution as a by-product.—E. S.

French Patents.

Sulphuric Acid or Sulphuric Anhydride; Process and Apparatus for Making ——. H. Hilbert and the Bayerische Akt. Ges. f. Chemische und Landwirtschaftlich-Chem. Fabrikate. Fr. Pat. 331,289, April 18, 1903.

See Eng. Pat. 9453 of 1903; this Journal, 1903, 1085.
—T. F. B.

Alumina; Manufacture of Anhydrous ——. C. A. Doremus. Fr. Pat. 331,400, April 21, 1903.

See U.S. Pat. 725,683 of 1903; this Journal, 1903, 627.
—T. F. B.

Barium Oxide; Process of Manufacturing ——. W. Feld, Germany. Fr. Pat. 331,438, April 23, 1903.

A mixture of barium carbonate and carbon is moulded into portions, which are formed into capsules by coating with carbon or with a carbon-containing material. A number of such capsules may be further enclosed within a similar carbonaceous envelope. When the mixture thus prepared is suitably heated, barium oxide is formed throughout, available for the preparation of barium peroxide. But if the uncoated mixture is heated, the superficial carbon burns away before reduction is effected, and the barium carbonate is apt to fuse on the surface, thus obstructing the process. Reference is made to German patent, No. 101,734.—E. S.

Zinc Hydrosulphite, Solid, and Sparingly Soluble in Water; Manufacture of ——. Chemische Fabrik Grünau, Landshoff and Meyer. Fr. Pat. 331,095, April 10, 1903.

Powdered zinc is agitated with one and a half times its weight of water, whilst a jet of sulphur dioxide gas at not above 45° C. is injected until the zinc is dissolved, the process being supplemented, if desired, by the introduction of liquid sulphur dioxide free from water. A quantity of powdered sodium bisulphite, equal in weight to the zinc taken, is then added, and the zinc hydrosulphite, which separates in the solid state as the bisulphite, dissolves and is separated by filtration. The presence of some sodium bisulphite adhering to the product is stated not to be injurious in the applications of the same.—E. S.

Cyanides; Preparation of ——. J. Grossmann, England. Fr. Pat. 331,331, April 18, 1903.

Potassium ferrocyanide is heated in a leaden still with dilute sulphuric acid (for instance), and the hydrogen cyanide evolved is collected in milk of lime, to which is added a proportionate quantity of an alkali sulphate, whereby a solution of an alkali cyanide is obtained on filtration.

Part of the cyanogen in the ferrocyanide treated remains behind as insoluble iron and potassium ferrocyanide (Everitt's salt). This is boiled with an alkaline lye, or with a solution of an alkali carbonate or of an alkaline-earth hydroxide, or with a mixture of these, in slight excess, a current of air being continuously passed through the boiling liquid. The potassium ferrocyanide is thus reproduced from the Everitt's salt.—E. S.

Permanganates of the Alkaline Earth and other Metals; Electrolytic Production of ——. Chem. Fabrik Griesheim Elektron. Fr. Pat. 331,376, April 20, 1903.

See U.S. Pat. 727,792 of 1903; this Journal, 1903, 696.
—T. F. B.

Products [Acid Sulphates] obtained from Dry Alkali Sulphates, and Process of Manufacturing same. S. Trivick. Fr. Pat. 331,849, April 28, 1903.

See U.S. Pat. 728,335 of 1903; this Journal, 1903, 742.
—T. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

English Patents.

lass ; Process for Etching ——. B. Z. Meth, Brzozdowce, Galicia. Eng. Pat. 24,610, Nov. 10, 1902.

'he steel or zinc plate, on which the pattern to be transerred to the glass has been deeply etched, is inked with a asty printing and etching medium composed of 2 parts of mmonium fluoride, 1 part of hydrofluoric acid, 70 parts of agnesium carbonate, 30 parts of white dextrin, 20 parts f yellow dextrin, 5 parts of aniline black, and 30 parts of ater. A print is then made on ordinary tissue paper, hich is transferred as usual to the glass, and washed off ith water after about thirty minutes, the glass being etched dead white.—A. G. L.

ilns for Porcelain and the like ; Firing ——. M. L. Goebel, Kronach, Bavaria. Eng. Pat. 20,586, Sept. 20, 1902.

ee Fr. Pat. 324,708 of 1902 ; this Journal, 1903, 629.
—T. F. B.

French Patent.

Muffle for Heating Ceramic Products. B. Demaison, France. Fr. Pat. 331,744, May 5, 1903.

y arranging the bricks composing the hearth of the uffle proper in differently placed layers, channels are rmed close to the casing of the hearth, through which the roducts of combustion pass, and in which they give up a rge quantity of their heat.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Mortar ; Composition of an Old ——. R. Meyer. Ber., 1903, **36**, [12], 2981—2982.

ld mortar from a 14th century church in Brunswick ve the following results on analysis :—Sand (insoluble lica), 54·77 ; soluble silica, 3·80 ; calcium carbonate, ·29 ; calcium hydroxide, 11·09 ; magnesium oxide, 76 ; iron and aluminium oxides, 3·50 ; residue from eatment with hydrofluoric acid of substances insoluble hydrochloric acid, 1·76 ; and moisture, 3·20 per cent. tal, 99·16 per cent.

The moistened mortar had a strong alkaline reaction, but was not determined whether the quicklime was present free hydroxide or in combination with the carbonate as asic salt.—C. A. M.

English Patent.

ick Kilns ; Impts. in ——. J. D. Wilson, St. Leonards, N.S.W. Eng. Pat. 17,061, Aug. 5, 1903.

order to expel the vapours given off by the bricks in ocess of drying, the hot gases from the burning bricks made to meet them on their way to the chimney by ans of a pair of horizontal flues communicating with h other at their ends and forming a continuous flue, nnected with the burning chambers by vertical flues, ich are controlled by valves and dampers. Greater ilities for repairs and greater strength are also given to kiln by constructing the arches of the kiln so that each ss line of feed holes is a straight joint or slot of suitable th, the longitudinal lines of feed holes being formed as sired by the covering ring of bricks, which may be either -shaped or square.—A. G. L.

United States Patents.

me ; Making Artificial ——. Mathilde Cordes, *née* Müller, Hanover, Germany. U.S. Pat. 739,835, Sept. 29, 1903.

mixture of hydraulic lime and of barium carbonate or roxide with water is combined with gypsum and comuted peat, with a "pulverulent material of higher cific gravity than peat" (ashes, for instance) and with od shavings. The composition is moulded and dried.
—E. S.

Bricks ; Manufacture of ——. M. Perkiewicz, Ludwigsberg, Germany. U.S. Pat. 740,040, Sept. 29, 1903.

See Eng. Pat. 12,095 of 1903 ; this Journal, 1903, 1088.
—T. F. B.

Building Material ; Manufacture of Artificial ——. A. Seigle, Lyons. U.S. Pat. 740,188, Sept. 29, 1903.

See Fr. Pat. 323,666 of 1902 ; this Journal, 1903, 497.
—T. F. B.

French Patents.

Refractory Material Obtained without Heating, for Furnaces and Metallurgical Apparatus in General. H. Estève, France. First Addition, dated April 7, 1903, to Fr. Pat. 329,802 of Feb. 7, 1903.

The material is composed of plumbago, graphite, kaolin, magnesia, and other earths, coloured or white. Tar or a similar binding agent may be added. Two compositions are given, one consisting of 120 parts of graphite, 480 parts of plumbago, 200 parts of kaolin, and 200 parts of magnesia, the other of 100 parts of graphite, 400 parts of plumbago, 350 parts of kaolin, and 150 parts of magnesia.—A. G. L.

Sand-Scourer ; A Continuous and Methodical ——. J. A. Dejust, France. Fr. Pat. 331,527, April 27, 1903.

The sand to be washed is introduced from a hopper, provided with a damper, into a vertical cylinder of wood or metal containing a number of plates, preferably inclined at an angle of 45°, from one of which the sand falls to the next in its descent to the bottom. These plates are roughened, so as to divide the sand. A small quantity of water is introduced through a cock at the bottom of the hopper, to facilitate the passage of the sand downwards. The main quantity of the water used in the washing enters through a cock in the lower part of the cylinder, and, as only a small orifice is provided for the exit of the sand, the water rises in the cylinder through the sand till it overflows at a point below the hopper, carrying with it the saline impurities of the sand. A screen is provided at the exit by which the sand leaves the cylinder, serving to separate the sand from that part of the water which leaves the cylinder at this point.—A. G. L.

Portland Cement Kiln ; Continuous ——. W. W. Maclay. Fr. Pat. 331,405, April 21, 1903.

See U.S. Pat. 725,975 of 1903 ; this Journal, 1903, 630.
—T. F. B.

Cement ; Manufacture of ——. G. Geissler and G. Geissler, jun. Fr. Pat. 331,514, April 27, 1903.

See Eng. Pat. 9835 of 1903 ; this Journal, 1903, 868.
—T. F. B.

X.—METALLURGY.

Manganese Steels ; Properties and Constitution of ——. L. Guillet. Comptes rend., 1903, **137**, [12], 480—482.

Micrographic examination of manganese steels showed their close similarity to nickel steels (see this Journal, 1903, 213). Only about one-half the amount of manganese, however, is required to produce the same effect as nickel. The two series of steels examined contained 0·1 to 0·25 per cent. and 0·7 to 0·95 per cent. of carbon, the manganese varying in the low-carbon steels from 0 to 33 per cent., and in the high-carbon steels from 0 to 12 per cent. The results were as follows :—

Class.	Micrographic Structure.	Low Carbon.	High Carbon.
		Mn per Cent.	Mn per Cent.
1	Pearlite	0—5	0—3
2	Martensite or troostite *	5—12	3—7
3	γ-Iron	Above 12	Above 7

* The steels of class 2 show *martensite* structure when they contain less than 0·5 per cent. of carbon ; otherwise, *troostite*.

The mechanical properties are in complete agreement with the micro-structure. *Pearlite* steels show great breaking stress and also high resistance to blows. Thus manganese alone does not render the steel brittle; this only happens where the sum of the carbon and manganese are sufficient to give a *martensite* structure. Low-carbon steels containing less than 4 to 5 per cent. of manganese are not at all brittle.—T. F. B.

Carbide of Chromium and Tungsten; A Double ——. H. Moissan and A. Kouznetzow. Comptes rend., 1903, **137**, 292—295.

The authors have prepared, by different methods, a double carbide of chromium and tungsten of the composition $W_2C.3Cr_3C_2$, analogous to the compounds previously described by Carnot and Goutal (this Journal, 1898, 1150; 1901, 583). This new double carbide has the sp. gr. 8·41; it is very stable, not being acted upon by acids or the principal reagents, and is also very hard. The authors state that it is probable that the addition of tungsten to chrome-steel would cause the formation of this compound, and at the same time confer upon the steel new properties. —A. S.

Cyanide Plants; Consumption of Zinc on ——. W. W. Virgoe. J. Chem. Metall. and Min. Soc. of S. Africa, 1903, **4**, 80—92.

For scientific investigation of this problem the consumption should be recorded (1) per ton of ore treated, (2) per unit of solution flowing through the boxes, distinguishing "mechanical" and "chemical" loss. Commonly, with gold-bearing solutions, the consumption of zinc is in the proportion of 16 to 1 of gold deposited, but only 1·8 to 1, or even 1 to 1, of silver deposited. Excessive mechanical loss is generally due to unnecessary handling, scrubbing, &c., during the clean up; or to want of care in placing the zinc under water when removed from the boxes; or to the uneven flow of solution during the precipitation; or to the use of "threads" of zinc of uneven thickness; or to the employment of too weak solutions.

Excessive chemical losses result from too great alkalinity of the solutions; or to the precipitation of copper and other "base" metals on the zinc; or to the contact of the zinc with unprotected iron surfaces.

More generally, strong solutions depositing considerable quantities tend to cause a heavy chemical consumption of zinc, and weak solutions depositing small amounts cause heavy mechanical and light chemical loss.

The author does not favour the use of zinc dust in place of zinc threads.

Many detailed examples of the working of plants on sands and slimes under varying conditions are given. An excess of alkali in the form of lime is absolutely necessary in all solutions, and sump tanks should be wide and shallow rather than narrow and deep, and not so closely covered as to prevent free access of air.—J. H. C.

Roasting and Filter-Press Treatment [Sulpho-Telluride Gold Ores] at Kalgoorlie. J. T. Marriner. Eng. and Mining J., 1903, **76**, [10], 352.

The ore is subjected to dry-crushing, first in Gates rock-crushers and then in Griffin or ball-mills; it is next roasted in Edwards or Merton furnaces, and the roasted product mixed with dilute cyanide solution and allowed to settle in V-shaped boxes. The coarse sands are ground till the pulp will pass through a screen with 100 holes to the linear inch, and are then transferred together with the "fines," to the agitation vats. The pulp is agitated with cyanide solution, of about 0·03 per cent. strength, for 8—12 hours, the gold-bearing solution separated by filter-pressing, and the gold deposited on zinc. The average extraction obtained on the large scale was 92·2 per cent. The accompanying table shows the costs of treatment per ton of ore for 1902 with a plant having a capacity of 2,000 tons per month.—A. S.

	s.	d.
Power (including condensed water) and compressed air used in filter-pressing	5	9·58
Crushing	0	9·08
Milling in ball-mills	2	0·65
Roasting	6	0·18
Grinding and amalgamating in Wheeler pans	1	3·88
Filter-pressing and agitating	2	7·00
Trucking	0	10·65
Precipitation and clean-up	0	8·58
Cyanide—1·13 lb. per ton of ore	1	3·94
Water (salt water for plant use)	0	9·85
Assays	0	1·94
General expense and maintenance	1	4·12
Total	23	9·45

Tin and Tungsten; Magnetic Separation of ——, at Gunnislake Clitters, Cornwall. E. Skewes. Eng. and Mining J., 1903, **76**, 424.

The ore is first treated in a 25-stamp mill containing a set of Cornish rolls, a crusher, eight Buss tables for the sands, Luhrig classifiers and Luhrig vanners. The concentrates from the mill are roasted and then passed to the magnetic separator, which is about 6 ft. high, 12 ft. long, and 6 ft. wide, and has a capacity of about 5 tons a day. The concentrates are carried on an endless travelling belt, about 2 ft. wide, over two sets of adjoining magnets, of which the first set, of 4 ampère strength, attracts the iron ore, and the second set, of 12 ampère strength, attracts the tungsten ore, whilst the tin ore is carried on by the belt to the tail roll. The iron and tungsten ores are received in bins arranged at right angles to the belt. The tungsten ore is then separated by stirring in a sieve and tapping by a hammer into two layers—a light upper layer, from 2 to 4 ins. deep, which is treated again in the separator, and a heavy lower layer, which is ready for sale as a product containing from 60 to 64 per cent. of tungstate of iron. —A. S.

Metals; Volotilisation of ——, as Chlorides. S. Croasdale. Eng. and Mining J., 1903, **76**, 312—314.

The author has made a large number of experiments, extending over several years, with regard to the volatilisation of metals as chlorides from their ores by roasting with sodium chloride and sulphur in an oxidising atmosphere. Detailed results are given as obtained with ores of gold, silver, copper, lead, zinc, bismuth, arsenic and antimony, and complex ores. The ore should be ground so that it will pass through a screen with 20 holes to the linear inch; silicious ores give better results if crushed till they will pass through a screen with 40 or 60 holes to the inch. The crushed ore is mixed with sulphur and salt, and charged into the furnace at a temperature of 750°—850° C. The amount of sulphur should be from 0·25 to 0·50 per cent. in excess of that required to form the normal sulphides, and the quantity of salt from 15 to 20 per cent. in excess of that necessary to form the chlorides of the base metals other than zinc, to be volatilised. The best results are obtained in a reverberatory furnace in the form of a revolving cylinder, lined with fire-brick, 30—50 ft. long, and with an inside diameter of 5—6 ft. at the end from which the roasted ore is discharged. The cylinder is mounted at a slight angle. The volatilised metals are recovered by passing the fumes and products of combustion through successive layers of water, supported upon perforated diaphragms, preferably made of a textile fabric. The condensing solutions become slightly acid from the sulphuric acid formed. Metallic gold, silver chloride and lead sulphate are recovered by filtration, and copper is separated from the filtrate by precipitation with scrap iron or by electrolysis.—A. S.

Ruthenium Silicide; Preparation and Properties of —— H. Moissan and W. Manchot. Comptes rend., 1903 **137**, 229—232.

Ruthenium, when melted by heating in the electric furnace combines readily with silicon, giving a crystalline silicide RuSi, of great hardness, which has the sp. gr. 5·40, and is very stable towards most reagents.—A. S.

Lead-Tin-Antimony Alloys; Analysis of ——. S. Burman. XXIII., page 1150.

Vanadium; New Method of Determining ——, and it Application to Metallurgical Products. E. Campagne XXIII., page 1149.

English Patents.

Steel or Ingot Iron; Manufacture of ——. B. Talbot, Leeds. Eng. Pat. 24,248, Nov. 5, 1902.

See Fr. Pat. 324,448 of 1902, and Addition to same; this Journal, 1903, 559 and 634.—T. F. B.

Ore; Agglomerating Finely-divided ——. A. Malden, Westminster, and W. J. Malden, Hollesley Bay, Suffolk. Eng. Pat. 19,351, Sept. 3, 1902.

Finely-divided ore material is made up into briquettes by he aid of a solution of borax, in addition to which clay and lime may be used. Iron ore is preferably agglomerated by the addition of 6 per cent. each of clay and lime and a "small percentage" of borax, with or without a small proportion of an alkali carbonate.—E. S.

Mattes and Raw Metals; Treating ——, *in Reverberatory Furnaces.* A. L. A. Conein, Paris. Eng. Pat. 21,391, Oct. 1, 1902.

The products to be treated are melted, or introduced in the molten state, into a reverberatory furnace, and a mixture of superheated steam, air, and silex, sometimes with the addition of lime, is blown on to the surface of the bath hrough inclined blast pipes placed at each side of the urnace in parallel direction, but not in the prolongation of ach other. Liquid hydrocarbons are also injected by the team when it is desired to raise the temperature of the bath. The process is mainly adapted for the conversion of copper or of nickel matte into copper or nickel, the refining of black copper, and for obtaining steel or puddling iron. —E. S.

Linings of Vessels for Metallurgical Work. G. Westinghouse, London. From W. J. Knox, Allegheny, Pa., U.S.A. Eng. Pat. 21,807, Oct. 7, 1902.

See U.S. Pat. 710,916, Oct. 7, 1902; this Journal, 1902, 1400. —E. S.

Ore Roasting Furnaces. J. B. F. Herreshoff, New York City. Eng. Pat. 13,877, June 22, 1903. Under Internat. Conv., Jan. 16, 1903.

See U.S. Pat. 729,170 of 1903; this Journal, 1903, 747. —T. F. B.

Blast Furnaces; Impts. in ——. G. K. Hamfeldt, Munhall, Allegheny, U.S.A., and T. A. Tesch, Swissvale, Allegheny, U.S.A. Eng. Pat. 13,918, June 22, 1903.

The invention relates to a cylindrical form of blast-furnace op, the upper part being contracted and provided with a hopper. This cylindrical shell is cast in sections, bolted ogether, and is provided with water troughs round its ircumference to keep it cool. A large opening for the harging of big pieces of ore is provided laterally; as are an explosion door and an auxiliary gas pipe leading from he gas exit.—L. F. G.

Cupola Furnaces. A. J. Boult, London. From A. Seydel, Frétigny, France. Eng. Pat. 14,305, June 27, 1903.

The furnace comprises a vertical shaft, reduced in diameter n the upper and lower parts, with a heating chamber bove it having tubular extensions, and an outer casing urrounding the shaft casing and heating chamber, with uyères between the outer casing and the interior of the urnace. There is a series of air-heating passages between he lining of the shaft and its casing, and injectors for iquid fuel entering the top of the melting zone. The main eatures are stated to be: reduction in the velocity of the scaping gases; a large heating and a large air chamber; ombustion outside the furnace proper, of the gases and heir renewed combustion for heating the air chamber; the eating of the blast-air supplied to the tuyères; and means or introducing one or more non-solid fuels, in addition to he ordinary fuel.—E. S.

Separation of Minerals and Extracting some of them as Concentrates; Process and Apparatus for Effecting the ——. G. A. Goyder and E. Laughton, both of Adelaide, Australia. Eng. Pat. 16,839, July 31, 1903.

Finely-divided minerals are treated in a shallow tank ith an acidulated solution, and particles of the mineral adhering to the gas bubbles formed, are deflected on their passage upwards by inclined planes above the tank floor. Means are provided for feeding the ore into one end of the tank, along its bottom, overlying which are the deflector plates with suitable troughs placed between them. There are also means for causing the concentrates to travel along the troughs, and for discharging them as well as the tailings.—E. S.

Pickling Metal Plates; Mode of and Means for Treating Water used for ——. R. Thomas and Co., Ltd., R. B. Thomas, and J. H. Lones, all of Llanelly, Carmarthenshire. Eng. Pat. 22,860, Oct. 21, 1902.

The water used in washing metal plates that have been pickled in acid is pumped into an overhead tank, whence it is discharged through a perforated spraying pipe into a precipitating tank, which simultaneously receives, in such manner as to fall upon the spray, a continuous flow of milk of lime from an elevated trough fitted with an agitator. The iron is thus precipitated from the water, which latter is drawn off from above the deposit into a secondary tank, wherein the settling is completed, and the water is then ready for use again.—E. S.

United States Patents.

Iron; Carburising ——. W. A. Koeneman, Chicago, Ill. U.S. Pat. 740,025, Sept. 29, 1903.

Iron, or an "iron bearing compound," is melted, and caused to flow, free from slag, upon the top of a deep column of incandescent carbonaceous material, so as to continuously percolate through it, whilst oxygen is introduced into the lower part of the column, whereby the "cleaned iron, in its state of fine division, and while descending, is subjected to the carburising effect of the carbon mass and to gas continually generated in the said mass." Compare U.S. Pat. 712,812, Nov. 4, 1902; this Journal, 1902, 1538.—E. S.

Lead Drosses; Press for Squeezing Mushy, Zinky, or Coppery ——. W. H. Howard, Pueblo, Col. U.S. Pat. 739,003, Sept. 15, 1903.

A plunger, having a number of teeth projecting from its under side, is loosely swiveled on to the lower end of a fixed upright screw in combination with a stationary frame, the teeth being adapted to indent the drosses placed beneath, within a frame or holder having a dumping bottom, the holder being movable, by means of mechanism connected to the screw, up towards, or down away from, the toothed plunger, without turning the latter, so that the plunger may be afterwards freely turned to cause the teeth to make a new series of holes in the material. The holder and the bottom, although independent, are capable of being raised or lowered as a unit, means being provided for locking the holder to the plunger, to ensure its separation from the bottom.—E. S.

Ores; Process of Treating ——. F. Laist, Assignor to H. Smith and P. C. Brown, all of Salt Lake City, Utah. U.S. Pat. 739,011, Sept. 15, 1903.

An alkaline-earth sulphide suspended in water is subjected to the action of carbon dioxide; the alkaline-earth carbonate produced, is used as described below, and the hydrogen sulphide evolved is used to precipitate copper as sulphide from its solution, obtained, for instance, by treating copper ores with sulphuric acid, the acid solution remaining after separation of the precipitate being used for treating fresh portions of ore. The copper sulphide, obtained as described, is "melted" to obtain metallic copper and gases rich in sulphur dioxide, which gases are passed over an alkaline-earth carbonate; the carbon dioxide evolved is utilised in the first process, and the sulphite formed is reduced to sulphide, also available in the cycle of operations.—E. S.

Ores; Process of Disintegrating ——. C. T. Snedekor, Chicago, Ill. U.S. Pat. 739,446, Sept. 15, 1903.

The ores, at the ordinary temperature, are submerged in solution of an alkali, on removal from which they are highly heated, and then, while still hot, returned to the same solution.—E. S.

Ores of Gold and Silver; Process of Treating Refractory Complex ——. C. E. Baker and A. W. Burwell, Cleveland, Ohio. U.S. Pat. 739,374, Sept. 22, 1903.

Ores of gold and silver containing a base metal or metals and a metalloid, are heated in a current of chlorine, and the chloride of the metalloid formed, is volatilised and collected. The base-metal chloride formed in the process is dissolved out of the cooled ore, and the solution is electrolysed to obtain the base-metal chloride and free chlorine. The gold and silver in the ore are then separately recovered.—E. S.

Metallurgical Furnace. W. F. Hannes, Deming, N. Mexico, Assignor to W. J. Browning, Concepcion del Oro, Mexico. U.S. Pat. 740,360, Sept. 29, 1903.

The furnace has a lower chamber with vertical walls, and tuyères at its lower portion; this chamber merges into an upper chamber, the walls of which enclose an increasing space to the top. Tuyères for supplying an oxidising blast are located at the junction of the two chambers. A cylinder suspended from a series of converging beams above the furnace, carries, movably secured to a collar at its bottom, a fuel-casing, increasing in diameter towards its bottom, which bottom reaches to just below the junction of the two furnace chambers. Compare Eng. Pat. 10,929, May 13, and U.S. Pat. 712,374, both of 1902; this Journal, 1902, 1141 and 1538.—E. S.

French Patents.

Refractory Material, obtained without Heating, for Furnaces and Metallurgical Apparatus in General. H. Estève. Addition to Fr. Pat. 329,802. IX., page 1131.

Nickel Carbonyl; Manufacture of ——, and Extraction of Metallic Nickel therefrom. J. Dewar. Fr. Pat. 331,225, April 15, 1903.

See Eng. Pat. 9300 of 1902; this Journal, 1903, 700.
—T. F. B.

Bronze or other Metallic Powders; Manufacturing ——. Soc. A Baer and Co., Germany. Fr. Pat. 331,371, April 20, 1903.

The metal or alloy to be powdered, is rained into a sheet-iron chamber or cylinder, in which a shaft carrying blades is rapidly rotated, so as to greatly agitate the air and thereby minutely subdivide the metal at the moment of its passage from the liquid to the solid state, the blades also assisting by beating the particles with which they come into contact. Air or non-oxidising gases may, according to another method, be compressed and injected into a chamber so as to strike athwart the molten metal or alloy flowing through a narrow passage, whereby the stream is broken up and caused to impinge against suitable stationary or movable surfaces.—E. S.

Mercurial Vapours; Apparatus for Carrying off ——. Widow of P. Delage, *née* Marie Taddei. Fr. Pat. 331,432, April 22, 1903.

The chamber or furnace room in which operations involving the evolution of mercury fumes are conducted, is roofed in connection to a lofty double chimney supplied internally with heated air by an entering side pipe, whereby all fumes evolved below are drawn upwards and discharged into the air at a considerable elevation.—E. S.

Alloy and its Manufacture. T. W. Just and W. F. L. Frith. Fr. Pat. 331,464, April 24, 1903.

See Eng. Pat. 9696 of 1902; this Journal, 1903, 198.
—T. F. B.

Metallic Coatings Protective against Oxidation; Obtaining ——. A. Lévy. Fr. Pat. 331,669, May 1, 1903.

An oxidisable metal, such as iron, is preliminarily coated with zinc, to form a couple in which the iron is electrically protected; a coating of a metal, such as copper, nickel, or silver, is then formed upon the zinc to protect the first couple without forming a new couple that might favour oxidation.—E. S.

Aluminium; Method of Soldering ——. C. Sörensen. Fr. Pat. 331,798, May 7, 1903.

See Eng. Pat. 9715 of 1903; this Journal, 1903, 914.
—T. F. B

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electro-chemical Analysis; Use of a Mercury Cathoc in ——. E. F. Smith. XXIII., page 1150.

Metals; Rapid Electrolytic Precipitation of ——. F. F. Exner. XXIII., page 1150.

Metals; Electrolytic Separation of Certain ——. E. F. Smith. XXIII., page 1150.

English Patents.

Battery Elements; Secondary ——, and the Process
Producing same. L. Fiedler and G. Puchmüller, Lond
Eng. Pat. 19,999, Sept. 12, 1902.

A papier-maché box surrounds a close-fitting zinc b
the latter being connected below to a second smaller in
zinc box, these forming the negative electrode. A box
peroxide of lead, connected by a cross-piece at the top
placed between the two zinc boxes, and forms the posit
electrode, and is insulated below from the negative b
layer of asphalt. The electrolyte consists of a mixture
diluted sulphuric acid, 1,500 parts; mercury sulphate,
parts; zinc sulphate, 500 parts; potassium ferrocyani
50 parts; and may be mixed with sawdust to form a jel
The battery is closed with a layer of sawdust, a piece
cardboard provided with an air pipe and soaked in paraf
and finally with plastic material. The zinc plates beco
covered with a coating of ferrocyanide of zinc and m
cury, which protects the plates against the destructive act
of the electrolyte.—B. N.

Electric Currents for Electrolysis; Apparatus for
Generation and Application of ——. F. E. Elmo
London. Eng. Pat. 24,330, Nov. 6, 1902.

This invention relates to improvements on Eng. P
26,673, 1901 (this Journal, 1903, 371). The magnet of t
dynamo consists of an annular box, closed, with the e
ception of a horizontal air-gap, through which extends
horizontal rotating disc of conducting material forming t
armature. Two annular electrolytic cells are arranged o
on each side of the air-gap, and concentric cylindrical she
are suspended from the rotating disc so that the one set
electrodes of the outer cell in the annular magnet box :
as anodes, and the other set in the inner cell as cathod
or the reverse, according to the direction of rotation of t
disc or the direction of the current in the magnet co
Stationary cylindrical shells stand up between these el
trodes and form the electrodes of opposite nomenclatu
the fixed electrodes in each cell being joined below, and t
two sets connected by a metallic conductor passing throu
the air-gap in the magnet box. The rotating electro
have upper and lower flanges, and a pipe connects e
suspended cylinder of the inner set with a correspondi
cylinder of the outer set. Mercury is delivered on to t
lower flanges of the inner set, rises up the surfaces by ce
trifugal action, and is then delivered by the pipes and ma
to flow down the surfaces of the outer set, the flang
ensuring a certain depth of mercury continually on t
plates. When salt in solution is decomposed in the inn
cell, water is circulated through the outer cell, and the acti
is as follows:—The disc is rotated so that the suspend
cylinders in the inner cell are cathodes, and the liberat
sodium is thus transferred, by the travelling mercury,
the surfaces of the suspended anodes in the outer cell, wh
the metal is dissolved forming caustic soda. The chlori
is drawn off by suction through a pipe opening above a b
which closes the inner cell, and the hydrogen liberated
allowed to escape.—B. N.

lectrodes for Electrolytic Purposes; Impts. in ——. J. Hargreaves, Farnworth-in-Widnes. Eng. Pat. 19,368, Sept. 4, 1902.

HE electrode consists of a number of blocks of gas carbon graphite, with metallic conducting bars or strips passing rough perforations in the blocks, and with tightening evices for drawing and thus pressing the blocks together. arious methods are described for securing liquid-tight ints between the blocks of carbon. Castings of lead other suitable metal are used for filling the perrations, the latter in places having enlarged cavities, so at the contraction of the neck of metal on cooling draws e blocks tightly together. Powdered graphite, metallic ings, or other conducting material, may be rammed ghtly into the perforations, so as to press the bars or rips against the blocks, or so as to make electric connecon between the bars and blocks. A modification is scribed in which a metal tube, preferably platinum, with tings so as to allow for expansion, is placed in the perrations, and suitable methods are used for making electric nnection between the conducting bars and the tube, and r pressing the latter against the carbon blocks. Compare ng. Pat. 10,204, May 3, 1902; this Journal, 1903, 703.
—B. N.

lectrodes for Electrolytic Apparatus; Secondary ——, *more especially intended for Use in the Manufacture of Chlorates.* P. Imhoff and The United Alkali Co., Ltd., Liverpool. Eng. Pat. 25,442, Nov. 19, 1902.

E Fr. Pat. 330,016 of 1903; this Journal, 1903, 1054.
—T. F. B.

nc Oxide; [Electric] Method and Apparatus for Producing ——. B. H. Thwaite and T. J. Denny. Eng. Pat. 18,015, Aug. 16, 1902. XIII. A., page 1138.

etallic Sulphides; Obtaining ——, *in Electric Furnaces.* I. T. Brown. Eng. Pat. 24,236, Nov. 5, 1902. VII., page 1130.

gar; [Electric] Process and Apparatus for Making ——. M. H. Miller, D. Huether, A. H. Hough, A. McNeil, and R. Fisher. Eng. Pat. 14,182, June 25, 1903. XVI., page 1142.

UNITED STATES PATENTS.

Battery; Storage ——. J. T. Niblett, London. U.S. Pat. 740,034, Sept. 29, 1903.

HE battery plates are composed of lead oxide prepared in e ordinary way, electrolysed lead compounds or electroic lead oxide, and kieselguhr (silicious marl); or the ates may be made from electrolysed and non-electrolysed tive material incorporated with kieselguhr, the latter parting permeability. It is mentioned that the positive pole plate may have a higher percentage of kieselguhr than the negative one; thus the former may contain 5 per cent. and the latter $2\frac{1}{2}$ per cent. of kieselguhr incorporated with the material of the plates.—B. N.

Gases; Apparatus for [Electrically] Treating ——. H. Pauling, Brandau. U.S. Pat. 739,920, Sept. 29, 1903.

This invention consists of an apparatus for treating gases by means of the electric spark. Two electrodes are arranged in line, one consisting of a tube ending in a nozzle and the other ending in a disc; or the latter may also be tubular, with a disc perforated with openings communicating with the hollow of the tube. The electrodes are preferably enclosed in an insulating casing.—B. N.

Gases; Apparatus for [Electrically] Treating ——. H. Pauling, Brandau. U.S. Pat. 739,921, Sept. 29, 1903.

By means of this apparatus, gases, vapours, and the like may be subjected to electric spark discharges. A cylinder of insulating material, capable of being rotated, is wound with a helix of wire, the ends of the latter being connected to the shaft of the cylinder. A metal strip is fixed a short distance from and parallel to the cylinder, and the strip and cylinder shaft are connected to the source of electricity. The gas to be treated is blown through a tube furnished with a set of nozzles, the latter being arranged parallel to the strip and halfway between the strip and the cylinder.
—B. N.

Filaments [for Incandescent Electric Lamps]; Electric Furnace for the Manufacture of ——. W. L. Voelker, Erie, Assignor to the Electro-Carbide Lamp Syndicate, Ltd., London. U.S. Pat. 740,379, Sept. 29, 1903.

See Eng. Pat. 16,653 of 1901; this Journal, 1903, 18.
—T. F. B

French Patent.

Insulating Substance of High Melting Point. Soc. Franc. des Cables Electriques (système Berthoud, Borel, et Cie.). Fr. Pat. 331,230, April 17, 1903.

By heating pitch in presence of oxidising agents (*e.g.*, manganese dioxide or litharge) copious evolution of carbon dioxide occurs, and the residue, having a high fusing point, is very suitable for insulating purposes.—T. F. B.

(B.)—ELECTRO-METALLURGY.

Aluminium; Some Laboratory Observations on ——. C. F. Burgess and C. Hambuechen. Electrochem. Ind., Philadelphia, Jan. 1903, 165–168.

The authors obtained the following results on measuring the potential of an aluminium electrode immersed in various aqueous solutions:—

Solution.	Time in Hours.								
	0·0.	0·5.	1·5.	5·0.	6·2.	21·6.	27·9.	77·9.	99·9.
	Potential in Volts.								
tassium chloride (N/1 solution)	0·370	0·226	0·226	0·226	0·307	0·220	0·235	0·232	0·250
uminium chloride (dilute solution of commercial salt)	0·382	0·235	0·220	0·220	0·310	0·211	0·220	0·220	0·220
uminium chloride (dilute solution of pure alt)	0·361	0·211	0·205	0·211	0·250	0·199	0·220	0·214	0·217
drochloric acid (N/1 solution)..........	0·406	0·256	− 0·062	0·211	0·271	0·250	0·250	0·232	0·232
lphuric acid (N/1 solution).............	0·400	0·121	0·139	0·151	0·220	0·169	0·160	0·150	0·139
tric acid (N/1 solution)	0·220	0·040	0·040	0·040	0·010	− 0·023	0·010	− 0·032	− 0·017
dium hydroxide (N/1 solution)	1·120	1·000	0·964	0·889	0·769	0·790	0·721	0·925	1·090
„ „ (N/10 solution)	1·147	0·976	0·913	0·826	0·805	0·220	0·880	0·820	0·874
drofluoric acid (N/1 solution)...........	0·430	0·382	0·397	0·238	0·250	0·229	0·223	0·370	0·289
nmonium chloride (N/1 solution)........	0·367	0·232	0·274	0·580	0·610	0·235	0·232	0·250	0·310
nmonium fluoride (N/1 solution)........	0·925	0·616	0·595	0·556	0·211	0·217	0·370	0·400	0·454
tassium fluoride (N/1 solution)..........	0·010	− 0·050	− 0·053	− 0·023	− 0·023	− 0·068	− 0·008	− 0·026	− 0·053
„ „ (N/10 solution).........	0·223	0·346	0·445	0·652	0·610	− 0·026	0·022	0·100	0·040
xture of equal parts of N/1 ammonium chloride and ammonium fluoride solutions	0·925	0·370	0·319	0·280	0·250	0·220	(*)	0·274	0·262
xture of N/1 ammonium chloride solution and N/10 potassium fluoride solution	0·760	0·850	0·820	0·790	0·778	0·529	0·286	0·187	0·235

(*) On allowing current to flow, the potential rose from 0·220 to 0·403 volt.

Of the salts tested, ammonium fluoride appears to be the best to use in connection with aluminium for battery purposes.—A. S.

Electrolytic Deposition and Separation of Metals; Quantitative ——. H. Nissenson and H. Danneel. XXIII., page 1151.

ENGLISH PATENTS.

Calcium; [Electrolytic] Process for the Production of Metallic ——. W. E. Evans, London. From Electrochem. Werke, Ges. m. beschr. H. Eng. Pat. 20,084, Sept. 13, 1902.

SEE Fr. Pat. 321,303 of 1902; this Journal, 1903, 638.
—T. F. B.

Copper: [Electrolytic] Recovery of ——. *from Solutions containing it.* E. Casper, London. From B. Comba, Turin, Italy. Eng. Pat. 20,657, Sept. 22, 1902.

THE apparatus is without diaphragms, and the iron scrap used is separated from the cupreous liquor, and is dissolved without coming into contact with the copper, which latter is precipitated on to a number of suspended sheets of lead, metallically connected to the iron. Electric action is set up between the lead and the iron by a layer of acidulated water of a lower specific gravity than the copper solution placed in the vessel, this layer being lifted up so as to come into contact with them, by introducing at the bottom of the apparatus the cold cupreous liquor, which is freed from air-bubbles, while flowing in, by a special device, and does not intermingle with the liquid of less specific gravity above. As the cupreous liquor is decomposed, it is automatically replaced by fresh solution. The upper layer of acidulated water is heated by an immersed steam pipe.
—E. S.

Radio-active Metallic Coatings; Production of ——. H. H. Lake, London. From Fabrik Chem. Praeparate von Dr. R. Sthamer, vorm. Sthamer, Noack and Co., Nobelshof, Hamburg. Eng. Pat. 20,922, Sept. 25, 1902.

"RADIO-ACTIVE metallic coatings" are produced by immersing metallic bismuth in a solution containing radioactive substances (*e.g.*, the solution of the residue of the treatment of "uranpitchblende" with sulphuric acid). Another process consists in decomposing the solution of the radio-active substances electrolytically, bismuth forming the cathode, and carbon the anode.—T. F. B.

FRENCH PATENTS.

Furnace; Electric ——. J. M. Carrère. Fr. Pat. 331,740, May 5, 1903.

SEE Eng. Pat. 10,194 of 1903; this Journal, 1903, 873.
—T. F. B.

Metals; Electrolytic Deposition of ——. L. Dessolle. Fr. Pat. 331,265, April 17, 1903.

THE cathodes, or castings of the objects to be coated, are suspended from radial movable pieces, which are carried round the axis of the electrolytic vessel by other movable parts disposed eccentrically, so that by means of cranks, the cathodes receive two independent movements: (1) a common movement of rotation around the axis of the electrolytic vessel; (2) a rotation of each in the opposite direction around its own axis of suspension. The anodes are suitably disposed below the cathodes, and, if necessary, a second set of the latter may be used concentrically with the first. A more uniform deposition of metal is attained, the formation of beads being prevented, and a more intense current may be employed, polarisation being prevented by the friction of the cathodes with the electrolyte.—B. N.

Allay, or Binary Metallic Compounds. Soc. Anon. La Néométallurgie. Fr. Pat. 331,276, April 17, 1903.

NATURAL or artificial oxides of manganese and of silicon, preferably so proportioned as to yield the compounds Mn_4Si, Mn_2Si, MnSi, or $MnSi_2$, are heated with carbon in an electric furnace to form the alloy "mangano-silicium." This alloy finds its principal application as a deoxidising or reducing agent in the purification of molten iron to obtain a steel containing but little manganese and carbon. Compare Fr. Pat. 326,140, Nov. 6, 1902; this Journal, 1903, 805.—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Glycerides; Natural and Synthetical Mixed ——. Kreis and A. Hafner. Ber., 1903, **36**, [12], 2766—277

IN former communications (this Journal, 1902, 154 1903, 638) the authors showed that the crystals isola from beef and mutton fat consisted of α-palmitodistear whilst they concluded that the corresponding cryst from lard were β-palmitodistearin. Pure β-palmitodistea was now prepared synthetically from α-distearin (obtair from α-dichlorhydrin) and palmitic acid by a modificati of Guth's method (this Journal, 1903, 427, 639). T crystallised from ether or petroleum spirit in bunches microscopic needles melting at 52·2° (62° C. after fusio and at 63° C. in the crystalline state. The mixed glycer obtained from lard melted, however, at 51·8° and 66 and crystallised in long plates, and was therefore neitl α- nor β-palmitodistearin.

The fatty acids obtained from the different mix glycerides were next examined. Those from the compou from beef or mutton fat melted at 64° C., and those fr the lard, at 62° C. The following amounts of stearic a were found:—Beef fat crystals, 70·2; mutton fat cryst 71·1; and lard crystals, 69·0 per cent. of stearic ac The calculated amount of stearic acid for palmitodistea is 69 per cent., whilst the synthetical compound was fou to contain 70·5 per cent., the difference being attributed unavoidable errors in the manipulation. Hence the resu showed that the lard crystals contained 2 mols. of stea acid, so that the other constituent could only be an acid formula $C_{17}H_{34}O_2$.

To determine whether this was palmitic acid or not, t following method of separating stearic and palmitic ac was devised:—After determination of the stearic acid Hehner and Mitchell's method, the mixture of fatty ac was dissolved in 96 per cent. alcohol in sufficient quantity keep the palmitic acid in solution at 0° C. After 12 to hours' standing at this temperature the filtrate from t stearic acid (containing only 0·12 grm. of stearic acid 100 c.c., but all the palmitic acid) was treated with an al holic solution of magnesium acetate in equivalent quantity the stearic acid present. The precipitate was filtered after 12 to 14 hours at the ordinary temperature, and t fatty acids separated from the filtrate. They were th redissolved in just sufficient alcohol for solution, and o third of the quantity of magnesium acetate solution add the process being continued until eventually pure palm acid was obtained. By this means, pure palmitic a (m. pt. 62·3° C.) was separated from the beef and mutton crystals, whereas the lard crystals yielded a fatty acid melti at 55° to 56° C., and having the composition $C_{17}H_{34}$ Holde (this Journal, 1901, 1003) showed that a similar a isolated from olive oil was probably daturic acid (m. 51·5° to 57° C.).

Preparation of Synthetical Mixed Glycerides contain. Olein.—Guth (*loc. cit.*) was unable to prepare oleodip- mitin and oleostearopalmitin by his method of prepar mixed glycerides. The authors, however, have found t by the action of oleic acid on dipalmitin and distearin, c siderable quantities of tripalmitin and tristearin are form whilst there is also a relatively small yield of oleodipalm and oleodistearin. The latter compound was prepared heating α-distearin with oleic acid for 16 hours un reduced pressure, and the mass treated as described in previous paper (*loc. cit.*). When purified, it crystall in bunches of needles melting at 28° to 30° C., and 42° C. in the crystalline condition. Oleodistearin already been detected in Mkani fat by Heise and Henriques and Künne (this Journal, 1899, 377, 590), by Fritzweiler in cacao butter, the compound melting 27°—28° C. and at 44° to 45° C. The difference betw the melting points of the natural and synthetical glycer may be due to the compounds being isomeric. It is no- worthy that the substance separated by Hansen from l fat, and regarded by him as oleodipalmitin (this Jour, 02, 553), had a melting point of 48° C., which is usiderably higher than that of the above oleodistearin.

—C. A. M.

ive Oils and Olive Oil Substitutes. L. M. Tolman and L. S. Munson. J. Amer. Chem. Soc., 1903, 25, [9], 954—962.

etails are given of the constants of 38 samples of Cali-nian olive oil and 18 samples of pure Italian olive oil. e range in the iodine value (Hübl) of these oils was ·5 to 89·8, which, as the authors point out, allows of eat adulteration. The Californian olive oils showed some-at higher Hübl values than the Italian oils, the average the former being 85·1 and for the latter 81·5. In commercial samples of Italian oil, in which no adul-ation was detected, the average Hübl value was 80·5. e analytical data of various oils (freshly expressed) ich are used as substitutes or adulterants of olive oil e also given.—C. A. M.

ce Oil; Characteristics of ——. C. A. Browne, jun. J. Amer. Chem. Soc., 1903, 25, [9], 948—954.

etham (this Journal, 1893, 848) found that rice oil was aracterised by the high percentage of fatty acids it ntained. In investigating the cause of this, the author tracted samples of oil both from the rice itself and from the an. The latter, including the gluten layer and germ of grain, was found to contain nearly 15 per cent. of oil.

The chemical and physical characteristics of an oil ex-cted from the bran were as follows:—Sp. gr. (99°/99° C.), 8907; m. pt., 24° C.; acid value, 166·2; saponification lue, 193·5; iodine value, 91·65; Reichert-Meissl value, 1; molecular equivalent of insoluble fatty acids, 289·3; d melting point of insoluble fatty acids, 36° C.

In warm weather the oil partially liquefies, forming a own fluid, with a deposit of crystalline fats, which the thor judged to be glycerides of acids of high molecular ight, such as arachidic or behenic acids. The oil only comes perfectly clear and transparent at 47° C.

Lipase in Rice Bran.—Oil from fresh rice bran was found have only slight acidity, but, on standing, the proportion free acid rapidly increased, whilst the oil became rancid. e rice bran was next tested for the presence of lipase by xing 20 c.c. of a 20 per cent. cold aqueous extract with equal volume of castor oil, and rendering the mixture ntly alkaline to litmus. After 24 hours, the emulsion d become acid, and after a week the oil extracted with er had an acid value of "29·7," indicating that about per cent. had been hydrolysed.

In experiments on the action of the lipase upon rice oil der natural conditions, freshly ground rice bran was ided into two portions, one of which was heated to ° C. to destroy enzymes. Both were then tied up in sacks d left for a month, after which the oil was extracted and amined. The following results were thus obtained:—

——	Free Acid as Oleic Acid.
	Per Cent.
w rice (stored many months)	6·9
esh bran (six hours after grinding).......	12·5
an one month old, unheated	62·2
" " heated.................	24·0

From these results the author concludes that the develop-nt of acidity in rice oil may be due in some degree to idation, but is mainly caused by enzymic action. tention is called to the practical application of the ults in checking or preventing rancidity in rice meal similar products, the material being heated, immediately er grinding, to a sufficient temperature to destroy the zyme.

Digestibility of Rice-Oils.—Practical experiments on o steers fed upon rice oil showed that on the average ·8 per cent. of oil in the former and 73·6 per cent. in the ter was digested. The unsaturated fatty acids and those lower molecular weight were most readily assimilated.

—C. A. M.

Oils of Certain Palms from French Guiana. Bassière. Moniteur Officiel du Commerce; through J. Pharm. Chim., 1903, 18, [7], 323—329.

Pinot Oil.—The "pinot" or ouassay palm is generally referred to *Euterpe oleracea*, Mart., which, in Brazil, furnishes the oil known as "Para palm oil" or "Para butter." It is very plentiful in French Guiana, growing in profusion in the dried-up salt marshes of the lowlands, where it replaces the mangroves; these localities are known as "pinotières." The oily kernels of the seeds give a purple, pleasant-tasting emulsion when crushed with water. The oil is extracted by boiling the crushed kernels with water and skimming off the supernatant fat. It forms, when fresh, a clear, edible, slightly perfumed oil, with a pleasant flavour, but it does not keep well. The sample examined six months after extraction and bottling was greenish in colour, not homogeneous, and had a most nauseous taste. It had the following characters:—Acid value, 81·7; saponification value, 162·4; iodine value, 136; m.pt. of fatty acids separated after saponification, 12° C.; these acids comprised 52 per cent. of oleic acid and 48 per cent. of acids solid at normal temperatures. The oil is but slightly siccative. It saponifies readily.

Maripa Fat.—This is probably the product of two, if not three, species of palm belonging to the genus *Attalea*: *A. maripa*, Mart. (*Palma maripa*, Aubl.); *A. excelsa*, Mart. (*Maximiliana maripa*, Drude); and possibly also *A. spectabilis*. The white or yellowish butyraceous matter furnished by the ripe fruit is much esteemed as an edible fat; its chemical composition is unknown. The fat of the kernels of the seeds, extracted by the same boiling method as pinot oil, is white and fragrant. It is employed in French Guiana in a similar manner to cocoanut fat, and has a reputation as a medicinal liniment; it is fluid at the normal temperatures of the tropics, but has a butter-like consistence in temperate climates. The sample examined was slightly rancid; its m.pt. was 23° C. It had the following characters:—"Iodine value, 9·49"; saponification value, 259·6; m. pt. of fatty acids separated after saponification, 25° C.; these contain 11·5 per cent. of oleic acid, the rest being solid at normal temperatures. Maripa fat is practically identical with cocoanut fat in all its characters. After steam-purification, it should furnish a useful edible vegetable butter. It saponifies easily, forming a pasty soap which lathers well.

Comon oil is furnished by at least two species of palm, *Œnocarpus batana*, Mart., and *Œ. bacaba*, Mart. The fruit of the former gives a pale, bland oil known as "Patava oil," which is used for lighting, for culinary purposes, and for adulterating olive oil. The kernels of the seeds yield, when boiled with water, a pale yellow, limpid oil having the following characters:—Acid value, 8·6; saponification value, 169·1; iodine value, 96·5; Hehner value, 95·7; acetyl value, 3·4; Reichert value, 1·2. The fatty acids have the molecular weight 281·9; when separated after saponification they melt at 19° C. and contain 19 per cent. of oleic acid. The oil is but slightly siccative; it saponifies easily, giving a white soap which retains but little water.

—J. O. B.

Fats; Enzymic Decomposition of ——. K. Braun. Ber., 1903, 36, [12], 3003—3005. (This Journal, 1903, 639, 873.)

The fact established by the author in his previous communications that pure emulsin only decomposes castor oil slightly more than sweet almonds do, has led him to make similar experiments with pure abrin. 25 grms. of the seed kernels of *Abrus precatorius* were crushed and extracted for 48 hours with 200 c.c. of brine, and the abrin precipitated from the filtered extract by means of acetic acid and sodium chloride, and purified by dialysis. The pure product had only a slight decomposing action on castor oil, whilst the abric acid in the seeds had a somewhat stronger influence. At 90° C. the seeds lost both their poisonous property and their power of decomposing fat. It is suggested that the formation of free acid may be due to decomposition by an enzyme, and hydrolysis by the acid in the seeds.

Similar experiments with croton seeds showed that pure crotin had no hydrolysing effect on fats. With reference to the action of myrosin (this Journal, 1903, 873) it is shown that the seeds of *Cheirantus cheiri* have far less influence than the stems or buds. Thus, on treating 10 grms. of castor oil with 1·5 grms. of the crushed seeds and 25 c.c. of water at 15° C., the amount of acidity expressed in terms of the standard alkali solution had only increased from the original 1·3 c.c. to 2·8 c.c. after 24 hours, and to 3·9 c.c. after 72 hours. (See this Journal, 1902, 1541; 1903, 68, 805, 1094.)—C. A. M.

Elæomargaric Acid [from Japanese Wood Oil]; Composition of so-called ——. T. Kametaka. J. Chem. Soc., 1903, **83**, 1042—1045.

The solid fatty acid of the oil of *Elæococca vernicia*, or Japanese wood oil, was prepared by saponification with alcoholic potash, followed by treatment with hydrochloric acid. After recrystallisation from alcohol, the acid was obtained in the form of white, lustrous laminæ, melting at 43°—44° C. The bromine-addition and oxidation products of the acid were prepared by Hazura's methods (Monatsh. für Chem., 1887, **8**, 148; and this Journal, 1888, 506). The bromine-addition product had the composition $C_{18}H_{32}O_2Br_4$; it melted at 114° C., and appeared to be identical with the product obtained from linolic acid. Two oxidation products were obtained: (1) an acid, $C_{18}H_{32}(OH)_4O_2$, melting at 171°—172° C., and agreeing with sativic acid; and (2) an acid, $C_{18}H_{34}(OH)_2O_2$, melting at 126° C., and consisting, probably, of impure dihydroxystearic acid. The author concludes that the solid acid, which Cloëz (Comptes rend., 1875, **81**, 469; 1876, **82**, 501, **83**, 943) named elæomargaric acid, and for which Maquenne (Comptes rend., 1902, **135**, 696) recently proposed the name α-elæostearic acid, has the composition $C_{18}H_{32}O_2$, and is a stereoisomeride of linolic acid. (See also this Journal, 1896, 661; 1897, 195, 684; 1898, 305, 674, 772; 1899, 283; and 1900, 156.)—A. S.

Olive Oil; The Babcock-Blasdale Viscosity Test for ——. H. Abraham. XXIII., page 1153.

Soap Solutions; Viscosity of ——, as a Factor in Oil Analysis. H. C. Sherman and H. Abraham. XXIII., page 1153.

English Patents.

Oil Filters. W. F. Warden, Akron, Ohio, U.S.A. Eng. Pat. 16,223, July 22, 1903. Under Internat. Conv., March 25, 1903.

This apparatus consists of a vertical cylindrical tank divided, by means of a partition, into an upper and lower compartment. The latter is half filled with water, whilst the oil is introduced into a conical filtering chamber in the upper compartment, surrounded by a water-jacket containing a heating-coil. After passing twice through filtering material, the oil enters a tube (also packed with filtering material) which projects downwards nearly to the bottom of the lower compartment, and has a conical outlet opening on to a horizontal plate. After being distributed on this plate, it rises through the water, and is drawn off through a cock placed just above the water-level.—C. A. M.

Oil; Apparatus for Bleaching and Condensing Vegetable ——. S. Lewiak, Warsaw, Russia. Eng. Pat. 14,518, June 30, 1903.

The oil is heated by steam to a temperature of at least 100° C. in a boiler capable of being hermetically closed, and is mechanically agitated, whilst air, heated under pressure within the boiler, is introduced in fine streams or bubbles. Oils thus treated are stated to be decolorised in a few hours, and to be rendered elastic, glossy, and capable of absorbing large amounts of other liquids.

The stirrer specially claimed, consists of a central shaft on which is loosely mounted a frame or drum with four or more arms. Both standard and frame are provided with vertical perforated alternating blades, which are made to rotate in opposite directions. A fan with radial paddles on which are fingers arranged as pivots, is used at the top of the apparatus, to give vent to the air and keep back the froth.—C. A. M.

Lubricating Power of Oils, Greases, and other Lubricants; Apparatus for Testing the ——. H. V. Blake Eng. Pat. 25,492, Nov. 20, 1902. XXIII., page 1148.

French Patents.

Filter-Plates for Presses, to replace the Cloth Bags use in the Extraction of Essences and Oils from Seed B. Cape and L. Oddo. Fr. Pat. 331,094, April 16, 190

Across a metallic frame are stretched a layer of anima hair and a layer of cotton wool, retained in position by cover of wire gauze. The seeds are placed beneath thi inside a packing-ring of india-rubber or other material, an pressure is then applied. The expressed liquid thus filter through the cotton-wool and animal hair.—L. F. G.

Artificial Wax; Manufacture of ——. L. Delahaye. Fr. Pat. 331,714, May 4, 1903.

A substitute for beeswax or other waxes is prepared fro paraffin wax, colophony, petroleum spirit, and cadmiu yellow or other pigment, in alcohol or other suitable liqui in proportions which may be varied according to the natur of the product required.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Refined Lead: Influence of the Presence of Small Amoun of Other Metals in —— [White Lead, Red Lead O. Herting. Chem.-Zeit., 1903, **27**, [76], 923—924.

The paper deals principally with the effects produced b traces of foreign metals in lead when the latter is employed Bismuth has the greatest influence, more than 0·018 p cent. making the lead unsuitable for red-lead manufactur or for the production of nitrites; but metal containing considerable quantity of bismuth may be used for makin white-lead. Tin, arsenic, and antimony were only prese in exceedingly minute quantities in some of the sample examined, and in other cases could not be detected. Lea containing copper yields a more or less greenish white-lead whilst the presence of much silver causes the white-lead t have a reddish shade.—W. P. S.

English Patents.

Zinc Oxide; Method and Apparatus for Producing —— B. H. Thwaite and T. J. Denny, both of London. Eng Pat. 18,015, Aug. 16, 1902.

Granulated zinc is heated in an electric furnace throug which a current of air is forced. This carries the zin oxide formed by combustion of the volatilised zinc throug a suitable passage into a depositing chamber having sloping floor leading to a closed outlet, through which th deposit is withdrawn. The chamber is provided with a outlet at the top, closed by material which permits passag of the excess air, whilst arresting the zinc oxide.—E. S.

Casein Coating and Painting Compositions. J. R. Hatmaker, London. From S. S. Ruston, Syracuse, N Y Eng. Pat. 21,692, Oct. 6, 1902.

See Fr. Pat. 325,001 of 1902; this Journal, 1903, 640. —T. F. B

United States Patent.

Pigment, and Method of Producing it. A. S. Ramage, Cleveland. U.S. Pat. 739,144, Sept. 22, 1903.

Claim is made for a pigment consisting of a mixture o ferrous and ferric oxides and basic ferric sulphate—

$$Fe_2O_3, Fe_2(SO_4)_3,$$

produced by blowing air through ferrous sulphate liquor neutralising the acid liberated, thus precipitating basi ferric sulphate, oxidising until about two-thirds of the ir (remaining in solution) is converted into the ferric state, and then precipitating the iron as oxide. The resulting precipitate is calcined.—T. F. B.

(*B.*)—RESINS, VARNISHES.

ssil Resins; Some Chemical Constants of ——. R. A. Worstall. J. Amer. Chem. Soc., 1903, **25**, [8], 860—871.

ᴇ wide variations in iodine values, and also in acid values several varieties of copals and also of dammar resin, int to the almost universal tendency of fossil resins to dergo oxidation in air, a property which renders the emical comparison of different samples of value only en the samples are of the same general (physical) ture; thus, it is useless to compare "nubs" with "dust," cause oxidation is always greater the finer the particles of in.

Kauri Copal.—The iodine values varied between 170 (for ge lumps) and 74 (for dust); acid values 72 (lumps) d 142 (dust), the acid value varies inversely as the line value, and the sum of the two constants is proximately constant (average, 228; maximum, 248, nimum, 205). Kauri copal is free from esters.

Manila Copal.—The iodine values ranged from 148 rge) to 104 (dust), and acid values from 146 (lumps) 199 (dust), the sum of the two averaging 304. Oxidan by air is not so rapid as in the case of kauri copal. ters were absent.

Pontianac Copal appears to occupy an intermediate sition between the last two, both in chemical and ysical properties. Two samples examined gave iodine lues 142 and 119, acid values 135 and 143. No esters ere present.

South African Fossil Copals are all free from esters. e following table contains some characteristics:—

Resin.	Description.	Iodine.	Acid.
nzibar	White "sorts"	79	123
"	Amber chips	104	115
ozambique	White "sorts"	80	136
adagascar	Amber "sorts"	95	126

Zanzibar copal does not appear to be readily oxidised.

West African Fossil Copals.—"North Coast" or "Akra," d and white Angola, Congo and Benguela were examined. he iodine values varied from 143 to 122, and the acid values om 108 to 152. Oxidation by air materially decreased the dine values of the Congo and Angola resins, while the id values remained the same. Esters were absent.

Sierra Leone Copal gave iodine values 118 and 114. id values 105 and 102. It contains no esters, and is not adily oxidised.

Brazilian Copal gave iodine values 123 to 134, acid lues 131 to 149.

Dammar, like the fossil resins, is oxidised in air. The acid lues of the samples examined varied between 24 and 55; e iodine values range from 103 to 124.—T. F. B.

(*C.*)—INDIA-RUBBER, &c.

India Rubber Goods; Acid-proof ——. C. O. Weber. India Rubber J., 1903, **26**, [7], 317.

ʜɪʟsᴛ no kind of manufactured rubber will, for any length time, resist the action of dilute nitric acid, concentrated lphuric, or hydrochloric acid, or of even very highly conntrated organic acids, such as acetic or formic acids, low ades of rubber are more readily attacked than Para rubber. ara rubber is much less easily attacked if mixed with paraffin ax, ceresin, paraffin wax treated with sulphur or mineral l, one part of wax being added to 10 parts of rubber. he experiments made by the author show that much less the acid is absorbed by such mixings than if pure lcanised Para rubber were used, excepting in the case f acetic acid, which is absorbed more readily even than ater. For acid-proof mixings, those fillers which form luble salts with the acids with which the rubber will come in ntact, should be avoided, such as zinc oxide, whiting, zinc lphide, lithopone, and considerable quantities of magnesia magnesium carbonate, as they are gradually dissolved om the rubber, leaving it in a porous state. Suitable llers for acid-proof rubber are: barytes, French chalk, china clay, lead sulphide, lead sulphate, and litharge. The latter, however, should be used in small proportions only: substitutes should also be avoided, specially white substitutes, better results being obtained by using vegetable oils and a larger proportion of sulphur. The durability of acid-proof goods is directly proportional to the degree of vulcanisation.—J. K. B.

United States Patents.

Wurtzilite; Process of Treating ——, *for Paints, Varnishes, &c.* S. R. Whitall, Assignor to F. M. Whitall and J. R. Edson, Washington, U.S.A. U.S. Pat. 734,482, July 21, 1903.

Wᴜʀᴛᴢɪʟɪᴛᴇ or elaterite (an elastic mineral pitch) is dissolved by the aid of heat in petroleum or its distillates, or in any of the ordinary solvents of rubber, and the solvent is then removed until a solid consistent mass resembling rubber remains. The residue, which is brown, has a conchoidal fracture when hard. The solution may be mixed with linseed oil, or the solid residue may be dissolved in oil by heat.—M. J. S.

Wurtzilite, Rubber, &c.; Composition of ——. S. R. Whitall, Assignor to F. M. Whitall and J. R. Edson, Washington, U.S.A. U.S. Pat. 734,483, July 21, 1903.

Tʜᴇ claim is for an intimate mixture of wurtzilite and rubber, in which the physical properties of each are indistinguishable, obtained by previous solution in a common solvent.

—M. J. S.

French Patents.

Caoutchouc: Extraction or Purification of Crude ——. Soc. W. F. Schmoele. Fr. Pat. 331,765, May 6, 1903.

Tʜᴇ invention describes a simple mechanical process for working up inferior kinds of crude rubber, specially intended for use in the countries where the plants grow, so as to save cost of transport on useless material. The installation consists of a pair of agitating cylinders, revolving on horizontal axes, and fitted, one with rollers (corrugated if desirable), the other with metal balls. The first cylinder is loaded with the crude bark, the charging aperture is covered with sieve of suitable mesh, and the whole is revolved till much of the woody fibre has passed from the vessel. The residue is transferred to the ball mill, and similarly treated in presence of cold water, at first with a tight lid, afterwards with one of canvas of wide mesh; and, finally, boiling water is introduced, which removes the last particles of bark, and causes the caoutchouc to cohere into lumps.

—F. H. L.

India-Rubber, Leather, Wood, Iron, &c.; Method for Uniting ——. W. M. Kimberlin. Fr. Pat. 331,559, April 28, 1903.

Tʜᴇ surfaces to be joined are roughened, and then coated with a film of rubber or gutta-percha applied in solution. The surfaces are then treated with an agent capable of vulcanising rubber without heat, such as sulphuryl chloride, brought in contact and compressed for a sufficient time. See also Eng. Pat. 18,673; this Journal, 1903, 919.

—R. L. J.

XIV.—TANNING; LEATHER, GLUE, SIZE.

"Non-Tannin"; Researches on the Absorption of —— by Hide Substance. E. Nihoul. Bull. de l'Assoc. belge des Chim., 1903, [5, 6, 7].

Tʜᴇ author points out that the indications obtained in the laboratory, of the value of given tanning materials often fail to agree with the practical results obtained in the tanyard. For some part of this difference, the nature of the tannery water is responsible (see this Journal, 1902, 865). A further explanation is that some constituents which are returned in analysis as non-tannins, exercise some hitherto unknown action in the tan-pit.

The author has examined the non-tannins of pine-bark, chestnut-bark, and sumac, and finds that these become partially assimilated, playing the part, after a time, of tannins. Experiments in two directions were made, as briefly follows :—

A. *Interaction between Soluble Non-Tannins and Raw Hide when Oxidation is limited.*—" Non-tannin " solutions were prepared exactly as in analysis by the official method of the International Association of Leather Trades Chemists, and mixed with uncoloured hide-powder from the upper portion of the bell filter after analysis, *i.e.*, powder saturated with detannised liquor.

Small flasks were filled to the brim with these mixtures of soluble non-tannins and hide-powder, a trace of thymol was added as preservative, and they were set aside for periods of one, three, and five weeks. The mixtures were then filtered, and the soluble non-tannins determined by evaporation just as in analysis, the results being incorporated with the analysis made at the beginning of the experiments, and tannin, &c. calculated by difference, as though no interval of time had occurred.

Under these conditions, the non-tannins of chestnut increased ; *i.e.*, they appear to exert a solvent action on the hide-powder. The non-tannins of both pine and sumach, however, were diminished, that is, some portion was absorbed by the hide-powder. In other words, pine-bark and sumac probably give better results in the tan-yard than analysis by the present method indicates.

B. *Behaviour of Non-Tannin Solution exposed to Air.*—Small flasks were half filled with clear non tannin solution preserved as before with thymol, but containing no hide-powder in suspension, and allowed to stand for 14 and 61 days. After 14 days, portions were passed through the hide-filter to determine whether any of the non-tannins had changed into tannins, *i.e.*, matter absorbed by hide. In the case of chestnut and pine, the original amount of " tannin " was increased by nearly one unit per cent., and by nearly four units in the case of sumac. After 61 days, the liquors had all formed precipitates, so they were filtered, a portion of each being evaporated to find the change in amount of non-tannin, and another portion passed through the hide-filter to find whether the whole was still non assimilable. Barely more than half the original soluble non-tannins of chestnut passed through, *i.e.*, in practice, nearly half would be retained by the hide, part by direct absorption, and part as a precipitate in the fibres of the skin. A similar effect was observed in the case of the non-tannins of pine and sumac, though to a less extent.

The following figures, selected from the numerous tables in the paper, and obtained by correcting the original figures for total tannin by adding to them the amounts of non-tannin found to become assimilable, show how, under the described conditions, the non-tannins decompose and increase the so-called tannins (matter fixed by hide) :—

Variation in " Total Matters fixed by Hide," due to Action of Non-Tannins. Expressed in Grms. fixed per 100 *of Original " Total Soluble Extract."*

A. By contact with hide substance :—

—	First Analysis.	After 7 Days.	After 21 Days.	After 35 Days
Chestnut bark	70·25	67·28	66·61	..
Pine bark................	83·39	85·33	85·64	85·91
Sumac	57·61	58·83	61·11	61·08

B. By standing in contact with air :—

—	First Analysis.	After 14 Days.	After 61 Days.
Chestnut bark	70·25	74·93	80·37
Pine bark.....................	83·39	86·49	90·43
Sumac........................	57·61	69·41	73·83

The results are also plotted in curves, which indicate that the non-tannins of pine rapidly produce their maximum effect, that with sumac the process is a gradual one, whilst with chestnut the net result is negative and a slight dissociation of the already tanned hide probably takes place.

The behaviour of dextrin and gallic acid, regarded as non-tannins, is also discussed in the paper.—R. L. J.

English Patents.

Tanning Machines ; Impts. in ——. C. J. Glasel, New York, U.S.A. Eng. Pat. 17,817, Aug. 17, 1903.

Mechanical details are given of a cylindrical drum provided with a cage inside, both of which revolve, and have also a reciprocating motion in the direction of the axis of rotation. —R. L. J.

Leather and other Materials ; Coating [Enamelling] —— W. R. Smith and J. D. Larkin, Buffalo, U.S.A. Eng Pat. 14,547, June 30, 1903.

The under side of the leather or other material is protected by close contact with (1) a hollow tray containing a circulating fluid, or (2) a non-conducting material such as asbestos, whilst the upper and prepared surface is exposed to heat.—R. L. J.

United States Patents.

Tannin ; Process of Extracting ——. M. Hönig, Brünn, Austria-Hungary. U.S. Pat. 738,905, Sept. 15, 1903.

Tanning materials are leached with hot sulphite lye, as obtained in the manufacture of sulphite pulp ; zinc may then be added, and an acid to liberate the sulphurous and acetic acids in the tan liquor so obtained.—R. L. J.

Tanning Extracts ; Process of Making ——. G. Klenk, Hamburg. U.S. Pat. 740,283, Sept. 29, 1903.

Tannin extracts, soluble in cold water, are produced by treating the crude tan liquor first with aluminium sulphate and then with sodium bisulphite, and finally heating the mixture in a closed vessel to a temperature between 120—130° C., with a pressure of 2—3 atmospheres. (Compare U.S. Pat. 734,889, July 28, 1903 ; this Journal, 1903, 1007.)—R. L. J.

French Patents.

Willow Shoots ; Process for Converting ——, *simultaneously into Long Fibres for Spinning and a Substance suitable for Tanning Purposes.* L. von Ordody. Fr. Pat. 331,468, April 24, 1903. V., page 1127.

Phenol ; Tanning with ——. J. Chereau. Fr. Pat. 331,701, May 4, 1903.

Ordinary tan liquor of 1—3° B. density (100 kilos.) is mixed with phenol (10 kilos.) and crude petroleum or coal-tar oil (20 kilos., more or less according to the desired softness of the leather). This liquor is employed for 3—6 weeks, and strengthened up at intervals of eight days, the density being raised ½° on the first two occasions and 1° on others. The skins are then placed in the " layers " for 1—3 months, and finished in the usual manner.—R. L. J.

Leather ; Treatment of ——. [*Waterproofing, &c.*] P. Magnus. Fr. Pat. 331,239, April 16, 1903.

The leather, especially chrome leather, is dried, and placed for 10—30 mins. in a bath of benzine (85 parts), benzol (10 parts), " naphtha " (3 parts), and refined petroleum (5 parts), and then worked on the flesh side with a metal brush and more of the solution. These operations are repeated a second and third time. A solution of Para rubber (20 parts), petroleum spirit (80 parts), benzol (10 parts), " naphtha " (2 parts), and fish-glue (4 drachms) is then brushed in ; this is diluted and applied, and still further diluted for a third coat. A final solution is employed consisting of petroleum spirit (75 parts), benzol (20 parts) " naphtha " (1 part), and refined petroleum (5 parts). Each coat is allowed to dry before the next is applied.—R. L. J.

XV.—MANURES, Etc.

Superphosphate, Double; Value of Insoluble Phosphoric Acid in ——. B. Schulze. Deutsche landwirtsch. Presse, 1903, [2]; Biedermann's Centralbl., 1903, **32**, 713.

The usual double superphosphate contains 4 to 6 per cent. of phosphoric acid, which is only soluble to the extent of 50 per cent. in citrate solution. Since considerable value is attributed to these kinds of phosphoric acid, the author prepared, from double superphosphate, a product containing 0·24 per cent. of phosphoric acid soluble in water, 18·22 per cent. of phosphoric acid soluble in citrate solution, and 25·13 per cent. of total phosphoric acid. With this product and with phosphoric acid soluble in water, a series of comparative vegetation experiments were carried out, with and without the addition of lime. From the results, the author concludes that the portion of phosphoric acid in double superphosphate which is insoluble in water cannot be compared with phosphoric acid soluble in water. In soils poor in phosphoric acid the insoluble phosphoric acid has only from one half to one third the manurial effect of soluble phosphoric acid.—J. L. B.

Beet Sugar Works; Utilisation of the Residual Liquors of —— [as Fertiliser]. G. Garbarini and A. Bozzani. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, 110—114.

The mother-liquors of beet sugar works and the wash from the distillation of molasses are concentrated to 60° Brix, and three parts of the concentrated liquor mixed with one part of peat. The paste is dried by the heat of flue gases, or by being spread out in the sun.

All the fertilising substances contained in the mother-liquor are thus preserved, and the dried product preserves its pulverulent condition, suitable for being spread out when required. The proportion of potash being high in relation to the other elements, the paste may be mixed with a rich superphosphate to form a "complete manure."—L. J. de W.

Potassium; Colorimetric Determination of Small Quantities of —— [in Soil Extracts]. L. A. Hill. XXIII., page 1152.

English Patent.

Superphosphate: Plant for Use in the Manufacture of ——. J. Lütjens, Hanover, Germany. Eng. Pat. 10,508, May 8, 1903.

The emptying of "dens" for superphosphate is facilitated by raising the ground sufficiently to allow the transporting cars to be driven beneath for charging through openings. Before such openings, disintegrating machines are arranged, into which the superphosphate may fall. Transporting devices, which may be combined with drying devices, receive the disintegrated superphosphate direct from the machine.—E. S.

French Patents.

Gorse; Treatment of ——, to produce a Cattle Food, Paper Pulp, and a Fertiliser. G. P. Horteloup. Fr. Pat. 331,176, April 14, 1903. XVIII. A., page 1145.

Manure from Molasses; Manufacture of ——. Soc. Cavallier and Co. Fr. Pat. 331,725, May 5, 1903.

Equal weights of molasses, roasted and ground leather, and of dry superphosphate, are heated together to 90°—95° C., and are thoroughly mixed. The claims also include the mixture with molasses of any suitable absorbent matters or chemical products, besides such as may be of use in the treatment of the diseases of plants.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Works Products; Purification of ——, by Barium Aluminate. J. Zamaron. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, 53—59.

The crude aluminate of barium had the same composition as that used by Rembert (this Journal, 1903, 563), over whom the author claims priority. On boiling 100 grms. of the frit of aluminate for 45 minutes in a litre of water, a solution was obtained of 600 c.c. at 8·6° B., and when mixed with washings, a solution at 5·3° B., containing 36·61 grms. of barium aluminate, Al_2O_3BaO, per litre.

The results obtained by using the frit of aluminate directly, on diffusion juice, were not so good as by the ordinary treatment with lime, but the solution gave superior results. The juice was treated with 1 grm. of aluminate per litre, limed, and heated to 85° C., then, without previous filtration, carbonated. The same quantities of lime were used as when the aluminate was not added. The purification with lime alone was 5·10, with previous addition of aluminate 6·56, the original juice being 83·1.

The improvement effected on juice from the second carbonating and on the non-sulphited syrups was equally good.—L. J. de W.

Sugar Juices; Purification of ——, by Barium Aluminate. F. Dupont. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, 59—65.

As compared with the ordinary double carbonating, aluminate of barium gives an increase of purity of 1 to 2 degrees; the increase of the saline quotient is at times *nil*, at others 0·5 to 1·5. In other words, it removes from juice already treated by double carbonating, a further 1·5 to 2 kilos. of impurities per 100 kilos. of sugar, or the yield of sugar on the beetroots is raised from, say, 12 to 12·39 per cent.

In contact with the impurities of sugar juices at 70°—75° C. the aluminate decomposes, the base combining with mineral acids and organic matters to form insoluble barium salts, which are precipitated, while the alumina combines with lime, magnesia, silica, and oxide of iron to form compounds likewise insoluble. The alumina further combines with organic colouring matters to form lakes, thereby improving the colour.

To obtain the full effect of the aluminate of barium, diffusion juice should be heated with it to 85° C., carbonated juice and syrups to 95° to 100° C., and the temperature maintained for several minutes, as the decomposition is not instantaneous. The aluminate should always be used in solution, since the powder dissolves very imperfectly in the juice.

The aluminates of the alkalis are soluble, those of barium and strontium are less soluble (10 per cent.), whilst the aluminates of calcium, magnesium, zinc, and iron are insoluble.—L. J. de W.

"Frog-Spawn Fungus" [Sugar]. T. de Veer. The Beet-Sugar Gazette, 1903, **5**, [17], 300—301.

The following mixture may be used as a culture medium for the so-called "frog-spawn fungus," *Leuconostoc mesenterioïdes*, met with in sugar factories:—10 per cent. of gelatin, 3 to 6 of sucrose, 1 of beef extract, 1 of peptone, and 1 of common salt, the whole rendered slightly alkaline with sodium carbonate. The *leuconostoc* appears on the surface of the gelatin in the form of "sago" kernels.

Another form has been obtained by a culture on boiled potato shavings, glycerin, gelatin, maltose-gelatin, milk-gelatin, &c., distinguished for its entire absence of slime. It is also found in albuminous matter in which dextrose or sucrose is absent. The result is then a white sediment.

No difference is found between the American and the European *leuconostoc*. The European and Indian forms both have the property of dissolving glucose, sucrose, "maltose," and dextrin, and developing gas in the process. According to Baumert the acid formed, is mostly lactic.

"The growth of *leuconostoc* is prevented if temperatures of not less than 43° C. be maintained in the factory," and the temperature ought to be reached as speedily as possible. Slime taken at its best development and dried, maintains its vitality for years. The naked variety shows less vitality in this case. *Leuconostoc* may also occur in rivers. Not all slimy growths are due to *leuconostoc* (this Journal, 1896, 209). Zopf has shown that *clostridium*, or species of *ascococcus*, or *bacillus fumescens* may produce slime masses similar to those of *leuconostoc*.—L. J. de W.

Starch Manufacture; Influence of Atmospheric Conditions on ——. H. Federer. Chem.-Zeit., 1903, **27**, [76], 925—926.

According to the author, the spoiling of starch is not caused by atmospheric conditions, but is chiefly due to the quantity of albuminoids left in it, the amount of the latter depending on the duration of the time of drying the starch and the percentage of alkali used in the manufacture.
—W. P. S.

Sucrate Works; Utilisation [as Fertilisers] of the Residual Liquors of ——. G. Garbarini and A. Bozzani. XV., page 1141.

Glucose; Determination of Commercial ——, in Molasses, Syrups, and Honey. A. E. Leach. XXIII., page 1153.

Paper from Bagasse. Papier-Zeit., 1903, **28**, 2891. XIX., page 1145.

Starch; Determination of the Stiffness of ——. O. Saare and P. Martens. XXIII., page 1153.

English Patent.

Sugar; Process and Apparatus for Making ——. M. H. Miller, D. Huether, A. H. Hough, A. McNeil, and R. Fisher, all of Wiarton, Ont., Canada. Eng. Pat. 14,182, June 25, 1903.

Sugar juice, at a relatively high temperature, is subjected to the action of an electric current whilst in motion. The motion may be obtained by moving the electrodes, carried by metallic frames, by an agitating device, or else the juice may be caused to flow over a number of metallic frame-electrodes. The electrolysed juice is then filtered and treated with sulphur dioxide.—J. F. B.

United States Patents.

Saccharine or other Solutions; Process of Clarifying ——. E. W. Deming, New Orleans. U.S. Pat. 739,100, Sept. 22, 1903.

Impure saccharine solutions are heated under pressure to a temperature above their ordinary boiling point. The coagulated impurities are separated from a moving column of the liquid still under pressure by settling and removing the lighter and heavier impurities separately.—J. F. B.

Sugar Juice; Continuous Carbonation of Alkaline ——. L. Nandet, Paris. U.S. Pat. 739,702, Sept. 22, 1903.

The alkaline juice and "an acid gas" are introduced by separate pipes into the bottom of the carbonating vessel, in which baffle screens are situated. Means are provided whereby the admission of alkaline juice is controlled by the level of the treated juice in the vessel. A supplementary tank is provided outside the vessel and connected with the latter by means of a U-pipe of larger diameter than the juice-inlet pipe; means are provided in this tank for regulating the outflow of the treated juice through the U-pipe.
—J. F. B.

Sweetmeats; Process of Making ——. E. Shaw, London. U.S. Pat. 739,229, Sept. 15, 1903.

Sweetmeats, jam, &c., are prepared by inverting one part of the sugar by the addition of tartaric acid in the proportion of about 3½ oz. of acid per cwt. of sugar; the other part of the sugar is treated with an alkali in the proportion of about 75 per cent. of the acid, and is subsequently added to the inverted sugar solution. The mixture of sugars is further boiled to the desired degree, and consists of about 4 parts of plain sugar to 1 part of inverted sugar.—J. F. B.

French Patents.

Beetroots; Preparing ——, in order to obtain a Juice of a High Degree of Purity. J. Dziengielowski. Fr. Pat. 331,717, May 4, 1903.

Whole beets, as far as possible intact, are heated thoroughly (say, for 1½ hours) at a temperature between 45° and 60° C. (preferably 50°—60° C.) by means of a circulating liquid, such as water or saccharine juice, the temperature of which does not exceed by more than 1°—3° C. the temperature to which the beets are to be heated. The beets are then sliced or reduced in any convenient manner, and subjected to any process (preferably diffusion) whereby the juice may be extracted. The heating liquor, after enrichment by repeated use, is treated in the same manner as diffusion juice.—J. F. B.

Diffusion Batteries; Utilisation of the Sweet Waters of ——, in Sugar Factories. B. Tyszkiewicz and J. de Valavski. Fr. Pat. 331,638, April 27, 1903.

The very dilute sweet waters drained and expressed from the exhausted chips are utilised for displacing the weak juices from the diffuser which is to be emptied. The sweet waters thus enriched are passed on to the other diffusers of the battery, and finally emerge in the form of diffusion juice of full strength. Meanwhile, the diffuser, which has been treated with the sweet waters, is further treated with fresh water, the latter being recovered and pumped up to the sweet-water tank for exhausting the next diffuser.
—J. F. B.

Manure from Molasses; Manufacture of ——. Soc. Cavallier and Co. Fr. Pat. 331,725, May 5, 1903. XV., page 1141.

Starch, Dextrin, and Amylaceous Products; Manufacture of ——. R. Goldschmidt and J. Hasek. Fr. Pat. 331,061, April 19, 1903.

Potatoes are washed and reduced to a pulp in the ordinary way; the mass is then treated with a mineral acid, and agitated in a centrifugal machine until the liquors which run away are free from starch. The solid residue remaining in the centrifugal machine is then reduced to a paste by the addition of mineral acid (if dextrin be required), or, if not, it is dried, ground, sifted, and bolted, the starch being used as such or converted into amylaceous products.
—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Ferments and Toxins; Action of Fluorescent Substances on ——. H. von Tappeiner. Ber., 1903, **36**, [12], 3035—3038.

Raab has found that a very large number of fluorescent substances have a poisonous influence upon living cells in the presence of light; the author has investigated the action of similar bodies upon enzymes.

Mixtures were made of starch paste and diastase; to one was added 0·05 per cent. of eosin. When the mixture containing eosin was kept in the dark, the same proportion of maltose (about 76 per cent. in five hours) was produced as in the control mixtures. But when the mixture containing eosin was exposed to daylight during the whole course of the experiment, only 21·3 per cent. of maltose was produced in the same time. Only a very few of the fluorescent bodies tested were found to be active towards enzymes, *viz.*, eosin, Magdala Red, and Quinoline Red, all of these substances having an absorption spectrum in the green or pale blue portion. When these rays were excluded, by filtering the light through a layer of the fluorescent substance under examination, the influence of the latter in the mixture was destroyed, and the conversion was as rapid as when effected in the dark. This action of the fluorescent bodies in presence of light brings about a permanent crippling of the enzyme, since 18 hours' further action in the dark only increased the proportion of maltose, in the case quoted above, to 46 per cent. Exactly similar results were obtained with the enzymes invertase and papayotin. In the latter case, however, two more substances are to be included amongst the active bodies, *viz.*, uranin (weak) and dimethylphosphine (very weak).

Similar experiments were carried out with the toxin, *ricin*. Exposure to daylight in presence of eosin for 14 hours completely destroyed the agglutinating property of ricin towards the red corpuscules of the blood. In this case a far larger number of the fluorescent substances were active than in the case of the enzymes, the results approaching more nearly to those obtained with living cells.—J. F. B.

Invertase; Action of Aniline Dyestuffs on ——. S. Mereschkowsky. Centralbl. f. Bakt. und Parasitenk., 1903, **11**, 33; Woch. f. Brau 1903, **20**, 487.

The author has examined the action of magenta, Congo Red, and safranine on invertase. A small quantity of magenta had no appreciable effect, but a large quantity prevented the inversion of cane sugar. In a concentration of 1 : 1000, magenta exerted a marked retarding action on the enzyme, but Congo Red under similar conditions had no such effect. Safranine also retarded the action of invertase proportionally to the concentration of the dyestuff. In a concentration of 1 : 4000, magenta lowered the reproducing power of yeast, and 1 : 1000 completely stopped it. —J. L. B.

Hops in the Year 1902; *Examination of* ——. E. Hantke and H. W. Rohde. Letters on Brewing, 1903, **2**, 323—332.

The following 18 samples of hops were submitted to a detailed chemical and physical examination. The first 13 samples are of German origin; the last 5, American. The samples are arranged in order of price :—

Sample.	Total Resin.	Soft Resin.	Hard Resin.	Total Acidity as Lactic Acid.	Volatile Acidity as Valeric Acid.	Tannin.	Moisture.	Ash.	Nitrogen.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1. Austrian hops........	15·15	11·54	3·61	2·55	0·21	4·98	8·5	..	
2. Bohemian "Auschaer" hops................	14·15	9·09	5·06	2·17	0·42	6·40	10·5	..	..
3. Mittelfranken hops ..	17·99	13·74	4·25	2·50	0·90	2·02	8·0	..	..
4. Spalter Kreis hops ...	15·25	10·19	5·06	2·45	0·22	1·97	12·0	..	..
5. Wolnzacher hops.....	16·44	12·84	3·60	2·83	0·51	1·42	10·0	..	..
6. Stadt Spalt hops.....	16·82	13·43	3·39	2·45	0·32	4·28	10·0	..	..
7. Spalt Bezirks hops ...	16·89	11·85	5·04	2·08	0·15	2·44	10.0	..	..
8. Bohemian Herrschafts hops................	15·29	10·95	4·34	2·12	0·21	3·76	10·5	..	..
9. Spalter hops	15·34	11·90	3·44	2·26	0·61	1·34	9·5	..	..
10. Choice Saaz hops.....	15·21	11·83	3·38	2·36	0·69	3·86	9·5	..	..
11. First-class choice Saaz hops................	16·66	12·74	3·92	2·83	0·48	2·12	9·0	..	..
12. Posen hops...........	14·70	11·28	3·42	2·74	0·70	1·82	8·0	..	..
13. Bavarian Mountain hops................	14·96	9·32	5·54	2·08	0·17	4·48	10·0	..	..
14. California hops.......	12·93	8·56	4·37	1·65	0·63	2·36	8·5	6·9	1·62
15. Oregon hops	14·58	8·52	6·26	1·98	0·40	3·87	12·0	8·8	2·38
16. California hops.......	14·59	11·26	3·33	1·74	0·73	3·18	9·0	7·5	1·93
17. Oregon hops	15·07	11·08	3·99	1·89	0·42	4·46	8·0	6·9	2·23
18. California hops.......	13·81	10·12	3·69	1·98	0·56	1·42	10·5	5·7	1·98

The percentage of the various constituents do not correspond to the commercial value, for sample 6 should be the highest price, as it contains the most soft resin and tannin. Possibly the hops are not correctly valued, too much importance being attached to the appearance and other physical properties, and a hop which is not well known may have the same practical value as a good variety. The authors insist that chemical analysis must go hand in hand with an examination of the general properties if samples of hops are to be correctly valued.—J. L. B.

Fermentation; Causes of Boiling ——. H. Harders. Letters on Brewing, 1903, **2**, 363—364.

The author considers that the mechanical cause of a boiling fermentation is due to the premature settlement of the yeast. In some cases the phenomenon arises from the hops. The yeast from a boiling fermentation was examined under the microscope, and it was found that most of the cells had small excrescences consisting of hop resin. Under fermentation conditions these cells would sink. The hops used were over-ripe and dry; in the copper the leaves were all detached from the spindle, whereby much resin of an abnormal character found its way into the wort.

Radical changes in the mashing process, such as in the fermenting or pitching temperatures, may also cause boiling fermentations, for the yeast will not at once find its accustomed nutritive substances or temperature conditions, so that its earliest development will be retarded, and it will be induced to settle prematurely.—J. L. B.

Liqueur Wines and Musts rendered Intoxicating Artificially; Examining and Distinguishing ——. G. Halphen. Ann. Chim. anal. appl., **8**, 246—252. Chem. Centr., 1903, **2**, [13], 767.

As nitrogenous food, yeast consumes in the first place ammonia and ammonium salts, and as musts are comparatively rich in ammonium compounds, the non-occurrence of such compounds in a sweet wine may be regarded as a safe indication that the latter has been prepared by fermentation. The amount of volatile acids present affords a further clue, especially in the cases of musts poor in ammonium compounds and of wines containing a comparatively large proportion of ammonia owing to the fermentation having been carried on under unfavourable conditions, *e.g.*, at a too high temperature. Musts contain only a small amount of volatile acids; the amount is increased to a certain extent by normal fermentation, and to a much greater extent by fermentation under unfavourable conditions. The ratio between the amounts of dextrose and levulose is also of value, as dextrose is fermented more rapidly than levulose, whilst in musts the two sugars are present in nearly equal proportions. From the results of the examination of :—(1) products obtained by the addition of alcohol directly to the musts; (2) wines prepared by partial fermentation of musts and subsequent addition of alcohol; and (3) wines prepared by complete fermentation of musts and subsequent addition of alcohol—the author concludes that a sweet wine containing more than 0·01 grm. of nitrogen in the form of ammonia and less than 0·1 grm. of volatile acid per litre, must be regarded as a must fortified by the addition of alcohol. When more than 0·2 grm. of volatile acid per litre is present, the possibility of the wine having been prepared by partial or defective fermentation must be considered, and the ratio between the amounts of dextrose and levulose and the proportion of glycerin present must be determined.—A. S.

Marcs; Utilisation of ——. E. Barbet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [1 and 2], 37—38.

At Rheims the juice obtained by first pressing the grapes is used for producing the finest brands of champagne. The second pressing gives an inferior quality. In all, seven successive pressings may be made. Then sweet water is poured over the marc to produce a sour wine called *piquette*. The marc is again pressed, and finally distilled.

In the south of France, after pressing, the marc is thrown on the fields, although containing 4·5 per cent. of alcohol. There is also a large quantity of tartar when fermentation has taken place in presence of the grapes to produce red wine, and crude cream of tartar is worth 1·35 francs per kilo.

This failure to utilise the valuable residues in the marc is largely due to aversion to admit the excise officials.

In Italy numerous distillery companies are formed for distilling the marc, and this example is worthy of imitation.

After the spirit is extracted, the pips or stones form an excellent food for fowls, particularly pigeons. An excellent oil may also be extracted therefrom, and the residue forms good manure. This cannot be said of the undistilled marc, which is too acid, and not having been sterilised by heat is liable to convey noxious disease germs to future growths.
—L. J. de W.

Organic Acids of Wine; Determination of the ——. A. Partheil. XXIII., page 1154.

English Patents.

Grain; Process for Softening ——. V. Lapp, Leipzig, Germany. Eng. Pat. 11,749, May 22, 1903.

Grain is steeped with repeated alternate discharge of the soaking water, aeration of the grain, and supply of fresh water. The grain, softened by water, at about 12 C., is subjected during about 24 hours several times (preferably three times) to fresh charges of water at 12° C., and finally to a charge of water at 15° C. During the intervals, of about one hour, between each charge, the grain is subjected to the action of liquid air enriched in oxygen by partial evaporation, the supply of this oxygenated air being regulated so as to keep the grain under pressure during the soaking operations. If desired, the water may be treated with liquid air before being admitted to the grain.—J. F. B.

Fermenting Vats and Storage Vessels for Beer; Process for Coating Metallic ——. V. Lapp, Leipzig, Germany. Eng. Pat. 14,839, July 3, 1903.

The large metal vessels are first washed out with water and then with a dilute solution of sodium carbonate. The walls are then painted with a solution of tannic acid, which is allowed to remain on for 10 or 12 hours and then rinsed off. This application of tannic acid is then repeated two or three times, iron tannate being produced on the walls. The partially exhausted tanning materials used for the preparation of the tannin are then boiled with water in the vessel for several hours; a second boiling is then effected with hops and water. The walls are next coated in the warm state with a solution of shellac, the "interlac" of commerce. After several days the vessel is painted with a saturated solution of gypsum, mixed with a little beer sediment. When this has dried, milk of gypsum is boiled in the vessel for five or six hours and the coating is complete.—J. F. B.

Brewing Process; Improved ——. R. Kubessa, Kalk, Germany. Eng. Pat. 15,935, July 18, 1903.

Malt is separated into three or more constituents, *viz.*, flour, various sizes of grist and empty hulls. Each portion is mashed separately under conditions most suitable for the extraction of each. For instance, the flour may be mashed and then boiled if desirable. The grists are boiled to gelatinise the starch, and subsequently saccharified by adding the unboiled flour mash. Meanwhile, the empty hulls are extracted with warm water without boiling, in such a manner as to obtain an extract rich in diastase, but devoid of objectionable hull constituents. The hull extract is finally added to the flour and grist mashes, saccharification is completed, and the whole mash is filtered through the exhausted hulls.—J. F. B.

Vinegar; Apparatus for the Manufacture of ——. R. Douglas, New York, U.S.A. Eng. Pat. 11,526, May 20, 1903. Under Internat. Conv., May 20, 1902.

In a vinegar generator are provided a receiving tub or tank, bundles of fibrous material having interstices between the fibres, the bundles being supported in a practically upright position, immovable and non-compressible supports being arranged to support the fibrous material of the bundles at intervals, means for introducing the mash and withdrawing it, and means for creating a constant circulation of air through the interstices of the fibrous material.
—J. F. B.

French Patents.

Alcohol; Process of Obtaining a Higher Degree of Purity in ——, during Alcoholic Fermentations in which Malt is used. C. J. Somló. Fr. Pat. 331,578, April 29, 1903.

See Eng. Pat. 11,323 of 1903; this Journal, 1903, 1061.
—T. F. B.

Fermentation Apparatus; Automatic Cooling Device for ——. W. de Rougemont. Fr. Pat. 331,684, May 2, 1903.

See Eng. Pat. 11,038 of 1903; this Journal, 1903, 1009.
—T. F. B.

Saturator with Sprays to be used for the Aeration of Wines, Brandies, &c.; and Oxidation of Dye-Solutions, &c. J.-L. Planeur. Fr. Pat. 331,092, April 11, 1903.

A cylindrical vessel has at its upper and lower ends two chambers, connected with its interior through two nozzles or sprays. The vessel is mounted on trunnions, so that it can be turned upside down. One of the trunnions is hollow, and contains the inlet-pipe for the gas with which the liquid is to be saturated. The top vessel is filled with liquid, and gas from a gas-holder provided with regulating valves is led into it by way of the hollow trunnions. The pressure of the gas forces the liquid through the nozzles into the cylindrical vessel, where it meets with another stream of gas issuing from the inlet pipe, thereby becoming saturated. When all the liquid has been forced out, the pressure of the gas inside the vessel opens a valve situated at the top of the lower chamber, and the liquid flows into the latter. The saturated liquid is then drawn off. Should the saturation be incomplete, the vessel is turned upside down again, and the process of saturation repeated.
—L. F. G.

Wines; Process and Apparatus for Making Sparkling ——. E. W. Kuhn. Fr. Pat. 331,312, April 21, 1903.

The wine is placed in receptacles constructed of silvered or enamelled metal, capable of withstanding a working pressure of six atmospheres. These vessels are provided with a conical bottom, with a discharge cock at the lowest point. The vessel is in communication at the top with a store of compressed carbon dioxide. The wine is forced through a pipe in the lower part of the vessel into a filter, then into a refrigerating and saturating vessel, to which carbon dioxide is also supplied under pressure. After saturation the wine passes through a second filter into a counter-pressure bottling apparatus.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Dyestuffs for the Colouring of Foods; Use of Artificial ——. G. Senacherl. Zeits. Oesterr. Apoth.-Ver., **41**, 847—849; 867—870. Chem. Centr., 1903, **2**, [13], 769.

Of the dyestuffs examined by the author from the hygienic standpoint, only the following should be allowed for use in the colouring of foodstuffs:—Azo dyestuffs, with the exception of Orange II. (Mandarin); triphenylmethane dyestuffs, with the exception of hydroxy derivatives; pyrone dyestuffs; and the oxyketone dyestuffs. Of the dyestuffs of the azine series, the indulines might be allowed, and of the remaining classes of dyestuffs, Naphthol Yellow S and Methylene Blue.—A. S.

Caffeine and Theobromine in Kola Nuts, Guarana, Tea, and Coffee; Modified Process for the Determination of ——. E. Leger. XXIII., page 1154.

Theobromine [in Cacao or Chocolate]; Quantitative Determination of ——. Katz. XXIII., page 1154.

English Patents.

Milk; Drying and Preserving ——. J. R. Hatmaker, London. From J. A. Just, New York, U.S.A. Eng. Pat. 21,617, Oct. 4, 1902.

Whole or separated milk is exposed in a thin layer on a surface heated above 212° F., so as to cause rapid evaporation of the water, the process being allowed to complete itself spontaneously, leaving a moist, porous, sterile product. To preserve the casein unaltered, a suitable proportion of sodium phosphate or other salt is added, whilst the fat is rendered stable by the addition of a small amount of sodium hydroxide or other alkali. (See also this Journal, 1902, 1548; 1903, 645, 815.)—C. A. M.

Milk; Sterilisation of ——. N. Bendixen, Copenhagen. Eng. Pat. 12,555, June 3, 1903.

Separate vessels are provided in which the preliminary heating and other preparatory treatments, the sterilising proper (heating from 50° to 128° C.) and the cooling are conducted separately. The operations are thus made continuous; the sterilising vessel is discharged by means of the pressure existing in it; in order to avoid scorching, it is only emptied down to the level at which the milk is thrown by the stirrer against the hot walls of the vessel; the sterilising vessel is not closed until the temperature of the milk has been raised to 100° C.—J. F. B.

Centrifugal Separator [*Milk*]. A. L. Christenson, Stockholm. U.S. Pat. 739,648, Sept. 22, 1903.

A centrifugal separator bowl, having cream and blue-milk outlets, and an inlet pipe for the whole milk, is provided with a liner inside the bowl, consisting of a longitudinally folded partition, and wings attached to and extending from the outer folds of the said partition, the latter being provided with outlet openings at the outer parts of the folds. —J. F. B.

French Patents.

Sterilising Organic Liquids; Process and Apparatus for —— [*by Ultra-Violet Rays*]. Soc. B. Seiffert und Sohn. Fr. Pat. 331,619, April 30, 1903.

See Eng. Pat. 9242 of 1903; this Journal, 1903, 878. —T. F. B.

Gorse; Treatment of ——, *to produce a Cattle Food, Paper Pulp, and a Fertiliser.* G. P. Horteloup. Fr. Pat. 331,176, April 14, 1903.

Gorse is tied in bundles of about 15 kilos. each, the upper portions are then cut off, and dried by a current of hot air; the product is treated in a decorticating mill and used as a food for cattle. The lower portions of the stems are chopped up and boiled, with a solution of caustic soda for conversion into paper pulp. The used soda lye is evaporated and calcined for recovery, whilst the vapours evolved during these processes are conducted through a coke-tower charged with sulphuric acid, the ammonium sulphate being recovered and employed as a fertiliser.—J. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Waters, Potable, in South-West Lancashire. J. Campbell Brown. Brit. Assoc. Southport, 1903. Engineering, 1903, **76**, 472.

The results are given, in a series of tables, of the examination of (1) surface waters; (2) deep-well or bore waters; and (3) shallow-well or spring waters.—A. S.

Potassium; Colorimetric Determination of Small Quantities of —— [*in Drainage Waters*]. L. A. Hill. XXIII., page 1152.

English Patent.

Ammonia from the Sewerage Waters of Towns; Mode and Means for Continuously Extracting ——. R. Schilling and C. Kremer, Frankfort, Germany. Eng. Pat. 15,752, July 16, 1903.

The waste water, freed from suspended matter, is mixed with milk of lime in a closed vat and is then passed through a distilling vessel, in such a way that it is split up into minute drops or spread out into very thin films, whilst heated combustion gases are forced through it in the reverse direction, carrying away the ammonia to be afterwards fixed by sulphuric acid.—L. A.

United States Patent.

Sewage; Apparatus for Treating and Utilising ——. R. J. G. Wood, New Jersey, U.S.A. U.S. Pat. 739,049, Sept. 15, 1903.

A large drying cylinder revolves inside a furnace or other casing at an inclined angle to the ground and from its upper end there rises, at a still greater angle, a revolving, filtering or straining cylinder fed by a hopper and elevator from the discharge end of the drier. The sewage is thus continuously strained and heated until sufficiently dry. —R. L. J.

(*C.*)—DISINFECTANTS.

English Patent.

Antiseptic; Solid Soluble [*Trioxymethylene and Sodium Sulphite*]. B. J. B. Mills, London. From La Soc. Anon. Produits Chimiques Spéciaux, Lyon-Monplaisir. Eng. Pat. 23,460, Oct. 27, 1902.

See Fr. Pat. 325,391 of 1902; this Journal, 1903, 708. —T. F. B.

United States Patent.

Disinfectants [*Formaldehyde*]; *Process of Manufacturing* ——. C. Spengler, Davos-Platz, Switzerland. U.S. Pat. 739,941, Sept. 29, 1903.

See Eng. Pat. 15,271 of 1901; this Journal, 1902, 1150. —T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Paper from Bagasse. Papier-Zeit., **28**, [81], 2891.

Owing to the length and elasticity of the fibre, bagasse, if properly treated, yields a very good half-stuff, eminently suitable for strong wrapping papers.

Experiments conducted on bagasse from Java showed a yield of half-stuff of 48 per cent. This was very tough and could be bent several times without breaking. These properties are considerably better than those of straw pulp, which is extensively used for paper-making; they should be capable of still further improvement by more prolonged beating.

The repeated failures of enterprises for making paper from bagasse in tropical countries are attributable to industrial and economic difficulties and not to the nature of the fibre.—J. F. B.

English Patents.

Cellulose; Manufacture of —— [*from Plants*]. C. Kellner, Vienna. Eng. Pat. 24,542, Nov. 8, 1902.

See Fr. Pat. 326,313 of 1902; this Journal, 1903, 817. —T. F. B.

United States Patents.

Sizing, and Process of Producing same. A. A. Dunham, New York, Assignor to Casein Co. of America, N.J. U.S. Pat. 739,657, Sept. 22, 1903.

A dry glue or sizing composition consisting of granular or broken casein combined with about 10 per cent. of animal glue.—F. H. L.

Paper; Method of Treating ——, *for Toughening and Rendering it Impervious.* C. J. Goessmann, Worcester, Mass., Assignor to Vellumoid Paper Co. U.S. Pat. 740,006, Sept. 29, 1903.

The paper is treated by first exposing one side of it to the hot glutinous material, the other side being simultaneously exposed to the air. Saturation is thus effected in a manner which facilitates the expulsion of the air and gases enclosed in the paper. The other side of the paper is then treated with the glutinous material, the excess of the latter is removed and the residue is fixed by means of formaldehyde, dried, washed and again dried.—J. F. B.

French Patent.

Gorse; Treatment of ——, to produce a Cattle Food, Paper Pulp, and a Fertiliser. G. P. Horteloup. Fr. Pat. 331,176, April 11, 1903. XVIII. A., page 1145.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Radioactive Constituent of the Bismuth from Joachimsthal Pitchblende. W. Marckwald. Ber., 1903, **36**, 2662—2667.

Radio-tellurium.—From 6 kilos. of bismuth oxychloride, prepared from about 2,000 kilos. of Joachimsthal pitchblende, the author obtained 1·5 grms. of radio-tellurium by the method previously described (this Journal, 1903, 49). The product was, however, found to consist almost entirely of ordinary tellurium, containing only a fractional part of 1 per cent. of the radioactive constituent. It was converted into chloride, and from the hydrochloric acid solution the tellurium was precipitated by hydrazine hydrochloride. After once repeating the precipitation, the filtrate was concentrated and digested on the water-bath with a drop of stannous chloride solution; 4 mgrms. of a dark-coloured precipitate were obtained. Even when the filtration was repeated several times, the filtrate still contained small quantities of the active substance, apparently in a state of colloidal solution. The radioactive substance thus obtained, dissolves readily in cold dilute nitric acid, and by evaporating the acid solution, and dissolving the residue in hydrochloric acid, a solution of the chloride is obtained, from which, by immersing in it a plate of copper, tin, antimony, &c., the active substance can be deposited in a very fine state of division. A deposit of about 0·01 mgrm. on a copper plate with a surface of 4 sq. cm., is sufficient, when in proximity to a zinc blende screen, to render the illumination of the latter visible to an assemblage of several hundred persons.

Polonium.—The author claims that the new reactions recently observed by Mme. Curie (Phys. Zeits., **4**, 234) with polonium enriched by her fractionating process, confirm the opinion previously expressed by him that polonium is not identical with radio-tellurium. Polonium behaves quite differently from radio-tellurium, in that its nitric acid solution gives with water a yellow to brown precipitate, soluble in acids.

Experiments are also described showing that the tellurium with induced radioactivity mentioned by Giesel (this Journal, 1903, 928) behaves quite differently from radio-tellurium. The author, in reply to Giesel, states that he did not claim the name polonium for the radioactive substance discovered by him. At the time of his discovery, the name polonium was already so indefinite that it was necessary to distinguish between Curie's and Giesel's polonium; the author therefore adopted provisionally the name radio-tellurium, on account of the apparent close relationship between the substance discovered by him and tellurium. (See also this Journal, 1902, 994, 1301.)

—A. S.

Radioactive Thorium. K. A. Hofmann and F. Zerban. Ber., 1903, **36**, 3093—3096.

The authors confirm their previous statement (this Journal, 1902, 368) that freshly-prepared thorium compounds from various minerals possess varying degrees of radioactivity, according to the proportion of uranium contained in the mineral. After keeping for from 1½ to 2 years, all the preparations examined showed a fairly uniform β-radiation of very small penetrating power, whilst the ionising α-radiation of the compounds was reduced nearly to the value of that of uranium preparations, and then became fairly constant. This residual activity may be due to the presence of a trace of actinium. The fact that thorium compounds prepared from orthite, gadolinite, &c., were not radioactive, shows that pure thorium compounds possess no primary radioactivity. The gadolinite used showed the phenomenon of pyroluminescence, *i.e.*, of suddenly glimmering throughout its whole mass when heated, but this was not connected with radioactivity. The authors consider that the fact that thorium compounds from bröggerite, eleveite, euxenite, and samarskite, and also thorium compounds rendered active artificially by means of uranium, become considerably less radioactive in the course of a few months, whilst a small quantity of a substance resembling thorium, obtained from pitchblende, was as strongly radioactive after keeping for one year as when freshly prepared, confirms the view of Debierne (Comptes rend., **129** 593, and **130**, 906), that the latter preparation contains the primary active constituent, actinium.

—A. S.

Iodine; Purification and Determination of ——. A. Gross. J. Amer. Chem. Soc., 1903, **25**, [9], 987—990.

Various methods of purifying iodine have been studied by the author, who concludes from his experiments that the purest product is yielded by Stas's method, in which the iodine is dissolved in potassium iodide solution, precipitated by the addition of water, dried over "calcium nitrate" and sublimed. With products prepared in this way, the average of five determinations showed 100·02 per cent. of iodine; whilst Lean and Whatmough's method of preparing the iodine from cuprous iodide gave 99·65 per cent.; and a sample of unpurified iodine, 98·83 per cent. Sulphuric acid was found to be the best drying agent, but the iodine was not contaminated when dried over calcium chloride. For the determination of the iodine, a method based on its conversion into zinc iodide and titration with silver nitrate was employed. About 2 grms. of the iodine were shaken in a closed flask with 40 c.c. of water, and about 4 grms. of shot zinc, and the flask left until the liquid became colourless. Its contents were then filtered and the filtrate and washings made up to 500 c.c. Of this solution, 50 c.c. were transferred to a porcelain dish and titrated with silver nitrate, potassium chromate being used as indicator.

—C. A. M.

Bismuth Lactate; Method of Preparing ——. Supplement to the Dutch Pharmacopœia; through Pharm. Zeit., 1903, **48**, 532.

Six parts of bismuth subnitrate are treated in a flask with a mixture of five parts of solution of ammonia and 10 parts of water. After standing, the supernatant liquid is decanted, and the precipitate washed. Five parts of lactic acid are then added and the resulting solution filtered into 10 parts of alcohol. The precipitate thus formed is collected and dried. Bismuth lactate is required, when incinerated with ammonium nitrate, to leave a residue of 55 to 59 per cent. of bismuth oxide.—J. O. B.

Solanine. A. Hilger and W. Merkens. Ber., 1903, **36**, [12], 3204—3206.

Solanine may readily be converted into the crystalline form by digestion with 96 per cent. alcohol (1 grm. of solanine to 150 grms. of alcohol) for some time at 65° C. After two or three crops of crystalline solanine have been obtained, the solution solidifies owing to the separation of the gelatinous, amorphous form of solanine—so-called solaneine. The latter is merely the anhydride of the crystalline solanine, which loses 5 mols. of water. The former is converted into the latter by keeping a solution in aqueous acetone for about eight months. Solanine is hydrolysed when distilled with 2 per cent. sulphuric acid for three or four hours, the volume being kept constant by the addition of water, and the distillate being collected under ether. From the distillate crotonic aldehyde (b. pt. 104° C.) may be isolated, whilst the solution in the distilling flask contains *d-glucose*, and the base, *solanidine*, was extracted from the residue. Solanine yielded 56·3 per cent. of solanidine, and 26·06 per cent. of *d*-glucose. The composition of solanine and solanidine having been re-determined by analyses, the hydrolysis of solanine may be represented by the following equation:—

$$\underset{\text{Solanine.}}{2C_{52}H_{97}NO_{18}} = \underset{\text{Solanidine}}{2C_{39}H_{61}NO_2} + \underset{\text{Glucose.}}{3C_6H_{12}O_6} + \underset{\text{Crotonic aldehyde.}}{2C_4H_6O} + 12H_2O.$$

—J. F. B.

Quillaiaic Acid. P. Hoffman. Ber., 1903, **36**, 12], 2722—2734.

Quillaiaic acid was prepared from saponin, obtained from quillaia bark. The aqueous solution of the bark extract was first treated with a small quantity of lead acetate, which removes colouring matters and also a small quantity of the quillaiaic acid. By further precipitation with lead acetate, quillaiaic acid is obtained. The product is purified and the pure substance isolated by Kobert's method.

Thus prepared, quillaiaic acid is a brown, hygroscopic powder, possessing the typical characters of the saponins; it may be freed from an acid impurity which gives an intense red coloration with Millon's reagent, by repeated solution in alcohol and precipitation by ether. Quillaiaic acid has a faint acid reaction, and does not decompose carbonates. It is precipitated by lead acetate and by barium hydroxide, but the latter decomposes it on boiling. Isobutyl alcohol is a convenient medium for extracting it from aqueous solutions. It is poisonous, and has a solvent action upon the blood corpuscles. Quillaiaic acid, being a glucoside, is split up by boiling with dilute acids; *sapogenin*, insoluble in water, is produced and the solution contains sugars. Sapogenin is soluble in alcohol, glacial acetic acid, ammonia and alkali hydroxides and carbonates; it is of an acid nature and yields a crystalline derivative with potash.

The solution of sugars obtained by the hydrolysis of quillaiaic acid contains galactose and a dextro-rotatory sugar, not fermentable by yeast, the methylphenylhydrazone of which melts at 176°—177° C. From 100 parts of quillaiaic acid, 31·17 parts of sapogenin, and 29·23 parts of galactose were obtained.—J. F. B.

Terpenes and Essential Oils. O. Wallach. Annalen, 1903, **329**, [1], 82—133.

The subjects treated of in this paper are as follows:—The constitution of pulenone; the conversion of cyclic ketones into pyrazole bases, and the behaviour of cyclic ketones towards semi-carbazides.—E. F.

Grass Oils; West Indian ——. E. J. Parry. Chem. and Druggist, 1903, **63**, [1234], 507.

The oils of *Andropogon Nardus* and *A. Schœnanthus* have been distilled experimentally in Trinidad and Jamaica. H. H. Cousins obtained the following results with the Trinidad oils:—

——	*A. Nardus.*	*A. Schœnanthus.*
Sp. gr. at 15° C.	0·9084	0·9315
Optical rotation	+ 0·1°	+ 3°
Aldehydes	15·5 per cent.	48·2 per cent.

The *A. Nardus* oil showed a total geraniol and citronellal value of 53 per cent. The *A. Schœnanthus* oil closely resembled lemon-grass oil.

The author has examined specimens of the Jamaica oils. The *A. Nardus* oil was of a pale colour, and had an exceptionally fine odour. Sp. gr. at 15° C., 0·8955; optical rotation (100 mm. tube), —3° 30′; refractive index at 20° C., 1·4712; aldehydes, 25 per cent.; geraniol and citronellal, 87 per cent. It is soluble in 1 vol. of 80 per cent. alcohol, and on further addition of 10 vols. shows only the faintest opalescence.

The *A. Schœnanthus* oil is a true lemon-grass oil, but differs from normal Eastern oils in its insolubility in 70 per cent. or 80 per cent. alcohol. It had the following characters:—Sp. gr. at 15° C., 0·8965; optical rotation (100 mm. tube), — 0° 30′; aldehydes, 83 per cent.; refractive index at 20° C., 1·4896.—A. S.

Phosphorus in Phosphorated Oil; Determination of ——. W. Straub. XXIII., page 1152.

Phosphorus [in Phosphorated Oil]; Quantitative Determination of ——. Katz. XXIII., page 1152.

β-Naphthol in Benzonaphthol; Detection of Free ——. A. Jorissen. XXIII., page 1152.

Cinnamic Aldehyde; Gravimetric Determination of —— *[as Semioxamazone]*. J. Hanus. XXIII., page 1154.

Alkyl; Determination of ——. H. Decker. XXIII., page 1152.

Cocaine, α-Eucaine and β-Eucaine: Method of Distinguishing ——. G. Eigel. XXIII., page 1152.

Morphine and Codeine; Some Colour Reactions of ——. G. Garbutti. XXIII., page 1152.

Eugenol; Determination of ——, *in Clove Oil.* H. Thoms. XXIII., page 1155.

English Patents.

Acyl Bodies [Anhydrides or Acid Chlorides]; Manufacture of Organic ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on Rhine. Eng. Pat. 24,255, Nov. 5, 1902.

Anhydrides or chlorides of organic acids are produced by the action of salts of chlorosulphonic acid on an organic acid or its salts.

Acetic anhydride is prepared by warming 150 parts of sodium chlorosulphonate with 170 parts of anhydrous sodium acetate to about 70° C. Heat is evolved, and part of the acetic anhydride distils over, the remainder being obtained by further heating.

If the proportions of sodium chlorosulphonate and sodium acetate employed are 9 and 4 respectively, acetyl chloride is the product of the reaction.—T. F. B.

4-Amino-2 : 3-dimethyl-1-phenyl-5-pyrazolones and Homologues thereof; Manufacture of Substitution Products of ——. O. Imray, London. From Farbwerke vorm. Meister Lucius und Brüning, Hochst-a-Main, Germany. Eng. Pat. 26,271, Nov. 28, 1902.

4-Bromo-1-phenyl-2 : 3-dimethyl-5-pyrazolone or a homologue thereof is heated with a secondary amine. The reaction is expressed by the equation $C_{11}H_{11}BrN_2O + 2NHR_2 = NHR_2.HBr + C_{11}H_{11}N_2O(NR_2)$. For instance, the above bromo-compound is heated with an aqueous solution of dimethylamine or with piperidine at 150° C. in a closed vessel. The unaltered reagents are removed, and the new base is extracted by ether or benzene, or precipitated after the addition of alkali.—J. F. B.

French Patents.

Filter-Plates for Presses; to replace the Cloth Bags used in the Extraction of Essences and Oils from Seeds. B. Cape and L. Oddo. Fr. Pat. 331,094, April 16, 1903. XII., page 1138.

Oxalates; Manufacture of ——. R. Koepp & Co. Fr. Pat. 331,498, April 25, 1903.

Formates are heated with small quantities (less than 5 per cent.) of alkali hydroxide.

For instance, when sodium formate is heated with 1 per cent. of sodium hydroxide, the mixture rapidly melts, hydrogen is evolved at about 290° C., and the reaction is complete at about 360° C., the whole process occupying about half an hour.—T. F. B.

Carbon Compounds having the General Formula $C_{10}H_{16}O$; Process for Obtaining ——. Carbon Hydrate Chemical Co. Fr. Pat. 331,509, April 25, 1905.

See Eng. Pat. 9340 of 1903; this Journal, 1903, 880.
—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Solarisation. L. Zehnder. Ann. der Physik, 1903, [10]; Electrician, 1903, **51**, 802.

The author finds that the various known types of radiation show characteristic differences with regard to the reversal effects known under the name of solarisation. Visible light, cathode rays, and Röntgen rays produce solarisation first on the front surface of the film, whilst in the case of ultra-violet light and "canal" rays, the abnormal image appears first on the back of the film. If printing-out paper be exposed to Röntgen, "canal," cathode, radium, or ultra-violet rays and then exposed to daylight, the image is reversed, the portions previously exposed having become less sensitive to daylight. "Canal" rays produce remarkable surface colours on the paper. "Canal" and cathode rays do not produce any effect through the back of the paper, but Röntgen rays penetrate it easily.—A. S.

English Patents.

Photographic Films; Impts. in ——. Sandell Films and Plates, Ltd., and W. H. Smalley, South Norwood. Eng. Pat. 25,243, Nov. 17, 1902.

See U.S. Pat. 723,054 of 1903; this Journal, 1903, 511.
—T. F. B.

Photographic Printing; Impts. in ——. E. S., Shepherd and O. M. Bartlett, London. Eng. Pat. 24,234 Nov. 5, 1902.

See U.S. Pat 728,310 of 1903; this Journal, 1903, 760.
—T. F. B.

French Patent.

Sensitive Emulsion for Metal Plates, &c., used for Colouring Photogravures, Photographs, and Cinematograph Films. Cie. Gen. Photographes, Cinematographes et Appareils de Précision. Fr. Pat. 331,734, May 5, 1903.

Metal plates, carefully cleaned and dried, are coated with a layer of sodium, potassium, barium, or other alkali or alkaline earth metal, and dried. A silver bromide-gelatin emulsion is then applied, consisting of silver bromide 1 part, gelatin 2 parts, water 9 parts, in such a quantity that there remains in the emulsion 20 per cent. of the silver employed.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Cordite; Explosive Pressure and Rate of Combustion of ——. J. E. Petavel. Brit. Assoc., Southport, 1903, Engineering, 1903, **76**, 452.

The author carried out a series of experiments with cordite in spherical and cylindrical explosive chambers connected with recording pressure-gauges. The spherical chamber had a diameter of 10 cm.; the cylindrical chamber was 69 cm. long and had the same capacity as the spherical one, *viz.*, about half a litre. The cordite was used in the form of thin threads or sticks, and the influence of the size of the cordite, of the charging density (expressed as the weight of the charge in grms. divided by its volume in c.c.), which is also the gas density after the explosion, and of the shape of the enclosure was determined. The pressures recorded reached 2,000 atmospheres. The fact that the larger and the more finely-divided the material of the charge, the quicker is the explosion, *i.e.*, the steeper are the explosion curves, was confirmed. The explosive burnt quicker under high than under low pressures. By doubling the charge, more than double the pressure was produced. In the cylinder the charge cooled four times as quickly as in the sphere. In the experiments with the sphere the explosive-wave curves were regular, but with the cylinder they were wavy, owing to the vibrations set up. When the charge was not uniformly distributed, these vibrations became dangerous.—A. S.

Explosives in Coal Mines Order. Sept. 5, 1903. A. Akers-Douglas, one of H.M. Principal Secretaries of State, Home Office, Whitehall.

Negro Powder has been added to the list of permitted explosives. It consists of ammonium nitrate (86—90 parts), trinitrotoluene (9—11 parts), graphite (1—3 parts), colouring matter (0—·1 parts), and moisture (0—1 parts). The explosive is wrapped in waterproof paper and a No. 6 detonator is used.—G. W. McD.

United States Patent.

Detonating Composition. H. von Dahmen, Assignor to J. Führer, Vienna. U.S. Pat. 740,355, Sept. 29, 1903.

See Eng. Pat. 24,812 of 1902; this Journal, 1903, 411.
—T. F. B.

French Patents.

Glazing Gunpowder, Blasting Powder, &c.; Apparatus for ——, and other Purposes. A. I. du Pont. Fr. Pat. 331,066, April 9, 1903.

See Eng. Pat. 7695 of 1903: this Journal, 1903, 822.
—T. F. B.

Glazing Gunpowder, Blasting Powder, &c.; Process of ——. A. I. du Pont. Fr. Pat. 331,067, April 9, 1903.

See Eng. Pat. 7712 of 1903; this Journal, 1903, 822.
—T. F. B.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

English Patents.

Gas; Apparatus for Testing Illuminating —— [for Hydrogen Sulphide]. Gasmesserfabrik Mainz Elster and Co., Mainz. Eng. Pat. 25,958, Nov. 25, 1902.

The apparatus claimed, consists of a box rendered gas-tight by means of a mercury seal, and provided with gas inlet- and exit-pipes; also with an aperture for inspection, covered with glass or other transparent medium. A strip of lead acetate or other test-paper carried over rollers, is passed intermittently or continuously through this box and exposed to the action of the gas transversing it. Claim is also made for the connection with the gas-cock of a sand-glass, so that on turning the cock a definite period of gas-admission may be secured.—L. F. G.

Lubricating Power of Oils, Greases, and other Lubricants; Apparatus for Testing the ——. H. V. Blake, Accrington. Eng. Pat. 25,492, Nov. 20, 1902.

This apparatus consists of a vertical shaft driven by suitable mechanism, having a conical or hemispherical cup on its upper end. Into this cup is accurately fitted a conical or hemispherical plug which will easily revolve in the cup, carrying a vertical spindle or shaft to which are fitted one or more horizontal arms to which vanes are attached. Pressure can be applied to the plug by means of a weighted lever. Separate counters give the number of revolutions of the cup and plug respectively. The lubricant to be tested is placed in the cup, and after the plug has been inserted, the former is caused to rotate rapidly for a definite length of time. The number of revolutions made by cup and plug having been read off and recorded, the former is cleaned and another or standard lubricant is similarly tested. The lubricant which best reduces the friction between cup and plug will cause the latter to make the smallest number of revolutions.—L. A.

INORGANIC—QUALITATIVE.

Sulphides, Sulphites, Sulphates, and Thiosulphates; Method for the Detection of ——. L. Dobbin. Chem. and Druggist, 1903, **63**, 520.

The author recommends the following modification of Autenrieth and Windaus' method (see this Journal, 1898, 606). The neutral or slightly alkaline solution is tested for sulphides by the addition of cadmium nitrate, and if a yellow precipitate is produced, excess of cadmium carbonate is added. The cadmium sulphide is filtered off, the filtrate shaken with excess of strontium chloride, the mixture allowed to stand for 15 minutes, filtered, and the residue washed with water. A portion of the filtrate is heated with dilute hydrochloric acid, when, if thiosulphates be present, a precipitate of sulphur is produced. The remainder of the filtrate is diluted, slightly acidulated with hydrochloric acid and tested for sulphates by the addition of barium chloride. The precipitate obtained

with strontium chloride, is treated with dilute hydrochloric acid; evolution of sulphur dioxide indicates the presence of sulphite, while if sulphates be present, an insoluble residue is left. The solution (filtrate) is treated with barium chloride, allowed to stand for 5 minutes, filtered, and to the filtrate a solution of iodine in potassium iodide is added, till a permanent faint yellow coloration is produced; a white precipitate then indicates the presence of sulphates.
—A. S.

INORGANIC—QUANTITATIVE.

Sulphuric Acid; New Method of Determining [as Strontium Sulphate] ——. R. Silbenberger. Ber., 1903, **36**, [12], 2755—2762.

The precipitation of sulphuric acid as strontium sulphate in alcoholic solution is stated to give absolutely accurate results. The liquid (corresponding to about 0·5 grm. of sulphuric acid), in bulk about 50 c.c., is acidified with hydrochloric acid, heated to boiling, and precipitated by 15 c.c. of a 10 per cent. alcoholic solution of strontium chloride; 100 c.c. of 95 per cent. alcohol are added, the liquid well stirred, and set aside till quite cold. It is now filtered, the precipitate washed three times by decantation with 100 c.c. of alcohol, then brought on the filter and washed with alcohol till free from chlorine. It is dried, the filter incinerated with the precipitate, and the whole gently ignited. In presence of iron, the slightly acidified solution is precipitated as above, 120 c.c. of alcohol added, the whole digested at a gentle heat for an hour, allowed to cool completely, and the liquid poured off as above. The precipitate is warmed with 2 c.c. of hydrochloric acid (2 of acid to 1 of water) and 50 c.c. of alcohol, the liquid filtered after cooling, then the precipitate washed three times with alcohol, and the operation concluded as above. In presence of chromic salts, the digestion of the liquid, after precipitation, should be continued for three hours. Zinc salts have no influence.
—J. T. D.

Calcium and Oxalic Acid; Method of Standardising Potassium Permanganate Solution for Use in Determining ——. H. Walland. Chem.-Zeit., 1903, **27**, [76], 922—923.

A suitable amount of calcium carbonate is ignited in a weighed platinum crucible until it is completely converted nto calcium oxide, and a constant weight obtained. The ontents of the crucible are dissolved in dilute hydrohloric acid, the calcium is precipitated from the solution s oxalate, the latter, after washing, being dissolved in ilute sulphuric acid and titrated with the permanganate olution. The titre of the solution is thus obtained for oth calcium oxide and oxalic acid. It is claimed that his method gives more accurate results than when the ermanganate is standardised upon other substances, and he slight solubility of calcium oxalate in actual determinaons is allowed for, if the same conditions as regards bulk f solution and quantity of wash water be adhered to in he analyses. (For solubility of calcium oxalate, see this ournal, 1901, 1026.)—W. P. S.

ismuth; Separation of —— from Copper, and Volumetric Determination of the former. H. S. Riederer. J. Amer. Chem. Soc., 1903, **25**, 907—919.

HE method described by Warwick and Kyle (this Journal, 01, 620) is asserted by the author to be unreliable. He ds that bismuth may be completely precipitated by ding tartaric acid to the acid solution, rendering the uid alkaline with potassium hydroxide, adding potassium anide in slight excess, and passing a current of hydron sulphide. Since copper remains in solution under se conditions, the method affords a rapid means of parating small amounts of bismuth from large amounts copper.

Bismuth is also quantitatively precipitated by ammonium lybdate from a solution rendered just acid with nitric d. The precipitate of bismuth ammonium molybdate y be washed with a 3 per cent. solution of ammonium phate, and the bismuth present determined by dissolving it in sulphuric acid, reducing the molybdenum, and re-oxidising with potassium permanganate, as in the method of determining phosphorus.—C. A. M.

Molybdenum; Reduction of ——, by Zinc, and the Ratio of Bismuth to Molybdenum in Bismuth Ammonium Molybdate. E. H. Miller and H. Frank. J. Amer. Chem. Soc., 1903, **25**, 919—928.

The authors lay stress on the necessity of absolute uniformity in the conditions of reduction and titration. When the reduction is carried out by means of a column of 15 inches of 20 to 30-mesh zinc and 10 c.c. of strong sulphuric acid in a volume of 200 c.c. for six minutes at 70° to 75° C., and the liquid titrated without delay in the reduction flask, without the use of an atmosphere of carbon dioxide, the following factors apply:—In the case of unamalgamated zinc the iron standard of the permanganate solution, multiplied by 0·88, gives the corresponding value in grms of MoO_3, whilst the factor for phosphorus when the yellow precipitate is titrated, is 0·01579. If amalgamated zinc be used, these factors are 0·8842 and 0·01586 respectively, whilst the corresponding factors, based on the reduction of the molybdate to $Mo_{24}O_{37}$, are 0·8832 and 0·01584.

Bismuth ammonium molybdate (see preceding abstract) cannot be washed or dried without decomposition, but the authors' experiments show that the ratio of bismuth to molybdenum is 1:2, and they conclude that if its composition is not $BiNH_4(MoO_4)_2$, the variation from that formula is too slight to cause error in the use of the precipitate for the determination of bismuth by titration with permanganate solution.—C. A. M.

Aluminium, Beryllium, and Indium Hydroxides; Solubility of ——, in Ammonia and Amines [Separation of Beryllium from Aluminium and of Indium from Iron]. C. Renz. VII., page 1129.

Vanadium; New Method of Determining ——, and its Application to Metallurgical Products. E. Campagne. Ber., 1903, **36**, [12], 3164—3176.

The author's method depends on the reduction of vanadic acid by hydrochloric acid, and re-oxidation with permanganate in sulphuric acid solution:—

$$V_2O_5 + 6HCl = V_2O_2Cl_4 + 3H_2O + Cl_2;$$

$$V_2O_2Cl_4 + 2H_2SO_4 = V_2O_2(SO_4)_2 + 4HCl.$$

$$5V_2O_2(SO_4)_2 + 2KMnO_4 + 8H_2SO_4 =$$
$$5V_2O_2(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O.$$

The vanadate (containing about 0·1 grm. of metallic vanadium) is heated with a large excess (50 c.c.) of hydrochloric acid (sp. gr. 1·17) till reduced to a small bulk, and this evaporation is repeated twice. To the residue, 5 c.c. of strong sulphuric acid are added, and the evaporation continued till fumes of sulphuric acid appear, all hydrochloric acid being expelled. The liquid is allowed to cool, diluted to 300 c.c. with water, heated to 60° C., and titrated with permanganate (about 1 grm. of potassium permanganate per litre is a convenient strength).

Vanadium in Steel.—5 grms. of the metal are dissolved in nitric acid of sp. gr. 1·20. After evaporation to dryness on the sand-bath, heating is continued till the nitrates are converted into oxides. The latter are then dissolved in 50—60 c.c. of hydrochloric acid, and the liquid is evaporated to 40 c.c., when about 20 c.c. of hydrochloric acid (sp. gr. 1·12) are added (to rinse out the flask used for dissolving the steel in), and the whole is introduced into a Carnot's separating funnel, followed by the addition of 100 c.c. of ether. The contents of the funnel are then well shaken, and cooled by immersion in water. The greater part of the aqueous solution (from which nearly all the iron will now have been removed) is then returned to the solution-flask, and after a few minutes the remainder slowly added. The solution is evaporated to a small bulk, the residue taken up with 50 c.c. of hydrochloric acid, evaporated again to a small bulk, and this repeated. The residue is heated with sulphuric acid and titrated as above. Of a steel containing 2 per cent. or more of vanadium, 2·5 grms. are taken instead of 5. Modified methods are briefly given for applying the method in the cases of ferrovanadium, cuprovanadium, and aluminovanadium.

Vanadiferous Iron Ores are treated like steel, 10 grms. being taken, and the iron removed by means of ether.

Vanadium has no influence on the determination of most of the other constituents of steel, nor do they, with the exception of chromium, influence its determination by the method described.—J. T. D.

Lead-Tin-Antimony Alloys; Analysis of ——. S. Burman. Oesterr. Zeits. Berg.-Hütt., **51**, 417—418. Chem. Centr., 1903, **2**, [14], 806.

0·5 GRM. of the alloy is covered with hydrochloric acid, 2—3 grms. of tartaric acid added, and sufficient bromine to obtain complete solution of the metal. The bromine is expelled by heating with a few drops of hydrochloric and nitric acids, and the lead precipitated as chloride by adding to the solution 10 times its volume of absolute alcohol. The precipitate is washed with alcohol containing dissolved tartaric acid, and dried at 200° C. The filtrate, after expelling most of the alcohol by boiling, is neutralised with ammonia, 10—15 grms. of "sodium sulphite" and 1 c.c. of hydrochloric acid added, and the liquid made up to 700 or 800 c.c. and boiled. Antimony sulphide is precipitated, and hydrochloric acid is then added until precipitation is complete. Any antimony remaining in solution is precipitated by sulphuretted hydrogen; this can be readily effected without precipitation of tin sulphide, since precipitation of tin sulphide only begins after some minutes. The antimony sulphide is collected on a weighed filter-paper and dried. To determine the amount of sulphur precipitated with the antimony sulphide, a portion of the precipitate is cautiously ignited in a Rose's crucible, and the proportion of antimony sulphide calculated. The arsenic and tin are precipitated by hydrogen sulphide. The precipitate is boiled with acid potassium sulphite solution to dissolve the arsenic sulphide, the residue is washed with hydrogen sulphide solution and ammonium acetate solution and ignited to obtain oxide of tin.—A. S.

Electro-chemical Analysis; Use of a Mercury Cathode in ——. E. F. Smith. J. Amer. Chem. Soc., 1903, **25**, 883—892.

EXPERIMENTS have been made by the author as to the possibility of determining the negative radicle in salts simultaneously with the deposition of the metal on a mercury cathode, and also on the possibility of separating metals by the use of this cathode.

Electrolysis of Sulphates.—For this purpose a small beaker (50 c.c.) was used, through the sides of which, near the bottom, a thin platinum wire was introduced, so that the inner piece dipped into the mercury, whilst the exterior piece touched a disc of copper on which the beaker rested, and which was connected with the negative electrode of a battery. Solutions of copper sulphate were electrolysed in this apparatus with a current of 0·02 to 0·13 ampère and 2·25 to 5 volts, the mercury (24 sq. c.m. in area) being shaken from time to time to effect complete amalgamation. When colourless, the supernatant liquid was siphoned off and replaced by water, the current being continued until the washings amounted to about 500 c.c. The sulphuric acid in the liquid was then titrated with N/10 sodium carbonate solution, whilst the amalgam was washed with alcohol and ether, dried, and weighed.

In the case of a nickel sulphate solution, electrolysis with a current of 0·05 to 0·06 ampère and 4 volts gave accurate results. Equally good results were obtained with zinc sulphate by the use of a current of 0·26 ampère and 6 volts for a period of six hours, whilst ferrous ammonium sulphate yielded 14·19 to 14·33 per cent. of iron as against the theoretical 14·28 per cent.

The method also gave good results in the separation of iron from uranium, titanium, zirconium, and thorium.

Electrolysis of Nitrates.—It was found that by adding a known quantity of standard sulphuric acid to the liquid before electrolysis, the nitric acid was quantitatively liberated as such (instead of being converted into ammonia) and could be subsequently titrated in the same way as the sulphuric acid in sulphates.

Electrolysis of Halides.—The following method was eventually adopted:—About 50 grms. of pure mercury were weighed in the beaker above described, and the aqueous solution (about 40 c.c.) of the salt (sodium chloride) introduced. A weighed anode of platinum gauze coated with silver was suspended in this, and the current passed through at the ordinary temperature. As soon as the silver ceased to darken, the gauze was removed, rinsed with water, washed with alcohol and ether, dried for a short time, and weighed. A platinum spiral was then substituted for the gauze, and the current reversed so as to make the mercury the anode. After about 20 minutes the whole of the sodium was converted into the hydroxide, and the solution was then titrated with standard acid. The time required for the decomposition of the salt was six hours, and the current was 0·0325 to 0·03 ampère and 2 volts.

Accurate results were obtained with barium chloride, strontium bromide, and other haloid salts.

It was also found possible to electrolyse sodium chloride and barium chloride without using the mercury cathode, a platinum spiral being substituted for it. Test experiments are quoted indicating the accuracy of the method.

—C. A. M.

Metals; Rapid Electrolytic Precipitation of ——. F. F. Exner. J. Amer. Chem. Soc., 1903, **25**, 896—907.

THE quantitative precipitation of various metals can be effected very rapidly by making the anode rotate in the electrolyte at a speed of 500 to 600 revolutions per minute. In the author's experiments to determine the essential conditions, the anode consisted of a bowl-shaped spiral of platinum wire, 2 ins. in diameter, which was made to rotate in 110 to 125 c.c. of the electrolyte contained in a platinum basin covered with a glass cover. In each case the liquid was heated nearly to the boiling point before the introduction of the current, and no external heat subsequently employed. At the end of the decomposition, the rotator was stopped, the current reduced, and the exposed metal covered with water to prevent oxidation. After siphoning off the liquid, the deposit was washed and dried in the usual way and weighed. Good results were obtained, under conditions described in the original, in the case of the following metals:—Nickel, zinc, silver, bismuth, mercury, cobalt, cadmium, iron, lead, molybdenum, tin, gold, and antimony; in the separation of copper and nickel; and in the analysis of nickel coins.—C. A. M.

Metals; Electrolytic Separation of Certain ——. E. F. Smith. J. Amer. Chem. Soc., 1903, **25**, 892—896.

Silver from Selenium.—(*a*) *In Alkali Cyanide Solution*—The following conditions gave excellent results in the separation of 0·1341 grm. of silver from 0·2500 grm. of sodium selenate:—Potassium cyanide, 3 grms.; total dilution, 150 c.c.; $N.D_{100}$ = 0·02 ampère; pressure, 2·5 volts; temperature, 60° C.; and time, six hours. Silver found, 0·1333 grm. By increasing the current to 0·05 ampère and 3·5 volts, the precipitated silver separated in three hours weighed 0·1340 grms.

(*b*) *In Nitric Acid Solution.*—A deposit of silver weighing 0·1342 grm. was obtained from solutions of the same strength as above, under the following conditions:—Nitric acid (sp. gr. 1·43), 1 c.c.; total dilution, 150 c.c.; $N.D_{100}$ = 0·015 ampère; pressure, 1·25 to 2 volts; temperature, 60° C.; and time, three hours. The deposit was crystalline and adherent.

Silver from Tellurium in Nitric Acid Solution.—Silver present, 0·1341 grm.; sodium tellurate, 0·1344 grm.; nitric acid (sp. gr. 1·43), 1 c.c.; dilution, 150 c.c.; $N.D_{100}$ = 0·01 to 0·015 ampère; pressure, 1·25 to 2·0 volts; temperature, 60° C.; and time, $3\frac{1}{2}$ hours. Silver found, 0·1344 and 0·1341 grm.

Mercury from Selenium.—The conditions used in the separation of silver from selenium in alkali cyanide or nitric acid solution were found satisfactory.

Mercury from Tellurium.—The most favourable conditions were as follows:—Mercury present, 0·1272 grm.; sodium tellurate, 0·2500 grm.; nitric acid (sp. gr. 1·43), 3 c.c.; dilution, 150 c.c.; $N.D_{100}$ = 0·04 to 0·05 ampère; pressure, 2 to 2·25 volts; temperature, 60° C.; and time, 5 hours. Mercury found, 0·1276 grm.

Copper from Selenium—(a) In Alkali Cyanide Solution.—Copper present, 0·0745 grm.; sodium selenate, 0·2500 grm.; potassium cyanide, 1 grm.; dilution, 150 c.c.; $N.D_{100}$ = 0·2 ampère; pressure, 3·5 to 4 volts; temperature, 60° C.; and time, 5 hours. Copper found, 0·0745 and 0·0742 grm.

(b) In Nitric Acid Solution.—The best conditions were:—Nitric acid (sp. gr. 1·43), 1 c.c.; dilution, 150 c.c.; $N.D_{100}$ = 0·05 to 0·08 ampère; pressure, 2 to 2·5 volts; temperature, 65° C.; and time, four hours. Copper found, 0·0747 and 0·0738 grm.

(c) In Sulphuric Acid Solution.—For the separation of the same quantities of copper and selenium, the conditions were:—Concentrated sulphuric acid, 1 c.c.; $N.D_{100}$ = 0·05 to 0·10 ampère; pressure, 2 to 2·5 volts; temperature, 65° C.; and time, less than six hours. Copper found,)·0743 grm.

Copper from Tellurium.—The separation in alkali cyanide solution failed. In sulphuric acid solution good results were given under the following conditions:—Copper present, ·0715 grm.; sodium tellurate, 0·20 grm.; concentrated ulphuric acid, 1 c.c.; dilution, 150 c.c.; $N.D_{100}$ = 0·05 o 0·1 ampère; pressure, 2 to 2·25 volts; temperature, 5° C., and time, six hours. The separation can also be eadily effected in nitric acid solution.—C. A. M.

lectrolytic Deposition and Separation of Metals; Quantitative ——. H. Nissenson and H. Danneel. Zeits. f. Electrochem., 1903, **9**, [37], 760—765.

HE following have been chosen, after special trial, from he large number of electrolytic methods extant and mployed commercially, as combining reliability with the mallest demand of time and attention to details in their anipulation:—

Determination of Lead.—0·5 to 1 grm. of substance is issolved by boiling with 30 c.c. of nitric acid of sp. gr. 1·4. ot water is added, the solution brought to the boil, filtered to a weighed platinum dish of about 180 c.c. capacity, and lectrolysed by a current of 1·5 ampères. The lead peroxide dried at 180°—190° C. and weighed.

Determination of Copper.—The ore or alloy, which must e free from arsenic, antimony, bismuth, mercury and lver, is dissolved in 10 c.c. of nitric acid, of sp. gr. 1·4, d electrolysed. If lead is also present, this is deposited peroxide on the anode. If much lead is present, the latinum dish is used as anode, on account of its large rface. The current density is 1 to 1·5 ampères.

If arsenic or antimony be present, the ore is dissolved in ncentrated sulphuric acid, the solution diluted and the trate boiled; a boiling concentrated solution of sodium iosulphate is then added, the precipitate filtered, washed, ied, calcined in a porcelain crucible and strongly heated volatilise the arsenic and antimony. The residue of pper oxide is dissolved in 10 c.c. of nitric acid, and ctrolysed as above.

Determination of Antimony.—0·5 to 1 grm. of substance dissolved by heating with 3 c.c. of nitric acid, sp. gr. 1·4, c.c. of water, and 1 to 2 grms. of tartaric acid. 3 c.c. concentrated sulphuric acid are added to the clear lution, and the latter concentrated till all the nitric acid is iven off. The residue, when cold, is dissolved in water, d filtered off from the lead sulphate, and the antimony posited electrolytically from sodium sulphide solution; rrent density is 1·5 to 1·7 ampères.

Determination of Tin.—Tin, which is usually alloyed th antimony, is dissolved in nitric and tartaric acids as scribed above for antimony. A larger quantity of tartaric d is, however, necessary, especially if much tin be sent. When the alloy has dissolved, sulphuric acid is ded to precipitate the lead, the solution concentrated till the nitric acid is driven off, the residue diluted with ter, filtered, and neutralised with caustic soda. 80 c.c. a cold saturated solution of sodium sulphide are then led, the solution boiled, and electrolysed. If no lead is sent, the nitric acid solution can be at once neutralised h caustic soda, and then treated with sodium sulphide as ove. On electrolysing, the antimony only is deposited. The solution, which contains the tin, is heated with 25 to 30 grms. of ammonium sulphide, and electrolysed with a current density of 1·5 ampères, deposition being complete in one to two hours. Should only small quantities of antimony be present, this will always contain a little tin, and it is necessary to repeat the electrolytic separation.

Tin Ores.—5 grms. of the ore are fused with 15 grms. of a mixture of 1 part of black flux (1 part of cream of tartar and 3 parts of potassium nitrate heated together in an iron spoon), 1 part of borax, 4 parts of sodium carbonate, and 1·5 parts of charcoal, the mass being covered with common salt. The regulus may contain, besides tin, also lead, copper and antimony, the tin being determined by the method described above. The tin can also be deposited from a solution of acid ammonium oxalate, instead of from ammonium sulphide solution, with a current density of 1·5 ampères.

Detemination of Cobalt and Nickel.—5 grms. of the powered material, which has been dried at 100° C., are heated with 15 c.c. of concentrated sulphuric acid on a sand-bath, till the residue appears white. After cooling, the mass is boiled with water, filtered, and sulphuretted hydrogen passed into the filtrate, to precipitate arsenic and copper. The filtrate from these is heated to remove the sulphuretted hydrogen, and oxidised with hydrogen peroxide; 150 c.c. of ammonia solution and 10 grms. of ammonium sulphate added, the solution boiled, and when cold, made up to 500 c.c. 100 c.c. (= 1 grm. of substance) are then filtered off, boiled, and electrolysed with a current density of 1·5 ampères, the cobalt and nickel being deposited together. After weighing, the mixed metals are dissolved in very little nitric acid, and the cobalt separated as potassium cobalt nitrite. This is filtered off, washed with a concentrated solution of potassium sulphate, dissolved in hot sulphuric acid, and concentrated. After cooling, 25 c.c. of ammonia solution and 2 grms. of ammonium sulphate are added, the solution boiled, and the cobalt deposited at a current density of 1·5 ampères. The nickel is found by difference.

The determination can also be carried out as follows:—10 grms. of nickeliferous matter are fused with 40 grms. of sodium arsenite and 15 grms. of the following mixture: 1 part of black flux (see above) 1 part of borax, and 4 parts of sodium carbonate. The regulus contains arsenic, copper, nickel, and cobalt, and is dissolved in a concentrated solution of bromine in hydrochloric acid. The solution is concentrated, and boiled with 15 c.c. of sulphuric acid (1:2) till white fumes make their appearance. After cooling, the residue is dissolved in water, the copper precipitated as sulphide, the filtrate oxidised with hydrogen peroxide, and 40 c.c. of ammonia solution added. The solution is then boiled and electrolysed.

For cobalt nickel ores, 2 grms. of substance are taken, and 2·5 grms. of sodium arsenite, 0·15 grm. of iron powder, and 15 grms. of the above mixture.

Determination of Zinc.—0·5 to 1 grm. of the ore or alloy are dissolved in *aqua regia*, and evaporated with the addition of sulphuric acid. If metals of the sulphuretted hydrogen group are present, these are first precipitated. The filtrate is boiled, oxidised with hydrogen peroxide, precipitated with ammonia, and the precipitate of iron, manganese, and aluminium hydroxides dissolved in sulphuric acid and again precipitated with ammonia. To the united filtrates tartaric acid is added, the solution boiled and electrolysed. A platinum dish is used as anode, and a brass-wire gauze disc of 7 cm. diameter as cathode. 0·2 grm. of zinc is easily deposited in one hour by a current of 1·6 ampères with a potential difference of 3·6 volts.

Determination of Cadmium.—Classen's method is recommended.—L. F. G.

Iron from Manganese; Electrolytic Separation of ——. J. Köster. Ber., 1903, **36**, [12], 2716—2719.

IN precipitating iron electrolytically from solutions containing manganese, the manganese peroxide thrown down on the anode always carries with it some iron. Classen avoids this, in the case of small amounts of manganese, by adding to the double oxalate solution a large excess of ammonium oxalate and electrolysing at

80°—90° C., when the oxalic acid keeps the manganese reduced, and peroxide only forms after nearly all the iron has been deposited. This process fails, however, if much manganese be present, and the author, after trying many reducing agents, has found that phosphorous acid is effectual. The solution containing the iron and manganese as ammonium-metal-oxalates together with 10 grms. of ammonium oxalate, is electrolysed in the cold, and as soon as any sign of deposition of manganese peroxide on the anode is observed, a few c.c. of a 10 per cent. solution of phosphorous acid are added. This addition is repeated, but as sparingly as possible, during two hours, when most of the iron will have deposited, and the deposition of manganese peroxide on the anode will no longer be harmful. The addition of more phosphorous acid will keep up the manganese to the end, but then the iron will need 7—8 hours for complete deposition, instead of 5—6. Finally, the cathode is washed without interrupting the current, and lastly rinsed with alcohol.

The current density used is 1·5—2·0 ampères, and the potential difference, 3—4 volts.—J. T. D.

Potassium [in Soil Extracts and Drainage Waters]; Colorimetric Determination of Small Quantities of ——. L. A. Hill. J. Amer. Chem. Soc., 1903, **25**, [9], 990—992.

In this method, which was devised for the analysis of soil extracts and drainage waters when a gravimetric method was impracticable, the potassium is precipitated in the usual way as platinochloride, which is subsequently dissolved in water and reduced with stannous chloride in the presence of free hydrochloric acid. A distinct coloration is given on the addition of the stannous chloride even when the amount of potassium oxide in the original solution did not exceed one part per million. The colour is matched by that produced under the same conditions by a standard solution of potassium platinochloride containing 0·518 grm. in 100 c.c. One c.c. of this solution diluted to 100 c.c. gives a solution of which 1 c.c. is equivalent to 0·00001 grm. of potassium oxide.—C. A. M.

Phosphorus in Phosphorated Oil; Determination of ——. W. Straub. Pharm.-Zeit., **48**, 616. Pharm. J., 1903, **71**, 383.

The author makes use of the formation of copper phosphide by the action of phosphorus on copper sulphate solution (this Journal, 1903, 1045), for the determination of phosphorus in phosphorated oil; 5 c.c. of the oil are shaken vigorously, for exactly two minutes, with 5 c.c. of a 5 per cent. solution of copper sulphate. In the presence of 0·2 per cent. of phosphorus, a black colour is produced during the shaking; with 0·02 per cent., a black colour after two minutes; with 0·01 per cent., a dark brown colour after four minutes; with 0·005 per cent., a light brown colour after one hour; and with 0·0025 per cent., a few brown flocks after one hour.—A. S.

Phosphorus [in Phosphorated Oil]; Quantitative Determination of ——. Katz. Chem.-Zeit., 1903, **27**, 957.

Ten grms. of phosphorated oil, or a corresponding quantity of any solution not containing more than 0·1 grm. of free phosphorus, is thoroughly agitated with an excess of a 5 per cent. aqueous solution of copper nitrate until a permanent black emulsion results, and all vapour of phosphorus has disappeared. Fifty c.c. of ether are then shaken up with the mixture, followed by 10 c.c. of hydrogen peroxide, or sufficient to entirely discharge the black colour at first formed. After separation, the aqueous layer is run off, the ethereal liquid washed by shaking out with three successive portions of water, each of 10 or 20 c.c., and the mixed aqueous solutions are evaporated to 20 c.c. after the addition of a few drops of hydrochloric acid. The acid liquid is then filtered, treated with sufficient ammonia to redissolve the precipitate at first formed, and the phosphoric acid determined in the usual manner, by precipitation with magnesium mixture.

—J. O. B.

Iodine; Purification and Determination of ——. A. Gross. XX., page 1146.

ORGANIC—QUALITATIVE.

Palmitic and Stearic Acids; Separation of ——. H. Kreis and A. Hafner. XII., page 1136.

β-Naphthol in Benzonaphthol; Detection of Free —— A. Jorissen. Répertoire, **15**, 365. Pharm. J., 1903, **71**. 453.

20 centigrms of the sample are treated with 2 c.c. of glacial acetic acid, and two drops of a solution of citric acid added. If β-naphthol be present, the mixture is coloured yellow, whilst if the benzonaphthol be pure, no coloration is produced.—A. S.

Cocaine, α-Eucaine, and β-Eucaine; Method of Distinguishing ——. G. Eigel. Apoth.-Zeit., **18**, 603 Pharm. J., 1903, **71**, 482.

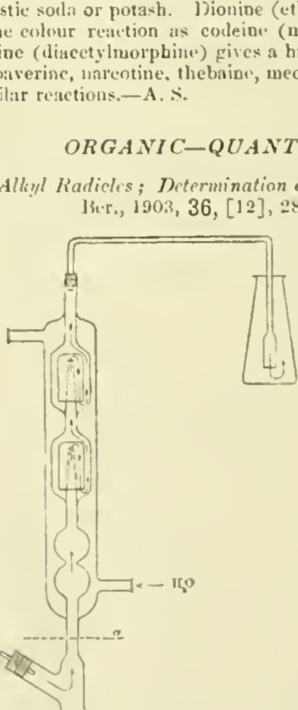
If to 10 c.c. of a 0·1 per cent. solution of the hydrochloride a drop of ammonia be added, α-eucaine gives a white precipitate, whilst β-eucaine and cocaine remain unaltered One drop of a 1 per cent. solution of α-eucaine hydrochloride when treated with one drop of a 10 per cent solution of potassium iodide, deposits, in a few minutes crystals of α-eucaine hydriodide; β-eucaine and cocaine giv no precipitate. If to one drop of a 1 per cent. solution of the hydrochloride, a drop of a 5 per cent. solution of mercuric chloride be added, α-eucaine and cocaine give a white precipitate, whilst β-eucaine remains unaltered.—A. S.

Morphine and Codeine; Some Colour Reactions of —— E. Gabutti. Boll. Chim. Farm., **42**, 481—482. Chem Centr., 1903, **2**, [14], 807.

If a small quantity of the alkaloid be heated with a littl concentrated sulphuric acid till a faint rose coloration i produced, then a small quantity of chloral or bromal added and the mixture again cautiously heated and stirred, codein gives a bluish-green, and morphine a violet coloration Codeine containing morphine gives, under the same conditions, a brownish-violet colour, so that the reaction ca be used for the detection of morphine in codeine. Th bluish-green coloration given by codeine changes on standing, finally to a rose coloration, and the same change i caused by the addition of a little water or of ammonia, o caustic soda or potash. Dionine (ethylmorphine) gives th same colour reaction as codeine (methylmorphine), whils eroine (diacetylmorphine) gives a brownish-red coloration Papaverine, narcotine, thebaine, meconine, &c., do not giv similar reactions.—A. S.

ORGANIC—QUANTITATIVE.

Alkyl Radicles; Determination of ——. H. Decker. Ber., 1903, **36**, [12], 2895—2897.



The author has de signed the apparatu shown in the figu for alkyl determ nations by Zeisel method, so that ther shall be no contac of hydriodic or aceti acids with cork connections. The tw chambers within th apparatus are fille to about 0·5 cm above the lower edg of the inner bell wit water (25 to 30 c.c charged with abou 0·5 grm. of phosphorus which ha been well boiled wit water, and the dete minations made in th usual manner.

The results give by Zeisel's metho are not always shar and exact. Thus Solonina found that in the case of thymol nitroso dyestuffs, it was necessary to continue the boiling for three to four hours, and to use a saturated solution of hydriodic acid in order to liberate the whole of the ethoxyl. On the other hand, there are substances (*e.g.*, 8-nitroquinone methylate) which gradually part with their alkyl when merely boiled at a little above 100° C. In like manner Zeisel's method cannot be used for phenylacridine-iodoethylate and iodine green. In such cases the alkyl radicle may be readily determined without the use of hydriodic acid, by heating the substance in a U-tube in a sulphuric acid bath, and conducting the alkyl iodide by means of a current of carbon dioxide into a receiver containing alcoholic silver nitrate solution. At the end of the operation the U-tube is again weighed, thus giving the amount of the residual tertiary base at the same time as the alkyl iodide.—C. A. M.

Olive Oil; The Babcock-Blasdale Viscosity Test for ——. H. Abraham. J. Amer. Chem. Soc., 1903, **25**, 968—977.

Babcock's method (this Journal, 1896, 205) may be simplified as follows: Two portions of the oil of 3 grms. each are weighed into dry 100 c.c. flasks. One of these is saponified by the addition of 5 c.c. of the potassium hydroxide solution and 2 c.c. of alcohol, and heated in a flask with a valve stopper. From the saponification value of the oil the amount of potassium hydroxide to be added to the second portion of oil, can be calculated, an excess of 2·5 c.c. being allowed. The second portion of oil, after saponification, is evaporated in a current of air freed from carbon dioxide, the nearly dry soap dissolved in water, and the solution cooled to 20° C., and diluted to 100 c.c. An Ostwald's viscosimeter is used for the determination, and several readings taken of the efflux velocity of portions of 3 c.c. of the solution.

The "absolute viscosity" of an oil is obtained by means of the formula $v_1 = \left(\frac{s_1}{t}\right) t_1$, where t represents the time of low; s_1, the specific gravity of the liquid, and t the time of low of water under the same conditions.

The specific gravities of soap solutions of all the principal ils approximate 1·07 (within ± 0·005), so that 1·07 may e substituted for s_1 in the equation, which can then be educed to $v_1 = kt_1$, where k is a constant of the particular pparatus employed. The value of v_1 is generally 165—185 or pure fresh olive oil, whilst in the case of most other oils ranges from about 125 to 135.

The viscosity should be determined on the freshly preared solution. The results given by this modified method re obtained in less than half the time required by the riginal method described by Blasdale.—C. A. M.

oap Solutions; Viscosity of ——, as a Factor in Oil Analysis. H. C. Sherman and H. Abraham. J. Amer. Chem. Soc., 1903, **25**, 977—982.

HE authors have determined the viscosity of the soap lutions (see preceding abstract) of olive and other oils, gether with the specific gravity, iodine value, and laumené figures of the samples. As a rule a high pecific gravity of olive oil is accompanied by a higher dine value, but a lower viscosity figure. The soap lutions of olive and almond oils have much greater scosity than those of other oils commonly met with. ence the method is capable of detecting a considerable nount of lard oil in olive oil for which adulteration no od test is known. For example:—Olive oil, 128·1; ive oil containing 25 per cent. of lard oil, 158·6; with 50 r cent. of lard oil, 147·6; and with 75 per cent., 137·8. e viscosities thus found were identical with the lculated figures. In the case of arachis and cotton-seed s, however, in admixture with olive oil, the results were nsiderably lower than the calculated values.

Mixtures of soap solutions of pure fatty acids gave mewhat similar results. Thus, 3 grms. of lauric acid ponified showed a viscosity figure of 126·6, whilst oleic id showed 239·7; and stearic acid gave a solution too scous to be tested. Yet it was possible to add large nounts of the stearate or oleate solutions to the laurate lution without materially increasing the viscosity of the ter.

The characteristic high figures given by olive and almond oils are attributed by the authors to quantitative relationships in the fatty acids present. By exposing the oils to the air for a long time at the ordinary temperatures, much lower figures are obtained.—C. A. M.

Liquid Glucose [Dextrin-Maltose]; Determination of Commercial —— in Molasses, Syrups, and Honey. A. E. Leach. J. Amer. Chem. Soc., 1903, **25**, [9], 982—987.

The method used in the Massachusetts Board of Health laboratory is based on the assumption that 175 is the polarisation figure of a normal weight of the liquid glucose (dextrin-maltose) (26·048 grms.) in 100 c.c. polarised in a 200 mm. tube. The percentage present in a sample is calculated by means of the formula—

$$G = \frac{(a - S)100}{175}$$

where G represents the required percentage of commercial glucose, a the direct polarisation reading, and S the percentage of cane sugar as calculated from the polarisation before and after inversion, by Clerget's method. In the case of honey, more accurate results are obtained by dividing the polarisation reading at 87° C. by the factor 175.

The author defends this method against various criticisms. He has found great uniformity in the composition of the liquid glucose used for different purposes. Thus, seven samples examined in 1893, 1898, and 1901, gave polarisation readings of 168° to 177°, the average being 174°. A sample specially intended for chewing-gum polarised at 184·6°, whilst a number of samples obtained from confectioners and jam manufacturers gave readings of 150° to 157°.

Although the method would be unreliable in the case of hypothetical mixtures of grape, cane, and invert sugars, in the adulteration of honey, and molasses, the mixer invariably uses the special grade of glucose best suited for his purpose, and with this the method yields results approximating the truth. (See also this Journal, 1899, 1058.) C. A. M.

Starch: Determination of the Stiffness of ——. O. Saare and P. Martens. Zeits. Spiritusind., 1903, **26**, [40], 436—437.

The stiffness and sizing power of starch is liable to great variations in different samples, and several methods have been proposed for the determination of these properties and for the valuation of starch from a technical point of view. In the authors' hands none of these methods have led to concordant numerical results, and the following method is proposed:—

An immersion body is constructed of a circular brass plate, 22 mm. in diameter, to which a brass wire is fixed vertically at the centre, having a mark at a distance of 3 cm. above the disc and terminated by a hook at the top.

The starch paste is prepared by weighing out a certain quantity (7 grms.) of starch into a beaker of 200 c.c. capacity, provided with a small metal spoon. The whole is tared, and about 164 c.c. of boiling water are added with continuous and gentle stirring. The beaker is then rapidly filled up with sufficient boiling water to bring the weight of the paste up to 200 grms., stirring all the time. This may be effected either immediately or after immersion in a boiling water-bath for 2, 5, or 10 minutes. The spoon is then removed, and the brass disc, supported by a clamp, is immersed in the paste exactly up to the mark; 10 c.c. of olive oil are poured over the surface to prevent the formation of a hard skin by evaporation, and the whole is left absolutely at rest for 20 hours at a temperature of about 17·5° C.

A hand-balance, one of the pans of which has been replaced by a counterpoise hook, is then fixed above the beaker, and the hook of the counterpoise is attached to that of the disc. On the other scale-pan an uninterrupted stream of sand is discharged at a uniform rate of about 9 grms. a minute until the disc is torn from the paste. The weight of the sand is then taken as a measure of the stiffness of the paste.

Experiments showed that the time during which the paste was heated at the boiling point had a considerable influence on the results. Certain starches, especially those with a high gelatinising point such as wheat and maize starches, did not attain their maximum stiffness until they had been boiled for several minutes. On the other hand, certain potato-starch pastes had a maximum stiffness without heating; any heating beyond that necessary to produce the maximum stiffness caused a rapid decrease in stiffness; the values of the various samples showed a tendency towards equalisation by prolonged heating.

The following results were obtained with four samples of potato starch, a quantity corresponding to 7 grms. of the dry material being taken for each test :—

——	No. 1	No. 2.	No. 3.	No. 4.
Paste prepared with boiling water, no further heating.	45·9	32·1	26·8	58·6
Paste heated for 2 minutes in boiling water-bath.	40·0	39·2	30·6	47·7
Paste heated for 5 minutes in boiling water-bath.	31·4	32·0	29·4	36·9
Paste heated for 10 minutes in boiling water bath.	24·1	26·0	26·5	26·8

—J. F. B.

Organic Acids of Wine: Determination of the ——. A. Partheil. Ber. Dtsch. pharm. Ges., **13**, 304—308. Chem. Centr., 1903, **2**, [12], 745.

In the methods now used for the determination of lactic acid in wine, the volatility of that acid with steam (this Journal, 1903, 1106) is not taken into consideration, and consequently the results are not accurate. For the separation of lactic acid from tartaric, succinic, and citric acids, which are also present in wine, the author proposes a method based upon the fact that the barium salts of the latter acids are practically insoluble in 80 per cent. alcohol. From the filtrate, after removing the alcohol, the lactic and acetic acids are distilled over by a current of superheated steam.

50 c.c. of the wine are heated for half an hour on the water-bath with a slight excess of barium hydroxide solution, in order to saponify the lactic anhydride present; the liquid is then treated with a few c.c. of barium chloride solution, a further quantity of barium hydroxide solution added, and the liquid evaporated to 20 c.c. This residue is made up to 50 c.c. with water, 150 c.c. of 96 per cent. alcohol added, the mixture vigorously shaken and immediately filtered. The filter is well washed with a mixture of 1 part of water and 3 parts of 96 per cent. alcohol, the filtrate and washings evaporated to a small volume, acidified with a few drops of phosphoric acid, and the acetic and lactic acids distilled over by the aid of superheated steam. In the distillate the lactic acid is determined by the method previously described (*loc. cit.*).—A. S.

Theobromine [*in Cacao or Chocolate*]; *Quantitative Determination of* ——. Katz. Chem.-Zeit., 1903, **27**, [78], 958.

The author modifies previously published methods for the determination of theobromine in cacao or chocolate.

Ten grms. of the substance are boiled with 100 c.c. of water and 10 c.c. of dilute sulphuric acid for half an hour under a reflux condenser. 8 grms. of magnesia, previously rubbed down with water, are added, together with sufficient water to bring the total volume to 300 c.c. The mixture is again cohobated under the reflux condenser for one hour, then filtered through a suction filter; the residue is again boiled thrice in succession, each time with 100 c.c. of water. The mixed filtrate and washings are evaporated to about 10 c.c., treated, while warm, with 2 grms. of crystalline phenol or 2·5 grms. of colourless liquid carbolic acid, and washed with tepid water into a Katz perforator. The liquid is then extracted with chloroform for three hours, the chloroform distilled off, and the last trace of phenol removed on the water bath by means of a current of air from a hand-bellows. The residual theobromine is finally dried for 30 minutes and weighed.—J. O. B.

Caffeine and Theobromine in Kola Nut, Guarana, Tea, and Coffee; Modified Process for the Determination of ——. E. Léger. Pharm. Chim., 1903, **18**, 57—61.

Kola Nut.—A quantity of the powdered nut equivalent to 15 grms. of the dry substance, is mixed in a mortar with 10 grms. of calcined magnesia and 15 c.c. of water, and introduced into a 500 c.c. flask, which is then corked and set aside for two hours; 150 c.c. of chloroform are then added, and the whole weighed. A reflux condenser is attached, and the mixture is boiled on the water bath for an hour. It is then cooled, the original weight is made up by the addition of more chloroform, and the whole thrown on to a pleated filter, the funnel being at once covered with a glass plate, and the filtrate collected in a graduated cylinder, the last portion of liquid being obtained by tapping the covered funnel. In this manner 100 c.c. of filtrate corresponding to 10 grms. of kola will be obtained. The chloroform is then distilled off, and the residue dried at 100° C., taken up with 12 c.c. of a mixture of one part of hydrochloric acid and two parts of water, and the insoluble waxy and resinoid matter filtered off with a small filter. 10 c.c. of the colourless filtrate are well shaken with 20 c.c. of chloroform and an excess of solution of ammonia, the chloroformic solution of the alkaloids withdrawn, and the aqueous ammoniacal solution again shaken out twice with two separate 20 c.c. of chloroform. The mixed chloroformic solution is washed once with 2 c.c of water, separated, and the solvent distilled off in a tared conical flask. The colourless residue is dried at 100 C., and finally weighed. The percentage of total alkaloids is found by multiplying this weight by 12. The yield should not be less than 1·25 per cent.

Guarana.—An amount equivalent to 9 grms. of dry material is mixed with 6 grms of calcined magnesia and 10 c.c. of water, and treated as described under kola. The amount of chloroform employed for extraction is 90 c.c. and 60 c.c. of chloroformic filtrate, equivalent to 6 grms. of material, is collected. The crude alkaloids are dissolved in 12 c.c. of acid water, 10 c.c. of which are taken for the final liberation of the bases. The percentage of caffeine is then found by multiplying the weight obtained by 20.

Tea.—The greenish residue left after distilling the chloroformic extract, is treated with 25 c.c of light petroleum spirit, and 25 c.c. of a mixture of one part of hydrochloric acid and four parts of water. After agitation and separation, the acid liquid is withdrawn, and the green petroleum spirit layer twice washed, first with 15 c.c., and then with 10 c.c. of dilute acid of the same strength. The mixed acid extract is shaken out once more with 10 c.c. of petroleum spirit, and the acid aqueous solution of caffeine again separated. The alkaloid is then liberated by means of a slight excess of ammonia, and shaken out with three successive portions of 20 c.c. each, of chloroform. The united chloroform extract is washed with 2 c.c. of water, separated, and the chloroform distilled off from a small tared flask; the residue is dried at 100 C. and weighed. The amount of caffeine thus found should not be less than 2 per cent

Coffee.—The first obtained chloroformic residue is treated with 24 c.c. of distilled water, the containing flask closed with a rubber stopper, and then heated on the water-bath to 60—65 C. After thorough agitation, the solution is allowed to cool, and separated from the insoluble fat by filtration. 20 c.c. of filtrate being collected. This is extracted by shaking out with three successive washings of chloroform, each of 20 c.c. The mixed chloroformic extract is evaporated from a tared flask, the residue dried at 100° C., and weighed. This weight multiplied by 12 gives the percentage of alkaloid in the dry material.—J. O. B.

Cinnamic Aldehyde; Gravimetric Determination of —— [*as Semioxamazone*]. J. Hanuš. Zeits. Untersuch. Nahr. u. Genussm., 1903, **6**, 817—827.

It is found that cinnamic aldehyde, both pure, and as it occurs in cinnamon and cassia oils, may be quantitatively precipitated in the form of semioxamazone—

$$C_6H_5.CH : CH.CH : N.NH.CO.CO.NH_2,$$

by treating an aqueous suspension with a solution of semioxamazide in hot water.

About 0·10 grm. of the aldehyde is emulsified by agitation with 100 c.c. of water and treated with 0·25 to 0·35 grm. of semioxamazide dissolved in 15 c.c. of hot water; the mixture is well shaken together, occasionally, for three hours, then allowed to stand for 24 hours. The crystalline cinnamic-aldehyde semioxamazone is then collected on a tared Gooch filter, washed with cold water, dried at 105° C. for about four or five hours, then weighed. The weight of semioxamazone multiplied by the factor 0·6083 gives the amount of cinnamic aldehyde present. For the determination of the amount of aldehyde in innamon and cassia oils, from 0·15 to 0·2 grm. is mployed.

To determine the amount of cinnamic aldehyde in innamon or cassia barks, from 5 to 8 grms. of the finely-ground material are distilled with steam, until about 00 c.c. of distillate have been collected. The volatile oil is xtracted from the distillate by shaking out three or four imes with ether, and after distilling off the ether, the oil is mulsified, and treated with semioxamazide as described bove.

By this method the figures obtained with commercial innamic aldehyde were from 99·21 to 100·66 per cent., ommercial cinnamon oil from 46·78 to 80·51 per cent. of innamic aldehyde; Ceylon cinnamon oil from another ource, 79·05 to 80·33 per cent. Synthetic cassia oil, 95 19 95·58 per cent. of cinnamic aldehyde. Cinnamon bark as found to yield from 1·75 to 2·04 per cent. of aldehyde.

It is claimed that the method gives results more accurate an those of the bisulphite absorption process generally nployed.—J. O. B.

ugenol ; Determination of ——, in Clove Oil. H. Thoms. Chem.-Zeit., 1903, 27, [78], 954.

HE original method of the author (this Journal, 1893. 4) having been shown to be inaccurate, it is now modified bring it into accord with the more advanced knowledge the constituents of clove oil.

Determination of Total Eugenol.—Five grms. of clove are heated on the water-bath with 20 c.c. of 15 per cent. ustic soda solution for half an hour. The alkaline lution of eugenol is run off from the layer of sesqui-penes and the latter is washed with two successive akings. each of 5 c.c. of the caustic soda solution e united alkaline solutions are now well mixed with grms. of benzoyl chloride, and, when the reaction is com-te, the uncombined benzoyl chloride is driven off by ating for a short time on the water-bath. After cooling, crystalline ester is filtered off, heated with 50 c.c. of ter until the crystals have melted, the oily liquid well tated with water, and again allowed to crystallise. is remelting and recrystallising is repeated twice, each e with 50 c.c. of water. The product is then dissolved 25 c.c. of 90 per cent. alcohol, and the solution cooled, en the benzoyl-eugenol will crystallise out in a few nutes in the form of small crystals. The whole is then led to 17° C., and the crystalline precipitate collected a small tared filter and washed with sufficient 90 per t. alcohol to bring the volume of the total filtrate to c.c. The moist filter and precipitate are dried at ° C. and weighed. The percentage of total eugenol in ven weight of clove oil may be found by the formula—

$$\frac{4100\,(a + 0{\cdot}55)}{67b}$$

w re a is the weight of benzoyl-eugenol obtained and b the weight of clove oil taken ; 0·55 is a correction for solubility of benzoyl-eugenol in 25 c.c. of 90 per cent. a hol at 17° C.

etermination of Free Eugenol.—Five grms of the oil a lissolved in ether and quickly shaken out with 20 grms. of 5 per cent. caustic soda solution. The ethereal solution is ain shaken out with 5 c.c. more soda solution, and th united alkaline solutions are warmed to drive off the tr of dissolved ether, then treated with benzoyl chloride a the process continued as described above. The ben-zc-eugenol thus obtained will be the equivalent of the fr eugenol. The eugenol present in the form of esters is ob ned by difference.—J. O. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Ozone ; Oxidations Effected by ——. C. Harries. Ber., 1903, 36, [12], 2996—2997.

In a former communication (Ber., 36, 1933) the author stated that in the case of bodies of the aliphatic series, the oxidation by means of ozone stopped at the formation of aldehydes. He now asserts that this only referred to the conditions of the experiments, in which practically no acid was formed by oxidation, whereas in the case of alcohols of the aromatic series, the oxidation readily proceeded as far as the formation of acids (*e.g.*, benzoic acid).

Iodobenzene on oxidation with ozone turns brown after a long time, and on evaporation of the unaltered iodobenzene, leaves a solid brown deposit, which on treatment with chloroform and a little dilute hydrochloric acid, yields acicular crystals of iodosobenzene.—C. A. M.

Magnesium Suboxide. G. Baborovsky. Ber., 1903, 36, 12], 2719—2720.

Christomanos (this Journal, 1903, 920) obtained, by suddenly cooling a magnesium flame, a grey deposit of composition corresponding to Mg_8O_5 or Mg_3O_2, which he took to be a mixture of magnesia and metallic magnesium. Experiments on the electrolytic solution of a magnesium anode show that it dissolves with an apparent valency of 1·3, and the anodic deposit has a composition similar to Christomanos' deposit. From the constancy of the apparent valency under varying conditions, and from the apparent homogeneity of the deposit under microscopic examination, the author concludes that it is really a suboxide and not a mixture, though it may perhaps readily decompose into magnesia and magnesium.—J. T. D.

Hydrocarbons ; New Synthesis of ——, by means of Organo-Magnesium Compounds. J. Houben. Ber., 1903, 36, [12], 3083—3086.

When an ethereal solution of an alkyl magnesium haloid compound is added to an ethereal solution of methyl sulphate, reaction takes place with the production of hydrocarbons in which the methyl group replaces the halogen atom.

Ethyl benzene.—For instance, 4·8 grms. of magnesium were treated with 25 grms of benzyl chloride dissolved in 300 c.c. of ether ; the mixture was added drop by drop to an ethereal solution of 25 grms. of methyl sulphate, cooled by ice. The product was decomposed by ice and sulphuric acid, extracted by ether, and fractionated ; yield, 21 per cent. of ethyl benzene.

Toluene was prepared in a similar way from bromobenzene and *p-xylene* from *p*-bromotoluene.

Another synthesis of hydrocarbons is obtained by the action of alkyl-magnesium haloids upon alkyl haloids according to the equation—

$$RMgBr + R'Br = MgBr_2 + RR'.$$

In this case the ether must be evaporated and the mixture must be heated to a temperature above 100° C.: the reaction being rather violent, it may be conveniently effected by boiling the reagents in presence of an excess of toluene for about an hour. Ethyl benzene is thus obtained by the action of methyl-magnesium iodide upon benzyl chloride. Methyl-magnesium iodide will not react in this manner with bromobenzene, but if the latter be converted into phenyl-magnesium bromide, it will react with various alkyl bromides.—J. F. B.

New Books.

Koloristische und Textilchemische Untersuchungen. Von Dr. Paul Heermann. Julius Springer's Verlag, Berlin. 1903. Price M. 10.

Small 8vo volume containing 383 pages of subject-matter, with nine illustrations, the alphabetical index, and thereafter a table of atomic weights, and three tables representing Formánek's dyestuff groups. The matter is subdivided as follows :—

I. INVESTIGATION OF COAL-TAR DYESTUFFS: Qualitative Dyeing and Dye-Testing. Quantitative Dye-Testing. Colorimetry. Spectroscopy, &c. Chemical and Physical Methods of investigating Coal Tar Dyestuffs. II. INVESTIGATION OF NATURAL DYESTUFFS: Logwood and Logwood Extracts. Indigo. Orseille. Cochineal, and other Vegetable Dyestuffs. III. TESTING DYED AND PREPARED FIBRES: Testing Mordants on the Fibre. Detecting and Determining Arsenic in Fabrics. Determining Weighting Materials, also Dressing and Sizing Materials on the Fibre. Determining the Fastness, &c., of Dyestuffs on the Fibre. Resistance to Light, Air, and Weather, with Tables. Testing Dyestuffs on the Fibre. Grouping the Dyestuffs and their Reactions, &c. Spectroscopic Examination of Dyed Goods. IV. REACTION OF DYESTUFFS ON THE FIBRE.

DIE WIRKUNGSWEISE DER REKTIFIZIER- UND DESTILLIER-APPARATE, mit Hilfe einfacher mathematischer Betrachtungen. Dargestellt von E. HAUSBRAND. Zweite Auflage. Julius Springer, Berlin. 1903. Price M. 6.

8vo volume containing 114 pages of subject-matter, with 18 illustrations and 19 tables. The matter is subdivided as follows:—A. RECTIFYING APPARATUS AND ITS FUNCTIONS, APPLICATIONS, &c. Best Manner of Working. Typical Rectifying Columns, &c. B. CONTINUOUS STILLS AND DISTILLING APPARATUS. Operation and Functions. Typical Stills and Columns, &c. The Spirit Column alongside of the Mash Column. The Spirit Column above the Mash Column. Examples of the use of formulæ for Determining the Weights and Percentages of Alcohol and Water under Various Conditions, and also the Heat consumed in Continuous Stills, &c., &c.

Trade Report.

I.—GENERAL.

GERMAN TRADE FOR THE FIRST HALF OF 1903.

Foreign Office Annual Series, No. 3085.

The foreign trade of the German Empire was much larger than last year, both for imports and exports.

The imports of merchandise reached 21,720,000 tons, valued at 153,100,000*l.*, against 19,660,000 tons, of the value of 141,960,000*l.*, in 1902, and 20,770,000 tons, amounting to 137,600,000*l.*, in 1901 (January to June).

Exports compare as follows:—

—	Quantity in 1,000,000 Tons.	Value in 1,000,000*l.*
January to June		
1903	18·3	120·5
1902	15·8	111·1
1901	15·0	105·8
Increase in 1903 over 1902	2·5	9·4
„ 1902 „ 1901	3·3	13·7

Compared with the corresponding figures of last year, the most noticeable increases took place in the following articles:—

Articles.	Quantity in 1,000 Tons.	Value in 1,000*l.*
Coal	1,479	1,120
Earths and ores	609	1,051
Iron and iron wares	327	2,351
Chemicals and dyestuffs	57	585
Cotton and cotton goods	7·3	1,420
Paper	9·8	600
Copper and copper wares	9·2	515
Silk and silk wares	0·2	140
Wool and woollen wares	1·8	385

The export of sugar has, for special reasons, diminished considerably:—

Exports of Sugar.

—	Quantity in 1,000 Tons. Jan. to June 1903.	Quantity in 1,000 Tons. Jan. to June 1902.
Raw sugar	148·2	271·6
Loaf	288·2	295·2
Other kinds	7·9	14·3

Last year the principal sugar-importing countries, the United Kingdom and the United States of America, imported large quantities of German sugar in order to profit by the prevailing low prices, which were expected to advance in consequence of the Brussels Sugar Convention.

Coke.—Nearly three-fifths of the coke imports came from Belgium, viz., 124,330 tons. Imports from the United Kingdom have decreased from 16,700 tons in January to June 1901, to 9,916 tons in 1902, and 5,510 tons in 1903.

Belgium and France have taken much larger quantities of German coke than heretofore, whilst Mexico has likewise become a good customer for that article, the shipments to that country in the first six months of the present year amounting to no less than 77,600 tons, as compared to only 30,500 and 28,700 tons in the corresponding periods of 1902 and 1901.

Potash.—Notwithstanding that the "Kalisyndicate" terminates only on June 30, 1905, negotiations for its renewal are already in progress. As in the case of the Coal Syndicate, it would seem to have become imperative to re-organise the syndicate in a manner calculated not only to bring the members more completely under the control of the board, but also to enable it effectively to meet competition from without. It is intended, therefore, to substitute for the existing somewhat loose combination a limited liability company, and to create a reserve fund for the purpose of acquiring mining property and shares.

Calculated on a basis of pure potash, the syndicate sales increased by no less than 37,600 tons in the first five months of the year.

Portland Cement.—For years the condition of the German Portland cement industry has been most unsatisfactory. The inland consumption is estimated at 14,500,000 casks per annum, whereas the works can produce close on 29,000,000 casks. Repeated attempts to form a German Cement Syndicate, and to regulate the prices and the production, have proved unsuccessful.

The old-established works are alone remunerative. The South African war and the state of the Transvaal gold mining industry has also severely affected the trade. German cement is excluded from the principal European markets by reason of prohibitive duties, and, while it is exempt from duty in Germany, the import duties, including clearing expenses, per 10 tons amount to 8*l.* 10*s.* in Russia; 5*l.* 5*s.* in Austria-Hungary; 6*l.* 10*s.* in Roumania; 5*l.* in Italy; 3*l.* in Switzerland and Sweden; and 1*l.* 5*s.* in Norway. Thus only Great Britain and the transatlantic markets are open. In 1902 Germany imported 51,947 tons and exported 641,520 tons. For the first six months of the last three years the imports and exports compare as follows:—

—	Imports.	Exports.
January to June—	Tons.	Tons.
1903	25,950	374,381
1902	26,788	241,608
1901	39,719	209,153

Sugar.—From September 1 next, duty on sugar importe into Germany from countries included in the Brussels Convention and on sugar exported from and re-imported int Germany will be levied at the rate of 18 marks 80 pf (18*s.* 7½*d.*) per 100 kilos. of refined sugar and its equivalents, and at the rate of 18 marks 40 pf. (18*s.* 4*d.*) pe 100 kilos. of raw sugar.

The prospects of the beetroot harvest are good, the weather having so far been favourable to the growth and quality of the beets.

Chemical Industries of Germany.

Bd. of Trade J., Oct. 15, 1903.

H.M. Consul-General at Hamburg sends a memorandum on the condition of chemical industries in Germany, in which, speaking of the remarkable development of these industries during the latter part of the last century, he writes:—

"There can be no doubt that, to a certain degree, this result has been due to the economic policy followed in Germany during the last decade; and that a judiciously arranged Customs tariff—which, whilst admitting most chemical primary materials duty free, has protected the weaker branches of industry by more or less high import duties on competing foreign chemical products—has contributed towards the development of German chemical industries. At the same time, however, it must be borne in mind that there are other causes to which the same should likewise be ascribed. Efficiency in the knowledge of chemistry attained after a long and thorough training in one of the many excellent State-aided educational establishments of this country, unabated study and research after entering practical life, with constant attention to the progress of chemical and physical science all over the world, on the part of the technical staff of German chemical factories, combined with a thorough business knowledge on the part of the commercial managers—these certainly have had an important share in placing German chemical industry in its present predominant position."

Milan (Italy): Imports during 1902.

Foreign Office Annual Series, No. 3090.

This analysis, though based on incomplete data, conveys some idea of what goods have been imported.

Beer comes mostly from Austria-Hungary and Germany.

Spirit, mainly entered as "pure," comes from Germany.

Oils comprise fixed oils from Germany, olive oil from France, linseed oil from Austria-Hungary, France, and Germany, and other kinds from the United Kingdom.

Mineral oils, including petroleum, from Austria-Hungary and to a lesser extent from Germany.

Essential oils in small quantities from the United Kingdom, France, and Germany.

Chemical products are largely imported, the greater part being from Germany, but as regards medicines, the United Kingdom, France, and other countries enjoy a fair share of this trade.

Soap of the ordinary and scented qualities comes more from Germany than from other countries, and it is the same in the case of perfumery.

Colours, dyes, and *varnishes* include colours of various descriptions, mainly from Germany. Indigo from India. Varnishes of French make and also of British and German. Black lead pencils, ink, and shoe blacking, form part of this category, and to a not inconsiderable extent, but here again Germany takes the lead.

Legal Position of the Inventor.

Chem.-Zeit., Sept. 12; *and Chem. Trade J., Oct.* 10.

In America, the law states that a patent is only to be granted to the first discoverer of a new process or appliance, and the applicant must declare that to the best of his belief he is the first discoverer. In Germany, as in England, the patent is granted to the first applicant, and it will only be transferred to an earlier inventor if he can show that the invention has been purloined from him. This standpoint has been taken up by the German patent law in order to cause every inventor to hasten to announce his invention, and not to attempt to work it first as a trade secret. Accordingly, the German law does not oblige an applicant to name the real discoverer. In many cases this would be very difficult, because, as is well known, several men may invent the same thing independently of one another. It is not at all probable that the German patent law will be altered in this respect.

Technical Education in the German Customs.

Times, Oct. 8.

When a tariff is so highly specialised as the new German tariff, with the object of protecting every branch of home industry in the most effective manner, it is evident that the technical knowledge of the officials who have to give effect to Customs regulations must be most profound and minute. The German Government now intends to have its Customs officials instructed, not only, as at present, in the superficial knowledge of the products of commerce and industry, but also in chemistry, physics, and mechanical technology. It is also regarded as desirable that these officials should be acquainted with the elements of finance, of commercial policy, and of commercial geography. At the most important Customs offices in every province a laboratory, together with a library of technical books, will be established, where the minor officials will receive technical instruction from Customs officers of higher rank. These higher officials will themselves be trained in a great laboratory and auditorium which it is proposed to build at the chief Customs office for foreign goods in Berlin. The teachers in this establishment will in part be professors of the technical colleges and kindred institutions in the German capital.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Asphaltum Production of U.S.A.

Bd. of Trade J., Oct. 15.

The production of asphaltum in the United States during the past 11 years is given in a bulletin recently issued by the United States Geological Survey. The quantity and value of the asphaltum and bituminous rock produced from 1882 to 1902 was as follows:—

Year.	Quantity.	Value.
	Tons of 2,000 lb.	Dols.
1882	3,000	10,500
1887	4,000	16,000
1892	87,680	445,375
1897	75,945	664,632
1900	54,389	415,958
1901	63.134	555,335
1902	99,659	677,594

In the year 1902 a very large proportion of bituminous sandstone was produced, having a relatively less value per ton.

Paraffin Countervailing Duty: U.S. Customs Decision.

Sept. 11, 1903.

Paraffin imported from the Island of Java is subject to a duty of 6 per cent *ad val.* under the proviso to paragraph 626 of the Tariff Act. This proviso imposes a duty on petroleum products imported from a foreign country equal to the duty exacted by them on similar products from the United States. No specific duty is levied by the Dutch East Indies on paraffin, but a duty of 6 per cent. *ad val.* is collected on all articles not mentioned by name. The claim of the importers that it was free of duty as "paraffin," under paragraph 633, was overruled, and the duty of 6 per cent. imposed.—R. W. M.

VII.—ACIDS, ALKALIS, Etc.

New Tare on Nitrate of Soda Bags.

W. Montgomery and Co., Sept. 28, 1903.

The Chilian Government has issued a decree which provides that, from the 1st April 1903, all nitrate of soda exported from Chili shall be in bags containing about 2 cwts. each. This change involves the use of a smaller bag than was hitherto employed, and upon the smaller bag, with a greater number of them to the ton, a smaller tare also is involved. This has been fixed in nearly all markets at not exceeding 2 lb. per bag.

X.—*METALLURGY.*

MINERAL PRODUCTION OF CANADA.

U.S. Cons. Reps., No. 1760, *Sept.* 28, 1903.

The total production of pig iron in Canada in 1902 from Canadian and foreign ores amounted to 357,903 short tons, valued at 4,243,545 dols., of which it is estimated 71,665 tons, valued at 1,043,011 dols., should be attributed to Canadian ore, and 286,238 tons, valued at 3,200,534 dols., to the ore imported.

The total values reported for 1886, 1897, 1901, and 1902 have been as follows :—

	Dols.
1886	10,221,255
1897	28,661,430
1901	66,712,708
1902	64,970,732

The rapid growth since 1897 has been largely due to the discovery and development of the gold placers of the Yukon.

The grand total of the value of the production of all the mineral industries of Canada shows a falling off of 2·6 per cent. This is due not merely to the decrease in the Yukon output of gold, amounting to 3,500,000 dols., but also to the very considerable falling off in values of all the remaining metallic minerals other than nickel. But for the large growth of the coal and coke industry, helped by increases in many of the other non-metallic products, the decrease in the grand total on account of the metallic class would have amounted to nearly 10 per cent.

In regard to their relative importance the metal industries as a group still occupy the first place, although not leading to the extent they did in former years. They contributed about 55 per cent. of the whole, the non-metallic following with nearly 33 per cent., and the structural class with nearly 12 per cent. Grouping the metalliferous class with coal and coke, about 81 per cent. of the value is accounted for.

Product.	Quantity.	Value.
Metallic.		
Gold :		Dols.
Yukon	..	14,500,000
All other	..	6,241,245
Total	..	20,741,245
Copper Lb.	39,168,202	4,553,695
Iron ore (exports) Tons	428,904	1,065,019
Pig iron from Canadian ore ..	71,655	1,043,011
Lead Lb.	23,000,000	935,870
Nickel ..	10,693,410	5,025,903
Silver Oz.	4,373,000	2,280,957
Zinc Lb.	166,700	8,068
Total metallic	..	35,653,768
Non-metallic.		
Coal Tons.	7,639,255	15,538,611
Coke "	506,466	1,538,930
Gypsum "	332,045	356,317
Limestone for flux "	293,168	218,809
Petroleum Barrels	521,485	931,740
Salt Tons.	63,056	288,581
Total	..	18,875,988
All other non-metallic	..	2,369,106
Total non-metallic	..	21,245,094
Structural Materials and Clay Products.		
Cement, natural rock Barrels	124,400	91,870
Cement, Portland ..	594,594	1,028,618
Total	..	1,120,488
All other structural materials, &c.	..	6,651,382
Total	..	7,771,870
Estimated value of mineral products not returned	..	300,000
Metallic	..	35,653,768
Non-metallic	..	21,245,094
Total for 1902	..	64,970,732

It will be noticed that although the output of pig iron from Canadian ore has fallen off, the whole iron-smelting industry shows marked growth notwithstanding. Taking the values of the coal and coke produced during 1902, together with those in the allied iron-smelting industry, an increase of nearly 4,500,000 dols. is exhibited, showing a growth in these, the most commercially important industries of the country, more than offsetting the diminution of the 3,500,000 in the necessarily fluctuating product of the placer-gold washings of the Yukon Territory.

The *per capita* value of the total mineral products for 1902 was 11·87 dols., as compared with 2·23 dols. in 1886, the first year for which figures are available.

NICKEL PRODUCTION IN U.S.A. IN 1902.

Iron Age, Sept. 3, 1903.

The only nickel ores produced on a commercial scale in the United States during the year were as by-products from ores obtained from Mine La Motte, Missouri. The 20 tons of matte containing nickel and cobalt which were refined at the works of the Mine La Motte Lead and Smelting Company, yielded 5,748 lb. of metallic nickel and 3,730 lb. of cobalt oxide. This is a decrease of 952 lb. in the production of nickel and of 9,630 lb. of cobalt oxide, compared with 1901. The quantity and value of nickel obtained from domestic ores during the past five years is given as follows :—1898, 11,195 lb., value 3,956 dols. ; 1899, 22,541 lb., value 8,566 dols ; 1900, 9,715 lb., value 3,886 dols. ; 1901, 6,700 lb., value 3,551 dols. ; 1902, 5,748 lb., value 2,701 dols.

As most of the nickel used in the United States is obtained from Canada, the following table is given to show the amount of nickel ore mined and smelted in Canada and the amount of matte obtained from it for the years 1896 to 1902, inclusive :—

Year.	Ore produced.	Ore smelted.	Matte obtained.	Nickel in Matte.
	Tons.	Tons.	Tons.	Lb.
1896	109,097	73,505	9,733	3,897,000
1897	93,155	96,093	14,034	3,998,000
1898	123,920	121,924	21,101	5,567,000
1899	203,118	171,230	19,215	5,744,000
1900	216,695	211,960	23,448	7,080,000
1901	326,945	270,380	45,134	8,882,000
1902	269,538	233,338	24,691	10,693,410

GOLD PRODUCTION OF WESTERN AUSTRALIA.

H. C. Hoover. Inst. of Min. and Met., Oct. 15, 1903.

The gold mining industry of Western Australia is based upon a wide distribution and great profusion of gold deposits. Reef gold has been found in over 7,000 different places, and there are over 1,300 different properties which have in 1902 produced ore for treatment, with a production of 1,819,309 oz. of fine gold.

The breadth of the industry should, with more liberal treatment of prospectors, expand, not only upon the known deposits, but upon the vast unprospected portion of the goldfield. Considering that only 10 per cent. of the known area is at all prospected, it is not improbable that other mining centres of great importance may be found.

The demonstrated possibility of working 7 dwt. ores, together with the improving *personnel*, both as to local ownership and quality of management, will bring about further expansion, especially in districts outside of Kalgoorlie, by bringing into play lower grade deposits, and thus more sound position of individual mines.

The sixteen great mines of the Colony will in themselves, on even present showing, bring about a great expansion in the colonial product, and should, with permanence in depth, towards which every evidence points, in themselves maintain a great output for many years to come.

XII.—FATS, FATTY OILS, Etc.

Soap in China.

Foreign Office Annual Series, No. 3092.

H.M. Consul at Wuchow reports that shaving soap is being adopted, and the remarks he makes concerning the assistance which an attractive package affords to the sale of anything offered to the Chinese, are worthy of attention. It is significant that the large importations of soap have led to the establishment of soap factories in China itself, and as the proprietors put foreign marks on their products, they impose on the country buyer.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Production of Senegal.

Foreign Office Annual Series, No. 3089.

Senegal is adapted to the cultivation of rubber, for which there is a remunerative demand, a reddish quality called "Akou" fetching as much as 2*s.* 4*d.* per lb. locally. A medium quality called "Mandiago" is sold for about 1*s.* 6*d.* per lb., while an inferior quality can be obtained for 9*d.* per lb.

Among the rubber plants cultivated, the *Landolphia Fomentosa* and *Vogelii* give good results.

Attention has been given to the cultivation of rubber by the Government, which has become an industry of some importance. In view of the declining output, the necessity of further State aid is being urged by the local merchants.

The principal European markets are Liverpool and Hamburg.

A duty of 5 per cent. *ad valorem* is imposed on rubber exported from Senegal, except at Casamance, where 7 per cent. *ad valorem* is charged on all exports.

Gutta-Percha in German New Guinea.

Bd. of Trade J., Oct. 1, 1903.

According to the 1902–03 report of the "Colonial Scientific Committee," the gutta-percha recently discovered in German New Guinea by the Schlechter Expedition in the low country has proved to be of good quality. It can be employed as an admixture in the manufacture of cables, and, if carefully collected, might even be used pure. The quality of the gutta-percha in the high lands, in the Finisterre and Bismarck mountains, is even better. This New Guinea gutta-percha is now being tested in various German cable works. The secretary of the German Imperial Post Office has granted a considerable sum for the purpose of experimental manufacture with the product.

The committee proposes to create, for a period of three years, some kind of an establishment which will undertake he training of the native population of New Guinea to xtract the gutta-percha under the supervision of Herr chlechter.

Rubber Waste: U.S. Customs Decision.

Sept. 11, 1903.

Scrap rubber is free of duty under paragraph 579, and et subject to a duty of 10 per cent. *ad valorem* as waste, not specially provided for," under paragraph 463, .T.—R. W. M.

XIV.—TANNING; LEATHER; GLUE, Etc.

Egg Albumin: U.S. Customs Decision.

Sept. 16, 1903.

An article, consisting of the whites of eggs to which a reservative had been added, is dutiable at 3 cents per lb. s "egg albumin" under paragraph 245 of the Tariff Act. rdinary egg albumin has had the water removed, but the ct that the water was still present in the above article as held to constitute no material difference.—R. W. M.

XVI.—SUGAR, STARCH, Etc.

Sugar Legislation in Holland.

Bd. of Trade J., Oct. 8, 1903.

The new sugar law came into operation in the Netherlands on Sept. 1.

According to article 8, the provisions respecting bounties are repealed, except in so far as concerns the bounties to which claim shall have arisen before the present law shall have come into operation.

A royal decree establishes the countervailing duties to be levied on bounty-fed sugar imported into Holland from Denmark, Japan, Roumania, Russia, and the Argentine Republic. These duties are as follows, in florins per 100 kilos.:—Denmark: Raw, 0·84; refined, 1·68. Japan: Candy, 1·25. Roumania: Raw, 8·52; refined, 10·80. Russia: Not less than 99 per cent., 3·90; not less than 88 per cent., 3·43; less than 88 per cent., 2·96. Argentine Republic: All sugar except that which is exported from that country without payment of excise duty, 24·00.

Sugar Legislation in France.

Bd. of Trade J., Oct. 8, 1903.

The following is a statement of the duties now leviable in France on sugar and sugared products imported from foreign countries, together with a summary of the principal regulations affecting their importation. French colonial sugar is subject to special regulations:—

Import Duties on French "Minimum" Tariff.

Tariff No.		Frs.	Cts.
91. Sugar, foreign:—			
In powder, estimated to yield on refining—			
98 per cent. or less (of whatever origin)	Per 100 kilos. net (of refined sugar)	25	00
	and, in addition, Per 100 kilos. net (actual weight) ...	5	50
More than 98 per cent.	Per 100 kilos. net (actual weight) ...	31	00
Refined—			
Candy	„	33	17
Other	„	31	00
92. Molasses:—			
For distillation, including exosmotic waters	Per 100 kilos. net	0	20 per degree of absolute saccharine richness.
Other than for distillation, having an absolute saccharine richness of—			
50 per cent. or less	„	19	50
Over 50 per cent.	„	40	90
93. Syrups, bonbons, candied fruits ..	„	31	00
94. Sweet biscuits	„	[†]29	50
95. Preserves (*confitures*):—			
With sugar or honey	„	15	50
Without sugar or honey	Per 100 kilos. gross	8	00
98. Chocolate:—			
Containing more than 55 per cent. of cocoa	Per 100 kilos. net	[‡]150	00
Containing 55 per cent. or less of cocoa	„	101	12

The "manufacturing tax" of 1 fr. per 100 kilos., formerly levied under the sugar law of 1897, is suppressed; and the "refining tax," levied under the same law, is reduced from 4 to 2 frs.

[†] Namely, half the duty on refined sugar and on flour, with an additional 6 frs.

[‡] Must be accompanied by certificates of origin.

The "refining tax" is leviable at the following rates:—

		Frs.	Cts.
Refined sugar, and other sugar treated as refined....	Per 100 kilos.	2	00
Sugar candy........................	" "	2	14
Molasses, other than for distillation—			
50 per cent. or less.............	" "	1	25
More than 50 per cent.	" "	2	00
Syrups, bonbons, and candied fruits	" "	2	00
Preserves (*confitures*) and sweet biscuits........................	" "	1	00
Sweetened condensed milk	" "	0 1 or 2 according to proportion of sugar.	80 00 00
Chocolate containing 55 per cent. or less of sugar.....................	" "	1	13

Exhausted molasses, containing not more than 50 per cent. of actual saccharine richness, may be admitted free of duty for agricultural purposes under conditions to be fixed by decree.

The system of "*détaxes de distance*" established under the law of 1897 is continued, but the amounts of the rebate (*détaxe*) are to be calculated on the basis of the actual cost of transport; always provided, however, that the rates laid down in articles 2 and 3 of that law are not exceeded.

The special reductions of duty for sugar employed in sweetening wines, cider, and perry are abrogated.

Certificates of Origin for Sugar.

The following regulations relating to certificates of origin for sugar imported into France have recently been issued for the guidance of French Customs authorities and others:—

Under the new regulations, foreign sugar imported into any of the countries which are parties to the Brussels Sugar Convention must be accompanied by a certificate of origin setting forth—

1. The description and quantity of the sugar.
2. The description, number, and marks of the packages.
3. The countries of origin or of production.
4. The country of destination.
5. The mode of transport (railway, ship, or boat).
6. The time for which the certificate is available [maximum period—one year, not including the time during which the sugar may have remained in warehouse].

For sugar arriving from countries which are not parties to the Convention, the certificate must, in addition, state that they proceed from a factory not manufacturing sugar produced in a bounty-giving country to which the countervailing duty or prohibition laid down in article 4 of the Convention applies.

These certificates must be issued by the Excise or Customs authority of the producing or manufacturing country; and, in the case of sugar from countries which are not parties to the Convention, a consular visa may also be demanded. The certificates lose their validity if, in course of transport, the merchandise is transhipped in a bounty-giving country. Exception may be made in the case of *force majeure*, or in the case of sugar from a country which is a party to the Convention, when such sugar has passed in transit through a bounty-giving country under conditions which guarantee its identity. In such cases the Administration must be apprised of the fact.

Sugar not accompanied by a certificate of origin is subject to the highest countervailing duty fixed by the Permanent Sugar Commission, *viz.*, 50 frs. per 100 kilos. Exception may be made in the case of unintentional irregularities, on security being given for the eventual production of a proper certificate, or, in default, the payment of the maximum duty.

Proof of origin is not required in the case of importations which have no commercial character, such as parcels accompanying passengers or arriving by parcel post, or for domestic use; always provided that the Customs Department have no reason to suspect the origin of the products.

STARCH AT MALAGA (SPAIN).

Bd. of Trade J., Oct. 8, 1903.

The *Handels Museum* (Vienna) states that starch is one of the articles which is imported into Malaga in considerable quantities, the value of such imports during 1902 being 210,609 pesetas from Germany, 205,130 pesetas from Belgium, and 21,849 pesetas from France. Cheap rice starch is stated to have the best chance in this district.

XVII.—BREWING, WINES, SPIRITS, Etc.

SPIRIT DUTY.

Report of Commissioners of Inland Revenue for Year ended March 31, 1903.

Under this head the net receipt of duty was 19,033,296*l.*, an increase of 542,517*l.* over 1901–2. Comparing the number of proof gallons distilled in 1902–3 and 1892–3, there was an increase of 5,330,000 gallons, or 12 per cent., and the number of distilleries has advanced in that period from 168 to 190. The number of proof gallons of spirits remaining in bonded warehouses on March 31st, 1893, was 99,756,000, and on March 31st, 1903, 166,527,000, an increase of 66 per cent. The number of proof gallons of spirits on which duty was paid was 31,393,000 in 1892–3 and 35,897,000 in 1902–3, an increase of 14 per cent. The number of proof gallons retained for consumption as beverage in the United Kingdom was 30,661,000 in 1892–3, and 34,765,000 in 1902–3, an increase of 13 per cent. If to these figures the numbers of gallons of colonial and foreign spirits imported be added, the consumption per head of the population in 1892–3 was 1·00 proof gallon, and in 1902–3 it was 1·03 proof gallons. The number of proof gallons of home-made spirits exported in 1892–3 was 3,873,000, and in 1902–3 6,439,000, an increase of 66 per cent. The total number of proof gallons of home-made and colonial and foreign spirits methylated in 1892–3 was 3,535,000 gallons, and in 1902–3 it was 5,452,000, an increase of 54 per cent. The Finance Act, 1902, gave power to the Board of Inland Revenue to authorise the use of duty-free spirit in arts and manufactures. It was thought that our manufacturers would thus enjoy a similar facility to that possessed by certain of their foreign competitors, but it was soon found that the regulations issued, and which are embodied in the Commissioners' report, did not confer the desired privilege. The Board state that they will entertain favourably applications to use duty-free spirit from "recognized bodies formed for the advancement of science, or of scientific education, and requiring to use pure spirit in processes of research and of illustration," and from "persons engaged in an industrial enterprise of such magnitude and importance as to give to it a character of public interest in its bearing upon national trade."

ALCOHOL; DENATURATION OF ——, IN RUSSIA.

Bd. of Trade J., Oct. 15, 1903.

The *Handels Museum* (Vienna) reports that the Russian Ministry of Finance has authorised the proprietors of agricultural distilleries to denature their alcohol, and to utilise it for lighting, motive power, &c., for a period of three years, without being called upon to pay the consumption tax.

This provision, it is added, will create in Russia a considerable demand for alcohol lamps, and especially for alcohol motors, both fixed and movable.

XVIII. A.—FOODS.

Adulterated Butter; Prohibition of the Importation into Canada of ——.

Bd. of Trade J., Oct. 8, 1903.

The *Canada Gazette* for 22nd August last, contains the text of the "Butter Act, 1903," which was assented to on 13th August 1903.

The following are the chief provisions thereby enacted:—

No person shall manufacture, or import into Canada, or offer, sell, or have in his possession for sale—

1. Any butter containing over 16 per cent. of water.

2. Any oleomargarine, butterine, or other substitute for butter, manufactured wholly or in part from any fat other than that of milk or cream.*

3. Any renovated butter, process butter, or butter which has been treated in the manner as described below, that is to say—no person shall mix with butter any acid, alkali, chemical, or any substance whatever, which is introduced or used for the purpose or with the effect of causing the butter to absorb water or any part of milk or cream.

XX.—FINE CHEMICALS, Etc.

Morphia in China.

Foreign Office Annual Series, No. 3092.

The new import tariff, agreed upon between China and the Treaty Powers in terms of the Final Protocol of 1901, substitutes for a 5 per cent. *ad valorem* charge on morphia a specific duty of 3 Haikuan taels per ounce, equal to 181 per cent. *ad valorem;* and in Article XI. of the new Treaty negotiated by Sir James Mackay, the British Government agree to a prohibition forbidding its general importation into China, except, under certain conditions, for medical use. It ought, therefore, shortly to disappear from the list of imports, in which the quantity imported last year is put down at 195,133 oz., an increase of 56,566 oz. over 1901.

XXII.—EXPLOSIVES, MATCHES, Etc.

Fulminate of Mercury Manufacture in Alderney.

Pall Mall Gazette and Daily Mail, Oct. 8, 1903.

An order has been issued prohibiting the manufacture of explosives on the island of Alderney. The order is the result of an official inquiry into a number of mysterious ases of death among the cattle on the island. Traces of ercury were found in the viscera of the dead cattle, and n many meadows and gardens the herbage was impregnated ith it. The presence of the mercury powder is attributed o an explosion at a factory where fulminate of mercury as being manufactured. The explosion occurred on eptember 10 at the time of the recent gale, which scattered he powder broadcast. Further losses of cattle continue o be reported.

In answer to statements made, Messrs. Helcké Brothers xplain that they never manufactured iodine at their works here, but went to Alderney solely because they were ermitted to use pure alcohol in the manufacture of fulminate of mercury, under certain conditions granted by the ourt of Alderney. No objection has been raised to the orks for over thirty years, and no mishap has occurred ntil the night of the gale, when the factory was struck by ghtning.

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* The *importation* of all oleomargarine, butterine, and other ubstitutes for butter is already prohibited by Act 16 of 1897.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 21,765. Jouve. Manufacture of distilling, evaporating, or like apparatus. Oct. 9.

,, 21,915. Boylan. Superheating steam. Oct. 12.

,, 22,066. Schütz. Lubrication of steam in steam-engines of all kinds by means of alkaline lye.* Oct. 13.

,, 22,120. Bolton. Apparatus for superheating steam. Oct. 14.

,, 22,162. Petersson. Furnace or kiln for roasting ore, burning dolomite, &c.* Oct. 14.

[C.S.] 21,256 (1902). Hölbling and Ditz. Catalysis. Oct. 14.

,, 24,334 (1902). Hollington. Apparatus for the compression of gases. Oct. 14.

,, 1298 (1903). Stade. Apparatus for evaporating liquids. Oct. 14.

,, 19,623 (1903). Blacke. Process for regulating the temperature of liquids, more particularly of water in central condensing plants, &c. Oct. 21.

II.—FUEL, GAS, AND LIGHT.

[A.] 21,565. Love. Coal-gas retorts. Oct. 7.

,, 21,614. Pointon and Pointon. Gas producers. Oct. 8.

,, 21,760. Clay. Making a cheap power-gas. Oct. 9.

,, 21,855. Hemingway and Booth. Appliances for washing or purifying gas. Oct. 10.

,, 21,964. Derval. Inclined gas retorts. Oct. 12.

,, 21,967. Dahmen and Hagyi-Ristic. Process of manufacturing carbonaceous substances.* Oct. 12.

,, 21,990. Tweedale, Tweedale, and Smalley. Apparatus for cooling and purifying producer-gases. Oct. 13.

,, 22,057. Doyle. Furnaces.* Oct. 13.

,, 22,201. Wood and Larkin. Producing and utilising gases for power and effect work. Oct. 15.

,, 22,251. Gilbert-Stringer. Apparatus for generating combustible gas. Oct. 15.

,, 22,272. Laurenius. Retort furnaces for charring or coking peat, &c.* Oct. 15.

,, 22,290. Croissant. Manufacture of water-gas. Oct. 15.

,, 22,310. Eaton. Artificial fuel. Oct. 16.

,, 22,451. Evered and Co. (Weiblin). Incandescent mantles. Oct. 17.

[C.S.] 24,152 (1902). Thwaite. Purification of iron-making blast-furnace gas or any similar combustible gas. Oct. 21.

„ 24,215 (1902). Goode and Mitchell. Compressed steam fuel. Oct. 21.

„ 24,878 (1902). Beanes and Werner, Pfleiderer and Perkins, Ltd. Gas producers. Oct. 21.

„ 25,560 (1902). Robson. Producer gas plant. Oct. 14.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 21,968. Hoering and Mjöen. Apparatus and method for coking hydrous bituminous combustibles.* Oct. 12.

„ 22,091. Thompson (Ges. zur Verwerthung der Boleg'schen Wasserlöslichen Mineralöle und Kohlenwasserstoffe). Production of water-soluble or easily and permanently emulsifiable hydrocarbon derivatives.* Oct. 13.

„ 22,092. Thompson (Ges. zur Verwerthung der Boleg'schen Wasserlöslichen Mineralöle und Kohlenwasserstoffe). Production of water-soluble or emulsifiable vaseline.* Oct. 13.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 21,800. Imray (Meister, Lucius und Brüning). Manufacture of yellow, orange-yellow to orange sulphurised dyestuffs. Oct. 9.

„ 21,945. Imray (Meister, Lucius und Brüning). Manufacture of clear yellow, orange-yellow to yellow-orange sulphurised dyestuffs. Oct. 12.

„ 22,289. Ransford (Cassella and Co.). Manufacture of *p*-acetylamido-*o*-amidophenol, and dyestuffs therefrom. Oct. 15.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 21,595. Mather. Fabric printing machinery. Oct. 7.

„ 21,667. Bergmann. *See under* XII.

„ 21,671. Heide (McClure). Colour printing process.* Oct. 8.

„ 21,949. Gebauer. Apparatus for subjecting fabrics, warps, yarns, &c., to the action of fluids or chemical solutions. Oct. 12.

„ 21,958. Ransford (Giesler). Production of coloured effects on tissues. Oct. 12.

„ 21,986. Rosenberg. Process of printing and dyeing bleached or unbleached textile fabrics simultaneously in four colours. Oct. 13.

„ 22,127. Rycroft. Continuous dyeing and printing process. Oct. 14.

[C.S.] 22,748 (1902). Rudometoff. Multi-colour printing. Oct. 14.

„ 26,725 (1902). Shackleton and Barraclough. Dyeing of yarns and threads. Oct. 14.

„ 28,100 (1902). Gebauer. Apparatus for treating fibres, yarn, fabrics, &c., with heated liquid. Oct. 14.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 21,382. Brookes (Chem. Werke Hansa). Manufacture of soluble compounds containing iron and arsenic. Oct. 5.

„ 21,392. Schulze. Process for the manufacture of porous barium oxide.* Oct. 5.

„ 22,024. McKim and McKim. Apparatus for washing and grading barytes. Oct. 13.

„ 22,180. Williams and others. Manufacture of cyanides, and apparatus therefor. Oct. 14.

[C.S.] 26,566 (1902). Davis. Manufacture of alkali prussiates. Oct. 21.

„ 27,543 (1902). Hulin. Apparatus for treating metals or matters in fusion with sodium or alkaline compounds. Oct. 14.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 21,578. Reichel. Method for preserving wood. Oct. 7.

„ 21,799. Justice (Aktieselskabet Venezuela-Asfalt Kompagnie). Manufacture of artificial asphalt.* Oct. 9.

„ 21,947. Hocke. Manufacture of Portland cement. Oct. 12.

„ 22,376. Hearson (Schröder). Artificial marble.* Oct. 16.

„ 22,441. Mellinger. Chemical binding compound, and process of manufacture thereof.* Oct. 17.

[C.S.] 25,075 (1902). Ingham, Langton, and Ingham. Kiln for burning pipes, bricks, &c. Oct. 14.

„ 26,078 (1902). Bamber. Manufacture of Portland cement, and apparatus therefor. Oct. 21.

„ 26,683 (1902). James (Passow). Manufacture of cement. Oct. 14.

„ 27,345 (1902). Gautsch. Rendering wood uninflammable. Oct. 21.

„ 27,518 (1902). Anderson, and Southhook Fire Clay Co. Manufacture of glazed or enamelled bricks. Oct. 21.

„ 9508 (1903). Lilienthal. Artificial marble. Oct. 14.

„ 19,784 (1903). Kroll. Preservation of timber. Oct. 21.

X.—METALLURGY.

[A.] 21,665. Oxnam and Oxnam. Process of hardening copper and extracting metals from matrices. Oct. 8.

„ 21,854. Chandoir. Cadmium alloy. Oct. 10.

„ 21,931. Sayer and Spiers. Extraction and recovery of gold. Oct. 12.

„ 22,073. Green and Prescott. Manufacture of metallic alloy. Oct. 13.

[C.S.] 15,280 (1902). Scammell. Separating metals from their ores. Oct. 21.

„ 27,543 (1902). Hulin. *See under* VII.

„ 3822 (1903). Reichwald (Krupp). Spring steel. Oct. 14.

[C.S.] 3823 (1903). Reichwald (Krupp). Malleable cast iron. Oct. 14.

" 4345 (1903). Zenzes. Manufacture of cast iron of high tensile strength. Oct. 14.

" 17,183 (1903). Schulte-Steinberg. Utilisation of blast furnace waste. Oct. 14.

" 18,213 (1903). Kauffmann. Ovens for roasting ores, &c. Oct. 14.

" 18,480 (1903). Compound Metals Co. (Wachwitz). Welding of metals. Oct. 14.

" 19,783 (1903). Delprat. Extracting zinc and other sulphides from their ores. Oct. 21.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 21,609. Creswick and Shaw. Electro-deposition of metals upon aluminium. Oct. 8.

" 22,090. Cornaro. Manufacture of electrodes and resistances. Oct. 13.

" 22,356. Cowper-Coles. Apparatus for use in the electro-deposition of metals. Oct. 16.

[C.S.] 21,901 (1902). Schmitt and Fabre. Electric accumulators. Oct. 21.

" 18,485 (1903). Wade (Rodman). Storage batteries. Oct. 14.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 21,373. Conmont. Scented toilet soap.* Oct. 5.

" 21,667. Bergmann. Process for the removal of fat-extracting solvents from materials. Oct. 8.

" 21,781. Griendt. Wax-like product, and process of producing the same. Oct. 9.

" 22,085. Godard. Purifying and deodorising oils and fatty matters. (Belgian Appl., Oct. 16, 1902.)* Oct. 13.

" 22,086. Godard. Decolourising oils and fatty matters. (Belgian Appl., Oct. 28, 1902.)* Oct. 12.

" 22,487. Hausamann. Treatment of fats and fatty acids. Oct. 17.

[C.S.] 25,876 (1902). Garfield. Extraction and recovery of fatty matters from liquid or semi-liquid material containing them. Oct. 14.

" 26,728 (1902). Johnson. Extraction of oil from fish-livers, &c. Oct. 14.

III.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—*Pigments, Paints.*

[A.] 21,498. McGlew and Harrisson. Anti-fouling paint. Oct. 6.

" 22,417. Barker (Coleman). Anti-fouling coatings for maritime purposes, and manufacture thereof.* Oct. 17.

C.S.] 19,537 (1903). Armbruster and Morton. Processes of making pigments. Oct. 21.

" 19,538 (1903). Armbruster and Morton. Processes of making pigments. Oct. 21.

B.—*Resins, Varnishes.*

[C.S.] 17,035 (1903). Leppert and Rogovin. Boiling of drying oils for the purpose of lacquer and varnish manufacture. Oct. 21.

C.—*India-rubber, &c.*

[A.] 21,890. Lawrence. Apparatus and process for extracting rubber, gums, &c.* Oct. 12.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 21,579. Weiss. Process for extracting tannin from leather or leather waste, &c., for the manufacture of gelatine and glue.* Oct. 5.

" 22,069. Martin. Vegetable gelatine, and process of manufacturing the same.* Oct. 13.

" 22,156. Payne. Preparation and use of tanning extracts. Oct. 14.

" 22,442. Mellinger. Process of removing hair from hides.* Oct. 17.

[C.S.] 22,729 (1902). Marter, Hanbury, and Gardner. Manufacture of products for use in lieu of leather, raw hide, ivory, and other materials in the manufacture of various articles. Oct. 21.

" 27,053 (1902). Rheinische Patent-Leim und Gelatine-Industrie, and Arens. Manufacture of glue and gelatine. Oct. 14.

" 13,543 (1903). Klein. Machine for treating raw hides and skins. Oct. 21.

XV.—MANURES.

[C.S.] 7776 (1903). Carstairs and Allrich Guano Co., Ltd. Separating proteids from non-nitrogenous bodies. Oct. 21.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 22,370. Thompson (Bredt and Co.). Processes for making soluble starch.* Oct. 16.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 21,580. Hewer. Apparatus and process for infusing and extracting hops. Oct. 7.

" 21,848. Monssong. Method and apparatus for the distillation of alcohol. Oct. 10.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

B.—*Sanitation; Water Purification.*

[A.] 21,341. Dunbar. Decomposing and freeing mud from water. Oct. 5.

" 21,591. Dorling. Sterilisation of water. Oct. 7.

" 21,668. Baudry. Simultaneous production of purified and sterilised water, as well as of distilled water.* Oct. 8.

" 21,770. Alton. Sewage precipitant. Oct. 9.

" 21,954. Robins. Treatment of smoke, steam, sewer gas, impure air, &c., for preventing or mitigating a nuisance. Oct. 12.

[C.S.] 15,425. (1903). Duyk. Process for sterilising and purifying potable and residuary waters. Oct. 14.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 21,789. Noguès and Proveux. Manufacture of nitrated cellulose and its compounds. Oct. 9.

„ 22,299. Cave-Brown-Cave. Apparatus for the treatment of celluloid or like substances. Oct. 16.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 21,647. Boehm (Merck). Manufacture of *C-C*-dialkylbarbituric acids. Oct. 8.

„ 21,833. Newton (Bayer and Co.). Production of derivatives of pyrimidine. Oct. 10.

„ 22,163. Zimmermann (Chem. Fabr. auf Actien vorm. E. Schering). Manufacture of acidyl derivatives of rufigallic acid alkyl ether. Oct. 14.

[C.S.] 9322 (1903). Mills (Barbier). Manufacture of saccharin. Oct. 21.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[C.S.] 25,821 (1902). Newton (Bayer and Co.). Manufacture of sensitive photographic emulsions. Oct. 14.

„ 6356 (1903). Reichel. Manufacture of unfading photographs in natural colours on paper according to the three-colour process. Oct. 14.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 21,365. Schnebelin. Explosive powder. (Belgian Appl., Oct. 30, 1902.)* Oct. 5.

„ 21,481. Bowen. Explosives. Oct. 6.

„ 21,482. Bowen. Explosives. Oct. 6.

„ 21,670. Luck. Manufacture of explosives. Oct. 8.

* * *

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Noyes, Prof. W. A., l/o Terre Haute ; 1505, Bolton Street, Baltimore, Md., U.S.A., Editor (Journal of American Chemical Society).
Parker, W. B., l/o Claremont Road ; 1, Manor Road, Park Estate, Rugby.
Pennington, R. W. R.; Journals to "Carbonic," Mazagon, Bombay, India.
Richardson, D. B.; Journals to The Elms, Torquay, Devonshire (temp.).
Schieren, G. A.; communications to Dixie Tannery, Bristol, Tenn., U.S.A.
Schulze, Emil A. F., l/o Balham ; 15, Stanthorpe Road, Streatham, S.W.
Scott, Leonard C., l/o Chicago ; c/o Kennicott Water Softener Co., 29, Great St. Helens, London, E.C.
Stingelin, Dr. Fritz, l/o Jersey City ; Union Knitting Mill, Schuylkill Haven, Pa., U.S.A.
Sutherland, D. A., l/o 28 ; 13, Victoria Street, Westminster, S.W.
Swan, Dr. Jos. W., F.R.S.; communications (temp.) to Holmwood, Parkstone, Dorset.
Taber, G. H., l/o Philadelphia ; 814, Frick Building, Pittsburg, Pa., U.S.A., Genl. Manager (Gulf Refinery Co.).
Warburton, Thos., l/o Ardwick ; 12, Seymour Road South, Clayton, Manchester.

CHANGES OF ADDRESS REQUIRED.

Peter, Dr. A. H., l/o 205, Third Avenue, New York City, U.S.A.
Thompson, W. G., l/o Tonge Springs Works, Middleton, near Manchester.

MEMBER OMITTED FROM LIST.

1902. Davies, Wm. Rhys, 60, Northampton Terrace, Bradford, Yorks, Analytical Chemist.

Deaths.

Kohl, H. C., Craigsville, Va., U.S.A.
Walls, Arthur W., North Woburn, Mass., U.S.A. July 7.

Liverpool Section.

Meeting held on Wednesday, October 28th, 1903.

MR. FRANK TATE IN THE CHAIR.

THE THIRD HURTER MEMORIAL LECTURE.

THE SURFACE STRUCTURE OF SOLIDS.

BY GEORGE BEILBY.

In inviting me to deliver the third Hurter Memorial Lecture, you have done me an honour for which I heartily thank you. Not only is it an honour to be asked to help in this way to keep for the memory of Ferdinand Hurter its well-earned place in the minds and hearts of those who knew him personally or by repute, but it is an additional honour to be summoned to follow in this labour of love the previous holders of this lectureship, Prof. George Lunge and Sir William Abney.

Through the courtesy of the officers and Committee of the Section, the invitation to deliver the lecture was accompanied by the statement that the choice of a subject was to be left entirely to the discretion of the lecturer. In the first Hurter Memorial Lecture, Prof. Lunge ably represented the special branches of industry with which Hurter had been so long associated; while in the second, Sir William Abney appeared as the most distinguished worker in and exponent of that part of science in which Hurter had found recreation in the midst of an active business life. In my own case, it seemed unlikely that I could hope to ing to Liverpool, the natural home and centre of the kali and its allied industries, any technical communica- n of such value as to be worthy either of the occasion or the place. It appeared to me, as I feel sure it must to u also, that any tribute offered to the memory of a man such originality and independence of thought as Ferdi- nd Hurter must at least be fresh and unhackneyed. ter some hesitation, I decided to bring before you a *sumé* of the work which has occupied me for some years st, not because it can be regarded as in any way specially propriate to the occasion, but because it is for me the st I can offer. In this spirit I will ask you to receive it. venty years ago it might have been difficult to convince y half-dozen of the average followers of Applied Chemistry it the study of so physical a subject as the nature of the id state could have any possible interest for them; but times have changed, and the sight of the physical lion ng down with the chemical lamb has ceased to arouse r apprehensions. Indeed, signs are not wanting that the nb is no longer satisfied to be a purely passive participator these *réunions*.

If extenuating circumstances may be pled for my own nderings into a non-utilitarian branch of knowledge, I uld state that the excursion had its origin in some ublesome experiences in which the disintegration of t metals by dry ammonia caused considerable difficulty certain manufacturing operations. At the outset, the oblem involved was attacked as a technical one, but as was pursued, various interesting paths into the less plored regions of micro-metallurgy were opened up, and original problems were to some extent overshadowed the wider possibilities of the subject.

THE SURFACE STRUCTURE OF SOLIDS.

The time-honoured idea that the solid state is a state inertness and repose has had to give way before the idly accumulating proofs that the molecules of the solid te possess activities of a most marked and varied nature. e discovery by Spring of the chemical interaction of d substances, the measurement of the rate of diffusion one solid metal into another by Roberts-Austen, and the regation of the crystalline constituents of solid alloys ught to light by the modern study of micro-metallurgy, concur in showing unmistakably the actual as well as potential activity of the molecules in the solid state. startling discoveries which have resulted from the ly of radio-activity were not needed for the proof of ecular activity in solids; but all the more do these nomena, and the speculations to which they have given , bring home to our minds with startling vividness the ificance of the vast stores of potential energy which st in the solid molecule even in the deathlike regions in ch temperature has almost ceased to exist.

he study of the solid state may be approached by eral routes; we may follow the line of the directly ble, studying this by the unaided eye or with the help the microscope; or we may draw conclusions as to structure and changes of structure by observing the aviour of solids under the influence of light, heat, gnetism, or electricity. A third method is the purely hematical, in which certain assumptions having been le as to the ultimate or proximate elements of structure, interrelations of these are treated as questions of pure amics. The special methods of the chemist may be ected to throw indirect light on the problems of the cture of solids, as will be evident when the experiments pring are referred to later.

n the modern study of micro-metallurgy, the micro- pe, the pyrometer, and the test tube all contribute their a, and changes of structure made visible by the micro- pe are directly associated with corresponding changes in sical and chemical constitution.

hile these various methods of study have produced a s of invaluable data and experience, it appears to me, a clear definition of the solid state has still to be ulated. Of late years there has been an increasing osition to stretch the ideas of the crystalline state in r that room may be found for the greater number of phenomena of the solid state. But have we really any evidence that the crystalline state persists right down to the molecule? Are we entitled to assume that the molecules of crystalline substances have themselves the properties of crystals? I think there is considerable room for doubt whether this is the case. A crystal, according to the conclusions of mathematical crystallography, is a *homogeneous assemblage of certain units.* These units are, in themselves, no more crystals than a single private soldier is a battalion in small. Further than this, even a heterogeneous assemblage of 1,000 individual soldiers does not make a battalion, for this only exists in its corporate capacity after the men have fallen into orderly formation—when, in fact, they have become "a homogeneous assemblage of units." Thus with all solids, it appears to me that, while the crystalline state may well be looked upon as the ideal solid state towards which the molecules must naturally tend, yet it is easy to conceive that the molecules themselves, or even certain complexes made up of a number of simpler molecules, may also occur as a heterogeneous assemblage in which, for some reason, the marshalling of the units by crystallic force has been controlled and kept in check by other forces or tendencies. The observations which I am to lay before you this evening appear to me to fall most naturally in line with this view.

Before laying these observations before you I will refer very briefly to some of the more important contributions which have been made to the knowledge of the solid state.

In 1880 Prof. Walthier Spring (Bull. Acad. Belge., 1880, [2], **49**, 323—379) showed that coarsely-powdered salts could be made to cohere into a solid mass, the conditions necessary being pressure, temperature, and time. He suggested two analogies to this phenomenon: the one being the regelation of ice, and the other the liquefaction of gases by pressure. The apparatus used by Spring was capable of exerting a pressure of 10,000 atmospheres, and experiments were made on various metals at high pressures and at the ordinary atmospheric temperature. Among the many results obtained, lead-filings were compressed into a uniform block by a pressure of 2,000 atmospheres, and finely powdered bismuth was converted, by a pressure of 6,000 atmospheres, into a uniform crystalline block. In these experiments the action did not take place suddenly, but increased steadily with the pressure. Precipitated alumina dried at 140° became compact and translucent at 5,000 atmospheres: it had apparently flowed like a liquid, while silica both natural and artificial, altogether refused to flow under pressure. In these earlier experiments Spring attributed the welding or flowing mainly to pressure; that is, to the close approximation of the particles brought about by pressure. In a second series of experiments in 1887–8 (Zeits. physikal. Chem., **2**, 536—538), he showed that chemical reactions could take place between substances in the solid state which were simply in contact with each other. When dry barium sulphate and sodium carbonate are mixed and compressed, a reaction sets in which gradually spreads through the whole mass, barium carbonate and sodium sulphate being produced. Finely divided copper mixed with dry mercuric chloride was left to itself in a sealed tube, being only shaken from time to time to ensure fresh contacts between the substances. In four years the reaction was complete, and had resulted in the production of cuprous and mercurous chlorides. The first series of experiments had shown that separate solid particles of the same substance might be made to cohere under suitable conditions of pressure and time, while the second series went a step further than this, and showed that atomic or chemical interchange could take place between solids. A third series of experiments, published in 1894 (Zeits. physikal. Chem., **15**, 65—78), led to a further step, in which extreme pressure was dispensed with, and alloys of two metals were formed by bringing their carefully trued faces together under sufficient pressure to ensure contact, and maintaining them at a temperature considerably below the melting-point of the more fusible. Complete union resulted, and the penetration of each metal by the other was shown by the formation of two layers of alloy.

Spring appears still to have regarded the regulation analogy with favour, though one would have thought that his experiments being now conducted under very moderate pressure, he could hardly have supposed that the phenomena in any way depended on the infinitesimal reduction of melting-point which would result from increased pressure.

In the arts, there was probably no period at which the flow and welding of metals was not practically utilised. The fact that this flow exists was, therefore, not a discovery of modern science. The great value of Prof. Spring's research lay in the fact that it was one of the most persistent attacks which had ever been made on the problem of the conditions which determine flow in solids. Incidentally these researches brought to light some very important phenomena which were closely related to another property of solids, namely diffusion. Diffusion in solids, like "flow," had been made use of in the arts before its significance was recognised by science. The manufacture of steel by cementation depends entirely on the actual penetration of the carbon molecule into the iron which is being converted. Whether Robert Boyle had this familiar operation in mind when he gave it as his view that "even such bodies as are solid may respectively have their little atmospheres," I do not know; but his further suggestion that "it might yet be found that metals are volatile at ordinary temperatures," shows that, for him, the solid state was not a condition of dead inertness and isolation.

The study of diffusion of metals was not seriously taken up till the fourth quarter of the past century. In 1883 accurate measurements of diffusion were made by Dr. Guthrie (Phil. Mag., 1883, **16**, 321). His experiments consisted in diffusing various solid metals into mercury. Zinc, tin, lead, sodium, and platinum were experimented with. This study was taken up by the late Sir William Roberts-Austen, who determined the rate of diffusion of gold and platinum into lead, both in the liquid (Phil. Trans., **187**, 383) and in the solid (Proc. Roy. Soc., 1900, **67**, 101) state. Results of diffusion into solid lead were shown in a peculiarly clear way in diagrammatic form.

It was long in doubt whether the production of steel from iron by the cementation process resulted from the direct passage of the carbon molecule into the iron. This doubt was set at rest by Roberts-Austen (Nature, 1889, **41**, 14) in 1889, when he showed that pure iron could be carbonised by diamond *in vacuo* at a temperature far below the melting-point of iron, and under conditions which absolutely precluded the influence of occluded gases.

While the certain knowledge was being thus arrived at that the elements, even in a solid state, can interpenetrate each other and combine to form new compounds (so that in this respect the difference between the mobility of the molecules in the solid, liquid, and gaseous states is only one of degree), new points of similarity were being brought to light in another direction. The new analogy was that between the states of solution in solids and liquids. The theory of solid solution in alloys and the crystallisation of definite alloys from this state of solution is now one of the most widely accepted doctrines of metallurgy. It has further been definitely established that, not only do definite alloys crystallise out of a mixture at the moment of solidification, but that the crystalline structure itself continues to alter in the completely solidified mass. The growth of crystals takes place not merely at the expense of the eutectic or "mother substance," but it has been proved in the clearest possible way that large crystals continue to grow at the expense of small, eventually swallowing them up, as is often the case with crystals growing in an aqueous solution (Neville and Heycock, Proc. Roy. Soc., **69**, 325). The observations which it is my privilege to bring before you this evening appear to me to supply fresh proofs of the mobility of the solid molecule, while they for the first time enable us to define more closely some, at least, of the conditions of this mobility, and the limitations under which it takes place.

During the past 40 years a complete science of micro-metallurgy and metallography has grown up, and the minute structural changes which take place in metals and in alloys, have, through the reproduction of photomicrographs, become familiar to students and to readers who have never themselves used the microscope. For the purpose of the present lecture it is important that the general methods of microscopic research should be understood in order that the observations to be discussed may be rightly interpreted I therefore make no apology for briefly describing thes methods for the benefit of those who are not familiar wit the modern microscope as an instrument of research.

In the study of rocks and minerals, which are as a rul comparatively transparent, it is usual to examine th specimen by transmitted light, and the method of preparation is to grind down a slice of the mineral till it is sufficiently thin to transmit light freely. It is then carefull polished till all scratches have disappeared. The crystallin structure is now visible, but in many cases it is advantageou to study the microscopic details by means of polarise light. For obvious reasons even the thinnest of minera sections are still, in the microscopic sense, of considerabl thickness. This thickness imposes limits on the degree o magnification which can be usefully employed.

Micro-metallurgy has hitherto been mainly concerne with the changes in crystalline structure which result fro mechanical or thermal treatment. The ordinary method o preparation is to grind a perfectly flat smooth face on th specimen. This face is then carefully polished till it i scratchless. The structure is then developed by etchin agents, by heat colouring, or by carefully regulated abrasio The resulting surface ought to be as nearly as possible i one plane, the structure being shown in two dimensio like a sectional plan. As transmitted light is not availabl for the microscopical examination of these opaque met specimens, the alternatives are, to illuminate by obliquel reflected or by normally reflected rays. In the former th image of the illuminant is brought to a focus directly on th surface of the specimen. The angle of incidence of th pencil of oblique rays is limited by the distance betwee the front lens of the objective and the upper surface of th specimens. If the space is very small the pencil of rays h to be nearly horizontal. As the angle with the horizont becomes very acute, the illumination becomes unsatisfactor unless it is merely desired to show surface irregularities b what is called a "grazing illumination." In this case th nearly horizontal light catches the tops of any irregularitie and shows them as bright spots or outlines on an otherwi dark ground. For illumination by normally reflected ray the image of the illuminant is focussed on a small transparent mirror which is placed within the tube of the micro scope at an angle of 45° with the optical axis. The ray from the mirror are reflected downwards, and passin through the lenses of the objective are focussed on th specimen, forming a critical image of the illuminant in th centre of the field. By this method of illumination ther is evidently no limit to the nearness of the objective to th surface of the specimen, and lenses of the highest resolvin power can be used under the most favourable condition For this reason illumination by normally reflected ligh has been almost universally employed in micro-metallurg obliquely reflected light being generally reserved fo examination at low magnifications.

It is important to remember that the images produced b these two forms of illumination are to each other as negati and positive—the lights of the one are the shadows of th other, and *vice versâ*. If one thinks for a moment, th reason is sufficiently obvious. Take a perfectly smoot surface and illuminate it by an oblique pencil at an angl of 45°. Obviously the angle of the reflected rays will als be 45°, and no rays will be reflected into the microscop hence this smooth surface will appear black when looked a through the microscope. Now illuminate the surface b means of the mirror inside the microscope. The rays no reach the surface through the front lens and are returne into the microscope by reflection from the surface, whic therefore appears brilliantly bright. These features o illumination by oblique and by normal rays are shown o Figs. 31 and 32, which are photomicrographs of a surface o frosted silver on which a burnisher mark has been mad On both a certain amount of light is scattered by th general surface, but where the burnisher has pressed th irregularities into a smooth reflecting surface the blackne under oblique and the brightness under normal rays is we seen. If the surface is not uniformly flat, those parts whic are at an angle will reflect the rays outside of the micr scope, and will be seen as black patches. If oblique ray re turned on an undulating or rippled surface the different arts will appear light or dark according to the particular ngle at which they receive the incident rays. If the urface under examination is not perfectly smooth, but if it as some texture sufficiently fine to scatter the incident ays instead of reflecting them unbroken, it will appear ight both by normal and by oblique rays; but each light will develop its own appearance of texture, as the rays eflected into the microscope by the two kinds of illumination can never be identical pictures. When the surface s not absolutely opaque a new element is introduced, for ow the effects of absorption and refraction will affect the ppearance by the two kinds of illumination. General bsorption of light of particular wave lengths will colour he picture. If a transparent layer covers the reflecting urface of the specimen, in addition to the images produced y simply reflected rays, there may also be images resulting rom refraction occurring in the surface layer.

The microscopic images produced by rays transmitted hrough a transparent or translucent specimen result partly rom the total or partial absorption of the rays, and partly rom their refraction. In interpreting the photomicrographs which I shall show you, all these factors, as well as others which cannot now be referred to, are concerned in the production of the picture.

Throughout the lecture it will be necessary to refer to magnitudes which are far removed from our everyday standards. The stage on which the activities of the solid molecules are displayed is bounded on one side at least by the somewhat narrow limits of the molecular attractions. Further, the arguments to be here advanced are mainly founded on microscopic observations in many of which the resolving power of the most modern lenses has been pushed to its utmost limit. It will therefore make for clearness if at the outset we pass briefly in review the state of existing knowledge as to the size of solid and liquid molecules and the range of their attractions.

For the clear marshalling of the facts relative to the range of the molecular forces we are indebted to Sir Arthur Rücker, who, in his brilliant lecture before the Chemical Society in 1888, brought together all the best and most trustworthy observations on this subject by the ablest physicists. After careful criticism and argument, the results of these observations are summarised in the form of a table, which now forms an invaluable standard of reference for all inquiries on this subject (J. Chem. Soc., 1888, **53**, 260).

From this table it will be seen that the superior limit ρ, the radius of molecular attraction, is given by Plateau and Maxwell at 118 $\mu\mu$ and by Plateau and Quincke at 50/59 $\mu\mu$. The diameter of the gaseous molecule is given by Exner, O. Meyer, and Van der Waals at 0·11 to 0·14 $\mu\mu$. In an earlier part of the lecture Lord Kelvin's conclusion is referred to, in which he calculates the diameter of the molecules of Zn and Cu to be probably at least 0·1 $\mu\mu$.

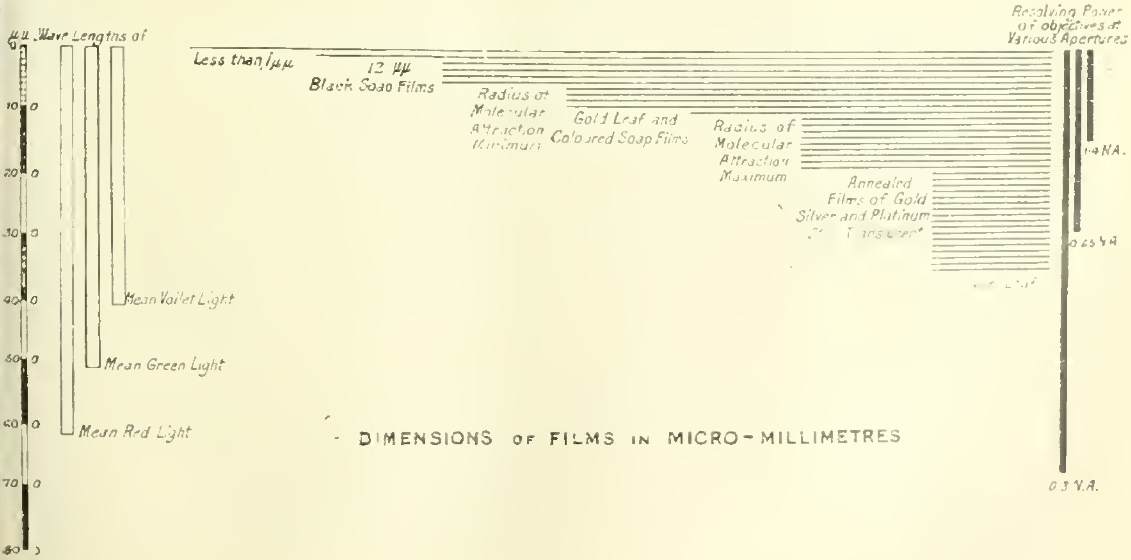
$\mu\mu$		
118	Superior limit to ρ	Plateau. (Maxwell.)
94–45	Range of unstable thickness begins	Reinold and Rücker.
59	Superior limit to ρ	Plateau.
50	Magnitude of ρ	Quincke.
12	Range of unstable thickness ends	Reinold and Rücker.
12	Action of silver plate on phase of reflected light alters	Wiener.
10·5	Thickness on permanent water film on glass at 23° C.	Bunsen.
4–3	Mean distance between centres of nearest molecules in gases at 760 mm. and 0° C.	O. Meyer.
3–1	Thickness of metal films which polarise platinum	[illegible]
1–0·02	Thickness of electric double layer	Lippmann and Oberbeck.
0·2	Smallest appreciable thickness of silver film	Wiener.
0·14–0·11	Diameter of gaseous hydrogen molecule	O. Meyer. Van der Waals.
0·07–0·02	Mean distance between centres of nearest liquid molecules	W. Thomson.
0·02	Inferior limit to diameter of gaseous molecule	W. Thomson.

In the diagram (Plate I.) an attempt has been made to show these and similar magnitudes in their interrelations by means of a drawing to scale. The scale used is an unusually large one; it is as 1:1,250,000; that is to say, the objects represented on the diagram are magnified 1,250,000 times. Take for instance the thickness of a gold leaf, which is about $\frac{1}{280000}$ of an inch, its representation on the diagram measures $4\frac{1}{2}$ ins.

But even on this very exaggerated scale a single molecule if drawn on the diagram would be so small as to be quite invisible to you. I have therefore prepared another diagram on a still larger scale (not reproduced here) which shows the number of molecules in one micro-millimetre of depth. The magnification in this case is 250 million times.

The unit of measurement used in the diagrams and throughout the lecture is the micro-millimetre, or the one-millionth part of a millimetre; this is generally written as $\mu\mu$ or as 10^{-6} mm. The advantage of this unit is that it is equally convenient for the expression of microscopic or of molecular dimensions.

PLATE I.


$\mu\mu$ Wave Lengths of
0
100
200
300
400
500
600
700
800
Mean Voilet Light
Mean Green Light
Mean Red Light
Less than 1 $\mu\mu$
12 $\mu\mu$
Black Soap Films
Radius of Molecular Attraction Minimum
Gold Leaf and Coloured Soap Films
Radius of Molecular Attraction Maximum
Annealed Films of Gold Silver and Platinum
Resolving Power of objectives at Various Apertures
1·4 N.A.
0·65 N.A.
0·3 N.A.
DIMENSIONS OF FILMS IN MICRO-MILLIMETRES

The diagram, Plate I., will be referred to from time to time during the evening, but it will be convenient to devote a few words now to a general description of its plan and arrangement.

Beginning on the left, there is a scale of micro-millimetres divided into tens and hundreds. Next to this are three bars which represent on the same scale the wave lengths of mean red, mean green, and mean violet lights respectively. The centre of the diagram is occupied by a series of seven sections all on the same scale, of leaves or films of thicknesses varying from 1 μμ up to 360 μμ.

The second diagram may be taken as supplementing this series of sections by showing on an enlarged scale a film a single micro-millimetre in thickness. Across this section are placed ten discs representing metal molecules of the dimension suggested by Lord Kelvin, namely, 0·1 μμ. The thickness of a gold leaf on this larger scale would occupy 75 feet, and it would need 900 discs to represent the number of molecules one above another contained in its thickness.

Returning now to the first diagram, it only remains to refer to the three black bars on the extreme right. These represent, still on the same scale, the resolving power of the three lenses with which the photo-micrographs which illustrate the lecture were made. The numbers placed at the lower ends of the bars are the numerical apertures of the lenses. Taking the third of the series, which is marked as having a numerical aperture of 1·4, its length is about 150 μμ. This means that if two lines were ruled on a glass plate 150 μμ apart they would be seen as two distinct lines by means of this lens. With either of the other lenses the two lines would merge into one; the lens would fail to resolve them.

The diagram shows at a glance that an object may be visible to the unaided eye even though one of its dimensions is far below the range of microscopic resolution. For example, the thickness of a gold leaf is about 90 μμ, that is to say it is 60 μμ below the resolving power of the lens of 1·4 N.A. Yet we can see the surface of the leaf with the unaided eye, and can examine it microscopically without difficulty. But if we try to see the edge of the leaf we shall fail, for instead of the real edge we shall see an ill-defined line, the apparent width of which will entirely depend on the aperture of the lens used. With the 1·4 lens the apparent width will be 150 μμ; with the 0·65 it will be 300 μμ, and with the 0·3 it will be 700 μμ.

The obvious lesson from this is, that in using the microscope in this region of micro-dimensions we must be careful to keep its limitations and their possible effects always in mind.

The propositions now to be laid before you are the following:—

(1) The operations of cutting, filing, grinding, or polishing produce on the surface of solids a thin film which is in many respects essentially different from the general body underneath it.

(2) This surface film results from a certain mobility which is conferred on a thin layer of molecules by the tool or polishing agent moving over the surface.

(3) While it is in the mobile condition the film of solid molecules behaves like a liquid, and is subject to the action of surface tension.

(4) If these propositions are established it will follow that a truly polished surface is one in which, for a certain minute depth, the substance has been liquefied and then smoothed by the action of surface tension.

(5) Heat and solvents can confer on the molecules of solids sufficient mobility to enable thin films or other minute portions of the solid to behave like a liquid.

(6) In the aggregation of solids from their molecules there is a certain size of the aggregate up to which its form is controlled by surface tension, and only after this point is passed can crystallic force come into full play.

(7) The metals are the most opaque bodies we know, but their substance is nevertheless intrinsically transparent.

(8) The "spicular" appearance frequently to be seen by the microscope on the surface of metals and other solids under obliquely-reflected light is due to a granular texture in the thin translucent film with which the surface is covered.

(9) This granular texture results wholly or in part from the action of surface tension on the surface layer of molecules while it is in the mobile condition.

These observations, and the conclusions drawn from them as to the mobility of the solid molecule within the range of the molecular attractions, and the behaviour of films of mobile molecules, not merely on the surface, but within the body of the solid, have a very direct bearing on the following subjects: The nature and the production of polished surfaces; the colour and lustre of metals; the plasticity and flow of solids; overstrain and elastic fatigue in solids; the surface action of contact substances or solid catalytes; and the separation and growth of solid aggregates in liquids and gases.

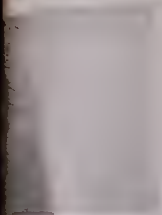
When a brush charged with ordinary oil-paint is drawn over a smooth horizontal surface, the coating of paint left on the surface shows the brush marks; that is to say, the points of the bristles of the brush draw little parallel tracks in the paint. If the paint is not too thin, and if it sets quickly enough, these tracks remain in the solidified paint as slight ridges and furrows. If the paint sets slowly the ridges and furrows disappear, leaving the surface smooth and liquid-like. If the brush were charged with melted tallow instead of with paint, the coating left on the smooth horizontal surface would set almost instantly, and the brush marks would be deeper and more sharply defined. The viscosity of the liquid layer and the length of time for which the liquid state persists are the factors which determine the nature of the surface which is produced.

In the case of the paint or the melted tallow, we see surface tension at work on a comparatively large scale. A thin layer of paint or varnish will not measure more than 25,000 μμ in thickness. Taking that portion of the layer which is under the influence of surface tension as being 50 μμ thick, we have the ratio of 1:5000 between the elastic skin and the layer which it covers. It is obvious that as the thickness of the total layer is diminished this ratio will become more and more favourable to the influence of surface tension. In the case of the surface film on solids, we are often dealing with thicknesses which are well within the range of the molecular forces.

Keeping the facts of surface tension in mind, and not forgetting the paint illustration, we will now look at some photo-micrographs of metal surfaces which have been filed, ground, and polished in various ways.

Fig. 33 is a small plate of silver which has been filed in one direction with a very fine file, which had about 50 cuts to the inch. After filing, the plate was gently rubbed, still in the direction of the file marks, on soft leather on which oxide of tin had been sprinkled. In this photograph the illumination was by oblique light. The polishing lines are seen as ridges and furrows. The ridges are not uniformly continuous, but are broken into granular or drop-like forms. Notice particularly that there are no sharp or ragged edges; the forms are all smooth and rounded. Fig. 41 is a piece of speculum metal which has been ground flat and then rubbed backwards and forwards on the finest emery paper. This photograph was made by normally reflected light with an oil immersion lens of the highest revolving power. The magnification of the original photograph is × 1,500. In this case also, the grooves and the intervening ridges are smooth and rounded. Even under this most searching resolution there is no appearance of sharp angles or faces. There is absolutely nothing to suggest that we are looking at the surface of one of the most crystalline and brittle of alloys.

Fig. 7 is a similar piece of speculum metal, which was first polished till a smooth unbroken surface was produced. On this surface a very fine scratch was drawn with a specially sharpened needle. The surface was now rubbed, as in the previous specimen, on the finest emery paper, the rubbing being at right angles to the needle scratch. The same ridges and grooves have been produced by the emery grains, but the needle scratch has provided



after rubbing.
× 215.

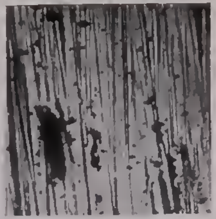


FIG. 2.—Antimony with emery furrows. Normal light. × 775.

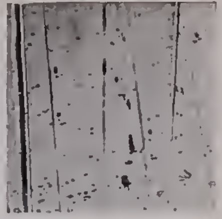
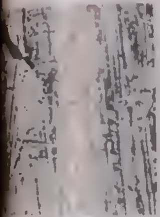


FIG. 3.—The same polished across the furrows and ridges. Normal light ×. 775.



—The same etched. Normal light × 775.

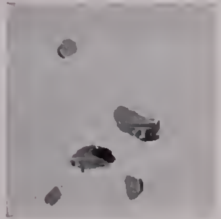


FIG. 5.—The same with pits covered by surface flow. Normal light. × 775.

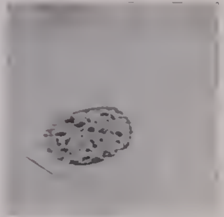


FIG. 6.—The same, large pit being covered. Normal light. × 775.

culum metal, particles removed by Normal light. × 1500

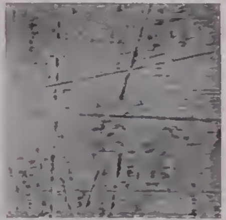


FIG. 8.—Tool steel, emery polished. Normal light. × 775.

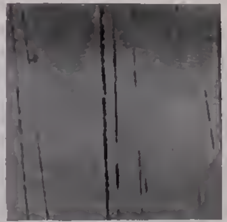


FIG. 9.—Speculum metal, polished across emery ridges and furrows. Normal light. × 775.

—The same, surface film completely Normal light. × 775.

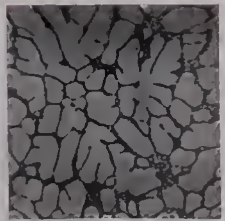


FIG. 11.—The same, surface film removed by etching. Normal light. × 775.

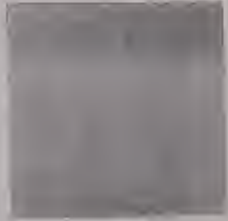


FIG. 12.—The same, surface film restored. Normal light. × 775.

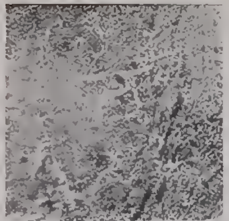


FIG. 13.—Gold leaf on glass, annealed. Transmitted light. × 440.

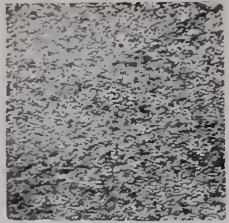


FIG. 14.—Gold paint on glass, annealed. Transmitted light. × 500.

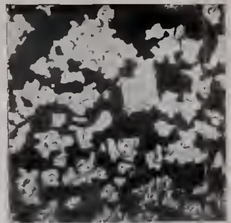


FIG. 15.—Thick gold film, annealed. Transmitted light. × 440.

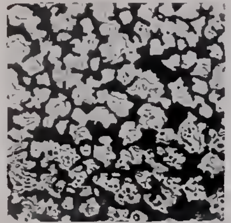


FIG. 16.—The same, but thinner. Transmitted light. × 440.

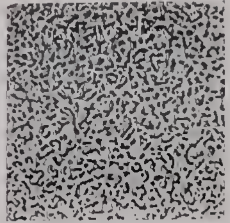


FIG. 17.—The same, still thinner Transmitted light. × 440.

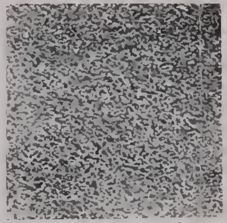


FIG. 18.—The same, very thin. Transmitted light. × 440.

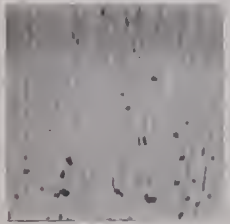


FIG. 19.—Gold plate, polished. Normal light. × 1500.

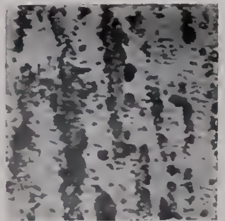


FIG. 20.—The same, after heating. Normal light. × 1500.

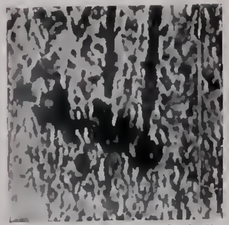


FIG. 21.—The same, after further heating. Normal light. × 1500.

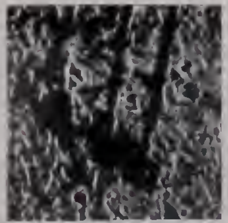


FIG. 22.—The same, still further heated. Normal light. × 1500.

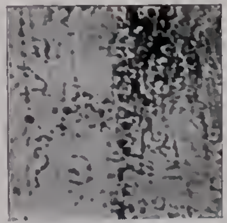


FIG. 23.—Gold plate, heated. Normal light. × 1500.

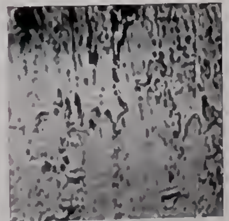


FIG. 24.—The same, further heated. Normal light. × 1500.

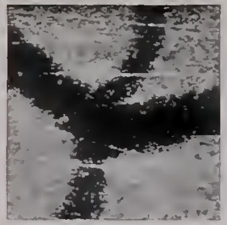


FIG. 31.—Burnisher marks on frosted silver. Oblique light. × 200.

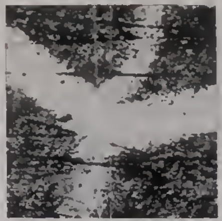


FIG. 32.—The same. Normal light. × 200.

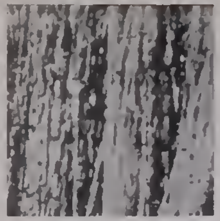


FIG. 33.—Silver, partly polished, ridges breaking into drop-like forms. Oblique light. × 580.

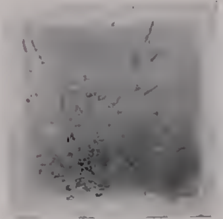


FIG. 34.—Annealed silver leaf. Transmitted light. × 1.

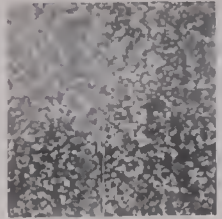


FIG. 35.—Frosted silver, showing granules or spicules. Oblique light. × 580.

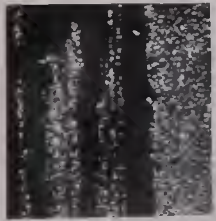


FIG. 36.—Silver film on glass, showing granules Oblique light. × 580.

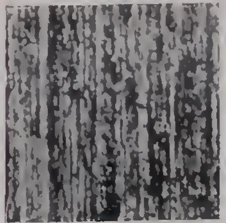


FIG. 37.—Lead, cut surface, flow lines breaking up into granules. Oblique light. × 580.

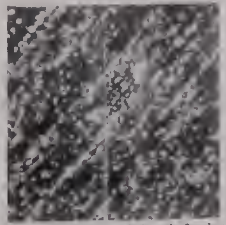


FIG. 38.—The same, lighted along the flow lines. Oblique light. × 580.

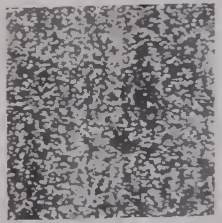


FIG. 39.—Specular appearance on etched copper. Oblique light. × 580.

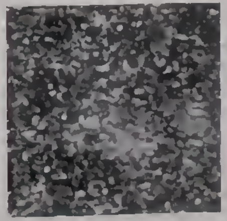


FIG. 40.—Specular appearance on very thin film of platinum on glass Oblique light. × 1000.

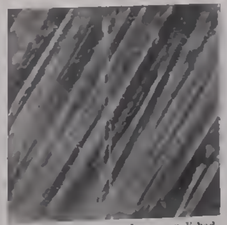


FIG. 41.—Speculum metal, emery polished. Normal light. × 1500.

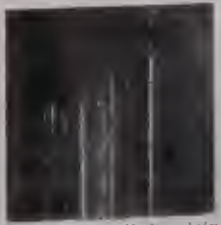


FIG. 42.—Glass, grooved by diamond edge. Oblique light. × 200.

a deep channel or receptacle, in which the metal scraped off by the emery has collected. The general appearance of hese scrapings is that of smooth granular forms, and is in entire accord with that of the ridges and grooves from which the metal particles have been removed. These photographs show the same general resemblance to a freshly painted surface on which the ridges and furrows eft by the brush are visible.

Fig. 9 is a piece of speculum metal which has been rubbed on rouged wash-leather across the ridges and grooves eft by the emery. The flow of the surface layer across he grooves is distinctly seen. In this case the flow has been caused by the much gentler agency of the rouged eather.

Fig. 10 is the same, further rubbed on the leather. The emery scratches have entirely disappeared, and the outlines of the crystalline grains of which the metal is built up are now visible as slight depressions on the general surface.

Fig. 11 is the same after a quick treatment with soluions of potassium cyanide. The treatment has completely emoved the surface film which was developed by rubbing on leather, and has fully disclosed the crystalline grains urrounded by the "mother substance" or eutectic.

Fig. 12 is the same, again polished on rouged leather. The surface film is completely restored.

Speculum metal being an alloy it might be supposed hat in its case the effects of flow to some extent depend n the presence of the eutectic in which the crystalline rains are embedded. That this is not the cause of surface ow in the crystalline metal is clearly shown when the oregoing experiments are repeated, using, instead of peculum metal, a piece broken from a large crystal of ure antimony.

The experiment was made by filing a flat surface on the ntimony with a very fine watchmaker's file. Even with his smooth file the surface of the antimony was a good eal broken into crystalline ridges and hollows by the lintering of the brittle metal. After as flat a face had een obtained as was possible with this tool, the antimony as rubbed, still in the direction of the file marks, on the nest emery paper (No. 00 French) till the file marks had isappeared, only the deeper pits and hollows remaining. ig. 2 shows the surface at this stage, from which it is seen hat the general character of the ridges and furrows left by he emery is smooth and rounded, and that the smaller pits, hich had resulted from the breaking out of crystalline hips, are in many cases losing their angularity and suming a rounded form. The specimen was next rubbed cross the line of the emery scratches on a polishing block vered with wash-leather sprinkled with the finest rouge. ig. 3 shows the surface at this stage. The polishing has read the metal across the ridges left by the emery like a scous paste, sometimes filling the furrows and sometimes idging them over. In some cases the line of the furrow u only be traced by the row of holes in the covering film. he circular form and the smooth rounded edges of the les are quite consistent with the other appearances of scous flow.

A part of the surface was now etched with a solution of tassium cyanide. Fig. 4 shows the effect of the solvent removing the layer which had been spread over the rface by the polishing. The portion of the original otograph which is reproduced here, shows on the right le the effect of the removal of the surface, and on the left portion which was protected from the action of the solvent varnish. The removal of the surface layer has again covered the furrows and ridges left by the emery, and e impression conveyed by the preceding photograph ig. 3) is confirmed, namely, that the ridges and furrows d been covered over, not levelled down or removed. It further seen that the understructure of the ridges is rough d crystalline, the appearance of the flow given by the lishing having been only skin deep.

In examining the specimen under the microscope the ention was arrested by the curious appearance presented two of the pits on the surface, which appeared as if vered over with a film of greatly diminished reflecting wer as compared with the rest of the surface. A search over other parts of the surface disclosed a number of similar pits which showed the covering film with greater distinctness. A group of these pits is shown on Fig. 5, in which the surface markings can be traced across the film over the pit.

On another part of the surface which had not been exposed to the solvent, a pit was discovered in which the film appeared to be in process of building up (Fig. 6). It is difficult to believe that the flowing metal could be carried across the pit from side to side without the help of some support from below. It seems most probable that this support has been provided by small granules or flakes scraped off at an earlier stage, which had lodged in the pit, filling it loosely up to the general surface level.

These observations on the polishing of antimony show plainly that under certain conditions this brittle crystalline metal can be spread over an irregular surface so as to form a smooth varnish-like covering by which all the asperities are smoothed and rounded into gently flowing curves. It is further seen that this surface layer or film when, as in the pits of Figs. 5 and 6, it is not in solid contact with the more massive metal underneath, has a much diminished reflecting power.

The pressure necessary to produce surface flow in antimony is very slight. The specimen was rubbed backwards and forwards on the leather-faced block by the pressure of the forefinger. The seizing of the metal surface by the rouged leather could be distinctly felt as the specimen was passed over it, and was obviously more marked with rouged than unrouged leather. On a moderately flat surface the seizing seems to take place uniformly all over the surface, and not merely at a few points at a time, so that each passage over the leather changes the whole surface slightly.

The extremely slight mechanical treatment which will suffice to cause molecular movement and flow on the surface of a highly crystalline substance is seen in a remarkable way in the behaviour of calc-spar.

A crystal of calc-spar was split so as to present a fresh smooth face which had never been touched or rubbed in any way. A small drop of very dilute hydrochloric acid (containing about 0·2 per cent. HCl) was placed on this fresh face, and, after 10 to 15 seconds, was removed by touching the spot with a torn edge of soft filter paper. The liquid tends to spread over the face in all directions, no doubt owing to the perfect freedom from dust and grease of the surface; but, as far as possible, it is desirable to confine the etching action to one spot, so that a comparison between the etched and the unetched portions may be more readily made. Slight etching resulted from the treatment; but the etched surface, though slightly undulating and irregular, showed no new structure or markings. When the experiment is repeated a number of times it is generally found that the surface, though slightly lowered where the acid has acted, is otherwise unaltered. The face of the crystal was now firmly stroked a few times in one direction with the point of the forefinger covered with clean, soft wash-leather. Under the microscope the surface was still smooth and unmarked by the stroking. A drop of the dilute acid was placed on a part of the stroked face which had not been touched by the previous application of acid. The drop flattened to a hemisphere, but did not spread. After 10 to 15 seconds it was removed as before. The pit produced was extremely shallow, but had well-defined edges, and the flat bottom was covered with furrows and ridges running in the direction of the strokes with the finger. This experiment was repeated in a variety of ways, and on all of the three parallel sets of faces. The direction of the strokes was varied, so as to make a number of different angles with the cleavages. In every case the result was the same, *even a single stroke showed unmistakably on the etched surface.*

Fig. 1 shows a part of the etched surface of this crystal. The unetched portion has the smooth, glass-like surface of the natural face, only a few very faint scratches being visible under the most searching examination. Faint cleavage lines crossing the face indicate that the stroking had not been parallel with any of the natural cleavages.

The number and depth of the flow lines is influenced by the amount of the stroking and by the pressure exerted by the finger. Flow lines were distinctly developed by a single firm stroke in which, it was roughly estimated, the pressure exerted did not exceed 4 lb. per square inch. In this case the flow lines were obviously fewer than they were when a number of strokes had been given.

Some indication of the depth to which the molecular disturbance has penetrated is given by the additional time required for the acid to dissolve and remove all traces of the disturbance. If the acid is left on the surface for a sufficiently long time—for instance, with the acid in question, for 30 to 60 seconds—no trace of the flow lines remains, and the etched surface presents the same appearance as the etched surface of an untouched face, the limits of the disturbance have been reached. The depth to which this disturbance penetrates is not much affected by continued stroking. The influence of the stroking is therefore limited to a very thin surface film, but within this limit it is quite unmistakable. If a stroked and etched surface is further stroked, its details become rounded and glazed over.

The evidence of surface flow afforded by these experiments on calc-spar is even more striking than that derived from the similar experiments on metals. Not merely the slightness of the mechanical disturbance which causes the flow, but the nature of the material in which the flow is caused, impart to this experiment a special interest and value. Calc-spar supplies us with single, well-defined crystals of great perfection. Not only can we make observations on any or all of the six faces of one of these crystals, but we can split the crystal so as to reproduce any of these faces, with the absolute certainty that the new face is fresh and untouched mechanically. Further, calc-spar is anhydrous and infusible, so that there can be no question that the fluid condition of the surface molecules is neither due to their solution in water of crystallisation nor to the reduction of the melting-point of the substance by pressure.

In the case of calc-spar we may fairly suppose that the number of molecules which are removed on the polishing leather is small compared with the number which compose the mobile surface layer. In polishing metals, there is often a considerable quantity of metal removed by the polishing agent, as for instance even the finest emery becomes quickly clogged with metal removed from the surface, while roughed leather becomes discoloured from the same cause. In the case of the emery, the tool edge, or the file, it seems probable that the flowing is caused by the seizing of the metal of the surface by the metal which is lifted by the tool or ploughing agent, and moves over the surface with it. When the final polishing stage is reached, the whole, or at any rate a large part of the surface, is "flowed" at the same instant, otherwise it would afterwards show striation or rippling. A freedom of movement has been conferred on the molecules which enables them to behave like liquid molecules. This freedom lasts only so long as the molecules are moving over each other under the action of the polishing agent. When the movement ceases, we must assume that the freedom also ceases, but not before the molecular attraction has drawn the surface into a continuous covering skin, comparable in smoothness with the surface of a liquid. In the case of the calc-spar rubbed by leather, the under surface revealed by etching, shows unmistakable signs of furrowing, but the unetched surface is perfectly smooth, with the smoothness of a liquid surface. Whether we suppose that the furrowing is caused by points on the leather, or whether it is caused by minute fragments detached from the crystal and carried along through the liquid-like surface film, in either case it is equally certain that the surface layer can only close over and mask the effects of the furrowing if it has been in a state of complete fluidity for a finite period after the externally caused movement has ceased. We may, I think, form a mental picture of the operation at the moment when the external movement ceases, and the unopposed molecular attraction assumes command, and maintains the movement till the molecules have reached the more stable equilibrium of a continuous surface skin. Where the ploughing action has extended deeper than the range of the molecular attraction, the ridges and furrows remain, only their outer surface being covered with a film left by the moving molecules. In the case of a brittle tender metal lik antimony, the liquid layer probably carries along with it such portions of the metal as have themselves escaped the flowing action, and have remained therefore as aggregates of solid molecules. Any considerable mixture of such solid aggregates will make the flowing layer more pasty and less perfectly fluid.

Two distinct facts are brought out by these observations. The first is, that by mechanical disturbance a considerable amount of freedom of movement is conferred on the solid molecules. The second is, that the molecules when in this state of freedom are under the control of the molecular attraction which determines the forms assumed by the mass of freed molecules at the moment when their freedom is about to cease through the withdrawal of the externally applied force.

It may be interesting to compare this view with some others which have hitherto been held as to the flow and interpenetration of solids.

We have already glanced at the experiments of Spring and at the conclusions which he drew from them. The phenomena with which he dealt clearly involved more than one form of molecular movement or activity. In the experiments in which a powdered salt was made to cohere into a solid mass, high pressure and high temperature acting for a considerable time were believed to be necessary. Read in the light of the observations which have been laid before you this evening, it would seem that the flow and aggregation resulted from three causes, namely, mechanical disturbance resulting from movement produced by the application of pressure; increased freedom of molecular movement due to increased temperature; and lastly, to the interpenetration resulting from the diffusion of free molecules or ions. Into Spring's three sets of experiment these causes enter in varying proportion. In the third series, in which different metals were alloyed by contact a a sufficiently high temperature, the factor of mechanically produced movement of the molecules was almost completel eliminated, the necessary molecular activity and movemen being produced by heat alone. In this case it is probabl that "flow" in the proper sense only occurred at the actua surfaces of contact, the rest of the union being brought abou by diffusion, as in Roberts-Austen's experiments with gol and lead. "Flow" I understand to be the translator movement of molecules in a body; while diffusion is th movement of individual ions or molecules in the midst of body of foreign molecules.

Flow therefore requires that a certain freedom o translatory movement shall be imparted to a number o molecules at once, either by mechanically applied force o by heat.

We will now consider those observations which bear o *the surface flow of solids under the influence of heat.*

For the study of these surface effects plates of pure gol were used. These were planished by beating on a polishe surface, and polished by rubbing them lightly on rouge leather. The difficulty of obtaining a scratchless, unto surface in a soft metal like pure gold is very great, bu fortunately for the purpose in view, a perfect surface wa not needed, indeed the presence of lines of flow wa sometimes an advantage.

Fig. 19 shows the surface of the polished plate. Thi and the three following figures are direct photograph without enlargement, by normally reflected light, with 3 mm. oil immersion apochromat of 1·4 N.A. The magni cation is × 1500. The lines of flow of the surface lay are distinctly visible.

Fig. 20 is the same plate after heating to between 70 and 800° for 10 minutes. The surface film has becom detached and broken up, evidently by the escape of a which had been imprisoned during the planishing an polishing operations. The surface has a viscous appea ance, and the holes made by the escaping gas add to th effect.

Fig. 21 is the same plate after further heating for a hour. The surface film appears to be aggregating an subsiding into the mass of metal below.

Fig. 22 is the same after further heating for an hour. I this case, as exactly the same spot has been photographe as in the preceding figure, it is possible to trace the further subsidence and disappearance of the original surface film.

Fig. 23 is another specimen of polished gold after heating for one hour. The ruffled surface again shows the effects of escaping gas.

In Fig. 24, after a further hour's heating, the final subsidence and the viscous flow of the surface are clearly seen.

In the study of massive forms of metal, microscopic examination can only be made by reflected light, either normal or oblique.

By employing thin films of metal supported on a transparent material such as glass or mica, transmitted light may be used, and we are thereby at once put in possession of a powerful aid to the study of the structure and behaviour of metal in its attenuated forms.

This subject was studied by Faraday with that wonderful care and resourcefulness which marks all of his experimental work, and the results of that study were published in the Bakerian Lecture of 1857. The lecture was entitled "The Experimental Relations of Gold and other Metals to Light," and he states that the researches described were undertaken in the hope that some insight might be obtained into the influence of extremely small solid particles on a ray of light. While this was the main object of the research, a number of new and interesting observations on the chemical and physical behaviour of the noble metals in their most attenuated forms were made and recorded. In view of the particular object of the research, Faraday did not allow himself to diverge far into the side paths which opened off the main road on which he was travelling. This is much to be regretted, from the point of view of the study of the physical behaviour of metals. A close study of the experiments, and of his reflections on them, has convinced me that had he allowed himself to wander a very little further along these side paths he would quickly have met and grasped the true explanation of the puzzling phenomena which he had encountered. Had he done so, the only loss would have been mine, for then I should have had no tale to tell you to-night.

Faraday began by dealing with gold leaf and silver leaf. He found that the average thickness of a gold leaf was $\frac{1}{250000}$ of an inch or "$\frac{1}{3}$ to $\frac{1}{8}$ part of a single wave of light." By laying the leaf on the surface of a weak solution of cyanide of potassium, he reduced its thickness to such a degree that he estimated "that 50 or even 100 might be included in a single progressive undulation of light." According to this estimate, the thickness of the reduced leaf would be $\frac{1}{10}$ to $\frac{1}{12}$ that of the original leaf, or about $\frac{1}{3000000}$ of an inch, or less than 10 $\mu\mu$. He states that the transmitted light was still green. Using the same method, I have obtained a leaf so thin that over most of its area the light transmitted was practically colourless (thrown on the screen). If Faraday's estimate of the thickness of his attenuated leaf be correct, then we may take it that this colourless leaf is not more, and is probably less than $\frac{1}{20}$ of the thickness of the ordinary leaf, or $\frac{1}{5000000}$ of an inch or 4·5 $\mu\mu$. At this degree of attenuation the metallic reflecting power is reduced to such an extent that it is only visible when the leaf is held in a very intense beam of light. For the purpose Faraday had in view, it was of the utmost importance to determine whether the transparence and colour of gold leaf were genuine and intrinsic, or whether they were due to the effect of a discontinuous and granular texture. His conclusion as to the first point was "that in spite of great irregularity in thickness caused by ribs and foldings," yet "in the best microscope and with the highest power, the leaf seemed to be continuous, the occurrence of the smallest hole making the continuity of the other parts apparent," and every part "possessing its proper green colour." Using modern lenses of the highest resolving power, together with intense and critical illumination, I have confirmed these observations to the fullest extent.

Faraday's next experiments were on the effects of heat on gold leaves spread on glass or quartz plates. At a temperature much below the softening point of glass the appearance of the metal is completely changed. The metallic lustre and reflecting power seem to disappear and white light is freely transmitted. He discusses this phenomenon from various points of view. The suggestion is made that there has been retraction of the gold into minute globular portions, leaving the glass uncovered between. But by further experiments he shows that this is not the case when a moderate temperature is employed for the annealing. The microscopic appearance still shows the same irregularities and the same continuity, though the colour is changed. In this case also, my observations, made under the more critical conditions, confirm those of Faraday. Fig. 13 is a photo-micrograph of an annealed gold leaf by transmitted light. (Annealed gold leaves, supported on glass, were exhibited which were so transparent that small writing could easily be read through the gold.)

When the gold leaf which has been altered by heat is gently pressed by the smooth rounded end of an agate pestle, the parts of the film which have been reached by the pressure are restored to the original green colour, and the metallic reflecting power of the leaf reappears.

Faraday discusses the phenomenon of the alternate appearance and disappearance of transparence and metallic reflecting power without arriving at any satisfactory conclusion. This discussion is again resumed by him after the corresponding experiments with silver leaf have been detailed. He found that silver leaf also is continuous. It is much more opaque than gold leaf, being also much thicker (nearly four times as thick) (diagram, Plate I.). When laid on plates of glass or rock crystal and heated it became very translucent and lost its metallic reflecting power, looking more like the film of chloride of silver, which is produced when a silver leaf is exposed to chlorine gas. Fig. 34 is a photograph of a piece of silver leaf which has been annealed at 350°. Before annealing, the leaf would have so completely stopped all light that its photographic image would have been simply a silhouette in black. When the silver leaf, altered by heat, is pressed by the agate burnisher, the metal becomes opaque and recovers its metallic reflecting power.

Faraday found that when a number of silver leaves were rolled together and heated in a glass tube to a temperature below the softening point of the glass, "it was changed so that the light of a candle could be seen through forty thicknesses; it had not run together, though it adhered where one part touched another. It did not look like metal unless one thought of it as divided dead metal, and it even appeared too unsubstantial and translucent for that; but when pressed together, it clung and adhered like clean silver and resumed all its metallic characters" (specimens of this "silver wort" were shown).

Faraday at this point resumes the discussion of the phenomena. I will again quote his own words:

"When the silver is much heated, there is no doubt that the leaf runs up into particles more or less separate. But the question still remains as to the first effect of heat, whether it merely causes a retraction of the particles, or really changes the optical and physical nature of the metal from the beaten or pressed state to another from which pressure can return it back again to its more splendid conditions. It seems just possible that the leaf may consist of an infinity of parts resulting from replications, foldings, and scales, all laid parallel by the beating which has produced them, and the first action of heat is to cause these to open out from each other; but that supposition leaves many of the facts either imperfectly explained or untouched. The Arts do not seem to furnish any process which can instruct us as to this condition, for all the operations of polishing, burnishing, &c., applied to gold, silver, and other metals are just as much fitted to produce the required state under one view as under the other."

In this paragraph Faraday leaves us with two alternative suggestions, the one being that the metal may exist in two forms—the transparent, dead form, and the metallic reflecting form; the other suggestion being that the changes produced by heating or by pressure are purely due to a certain mechanical subdivision into films of the metal, the beaten leaf being like a Venetian blind with its louvres closed, the effect of heating being to open the louvres so that light can pass through freely. I must confess that this last suggestion laid hold of my imagination, and for a considerable time seemed to me to supply the best explanation, not only of Faraday's observations, but also of a number of independent observations of my own. But a more extended investigation of the whole question of surface structure has convinced me that its application is very much more limited than I had at first supposed. Under proper conditions these superimposed films are certainly produced, and one of the first effects of heating is to open them up (Figs. 20 and 23). But these films are themselves translucent or transparent, and they are also undoubtedly continuous.

I now believe that the transparence which is developed by heat in thin leaves and films is an intrinsic property of the metal when it is in an unstrained condition, and that the highest degree of opacity and of metallic lustre is only found in surfaces which have been overstrained by the operation of burnishing or polishing.

For the investigation of this subject leaves of gold and silver are in many respects not the most suitable forms of film. The foldings and ribs, and the general irregularity of surface and thickness, complicate the problem unnecessarily.

By various chemical methods smooth continuous films of any thickness can be obtained. With these films the difficulties of examination are much reduced, and many troublesome features can be safely eliminated.

Films of gold, silver, and platinum have been made which ranged from 10 $\mu\mu$ to 20 $\mu\mu$ in thickness; and on annealing by heat these films have become highly transparent or translucent, while their smoothness and continuity have been greatly superior to that of gold and silver leaf. With these films before us, it is possible to feel quite sure that the transparence is an intrinsic property of the metal, and that it does not result from a merely mechanical alteration of its particles.

Faraday describes how he prepared gold films of varying thickness and of great smoothness and continuity by placing specks of phosphorus on the surface of a dilute solution of gold chloride.

Films made in this way were annealed by heating on glass. Figs. 15 to 18 show the effects of annealing on films of various degrees of thickness.

Before annealing, the thicker films (Figs. 15, 16, 17) were olive green by transmitted light and had a full yellow colour and metallic reflection by reflected light. The thickest film (Fig. 15) required a very intense light to show its green translucence. Fig. 16 had the same depth of colour as gold leaf, and Fig. 17 was thinner and paler. Fig. 18 was much thinner than any of the others, showed hardly any metallic reflection, and its colour was blue-purple by transmitted light. The thickness of these films ranged from 10 $\mu\mu$ to 150 $\mu\mu$.

After annealing, the colour of this film was rose-pink by transmitted light. The photograph shows that it was quite continuous, but with thickenings or aggregations distributed regularly over the surface. The photograph has been made somewhat dark in order that the structure may be shown more distinctly, but, as seen under the microscope, the surface was entirely free from dark or opaque patches.

In Fig. 17 the retraction into globular or rounded forms of greater opacity is very pronounced, but the continuous transparant film covering the whole surface is distinctly seen. Under the microscope this film was of a very pale pink colour, the thicker parts being of a slightly deeper shade. The opaque-looking granules of the photograph were really of a dark brown-green colour.

In Figs. 16 and 15 the thickened patches are of larger size and of greater opacity. The transparent parts seemed as if covered with an irregular film of pink jelly dotted over with little rounded heaps.

The bright gold and platinum paints made for ceramic gilding by the Gold und Silber Scheide Anstalt of Frankfurt, supply an excellent means of obtaining continuous films of almost any thickness. In these paints the metal has been brought into perfect solution in an essential oil. A plate of glass or of mica is smoothly coated with the paint, which is allowed to dry naturally. It is then heated in an air bath to about 400°, when the solvent oil and other volatile constituents are driven off and a smooth bright metallic film is found firmly adhering to the glass. At this stage the film is translucent and green by transmitted light. If the film is kept at a higher temperature for some time it becomes more transparent, and the colour by transmitted light changes to blue or purple. By long continued heating the film assumes a frosted appearance by reflected light, and the colour becomes paler by transmitted light.

These films are sometimes blistered by air bubbles, and an excellent idea of their continuity and transparence is obtained by carefully examining the spot where a bubble has been formed. So horn-like and translucent are these films that it was at first assumed that the paint contained a binding flux or frit, but, on careful inquiry I was assured by Dr. Fritz Roessler, the scientific director of the Frankfurt Works, that the films left on the glass are pure gold and platinum and free from any flux or frit. Fig. 14 is a gold film of this kind which has been annealed to the purple stage.

The thickness of a similar film was estimated by weighing the gold from a given area. Assuming that the density of the gold in this form is normal, the thickness was 166 $\mu\mu$, or about twice the thickness of a gold leaf. Under the microscope the thickness, as seen at bubbles and broken edges, seemed to be much greater than this. These films show conclusively that annealed gold is certainly translucent up to this limit of thickness (diagram, Plate I.).

In dealing with the surface flow caused by mechanical disturbance in the earlier part of this lecture, the conclusion was reached that this phenomenon is due to a certain freedom being imparted to the solid molecules, the formation of a smooth, liquid-like surface being due, as it is in liquids, to the action of surface tension. The photographs of metal surfaces already before you have shown unmistakably that the effects of heat also confers on the solid molecules a freedom which enables the superficial layer of molecules to behave like a viscous liquid.

A third agency by which this freedom may be conferred upon the surface molecules is the application of solvents or partial solvents. The solvent whose effects I will now show is mercury. When a surface of gold is exposed to mercury, the mercury at once forms a thin film of alloy. If the gold is gently heated so as to volatilise the mercury, the surface of the gold is left in a frosted condition.

The micro-structure of the surface now reveals the very interesting fact that in volatilising the mercury has not left behind it a sponge of gold as might have been expected, but that the gold is now in the form of transparent granules of a deep gold colour, which give little or no metallic reflection from their surface. The explanation appears to me to be, that at the moment of their separation from the mercury by heat, the molecules of gold are in a state of freedom which permits their mutual attraction to draw them together into granular or drop-like forms.

This phenomenon is even more plainly seen when mercury is allowed to act in the same way on metal films supported on glass. In this case, by the use of transmitted light, the micro-structure is seen to consist of granules and rounded forms.

If a film of gold on glass is exposed for an instant to mercury vapour, the minute globules which condense on the surface spread with great rapidity through the gold, forming a transparent alloy.

By gentle heating the mercury is driven off, and the gold is left in the form of a continuous film dotted thickly over with slight thickenings or mounds, which mark the points at which the alloy has been drawn up into aggregations.

When a minute globule of mercury is placed on a gold leaf laid upon glass the mercury may be watched by the microscope as it spreads between the many folds and laminations of the leaf.

The differences between the laminated texture of the leaf and the closer and more horn-like texture of compact films deposited by chemical agents is made very obvious when the behaviour of mercury on one and the other is watched by the microscope. In the leaf, thin streams of mercury may be seen shooting rapidly in all directions till the whole surface is converted into an alloy. In the compact film the mercury creeps slowly and almost inobviously from point to point. In the one case the mercury molecules move in a body from point to point, in the other they seem to diffuse through the substance of the gold. This seems to confirm Faraday's view as to the laminar structure of leaves of gold and silver.

In the foregoing sketch I have not presented the observed facts in the order in which they were made as the strictly chronological sequence is not so well adapted for presentation within the limits of a single hour. The aspect of the subject to which I shall now invite your attention was really that which first presented itself to me more than three years ago (Brit. Assoc. Rep., Glasgow, 1901, 604. Proc. Roy. Soc., **72**, 218, 226).

When a metal surface illuminated by obliquely reflected light along the line of its flow is magnified to from 100 to 200 diameters, the surface is seen to be dotted over with tiny spots of light like minute scales (Figs. 31, 35, 36, 38, 39). These spots are of various degrees of brightness, and of various shades of colour. If the metal under examination is lead, the all-pervading colour is blue, and the bright spots vary from bright white to a shade of blue barely distinguishable from the surrounding ground colour. As the surface of the metal is made flatter and smoother by polishing, the very bright spots become fewer or disappear altogether, and the fainter and more deeply coloured spots require a more intense light to reveal them. The spots which are only brought to light by intense light are altogether different in appearance from the bright spots which are visible by light of low intensity. These latter appear to be simply spots of light directly reflected from surfaces suitably inclined to the incident rays. They resemble the broken-up reflections from the ripples on a dark sheet of water. They reveal very little of the surface structure, except at those particular little patches which happen to be inclined at the proper angle. On a photo-micrograph they are generally surrounded by a blurred halo. The effect of the fainter spots is totally different. However ntense the illuminating beam may be, they retain their istinct form and colour, and the impression made on the eye is, that the forms are visible in virtue of a general ight and transparence over the whole surface. Any right reflecting spots of the first class which may be imultaneously visible with those of the second class, serve o emphasise the difference between the two appearances. The view which first occurred to me was that the faint pots constituted a certain scale-like under-structure which vas being seen through a greater or less thickness of ransparent film; the depth of colour being determined by he thickness of the covering film. The difficulty which resented itself in accepting this view was in imagining vhat could be the nature of the scale or plates which, when ubmerged in a medium of their own substance, could still ct as minute reflectors. This difficulty could only be met y supposing that the physical structure of the scales was o different that they could behave towards a ray of light n a markedly different way from the medium with which ey were surrounded. It is unnecessary to trouble you y detailing the difficulties presented by this view of the tructure, and the various suppositions by which attempts ere made to explain away or meet them.

Transparence of metal substance having been proved, nd the flow under the influence of surface tension having lso been established, the true explanation of the spicular ppearance followed not very long after.

The spicular appearance is caused by a granulation on e surface, the gathering into mounds of a transparent or anslucent material (Fig. 36). This granulation is re-arkably uniform in its superficial dimensions, but varies normously in thickness. Granules may be formed which re nearly complete spheroids (Fig. 35). The appearance f these indicates most plainly the part played by surface ension in their aggregation. They are neither more nor ss than solid drops. On metal surfaces frosted by heat by solvents the drop-like form is most obvious.

In thin films laid on glass, and also on the surface of rtially polished metal, the granules may be so thin as to absolutely invisible except by obliquely reflected light. heir radius of curvature becomes very great, so that even tically they are practically flat. This disc of cardboard a model on a scale of 1:250,000 of a thin granule; its diameter is 500 mm., and its thickness is 1 mm. You may very naturally ask on what grounds these statements as to dimensions are based. In anticipation of your question, I will explain the matter as fully as time will permit.

When the spicular structure by oblique light was first observed, one of the most striking features was the remarkable average uniformity in the units of structure. In the many metals examined the same amount of magnification was always necessary to bring this structure into view. When the test of measurement by the eye piece micrometer was applied it was found that the size of the units varied between 1000 and 2500 $\mu\mu$. The forms of these units are quite irregular, varying from simple rounds to elongated and kidney-shaped or shell-shaped figures. The outlines interlace and blend into complex combinations, which, however, always retain the same general characteristics as to form and size. As is well known to microscopists, the measurement of the magnified image depends to some extent on the N.A. of the lens employed. The cause of this is evident when it is remembered that all visible images are made up of minute bright discs, just as in a half-tone block the picture is built up of minute black dots. If the individual dots are small the grain of the block is said to be fine, and the resulting picture may be full of fine detail. If the dots are large, even the naked eye resolves the picture into its constituent dots, and no really minute detail can be reproduced. Any detail smaller than one of the dots will either appear as a single full-sized dot or it will not appear at all. This applies in exactly the same way to microscopic images; the resolving power, or the power of showing minute details, is measured by the size of the minute discs or antipoints of which the image is built up. The size of these discs is mainly determined by the numerical aperture of the lens. The great modern advance in practical microscopy has been coincident with the commercial production of lenses of high numerical aperture.

Making due allowance for the foregoing facts, it is found that measurement of the micro-images of granules or spicules by lenses of widely different N.A. are in very close agreement. This fact is of importance, as it practically proves the objective reality of the spicular structure. But it is needful to keep in mind that in all microscopic vision we are seeing diffraction images of the thing, not the thing itself as we should see it by simple vision.

From what has gone before, we may safely conclude that the micrometre measurements of the granular and spicular structure may be taken as giving a fair approximation to the dimensions of the structural units.

Turning now to the measurement of the thickness of granules and spicules, we may take it that the maximum is represented by the drop or globule whose thickness is nearly the same as its other dimensions. If granules or spicules were only visible in the surface of metals in their massive and opaque forms, the measurement of their thickness would be extremely difficult. Fortunately this spicular structure can be developed and seen in films of all degrees of transparence. As the thickness of films can be estimated very closely, and in some instances actually measured, we are at once in possession of data for the measurement of the maximum thickness which is possible for the granules composing any particular film. Let us start, therefore, with a gold leaf of the standard thickness of 90×10^{-6} mm. ($= 90\ \mu\mu$). We know certainly that the granules with which it is covered cannot be *thicker* than this. From the undoubtedly laminated structure of the gold leaf it is improbable that the granules which are seen on its surface really occupy the whole thickness of the leaf; each lamina may be made up of separate granules.

By floating the leaf on a dilute solution of cyanide of potassium, it may be thinned to almost any desired degree. If the estimate that the thickness of a gold leaf thinned by this method is 1/20 of its original thickness is correct, then the 90 $\mu\mu$ of the original leaf has been reduced to 4·5 $\mu\mu$. Now, on the thinned leaf which was shown on the screen, the spicular structure, as seen by obliquely reflected light, is very distinct and well-marked; therefore, we have in this specimen granules or spicules which are not thicker than 4·5 $\mu\mu$, while their superficial area remains the same as it is in granules 20 times as thick. Taking the average diameter of the spicule as 2000 $\mu\mu$, and the thickness as 4·5 $\mu\mu$, the ratio of diameter to thickness is as 400 : 1. But we are not by any means at the lower limits of thickness, for, even by the cyanide method, thinner films can be obtained, not perhaps in large, continuous sheets, but still in pieces of quite respectable size. The thinnest gold films made in this way are almost invisible while they are floating on water; it is only when they are dried that they can be seen distinctly. Under intense illumination these films were entirely without metallic reflection, but appeared of a faint rosy pink under the oblique light. The average thickness of gold films of this description is probably not more than 1 $\mu\mu$.

By chemically depositing silver on glass it is possible to obtain films of such thinness that they are invisible to the unaided eye. Only under an intense oblique beam is the spicular structure disclosed. Even in a film of this thinness the changes of colour and opacity produced by annealing and by burnishing can be distinctly seen by the microscope. Various observers have measured the thickness of metal films of minimum thickness, and figures ranging from 3$\mu\mu$ down to 0·2$\mu\mu$ have been obtained. I feel confident that I have seen a well-defined spicular structure in films not thicker than 1$\mu\mu$; at this thickness there are probably only 10 molecules in line across the section. The spicule at all degrees of attenuation retains approximately the same superficial area, so that the ratio of mean diameter to mean thickness, in the case of a 1$\mu\mu$ film, is as 1800 : 1. When it was discovered that the "granules" seen in gold films were of this extreme thinness, the name "granule" seemed quite inappropriate when applied to a figure whose thickness was only $\frac{1}{1800}$ of its diameter, and the name "spicule" was then given to these small units, and has been used ever since.

Now as to the cause of this particular structure in thin films and on the surface of solids, it is necessary to speak with caution.

The appearance in every solid substance of a structure whose units are of so nearly the same size superficially, and the persistence of this appearance as the film is reduced to an almost molecular thinness, is sufficiently remarkable.

It is not unnatural to argue that those molecular attractions which manifest themselves in liquids by the formation of drops and thin films may be held accountable for the similar appearances which occur in solids, seeing that it has been proved that the surface layer of molecules in solids can behave in many respects exactly like a liquid film. If this were so, we might regard the granule and the spicule as marking arrest points in the development of a globular or drop-like form from a uniform layer of mobile molecules.

The tendency of a thin stream of water to break up into drops under the influence of surface tension is well known. The picture on the screen is taken from an instantaneous photograph of a stream of water breaking up in this way.

In some of the photo-micrographs shown, notably in Fig. 33, it was pointed out that the ridges formed in the surface layer have a tendency to break up, as a liquid might do, into drops or granules. This is particularly well seen in the case of freshly-cut lead (Fig. 37). In this photo-micrograph the oblique pencil of light is striking across the line of the ridges. When the object is turned round through a right angle, so that the light strikes along the line of the ridges, the reflection is mainly from these granules, and the continuous lines of the ridges and furrows are no longer seen (Fig. 38).

The breaking up of ridges into granules takes place even when the film in which they occur is of extreme thinness. This can be shown on the screen by painting a piece of glass with a liquid in which a staining material has been dissolved. If the thickness of the film is properly adjusted, flow lines are produced, and these are seen breaking up into minute flattened drops. The continuity of the film all over the glass is proved by the fact that some of the minute drops grow by swallowing the others till in time a comparatively few large drops have taken the place of many small ones. This could only take place if the visible drops were in connection with each other by means of a continuous film. This is just what takes place when a thin film of gold or silver supported on glass is heated; thickening at points and granulation result, but a thin continuous film remains over the whole surface of the glass (Figs. 15, 16, 17).

In its scale, the illustration of granulation now thrown on the screen is only a little smaller than the paint-brush illustration with which we began; the phenomena observed can, therefore, only be regarded as roughly analogous to the microscopic phenomena of metal films. But it is possible to produce the true microscopic "spicular" appearance in a film of liquid of extreme thinness. A glass slip is touched by an oily brush, so that only the slightest smear is left on the surface; this is very gently wiped till it has almost disappeared, only the faintest dimness being visible when the glass is held under an intense light. If the surface is now examined under the microscope by obliquely-reflected light of sufficient intensity, ridges and "spicular" forms, the exact counterpart of those seen in solid surfaces, are distinctly visible.

The arguments and illustrations on which my preliminary propositions are based have now been presented to you in outline. It only remains to refer very briefly to the bearing of these propositions on certain matters of general interest.

The production of highly-polished surfaces for reflecting purposes is an art of great antiquity, but it became of scientific importance only after the invention of the reflecting telescope. The production of large lenses and specula for astronomical telescopes engaged the attention of the most distinguished astronomers; for these, therefore, the art of polishing assumed considerable importance. Lord Rayleigh, in his Royal Institution lecture on "Polish," gives some most interesting particulars as to his own experiments on the conditions which determine the successful grinding and polishing of glass. Lord Rayleigh seems on the whole to incline to the view that polishing and grinding are discontinuous; that is to say, that polishing as a process is distinct from grinding. This view he holds in opposition to Herschel, who strongly expressed the other view, namely, "that polishing was nothing more than grinding down large asperities into smaller ones by the use of hard gritty powders." Lord Rayleigh suggests that "so much discontinuity with the grinding action has to be admitted in any case, that one is inevitably led to the conclusion that in all probability the operation is a molecular one, and that no coherent fragments containing a large number of molecules are broken out."

If the propositions laid before you this evening have been established, then Lord Rayleigh's conclusion that "the operation is a molecular one," is confirmed and extended, for it is now shown that the removal of molecules from the surface during polishing is not the essential part of the operation, which in its essence involves the formation of a mobile layer of molecules *on* the surface.

So far as my observations have gone, I have found no exception to this; all the substances examined have shown the same signs of surface flow. Glass, agate, calc-spar, graphite, metals of all kinds, salts of all kinds, gelatin, and cellulose all appear to flow in the same way (Fig. 42).

Some of the observations recounted in this paper seem to bring us a little nearer to an understanding of *the colour and lustre of metals*. These phenomena are already recognised as the result of some combination of the absorption and reflection of light. We now know that the reflecting surface is itself transparent and coloured, so that even the most perfectly polished metal surface does not reflect the whole of the light it receives, a portion of it being lost by absorption in the transparent film. The depth of the colour results from the relative proportions in which the light striking the surface is reflected and absorbed, and this in turn is determined by the thickness of the transparent film and the angle at which the rays pass through.

The majority of metals are white or bluish-white, their transparent film being blue. Copper is pink, and its transparent film is red. Nickel is warm greenish-white, and its transparent film is bottle-green. In these metals the colour may be fully accounted for by assuming that a portion of the white light they reflect is tinted by its passage through the coloured film. The thicker this film is, the more strongly is the light tinted.

The warm pinkish-white of bismuth cannot result directly from the colour of its transparent film, which is of a deep indigo-blue colour. Whether the warm tint is caused by a film of oxide or whether the metal is truly dichroic has not yet been ascertained.

Gold, with its yellow-red reflection and green transparence, may fairly be held to be dichroic. Its ruby colour seems to be in some way associated with the reflection of light by thin films, and does not necessarily indicate the existence of two transparent forms, a green and a red. The thin films prepared by partially dissolving gold-leaf in cyanide solution exhibit an appearance of pink translucence only when a certain amount of light is reflected from their surface. By transmitted light the films are colourless according to their thickness.

Some of the effects of *metallic lustre* may be due to the presence of coloured films on the polished surface. Every change in the incidence of the light falling on the surface alters the depth of film through which the light has to pass, and produces variety and play in the coloured reflections.

There is no expression in use which properly describes the peculiar lustre of a perfectly scratchless, perfectly polished metal surface. Polishers themselves speak of a "black polish," but this may equally well refer to a scratchless polish on any surface.

Prof. Flinders Petrie has spoken of it as a "wet lustre," and the expression strikes me as a happy addition to the nomenclature of metallurgy.

I am hopeful that the discovery of the formation of thin films or layers of mobile molecules on and between the surfaces of solids will help to clear up some of the mystery which surrounds such subjects as *plasticity* and *flow in solids* and *the causes and effects of overstrain and elastic fatigue*.

Of more direct interest to the chemist is the possibility that light may be thrown by this line of study on the action of *contact substances*, or *solids catalytes*, and on *the separation and growth of solid aggregates in liquids and gases*.

With reference to the first of these questions some interesting observations were made a few months ago on the part played by extremely thin metal films in accelerating chemical action. In these experiments, films only a small fraction of the thickness of a gold leaf were found to be as efficient in promoting chemical combination as much thicker films had been. So far as I can see there is no advantage in using a film more than a few molecules in thickness. If this belief can be confirmed by more exhaustive experiments, it should be possible to find means by which valuable materials like gold or platinum may be presented in films of minimum thickness and of almost unlimited area. A cubic inch of platinum spread in a film five molecules in thickness would cover an area of over seven acres.

As the time at my disposal, and I fear also your patience, is more than exhausted, these matters of speculation, however fascinating, must be left for future development.

Newcastle Section.

Meeting held on Thursday, October 8th, 1903.

DR. J. T. DUNN IN THE CHAIR.

The Chairman, in presenting the Saville Shaw Medal to Dr. William Campbell, said that it was fitting that a memorial to the late local secretary, should take the form of a medal to be awarded to a student of the Durham College of Science for work done in inorganic chemistry or metallurgy, for those were the departments of the College with which Saville Shaw was for so long associated; and that no fitter recipient than Dr. Campbell could be imagined, inasmuch as he had received his earliest instruction in metallography from Saville Shaw, and might justly be described as his most distinguished pupil.

Prof. Louis said that as one of the two responsible for recommending that the medal be awarded to Dr. Campbell, he was guided by the recollection that Saville Shaw's own work was in that branch of knowledge known as metallography, and that a study of the physical structure of alloys gave valuable clues as to their importance in the arts, and to the failure in some of their applications. In this direction a small band of men was doing most valuable work, not the least of whom was one of the Section's most distinguished members—Mr. Stead.

CHAIRMAN'S ADDRESS.

THE LIFE AND WORK OF JOHN GLOVER, INVENTOR OF THE GLOVER TOWER.

BY DR. J. T. DUNN.

The idea having been mooted that a series of short biographical accounts of men who had made their mark on the history and progress of chemical industry, especially of those who have been connected with this Society, would be interesting and perhaps useful, I have endeavoured to get together materials which should enable me to give you a connected, if brief, account of the life and work of one who certainly has influenced fundamentally at least one important branch of chemical industry, who was connected with our own district, was a member of this Section, and was the first medallist of our Society—the late John Glover.

In my earlier years, and especially when I was Secretary of the Newcastle Chemical Society and of this Section, I saw something of Mr. Glover, and knew enough of him to admire many points in his character; but I never knew him intimately, and my acquaintance with him was only towards the end of his active career; nor should I have been able to give anything but a very meagre account of him, had I not been helped by many of those, his relatives and friends, who knew him much better than I, and who have responded most kindly to my request for information regarding him. May I, at the outset, offer to them my thanks: to Mr. Wm. Glover and Mr. Henry Glover, his sons, and his daughter, Mrs. C. S. Swan; to Sir Lowthian Bell, Dr. J. W. Swan, Mr. John Pattinson, Dr. Lunge, the Rev. J. C. Street, and Mr. James Hall of Dilston, all of whom have given me either facts in regard to Mr. Glover's life or lights on his character. And I have naturally, for information as to his work, turned largely to that storehouse of fact and reference, Dr. Lunge's "Sulphuric Acid and Alkali." With all this, I fear my account is still somewhat thin and incomplete.

John Glover was born in Newcastle in 1817. Little seems to be known of his early days, but he was apprenticed to a plumber, and in due course became a workman in the craft. Even during his apprenticeship, his taste for reading seems to have asserted itself, for "when serving his time as a plumber," says Mr. Wm. Glover, "he always carried a book. His master had the contract for keeping in repair the 'pants' which supplied the town with water. If ever he had to wait owing to any cause when repairing a pant, he used to sit in the pant and read. His employer also had a connection amongst the county houses—Ravensworth Castle, Blagdon, &c.—and when they wanted repairs they always asked for Glover to be sent, young as he was, as his work was done conscientiously. Many a time, I have heard him say, he was tramping over the Town Moor at two in the morning, coming home from Blagdon or some other country house. There was no eight hours' movement in those days."

As a plumber, then, he obtained employment in the Felling Chemical Works of Mr. Hugh Lee Pattinson, where the leaden chambers used in the manufacture of sulphuric acid required a staff for their repairs. His active mind, however, was not content with the mere carrying out of the mechanical part of his work; he wanted to understand the working of the whole process, applied himself to the study of chemistry, and was very anxious to get a post in the works laboratory. Thither he was removed, though to a humble post, and he worked there for some time.

His inventive and inquiring faculties were then at work. Alum was then made at Felling, and the iron was removed from the sulphate of alumina as Prussian blue, by precipitation with potassium ferrocyanide. This precipitation used to be carried out in the hot solution, and Glover found that a great saving (half) of prussiate was effected by doing it cold. He showed this to Mr. Hugh Lee Pattinson, who said, "John, thou hast made a mark."

Some time about 1842, Mr. Hugh Lee Pattinson erected a small chemical works at Washington; the work carried on there was the manufacture of magnesium carbonate, which was made by treating the magnesium limestone of the district, previously slightly ignited, with carbon dioxide at a high pressure, when the magnesium carbonate dissolved preferentially, leaving the calcium carbonate behind: the clear solution of magnesium bicarbonate was decanted, and the magnesium carbonate precipitated from it by heating by a rapid current of steam.

The carbon dioxide needed was obtained by treating limestone with hydrochloric acid, to obtain which salt was decomposed by sulphuric acid; and thus the sulphuric acid process was installed at Washington, with its lead chambers, and the staff for their repair. But it cannot have been only as a plumber that John Glover was transferred from the Felling to Washington, for before he left the Felling he had been engaged for Mr. H. L. Pattinson in experiments which led to that gentleman's patented process for producing oxychloride of lead, a substance later known as "Pattinson's White," and used as a paint. I have seen a little note-book of Glover's, containing analyses made at the Felling of various specimens of "arsenio-phosphate of lead"; and farther on in the book there are accounts of experiments on the behaviour of lead chloride, and of mixtures of lead chloride and carbonate, with lime-water. These experiments were obviously undertaken for Mr. H. L. Pattinson during the working out of his oxychloride process, and Glover's skill and suggestiveness in carrying out these experiments were no doubt the chief cause operative in his removal to Washington, where the process was to be worked.

The management of the Washington works was becoming too much for Mr. Hugh Lee Pattinson to undertake in addition to his duties at the Felling, for besides the magnesia process, with its associated manufactures of sulphuric acid, hydrochloric acid, and salt-cake, a difficulty in disposing of the last-named substance had led to the establishment of a soda plant to convert it into carbonate. Accordingly, Mr. Isaac Lowthian Bell was asked by Mr. Pattinson to undertake the superintendence of the works, an invitation which he accepted in the year 1845 or 1846. "I found Mr. Glover," says Sir Lowthian Bell, "living with his family close to the works, and there I spent a night or two each week."

Mr. Bell's first work was the erection of plant for the oxychloride of lead manufacture, just mentioned, and in this he had the assistance of Glover.

The chemistry of this process is extremely simple; it consists simply in dissolving galena in hydrochloric acid, thus producing lead chloride, which is then decomposed by the addition of exactly sufficient lime to convert half of the chloride into oxide, the result being, not the precipitation of half the lead as oxide or hydroxide, while the rest remains as chloride, but the conversion of the whole into insoluble oxychloride, Pb_2OCl_2.

Simple in outline as the process is, however, those of you who heard or read Mr. Newall's address in 1896, would learn that some of the chemical details, and still more some of the mechanical arrangements, caused very great difficulties. The necessity for using the lime in the form of clear lime-water; the necessity for adding this to the solution of lead chloride in exactly the right proportion; and the difficulty of ensuring immediate and complete admixture of the enormous bulks applied which had to be dealt with, are all points which emphasise the difference between a laboratory experiment and a manufacturing process; while the difficulty of getting rid of the iron which was present in the ore and which would have been fatal in the product, reminds us that Nature's laboratory furnishes us with materials that are usually far from pure. You will remember that this last difficulty was very ingeniously surmounted by Glover, by the use of lead peroxide.

Not only difficulty, but danger, attended the working out and carrying on of this process. The sulphuretted hydrogen evolved by the reaction of the hydrochloric acid on the galena was the source of this. "On one occasion," says Sir Lowthian Bell, "an alarm was given that a man was overpowered by the gas. Glover went with me at once, and we attempted to drag the man to the open air. Glover was at once thrown to the ground by the gas, and I was left alone with the victim, who was killed, and I had to drag Glover away by myself. This I fortunately succeeded in doing: otherwise the Carville works would never have been started."

The world, perhaps, would have been but little affected had the Carville works never existed, as far as the output of the works themselves is concerned; but how profoundly might the course of progress in the sulphuric acid manufacture have been altered had the Glover tower never emerged from its inventor's brain.

In spite of difficulties and dangers, however, the oxychloride process was worked out to a successful issue, and for several years Pattinson's White was manufactured at Washington. The process was given up in 1874 for reasons sketched by Mr. Newall in his address; but "It is curious," says Mr. Wm. Glover, "that so long as Sir Lowthian Bell and my father were at Washington they carried on this manufacture successfully, and when first my father left, and then Sir Lowthian Bell left, the process was soon abandoned."

The problem which was ultimately solved by the Glover tower seems to have presented itself to Glover soon after he went to Washington. "In 1847-8," he said in 1896, "the idea occurred to me that there would be a great saving of expense and material if I could succeed in breaking up the affinity between the sulphurous and nitrous compounds in Gay-Lussac acid without going through the operations of cooling and reheating which were then performed. The first experiment was simply to heat the compound, and the result was to confer on the sulphuric acid a greater power of holding the nitre, not a particle of which was then evolved. Then the idea of a deoxidising atmosphere occurred to me, and that idea was growing in my mind for fully ten years, during which time I was devoting the whole of my time to the erection of a vitriol work for the late Mr. Hugh Lee Pattinson, and the working out of that gentleman's patented process. Then I returned to my own experiments, and, by using a deoxidising atmosphere, succeeded in dissociating the sulphurous and nitrous compounds of the Gay-Lussac acid."

We are all familiar with the theory of the sulphuric acid manufacture as explained in the text-books. We remember very well the neat equations, which show how nitric acid is deoxidised by the sulphur dioxide and steam present in the chambers, forming sulphuric acid and nitrogen dioxide; how the oxygen present converts the latter substance into tetroxide, which is then immediately reduced again, while forming more sulphuric acid, to dioxide; and how the cycle of reactions might, in theory, go on indefinitely, so that any small quantity of nitric acid once introduced would serve the sulphuric acid maker for all time. So far was this from being the case in practice, however, so rapidly were the nitrous gases carried forward in the travel of the reacting gases through the chambers, and so rapidly expelled at the far end, that every 100 lb. of sulphur burnt in the form of pyrites required from 10 to 15 lb. of nitre to be used, if they were to be completely converted into sulphuric acid.

Many plans were devised to lessen the qantity of nitre necessary, or to recover and use again the nitrous gases leaving the chambers; but the only one of any permanent value was that of Gay-Lussac, who, in 1827, proposed to pass the gases from the chambers upward, through a tower acked with coke, down which trickled strong sulphuric cid. The sulphuric acid dissolved the nitrogen oxides om the gases which it met, and left the bottom of the wer as "nitrous vitriol"—vitriol, that is to say, containing ssolved a quantity of the compound which we now know s nitrosulphuric acid, $SO_2.{}^{NO_2}_{HO}$ (acid of sp. gr. 1·72, con-ining over 1 per cent. of N_2O_3).

Gay-Lussac's invention was not put into practice till 5 years after he proposed it; and, though its efficiency as absorbent of the nitrous gases was at once demonstrated, t even "40 years after its invention the majority of lphuric acid makers did not possess either Gay Lussac's any other apparatus for retaining the nitrous fumes."

The reason for this seemingly extraordinary circum-ance is not far to seek. The nitrous vitriol, flowing from e Gay-Lussac tower, is not in itself a useful product. e want the sulphuric acid it contains, and we want the rous compounds. But we want them separate—the acid its various technical uses, the nitrous compounds for eir work in the chambers. Now, the only means then own of separating them, was, either in troughs placed ide the chambers, or in what were called "steam-lumns" outside, to dilute the Gay-Lussac acid with ter, and to heat it by blowing in steam. When suffi-ntly hot, and sufficiently dilute, the nitrous vitriol gave the whole of its nitrogen oxides, which could be used in chambers again. But while nitre was thus saved, it s saved at a cost. Not to mention the minor point of rapid corrosion by the nitrous vitriol of some of the ms of apparatus in which its denitration was effected, we e only to consider that the chamber acid had to be in first place concentrated for use in the Gay-Lussac tower. t steam had to be generated to heat and dilute it, and t the dilute denitrated acid had to be again concentrated ore it could be applied to most of the purposes for which as wanted, in order to see that it is quite possible that cost of these operations might exceed that of the nitre ich was saved by them.

ohn Glover's "deoxidising atmosphere" did away with necessity for this dilution. Instead of decomposing the ro-sulphuric acid by water—

$$2SO_2{}^{OH}_{NO_2} + H_2O = 2H_2SO_4 + N_2O_3$$

a eaction which only occurs in presence of a large ess of water (or in the dilute acid)—he decomposed it by hur dioxide and water—

$$2SO_2{}^{OH}_{NO_2} + SO_2 + 2H_2O = 3H_2SO_4 + 2NO$$

a eaction which occurs with no more water than that r esented in the equation: no more than that already tained in the nitrous vitriol, which, though concentrated, i y no means H_2SO_4 (acid of sp. gr. 1·72 contains 78·92 p cent. of H_2SO_4).

e allowed the nitrous vitriol to trickle down a tower p ked with flints, in which it was exposed during its p sage to the upward current of hot burner-gas, which he c sed to pass through the tower on its way from the b ners to the chambers. The nitrous compounds were a ost completely removed from the acid, while the acid fl ing from the foot of the tower, far from being diluted, w more highly concentrated than the Gay-Lussac acid it f. (Contains 0·2 per cent. of N_2O_3, and has sp. gr. of 1 5, = 82·44 per cent. of H_2SO_4.)

was in 1859, at Washington, that John Glover built hi first tower. It was built of fire-brick set in molten su ur, and packed with fire-clay tiles. It did not last ve long, but long enough to show the practicability of the id . The Glover tower denitrated the Gay-Lussac acid pr tically completely, and the circulation of acid from Gay-L ac to Glover and Glover to Gay-Lussac was conti ous. Soon, however, it was found that the heat of the bu er-gases was sufficient to effect considerable concentrati of the chamber acid, while the denitration of the Gay-L sac acid was still more completely effected, in the upper po ons of the tower, by dilution of the Gay-Lussac acid wi the chamber acid; and in his later towers, besides im oving the mechanical construction, Glover introduced th modification, which still holds almost universally, of mixing the Gay-Lussac acid with chamber acid at the top of the tower. The denitration under these circumstances is complete, and the chamber acid is concentrated from 1·53 to 1·72 sp. gr. In this way the whole of the chamber acid produced is concentrated, and the old concentration pans are entirely done away with. "The introduction of the Glover tower alone," said Dr. Hurter, in 1896, "diminished the nitre consumption from 14 to 10 per cent. on the sulphur burnt. This is about one-third of the saving finally accomplished. But the one immediate and great advantage was the possibility of concentrating the chamber acid in this tower, so that the costly lead pans could be dispensed with."

Investigations into the reactions occurring in the Glover tower have shown that its influence on the process by no means ends with the obvious and purposed results of denitration and concentration. The concentration itself, indeed, is to a large extent only apparent, and occurs less from the removal of water than from the actual formation of sulphuric acid in the tower. Scheurer-Kestner's investigations showed that in a particular set of chambers about 16 per cent. of the total yield of acid was made in the Glover tower—a figure raised to 18—19 per cent. when that (2—2½ per cent.) formed in the tower, but carried on into the chambers, is considered. And, in fact, a work which made 6 tons of oil of vitriol per 24 hours before, made 7·8 tons per 24 hours after the introduction of the Glover tower. Lunge has calculated that the denitrating zone of the Glover tower makes 224 times as much acid as an equal cube of chamber space.

Again, the tower, in concentrating, furnishes steam to the chambers, and thus lessens the amount needed to be raised for the purpose; while it also cools the burner gases, which, entering the tower at a temperature of 300° C., leave it at 50°—60° C., the temperature (or near the temperature) most favourable for the reaction. "Thus the Glover tower," said Dr. Hurter, on the occasion quoted above, "has given hints as to further improvements in the manufacture of sulphuric acid, the development of which is being rapidly pushed forward." And, indeed, an enumeration of the various proposals which have been made within recent years for the improvement of the chamber process will show how the principles on which they are based are illustrated by one or other of the actions going on in the Glover tower.

It may, perhaps, be interesting at this point to mention a few of these proposals, and consider in what way they endeavour to achieve their object. Sorel suggested diminishing the size of the first chamber by one half, and passing the gases from that through a number of cooling tubes, and then through two or three small columns against a stream of strong acid (1·70). Gilchrist in the United States suggested "pipe columns." The gases from the Glover tower pass through a column which is traversed by a number of horizontal leaden pipes, through which a current of air is drawn; the gases are thus continually mixed, baffled by impact on the solid surfaces, and cooled, while, by having the outer surfaces of the lead tubes corrugated, there is continual exposure to the condensed acid which collects in the upper corrugations and drips over the surface of the pipes. Gilchrist claims to have reduced the necessary chamber-space to 11—13 cb. ft. per lb. of sulphur burnt for 24 hours, with a nitre consumption of 3 to 4 per cent. on the sulphur burnt. Meyer has introduced his "tangential chambers," circular chambers, into the upper portion of which the gases enter tangentially, and through which they pass in a spiral path gradually lessening in diameter, till they leave the bottom of the chamber by a central pipe, to be taken to the top of the next chamber. Meyer, too, let into the top of his chambers leaden tubes, closed at the lower end, through which a circulation of water is kept up; thus he keeps down the temperature, and utilises the heat of the reaction in heating the water, while the mixing and "baffling" action of the tubes is similar to that in Sorel's tubes or Gilchrist's pipe-columns. Hartmann has sought to effect this latter object too, by introducing into the ordinary chambers vertical leaden air-shafts, joined by burning to the roof of the chamber, and acid sealed at the bottom. The continual ascending current of air through these shafts carries away the surplus heat, and the baffling action is the same as in the other devices. Niedenführ has suggested the use, between the chambers, of the Lunge-Rohrmann plate-towers. All his chambers, but especially the second and third, are made much smaller than usual (about 1,000 cb. m. in a set equivalent to an ordinary set of 3,000 cb. m.), the work of the remainder of the space being done by the two intercalated towers. He also uses a small plate-tower as the first of two Gay-Lussacs, the second being an ordinary coke-packed tower

The possibility of completely absorbing a large excess of nitrous gases by using a sufficiency of Gay-Lussac accommodation, and of completely recovering the gases by denitration in the Glover tower, has led to the system of so-called "forced working" (which has been chiefly attempted in France), in which the whole process is hastened by having always present a much higher proportion of nitrous gases than is usual in ordinary work. The reaction thus occurring more rapidly, it is possible to pass through a given chamber space in a given time a much greater volume of the reacting gases; and in order to obtain the draught necessary to effect this (and also to acquire more perfect control over the regulation of the process), mechanical aids to or substitutes for the chimney draught have been introduced.

The history of the use of the fan has been traced by Mühlhaeuser, Plath, and others; fans for the purpose are made of hard lead, and now of stoneware, and are introduced either after the Glover tower or before the Gay Lussac, the latter being now the more generally approved. Benker and Hartmann have lately pointed out that in this forced working with the use of the fan, it is more than ever important to carry away the heat of reaction, so as to prevent the temperature from rising too high; and they have strongly advocated, in conjunction with the use of the fan, the substitution of steam in the chambers by water in the form of fine spray. The evaporation of this water in the chamber itself brings down the temperature to that most favourable to the reaction, and the outside production of steam is of course at the same time saved. Benker and Hartmann give some quite extraordinary figures, showing the increased production arising from the use of fan and spray. In one case a work using 7,800 kilos. of pyrites per day had its consumption increased to 13,800 kilos., or a reduction of chamber space from 18·9 to 10·7 cb. ft. per lb. of sulphur burnt, in another the daily production of acid rose from 16,000 kilos. to 24,000 kilos., corresponding to a reduction in chamber space from 23 to 15·3 cb. ft. per lb. of sulphur; while in a third the production of acid rose from 10 to 17 tons daily, the chamber space per lb. of sulphur decreasing from 24·6 to 14·5 cb. ft. It is, however, not quite clear whether, with this great saving of chamber space and economy of fuel, the nitre consumption is also low.

The principles on which most of these proposals are based have been already brought together and discussed by Lunge in his "Sulphuric Acid and Alkali"; and the modern developments of physical chemistry have shown that these principles are all in accord with one or other of the now well-known laws governing the progress of chemical reactions.

Some of the more recent of these proposals have been made as the direct consequence of the study of these laws —in particular the law of "mass action," and the influence of temperature in determining equilibrium between two opposing directions in a reversible action—and it is, I think, matter for congratulation that attempts at the improvement of industrial chemical processes should be based upon such scientific foundations; their success is likely to be more sure, and progress in improvement more steady, than when endeavour was made from a narrower outlook. These laws of chemical action were unknown when John Glover devised his tower: but his attempts to achieve his object were no haphazard process of trial and error, but were based upon his knowledge of the science of his day; and if it is to his credit that he did achieve, by the application of the science that he knew, the objects he had directly in view, of recovering the nitrous gases and concentrating the chamber acid, it is also a happy circumstance that he should at the same time have achieved, by the operation of the laws of science that he did not know, other ends that he had not in view, in the enormously increased yield of acid in the tower itself.

In 1861 John Glover left Washington, and went to Wallsend, where, in conjunction with Mr. F. Clark and Mr. J. Mawson, he founded the Carville Chemical Works. It was here that he really worked out the idea of his tower; and after some failures due to using too thin lead for the saucer, he soon arrived at practically the form which is in use at the present day.

He took no patent for his invention, nor did he try to keep it secret On the contrary, he freely furnished information in regard to it to all who asked. Dr. Lunge tells me that in 1865 or 1866, as a young chemist who had come to Tyneside to see some of its chemical industry, he was introduced by Dr. J. W. Swan to Glover, who showed him over the works. "A few years later," says Lunge, "in my then position as manager of a small alkali works at South Shields, I called again upon Mr. Glover for the purpose of seeing the tower which will bring his name down to posterity. He received me with the greatest kindness, and provided me, although manager of a competing firm, most frankly and unselfishly with all and every information needed. He did so to every visitor who applied to him."

Before very long the Glover tower, in spite of opposition and adverse criticism (a full account of which will be found in Lunge's "Sulphuric Acid and Alkali," Vol. I), had met with very widespread acceptance, and about 1870 1, Glover and his sons were kept busy designing towers to suit various installations. The fees charged for these plans represent the only pecuniary benefit Glover ever derived from his invention.

The Carville Chemical Works went on for over 20 years. Evil days came upon the chemical trade of the Tyne (into the causes of this it is no part of my business to enter here), and many of the works had to close their doors. Among these, in 1882, were the Carville Works; and John Glover's active connection with chemical industry ceased.

The rest of his life was spent in retirement, as far as manufacturing work was concerned, and he found vent for his energies in various branches of philanthropic work. He was an active member of the Committees of the Village Homes for Girls at Whitley, and the Discharged Prisoners' Aid Society, and was also one of the original members of Committee of the "Wellesley" Training Ship in the Tyne. In this he took for years a very great interest, and devised for the ship a most efficient system of ventilation, by which he secured an equable temperature at all seasons of the year.

In his later years Glover gradually withdrew from his public work, and to a great extent from intercourse with his fellows. This was due largely to his increasing deafness, a malady peculiarly trying to one of his genial and social instincts. Great as this deprivation must have been to him, however, he bore it with great fortitude and even contentment, and lived, quietly happy among his books, and in full possession and active use of his intellectual faculties, till the end of April 1902, when he passed away at the ripe age of 85. He was full of years, and he was the recipient of at least one public honour, an honour which he appreciated very highly, and the recollection of which must often have helped to brighten the cloud that settled over his later years: he was the first Medallist of this Society. In 1896 the Society's medal for conspicuous service to applied science was presented to him at the Annual Meeting in London, and eloquent testimony was borne, both by the President, Mr. Thos. Tyrer, and by Dr. Hurter in a paper written for the occasion, to the value and benefit of Glover's invention. In replying, and thanking the Society for the honour they had done him, he ended with a sentence of characteristic modesty — "I derive great pleasure also from the thought that my name should be coupled with that of one so eminent in the science of chemistry as Gay-Lussac."

John Glover was an active member of the Newcastle Chemical Society, a very regular attender at its meetings and a contributor of original and always kindly crit t its discussions. He was President of the Society for the essions 1870—1872. His address in October 1870 con- isted chiefly of suggestions for investigations, and ranged ver a wide variety of topics: sanitation and the germ heory of disease, the physics and chemistry of coal mining, osses in the Leblanc process, and analytical differences in he determination of sulphur in pyrites and of manganese eroxide in manganese ores. At the end he said: "Some f you may have imagined that most of my recommenda- ions have a mere money value for their end, and have not een made in the interests of pure science. If this is so, t is not, I assure you, because I undervalue the pursuit of cience for its own sake; for I believe that such of you as evote yourselves to purely scientific investigations, from he promptings of a pure and devoted love, may not, as our reward, gain material wealth, but you will have ormed, what is of infinitely greater value, a noble character nd a capacity for enjoyment which wealth cannot give."

In March 1871 he read a paper on the Adulteration of ortland Cement with Slag, and in his address in October f the same year he dealt with a topic which was always a avourite with him, urging the younger members to bring efore the Society all their observations and difficulties, nd pointing out that their elders, from their experience, ere best qualified to give effective criticism, and from eir recollection of their own youth most likely to make at criticism kindly and helpful rather than discouraging. n this respect what he said was most certainly and in igh degree true of himself.

Glover was also for many years a member of the ommittee of the Literary and Philosophical Society of ewcastle, and on his retirement from active work on the ommittee the society created him an honorary member— n honour which I believe I am the only one to share ith him. He was a man of great energy and strong will. pright, honourable, of strict integrity, and devoted to ty himself, he exacted those virtues from those with hom he had to do; but though he might be exacting he as always just. His ideal of life was the formation of haracter, and the attainment of this end he always held up efore his children. "Effort," he wrote to one of them, is always nobler than success; but we should be thoroughly onvinced of the fact that graces of character far exceed equirements (or graces) of the intellect in importance to e possessor." At Washington he endeavoured, with e aid of his friend Joseph Cowen, who came over d addressed the men, to make all the workmen teetotal. this he was largely successful, and had not only con- derable satisfaction from the moral point of view, but also ereby considerably diminished his "labour troubles," and proved the regularity of his processes and the quality of s products.

There was, however, no sternness or moroseness about lover. He was genial and kindly, fond of social inter- ourse, enjoyed his pipe, which he considered conducive thinking, and, I am told, could sing Newcastle songs ery well.

He had, naturally, many of the limitations of the self- ade man. If he accomplished so much, through his ility and inventive genius, we may well ask what he might ve done had he had the advantage of thorough scientific aining and many-sided knowledge. But he by no means nfined his intellectual activities to his professional work. e was a wide reader, conversant with much of the best of r English literature, and given to thought and specula- on on problems of the highest nature. These sides of lover's character have been so well described to me by e Rev. J. C. Street, now of Shrewsbury, but formerly ewcastle, a member of whose congregation and an timate friend of whom Glover formerly was, that I ake no apology for quoting, in conclusion, extracts in r. Street's own words:—"At this time he was in the ess of his active life, but he had always leisure for high ings, and rejoiced to fit in every part of his work with erything that was uplifting. He was a moral and iritual optimist, ardently believing in a supreme unity roughout nature, and in the ultimate good of all the man race. Amid all work and vicissitude he ever re the white flower of a blameless life, and kept his integrity clean and unspotted. He dignified his work, and made business a ladder by which he climbed to spiritual and moral goodness. When, in his lovely home in Jesmond Dene, he wandered with a friend among his trees and dells, it was a delight to listen to his high discourse, and to see the glow of his fine face as he linked together his knowledge about the beauties of nature and his aspirations after God. He was a transparently clean-souled man. He loved and sought after truth with unflagging zeal and courage, and knew not what it was to have even a momentary fear of whatever truth might reveal."

Mr. John Pattinson, in proposing a vote of thanks to the Chairman, referred to his own long friendship with Glover. He endorsed what had been said of his personal character; the example of his life could not but have a happy influence on the lives of the younger members of the Society.

Prof. Bedson, having known Glover for some 20 years, congratulated Dr. Dunn and the Society on his portrayal of the characteristic features of Glover's life. Whenever one met him one found that he took a great interest in both pure and applied science, and the advantage of this was seen in the manner in which he combined both to perfect the tower which had made him famous.

Nottingham Section.

Meeting held on Friday, October 23rd, 1903.

MR. J. T. WOOD IN THE CHAIR.

THE RELATIVE TANNING VALUES OF THE DIFFERENT SPECIES AND GROWTHS OF MYROBALANS.

BY DR. J. GORDON PARKER AND F. AUSTYN BLOCKEY.

Contribution from the London Leather Industries Laboratories, Herold's Institute, Bermondsey.

Myrobalans is the trade name given to the dried fruit of various species of Indian *Terminalia*. The chief source is the *Terminalia chebula*, a tree 40 to 50 feet high, which is valuable also for its timber. The nuts, or fruit, are about the size of a pigeon's egg, some varieties being round in shape and smooth, others more elongated and wrinkled. There are five chief varieties, called after the district from which they are obtained, the price and quality of which vary considerably, whilst opinions as to their actual value in the tanning trade in this country are often diametrically opposed, some tanners holding that Jubblepore myrobalans, or J's, as they are technically called, are worth more than Bhimlies or B's, while others are equally strong in their opinion that B's are better than J's. Some tanners always purchase the higher-priced varieties, demanding that the nuts shall be of a light green colour, and cut with a waxy cut, others prefer the darker, browner varieties, which are more powdery when cut; and more than one case has come before the authors' notice in which a tanner has rejected a delivery as being darker in colour than the sample, and, on arbitration, got an allowance, in one case of over 1*l.* a ton. Afterwards, the sample on which this tanner bought and the delivery on which he obtained 1*l.* allowance were analysed, and it was found that the myrobalans delivered were 3 per cent. stronger in tannin than the original sample, which, according to the opinion of three arbitrators, who were all practical men, was worth 1*l.* a ton more than the delivered bulk. It was, therefore, clear that a difference of opinion existed in the trade as to the real value of the different varieties apart from their market price. An attempt to ascertain the reason for this divergence of opinion was not very successful, as myrobalans are bought by one tanner for a purpose totally different from that for which his neighbour buys a different variety, some tanners using them simply for their strength and their apparent cheapness when compared with the price of oak bark or valonia, others using them on account of their brightening colour, others because of the light-coloured bloom they deposit on and in the leather, whilst again many tanners value myrobalans on account of their power to produce liquors rich in natural acids to be used in the early stages for plumping their young goods.

The authors, therefore, undertook this investigation with the object of ascertaining, if possible, the exact qualities possessed by the different varieties. It was necessary not only to ascertain which was the strongest in tannin, but whether the tannin in each variety was of equal value, strength for strength, which variety gave the most bloom, which produced the most acid, and, lastly, and by no means the least important, to ascertain the difference in colour imparted to the leather.

In order to carry out this work, Messrs. Fisher, King, and Co., of London, were good enough to obtain for us 11 different samples, all of average quality, and representing the different varieties and the different qualities or brands of these varieties, and, at the same time, were able to satisfy us of the authenticity of the samples.

The first part of the work was comparatively simple, *viz.*, the analysis of the varieties, in order to ascertain which variety or classification contained the most tannic acid as shown by the standard method of analysis for tanning materials, and from the subjoined table (Table I.) it will be noticed that B No. 1 appears to contain more tannin than any other variety, followed by J No. 1, then by R No. 1, and then by B No. 2. It is strange that the picked varieties, which are evidently picked by hand, and fetch a higher price in the market than No. 1 variety, in each case come out considerably lower in tanning strength than the No. 1's. We have ascertained that as the nuts ripen on the trees certain of these are picked off before the sun has had time to darken them in colour, and then afterwards, as the fruit ripens, the trees are shaken or the boughs knocked, and the fruit falls to the ground. It is then collected, and after reaching the warehouse, is picked over by hand in No. 1, No. 2, and sometimes No. 3 varieties, the colour being the essential point. It would appear that the colour of the fruit is in no sense an indication of the tanning strength, nor does it appear to be a true indication of the colour as shown by the tintometer measurements, and by the piece of leather here exhibited, tanned with the various varieties, as in each case the samples picked by hand, picked specially for their appearance, are not only weaker in tannin, but give darker solutions, the leather also being of a darker colour than that tanned with the fruit which has been allowed to ripen further, and afterwards knocked down to the ground.

TABLE I.

Analyses and Tintometer Readings recalculated to 12 per Cent. of Water.

—	Tannin.	Non-Tannins.	Insoluble.	Water.	Tintometer Colour Measurements of Solution containing 0·5 per Cent. of Tannin measured in 1-cm. Cell.		
					Red.	Yellow.	Black.
Picked Bhimley.	33·0	13·1	41·7	12·0	0·8	2·5	..
Bhimley 1	38·4	16·1	33·5	12·0	0·3	1·8	..
Bhimley 2	35·2	14·2	38·6	12·0	1·0	5·1	..
Picked Rajpore.	32·2	13·0	42·8	12·0	1·1	3·0	..
Rajpore 1.......	35·4	12·1	40·5	12·0	0·9	4·0	0·1
Rajpore 2.......	27·6	12·7	47·7	12·0	2·5	7·4	..
Picked Jubblepore	28·9	12·7	46·4	12·0	0·8	2·2	..
Jubblepore 1....	36·5	14·4	37·1	12·0	0·8	3·4	..
Jubblepore 2....	27·3	14·1	46·6	12·0	1·3	5·9	..
Vingorlas 1	31·5	9·5	47·0	12·0	1·2	3·0	..
Fair Coast Madras	34·8	15·4	37·8	12·0	1·2	3·9	..

One of us some years ago inspected a large number of myrobalans which had been sent over by the Indian Government to the Imperial Institute, and although the work has never been published, and we believe is not yet complete, as far as we could then ascertain, the valuable work done by the Imperial Institute showed that the longer the fruit was left on the tree, and the riper it got, the greater was the percentage of tannin present, and although the external colour of the nut was darkened in this ripening process, it had little or no effect upon the colour of the liquor got from the myrobalans or upon the leather tanned with this liquor.

To ascertain as far as possible by laboratory methods whether the tannin in each variety was of equal value, or, in more technical language, whether each variety possessed the same leather-forming value, the following experiments were undertaken. By means of a small copper leaching apparatus, a quantity of strong liquor was made from each variety of myrobalans. This liquor was made of such a strength as to contain more than 5 per cent. of tannin, and after analysing by the hide-powder filter method, such a quantity was measured out into a flask as when diluted with water to 500 c.c. would give 500 c.c. of a 5 per cent. solution of tannin. To the strong liquor thus measured out, a measured quantity of water was then added to make 350 c.c. of solution. To represent the hide, 10 grms. of pure air-dry hide-powder was weighed out into a bottle of about 3 litres capacity, and 150 c.c. of water added, and the hide-powder water turned in a churning apparatus for an hour, in order to thoroughly soften the hide-powder; 50 c.c. of the 350 c.c. of myrobalan liquor was now added at intervals of half an hour until all the solution had been employed, when, as will be seen, with the 150 c.c. of water used for washing, 500 c.c. of 5 per cent. tannin solution had been employed.

On completion of the tannage the whole contents of tanned hide-powder and liquor were removed to a filter funnel plugged with cotton wool, the hide-powder adhering to the sides of the bottle being carefully rinsed on to the funnel by means of the filtered liquor, no water being used at this stage. When all the hide powder was removed from the bottle it was allowed to drain about 24 hours, being occasionally pressed down to squeeze out liquor which it retained. The whole contents of hide-powder were now placed in a weighed basin, and the total weight of wet-tanned hide-powder noted. After thoroughly mixing, a portion was weighed out to estimate contained water, and a further portion of the wet powder was weighed out, placed in a filter funnel plugged with cotton wool, and washed with a litre of cold-distilled water, in order to remove soluble matter not actually combined with the hide-fibres. After being allowed to drain in the funnel for 24 hours, with occasional pressing as before, the total weight of tanned hide was again noted, and a portion weighed out for estimation of water. It was now easy to calculate from these data the actual weight of hide-powder produced under the conditions given, and the loss in washing. In the following table are given the results showing the gain in weight obtained in the tannage, starting from 10 grms. of air-dry hide-powder, which was equivalent to 8·5 grms. of dry powder, and all the calculations are made on actual dry matter.

TABLE II.

Weight-giving Properties of Myrobalans, calculated to 100 Parts of Raw Dry Hide.

—	Percentage Yield of Unwashed Leather.	Units of Weight Lost on Washing.	Percentage Yield of Washed Leather.
Picked Bhimley	154	29	125
Bhimley 1	159	35	124
Bhimley 2	161	35	126
Picked Rajpore.....	137	17	120
Rajpore 1	145	24	121
Rajpore 2...........	146	19	127
Picked Jubblepore..	166	33	133
Jubblepore 1	187	32	155
Jubblepore 2	187	30	157
Vingorlas 1	144	31	113
Fair Coast Madras ..	151	37	114

It will be noticed from the table that the different classes of each variety correspond fairly closely in their weight-giving properties, Jubblepores being considerably more valuable in this respect than any of the others, while the Bhimley and Rajpore varieties show little difference in the weight of leather produced after washing. It is also worthy of note that the No. 2 variety yields in every case the greatest weights, while the No. 1 quality seems usually to be better than the picked, which, as above stated, are the least ripe.

In carrying out these weight-giving determinations, it was necessary, as we have already pointed out, to make a quantity of liquor of such a strength that not more than 350 c.c. should be required to dilute to 500 c.c. of a solution containing 5 per cent of tannin. In order to judge approximately when such a strength of liquor had been obtained, we used the barkometer, a hydrometer used extensively in the leather industry for measuring the gravity, and at the same time giving a comparative idea of tannin strength. It was already well known that the readings of the barkometer were extremely liable to be misleading when used for liquors of different age and character, the presence of arge quantities of non-tanning matters present in old iquors increasing the gravity, and consequently the barkometer strength, while the tannin may be very low. With liquors, however, of similar age and character the readings of the barkometer usually correspond approximately with tanning strength; *e.g.*, a layer liquor of 500° Bk. containing 5 per cent. of tanning matter, when diluted with water to 2·5 per cent. of tanning matter, will show about 25 Bk.

We have found, however, that the barkometer was very nisleading as a guide to tanning strength with fresh nyrobalan liquors, and Table III. gives the gravity in legrees barkometer of strong myrobalan liquors and their nalyses, and it will be seen that liquors of one barkometer eading show in some cases more, and in some cases less, annin than liquors of higher barkometer reading.

TABLE III.

Sample.	Barkometer Strength of Liquor.	Percentage of Tanning Matter contained.
	Degrees.	
icked Bhimley	50	7·3
himley 1	49	7·1
himley 2	60	9·0
icked Rajpore	50	7·5
ajpore 1	47	7·3
ajpore 2	55	8·6
icked Jubblepore	55	6·7
ubblepore 2	70	8·1
ingorlas 1	55	8·7
air Coast Madras	62	8·7

Bloom.—As has already been pointed out, one of the chief ttractions of myrobalans to the sole leather tanner is their loom-yielding capacity, and it was, therefore, a matter of ome importance to try and estimate the amount of bloom eposited under tannery conditions by the 11 samples nder examination. For this purpose 50 grms. of each f the finely-ground samples was placed in the beaker of Procter tanning extractor, and very slowly extracted, radually raising the temperature to about 60° C. until a tre a strong myrab liquor was obtained. This was then each case poured into a large beaker and allowed to tand for seven days in the laboratory. By this time ery large deposits had occurred in the liquors made from the ubblepore and Vingorla samples, while only comparatively nall deposits had occurred in the liquors made from the himley, Rajpore, and Madras myrobalans.

In each case the contents of the beakers were now ltered, the deposit being collected on filter-paper and the iquor passing through. This clear liquor was now placed similar beakers and allowed to stand for a further eriod. The deposit on the filter-paper was carefully ashed with tepid water until 250 c.c. of filtrate had been btained. This washing in tepid water removed some oluble matter, but the matter which remained was probably rgely or entirely bloom (ellagic acid). In each case it as now placed in weighed basins, and dried until all the ater had been driven off. The weight of dry residue thus obtained shows the amount of bloom obtained under these conditions from the 11 samples of myrobalans.

In reference to the clear liquors, these were placed on one side for a further period of 17 days, by which time a further quantity of bloom had deposited. This was filtered and treated as before, the amount of bloom deposited on standing a further 17 days being thus obtained. The results are given in Table IV., in three columns. For practical tanning purposes, the figures correspond to bloom deposited from a liquor made by extracting 100 lb. of myrobalans in 200 galls. of water, the first column showing pounds of bloom deposited by allowing such a liquor to stand seven days; the second column showing a further deposit after the same liquor had stood an additional 17 days; and the third column the total bloom deposit in 24 days from a liquor made from 100 lb. of myrobalans, and treated in the manner indicated.

The results show that under these comparative conditions Jubblepore and Vingorla myrabolans are distinctly superior to all the others from the amount of bloom they yield. A matter of some importance also is, that with the three Jubblepore samples and the Vingorla a large part of the bloom is deposited during the first period, while in nearly all the other cases the greater part of the bloom is deposited during the second period. It may, therefore, be said that the samples of Jubblepore and Vingorla myrobalans examined deposit their bloom very quickly.

TABLE IV.

Percentage Yield of Bloom obtained from Strong Myrobalan Liquor after Standing.

—	7 Days.	17 Days.	Total. 24 Days.
	Per Cent.	Per Cent.	Per Cent.
Picked Bhimley	0·98	1·16	2·14
Bhimley 1	1·44	1·35	2·79
Bhimley 2	1·72	2·62	4·34
Picked Rajpore	1·55	3·60	5·15
Rajpore 1	0·90	3·54	4·44
Rajpore 2	0·98	3·04	4·02
Picked Jubblepore	3·28	3·43	6·71
Jubblepore 1	6·91	2·95	9·86
Jubblepore 2	4·76	3·63	8·39
Vingorlas 1	5·15	1·68	6·83
Fair Coast Madras	1·44	3·37	4·81

Acidity.—When hides for sole leather come from the rounding table full of lime and are suspended in weak liquors, complicated reactions take place between the acid and tanin of the liquors and the lime in the hides, and a great deal of the success of sole leather tanning depends on the correct adjustment of these, and if there is just sufficient acid to neutralise the lime carried in by the hides, they will tan and colour evenly, and the fibres be swollen in proper condition for receiving the weight-giving properties of the duster and layer liquors.

In modern sole-leather tanneries, however, where large proportions of extract are used, and the leather is not kept in the pits more than, in many cases, four months at the outside, it is obvious that natural fermentation of the non-tannin bodies of the tanning materials must take place to a much more limited extent than formerly, when less extract was used, and the leather kept in the liquors much longer. From this it follows that the amount of natural acid present in modern tan-yard liquors is in many cases less than was formerly present, and various means are resorted to in order to increase the amount of acid in the liquors or decrease the amount of lime retained by the hides. In the latter case the use of boracic and lactic acid for surface deliming has increased enormously of late, while in the former case it is very common to add acids, such as lactic, to the early suspender liquors as a means of artificially increasing their acidity.

One of the best materials for the purpose, however, and one which is perfectly safe in its action, is myrobalans. One of the most common methods in the sole-leather tannery is to add a certain quantity of ground myrobalans to the handler liquors. These liquors are almost invariably passed down the tannery as suspenders, and where myrobalans have been added, sufficient acid is in many cases developed naturally to prevent the need for artificial acidification. Some tanners have also taken advantage of the acid-developing power of myrobalans by suspending hides from the rounding table in pure myrobalans liquor before passing to the ordinary suspenders.

In view of these facts, it became of interest to see how far the samples under investigation differed in their acid-developing power.

In order to estimate this under comparative, and as far as possible under tannery, conditions, 50 grms. of each of the finely-ground samples were placed in beakers with 500 c.c. of distilled water, and allowed to stand, covered up to prevent evaporation, for five days, stirring up at frequent intervals. 50 c.c. of each of the liquors were now measured off, filtered until perfectly clear, and the acidity estimated in a small portion of it by titration with saturated lime-water, the point when an additional drop of lime-water caused a permanent turbidity, due to the acids being neutralised, and the formation of insoluble "calcium tannate" (Procter's method), being considered the end of the reaction. To the remaining myrobalan powder and liquor (450 c.c.) an additional 50 c.c of water was added to make up for that removed for the acidity determination, and the whole was allowed to stand for a further five days, stirring frequently as before. 50 c.c. was again removed, and the acidity determined as before, and the remaining 450 c.c. put back for further testing after another six days, this time no addition of water being made to make up for the liquor removed. Similar estimations were also made when the liquors had been allowed to stand altogether 23 and 30 days.

The results of these determinations are given in Table V., calculated as percentage of acetic acid developed, allowance being made for the liquor removed when the determinations were made.

From an examination of the table it will be seen that, taking the three varieties of each sample together, the Bhimley variety develops most acidity. If we exclude Jubblepore II. for the reason afterwards stated, the Jubblepore myrobalans develop least acidity. On reference to the previous table it will be seen that this variety develops most bloom, and it is therefore of interest to note that the sample giving the greatest yield of bloom also gives the least acid.

This fact is of some little practical importance. We have already pointed out that myrobalans have two principal uses in the sole-leather tannery, (1) as dusting material in the dusters and layers, and (2) to increase the acidity of the suspenders; and as a result of our experiments, Bhimley myrobalans are distinctly superior for the latter purpose, while Jubblepores are much the best where bloom is wanted.

As there was considerable difference in the amount of acidity developed from the different samples examined, we thought it might be of interest to determine the relative quantities of sugar contained in the different samples.

	Sugar. Per Cent.
Picked Bhimley	3·3
Bhimley 1	3·5
Bhimley 2	3·1
Picked Rajpore	3·2
Rajpore 1	3·0
Rajpore 2	2·9
Picked Jubblepore	3·5
Jubblepore 1	3·7
Jubblepore 2	3·9
Vingorlas 1	3·4
Fair Coast Madras	3·4

Messrs. Fisher, King, and Co. have been good enough to supply us with a list of maximum and minimum prices for the past season. These prices may of course alter with the season which is now commencing, as the price is regulated by the demand for a certain variety, and also by the harvest, one district giving possibly a good harvest this season which gave a poor one last.

—	Price per Cwt.			Average Price per Cwt.	Price per Unit of Tan per Ton.
	s. d.		s. d.	s. d.	s. d.
Picked Bhimley	7 1½		..	..	4 3¾
Bhimley 1	6 4½	to	6 10½	6 7½	3 5·3
Bhimley 2	3 7½	to	4 3	3 11	2 2·6
Picked Rajpore	5 0	to	5 1½	5 1	3 1·9
Rajpore 1	4 4½	to	4 10½	4 7½	2 7·2
Rajpore 2	3 7½	to	3 9	3 8	2 7·8
Picked Jubblepore	5 4½	to	6 1½	5 9	3 11·7
Jubblepore 1	4 10½	to	6 0	5 5	2 11·6
Jubblepore 2	3 10½	to	4 3	4 1	2 11·8
Vingorlas 1	4 4½	to	4 10½	4 7½	2 11
Fair Coast Madras	3 9	to	4	4 0	2 3·5

Summarising the results of the work, we have shown that, apart from price, Bhimley myrobalans come first for their acid-developing power, while Jubblepores and Vingorlas yield the most bloom. Bhimleys also produce the best-coloured leather, and, taken as a class, show the highest percentage of tanning matter. In order to compare the result of tannin determination with the average price for each variety, we have calculated the cost of 1 per cent. of tannin per ton or of one unit of tan per ton, and in the above table it can be seen that the most expensive variety costs 4*s.* 3¾*d.* per cent. per ton, the cheapest working out at 2*s.* 2·6*d.*

The authors trust that these results will be useful to the trade; they have not ventured to theorise or draw conclusions from the results, as they are aware that so much depends upon the method of use and the blend of the tanning liquors, but as the experiments were all carried out under identical conditions, the results are in each case comparable one with another.

We desire to acknowledge our indebtedness to Mr. W. H. Gates for checking and duplicating many of the experiments.

TABLE V.

Acidity, in Terms of Acetic Acid.

Pounds of acetic developed from 100 lb. of myrobalans after standing.

—	5 Days.	10 Days.	16 Days.	23 Days.	30 Days.
	Lb.	Lb.	Lb.	Lb.	Lb.
Picked Bhimley	2·4	3·7	4·1	4·8	5·4
Bhimley 1	3·2	5·1	5·8	6·3	6·4
Bhimley 2	3·2	5·1	5·6	5·6	6·5
Picked Rajpore	2·1	3·9	4·5	4·9	5·4
Rajpore 1	3·1	4·3	4·7	5·3	6·2
Rajpore 2	2·6	3·6	3·9	4·0	4·5
Picked Jubblepore	2·0	2·7	3·2	3·2	3·4
Jubblepore 1	1·9	3·4	3·8	4·1	4·5
Jubblepore 2*	3·3	4·2	4·6	4·9	6·3
Vingorlas 1	2·9	3·7	4·4	4·7	5·4
Fair Coast Madras	2·6	3·4	4·0	4·2	4·8

* It is probable that the acidity developed by Jubblepore 2 is abnormally high in comparison with the other samples, as this determination had to be made when the weather was much warmer, and it is extremely probable this would produce more acid.

THE RELATIVE TANNING VALUES OF GREEK AND SMYRNA VALONIA, AND THE COMPARATIVE VALUES OF CUP AND BEARD OF EACH.

BY DR. J. GORDON PARKER AND MR. FRANK LEECH.

Contribution from the London Leather Industries Laboratories, Herold's Institute, Bermondsey.

The object of this research was to ascertain, if possible, the relative value to the tanner of Greek and Smyrna valonia.

Valonia is the trade name given to the acorn cup of the Turkish oak (*Quercus aegilops*). It grows chiefly in Turkey in Asia Minor, and is shipped from the port of Smyrna, hence the term Smyrna valonia. A poorer quality of the same grows in the islands of the Grecian Archipelago, and is known as Greek valonia. It must, of course, be understood that the quality differs very considerably, accordng to the district from which it is obtained. It is possible o buy valonia which is grown in one specified district, and o pay as high as 16*l.* or 17*l.* a ton, and it is equally possible o buy a lower grade quality at the low price of 10*l.* a ton. According to the Board of Trade returns, about 300,000*l.* worth of valonia are imported into this country yearly. It s well known that the best varieties of Smyrna valonia eldom, if ever, come to this country; all the finer cups are sent to Trieste, where they are largely used by the Austrian and Russian tanners, England taking the second and third qualities.

It was, of course, impossible for us to work on the 2 or 14 different varieties that exist, as the tanners in this country do not as a rule know the district in which their valonia is grown, but buy chiefly on the appearance of the ample. The authors therefore relied upon two of the argest dealers in this material to supply them with a large ample of what they term "average" quality. The actual naterial we worked upon was made up of the dock samples f some [illegible] different shipments of each class which had urrived in Liverpool during the past three years; so that ve claim that our sample is a representative sample of both Smyrna and Greek valonia which has been used by the English tanners during that period. The relative average rice per ton of these two samples was, in the case of the Smyrna valonia, 11*l.* 10*s.*; and, in the case of the Greek alonia, 9*l.* 10*s.*

An analysis of each was made, taking two-thirds cup and ne-third beard to represent the bulk; the cup was sepaated from the beard and analysed, and a separate analysis made of the beard. The following table gives the analyses, ogether with the colour of the liquors measured by tintoneter, the colour being calculated on a solution containing per cent. of tannin in a centimetre cell. In order to get he exact shade of colour, the authors also tanned out a iece of calf skin in each of the solutions, and the resulting eather shows a very distinct difference not only between he two valonias, but also between the cup and beard of ach, the cup in each case giving a light yellow tannage. he beard in the case of Smyrna valonia giving a greyish annage almost similar to sumach, while the Greek beard ives a dark fawn colour, the cup and beard naturally triking the average of the two.

TABLE I.

Analyses and Tintometer Readings recalculated to 12 per cent. Water.

—	Tannin.	Non-Tannins.	In-soluble.	Water.	Red.	Yellow.
nyrna valonia	32·43	12·50	43·07	12·00	1·6	5·6
„ cup...	30·99	12·79	44·12	12·10	1·7	4·6
„ beard.	43·61	14·45	29·93	12·01	1·2	4·1
reek valonia.	32·07	12·96	42·97	12·00	1·5	5·0
„ cup	27·37	12·92	47·71	12·00	2·0	6·7
„ beard ..	41·03	13·96	33·01	12·00	1·3	4·4

Weight-giving Properties.—To find the relative weightiving or leather-producing qualities of the samples, the athors adopted the same method as was originally devised y one of us, *viz.*, by tanning out 10 grms. of prepared and arified hide-powder in a solution containing exactly 5 per ent. of tanning matters; after tanning, the total weight of e dried leather is taken, a portion of the same is washed free it from uncombined tannin, dried and weighed. his gives the total amount of chemically combined tannin, d also the amount which is mechanically adhering to the de-powder. In Table II. the results are given in per nt.

Looking at the middle column, which is the most structive, we note that in each case the beard possesses tannin which is capable of giving the greatest weight hide substance, there being a difference between the ard and the cup of Smyrna valonia of over 20 per cent. d in the case of Greek valonia of 5 per cent.

TABLE II.

Weight-giving Properties of Valonia, calculated to 100 parts of Raw Dry Hide.

—	Percentage yield of Unwashed Leather.	Percentage yield of Washed Leather.	Units of Weight lost by Washing.
	Per Cent.	Per Cent.	
Smyrna valonia	201·50	179·77	21·73
„ cup	239·41	164·71	74·70
„ beard	222·29	188·85	33·44
Greek valonia	227·59	166·41	61·16
„ cup	219·54	169·35	50·19
„ beard..........	208·04	173·44	34·60

It is interesting to note, in passing, the different densities of the 5 per cent. solutions:—

	Bk.
Smyrna valonia	40
„ cup	35
„ beard	39
Greek valonia	42
„ cup	45
„ beard	35

The amount of "bloom" which the various varieties deposit upon leather is one of the most important considerations, as valonia is used very largely by tanners because of its weight-giving and firming qualities, and no doubt its chief value as a firming tannage is the quality it possesses of depositing from its liquor ellagic acid, or bloom. This is deposited not only in the leather, but also on the surface. In modern English tannages valonia is nearly always used as a dusting material, that is to say, a layer of the dry ground material is put between each piece of leather in the tan pits, and left for some considerable time, varying from one to six weeks; during this period it deposits this ellagic acid and coats the leather over on the surface with a thin layer of this grey-coloured deposit.

In order to find out the percentage yield of bloom, 500 grms. of each of the finely-ground materials were placed in a large extraction beaker and extracted with boiling water until a liquor of 45° Bk. was obtained. A litre of the clear liquor from each sample was put into a large beaker and allowed to stand for 13 days; at the end of this time the liquor was filtered, the ellagic acid being filtered off, washed, dried, and weighed. The liquor was then allowed to stand for a further period of 13 days, and the process repeated, the same being once more repeated after a further period of 13 days. The results in percentage yield of bloom, calculated in pounds per 100 gallons of liquor, are given in the following table:—

—	13 Days.	13 Days after.	13 Days after.	Total. 39 Days.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Smyrna valonia.	7·84	2·09	1·23	11·16
„ cup	8·13	1·75	1·27	11·15
„ beard...	7·69	2·13	1·24	11·06
Greek valonia ..	5·93	1·55	1·31	8·79
„ cup......	6·68	2·11	1·11	9·93
„ beard....	6·17	2·26	1·2[illegible]	9·63

It will be noted that the Smyrna samples in each case give the highest quantity of bloom. This was to be expected from practical observations, whereas the Greek variety gives a much less quantity. It was expected by the authors that there would have been a greater difference between the quantity of bloom deposited from the cup and beard, as a general impression exists in the trade that the cup is a better bloom giving material than the beard, and it is a common custom in many tan yards to separate the cup and beard and to only use the ground cup for dusting the leather, extracting the beard in the extraction vats or leaches for liquor-making purposes. It must be borne in mind that the liquors were exactly the same strength in each case, but tanners must observe that the liquor was simply left to stand in glass vessels, covered with a piece of cardboard to keep them from dust, and the liquors were not in contact with leather. The authors, since doing this work, have left similar liquors standing with a piece of leather in each, and found that the presence of leather in the liquors accelerates the deposition of bloom. Therefore, although the above tabulated results are comparative, we do not state that identical results would be got in the tan-yard in contact with leather. One fact is, however, special notice, viz., that over 75 per cent. of the bloom is deposited from the liquor within the first fortnight, therefore it is questionable whether the custom which exists in some tan-yards of leaving the goods in layers for two and three months at a stretch is altogether advisable. The results point to the necessity of lifting the layers at the end of a fortnight, or three weeks at the outside, dusting the goods away again with fresh material for one or more similar periods.

The acid-forming power of valonia liquor was then estimated, and to this end 100 grms. of each of the ground material were placed in beakers with 500 c.c. of ordinary tap water at a temperature of 80° C.; this was allowed to stand over-night. The next morning 20 c.c. was taken from each of the beakers, filtered, the acidity was now determined by titration with a saturated solution of lime water, the strength of which was known, and the results calculated in terms of acetic acid; the contents of the beakers were stirred each day, and the acidity of the liquor estimated every seventh day, six estimations being made: the temperature of the liquor was also measured. The results obtained are as under:—

Table IV.

Acidity produced in 35 days, calculated as Acetic Acid.

—	May 20.	May 27.	June 3.	June 10.	June 17.	June 24.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Smyrna valonia	0·156	0·228	0·240	0·258	0·25[illegible]	0·252
" cup....	0·162	0·228	0·282	0·300	0·300	0·318
" beard..	0·180	0·288	0·330	0·342	0·324	0·330
Greek valonia..	0·240	0·294	0·348	0·366	0·330	0·390
" cup	0·282	0·288	0·300	0·324	0·324	0·348
" beard ...	0·142	0·312	0·414	0·462	0·312	0·474
	74° F.	70° F.	65° F.	65° F.	much colder.	

In each case the liquor from the beard appears to sour quicker than that from the cup, and the Greek valonia in each case produces more acid than the Smyrna variety. The following table gives the percentage of glucose in the six materials:—

Table V.

Smyrna valonia	2·05
" cup..	1·60
" beard..	2·05
Greek valonia	1·50
" cup	1·05
" beard..	1·55

It is claimed for the above work that it is by no means complete. The authors look upon it as only a preliminary investigation, but trust the results will be useful to the tanning trade. It is clear so far that the tanning value of the Smyrna variety, strength for strength, is worth considerably more than that of the Greek variety; the colour of the leather is in each case much better. The Smyrna variety, strength for strength, produces 25 per cent. more bloom than the Greek, produces on an average 10 per cent. more weight, analyses only slightly stronger, and costs on an average 2*l.* a ton more. From the above results, the authors incline to the opinion that Smyrna valonia is worth to a sole leather tanner a full 2*l.* a ton more than the Greek variety. We would point out that, in spite of care having been taken in getting accurate samples, we are of the opinion that the sample of Greek valonia is of considerably better quality than the average variety, and the Smyrna sample is if anything, below the average.

THE FASTNESS TO LIGHT OF LEATHERS DYED WITH COAL-TAR COLOURS IN MIXTURE.

BY M. CHAS. LAMB, F.C.S.

Contribution from the Leather Dyeing Department, Herold's Institute, London, S.E.

The shades of colour produced on leathers by single dyestuffs are quite commonly not the shades of colour that are required in commerce; the commercial shades being very generally such as call for a mixture of two dyestuffs of different colours.

In continuation, therefore, of his research, made in order to ascertain the relative fastness to light of single colouring matters when applied to leather (this Journal, 1902, 156), the author decided to investigate the effect of exposing to sunlight, leathers dyed with coal tar colouring matters in mixture, the fading periods of the leathers as dyed with the colours used singly having been previously determined.

In this further research pieces of leather tanned with sumach were dyed with various mixtures of two colouring matters which had been found to fade approximately in the same length of time. As standards of measurement pieces of leather dyed with a single dyestuff known to be very fugitive to light were made use of.

In the case of the acid dyestuffs the colours selected for mixture were chosen from those which faded in Period 1 (nine days) of the first research, namely Naphthol Green B and Methyl Eosine.

Leather was dyed with these dyestuffs mixed in the following proportions, the total weights of dyestuff employed being in every case the same. The patterns were dyed for three-quarters of an hour at a temperature of 48° to 50° C.; an addition of sulphuric acid being made to the dye-bath equal in weight to the weight of dyestuff employed.

Period 1.

18 parts Naphthol Green B, together with 2 parts Methyl Eosine.
16 " " " 4 " "
12 " " " 8 " "
8 " " " 12 " "
4 " " " 16 " "
2 " " " 18 " "

Leather was also dyed with mixtures of dyestuffs, used in the same above proportions, selected from the following periods.

Period 2.

{ Acid Violet 6 B.
{ Naphthol Yellow S.

{ Turquoise Blue.
{ Citronine A.

{ Fast Acid Green.
{ Citronine A.

Period 3.

{ Acid Yellow.
{ Acid Green 3 B.

{ Naphthol Yellow.
{ Bordeaux B.

Period 4.

{ Atlas Scarlet.
{ Bordeaux Extra.

{ Acid Brown R.
{ Bordeaux Extra.

{ New Golden Brown A 1.
{ Guinea Green B.

{ Acid Violet 3 B N.
{ Bordeaux Extra.

{ Indian Yellow T.
{ Guinea Green B.

{ Naphthol Blue Black.
{ Guinea Green B.

Period 5.

{ Acid Brown D.
{ Acid Phosphine J O.

{ Bronze Acid Brown.
{ Croceïn Scarlet R.

{ Orange 2.
{ Water Blue 3 B.

{ Acid Brown D.
{ Atlas Orange Y S.

{ Mandarine G Extra.
{ Naphthylamine Black 4 B.

Period 6.

{ Azo Bordeaux.
{ Scarlet 4 R.

{ Fast Red 21,528.
{ Ponceau 4 R.

Period 7.

Crocein Scarlet 7 B.
Acid Magenta 0.

Fast Scarlet B.
Azo Flavine.

Water Blue R.
Quinoline Yellow.

Period 8.

Ponceau 6 R B.
Azo Fuchsin S.

Bavarian Blue D B.
Chromotrope 6 B.

Acid Violet 3 B.
Violamine R.

The various patterns of shades of colour obtained with the above mixtures were exposed to light, and periodically examined to note the progress of the fading. It was found that the fading of the shades proceeded quite evenly, and in every case at the same rate as the fading of the leathers dyed with either, singly, of the two colours composing a mixture.

The use of sulphuric acid as an addition to the dye-bath when dyeing leather with "acid" colours having been condemned by the Society of Arts Committee on Leather for Bookbinding, the author made experiments with a view to discover some suitable substitute (J. Soc. Dyers and Colourists, Sept. 1903). The outcome of the experiments was that, by the addition of a suitable amount of formic acid to the dye-bath it was possible to obtain, and that without any detrimental effect upon the leather, a depth of colour equal to that produced by sulphuric acid. Having ascertained this the author repeated a number of the above experiments, using formic acid instead of sulphuric acid in the dyeing, and also exposed to light a large number of patterns of leather dyed with single acid colours with the addition of formic acid. It was found that the shades of colour on exposure behaved in every case exactly as had those produced with the addition of sulphuric acid.

In the case of the basic dyestuffs the colours selected for mixture were chosen from those which faded in the periods from 2 to 7 of the first research, as follows :—

Period 2.

9 parts of China Green, together with 1 part of Chrysoidine 4 G.
8 " " " 2 parts " "
6 " " " 4 " " "
4 " " " 6 " " "
2 " " " 8 " " "
1 part " " 9 " " "

Period 3.

Bismarck Brown G G.
Cannella T.

Methyl Green Cryst.
Phosphine 3 R B.

Bismarck Brown G G.
Phosphine 3 R B.

Cannella T.
Methyl Green Cryst.

Period 4.

Bismarck Brown Y Ext.
Phosphine R.

Phosphine R.
Methyl Green Y S.

Magenta.
Phosphine R.

Methyl Green Y S.
Bismarck Brown Y Ext.

Period 5.

Auramine Conc.
Methyl Blue.

Auramine Conc.
Rhodamine 6 B N.

In dyeing with the basic colours the leathers were prepared previous to dyeing by treatment with a solution of tartar emetic and salt, afterwards being well washed previous to immersion in the dye-bath.

The fading periods of the leathers dyed with mixtures of the basic colours were found to be identical with that of the fading of leathers dyed with either of the single colours of the mixture.

Experiments were also made to ascertain the effect of dyeing leathers with mixtures of fast and fugitive colours. It was found that in every case the fading proceeded exactly as in the case of leather dyed with the fugitive colour; this faded, the fast colour remained. For example, a shade of green was produced by a mixture of Turquoise Blue, a fugitive colour, and Acid Phosphine, a fairly fast colour. On exposure the blue faded quickly; eventually the colour became a shade of yellowish brown. A shade of green produced by a mixture of Naphthol Yellow S (a fugitive colour) and Water Blue 4 B (a comparatively fast colour) gradually became blue, the fugitive colour fading. Other mixtures of fugitive and fast colours behaved in exactly the same manner, that is to say, a fast colour in admixture with a fugitive colour does not apparently influence the fading of the fugitive colour. This may explain the fading of leathers dyed with single dyestuffs noted in the first research. The dyestuffs themselves were doubtless, in most cases, mixtures of two or more colouring matters of different fading periods.

In an article in the Berlin *Färber Zeitung* it was stated that an addition of formaldehyde to the dye-bath, when dyeing textiles with basic colours, increased the fastness to light of shade produced. In order to test whether any increased fastness of colour resulted from such an addition to the dye-bath when leather was under treatment, leathers were dyed with the basic colours enumerated above, and an addition of formaldehyde made to the dye-bath. The fading of the shades of colour so produced did not appear to be materially slower than when no such addition was made. In one or two cases, notably in the case of the Methyl Green Crystals and Phosphine R B mixture, the time required for complete fading to take place was much shorter than when no addition had been made to the dye-bath.

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I.—PLANT, APPARATUS AND MACHINERY.

Storing Inflammable Liquids; New Method for ——. Hüneke. Chem. Ind., 1903, **20**, [26], 503.

Essentially the method consists in displacing the air above the liquid by an indifferent gas, *e.g.*, ammonia, carbon dioxide, or, preferably, air containing 20 per cent. of carbon dioxide, thus wholly preventing the formation of a gaseous mixture capable of explosion. The inflammable liquid is contained in a closed tank, through the top of which two tubes, reaching to the bottom, are inserted. One of these serves as a delivery tube; the other communicates with the cylinder supplying the indifferent gas, through a safety tank of the same size as the first, placed in another room. To the tube between this second tank and the cylinder a branch tube is fixed, which is connected to an ordinary U-shaped mercury manometer. The gas in the whole apparatus is kept at a pressure of one-half atmosphere, in consequence of which the liquid is forced out at the delivery tube as soon as the tap in the latter is opened, its place being taken by the indifferent gas. Should the room take fire in which the tank is placed, the liquid would be heated to such a degree that the pressure of its own vapour would drive it into the second tank, the gas escaping through the manometer. From the second tank the liquid could not get back to the first, as the communicating tube stops short just below the top of the second tank.—A. G. L.

English Patents.

Acid-proof Vessels and the like; Manufacture of ——. J. K. Field, Bow, Middlesex. Eng. Pat. 21,650, Oct. 4, 1902.

Acid-resisting vessels and other articles are made of, or lined with a composition consisting of bitumen and paraffin or ceresin wax, to which a binding agent, such as dry paper-pulp, silk-waste, wood-meal, peat or asbestos fibre, &c., has been added in small quantities at a time.—R. A.

Evaporating Brine and other Liquids; Apparatus for ——. J. Foster, Glasgow. Eng. Pat. 26,836, Dec. 5, 1902.

The heating vessel is made in two or more sections, with a central space in which the liquid circulates between them, forming a chamber in which the liquid is in comparative repose. The heating tubes are constructed and arranged in increasing diameter from the outer circle of the heating vessel inwards towards its centre, so that the hottest liquor circulates from the smaller tubes into and through the larger tubes. With this arrangement, a reduced temperature is obtained at the centre, to facilitate the formation and precipitation of the crystals. As an alternative or additional arrangement for lowering the temperature, a jacketed space through which a cooling medium is circulated may be provided at the centre of the apparatus. (See also Eng. Pat. 12,190 of 1900; this Journal, 1901, 562.)—R. A.

Separators; Centrifugal ——. M. K. Bamber, Colombo, Ceylon. Eng. Pat. 27,173, Dec. 12, 1902.

A centrifugal apparatus for separating solids from liquids consists of a cylindrical box having two walls each formed with a series of holes, which can be brought into register by rotating one of the walls. Scrapers are fixed between the outside of the box and an external casing. (See also Eng. Pat. 7745 of 1902; this Journal, 1903, 544.)—R. A.

Condensing Fumes formed in Volatilisation Processes; Apparatus for ——. R. McKnight, Philadelphia. Eng. Pat. 18,292, Aug. 24, 1903. Under Internat. Conv., Jan. 5, 1903.

See U.S. Pat. 737,003 of 1903; this Journal, 1903, 1038.
—T. F. B.

United States Patents.

Products of Combustion [Carbon Dioxide] of Steam-Boiler Furnaces; Process of Utilising the ——. G. A. Schütz, Wurzen, Germany. U.S. Pat. 740,700, Oct. 6, 1903.

See Fr. Pat. 323,551 of 1902; this Journal, 1903, 495.
—T. F. B.

Furnace; Reverberatory [Hydrocarbon] Heating ——. S. Uren, Sacramento, Cal. U.S. Pat. 740,786, Oct. 6, 1903.

The enclosed heating-chamber of the furnace has vertical sides and ends, with openings closed by movable gates in the side wall. The floor of the furnace is inclined downwards towards one end, from which a discharge-passage leads, first downwards and then, at an angle, upwards, a slag-hole being provided at the lowest depression of this passage. A burner inlet-passage is located in the end wall, in line above the discharge-passage and near the top of the chamber, so that it discharges hydrocarbon fuel against the opposite end of the chamber, from which the fuel is deflected and returned along the floor to the discharge-passage.
—R. A.

Furnace for Roasting Ores. The Nichols Chemical Co., U.S.A. Fr. Pat. 332,065, 1903. X., page 1198.

French Patent.

Measuring Liquids, and Mixing them with Milk of Lime or other similar Liquid Substance; Apparatus for ——. O. Walter. Fr. Pat. 331,842, April 23, 1903.

The apparatus consists of a vessel provided with a float, which, as it sinks by the fall of the liquid in the vessel, moves a system of rods whereby a plug at the bottom of the vessel is closed, a plug for the supply of a further quantity of liquid to it, and the plug in a second vessel allowing of the escape from the latter of a measured quantity of, say, milk of lime or other liquid, are opened. As the float reaches its highest point, the system of rods reverses the action of the plugs. The rods also work, by their movement, an agitator in the milk of lime. By a variation of the apparatus it may include two floats, rigidly connected together, and two measuring vessels, supplied by an oscillating feeding arrangement.—W. C. H.

II.—FUEL, GAS, AND LIGHT.

Gas Purification; Simplified Method of ——, to completely recover Tar and Ammonia. Burgemeister. J. Gas Lighting, 1903, **84**, 102.

If the gas, as it leaves the retort or hydraulic main, be saturated with aqueous vapour, then, by subsequent vigorous cooling in the condensers, the whole of the tar is separated, as well as some of the ammonia, carbonic acid, and sulphuretted hydrogen. The cheapest method of introducing the steam is by dropping water into the ascension pipes at the rate of 80 drops a minute (see also this Journal, 1903, 203). For the removal of ammonia and other compounds from the gas, a water-spray washer (Fig. 1) is used in the place of scrubbers. Water supplied through the pipe C passes through the siphon-pipe B to the nozzle bove the stand-pipe A, and falls on to the disc D (see Fig. 2), which is about 10 ins. below the top of the vessel. About half of the liquid is converted into fine spray, whilst he other half runs off to the edge of the disc, which is xtended vertically downwards for about $\frac{2}{3}$ in., and then alls on to the conical ring E (see Fig. 3), by which about 0 per cent. of the liquid is converted into spray, the emainder falling on to the next cone, and so on. The washer has been tried on the large scale, and it is claimed o be much simpler and to give better results with regard to ecovery of ammonia than the usual apparatus.—A. S.

Fig. 1.

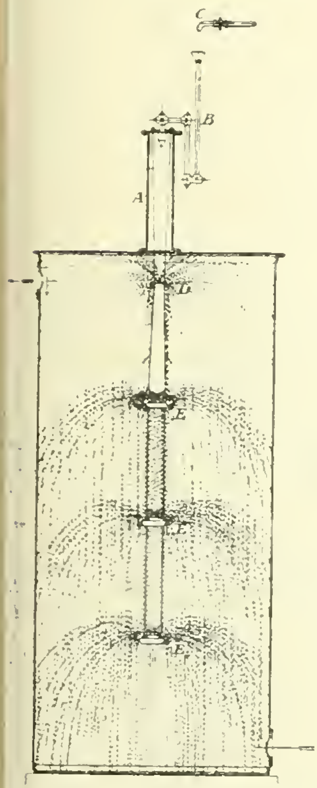


Fig. 2.

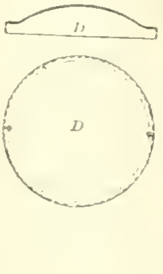
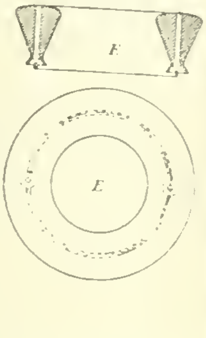


Fig. 3.



English Patents.

as Producers; Impts. in ——. C. Whitfield, Kettering. Eng. Pat. 14,077, June 21, 1902.

ee Fr. Pat. 321,672 of 1902; this Journal, 1903, 205.
—T. F. B.

as Producers; Impts. in ——. J. R. George, Worcester, Mass., U.S.A. Eng. Pat. 16,263, July 23, 1903.

he coal falls from the magazine, supported above the opening the top of the producer, into a rotating funnel-shaped shell, r distributing the coal, placed between the coal magazine and e opening into the heating chamber. The shell has its upper d larger end concentric with its axis of rotation, to which e lower end is eccentric. A disc, slightly larger than the pening in the bottom of the coal magazine, is placed ncentrically in the shell, with which it forms an annular ace, and impedes the passage of the coal when the stributor is at rest. The joints between the coal distributor and the heating chamber and the magazine are water-sealed to prevent the escape of gas; the water also cools the end of the distributor where it enters the heating chamber.

For the supply of air to the bottom of the heating chamber, two or more conical hoods are arranged one above the other, with the smaller at the top; a separate air passage is connected with each hood. The air supply is regulated by a common damper, which closes one air passage while it opens another, whereby the relative amount of air which passes up through the bed of fuel may be regulated and distributed.—W. C. H.

Water-Gas; Method of Manufacturing ——. J. Clay, Hebden Bridge, Yorks. Eng. Pat. 24 371, Nov. 7, 1902.

The method consists in driving off the more volatile gases from coal, as in ordinary coal-gas manufacture, and then forcing steam into the residual coke. This is effected by forming a steam channel in the bottom of a fireclay ◯-shaped retort; the steam passes into branches of the pipe, and from them, through orifices, into the mass of incandescent coke in the retort.—W. C. H.

Generator-Gas; Manufacture of ——, *and Apparatus used therewith.* J. E. Dowson, London. Eng. Pat. 25,319, Nov. 18, 1902.

Air, or air and steam, are admitted to the generator chamber, at the top and also at the bottom of the column of fuel, so that the lower part is worked by an up-draught, and the upper by a down draught, the gases formed being withdrawn through one or more outlets situated intermediately between the top and bottom of the generator. The generator may be provided with an external jacket, in which the air supply is heated before admission to the generating chamber.—W. C. H.

[*Combustible*] *Gas; Purification of* ——. C. H. Schill and H. Lane, both of Hyde. Eng. Pat. 26,195, Nov. 28, 1902.

Combustible gas, on leaving the generator and cooler, is treated with a suitable oil, such as inferior mineral oil, or a mixture of oil and other liquid, preferably in the form of a spray. The tar is said to be deposited in a solid spongy form, from which the oil can be recovered by pressure.
—W. C. H.

Gas; Apparatus for Washing and Similarly Treating ——. C. H. Schill, Newton Iron Works, Cheshire. Eng. Pat. 27,917, Dec. 18, 1902.

A vertical cylinder having any convenient number of inwardly projecting dished plates with central openings, a rotating shaft placed in said openings, and having a series of discs terminating at a suitable distance from the walls of the cylinder and alternating with the dished plates; means for supplying liquid to the top of the cylinder, gas to the bottom, and motion to the shaft.—F. H. L.

Incandescent Mantles; Manufacture of ——, *and Burners therefor.* W. W. Adam and M. A. Adam, both of London. Eng. Pat. 21,274, Sept. 30, 1902.

The process of burning off and seasoning the mantles consists in subjecting the mantle stockings to the action of a flame, which is automatically changed from an oxidising or "over-aerated" condition to that of maximum temperature, and gradually raising the mantles from the burners during the action of this alternating flame. The burner is provided with a perforated cap or head of solid metal, with ribs, to carry off the heat and prevent melting or burning back. The alternating character of the flame is produced by adding secondary air passages to the burners, these passages being automatically controlled during the process by a lever which operates the sleeves over the passages; the lever works in conjunction with the arrangement for raising the mantle stockings from the burners.—W. C. H.

United States Patent.

Ore-reducing Furnace; Means for Utilising Oil or Gas in ——. W. Kemp, Assignor to M. P. Freeman and B. L. Worthen. U.S. Pat. 741,504, Oct. 13, 1903. X., page 1198.

French Patents.

"Dawson" Gas Generator. L. Martin. Fr. Pat. 331,835, April 15, 1903.

The body of the generator is surrounded by a casing, thus forming an annular space which is open to the atmosphere at the top, and at the bottom communicates with the space under the grate. The air for combustion enters the annular space, and in its downward passage becomes heated partly by contact with, and partly by radiation from, the wall of the generator, and at the bottom passes over the surface of water in an annular trough, where it becomes charged with steam and then enters under the grate.—W. C. H.

Oil-Gas: Manufacture of ——. H. Blau. Fr. Pat. 332,115, May 16, 1903.

The process of manufacturing oil-gas by expansion or rarefaction with permanent gases is combined with a method of more or less completely removing these permanent gases from the mixture by fractionation or absorption. —W. C. H.

Oil-Gas; Manufacture of ——. T. Settle and W. A. Padfield. Fr. Pat. 332,267, May 20, 1903.

See Eng. Pat. 12,552 of 1902; this Journal, 1903, 789. —T. F. B.

Incandescence Mantles: Process for Making ——, Transportable. A. Oppenheim and R. Fener. Fr. Pat. 332,223, May 19, 1903.

See Eng. Pat. 27,821 of 1902; this Journal, 1903, 619. —T. F. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Petroleum from Berikei [Daghestan, Caucasia]. K. Charitschkow. Westnik shirow. weschtsch., 1903, **4**, 32. Chem.-Zeit., 1903, **27**, Rep. 256.

The occurrence of petroleum at Berikei has been known for 20 years, but only in 1894 were borings made. In 1898 the production was still only 13,000 ponds, but since then great progress has been made. In quality the oil is intermediate between the Baku and Grosny products. A specimen, of sp. gr. 0·8648 and flash point 40° C., gave on distillation:—Petroleum spirit (up to 100° C.), 1·57; ligroin (100°—150° C.), 5·85; kerosin of sp. gr. 0·8045 and flash point 28°·5 C. (150°—270° C.), 29·42; and residue of sp. gr. 0·9194 and flash point 127° C., 56·85 per cent. Another specimen, of sp. gr. 0·8711 and flash point 39·5° C., gave:—Spirit and ligroin (up to 150° C.), 1·5; lighting oil of sp. gr. 0·7957 and flash point 28·5° C. (150°—270° C.), 34·5; and residue of sp. gr. 0·921 and flash point 127° C., 60·7 per cent. The residues had a viscosity (Engler) of 4·56. The fraction of lighting oil deposited a considerable amount of coke. By purification of the crude kerosin with 1 per cent. sulphuric acid, about 28·9 per cent. (on the original oil) of the best kerosin (Mark 1.) was obtained. The characteristics of Berikei petroleum are that it requires little purification, gives good lighting oils, only a small amount of benzine, and 1—5 per cent. of ligroin. The residues yielded a good masut of similar viscosity to Baku masut; they did not solidify at − 20° C., and they had the following composition:—Carbon, 84·68; hydrogen, 12·10; sulphur, 0·072; and oxygen, 3·15 per cent. The gases issuing from the ground with the petroleum, when separated from admixed air, contained 12·82 per cent. of carbon dioxide, 65·84 per cent. of methane, and 19·92 per cent. of ethane. (See also this Journal, 1903, 547.)—A. S.

Pyridine in Aqueous Solution; Determination of ——. M. François. XXIII., page 1210.

Alkalis; Action of ——, on Glass and on Paraffin. F. Jones. XXIV., page 1212.

English Patents.

Tar and Mineral Oils; Deodorisation of ——. J. Wetter London. From Rütgerswerk-Akt.-Ges., Berlin. Eng Pat. 21,145, Sept. 29, 1902.

See Fr. Pat. 321,938 of 1902; this Journal, 1903, 621. —T. F. B.

Soot or Lampblack from Tar and other Carbonaceous Substances: Process of Manufacturing ——. G. Wegelin, Germany. Eng. Pat. 13,837, June 22, 1903.

An extension of Eng. Pats. 22,337 of 1899 and 10,228 of 1902 (see this Journal, 1900, 56, and 1902, 1022). The distillation of the tar or other carbonaceous material is assisted by the introduction of superheated steam, carbon dioxide, &c., and also by mechanical agitation.—T. F. B.

Naphthalene and Anthracene; Process and Means for the Purification of ——. F. E. Catchpole, New Cross, and E. A. Catchpole, Grove Park. Eng. Pat. 16,641, July 29, 1903.

The crude product, in the form of blocks or slabs, is placed on a perforated or channelled surface in a chamber suitably heated, and the impurities "sweated" out. Naphthalene is preferably heated to about 70° C., anthracene to not above 200° C. A slight washing with acid and distillation complete the process.—T. F. B.

Explosives for Blasting Purposes [Use of Petroleum By-product]. H. Dreany. Eng. Pat. 26,802, Dec. 4, 1902. XXII., page 1208.

United States Patent.

Mineral Oils; Refining ——. T. Macalpine, Chiswick Assignor to Alcohol Syndicate, Ltd., London. U.S. Pat. 741,517, Oct. 13, 1903.

See Eng. Pat. 18,728 of 1902; this Journal, 1903, 944. —T. F. B.

French Patent.

Asphalt; Artificial ——. J. A. Soriano. Fr. Pat. 332,051 May 13, 1903. IX., page 1196.

IV.—COLOURING MATTERS AND DYESTUFFS.

Potassium Ferrocyanide and Ferricyanide: Action of Iodine upon ——. J. Matuschek. Chem.-Zeit., 1903 **27**, 1000.

By the action of iodine upon solutions of potassium ferrocyanide and ferricyanide, the author obtained a blue compound of the same composition as Prussian blue, but differing from the latter by its insolubility in oxalic acid and ammonium tartrate solutions. To a solution of 20 grms. of potassium ferrocyanide solution in 500 c.c. of water, iodine was added in small quantities, with frequent shaking, and the mixture kept in the dark. The iodine was dissolved with comparative rapidity, the rate of solution apparently increasing with the amount of dissolved iodine. A blue deposit was formed on the bottom and sides of the containing vessel, but could not be separated directly by filtration, owing to its extremely finely-divided condition. In order to isolate it, a current of air was passed through the solution till all odour of iodine, hydriodic acid, or hydrocyanic acid had disappeared; the solution was then evaporated to dryness on the water-bath and the residue extracted with water, the blue compound left undissolved being separated by filtration. Similar results were obtained with a solution of potassium ferricyanide, but the iodine was dissolved more slowly.—A. S.

Berlin Green. C. Nicolaysen. Forhandlingar vid Nordiska Naturforskare- och Lakaremötet i Helsingfors, 1902; Chem. Centr., 1903, **2**, [15], 827.

By concentrating in the dark a mixture of ferric chloride and potassium ferricyanide solutions, a green precipitate of the composition $Fe : Fe(CN_6).Fe : Fe(CN)_6 : Fe.Fe(CN_6) : FeCN$, is produced, which is identical with the Berlin Green, obtained by the action of chlorine upon potassium ferricyanide. The compound is very hygroscopic and readily forms colloidal solutions. It is decomposed by heating, water and cyanogen being formed at 100° C., and ammonium formate, ammonium carbonate, and other products at 120° C. It is also decomposed by alkalis and by ammonia, ferric hydroxide and potassium ferrocyanide and ferricyanide being formed.—A. S.

Triphenylmethane and Diphenylmethane Dyestuffs; Constitution of Basic ——. Braun. Zeits. angew. Chem., 1903, **16**, 942.

The author prepared derivatives of Malachite Green and Auramine by acting upon the amino groups substituted in the benzene rings, and compared the products obtained with the original colour bases with regard to their salt-forming power. The compound, $(OH).(C_6H_5).C:[C_6H_4N(CH_3)CN]_2$, prepared from Malachite Green was possessed of weak basic properties, and dissolved in concentrated acids with a deep red colour. The green Malachite Green salts must consequently have a quinonoid structure. The compound, $NH:C:[C_6H_4NCH_3CN]_2$, prepared from Auramine was yellowish, and formed salts of the same colour as Auramine salts. The constitution of Auramine salts can therefore be best represented by formulæ of the following type:—$HCl.NH:C:[C_6H_4N(CH_3)_2]_2$.—A. S.

Diaminoanthrachrysone Disulphonic Acid; Decomposition of ——, *by Boiling.* A. Stohmann. Zeits. f. Farben- u. Textil-Chem., 1903, **2**, [20], 389—390.

Diaminoanthrachrysone disulphonic acid (1.5-diamino-2.4.6.8-tetrahydroxyanthraquinone 3.7-disulphonic acid) dyes unmordanted wool, from an acid bath, a bluish violet, which under certain conditions is transformed into a reddish violet when the dye-bath is boiled. The change is ascribed to oxidation (Ger. Pat. 114,636; see also Fr. Pat. 324,349; this Journal, 1903, 549), under the influence of which the amino groups in the compound in question are readily exchanged for hydroxyl groups, Acid Alizarin Blue B B (1.2.4.5.6.8-hexahydroxyanthraquinone 3.7-disulphonic acid) resulting, which dyes unmordanted wool from an acid bath a pure red colour. As supporting the above view, t has been observed (Ger. Pat. 114,636) that the change is prevented by the addition of reducing agents, *e.g.*, sodium bisulphite, to the dye-bath. It is found, however, to occur when a solution of the diamino compound in normal caustic soda solution is boiled with sodium bisulphite and aniline. Decomposition into the hexahydroxy compound takes place (1) almost instantly in the presence of alkalis, in either concentrated or dilute solution, and (2) slowly in very dilute acid solution. It does not occur, either at the ordinary temperature or on heating, even in the presence of oxygen gas, in a moderately dilute (1 : 20) solution of ulphuric acid. From the result of an experiment made with very dilute hydrochloric acid, in which a sample of dyed wool and a quantity of the diamino compound equal o that present in the wool were separately boiled, it would appear that the decomposition of the diamino compound akes place in solution and not upon the dyed fibre.—E. B.

Benzidine and Tolidine; Iodometric Determination of ——. A. Roesler and B. Glasmann. XXIII., page 1210.

Methoxyl and Glycerin Determinations. M. J. Strikar. XXIII., page 1211.

English Patent.

Sulphurised Dyestuffs [Sulphide Dyestuffs]; Manufacture of Bluish Black ——. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/M., Germany. Eng. Pat. 25,851, Nov. 24, 1902.

he product (a dialkyl indophenol) obtained by blowing air hrough an alkaline solution of equimolecular proportions f a dialkyl-*p*-phenylenediamine and phenol in presence of copper salt is heated with alkali polysulphide to 130°—50° C. The products are black powders, insoluble in water and soluble in hot sodium sulphide solution; they dye a deep bluish-greenish black.—E. F.

United States Patents.

Dye [Sulphide Dyestuff]; Substantive Black ——, *and Process of Making Same.* A. F. Poirrier, Assignor to Soc. Anon. d. Matières Colorantes et Prods. Chim. de St. Denis, Paris. U.S. Pat. 740,465, Oct. 6, 1903.

Dyestuffs are prepared by reacting with an aromatic sulphur-chloride derivative on a substituted diphenylamine, the ratio of amino to hydroxy groups in the diphenylamine being less than two of the former to one of the latter. The products contain sulphur, are readily soluble in water, and dye unmordanted cotton in bluish-black shades on which energetic oxidising agents, such as bichromate, have but little action.—E. F.

Acridine Dye [Acridine Dyestuff], and Process of Making Same. C. Ris and A. Mylius, Assignors to Aniline Colour and Extract Works, formerly J. R. Geigy, Basle. U.S. Pat. 740,468, Oct. 6, 1903.

See Fr. Pat. 330,487 of 1903; this Journal, 1903, 1082.
—T. F. B.

Disazo Dye [Azo Dyestuff]; Mordant ——, *and Process of Making Same.* A. L. Laska, Assignor to K. Oehler, Anilin und Anilinfarbenfabrik, Offenbach a/Main, Germany. U.S. Pat. 740,767, Oct. 6, 1903.

Disazo compounds of amines of the general formula $C_6X_3.NO_2.OH(1).(NH_2)(2)$ are combined in alkaline solution with monoazo dyestuffs resulting from the action of diazo compounds of the benzene series upon 2.5-aminonaphthol-7-sulphonic acid. The use of diazotised picramic acid for the first-mentioned component is specially mentioned. The dyestuff is specially claimed which is prepared by the action of diazotised picramic acid in alkaline solution on the dyestuff resulting from the action of diazotised *p*-nitraniline-*o*-sulphonic acid on 2.5-aminonaphthol-7-sulphonic acid. The resulting dyestuff is soluble in water, and yields on wool, with subsequent chroming, a bluish-black shade of great fastness to light, acids, alkalis, and milling.
—E. F.

Dye [Azo Dyestuff]; Black Mordant ——, *and Process of Making Same.* A. L. Laska, Assignor to K. Oehler, Anilin- u. Anilinfarbenfabrik, Offenbach a/Main, Germany. U.S. Pat. 740,768, Oct. 6, 1903.

Diazo compounds of amines of the general formula $C_6X_3.NO_2.(OH)(1).NH_2(3)$ are combined in alkaline solution with the monoazo dyestuffs resulting from the action of diazo compounds of the naphthalene series upon 2·5-aminonaphthol-7-sulphonic acid. The use of diazotised picramic acid for the first-mentioned component is specially mentioned. The dyestuff is specially claimed which is formed by combining diazotised picramic acid in alkaline solution with the dyestuff resulting from the action of diazotised 2-naphthylamine-3.6-disulphonic acid on 2.5-aminonaphthol-7-sulphonic acid. The product yields on wool, when subsequently chromed, bluish-black shades of great fastness to light, acids, alkalis, and milling.—E. F.

Azo Lake; Red ——. R. Gley and O. Seibert, Assignors to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 741,029, Oct. 13, 1903.

See Fr. Pat. 328,575 of 1903; this Journal, 1903, 992.
—T. F. B.

Sulphur Dye [Sulphide Dyestuff]; Green ——, *and Process of Making Same.* R. Gley, Assignor to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 741,030, Oct. 13, 1903.

See Fr. Pat. 332,104 of 1903; following these.—T. F. B.

French Patents.

Halogen Derivatives of Liquid Organic Compounds; Process and Apparatus for Obtaining ——. L. Marckwald. Fr. Pat. 328,053, Aug. 8, 1902.

See Eng. Pat. 17,695 of 1902; this Journal, 1903, 945.
—T. F. B.

[Sulphide] Dyestuffs; Production of Substantive Blue ——. Badische Anilin und Soda Fabrik. Fr. Pat. 328,063, Aug. 18, 1902.

See Eng. Pat. 19,940 of 1902; this Journal, 1903, 946.
—T. F. B.

Green Dyestuff containing Sulphur [Sulphide Dyestuffs]; Manufacture of ——. Act.-Ges. f. Anilinfabr. Fr. Pat. 332,104, May 15, 1903.

Green dyestuffs which dye cotton direct in very bright and fast shades, are prepared by boiling certain indophenols in aqueous solution with sulphur and alkali sulphides in presence of copper salts.

The indophenols used are prepared by the oxidation of *α*-naphthylamine or its sulphonic derivatives, together with either *p*-aminophenol or its homologues or its chlorine derivative.—A. B. S.

Monazo Dyestuffs [Azo Dyestuffs] for Production of Red Lakes; Manufacture of ——. Act.-Ges. f. Anilinfabr. Fr. Pat. [illegible], May 20, 1903.

Red dyestuffs which are very suitable for the manufacture of lakes, are prepared by combining 2:3-oxynaphthoic acid with the diazo derivatives of certain substituted aminobenzene-*o*-sulphonic acids represented by the general formula—

$$C_6H_3.NH_2SO_3H.X[1:2:4],$$

where X stands for the groups, NH_2, CH_3, NO_2, Cl, OCH_3; or other analogous substituent.—A. B. S.

Coloured Derivatives of Anthraquinone [Anthracene Dyestuffs] Manufacture of New ——. F. Bayer and Co. Fr. Pat. 332,261, May 20, 1903.

Blue dyestuffs which dye unmordanted cotton, and are very fast to chlorine, are prepared by heating the yellow product obtained by the oxidation of the blue dyestuff of Fr. Pat. 309,503 (this Journal, 1902, 42) with hydrochloric or hydrobromic acid, under pressure. The resulting dyestuffs contain halogens.—A. B. S.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Fibres (Indian) of the Agave Americana and Marsdenia Tenacissima. Board of Trade J., Oct. 15, 1903, Supplement; Imp. Inst. Bull. No. 3, 120—123.

The fibre of the *Agave Americana*, from Assam, is coarse, clean, and of good appearance, being yellowish white, with a fine gloss. Average length of staple, 44 ins. It contains cellulose, 79·6 per cent.; moisture, 9·7 per cent.; and ash, 1·5 per cent. It loses on "hydrolysis" 15·7 per cent.: on purification with acid, 2·4 per cent.; and on "mercerising," 7·1 per cent. Commercially, it is rather too dry and brittle, probably owing to faulty preparation, and corresponds to Sisal hemp from West India.

Marsdenia tenacissima fibre (Bengal) is very strong and fairly white, of average length 12—13 ins. It contains 91·5 per cent. of cellulose; 1·5 per cent. of ash; and 7·7 per cent. of water; and loses, on "hydrolysis," 8·4 per cent.; on acid purification, 3·5 per cent.; and on "mercerising," 4·4 per cent. It contains no lignocellulose. Commercially it is valued at 15*s.* to 18*s.* per ton, being only of use for tow, owing to the shortness of the fibre.
—T. F. B.

Cotton from Rhodesia. Board of Trade J., Oct. 15, 1903, Supplement; Imp. Inst. Bull. No. 3, 123.

A sample from Mashonaland was silky, fairly strong, of average length, white, with some yellowish stain. When clean, it is valued at about 6*d.* per lb.; in the natural condition, at about 5½*d.* A sample from Zambesia was bluish white in colour, silky, strong, and of good length. When cleaned, its value is about 6½*d.* per lb. A sample, labelled "cotton from the Loangwa Mountains," proved to be kapok, and is worth about 3½*d.* to 4*d.* per lb.—T. F. B.

English Patents.

Washing or Scouring Wool; Machines for ——. H. Colburn, Menston, and F. Colburn, Keighley. Eng. Pat. 25,990, Nov. 26, 1902.

The wool is fed on to a travelling brattice, then caused to advance through the washing bowl by means of a series of forks mounted on a framework, finally passing through pressure rollers on to a second travelling brattice, from which it is passed on to the succeeding operation. The framework is arranged to move backwards and forwards between anti-friction rollers, this motion being imparted by a crank operating within the slot of a lever, the latter being mounted in position so that its fulcrum relatively with the centre of motion of the crank is such that a greatly increased speed is obtained in one direction of movement of the framework. The sweep of the crank may also be adjusted so as to transmit a greater or lesser motion to the forks. Cams are used for raising or lowering the forks, the cams operating runners carried by sliding supports, and upon which sliding supports the anti-friction rollers are also mounted. Weighted levers assist the cams in raising the framework. The wool is finally fed to the squeezing rollers by means of forks operated by screws, the forks being guided by spring-regulated guiding pieces as they pass from one set of screws to the other, and in this way the forks are kept in their proper relative positions, and are prevented from becoming twisted or cross-bound.—B. N.

Saturating, Damping, Discharging, Washing, Carbonising, Bleaching, Drying, Humidifying, Steaming, &c.; Machinery for Treating Cloth or Yarn with Simple or Compound Liquors, Gases, &c., in such Processes as ——. E. Hardcastle, Horsforth. Eng. Pat. 17,608, Aug. 14, 1903.

The yarn to be treated is delivered by rollers into a sucker tray, so that as the material passes through the tray, it is raised slightly in passing over the slots of the suckers, and therefore the cloth, which is under a slight tension, is pressed tightly down on the suckers. The latter consist of channels communicating with chambers, in which a vacuum is created so as to suck the liquid from the tray, through the cloth, into the chambers, from which it is afterwards returned to the sucker tray. In some cases it is advantageous to have more than one sucker tray, with suckers in each tray.—B. N.

Printing Textile Fabrics; Process for ——. J. Cadgène, Zurich. Eng. Pat. 18,675, Aug. 29, 1903.

See addition to Fr. Pat. 274,791 of 1898; this Journal, 1903, 1083.—T. F. B.

United States Patents.

Yarns, &c.; Process of Treating ——, *with Volatile Liquids.* J. E. Prestwich, Farnworth. U.S. Pat. 740,778, Oct. 6, 1903.

See Eng. Pat. 1012 of 1901; this Journal, 1902, 113.
—T. F. B.

Bleaching; Apparatus for ——. F. C. Theis, Ohligs, Germany. U.S. Pat. 741,188, Oct. 13, 1903.

See Eng. Pat. 7870 of 1902; this Journal, 1903, 623.
—T. F. B.

French Patents.

Wool-Scouring and Fat Recovery; Machine for ——. J. M. J. Baudot. Fr. Pat. 331,956, March 23, 1903.

It is claimed that this machine avoids a loss of fatty substances and soap in washing wool after scouring or similar operations. The wool, as it comes from the scouring, is passed in the open width through a washing machine divided into three compartments and furnished with squeezing rollers, water sprays, &c. Only a small quantity of water is used, and when this becomes dirty it is run off into a tank and treated with hydrochloric acid to liberate the fatty acids, which rise to the surface, and can be removed in a semi-solid condition on cooling and standing.
—A. B. S.

Bleaching of Cotton Tissues ; Process and Apparatus for ——. W. Mathesius. Fr. Pat. 332,114, May 15, 1903.

The fabric enters over a broad roller at one end of the apparatus, and traverses seven or eight liquid seals, so that it is subjected to a gradually increasing temperature, pressure of stea , and concentration of caustic alkali. In the last compartment the fabric passes through rings, which twist it into a cord, and the latter then returns through the same set of seals, passing over suitable rollers, which turn by friction with the broad rollers. The valves in the steam pipes are controlled by connecting rods connected with floats, so that when the necessary head of liquid is obtained in each seal, the steam is cut off. The broad roller above mentioned is turned by bevel-gearing, and its axis is made watertight by a suitable stuffing-box, the friction rollers being carried on an axis working on pivots. A modification is described in which the last compartment is a wide one, and in which the material is passed many times through the same strong liquor before returning. Pipes, provided with valves, and communicating with each compartment, serve to introduce and withdraw the caustic liquor, and a circulation of the latter is also maintained in the direction of return of the fabric.—B. N.

Printing Textile Fabrics ; Process and Improved Means for ——. H. C. J. Deeks, J. Deeks, and M. Goodbody. Fr. Pat. 332,054, May 13, 1903.

The object of this invention is the production of designs n textile fabrics which are not manufactured in sufficient uantity as to necessitate the preparation of a printing ylinder. A flexible model is prepared from a frame of vood covered with fine silk gauze, the latter being coated vith wax or other suitable plastic material solid at the rdinary temperature of the air, and then stretched so as o obtain a smooth surface. The gauze is placed over an bsorbent groundwork, and the design neatly traced with hot tool. The wax melts away, leaving an open design, he gauze in these parts being afterwards carefully urnished. The model is held in intimate contact with he tissue, previously wetted, and the liquid colour is proected as a spray by a suitable vaporiser or atomiser moving utomatically over the cut-out parts of the model. As the aterial of the gauze is of a very fine texture, the threads o not reproduce themselves, and the design only is transerred to the fabric.—B. N.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Vood ; Process for Preparing ——, *for taking Colouring Matter.* J. Brenner, Austria. Eng. Pat. 17,808, Aug. 17, 1903.

he wood is steamed and then sulphuric acid of 10°—20 B. forced in to destroy the resinous incrusting matters. The ood is freed from acid by treatment with weak alkali and ashing with water. The dyestuff solution, mixed with a itable mordant, is then forced in through a cut across e grain.—A. B. S.

French Patents.

dhesive Material [*Printing*] ; *Production of* ——. L. Préaubert and G. A. Thubé. Fr. Pat. 331,805, May 7, 1903. XIII. A., page 1200.

Gelatin ; Production of Iridescent Effects with ——. H. A. Poussolle. Fr. Pat. 332,199, May 19, 1903.

eaves or other ornamental objects are coated with or rmed out of gelatin containing ammonium bromide in lution. They are then soaked in a bath of silver nitrate lution, and finally coated with a very dilute gelatin solun (*e.g.*, beautiful iridescent effects are obtained by using solution containing from 4 to 6 grms. of pure gelatin in itre of water).—R. L. J.

VII.—ACIDS, ALKALIS, AND SALTS.

Nitrous Anhydride ; Direct Synthesis of ——. D. Helbig. Gazz. chim. ital., 1903, **33**, 454. Chem.-Zeit., 1903, **27**, [85], Rep. 262.

Nitrous anhydride, N_2O_3, was obtained by passing a secondary current of about 1000 volts through liquid air, the primary current used being an alternating one. A green precipitate was obtained in this way, the quantity being about 0·5 grm. from 300 c.c. of air. The excess of air was removed by means of distillation under diminished pressure. The pure anhydride is a blue powder, melting at −111° C. with decomposition into nitric oxide and dioxide. —A. G. L.

Lime in presence of Alkalis ; Solubility of ——, *and the Causticisation of Alkali Carbonates.* A. d'Anselme. Bull. Soc. Chim., 1903, **29**, [18], 936—939.

The solubility of calcium hydroxide was determined in aqueous solutions containing increasing amounts of sodium hydroxide, and at temperatures varying between 20° and 100° C. When solutions of pure sodium hydroxide, of known strength, were mechanically agitated with excess of calcium hydroxide, the apparatus being immersed in a thermostat, equilibrium was established after about four hours. The results showed that the solubility of calcium hydroxide in water and in aqueous sodium hydroxide solutions decreases with increase of temperature, the solubility in water at 20° C. being more than double that at 100° C. At a given temperature, the solubility diminishes with the increase of sodium hydroxide, being practically *nil* in seminormal solution (20 grms. to the litre) at all temperatures.

Potassium Sulphates. W. Stortenbeker. Rec. trav. chim. Pays-Bas, **21**, 399—411. Chem. Centr., 1903, **2**, [15], 822.

The author examined the salts which separate from solutions of potassium sulphate in presence of sulphuric acid. The salt $K_2SO_4.KHSO_4$ has been previously described by Rose; its sp. gr. is 2·587. The salt $K_2SO_4.3KHSO_4$ separates from solutions containing 2—3 mols. of acid to 1 mol. of potassium sulphate; it forms more readily the lower the temperature. It separates in six-sided probably rhombic crystals, and has the sp. gr. 2·463. With somewhat higher concentrations of acid, the salt $K_2SO_4.6KHSO_4$, sp. gr. 2·327, separates in the form of needles. The salt $K_2SO_4.3H_2SO_4$, described by Schultz-Sellack, was also obtained, but the compound isolated by the author contained water of crystallisation. The sp. gr. of potassium hydrogen sulphate was found to be 2·314.—A. S.

Metallic Phosphates ; Action of Carbon Dioxide under Pressure on ——. A. Barillé. Comptes rend., 1903, **137**, [15], 566—568.

The trimetallic phosphates of potassium, sodium, ammonium, calcium, barium, and magnesium, react with carbon dioxide and water under pressure, forming unstable compounds called by the author *carbonophosphates*, $(M_2HPO_4)_2 2CO_2.(MHCO_3)_2$. These compounds readily dissociate, forming dimetallic phosphate and bicarbonate, and giving off carbon dioxide. The dimetallic phosphates of the same metals are not decomposed by carbon dioxide under the same conditions as above, but are dissolved, and fix carbon dioxide, apparently forming the substances $(M_2HPO_4)_2 2CO_2$, still more unstable than the substances formed from the trimetallic phosphates. The trimetallic phosphates of other metals are not decomposed, but simply dissolved by carbon dioxide and water under pressure. A table of the solubilities of a number of phosphates is given in the paper.—J. T. D.

Sulphur ; Temperatures of Inflammation of, and Slow Combustion of ——, *in Oxygen and in Air.* H. Moissan. Comptes rend., 1903, **137**, [15], 547—553.

Oxygen was very slowly led into melted sulphur kept at a constant temperature, by an almost capillary tube dipping several centimetres below the surface, so that before the oxygen came in contact with the sulphur at the open end of the tube, it had reached the temperature of the sulphur. Inflammation occurred at 282° C. When air was used instead of oxygen, the temperature of inflammation was 363° C. Oxidation of the sulphur was observed, however, at temperatures far below the inflammation point; and by sealing sulphur up with oxygen in tubes drawn out to a very fine end, and cooling the end below −186° C. (when the oxygen liquefied, but any sulphur dioxide formed solidified, and could be sealed off and examined after the oxygen had again evaporated), it was found that combination of sulphur and oxygen occurred at temperatures as low as 20° C. With air the same thing happened, though more slowly.—J. T. D.

Carbonic Acid in presence of Sulphites, Sulphides, and Organic Substances; Determination of ——. U. Stanek and J. Milbauer. XXIII., page 1209.

Persulphates; Determination of ——. C. Marie and L. J. Bunel. XXIII., page 1209.

Uranium and Uranyl Phosphate: Determination of ——, *by means of the Zinc Reducer.* O. S. Pulman. XXIII., page 1209.

English Patents.

Sulphuric Acid; Manufacture of ——, *by the Chamber Process.* R. H. Winslow, Salford, and B. Hart, Manchester. Eng. Pat. 26,916, Dec. 6, 1902.

The pipes or trunks connecting the lead chambers or towers used in the manufacture of sulphuric acid by the chamber process, are arranged to contain numerous vertical tubes, open to the air at the top and the bottom. The gases traversing the trunks circulate around these tubes and are cooled and mixed, the process being assisted by the interposition of baffle plates at right angles to the air tubes. Reference is made to Eng. Pat. 20,142, Oct. 9, 1901; this Journal, 1902, 1183.—E. S.

Alumina; Manufacture of Compounds of ——. H. Spence and P. Spence and Sons, Ltd., Manchester. Eng. Pat. 25,683, Nov. 22, 1902.

To solution of aluminium sulphate, ammonia sufficient to form ammonium sulphate with one-sixth of the sulphuric acid present, is added, and the solution, which should have while hot a sp. gr. of about 1·35, is cooled, when ammonia alum crystallises out. The mother liquor, containing basic aluminium sulphate $Al_2O(SO_4)_2$ is evaporated under reduced pressure to a sp. gr. of about 1·45 at about 70° C., and is then cooled, with agitation, to obtain the crystallised basic aluminium sulphate, which is readily soluble in water. Compare Fr. Pat. 331,836 of 1903, following these.—E. S.

Brine and other Liquids; Apparatus for Evaporating ——. J. Foster. Eng. Pat. 26,836, Dec. 5, 1902. I., page 1188.

Cyanides; Manufacture of ——, *and the Recovery of By-Products.* J. Grossmann and Grossmann's Cyanide Patents Syndicate, Ltd., Manchester. Eng. Pat. 36, Jan. 1, 1903.

See Fr. Pat. 331,331 of 1903; this Journal, 1903, 1130.
—E. S.

Liquid Air; Method of and Apparatus for the Production of ——. R. P. Pictet, Steglitz, near Berlin, and the Pictet Syndicate, Ltd., Manchester. Eng. Pat. 21,120, Sept. 29, 1902.

See Fr. Pat. 324,715 of 1902; this Journal, 1903, 628.
—T. F. B.

United States Patents.

Acid-Valve. J. Koch, West Berkeley, Cal. U.S. Pat. 740,762, Oct. 6, 1903.

The inlet and outlet pipes open into the valve body or casing, and one of these pipes is closed by a cup-shaped lift-valve provided with an operating stem. A cup-shaped "member" surrounding the stem is attached to the casing, and a seat, which is retained in position by a yoke, is provided above this member, to prevent the escape of acid. The parts subjected to much wear or strain are made of rigid metal, while the parts exposed to the acid are made of, or encased in lead.—R. A.

Zinc Peroxide; Process of Making ——. F. Elias, Philadelphia, Pa., Assignor to the Biogen Company, New York. U.S. Pat. 740,832, Oct. 6, 1903.

Barium peroxide is mixed with water, the finer particles of the hydrate formed are separated from the coarser particles, and are subjected to the action of a zinc salt of which the acid radicle is capable of forming a soluble salt with the barium. Compare U.S. Pat. 709,086, Sept. 16, 1902; this Journal, 1902, 1278.—E. S.

French Patents.

Sulphuric Acid; Manufacture of ——, *by the Aid of Insoluble Sulphates.* N. Basset. Fr. Pat. 331,897, May 9, 1903.

Calcium sulphate, mixed with carbon and tar, is made up into balls or the like, which, after drying, are heated in a retort, the gases from which, together with the gases of combustion, are washed, first with alkaline, and then with acidulated water, and the carbon dioxide is stored. The calcium sulphide produced, is subjected to the action of water and carbon dioxide, and the hydrogen sulphide evolved is burned by a current of air furnished by a special small gasometer. The resulting sulphur dioxide is led through a suitably heated oxidising column, packed with pieces of pumice or the like, with excess of air, and with oxygen, obtained by the successive oxidation and reduction of an alkali permanganate. The gases at their exit from the apparatus, traverse a water spray, and are condensed by suitable means.—E. S.

Alkalis and their Carbonates; Economical Manufacture of ——, *by Aid of Alkali Sulphates.* N. Basset. Fr. Pat. 331,898, May 9, 1903.

A saturated solution of an alkali chloride is heated in a closed earthenware vessel to 110°—120° C., and treated with dilute sulphuric acid, the dilution being such that the alkali sulphate formed may remain in solution. The hydrochloric acid gas evolved is collected in a compartmented tower, from the top of which water is sprinkled. The alkali sulphate solution is decomposed in a series of vessels by a solution of barium and calcium hydroxides, obtained by heating a mixture of barium carbonate and calcium carbonate with carbon, and treating the product with water. The caustic alkali solution thus obtained may be transformed into carbonate or bicarbonate by usual means. The barium and calcium sulphates, resulting from the decomposition of the alkali sulphate liquors, are mixed with carbon and calcined to form sulphides, from which, by the action of water and carbon dioxide, carbonates are again produced, whilst the hydrogen sulphide set free is converted by the processes described in the preceding patent (see the above abstract) successively into sulphur dioxide and sulphuric acid.—E. S.

Solid Sodium Percarbonate; Process for the Direct Manufacture of ——. H. Bauer. Fr. Pat. 331,937, May 12, 1903.

Hydrated sodium peroxide is mixed with a slight excess of liquid or solid carbon dioxide. The reaction takes place according to the equation—

$$Na_2O_2,8H_2O + CO_2 = Na_2CO_4 + 8H_2O.$$

The crystallised product is separated from the water set free in the reaction, and is dried. Compare Fr. Pat. 320,321, April 10, 1902; this Journal, 1903, 26.—E. S.

Cyanamide Salts; Process of Preparing ——. Cyanid-Ges. m. b. H. Fr. Pat. 328,031, July 22, 1902.

See Eng. Pat. 16,298 of 1902; this Journal, 1903, 551.
—T. F. B.

lluminium Sulphate; Manufacture of [*Basic*] ——. H. Spence. Fr. Pat. 331,836, April 16, 1903.

'o a partially basic solution of aluminium sulphate, of p. gr. 1·35 to 1·40, calcium carbonate (chalk), made into milk with water, is added with agitation, and the preipitate of calcium sulphate is quickly separated. The ltrate is concentrated up to about 1·45 sp. gr. at or near 0° C., and is then allowed to cool, crystallisation being itiated by addition of a crystal of the basic salt. The ystals of highly basic aluminium sulphate obtained are referably separated from their mother liquor by a centriigal apparatus. The crystals may be easily dried, and are eely soluble in water.—E. S.

xygen; Manufacture of ——. Cie. Française de l'Acétylène Dissous. Fr. Pat. 332,098, May 15, 1903.

MIXTURE is formed of some combustible matter, such as owdered metals, charcoal, hydrocarbons, cellulose, or the ke, with a large excess of a chlorate, preferably an alkali lorate and an indifferent substance, such as sand, and e mixture is placed in a suitable closed vessel, adapted to ve, when the mixture is ignited, oxygen under the desired essure. The described mixture may be prepared in cartlges or blocks, so as to yield at one charge any desired antity of oxygen.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

lass for Chemical Purposes; Classification of ——. F. Mylius. Zeits. f. Electrochem., 1903, **9**, [43], 847.

IE hydrolysis produced by the action of water on the ass at 18° and 80° C., is a reliable test of its quality. artz glass makes perfect vessels, and water contained these is not sensibly affected. For electric conductivity terminations, Jena glass No. 59^{III} is to be recommended. W. Hempel mentioned that ordinary green bottle glass sists the action of water better than white glass.—L. F. G.

venturin Glass; Green, Blue, and Red ——. Alexander. Sprechsaal, 1903, **36**, 1485. Chem.-Zeit., 1903, **27**, [85], Rep. 274.

IE following compositions were found to be best for enturin glass:—

——	Green.	Blue.
nd	100	100
lium carbonate	35	35
orspar	15	15
spar	30	30
rium carbonate	25	25
assium bichromate	12	10
nganese	7	5
alt oxide	..	0·5

For red aventurin glass the composition should contain rge quantity of flux and of lime, with little or no lead.
—A. G. L.

uartz Glass. H. Heraeus. Zeits. f. Electrochem., 1903, **9**, [43], 847—850.

CK crystal changes into a fusible glass at about 1,700° C., l vacuous quartz vessels can be heated to 1,350° C. hout suffering deformation. Quartz glass is worked up a temperature of about 2,300° C., and the intense heat the flame causes a loss of silica through volatilisation. The sp. gr. of quartz glass is 2·22, and its hardness is ermediate between that of orthoclase and rock crystal. coefficient of expansion is $\frac{1}{17}$th of that of platinum. It is fectly transparent to the ultra violet rays, and if a highsion current is sent through a vacuum tube made of rtz glass, ozone is produced outside the tube. The ractive index for D is 1·4585, and the dispersion for -F is 0·00676.—L. F. G.

Alkalis; Action of ——, *on Glass and on Paraffin.* F. Jones. XXIV., page 1212.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Clay; The Artificially Produced Increase in Strength of ——. H. Seger and E. Cramer. Chem. Ind., 1903, **20**, [26], 512.

THE authors have made experiments to test the correctness of Acheson's statement (this Journal, 1903, 496) that the addition of 2 per cent. of tannin to clay increases the strength of the air-dried material by 350 per cent. and of the burnt bricks by 50 per cent., whilst diminishing the shrinkage in drying. They found that Acheson's claims in this respect are unfounded. They determined the strength of dry briquettes made from 2 parts of sand, 1 part of fresh kaolin, and of similar briquettes in which the kaolin used had been stored in a moist condition for three weeks, alone, or with the addition of 2 per cent. of tannin, starch, or dextrin. The authors will now make further tests after 3 months storing. The fresh kaolin briquettes broke at 0·56 kilo. per sq. cm., the stored kaolin at 0·92, those treated with tannin at 1.01, with starch at 0·75, and with dextrin at 1·71. The shrinkage increased, instead of diminishing, with the increase in strength, being 4·71 per cent. with the fresh kaolin and 7·39 with the dextrin briquettes.—A. G. L.

Slag-Portland Cement. C. von Schwarz. Stahl u. Eisen, 1903, **23**, 1044. Chem.-Zeit., 1903, **27**, [85], Rep. 275.

BRIQUETTES made from slag-cement and mixed with 3 parts of sand, broke after seven days at 26·88 kilos. per sq. cm., and after 28 days at 38·25, the crushing-tests giving 270 and 375·75 kilos. per sq. cm. respectively. Concrete from the year 1894 made with 3 parts of sand and 3 parts of limestone for 1 part of slag-cement gave tensile-tests of 31·80 and 22·48, and crushing-tests of 295 and 318 kilos. per sq. cm. respectively. Towards abrasion the resistance of this concrete was about the same as that of granite. A ceiling of slag-cement was found capable of supporting a load 40 per cent. greater than that borne by Portland cement. White as well as grey iron slag may be used in making the cement, the higher content of oxides of manganese and iron in the former rendering it possible to burn the cement at a lower temperature and consequently effect a saving in fuel, besides rendering the cement more resistant towards the action of the sulphates in sea-water.—A. G. L.

ENGLISH PATENTS.

Refractory Material; Improved ——. W. W. Hollings, Brierley Hill, and J. S. Hollings, Wrexham. Eng. Pat. 22,898, Oct. 21, 1902.

THE material consists essentially of a "double mineral carbide," more usually termed oxycarbide, such as any of the silicon oxycarbides, used either alone or mixed with any suitable binding agent, such as fireclay, magnesite, or tar. The material is neutral to both acid and basic slags.
—A. G. L.

Refractory Articles of Manufacture. S. L. Mershon, Montclair, N.J. Eng. Pat. 18,284, Aug. 24, 1903. Under Internat. Conv., Aug. 29, 1902.

THE material, which is to be used for building-blocks, crucibles for steel making, &c., is made from any refractory silicate which is found in mass in a fibrous or interlocked foliated structure, but especially from silicate of magnesia, such as the talc found in St. Lawrence Co., N.Y. The natural rock is either carved or abraded to the desired shape and then vitrified by the action of successive graduated heats, or else the rock is first vitrified and then fashioned to the required form. Vitrified material made in this way may, after being polished, be heated to a white heat and cooled without losing its polish.—A. G. L.

Fireproof Materials; Production of ——. E. W. Engels, Düsseldorf, Germany. Eng. Pat. 25,221, Nov. 17, 1902.

MATERIALS are rendered fireproof by the application of a coating of a moist mixture of carborundum, and a suitable

binding medium, such as clay, gypsum, borax, alkali silicates, sulphate and borate of ammonium, &c. Compare U.S. Pat. 731,458 of 1903; this Journal, 1903, 952; also Eng. Pat. 11,567 of 1901; this Journal, 1902, 1031; also Eng. Pat. 4166 of 1900; this Journal, 1900, 902.
—W. C. H.

Kiln [for Bricks, Tiles, &c.]; Continuous ——. W. Ingham, Harrogate, B. Langton, Leeds, and L. Ingham, Leeds. Eng. Pat. 23,665, Oct. 29, 1902.

THE kiln consists of a series of chambers, with combustion flues on each side, and race-holes in the division walls between the chambers. Under the chambers are cross-flues, controlled by dampers, and running into the main flue connected with the chimney; by means of these dampers any chamber can be put out of the series as required, the race-holes in the division walls being similarly controlled by dampers. A series of openings is provided in the roof of the kiln, for firing the chambers.—W. C. H.

Bricks from Slate Waste and Lime; Manufacture of ——. L. Klefisch, London. From J. Klefisch, Cologne. Eng. Pat. 17,812, Aug. 17, 1903.

WASTE slate and lime are broken up, ground, and sifted, and mixed in suitable proportions, moistened with water, and pressed into moulds. The moulded articles, when set, are subjected to the action of moist, heated air, at a temperature slightly below 100° C., the moisture being derived by evaporation either from the bricks or from a vessel placed in the heating chamber. By this process it is claimed that a superficial layer of silicate of lime is formed on the articles. The articles may be further exposed to the open air for a time, and to a dry heat of over 100° C. in a chamber.—W. C. H.

Portland Cement; Manufacture of ——. H. K. G. Bamber, Greenhithe, Kent. Eng. Pat. 22,735, Oct. 18, 1902.

THIS is a process for conditioning and regulating the time of setting of Portland cement, and consists in blowing steam, which may be superheated, into the tube mill, or other mill of that class, during the process of grinding.
—W. C. H.

FRENCH PATENTS.

Wood; Apparatus for the Impregnation and Staining of ——. J. Pfister. First Addition, of May 1, 1903, to Fr. Pat. 318,249, Jan. 30, 1902.

THE vessel containing the impregnating liquid is provided with a funnel-shaped collar which reaches from the top edges almost to the bottom of the receptacle. Into this collar the trunks of trees of very different diameter may be made to fit tightly by simply lowering them to the required point. On now applying pressure to the liquid, it will mount up into the wood.—A. G. L.

Bricks, Artificial Stone, &c.; Manufacture of ——. F. W. Jenkins. First Addition, of May 9, 1903, to Fr. Pat. 329,346, Feb. 13, 1903. (See this Journal, 1903, 998.)

SAND, tailings, or fine gravel (97 per cent.) is intimately mixed with molasses (3 per cent.), which may first be diluted, and the resulting mixture is moulded under a pressure depending on the purpose to which the finished product is to be put, and then heated gradually, being finally kept at a temperature of 220° to 320° C. for 4 to 10 hours, after which it is allowed to cool slowly. Bricks made in this way are claimed not to break with a load of 300 kilos. per sq. cm., and to form a good insulating material for electrical purposes.—A. G. L.

Asphalt; Artificial ——. J. A. Soriano. Fr. Pat. 332,051, May 13, 1903.

ORDINARY bitumen is mixed with refined bitumen (6 per cent.) and manjack (Trinidad) bitumen (10 per cent.). The mixture is melted, powdered millstone grit (64 per cent.) is added, the whole heated for several hours, moulded, and allowed to cool.—A. G. L.

Portland Cement; Manufacture of ——. F. C. W. Timm Fr. Pat. 332,243, May 20, 1903.

THE raw materials are mixed, formed into bricks, and burn at a comparatively low temperature in a reverberator furnace, before being burnt to cement in a rotary or fixe kiln, the whole or a part of the carbon dioxide and wate being removed in the first furnace with a small expenditur of fuel.—A. G. L.

X.—METALLURGY.

[Gold] Telluride Ores; Treatment of ——, by Dry Crushing and Roasting at Kalgoorlie, Western Australia [Details of Costs.] W. E. Simpson. Inst. Min. an Metall. Paper read Oct. 15, 1903. 18 pp.

THE following table shows the details of costs per ton o telluride gold ore at three mines, of which the first thre columns refer to the dry (roasting) process, and the fourt column to the wet (Diehl) process :—

Mine	Boulder Main Reef.		Great Boulder Proprietary.	Lake View Consols
Process	Dry.		Dry.	Wet.
Value of Ore	13 Dwt.		28 Dwt. 3 Grains.	16 Dwt. 17 Grai
Tons treated	1,655.	1,750.	9,100.	7,446.
Ore Extraction, per Cent.	92·3.		92·2.	90·5.
	s. d.	s. d.	s. d.	s. d.
Rock-breaking	0 7·90	0 6·32	1 5·37	0 5·7
Transport to mill	..	..	..	0 7·4
Milling	4 1·02	3 8·76	3 2·91	2 7·4
Concentration	..	..	..	0 9·9
Roasting	3 6·55	3 6·31	3 8·83	0 4·8
Grinding and amalgamation / Classifying	3 0·06	2 6·17	1 6·88	1 11·5
				0 8·21
Agitation with cyanide	2 6·25	2 5·18	2 4·98	5 7·0
Filling, drying, and emptying presses	2 0·65	2 2·75	2 1·58	1 10·1
Disposal of residue	1 0·30	1 0·28	0 11·41	0 7·1
Precipitation and clean-up	0 4·95	0 4·62	0 2·92	0 4·4
Proportion of assaying, sampling, &c.	0 1·04	0 1·03	0 4·01	0 2·5
Supervision, &c.	*	*	0 10·55	*
	17 4·72	16 5·42	16 11·44	16 2·8

* In these instances a portion of the charge is distributed an the remainder charged to general expenses account.

See also this Journal, 1903, 911, 999, 1000, and 1132.
—W. G. M.

Copper; Calculation of Production and Loss in the Manu facture of ——. E. Juon. Oesterr. Zeits. Berg.-Hütt **51**, 411—414; Chem. Centr., 1903, **2**, [14], 810.

THE author has investigated the causes of the grea discrepancy between the analytical results obtained at th mine and at a copper works at Bogoslowsk, Russia. I was found that in the blast-furnace, 3·72 per cent. of th copper was lost in the form of dust and 3·29 per cen passed into the slag. In the Bessemerising process, 11·2 per cent. of the copper was lost, and in the refining furnac 1·98 per cent. The dust from the building in which th smelting was carried on contained 18·12 per cent. o copper, that from the roof of the Bessemerising buildin 48·80—73·46 per cent., and that collected outside th works, 3·32 per cent. of copper.—A. S.

Aluminium Alloys; Light ——. J. W. Richards. Eng. and Mining J., 1903, **76**, 508.

FOR the preparation of aluminium alloys, the aluminiu is melted, preferably in a magnesia-lined crucible, and th other metal stirred in. The melt should never be heate above cherry-redness, and the alloys should be allowed t cool before being poured. Alloys of aluminium with chromium, manganese, copper and nickel, silver, tungsten, German silver, magnesium, and zinc are being used commercially. The best chromium alloy is one containing 2·3 per cent. of chromium. Aluminium-chromium alloys resemble self-hardening steels in that they retain their hardness when heated and annealed. The hardest light aluminium alloy yet produced is one containing copper, nickel, and manganese, the last-named metal being added in the form of a rich aluminium-manganese alloy produced in the electric furnace. Commercial "nickel-aluminium" alloys are really alloys containing both nickel and copper; when suitable for rolling, they contain from 2 to 5 per cent. of nickel and copper together. For malleable aluminium-zinc alloys, up to 15 per cent. of zinc can be used, and for castings, up to 33 per cent. The alloy containing 15 per cent. of zinc can be rolled and drawn. The alloy containing 33 per cent. of zinc, known as "Sibley casting alloy," is very rigid, but is not so resistant to shock as the alloys containing less zinc.—A. S.

Manganese in Steel; Determination of ——. J. Malette. XXIII., page 1209.

Galena and Copper Pyrites; New Method of Decomposing —— *[for Analytical Purposes]*. C. Boucher. XXIII., page 1209.

English Patents.

Metallic Alloy or Metal; Manufacture of a New or Improved ——. T. W. Just, A. D. Jenkins, and W. F. L. Frith, all of London. Eng. Pat. 23,644, Oct. 29, 1902.

The alloy consists mainly of copper, nickel, and zinc, with small proportions of phosphorus (preferably added as "phosphor copper") iron, lead, tin, and aluminium, and with a very small proportion of vanadium, added as ammonium vanadate, or of palladium, added as palladium-sodium chloride, or of both. These ingredients are stated to give a white alloy. When it is desired that a golden-coloured alloy shall be formed, additional quantities of copper and tin, with brass, silver, and a very small proportion of a suitable form of arsenic are added to the first-named composition. Details of the processes for forming the alloys are described. Compare Eng. Pat. 9696, April 26, 1902; this Journal, 1903, 498.—E. S.

Furnaces [Ingot]; Regenerative Gas Reheating ——. F. Siemens, London. Eng. Pat. 25,057, Nov. 14, 1902.

The furnace is arranged to be heated by one or more U-shaped or horse-shoe flames, reversible in direction, so that the temperature of the furnace increases gradually along its bed from the charging to the withdrawing end. The withdrawing end may be partially separated from the charging end by a vertical transverse partition, which is provided with openings for the passage of the ingots, &c. In another form, the furnace is divided through part of its length by a longitudinal partition, and the U-flame from the hot-end of the gas furnace heats the whole of the chamber, the flame passing alternately in opposite directions around the partition at that end. In this case, a double row of ingots is fed into the furnace, such ingots being extracted alternately through doors in the sides.—R. A.

Zinc and other Sulphides; Extraction of ——, *from their Ores.* G. C. Marks, London. From G. D. Delprat, Broken Hill, New South Wales. Eng. Pat. 26,280, Nov. 28, 1902.

See U.S. Pat. 735,071 of 1903; this Journal, 1903, 1001.
—T. F. B.

Mattes and Raw Metals; Treatment of —— *in Metallurgical Hearth Furnaces.* A. L. A. Concin, Paris. Eng. Pat. 26,466, Dec. 1, 1902.

Mattes and raw metals, such as crude copper, nickel, tin, lead, or cast-iron, are melted on a hearth furnace, and exposed, by means of blast pipes distributed around the bath, to the oxidising action of steam and air, carrying a solid oxidising agent formed of the finely-divided oxides of the metals to be treated, with a powdered flux and hydrocarbons for increasing the temperature of the bath by their combustion. Compare Eng. Pat. 21,391 of 1902; this Journal, 1903, 1133.—E. S.

Materials [Metals]; Process of and Apparatus for Subjecting ——, *to the Action of Air or other Gases.* C. E. Mark, Chicago. Eng. Pat. 4537, Feb. 26, 1903.

See U.S. Pat. 728,261 of 1903; this Journal, 1903, 746.
—T. F. B.

United States Patents.

Precious Metals; Apparatus for Extracting ——. H. H. Thompson, Churchville, N.Y. U.S. Pat. 741,180, Oct. 13, 1903.

The apparatus comprises a receptacle having its upper portion surrounded by an overflow compartment provided with an outlet. The receptacle has a conical bottom with a central outlet, and has suspended within it loosely-mounted "diamond-shaped" agitating arms, each carrying a depending chain, the arms gradually decreasing in length from the centre outwards, and "adapted to be retained in their operative position when rotated in one direction, and to assume an inoperative position when moved in the opposite direction." Screened nozzles communicate through the bottom with the interior of the receptacle, and are connected to supply-pipes, which enter a coupling provided with a trap. A casing is mounted on the coupling, forming a compressed-air chamber in communication therewith. There are means for forcing through the pipes and nozzles entering the bottom of the receptacle, cyanide solution and compressed air conjointly, and water separately to each nozzle of the series. There are also means for exhausting the solution from the receptacle.—E. S.

Cyanide Solutions; Process of Treating [Regenerating] ——. W. H. Davis, Boulder, Col., Assignor to A. L. Collins, Denver, and F. L. Bosqui, Telluride, Col. U.S. Pat. 741,231, Oct. 13, 1903.

To cyanide solutions, during or after contact with the ore, an alkali hydroxide is added, and the solution is subjected to the action of an alternating electric current, in order, by "raising the osmotic pressure, to dissociate the double salts in the solution, causing precipitation of the hydrates of the base metals, and to combine the freed cyanogen with the alkaline hydrates, to cause simultaneous regeneration of the cyanide in the solution, and the clarifying of the latter."
—E. S.

Quicksilver [Mercury] Ores; Furnace for Calcining ——. J. M. Cutler, Ukiah, Cal. U.S. Pat. 740,539, Oct. 6, 1903.

An outer horizontal rotating cylinder, having a number of spirally-arranged flanges extending throughout its length, encloses a concentrically-supported inner cylinder, opening into the firebox at one end, and continued at the opposite end into a smoke-stack extending upwards through an ore-bin, which bin opens into the rotating outer cylinder. The inner cylinder has a number of longitudinally-extending flanges on its outer surface. There is a hot-air pipe within the smoke-stack communicating with the interior of the outer cylinder, at the opposite end of which is a fume-escape pipe. The ore-bin has a sloping bottom with grooves leading to a pipe below, for the escape of the metallic mercury which condenses within the bin.—E. S.

Furnace; [Ore] Roasting ——. C. H. Repath and F. F. Marcy, Anaconda, Mont. U. S. Pat. 740,589, Oct. 6, 1903.

The furnace has a series of superposed hearths, which are formed with apertures at the centre and periphery alternately. A central vertical stirring-shaft is provided with a series of radial stirring-arms extending into the several hearths, these arms carrying special rakes for forcing the material alternately inwards to the central apertures and outwards to the peripheral apertures. Stationary spouts are located between the hearths, and are arranged to direct the ore from each hearth to the hearth next below, in such a manner that the ore is protected from the influence of the draught.—R. A.

Ore-Reducing Furnaces; Means for Utilising Oil or Gas in ——. W. Kemp, Assignor to M. P. Freeman and B. L. Worthen, all of Tucson, Ariz. U.S. Pat. 741,504. Oct. 13, 1903.

The combustion chamber is situated in the tuyère opening of an upright furnace, in communication with a wind-box, from which air is supplied under pressure directly to the chamber around the fuel tubes. An annular burner in the combustion chamber has a fuel conduit and an internal air conduit, adapted to produce a flame supplied with air under pressure both in the interior of the flame and externally. Means are provided for supplying gaseous fuel to the burner; and there is an air conduit in communication with the wind-box.—E. S.

Ore-Roasting Furnace. J. Roger, Denver, Col. U.S. Pat. 741,549, Oct. 13, 1903.

In a circular furnace, a central pillar has a stationary ring near its lower portion, against the under side of which adjusting screws bear. A stationary bearing resting on the ring is provided with a depression constituting an oil-well, in which an adjustable sleeve, mounted on the pillar and carrying rabble mechanism and a rotatable water-trough, works. Water-feed pipes connect the trough with the rabble arms, and water-return pipes connect with the latter, and lead to a point of discharge. The outer parts of the rabble arms are supported by rods from the sleeve, so as to be independent of other means of support. The oil-well is sealed against the entrance of extraneous matters.—E. S.

Sulphide Ores; Treatment of ——. A. M. G. Sébillot. Paris. U.S. Pat. 740,701, Oct. 6, 1903.

The ores are treated in a closed vessel with sulphuric acid at a temperature above its boiling point, the excess of the acid used being recovered. The sulphated ore is calcined at 700° C., to "dissociate" the ferrous sulphate, and the calcined ore is lixiviated. Compare Eng. Pat. 20,077, of 1901; this Journal, 1902, 1399.—E. S.

French Patents.

Precious Metals; Process for the Recovery of ——. H. L. Sulman and H. F. Kirkpatrick-Picard. Fr. Pat. 332,140, May 16, 1903.

See Eng. Pat. 27,360 of 1902; this Journal, 1903, 1051.
—T. F. B.

Vanadiferous Ores and Products; Process of Treating ——. H. L. Herrenschmidt. First Addition, dated May 9, 1903, to Fr. Pat. 328,421 of Jan. 10, 1903. (See this Journal, 1903, 953.)

The processes given in the main patent for the reduction of vanadium oxides obtained as there described, are stated to be applicable to commercial vanadic acid, provided that in this case iron, not being present, should be added, preferably in the state of oxide, before effecting the reduction. In the cases given in the cited patent, the addition of iron before the reduction is unnecessary, since it is already present in the solutions treated. These statements apply equally when any other metal, as nickel, copper, &c., is used instead of iron to obtain a corresponding vanadium alloy.—E. S.

Furnace for Roasting Ores. The Nichols Chemical Co., U.S.A. Fr. Pat. 332,065, May 14, 1903.

The furnace comprises a series of superposed stages furnished with openings and hoppers for the introduction of the ores, preferably alternately central and peripheral. Rotating rakes operate on each hearth to discharge the ore through hoppers to the hearth immediately below. The hoppers may, according to one modification, be so supported as to turn with the rakes and discharge the ore through openings, instead of being stationary.—E. S.

Metal Sheets; Apparatus for Galvanising ——. Davies Brothers and Co., Ltd., England. Fr. Pat. 332,222. May 19, 1903.

The invention refers to an apparatus for facilitating the passage of metal sheets through a bath of molten zinc. Rotating wheels act in combination with rollers, with the aid of certain described devices, whereby the plates are dried whilst being led into the apparatus, are immersed, and then withdrawn in the coated state.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Nitrous Anhydride; Direct Synthesis of ——. D. Helbig. VII., page 1193.

United States Patent.

Cyanide Solutions; Process of Treating [Regenerating] ——. W. H. Davis, Assignor to A. L. Collins and F. L. Bosqui. U.S. Pat. 741,231, Oct. 13, 1903. X., page 1197.

French Patent.

Bricks, Artificial Stone, &c. [Insulating]; Manufacture of ——. F. W. Jenkins. Addition, of May 9, 1903, to Fr. Pat. 329,316, Feb. 13, 1903. IX., page 1196.

(*B.*)—ELECTRO-METALLURGY.

Steel; Cost of Making ——, *by Kjellin's Method.* Electrochem. Ind., Sept. 1903. Eng. and Mining J., 1903, **76**, 499.

In the Kjellin electric furnace at Gysinge, Sweden, a charge of about 1,000 kilos. can be smelted. The steel produced contains carbon, 0·95—1·45; silicon, 0·35—0·74; manganese, 0·33—0·49; phosphorus, 0·011—0·011; and sulphur, 0·010—0·015 per cent. The cost of the furnace, including the electrical plant, but not the source of power, is about 4,020 dols. The cost of production of 1,000 kilos. of steel is as follows:—Power (1,320 h.p.-hours), 5·00 dols.; pure charcoal-iron and soft iron for the charge, 32·50; mould, 0·25; repairs and brickwork, 2·08; depreciation and interest, 5·56; and wages, 2·50; total (not including general expenses, royalties, &c.), 47·89 dols. (See also this Journal, 1902, 1048).
—A. S.

Steel Making; Heroult's Process of Electric ——. P. L. T. Heroult. Electrochem. Ind., Sept. 1903. Eng. and Mining J., 1903, **76**, 508.

A charge of scrap iron mixed, if desired, with pig iron, is melted in the electric furnace (see this Journal, 1902, 1237; 1903, 217, 426), or is poured into the furnace from a ladle. If molten metal be introduced, it should be superoxidised or overblown, and free from slag. The charge is covered with an artificial slag and heated by means of the electric current. By pouring out the first slag and introducing new fluxes, the metal can be washed free from impurities, whilst, by addition of carbon, &c., complete deoxidation can be attained. The steel produced is stated to be very pure and equal to the best grade of crucible steel. About 1500 tons of steel have already been produced by Heroult's process.—A. S.

English Patent.

Iron and other Metals; Reduction of ——, *from their Ores.* B. J. B. Mills, London. From C. S. Bradley, New York, U.S.A. Eng. Pat. 17,434, Aug. 11, 1903.

Powdered hæmatite and iron pyrites, in the proportion of about two parts of the former to one part of the latter, by weight, are mixed, and the mixture is heated in an electric furnace, preferably by use of an alternating current. The reactions take place according to the following equations. $FeS_2 = FeS + S$; and $3FeS + 2Fe_2O_3 = 7Fe + 3SO_2$. A suitable flux may be used. The sulphur dioxide formed is recovered, and the molten iron is tapped from the furnace. The process is applicable to the reduction of ores of metals of the iron and chromium groups only. Alloys of any of these metals may be obtained by suitable additions made in the process.—E. S.

United States Patent.

Ores; Treating ——. C. E. Baker and A. W. Burwell, Cleveland, Ohio. U.S. Pat. 741,439, Oct. 13, 1903.

RES containing a base metal or metals and a metalloid, are sufficiently heated in a current of dry chlorine to volatilise he metalloid as a chloride. The metal chlorides formed re dissolved out of the residue. In the case of ores conaining copper and nickel, after the separation of the netalloid as described, the chlorides dissolved out of the esidue are converted into sulphates, from the solution of which the copper, and after neutralisation, the nickel are lectro-deposited. In the presence of iron, the electroleposition of the nickel is effected with a current density nsufficient to deposit the iron. Compare U.S. Pat. 739,374 f 1903; this Journal, 1903, 1134.—E. S.

French Patents.

Electrolytic Deposits; Process of Obtaining ——. Soc. Anon. Le Carbone, France. Fr. Pat. 331,930, May 11, 1903.

x order to avoid porous deposits of metal, the electrolyte s brought into contact with the cathode by means of a orous material (felt, cloth, &c.) impregnated with the lectrolyte. The anode is made in the form of a rotating rum, plate, or perforated tube, covered with porous material nd arranged so that the latter is supplied and impregnated ith the electrolyte. The cathode is arranged to press gainst the porous material, and, if necessary, may be kept movement so as to bring all parts of the surface to be lated into contact with the impregnated material.—B. N.

lectro-deposition of "Metals"; Impts. in the so-called "Casks for the ——." J. G. Robergel, France. Fr. Pat. 331,953, May 12, 1903.

REVOLVING cask of wood carries the articles to be plated, ich as spokes of bicycle wheels, and is partly immersed in e electrolyte. The dimensions of the cask are such as to revent the rods from taking a position at right angles to e direction of rotation. Oblique perforations permit of a irculation of the electrolyte from the outside to the inside f the cask, but the axes of perforation are such that the ods do not engage in the orifices. Metallic plates are ound longitudinally to the inside of the cask, each plate eing connected by conductors to a commutator outside the ath in such a way that only the immersed plates pass the ectricity. Adjacent conductors are connected to opposite ds of adjacent plates, so that the current passes out from e plate at the end adjacent to the commutator, and from e next plate at the end away from the commutator, thus suring a uniform distribution of electricity inside the sk. Rows of pins, for moving and stirring the rods to be ated, are fixed in the cask between the metallic plates, and, ensure better electrical contact between the rods, the ns and plates may be electrically connected.—B. N.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

live Oils; Removing "Margarin" from ——. E. Bertainchand. Seifensieder-Zeit., Augsburg, **30**, 507, 527. Zeits. angew. Chem., 1903, **16**, 995.

order to increase the value (as edible oils) of olive oils th a high solidifying point, the author proposes to separate om them about 10 per cent. of their "margarin." The tered oil is cooled to 6°—8° C., and then centrifugalised an apparatus plated on the inside with tin, and lined th filter cloths. It is stated that the acidity of the oil is t increased, and that the centrifugalised product is equal value to Bari olive oil, and at the same time cheaper. e residue in the centrifugal apparatus melts at 20° C., d can be used for the manufacture of soap.—A. S.

lmon Oil. Bruno de Greiff. Chem. Rev., 1903, **10**, 223.

LMON oil, which is produced in large quantities in British lumbia, is a clear, bright golden-yellow oil, with a mild hy odour and a comparatively pleasant taste. It has the following characters:—Sp. gr. at [illegible] C., 0·92586; saponification value, 182·8; Reichert-Meissl value, 0·55; Hehner value, 95·02; iodine value, 161·42; acid value, 4·98; iodine value of liquid fatty acids, 107·4; unsaponifiable matter, 1·4 per cent.—A. S.

Sesamé Oil; Colour Reactions of ——. H. Kreis. XXIII., page 1210.

Butter; Conversion of ——, *into a Tallowy Product, under the Influence of Light.* A. Lidow and Dshor. XVIII. A., page 1205.

Barringtonia Speciosa, Gaerth; Seeds of ——. W. P. H. van den Driessen-Mareeuw. XX., page 1207.

Glycerin in Wine; Determination of ——, *by means of the Iodide Method.* S. Zeisel and R. Fanto. XXIII., page 1211.

Methoxyl and Glycerin Determinations. M. J. Strikar. XXIII., page 1211.

United States Patent.

Grease; Apparatus for Separating ——. E. R. Edson, Cleveland, Ohio, U.S.A. U.S. Pat. 739,998, Sept. 29, 1903.

The grease-containing material is heated by means of a coil in the lower part of the inner chamber of the apparatus, which is also provided with means for the introduction of air under pressure and with stirring arms on a rotating shaft. The separated grease is congealed by means of a surrounding cooling jacket, and is carried over into a communicating water tank by means of water entering at the lower part of the chamber. A valved tube at the bottom of the apparatus communicates with the exterior.
—C. A. M.

French Patents.

Lubricating Product termed "Oleisonine"; Manufacture of a ——. A. Guillemaud. Fr. Pat. 331,858, May 8, 1903.

A mixture of an industrial oil with bran, ether, and yellow ochre is formed into a consistent product. Claim is also made for a device for applying this lubricant to ropemachine spindles.—C. A. M.

Wool Scouring and Fat Recovery; Machine for ——. J. M. J. Baudot. Fr. Pat. 331,956, March 23, 1903. V., page 1192.

Volatile Solvents; Recovery of the Vapours of ——, *in the Treatment of Perfumes and Fatty Matters.* J. Febvre. Fr. Pat. 332,087, May 18, 1903. XX., page 1207.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

English Patents.

White Lead; Process and Apparatus for the Manufacture of ——. W. Oliphant, Glasgow, and H. S. Elworthy, London. Eng. Pat. 22,663, Oct. 18, 1902.

The apparatus consists of a rotating vessel supported on trunnions, one of which is hollow, to allow passage of air and gases, the pressure of which is regulated by a special device. The vessel is charged with litharge or other lead oxide, a suitable quantity of water, and a small proportion of acetic acid, or of lead or ammonium acetate, and pure carbon dioxide is forced in under considerable pressure. Instead of lead oxide, finely-divided lead may be placed in the vessel, with an acetate as in the previous case, and steam, or steam and air, are forced in, and subsequently carbon dioxide. Reference is made to Eng. Pat. 25,007, Oct. 28, 1897; this Journal, 1898, 908.—E. S.

Soot or Lampblack from Tar and other Carbonaceous Substances; Process of Manufacturing ——. G. Wegelin. Eng. Pat. 13,837, June 22, 1903. III., page 1190.

Pigments ; Processes of Making ——. W. J. Armbruster and J. Morton, St. Louis. Eng. Pat. 17,784, Aug. 17, 1903.

See U.S Pat. 737,056 of 1903 ; this Journal, 1903, 1055. —T. F. B.

Pigments ; Compositions of Matter to be used for ——, *and Process of Making the Same.* W. J. Armbruster and J. Morton, St. Louis. Eng. Pat. 17,785, Aug. 17, 1903.

See U.S. Pat. 737,055 of 1903 ; this Journal, 1903, 1055. —T. F. B.

United States Patents.

Pigments ; Process of Making ——. W. J. Armbruster. St. Louis. U.S. Pat. 740,072, Sept. 29, 1903.

A solution of 1 mol. of barium sulphide is added to a solution of 1 mol. of an alkali sulphate and then a solution of 1 mol. of zinc sulphate is added, the precipitate filtered off, and the solution used again.—T. F. B.

Pigments : Process of Making ——. W. J. Armbruster, St. Louis. U.S. Pat. 740,073, Sept. 29, 1903.

A pigment composed of zinc sulphide and barium carbonate is made by precipitating a solution of barium sulphide with an alkali carbonate, and adding a solution of a zinc salt (*e.g.* the sulphate).—T. F. B.

French Patents.

Colour [*Pigment*] ; *Process of Manufacturing* ——. W. J. Armbruster and J. Morton. Fr. Pat. 332,095, May 15, 1903.

See U.S. Pat. 731,152 of 1903 ; this Journal, 1903, 874. —T. F. B.

Colour [*Pigment*] ; *New* ——, *and its Manufacture.* W. J. Armbruster and J. Morton. Fr. Pat. 332,096, May 15, 1903.

See U.S. Pat. 731,153 of 1903 ; this Journal, 1903, 874. —T. F. B.

Lakes ; Manufacture of Monazo Dyestuffs for Production of Red ——. Act.-Ges. für Anilinfabr. Fr. Pat. 332,145, May 16, 1903. IV., page 1192.

Adhesive Material ; Production of ——. L. Préaubert and G. A. Thubé. Fr. Pat. 331,805, May 7, 1903.

This consists of an emulsion of oil, fat, varnish, hydrocarbons, waxes, or other substances immiscible with water, in an aqueous solution of casein obtained by the action of an alkali or otherwise. Various applications of this product are also claimed, *e.g.*, in painting, printing, and the preparation of solid oil paints.—C. A. M.

(*C.*)—INDIA-RUBBER.

Caoutchouc ; Chemistry of ——. C. O. Weber. Ber., 1903, **36**, [12], 3108—3115.

Experiments are described in the paper which were made on the spot with freshly-collected *Castilloa elastica* milk.

On diluting a rubber milk, a homogeneous liquid is not obtained, but a large number of nodular aggregates are dispersed throughout the liquid.

Fresh *castilloa elastica* milk can be boiled without coagulation, although very rich in albuminous matter, and the lumpy liquid obtained by diluting the milk with water becomes perfectly homogeneous on boiling.

Tannic acid cannot be present in rubber latex, as frequently stated, since albumin is readily and completely precipitated by it, and rubber latex is at once coagulated. The dark green coloration observed on adding salts of iron to the latex is due to a glucoside, a compound of a crystallisable sugar (dambonite). The globules contained in rubber milk are shown by the microscope to consist of an envelope of albuminous matter containing a substance possessing the fluidity of an oil. On shaking the milk with ether, an ethereal solution of the mother substance of india-rubber is obtained and an aqueous layer. Since rubber itself is absolutely insoluble in ether, the oily liquid cannot be a solution of rubber. It is probably a substance capable of transformation into rubber by molecular change, *e.g.*, polymerisation. The author obtained 43 per cent. solutions of this liquid which were perfectly limpid, and filtered with ease, whereas 43 per cent. rubber solutions would be semi-solid. These solutions can be kept several weeks in a cool, dark place without apparent change, but sooner or later they become viscous, and once the change commences, it proceeds rapidly, and they are converted into tough water-white jellies. If the ether is allowed to evaporate, a colourless, glassy, and fairly transparent substance is obtained possessing all the properties of a high-class rubber.

The ethereal solutions do not polymerise on boiling, but on adding to them ether containing hydrochloric acid or a trace of formic acid, a very rapid rise of temperature takes place and polymerisation ensues.

The rubber so obtained yields 3 per cent. of resinous matter to acetone, and is composed of 87·89 per cent. of carbon and 11·8 per cent. of hydrogen. No doubt therefore remains that india-rubber, as such, is not pre-existent in the latex, but is formed by polymerisation from the thin oily liquid emulsified in it.—J. K. B.

Rubber of Urceola Esculenta from Burma. Board of Trade J., Oct. 15, 1903, Supplement. Imp. Inst. Bull. No. 3, 120.

A sample of rubber from *Urceola Esculenta*, from Rangoon, was very hard and showed no stickiness ; it was slightly porous and contained a large amount of vegetable matter. Analysis gave moisture, 6·9 per cent. ; resin, 7·0 per cent. ; caoutchouc, 76·2 per cent. ; and dirt, 9·9 per cent. (including ash, 1·7 per cent.). The rubber showed good elasticity and tenacity, and was valued as similar to Touquin rubber at 2*s.* to 2*s.* 1*d.* per lb.—T. F. B.

India-Rubber and India-Rubber Articles ; Analysis of ——. C. O. Weber. XXIII., page 1211.

United States Patents.

Gum [*Rubber*] ; *Art of Extracting* ——. W. A. Lawrence, New York, U.S.A., Assignor to Continental Rubber Co., Jersey City, N.Y. U.S. Pat. 741,256, Oct. 13, 1903.

Plants containing rubber or rubber-like gums are treated with a hydrocarbon capable of dissolving the rubber together with resins. A portion of the solvent is then evaporated, and the residual solution is treated with a hot solution of sodium hydroxide or other alkali, which precipitates the rubber, but retains in solution the resin, together with the remainder of the hydrocarbon solvent.—M. J. S.

Gum [*Rubber*] ; *Apparatus for Extracting* ——. W. A. Lawrence, New York, U.S.A., Assignor to Continental Rubber Co., Jersey City, N.Y. U.S. Pat. 741,257, Oct 13, 1903.

The apparatus consists of two co-operating members with disintegrating, rubbing surfaces, composed of yielding material, and held in rubbing contact with each other for a considerable distance. One member may be a wheel or other form of endless travelling surface, and the other a belt or apron applied to a portion of the periphery of the wheel, in the manner of a band brake. See following patent.—M. J. S.

Rubber ; Art of Extracting ——, *without Solvents.* W. A. Lawrence, New York, U.S.A., Assignor to Continental Rubber Co., New Jersey, N.Y. U.S. Pat. 741,258, Oct. 13 1903.

Vegetable tissues containing particles of rubber or rubber-like substances are softened by means of water or steam and are then subjected to combined rubbing and pressure, which causes the particles of rubber and resin to cohere into masses of appreciable size (see preceding abstract). The resin is then removed by treatment with alcohol or an alkaline solution.—M. J. S.

Matter [Rubber-substitute]; Composition of ——. W. A. Lawrence, New York, U.S.A., Assignor to Continental Rubber Co., Jersey City, N.Y. U.S. Pat. 741,259, Oct. 13, 1903.

The alkaline solution of naphtha and resin obtained as a secondary product in the extraction of rubber from plants of the genus *Parthenium* by patent 741,256 (see above) is claimed as a new composition.—M. J. S.

Rubber; Process of Refining Crude ——. W. A. Lawrence, New York, U.S.A., Assignor to Continental Rubber Co., Jersey City, N.Y. U.S. Pat. 741,260, Oct 13, 1903.

Crude rubber, containing resin and naphtha, is submitted to the action of alcohol, which dissolves the resin and naphtha. The alcohol and naphtha are then distilled off, and the distillate refrigerated so that the alcohol and naphtha form two distinct layers, which may be separated and employed afresh. Compare patent 741,256 (above).
—M. J. S.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Sheep- and Lamb-Skins for Coloured Shoe and Glove Leather; Tanning of ——. Leather Trades Rev., 1903, **36**, [917], 707—708.

Good leather for shoes and gloves is made from sheep- and lamb-skins by the following method :—

Preparing and Tanning.—The pelts are thoroughly soaked and softened down, then drained, painted on the flesh side with a solution of alkali sulphides (about 18 Tw.), and left till the following day. The wool thus loosened should be pulled double, *i.e.*, two skins are placed flesh to flesh, and the "slats" are placed in cold water to avoid damage by heating, until they are ready to be placed in the limes, which should be fresh, clean, and weak. Medium weight skins remain here four days, and are then bran-drenched. The quantities hereafter given are calculated for 100 skins unless otherwise stated. The drench is made from bran (1 bucketful) with enough old sour liquor at a temperature of 90° F. to allow the process to complete over-night. A second drench follows. Lactic acid (about 3 quarts, according to the amount of lime present, per 100 galls. of warm water) may be used instead of the bran-drench; it is safer and simpler.

For the pickling, which follows the drenching, and which also acts as a bleach and preserves the skins, sulphuric acid (2 quarts) and common salt (50 lb.), in sufficient water, are employed. These quantities will also serve for 150 small skins. The skins must be well opened out and stirred nearly the whole time (6—12 hours), and then well drained, after which they are weighed For each 100 lb. of drained pickled skins, the following liquors are made up :—

(A) Aluminium sulphate (3 lb.) dissolved by boiling in water (5 galls.).

(B) Soda crystals (3 lb.) boiled in water (5 galls.). (B) is slowly stirred into (A), and the resulting milky-white liquor (C) is set aside to cool, or its temperature lowered to 65° F. by addition of cold water.

(D) Common salt (5 lb.) dissolved in water (5 galls.).

(E) Chrome tanning liquor (3 galls.).

(F) "Salts of tartar" (1 lb.) dissolved in a minimum of water.

(G) Borax (2 lb.) in water.

The pickled skins (100 lb.) are drummed in (D) for ten minutes, or till thoroughly wet, and opened out; (C) is then added, and drumming is continued for 30 minutes; then (E) is added 1 gall. at a time, drumming being resumed for periods of half an hour, one hour, and one hour or more, respectively, after each addition. Then (F) is added and the drum revolved for $\frac{1}{2}$—$\frac{3}{4}$ hour. If the liquor is still a deep green colour, a further half pound of salts of tartar in solution is added. The tanning should now be complete. The goods are then smoothed out, drained for 24 hours, and "drummed" for 20—30 minutes in the solution of borax (G), and finally washed in running water till neutral in reaction. The skins are now "struck out" or pressed, shaved, stained, or coloured, "struck out" on the grain, and finished like ordinary chrome leather.

Staining and Colouring.—Skins tanned in the way described colour easily.

When aniline dyestuffs are used, a suitable mordant must be employed. Fustic or sumac extract answer well for light shades, and, for re-tanning, palmetto or peachwood extract. A good ox-blood shade is obtained as follows, all the quantities hereafter given being for each dozen small skins.—Extract of fustic, sumac, or palmetto (5 oz.) is dissolved in sufficient soft water at 110° F., and the shaved skins are drummed in it for 20 minutes, when "antimonine" (2 oz.) dissolved in a minimum of water is added, and drumming continued for 15 minutes. The skins are now washed in warm water and dyed, when they are again washed and "fat-liquored" if required for glove leather.

"Fat-liquors" for soft glove leather are made from potash soap (8 oz.) boiled in water (2 galls.), or egg-yolk (1 pint) and olive oil ($\frac{1}{2}$ pint) thoroughly emulsified together and drummed in at 90 F.; or a mixture of soap and oil is also used. After "fat-liquoring," the goods are washed off, set out lightly, oiled slightly on the grain with sperm or neatsfoot oil, nailed on a board in a stretched condition till thoroughly dry, then staked and finished. Black skins for imitation kid are coloured "on the flesh" and blacked "on the grain" after washing and shaving, and then dried out, the "fat-liquor" being omitted. A bath of lactic acid assists in removing grease from the grain.
—R. L. J.

Lactic Acid in the Manufacture of Patent and Japanned Goods; Value of ——, *and Methods of Use.* Leather Trades Rev., 1903, **36**, [917], 708—710.

The special advantages claimed for the use of lactic acid are that it completely removes lime, it ensures a fine, even grain, and does not dissolve hide substance—points of great importance in the manufacture of costly patent, enamelled, carriage, and furniture leathers. The effects produced by the acid are dependent on the amount used, the temperature employed, and the length of time for which the skins are treated with it. Heavy hides are conveniently plumped by using excess of acid in cold water, whilst skins and split hides may be bated by using less acid and at an increased temperature, assisted by adding some old lactic acid bate liquor or a proportion of common salt. The following formula is recommended for bateing :—Use 1 lb. of lactic acid for every 100 lb. of hides, green weight, for the first pack and add $\frac{3}{4}$ lb. of acid for every 100 lb. of hide in each succeeding pack. Hides should be bated for four or five hours, or over-night at 55°—75° F.; skins for one to three hours at 75°—95° F.

The bate is usually run continuously for a week or so, and two vats, A and B, may be used as follows :—Vat A is first started; at the end of a week B is half filled with fresh water, the lactic acid is added, and then the top half of vat A is pumped in, the remainder of A being run off. At the end of the following week A is refilled, in a similar manner to that described, using half the contents of vat B Thus two vats are used alternately, and always with a fairly old liquor.

Lactic acid is also useful for souring bark and extract liquors, and when retanning splits, if care be taken to avoid over-plumping.—R. L. J.

English Patents.

Tanning [with Iron Salts]. R. C. Parsons, London. Eng. Pat. 16,038, July 18, 1902.

Leather is tanned in a first bath of basic ferric salts, followed by a second bath containing formic, lactic, butyric, oxalic, citric, or tartaric acids, or their calcium or barium salts, with or without the addition of zinc sulphate, sugar, and glucose. The second bath may, for example, have the composition: formic acid, 400 grms.; zinc sulphate, 500—600 grms.; water, 100 litres. See also Eng. Pat. 9025, May 1, 1901; this Journal, 1901, 7[illegible]1.—R. L. J.

Leather; Improved ——, *and Process of Treating the same.* P. Magnus, Collingwood, Australia. Eng. Pat. 7492, March 31, 1903.

See Fr. Pat. 331,239 of 1903; this Journal, 1903, 1140.
—T. F. B.

XV.—MANURES, Etc.

Phosphate Manure: Cheaper Manufacture of ——. C. Fleck. Sprechsaal, 1903, **36**, 1117. Chem.-Zeit., 1903, **27**, [85], Rep. 275.

The Thomas slag is treated with steam under a considerable pressure in a boiler. In a few hours a fine powder is formed, owing to the slaking of the lime. With proper working, a dry powder is produced in this way which contains 2 to 3 per cent. more phosphoric acid soluble in citric acid than the powder obtained by crushing and grinding the slag.—A. G. L.

English Patent.

Manures from Waste Animal Materials; Manufacture of ——. W. H. Metcalfe, Sydney, Australia. Eng. Pat. 20,679, Sept. 22, 1902.

Blood, or the "soup" produced from boiling or steaming animal matter, is mixed with some absorbent material, such as sawdust, charcoal, or spent tan (about 10 lb. to a gallon of blood, &c.), and tannic acid is added to the mixture, to precipitate the gelatinous substances, and in quantity sufficient to deodorise the mass, which is then subjected to fermentation, at a temperature of about 100° F., for two or three months, dilute sulphuric acid being added in case of evolution of ammonia.—T. F. B.

XVI.—SUGAR, STARCH, GUM, Etc.

Beetroot; Existence of Optically Active Bodies [*"Plus Sucre"*] *other than Sugar in the* ——. Zamaron. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [3], 235—252.

In view of the repeated suggestion that beetroots contain optically active bodies other than sugar, which would have an effect upon the direct determination of the sugar by polarisation, the author has analysed various products, obtained in the manufacture of sugar, most carefully by the accepted methods. The results of the determination of saccharose by polarisation, corrected by Clerget's formula, and by the cupric reducing power before and after inversion, showed absolute concordance, and, in absence of positive demonstration, it must be concluded that no such bodies are present.—J. F. B.

Diffusion [*Sugar Manufacture*]; *Chemico-Physical Studies of —— on the Large Scale.* K. Andrlik. Zeits. Ver. deutsch. Zuckerind., 1903, **53**, [572], 906—927.

For the purpose of forming an idea of the importance and the variation of the separate non-sugar constituents during the diffusion process, the quantity found in the beetroot was compared with that found in the diffusion juice, the exhausted chips, and the waste waters, and, that the results might afford more general conclusions, diffusion was studied on the large scale in different factories and with varied beetroot material.

Of the sugar contained in the beetroot, 96—98 per cent. passed into the diffusion juice—more with hot diffusion than at a lower temperature. The increase of temperature seemed to have more influence on the exhaustion than increase of the quantity of juice drawn off. The difference between the sugar content of the beetroot and of the juice varied from 1·7 to 2·7, the smaller difference indicating more economical work, the exhaustion being equal in other respects.

Of actual ash, 66—71 per cent. diffused out in ordinary working—more with hot diffusion than with cold, and this holds true also of the injurious ash (alkalis, sulphuric acid, and chlorine), which forms 52·8 to 62·9 per cent. of the actual ash, 75·3 to 79·9 per cent. of this portion of the ash usually diffusing out.

Oxide of iron and alumina only diffuse to a slight extent, possibly since they may exist in a state of suspension merely, or because they form insoluble or difficultly soluble compounds with the acids of the beetroot. The diffusion of magnesia was 60—68 per cent., potash 76—83, soda 78—81, phosphoric acid 73—86, sulphuric acid 61—77, and chlorine 84—92.

Albuminoid nitrogen forms 33—72 per cent. of the total nitrogen of the beetroot, and only 15—23 per cent. of this passes into the juice. Beetroots poor in nitrogen contain a relatively higher percentage of albuminoid nitrogen, and the latter increases as the roots ripen.

Of the non-albuminoid nitrogen about 92·3 per cent. passes into the juice. Injurious nitrogen (that is, the difference between the total and albuminoid nitrogen, ammonia, and amides) forms 25 to 46 per cent. of the total. Beetroots poor in nitrogen contain [illegible] to [illegible] of the total as injurious nitrogen, those richer in nitrogen as much as 50 per cent., and 87·5 to 95·1 per cent. passes into the juice.

By diffusion a purification ensues, since the proportion of injurious ash and nitrogen passing into the juice is less than that of the sugar. The injurious ash and nitrogen, with the sugar, form a basis for judging correctly of the quality of beetroots for the purposes of the sugar factory.

—L. J. de W.

Saturation [*Sugar Manufacture*]; *Chemico-Technical Studies of —— on the Large Scale.* K. Andrlik. Zeits. Ver. deutsch. Zuckerind., 1903, **53**, [572], 928—945.

The quantity of non-sugar removed by saturation varies with the composition of the raw juice. Of organic substances there were removed 32—57, of true ash 70—31, and of total nitrogen 30·2—40·6 per cent. Of the non-sugar a portion is capable of being eliminated, but there is a constant quantity—the injurious non-sugar—which cannot be removed. The latter unalterable portion consists of injurious ash and nitrogen.

It was found that the injurious ash of the diffusion juice was 57·3 per cent. on the average, and the ratio of true to injurious ash was 1·49 to 1. In the liquor and massecuite the ratio is 1·043 to 1. The ratio is not constant however. In beets rich in invert sugar it is higher, on account of the accumulation of lime. It is possible from the carbonated ash of the raw juice to calculate the true ash of the saturated juice.

Of the total nitrogen the albuminoid nitrogen forms 14·7 per cent., and 93 per cent. is removed and may be found in the scums.

Ammoniacal and amide nitrogen form 17—27 per cent. of the total; this is set free during saturation, and 84—95 per cent. driven off during concentration.

About two-thirds of the total nitrogen remains unchanged and consequently affects the juice injuriously as regards purification. It consists principally of amino acids and betaine. Its amount serves for an estimate of the organic substances, the amount of which corresponds to 11·9 times that of the injurious nitrogen.

Knowing the amount of the injurious ash and nitrogen in the raw juice, the quotient of the saturated juice may be calculated within 0·5 per cent., thus enabling an approximate view of the possible saturation effect to be obtained.

—L. J. de W.

Sugar Juices; Concentration of ——, in the presence of Aluminium, or finely divided Aluminium Alloys. Besson's Process. J. de Grobert. Zeits. Ver. deutsch. Zuckerind., 1903, **53**, [572], 945—948. (See this Journal, 1902, 58, 1406 and 1545.)

The most suitable alloy was found to be one containing 5 per cent. of tin. Trials made both in France and elsewhere in sugar factories during the last two seasons have given very encouraging results.—L. J. de W.

Crystallisation [*Sugar Massecuites*] *during Motion.* G. Fouquet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [3], 193—219.

In crystallisation during motion, the all-important points are to start with a massecuite of relatively low purity containing a large proportion of good crystals, and to avoid the formation of fine grain during boiling and subsequently during cooling, by strict avoidance of actual supersaturation. It is always advantageous to boil the low syrups on a basis of hard regular crystals previously prepared from pure syrups. The final massecuite should be charged into the crystallising vessel at a temperature of 85° C.; it should contain 8 or 9 per cent. of water; its absolute purity coefficient should vary rom 76 to 72, and the proportion of crystals should be from 5 to 20 per cent. The higher the proportion of crystals, he lower will be the viscosity for a given purity. In order o control the process it is necessary to have curves for the olubility of sugar at various temperatures in syrups of arious degrees of impurity; the impurity is expressed by he ratio $\frac{\text{non-sugar}}{\text{water}}$, which remains constant for any one nassecuite. Reference to these curves shows the extent, f any, of the actual supersaturation, which is quite independent of the solubility of sugar in pure water. The final emperature to which the massecuite is to be cooled to btain molasses of any given purity can be calculated. The ime of cooling must be found by experiment. The more apid the cooling the better, provided no actual supersaturation occurs at any stage; a large proportion of rystals and low viscosity of the mother liquor permit rapid ooling. If fine grain has been precipitated by temporary upersaturation, due to rapid cooling, it must be redissolved ither by raising the temperature or by dilution; in the atter case the ratio of impurity is altered and a fresh nalysis must be made. Control of the process is obtained y determinations of percentage of crystals, purity of mother quor, exhaustion of mother liquor at various temperaures, and by comparing these with the theoretical curves alculated from those of the solubility.—J. F. B.

arbonic Acid in presence of Sulphites, Sulphides, and Organic Substances [in Sugar Works Precipitates and Deposits]; Determination of ——. U. Stanek and J. Milbauer. XXIII., page 1209.

Glutamic Acid; Optical Rotation of ——. K. Andrlik. XXIV., page 1213.

English Patent.

rystallisable Sugar contained in Saccharine Liquids obtained from Beetroot or Sugar-Cane; Extraction of ——. W. T. Whiteman, Middlesex. From The Syndicat pour l'Exploitation du Brevet Hlavati, Brussels. Eng. Pat. 15,274, July 10, 1903.

HE potash salts contained in saccharine liquids are emoved by the addition (after concentration of the liquid) f a quantity of ammonium hydrofluosilicate equivalent to ie potash salts present; after mixing, sufficient lime to aturate the hydrofluosilicic acid is introduced and the mass eated, to drive off the ammonia, "and thereby liberate the ydrofluosilicic acid," which forms, with the potash and me, insoluble potassium and calcium hydrofluosilicates hich can be removed by filtration.—T. H. P.

United States Patent.

ugar Juice; Apparatus for Treating ——. J. A. Besson, Caen, France. U.S. Pat. 738,397, Sept. 8, 1903.

HIS apparatus is intended for the treatment of sugar juice y a process involving the use of a small proportion of a etallic carbide, preferably calcium carbide, the acetylene roduced therefrom being stated to effect a purifying action. s the formation of acetylene is accompanied by heat, the pparatus provides for the application of a cooling agent to ie sugar solution The apparatus consists of a vessel of ylindrical shape containing in its interior another cylinder r tube of considerably smaller diameter. In the space etween them is arranged a spiral diaphragm, which causes ie liquid contents, consisting of the cooling material, to avel from end to end, circulating in the meantime round the entral tube, and the latter has within it a revolving shaft with an attached spiral blade, by means of which the sugar solution is forced to pass in the opposite direction. The juice, in fact, enters the casing (Fig. 1) as shown by the arrow, and is discharged below in a partially frozen state, being forced forwards by the screw. The surrounding casing contains the cooling liquid, the course of which is also shown by arrows. Thus the tendency to raise the temperature through formation of acetylene is overcome. After the juice has been sufficiently treated it is passed into the reservoir, part of which is shown at the highest part of Fig. 2, forming part of the apparatus.—J. F. B.

Fig. 1.

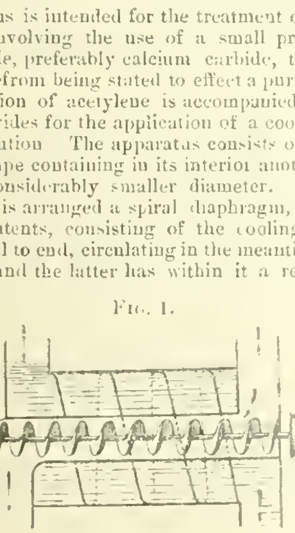
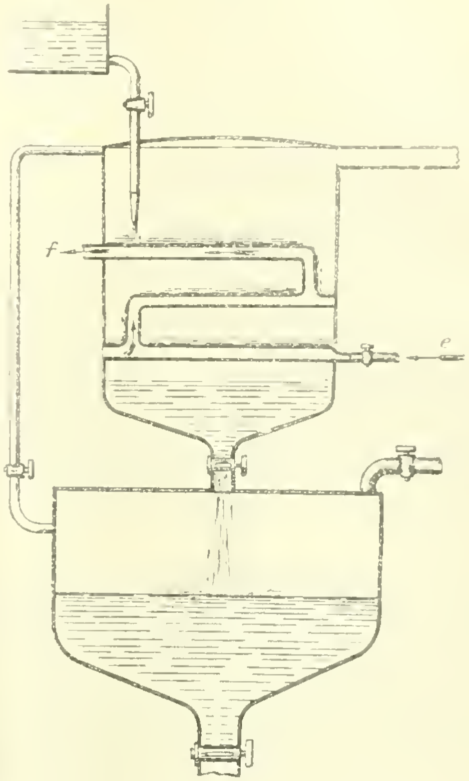


Fig. 2.



XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Utilisation of Waste ——, *in Breweries.* J. L. Baker. J. Fed. Inst. Brewing, 1903, 9, 468—491.

The author describes the processes which have been devised for the utilisation of waste yeast.

(*a*) *Processes for the Extraction of the Contents of the Yeast Cell.*—In addition to the processes under this heading referred to in an abstract (this Journal, 1899, 779) the author describes the following:—G. Meulemeister, Ger. Pat. 105,629 (this Journal, 1899, 1039); R. Rückforth, Eng. Pat. 25,101 of 1898 (this Journal, 1900, 65); Eichelbaum, Eng. Pat. 25,760 of 1899 (this Journal, 1900, 1129); R. Rückforth, Eng. Pat. 1709 of 1899 (this Journal, 1900, 264); L. Aubrey and the Wissenschaftliche Station für Brauerei in Munchen, Ger. Pat. 120,346 of 1899 (this Journal, 1901, 737); Lebbin (this Journal, 1901, 825); G. C. Marks, Eng. Pat. 21,153 of 1900 (this Journal, 1901, 1131); G. Bauer, Eng. Pat. 11,460 of 1900 (this Journal, 1902, 1290); G. Valentine, Eng. Pat. 9991 of 1900 (this Journal, 1901, 736); C. G. Kressel, U.S. Pat. 694,102 of 1901 (this Journal, 1902, 497); M. [illegible], Eng. Pat. 1[illegible],097 of 1901 (this Journal, 1902, 924).

These processes fall naturally into four classes:—(1) Simple extraction of yeast by boiling with water; (2) the extraction of the contents of the yeast cell, at a temperature below the coagulation point, by substances which possess the property of liquefying yeast; (3) extraction by means of heat and substances possessing the power of liquefying yeast; (4) the auto-digestion of yeast. To form some idea of the amount of substance obtainable from a given quantity of yeast, the author submitted washed and pressed brewers' yeast containing 22·5 per cent. of dry substance to different extractive treatments, with the following results:—

100 Grms. of Yeast treated by—	Yield from 100 Grms. of Pressed Yeast.
	Grms.
A. Boiling with water for three hours	5·61
B. Extracted with water at 140° F. for six hours..................................	8·75
C. Extracted at 140° F. for six hours in presence of dilute hydrochloric acid......	10·20
D. Extracted at 140° F. for six hours in presence of dilute hydrochloric acid and pepsin..................................	12·18
E. Auto-digestion at 80° F. for seven days...	18·00
F. Extraction with 0·25 per cent. hydrochloric acid at 30 lb. steam pressure for one hour	19·85

(*b*) *Therapeutic Yeast Preparations.*—As an internal remedy, the efficacy of yeast depends on the enzymes present, also to some extent on the improved nutrition derived from its easily digestible constituents. As a lotion its action depends on the bactericidal properties of the products of fermentation. The therapeutic value of permanent yeast preparations is measured by the presence of enzymes. (Compare Wochensch. für Brauerei, 1900, **17**, 207—208; R. Rapp, Münchener Med. Wochensch., 1902, No. 36; Baecker, International Medical Congress, Rome, 1899; W. P. Thompson, Eng. Pat. 7184 of 1899 (this Journal, 1899, 850).)

(*c*) *Conversion of Yeast into Manure.*—The utilisation of yeast as a manure is fairly well known. A serious disadvantage to its more general use is the difficulty of carriage, owing to its rapid putrefaction. To render yeast available as a manure, the object of the inventor has been to remove a portion of the moisture and thus inhibit putrefactive change. The following processes are described:—F. W. Greening, Eng. Pat. 20,060 of 1893 (this Journal, 1894, 1082); J. E. Johnson, Eng. Pat. 20,660 of 1897 (this Journal, 1898, 1060); G. Valentine, Eng. Pat. 9991 of 1900 (this Journal, 1901, 736); Wardle, Eng. Pat. 6971 of 1901 (this Journal, 1902, 183); and A. J. Oxford, Eng. Pat. 5926 of 1901 (this Journal, 1902, 421). It is pointed out that dried yeast could probably be used in the manufacture of compound manures. Whilst it would not pay any single brewery to turn its surplus yeast into manure, it would be profitable for the breweries in large towns to combine and send their yeast to a central factory to be treated. The author analysed a sample of dried mild-ale yeast and found that it contained, moisture 7·00, organic matter 81·40, phosphoric acid 5·60, lime 0·50, potash 3·50, and nitrogen as ammonia 9·96 per cent.

(*d*) *Application of Brewers' Yeast for Baking Purposes.*—A good bakers' yeast is worth about 30*l.* per ton, and, as brewers' pressed yeast is at the present time practically valueless, many processes have been devised to convert brewers' yeast into the more valuable product. (Compare W. Sarnighausen, this Journal, 1901, 1131; H. Meyers, Eng. Pat. 10,078 of 1892; F. Raben and F. Wrede, Ger. Pat. 130,299 of 1900 (this Journal, 1902, 715); E. Buchner, Ger. Pat. 97,240 of 1898 (this Journal, 1898, 594); M. P. Hatschek, Eng. Pat. 25,418 of 1899 (this Journal, 1901, 141); C. J. Lintner, this Journal, 1901, 1128.) Many of the methods for converting brewers' into bakers' yeast consist of the removal of the bitter substances taken up from the hops during the brewery fermentation. Brewery yeast is frequently submitted to a rapid growth with aëration in sweet wort, the product pressed, and sold as bakers' yeast. To test the effect of some of these processes, the author devised a modification of Hayduck's method for the determination of the fermentative power of a yeast, and determined the fermentative powers of the following samples of yeast at three different temperatures, *viz.*, 86°, 113°, and 123° F. (compare C. J. Lintner, this Journal, 1901, 1128):—(1) A sample of Scotch distillers' yeast; (2) mild-ale yeast; (3) mild-ale yeast after it had been treated with 0·5 per cent. solution of ammonium carbonate, then feebly acidified with acetic acid, well washed, and fermented for 24 hours in unhopped malt wort; (4) mild-ale yeast after fermentation for 36 hours in unhopped malt wort. Lintner (*loc. cit.*) showed that whilst distillers' yeast had nearly as great a fermentative power at 123° F. as at 86° F., German beer yeast had a much lower fermentative power at the higher temperature. The author finds that the same applies to English brewers' yeast. As compared with Scotch distillers' yeast, the fermentative power at 86° and 113° F. does not materially differ; but at 123° F. only one-half the amount of carbon dioxide is evolved during the same period. Washing yeast with dilute alkali greatly impedes the fermentative power. Fermenting brewery yeast in a sweet wort does not improve it, so far as its resistance to high temperatures is concerned. The results show that many of the processes for converting brewers' yeast into bakers' yeast are not founded on a sound basis.

(*e*) *Yeast Products applied in the Leather Industry.*—See R. L. Jenks, G. A. Clowes, and G. P. Hatschek; Eng. Pat. 10,628 of 1902 (this Journal 1903, 753).—J. L. B.

Saccharomyces Apiculatus; Spore Formation of ——. P. Lindner. Woch. f. Brau., 1903, 20, [43], 505—506.

Hitherto *S. apiculatus* has not been known to form spores when artificially cultivated; these have only been met with in cells taken directly in the "wild" state from the raw material for cultivation (Beijerinck). The author collected some of the freshly fallen flowers of *Robinia pseudoacacia* and placed them in a flask filled with wort. A second quantity of wort was then infected by means of two drops from the first flask. The principal organisms which developed were Dematium yeasts, oidium, *S. apiculatus*, and an elliptical sporulating yeast. A streak culture was taken from this wort at an early stage and kept under observation under the microscope. It was then noticed that, in some of the colonies of *S. apiculatus* which developed, the cells contained bodies distinctly recognisable as spores, from the definite character of the spore-walls and the presence of a few granules in the enclosed protoplasm. These spore-bearing cells had undoubtedly been developed during the process of cultivation and could not possibly have been survivals from the original "wild" cells. The spores could not, however, be induced to germinate nor were descendants obtained which showed any tendency to sporulation. It is suggested that certain special conditions are necessary for the production of spores by *S. apiculatus*; the cells may possibly have to pass through the intestines of some animal before they acquire this property. In collecting raw materials for the cultivation of *S. apiculatus*, it has been noticed that they only occasionally contain spore-bearing cells.

Morphologically, *S. apiculatus* is related to *S. Ludwigii*, but whilst the latter produces three or four spores in a cell, only one spore has as yet been observed in a cell of *S. apiculatus*.—J. F. B.

Starch Conversion in the Mash Tun. A. R. Ling. J. Fed. Inst. Brewing, 1903, 9, 446—461.

The author suggests that it would be well to discontinue the use of the term "dextrin" as applied to diastatic products, and adopt in its place the word "malto-dextrin." This would not only serve to indicate the origin of the product, but would also prevent confusion with torrefaction dextrin.

Brown, Morris, and Millar have stated that their malto-dextrin, which is the same as the malto-dextrin α of Ling and Baker (this Journal, 1897, 154), is completely converted into maltose by the action of diastase; the author, however, finds that, by submitting malto-dextrin-α, possessing the constants $[\alpha]_{D\,3\cdot86}$ 180·5 and $R_{3\cdot86}$ 36·7, to the action of diastase prepared from low-dried malt for 140 hours at 131° F., a mixture of 90 per cent. of maltose and 10 per cent. of glucose was formed.

Glucose is produced by the prolonged action on starch paste of diastase which has been heated in aqueous solutions above 140° F., but the author has never observed its formation in starch conversions made with diastase which has been heated in solution below 131° F. prior to adding it to the starch paste. When the products resulting from the action of unrestricted diastase on starch paste are isolated and submitted to the further action of the enzyme, glucose is formed. This difference in the action of restricted and unrestricted diastase is accounted for by the probability that as soon as glucose is produced, it undergoes condensation.

The glucose in starch conversions by restricted diastase does not exceed 12 per cent. of the total products, and on continuing to heat the mixed products and the enzyme at the conversion temperature, the glucose gradually diminishes in amount. This reversion is attributed to the synthetic action of the enzyme.

An experiment was carried out to ascertain if glucose per se could be condensed by diastase, but without success. It is suggested that the substance called by Lintner "isomaltose" may be a reversion product formed from glucose.

A series of mashes with malt and barley starch of different origin, carried out below the gelatinising temperaure of the starch employed, show that great differences exist between these and starch-paste conversions (this Journal, 1903, 1058), and there is every reason to believe hat in the mashing process, the starch is not gelatinised prior to undergoing hydrolysis.—J. L. B.

Colour of Wort; Determination of the ——. H. Hanow. Woch. für Brau., 1903, **20**, [42], 498—499.

AT the Fifth International Congress of Applied Chemistry, eld in Berlin, it was decided by representatives of the rewing research stations at Berlin, Hohenheim, Munich, Nuremberg, Weihenstephan, Vienna, and Zürich that the determination of the colour of a wort shall be based upon N/10 solution of iodine (containing 12·7 grms. of iodine nd 40 grms. of potassium iodide per litre). The colour hall be expressed as the number of c.c. of this solution hich must be added to 100 c.c. of water to produce the epth of colour possessed by the wort. The colour is not be calculated on a 10 per cent. wort or on 100 grms. of xtract, but is to be read off from the following table, which ives the colour corresponding with any particular gravity nd the number of c.c. of iodine employed.

Colour.	Number of c.c. of Iodine used with a Wort of			
	7·5°—7·7° B.	7·8°—8° B.	8·1°—8·5° B.	8·6°—8·8° B.
0·1	13	13	12	11—12
0·125	16	16	15	14—15
0·150	20	19	18—19	17
0·175	23	22	20—22	20
0·20	26	25	24—25	23
0·225	30	28	26—28	26
0·25	33	31—32	30	28—29
0·275	36	34—35	32—34	31—32
0·30	40	38	35—37	34—35
0·35	47	44—45	41—43	40
0·4	53	50—51	47—50	46—47
0·45	59—60	56—58	53—56	51—52
0·5	65—67	62—64	59—62	57
0·55	71—73	69—70	65—68	63—64
0·6	78—80	75—77	71—74	68—70
0·7	90—93	88—90	82—86	80—81
0·8	104—107	100—102	94—99	91—93
0·9	117—120	113—116	106—111	102—105
1·0	130—133	125—128	118—123	114—116

—T. H. P.

lycerin in Wine; Determination of ——, *by means of the Iodide Method.* S. Zeisel and R. Fanto. XXIII., page 1211.

Ethoxyl and Glycerin Determinations. M. J. Strikar. XXIII., page 1211.

English Patents.

Fermenting Tuns. L. Seyboth, Munich, Germany. Eng. Pat. 694, Jan. 10, 1903.

CTANGULAR fermenting tuns are constructed of cementrtar built around a support of metal trellis work. Cooling ls of metal piping are also braced to the metal frames of the support, and built into the walls of the tuns in such a manner that they are separated by a layer of cement from contact with the wort inside. The tuns are coated internally with a uniform layer of rosin or wax by spreading the latter upon fabric or paper and transferring the coating to the cement by passing a hot iron over the fabric whilst in contact with the walls of the tun.—J. F. B.

Spirit; Purification of ——. R. C. Scott, Liverpool. Eng. Pat. 25,438, Nov. 19, 1902.

The spirit is cooled to about 32° F. or lower, and then filtered, for instance, "through flannel faced with silk," by which means, it is claimed, many aldehydes, including furfural, are removed.—T. H. P.

French Patent.

Diffusion [Cider Manufacture]; New Process of ——. A. C. Briet. Fr. Pat. 331,854, May 5, 1903.

The diffusers, mainly intended for the cider industry, consist of cylindrical vessels of large diameter, taking a charge of slices not exceeding 60 cm. in height. In this way excessive pressure is avoided. The vessels are arranged in batteries of 12; each vessel is divided into two parts, the upper part, termed the "élément d'enrichissement," contains the slices enclosed between two perforated plates; whilst the lower portion, termed the "élément de dédoublement," is only connected with the upper portion by pipes leading from the top, above the layer of slices; this lower vessel serves to contain and store up the liquid from the upper one whilst the slices are being exhausted.—J. F. B.

Grapes and other Fruits; Preparation of Musts and Wine from ——. Soc. C. A. Kupferberg and Co. Fr. Pat. 332,282, May 22, 1903.

The grapes or other fruits are first lightly crushed by passage between rubber-covered rollers; they are then drained by aspiration on filters under the action of air or compressed carbon dioxide. The drained pulp is then lixiviated with water at a suitable temperature (60° C.) and again drained by aspiration; the second extract may be used for lixiviating a further quantity of fruits. The two qualities of must are treated separately by sterilisation, concentration, if necessary, and filtration, and are thus sufficiently purified for the manufacture of sparkling wines by fermentation in bottle.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Butter; Conversion of ——, *into a Tallowy Product, under the Influence of Light.* A. Lidow and Dshors. Westnik shirow. weschtsch., 1903, **4**, 151. Chem.-Zeit. 1903, **27**, Rep. 253.

Butter was exposed, in closed vessels, to the influence of the light from Auer burners, electric light, and the violet light produced by burning carbon bisulphide in an atmosphere of nitric oxide. The acetyl value increased from 50 to 87; the Reichert-Meissl value was not altered, nor was the iodine value to any notable extent. The colour of the butter changed from yellow to white, and the sample acquired the taste and odour of tallow.—A. S.

Starch in Pressed Yeast; Simple Method for the Determination of ——. N. Wender. XXIII., page 1211.

Yeast in Breweries; Utilisation of Waste ——. J. L. Baker. XVII., page 1203.

French Patents.

Paranucleoproteïds [Casein]; Process of Obtaining Clear Solutions of Impure ——. A. Spitteler. First Addition, dated Aug. 7, 1902, to Fr. Pat. 292,705, Sept. 21, 1899.

See Eng. Pat. 17,258 of 1902; this Journal, 1903, 815.

—T. F. B.

Meat: Process for Preserving ——. Dr. Emmerich's Fleisch-Konservierungs Ges. m. beschr. H. Fr. Pat. 328,052, Aug. 16, 1902.

SEE Eng. Pat. 18,138 of 1902; this Journal, 1903, 1062.
—T. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Nitrates; Reduction of ——, *by Sewage.* E. A. Letts, R. F. Blake, and J. S. Totton. Brit. Assoc., Southport, 1903. Chem. News, 1903, **88**, 182.

IT has been found, at Belfast, that the growth, in enormous quantities, of the green seaweed *Ulva latissima*, and the resulting nuisance which occurs when it is washed ashore and putrefies, is directly due to the fertilising properties of the nitrogenous constituents of the sewage which is poured into the lough in an untreated condition. The authors' experiments were made with the object of ascertaining to what extent and with what rapidity such nitrogenous constituents can be decomposed, so that their nitrogen may be evolved in the gaseous state. Experiments in which known volumes of potassium nitrate solution were added to a septic tank effluent, showed that the potassium nitrate is decomposed, nitrogen and sometimes also nitric oxide being formed. The oxygen of the nitrate appears eventually, either partly or wholly, in the form of carbon dioxide. In most cases the whole of the added nitrate—corresponding to 2·5 parts of nitric nitrogen per 100,000—was decomposed in 24 hours. The production of free nitrogen in contact beds (see this Journal, 1901, 1132) is probably due to the fact that when the beds are in contact with air, they become charged with nitrates, and then, when the sewage is introduced, the latter are decomposed. The decomposition of the nitrates is caused by certain micro-organisms, and not by enzymic or chemical action, as sterilised effluents were found to have no effect on the nitrate. Experiments with *B. Coli communis* and *B. Lactis aërogenes*, which in pure broth cultures cause the production of hydrogen, showed that in nitrated broth, the *B. Coli communis* liberates nitrogen from the nitrate.—A. S.

Nitric Acid in Water; Simple Method for the Quantitative Determination of ——. G. Frerichs. XXIII., page 1209.

Nitrate Nitrogen; Determination of ——, *in presence of Organic Nitrogen.* T. Pfeiffer. XXIII., page 1210.

ENGLISH PATENTS.

Water: Apparatus for the Purification of ——. Soc. C. and G. Pulinx, Lille, France. Eng. Pat. 26,188, Nov. 27, 1902. Under Internat. Conv., May 22, 1902.

SEE Fr. Pat. 327,968 of 1902; this Journal, 1903, 1011.
—T. F. B.

Filter or Bacteria Beds: Preparation of Materials for Use in ——. E. R. Candy, Balham, Surrey. Eng. Pat. 26,756, Dec. 4, 1902.

MATERIAL such as furnace clinker, coke, &c., in pieces of any suitable size, is coated with a powdered oxidising material, such as magnetic oxide of iron, charcoal, &c., which is caused to adhere by means of tar or some other cementing substance. The incrusted material has a greater surface area than the material before incrustation, and affords a better habitat for bacteria.—L. A.

FRENCH PATENT.

Measuring Liquids and Mixing them with Milk of Lime or other Similar Liquid Substance; Apparatus for ——. O. Walter. Fr. Pat. 331,842, April 23, 1903. I., page 1188.

(*C.*)—DISINFECTANTS.

UNITED STATES PATENT.

Disinfecting Purposes; Process of Producing Compounds [*Solution of Soap in Formaldehyde*] *for* ——. R. G. Groppler, Berlin. U.S. Pat. 740,421, Oct. 6, 1903.

SEE Eng. Pat. 7616 of 1900, this Journal, 1900, 923.
—T. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Analysis [*Mechanical Wood Pulp*]; *A New Quantitative Method of* ——. N. Teclu. XXIII., page 1212.

ENGLISH PATENT.

Cellulose from Sugar-Cane Trash, Pulp or Residues, and Similar Products: Process of Extracting ——, *for Making Pulp for Paper, Pasteboard, and the like.* M. L. de la Cámara and F. R. Egana, Granola, Spain. Eng. Pat. 20,575, Sept. 20, 1902.

SEE Fr. Pat. 324,599 of 1902; this Journal, 1903, 569.
—T. F. B.

FRENCH PATENTS.

Paper-making Machine. A. Lacroix. Fr. Pat. 331,865, May 9, 1903.

EXTREMELY thin webs of paper are made from inferior materials by avoiding any tension on the paper until it is nearly dry. For this purpose the wire of the machine is lengthened, and the paper is twice pressed between the wire and an upper felt. After passing between the second press-rolls, the wire is led back, whilst the paper continues to adhere to the underside of the felt. A bottom felt is then introduced beneath the paper, which is pressed again between the double felts. The felts being separated, the paper is carried on the underside of the top felt to a first drying cylinder, and it is only parted from the supporting felt after it has passed this stage; the final drying is effected by a second cylinder.—J. F. B.

Paper; Machine for Coating ——. C. W. F. Schumacher. Fr. Pat. 331,984, April 28, 1903.

THE paper, as it leaves the paper-machine, is brought to a sufficient state of dryness; it then receives a coating of composition on one side by means of rollers revolving in a trough; the coating is spread uniformly by reciprocating brushes, which press the paper against an endless travelling band; the coated paper then passes almost entirely round a large heated cylinder, which fixes the coat of enamel; it leaves the cylinder at a sharp angle round a heated guide roll, and then passes to another coating machine, the brushes of which are inverted, whereby the underside of the paper is coated. After the second coating has been fixed, in a similar manner to the first, the paper is fully dried by a series of ordinary drying cylinders.—J. F. B.

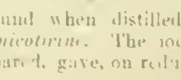
Celluloid; Use of a New Substance [*Formylated Albumin*] *as Substitute for Camphor in* ——. Soc. Anon. L'Oyonnaxienne. Fr. Pat. 331,819, May 8, 1903.

ALBUMIN (blood or egg) is treated with a dilute (5 to 10 per cent.) solution of formaldehyde for an hour, and the excess of formaldehyde is removed by washing with water. The "formylated albumin" thus produced is dried at a temperature not exceeding 40° C., and is mixed, in presence of alcohol, with nitrocellulose and, if desired, camphor.
—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Nicotine: Synthesis of ——. Pictet. Zeits. angew. Chem. 1903, **16**, 943.

BY the action of mucic acid on β-aminopyridine, a product was obtained, the potassium salt of which yielded, with methyl iodide, the compound—



This latter compound when distilled with lime, yielded methyl iodide and *nicotirine*. The iodo derivative of the nicotirine thus prepared, gave, on reduction, lævo-rotatory nicotine.—A. S.

Rare Earths ; New Method for the Separation of ——. O. Holmberg. Öfversigt af kongl. Vetensk. Akad. Förhandl., 1903, **28** ; Chem.-Zeit., 1903, **27**, [85], Rep. 266.

The author uses fractional crystallisation of the rare-earth salts of organic acids, especially sulphonic acids of benzene and naphthalene, for the separation of the rare earths, and obtained pure neodymium from didymium in this way, using *m*-nitrobenzene sulphonic acid.—A. G. L.

Pine Buds ; Essential Oil of ——. H. Haensel's Report, July 1903 : through Pharm.-Zeit., 1903. **49**, [57], 574.

Fresh pine buds yielded 0·238 per cent. of a light rown, extremely aromatic oil, the odour of which is similar o the fragrance exhaled by the young shoots of the pine. It has the sp. gr. 0·9338 ; and is readily soluble in most olvents, including absolute and 90 per cent. alcohol ; its otation determined in an alcoholic solution is −0 38′.

—J. O. B.

Grindelia robusta ; Essential Oil of ——. H. Haensel's Report, July 1903 : through Pharm.-Zeit., 1903, **48**, [57], 574.

he dried herb *Grindelia robusta*, when distilled with team, gave 0·28 per cent. of a dark brown essential oil, ith a powerful and peculiar odour. Its sp. gr. at 15° C. s 0·9582 ; the rotation, in alcoholic solution is −8° 8′. t gives a clear solution with ether, amylic alcohol and hloroform, but a turbidity with alcohol, benzene, and arbon bisulphide.—J. O. B.

haseolus Lunatus ; Cyanogenetic Properties of the Seeds of ——. Bd. of Trade J., Oct. 15, 1903, Supplement. Imp. Inst. Bull. No. 3, 114—115.

he seeds of the *Phaseolus Lunatus*, obtained from lauritius, on crushing with water, yield hydrocyanic acid, ght brown seeds giving about 0·04 per cent., and deep urple seeds up to 0·08 per cent. A cyanogenetic glucoside, *haseolunatin*, has been prepared from the seeds ; when oiled with dilute mineral acids, or on treatment with *nulsin*, this decomposed into acetone, glucose, and hydro-yanic acid. An enzyme, which decomposed the glucoside this manner, was also prepared from the seeds ; the fact hat it also decomposes amygdalin and salicin appears to entify it with *emulsin*.—T. F. B.

arringtonia Speciosa, Gaertn. ; Seeds of ——. W. P. H. van den Driessen-Mareeuw. Pharm. Weekblad, **40**, 729—735. Chem. Centr., 1903, **2**, [15], 841.

arringtonia speciosa is an Indian plant, the brown egg-haped seeds of which are used as bait for fish. The seeds e about 6 cm. long, contain 13·58 per cent. of water, and ·42 per cent. of ash. By successive extractions with light troleum spirit, ether, and 50 per cent. alcohol, the following oducts were obtained :—

(1) *From the Petroleum Spirit Extract.*—A yellow fatty l (yield, 2·9 per cent. on the dried seeds), easily soluble ether and chloroform, almost insoluble in methyl and hyl alcohols ; sp. gr. at 21° C., 0·9188 ; acid value, 87 ; ponification value, 172·6 ; Hübl iodine value, 134·1. e insoluble fatty acids of the oil consisted of oleic, lmitic, and stearic acids.

(2) *From the Ether Extract.*—Gallic acid (yield, 0·54 r cent.) and *barringtogenitin*, $C_{15}H_{21}(OH)_3$ (yield, 1·082 r cent.). The latter forms colourless needles, m. pt. 9°—180° C., soluble in ether, alcohol, and acetic ether ; oluble in water.

(3) *From the Aqueous Alcoholic Extract.*—*Barringtonin*, $H_{23}O_7(OH)_3$ (yield, 3·271 per cent.), a compound embling saponin, which forms a white amorphous powder, $]_D$ = −30°, insoluble in ether and petroleum spirit, ghtly soluble in cold absolute alcohol, soluble in warm ter and glacial acetic acid, and in caustic soda and monia solutions ; with cold water it forms a jelly. It ckens without melting at 205° C. When boiled with ate mineral acids it is split up into a sugar, $C_6H_{12}O_6$, and *ringtogenin*, $C_{10}H_{16}O_3$, together with a small quantity of volatile substance with an aromatic odour. The sugar luces Fehling's solution ; has $[\alpha]_D = -27·6°$, and forms phenylglucosazone which crystallises in yellow needles, melts at 180° C., is slightly soluble in water and easily soluble in alcohol. *Barringtogenin* forms a white powder, m. pt. 169°—170° C., soluble in alcohol and glacial acetic acid, slightly soluble in ether, and insoluble in water and in caustic soda and ammonia solutions.—A. S.

Methoxyl and Glycerin Determinations. M. J. Stritar. XXIII., page 1211.

Quinine Bisulphate ; Examination of ——, *by the Methods of Körner and Hesse.* P. Biginelli. XXIII., page 1210.

English Patent.

Terpene Alcohols [Nerol] ; Manufacture or Recovery of ——, *and the Manufacture of Perfumes.* J. Wetter, London. From Heine and Co., Leipzig. Eng. Pat. 26,362, Nov. 29, 1902.

See Fr. Pat. 326,658 of 1902 : this Journal, 1903, 819

—T. F. B.

United States Patents.

Monoformyl Derivative of 1.3-*dimethyl*-4.5-*diamino* 2.6-*dioxypyrimidine.* M. Engelmann, Elberfeld, Assignor to the Farbenfabriken of Elberfeld Co., New York. U.S. Pat. 740,636, Oct. 6, 1903.

Monoformyl-1.3-dimethyl-4.5-diamino 2.6-dihydroxypyrimidine is obtained by methylating (with methyl chloride and caustic soda) the monoformyl derivative of 4.5 di-amino-2.6-dihydroxypyrimidine.—T. F. B.

Acetylsalicylate of Sodium. B. R. Seifert and F. R. Engelhardt, Assignors to Chem. Fabrik von Heyden Act.-Ges., Radebeul, near Dresden. U.S. Pat. 740,702, Oct. 6, 1903.

See Eng. Pat. 15,517 of 1902 ; this Journal, 1902, 1296.

—T. F. B.

French Patent.

Volatile Solvents ; Recovery of the Vapours of ——, *in the Treatment of Perfumes and Fatty Matters.* J. Febvre. Fr. Pat. 332,087, May 18, 1903.

A process for recovering the vapours of volatile solvents used in treating perfumery [essential oils] and fatty matters, consisting in subjecting them to combined refrigeration and pressure.—L. A.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic Emulsions and Plates. K. Schaum and V. Bellach. Phys. Zeits., 1902, **4**, 4—7 ; 190—194.

The authors find that in the ripening of bromide-gelatin emulsions, there is slight reduction of the silver bromide, whilst, at the same time, the particles of bromide become larger and fewer, the smaller particles being dissolved and deposited on the larger ones. On drying, there is a shrinkage of the granules of bromide. There are, on the average, 270,000 granules per sq. mm. in the surface layer of the film. In a developed normal dry plate, the particles of silver are few and small in the superficial layer of the film ; many and large in the intermediate layer ; and again fewer and smaller in the layer nearest the glass. There is no spontaneous separation of silver in the gelatin during development, every silver granule corresponding to a pre-existing granule of silver bromide ; but there is some agglomeration, and some of the particles of bromide escape development, since in a normal dry plate in which there were 270,000 granules of bromide per sq. mm. in the superficial layer, there were not more than 82,000 granules of silver per sq. mm. in the developed plate. The size of the silver particles increases both with the duration and the brightness of the exposure, and with the duration of the development. Solarisation causes a decrease in the average size of the silver granules. The opacity of a negative depends not only upon the number and the distribution of the silver particles, but also on their size, which varies according to the ripening of the emulsion, the exposure, and the mode of development.—A. S.

English Patent.

Photographic Printing Process. H. S. Starnes, Bexley Heath. Eng. Pat. 25,244, Nov. 17, 1902.

The gelatin in the ordinary pigment process is replaced by a mixture of a soluble substance, such as gum arabic, and an insoluble substance, *e.g.* resin or shellac. The pigment is rubbed down in the solution of gum, an alcoholic solution of the resin is added, and the emulsion sensitised by bichromate. After exposure, the print is floated on water, pressed on to some absorbent surface, such as blotting-paper, and the print stripped off, the portions of the emulsion remaining soluble adhering to the absorbent surface in inverse proportion to the action of the light.
—T. F. B.

French Patent.

Photographic Development; Impts. in ——. Soc. Anon. Prod. F. Bayer et Cie. Addition, dated March 7, 1902, to Fr. Pat. 316,504, Dec. 3, 1901.

The bisulphite compounds of ketones, claimed in the principal patent as substitutes for alkalis in photographic developers, are used in addition to sodium thiosulphate (hyposulphite) in the fixing bath, giving it a slightly acid reaction. (See Eng. Pat. 24,619 of 1901: this Journal, 1902, 872.)—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Chemical Processes in which Gas is evolved: Apparatus for Recording ——, and its Application to the Study of the Slow Decomposition of Nitrocellulose. A. Mittasch. Zeits. angew. Chem., 1903, **16**, 929—939.

The decomposition vessel consisted of a small tube of about 8 c.c. capacity, provided, by means of a ground-glass connection, with an outlet tube for the gases. This was heated in a thermostat, which consisted of a small closed vessel, filled with aniline and connected, by a side tube, with a gas regulator; the thermostat was formed with a deep central indentation, forming an air-bath, in which was placed the decomposition vessel. The gases evolved passed to a U-tube filled with paraffin oil; in the narrower limb of the U-tube was a glass float, connected by means of a long piece of narrow glass tubing with a glass pen filled with ink. The pressure of the gas forced the float upward, and the movement was recorded, by means of the glass pen, upon a sheet of cardboard, to which a uniform horizontal movement was imparted by a clockwork arrangement. The experiments with nitro-cellulose were carried out at 140° C. About 0·12 grm. of the sample was well mixed with a diluting agent (sea sand, quartz powder, powdered marble, kieselguhr) and introduced into the carefully cleaned and dried decomposition vessel. Complete decomposition of the nitrocellulose was effected in about one day. The slow decomposition of nitrocellulose is a process which is catalytically accelerated by the products of the reaction (see also this Journal, 1903, 609—617). With the same sample, the velocity of decomposition varies considerably with the cleanness of the decomposition vessel and the nature and proportion of the diluting material. The best diluting material was found to be sea sand well purified by boiling with acid and subsequent strong ignition. The addition of substances of a distinctly basic character retarded the decomposition, but decomposable nitrogenous compounds, *e.g.*, ammonium nitrate and urea, considerably accelerated it.—A. S.

English Patents.

Illuminations; Producing Coloured Flames for ——. W. R. Hodgkinson, Blackheath. Eng. Pat. 23,019, Oct. 22, 1902.

Glycerin, alone, or mixed with other substances burning with non-luminous or but slightly luminous flame, is caused to dissolve chloride of copper, boric acid, or other substance which gives colour to flame. Asbestos bricks, or the like, saturated with such a solution, are heated to the volatilising point of the solvent, which is then inflamed.—W. G. M.

Blasting Purposes; Method of and Apparatus for Obtaining Explosive Effects for ——. W. O. Wood, Sunderland, and H. Knudsen, London. Eng. Pat. 25,025, Nov. 14, 1902.

Liquid air or gas is charged into a cartridge-shaped vessel with double walls, and between the interspace and the inside of the vessel, means are provided for effecting communication, or in some suitable way of removing the non-conducting covering of the vessel. This case is then placed in the borehole; after tamping, the valve is opened to allow the liquid to pass into the outer jacket, whereupon the rise of pressure caused by the vaporisation of the liquid causes the bursting of the case, and so the desired rending effect. A special reservoir for the liquid gas is also described.—W. G. M.

Explosives for Blasting Purposes. H. Dreany, Sudbury, Canada. Eng. Pat. 26,802, Dec. 4, 1902.

Seventy to eighty parts of nitroglycerin are mixed with 10—15 parts of "petrolatum, a by-product of petroleum," at a temperature of 100°—110° F., and 10—15 parts of nitrobenzene are added at about the same temperature. Sodium nitrate (100—120 parts) and wood pulp (about 25 parts) are added, if necessary, before the mixture cools.
—T. F. B.

Explosives; Impts. in ——. J. Wetter, London. From Westfälisch-Anhaltische Sprengstoff-Akt.-Ges., Berlin Eng. Pat. 25,540, Nov. 20, 1902.

See Fr. Pat. 329,031 of 1903; this Journal, 1903, 1015.
—T. F. B.

Safety Match or like Ignition Composition. A. Markl Prague. Eng. Pat. 22,895, Oct. 21, 1902.

The composition, which is non-poisonous, consists of:—sulphur, 1 part; amorphous phosphorus, 2 parts; powdere glass, 4 parts; ferric oxide, 6 parts; minium, 10 parts potassium chlorate, 10 parts; glue solution (1 in 15), 2 parts. In order to overcome the hygroscopic properties o the amorphous phosphorus, the latter is ground with th sulphur and the necessary quantity of water to a thick pulp which is dried and ground, and then mixed with the othe constituents.—G. W. McD.

Matches; Igniting Compositions for ——. J. Y. Johnson London. From Chemische Fabrik Griesheim-Elektron Frankfort-on-M., Germany. Eng. Pat. 26,891, Dec. 5 1902.

In addition to the composition described in U.S. Pat 727,758, May 12, 1903 (see this Journal, 1903, 710), mixture of zinc hypothiophosphite, potassium chlorate, iro oxide, ground glass, zinc oxide, and glue is described.
—W. G. M.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Indicator; Preparation of a New, Very Sensitive —— from m-Toluidine. J. Tröger and W. Hille. J. prak Chem., 1903, **68**, 297—309.

By passing sulphur dioxide into the cooled liquid obtaine on diazotising *m*-toluidine in sulphuric acid solution, voluminous red precipitate was obtained. The precipitat which was found to be a sulphonic acid, was purified b converting it into its potassium salt by means of potassiu acetate, crystallising this salt from water, in which it i only slightly soluble, and treating the crystals with dilut hydrochloric acid. The free sulphonic acid was thu obtained in crystalline form. The results of analyses an the great resemblance of the product to helianthin, indicat that it has the following constitution:—

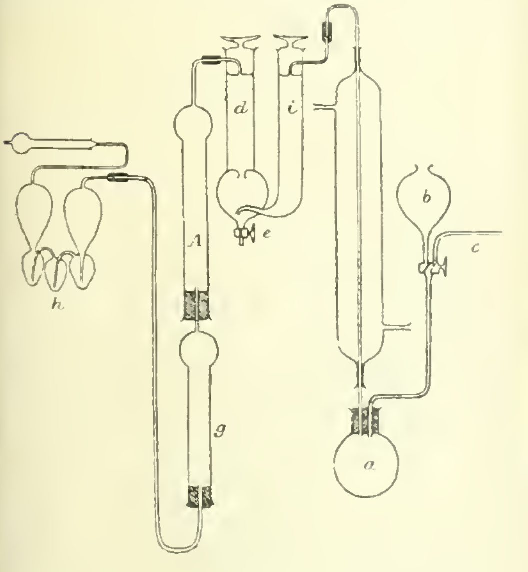
$$SO_3H.C_7H_6.N:N.C_7H_5(NH_2)_2.$$

The potassium or sodium salt forms an indicator which indifferent to weak acids, as carbonic acid, acetic aci hydrogen sulphide, &c., but is extremely sensitive to alkalis (yellow colour) and mineral acids (red colour). The sensitiveness of the indicator to alkalis is stated to be so great that the presence of alkali carbonate in tap water can be easily recognised.—A. S.

Carbonic Acid in the presence of Sulphites, Sulphides, and Organic Substances; Determination of ——. U. Stanek and J. Milbauer. Zeits. Ver. deutsch. Zucker-ind., 1903, **53**, [572], 958—961.

The determination of carbonates in presence of sulphites in sugar factory precipitates and deposits is interfered with by the sulphur dioxide evolved during the analysis, and the use of oxidising agents is inadmissible, since organic substances, such as oxalic acid, give off carbon dioxide under this treatment.

The authors' method is to drop dilute hydrochloric acid (1 in 5) on the mixture of carbonate and sulphite, and pass the evolved gases over moist granulated iodine to retain the sulphur dioxide. The carbon dioxide is freed from any iodine it has carried over by passing it over aluminium turnings, and dried over calcium chloride and anhydrous copper sulphate, and then absorbed by solution of caustic potash.



The apparatus used is a modified form of Messinger's: *a* is the decomposition flask; the side capillary *c* allows of air being drawn through at the end of the reaction; *b* contains the dilute hydrochloric acid, and *i* contains the iodine, granulated by being melted in a test-tube and poured into cold water. After each test the iodine is washed with water, and run off at *e*; *d* contains the aluminium shavings, A calcium chloride, *g* pumice saturated with anhydrous copper sulphate, and *h* the caustic potash solution.

Sulphuretted hydrogen is equally well retained by the iodine.—L. J. de W.

Persulphates; Determination of ——. C. Marie and L. J. Bunel. Bull. Soc. Chim., 1903, **29**, [18], 930—933.

0·3—0·4 grm. of the alkali persulphate is dissolved in 100 c.c. of water and neutralised in presence of methyl orange; 2 c.c. of methyl alcohol are added, and the solution is heated for five minutes at 70°—80° C., and is finally boiled for ten minutes and titrated with decinormal sodium hydroxide solution, methyl orange being used as indicator. 1 c.c. of N/10 sodium hydroxide solution corresponds to 0·0119 grm. of sodium persulphate.

Ammonium persulphate, which gives high results when methyl alcohol is absent, can be accurately determined by this method.—T. F. B.

Uranium and Uranyl Phosphate: Determination of ——, *by means of the Zinc Reducer.* O. S. Pulman. Amer. J. Science, Silliman, **16**, [4], 229—239. Chem. Centr., 1903, **2**, [15], 851.

According to Kern (this Journal, 1901, 1140), uranium in uranyl salts can be accurately determined by means of the zinc reducer of Jones, with subsequent titration by potassium permanganate solution in an atmosphere of carbon dioxide. The author finds, however, that the method gives too high results, the reduction proceeding somewhat beyond the formation of uranous salts. Correct results are obtained if the reduced solution be allowed to drop through the air into an open porcelain dish, the excessively reduced material being, in this way, re-oxidised to the uranous state without any notable formation of uranic compounds. The author finds that the best results are obtained with a solution in which the proportion of sulphuric acid to water is 1:6; the solution flows through the zinc reducer in about one hour, and 250 c.c. of hot water are afterwards passed through.

In the determination of phosphoric acid as ammonium uranyl phosphate, in order to prevent the precipitate passing through the filter, it is best to use, for the filtration, a Gooch crucible filled with very fine asbestos. The precipitate is washed with dilute ammonium acetate solution and some free acetic acid, dissolved in sulphuric acid, and the uranium determined as described above.—A. S.

Galena and Copper Pyrites; New Method of Decomposing —— [*for Analysis*]. C. Boucher. Bull. Soc. Chim., 1903, **29**, [18], 933—936.

The author finds that a mixture of sodium persulphate (3 parts) and ammonium nitrate (1 part) readily oxidises galena and copper pyrites to the respective sulphates. Blende, mispickel, and (especially) iron pyrites, and other sulphide minerals, which are more or less easily decomposed by acids, do not yield readily to treatment with persulphates.

Method.—1 to 2 grms. of the finely-powdered mineral are heated in a covered vessel, with four to five times its weight of the persulphate mixture, for 5—6 minutes. Galenas should be "moderately heated" on a sand bath; and copper pyrites must be heated very gently at first, but more strongly after the vigorous reaction has ceased. After cooling, the product is extracted with water and filtered, and the analysis completed in the usual manner. It should be noted that manganese is precipitated from acid solutions, as manganese dioxide, on boiling with persulphates.—T. F. B.

Manganese in Steel; Determination of ——. J. Malette. La Rev. techn., 1903, **24**, 327. Chem.-Zeit., 1903, **27**, [85], Rep. 267.

One grm. of the steel is dissolved in 20 c.c. of nitric acid (sp. gr. 1·2), and the solution diluted to 100 c.c.; 20 c.c. of this are heated to 90° C. with 15 c.c. of nitric acid of 36° B.; 1 grm. of ignited red lead is added and the heating continued for three or four minutes. A little more red lead is then added, the whole rapidly cooled, diluted to 50 c.c., and filtered through asbestos, the colour of the filtrate being compared with that of a solution containing 1·582 grms. of potassium permanganate per litre.—A. G. L.

Nitric Acid in Water; Simple Method for the Quantitative Determination of ——. G. Frerichs. Archiv der Pharm. 1903, **241**, [1], 47—53.

The method depends upon the fact that the nitrates occurring in water are readily converted into chlorides by treatment with hydrochloric acid, after which, the excess of acid being driven off by evaporation on the water bath, the residual combined chlorine is determined in the usual manner by titration with silver nitrate. The amount of chlorine originally present having been previously determined, and that amount deducted from the figure obtained in the second determination, the amount of chlorides equivalent to the displaced nitric acid is found.

The water to be examined is first tested qualitatively for nitrates with diphenylamine sulphate. If it contain sufficient to give a marked blue reaction, 100 c.c. are taken for the determination. If only a slight reaction be obtained, a correspondingly larger volume of the water is taken. The measured quantity of the water is evaporated to dryness on the water-bath, the dry residue treated with distilled water, and the insoluble matter removed by filtration. The filtrate is treated with 50 c.c. of hydrochloric acid, and evaporated to complete dryness in a porcelain capsule on the water-bath until no acid vapour is given off, complete desiccation being obtained by heating the capsule for a short time at 100° C. The residue is then dissolved in 30—50 c.c. of water, the complete conversion of all the nitrates into chlorides being assured by testing a drop of the solution with diphenylamine sulphate reagent. The amount of chlorine in the solution is then determined in the usual manner.

Nitrate Nitrogen; Determination of ——, in presence of Organic Nitrogen. T. Pfeiffer. Zeits. anal. Chem., 1903, **42**, [9 & 10], 612—617.

In reply to a statement made by Liechti and Ritter (this Journal, 1903, 824), the author brings forward evidence in support of a previous conclusion that the presence of ammonium salts, urea, or other organic nitrogenous bodies has a distinct influence in lowering the values obtained in the determination of nitric acid by Schloesing's method. From numbers quoted, it appears that the minus error so caused varies with the quantity of foreign nitrogenous matter present, and may be very large indeed when the quantity of the latter is several times that of the nitrate nitrogen. These results were obtained by means of an apparatus in which the gas was collected over mercury, thus avoiding any possibility of the action of dissolved oxygen upon the nitric oxide, which may take place if water is employed for collecting the gas.—J. F. B.

English Patent.

Röntgen Rays; Means for Determining the Action of ——. G. Holzknecht, Vienna. Eng. Pat. 17,666, Aug. 11, 1903.

It is found that certain alkali metal salts are coloured by the action of Röntgen rays. A fused mixture of an alkali sulphate and an alkali carbonate assumes colours, the intensity of which depends on the intensity of the rays and the time of exposure, and which resists the action of daylight for a considerable time. A mixture of one part of potassium sulphate and 0·007 part of sodium carbonate, fused at 1,000° C., is found to have almost the same sensitiveness as the skin, assuming a blue-green colour under the influence of the Röntgen rays, and therefore forms, when mixed with a colourless binding material, such as Dammar resin, a suitable indicator in the treatment of skin diseases, &c.; this method applies equally to the Becquerel rays.
—T. F. B.

ORGANIC—QUALITATIVE.

Sesamé Oil; Colour Reactions of ——. H. Kreis. Chem.-Zeit., 1903, **27**, 1030.

A New Constituent of Sesamé Oil.—In a previous communication (this Journal, 1903, 575) the author stated that certain sesamé oils contained a phenoloid substance, and attributed the green coloration obtained in Bishop's reaction to the presence of this body. The author suggests the name *sesamol* for this new constituent, and concludes from his experiments that it is the active agent in Bishop's reaction (this Journal, 1899, 1158).

Further experiments showed that *sesamol* was present in all sesamé oils, for even those not yielding an azo dyestuff on treating with diazo-naphthionic acid and alkali did so after being boiled for a short time with 10 per cent. sulphuric acid or shaken with cold hydrochloric acid (sp. gr. 1·19), showing that in these cases the *sesamol* was present in the form of a glucoside or other compound. It was proved that *sesamol* was a constituent of the natural oil, and not introduced during the extraction.

New Colour Reaction of Sesamé Oil.—5 c.c. of sesamé oil, shaken with 5 c.c. of 75 per cent. sulphuric acid and 0·3 c.c. of hydrogen peroxide solution (2—3 per cent.) yield an intense olive-green coloration. This reaction is capable of detecting 5 per cent. of sesamé oil in olive, cotton-seed, arachis, almond, peach, linseed, or castor oils.
—C. A. M.

Quinine Bisulphate; Examination of ——, by the Methods of Körner and Hesse. P. Biginelli. Boll. chim. farm., 1903, **42**, 209. Chem.-Zeit., 1903, **27**, Rep. 254.

In the examination of quinine salts other than the sulphate, by the methods of Körner and Hesse, these must first be converted into basic quinine sulphate by treatment with sodium sulphate solution. Since, however, the alkali salt formed by the reaction influences the solubility of the quinine sulphate, the results obtained are inaccurate. In the examination of quinine bisulphate, it is stated that all sources of error are avoided if the latter be converted into quinine sulphate by treatment with lead carbonate, according to the equation—

$$2(C_{20}H_{24}N_2O_2).H_2SO_4 + PbCO_3 =$$
$$(C_{20}H_{24}N_2O_2)_2.H_2SO_4 + PbSO_4 + H_2O + CO_2.$$

A quantity of the salt corresponding to 2·162 grms. of anhydrous quinine bisulphate is well mixed in a mortar with 1·5 grms. of pure lead carbonate and 20 c.c. of distilled water, and, when the reaction is complete, 5 c.c. of the filtered solution are tested by Körner's ammonia method. When Hesse's method is used, half of the above quantity of quinine bisulphate is taken.—A. S.

ORGANIC—QUANTITATIVE.

Pyridine in Aqueous Solution; Determination of ——. M. François. J. Pharm. Chim., 1903, **18**, [15], 337—338.

The method depends on the formation of the double gold salt $C_5H_5N.HCl.AuCl_3$, and the conversion of the latter into metallic gold.

In practice, a quantity of the aqueous solution of the base, or of its hydrochloride, equivalent to about 0·1 grm. of pyridine, is treated with 20 to 30 drops of hydrochloric acid, and then with an excess of gold chloride solution, as shown by the yellow colour of the supernatant liquid after the precipitation of the double gold salt. The mixture is heated on the water-bath until acid vapours are given off, and is then dried in an exsiccator. The dry residue is then rapidly washed with pure ether, free from aldehyde, on to a plain filter, the washing being continued until the ether passes colourless. Any double chloride adherent to the beaker is washed off with a little boiling distilled water, these aqueous washings being transferred to a tared Saxe capsule, and evaporated to dryness on the water-bath. The filter and its contents are then transferred to the capsule and the whole calcined, with the usual precautions. From the weight of gold thus found, the amount of pyridine is calculated, 196·6 parts of gold being equivalent to 79 of pyridine.—J. O. B.

Benzidine and Tolidine; Iodometric Determination of ——. A. Roesler and B. Glasmann. Chem.-Zeit., 1903, **29**, [80], 986.

The method depends on the reaction of the bases with one molecule of iodine, according to the equations—

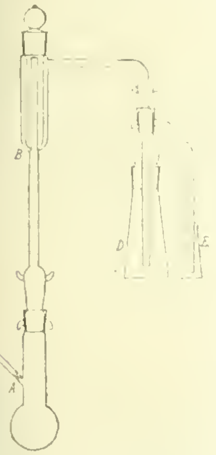
$$\underset{\text{(Benzidine)}}{C_{12}H_{12}N_2} + I_2 = C_{12}H_{11}IN_2 + HI.$$

$$\underset{\text{(Tolidine)}}{C_{14}H_{16}N_2} + I_2 = C_{14}H_{15}IN_2 + HI.$$

About 5 grms. of the base are dissolved in 5 c.c. of hydrochloric acid, sp. gr. 1·19, and water, by the aid of heat, and when cold, diluted to 500 c.c. with water. Twenty-five c.c. of this solution are neutralised with sodium bicarbonate solution until precipitation commences. This precipitate is redissolved in a trace of very dilute hydrochloric acid, care being taken that the final solution is perfectly neutral, since the presence of free acid will vitiate the results. The neutral solution thus obtained is diluted to 500 c.c., and titrated in the usual manner with N/20 iodine solution, run in drop by drop. The iodo-derivatives of the bases form voluminous dark blue precipitates, so the end reaction is best observed either with tarch paper or by spotting out with starch solution on a white tile.—J. O. B.

Methoxyl and Glycerin Determinations. M. J. Stritar. Zeits. anal. Chem., 1903, **42**, [9 & 10], 579—590. (See Zeisel and Fanto, next col.)

The author has devised certain improvements and simplifications in the apparatus employed for making determinaions by Zeisel's alkyl-iodide method. The distillation lask A, carries a side tube, narrowed to 1 mm. diameter, or the introduction of the current of carbon dioxide; the varm reflux condenser is discarded, and is replaced by a imple vertical tube. The washing apparatus consists of a mantle B, surrounding the top of the reflux tube and naving a tubular stopper reaching close to the bottom of the nantle. The size of the mantle is chosen so that it contains t least 5 c.c. of washing fluid. The mantle is provided with a side tube, bent, and then enlarged at C in the form of a stopper, through which the vapours are led into the absorption flask D and the guard flask E, containing respectively 45 c.c. and 5 c.c. of an alcoholic solution of silver nitrate. The glass stoppers should all be made tight by means of water or syrupy phosphoric acid. The boiling is effected, by means of a bath of phosphoric acid, at such a rate that the zone of condensation is situated about half way up the reflux tube. The author also describes a device for filtering the precipitated silver iodide. The liquid and precipitate are contained in a beaker, and bent tube, connected with a tubular filter, plugged with sbestos, is dipped therein; the lower end of the filter ibe is connected with a pump, and the liquid, precipitate, nd washings are each in turn drawn over through the bent ibe.



The hydriodic acid employed must be free from sulphur nd phosphorus compounds; it is purified by fractional istillation, the fractions boiling above 125° C. being nployed, provided they give perfectly blank tests when eated in the methoxyl apparatus.

The red phosphorus employed for washing the iodide apours must be carefully purified. In certain forms of pparatus, red phosphorus is open to the objection that, ot being in solution, it gets splashed upon the walls of the essel, the author finds that a concentrated solution of dium antimony tartrate satisfies all the requirements of n efficient washing liquid.—J. F. B.

ndia-Rubber and India-Rubber Articles; Analysis of ——. C. O. Weber. Ber., 1903, **36**, [15], 3103.

nalysis of Raw Rubber.—The reaction between indiaubber and nitrogen peroxide is utilised by the author for e estimation of real india-rubber in the raw material and manufactured articles. Instead, however, of using nitrous id, as suggested by Harries, he uses gaseous nitrogen troxide, obtained by heating lead nitrate. The gas is assed, through a drying cylinder containing glacial phosoric acid, into a benzene solution of the weighed raw ibber. It is not necessary to have a thoroughly homoneous solution of the sample, and the current of nitrogen troxide is stopped as soon as the solution acquires a deep d colour.

The solution is allowed to stand for about an hour, and the oduct then consists of a friable mass of an intense yellow lour, the constitution of which is expressed by the pirical formula $C_{10}H_{16}N_2O_4$. It is filtered off, and dried 50° C. After drying, the precipitate is treated with acetone, in which it instantly dissolves, but it is advisable to warm for a few minutes on the water-bath to ensure complete solution. On standing a short time, a grey mud separates from the deep-yellow solution, and consists of mineral constituents and albuminous bodies, which are collected on a filter, washed with acetone, dried, and weighed. The filtrate and washings are poured into eight times their volume of water, when the nitro derivative of pure rubber is precipitated as a fine, flaky, bright yellow precipitate. It is filtered off, washed with lukewarm water, dried at a temperature not exceeding [illegible] C., and weighed. The product contains 59·65 per cent. of pure rubber, but for technical purposes the figure 60 may be taken.

The albuminous bodies contained in the insoluble matter may be estimated by Kjeldahl's method, and the mineral matter by incineration of the contents of the filter.

The author considers it advisable to determine the resins (by extraction with acetone) in the same sample as the india-rubber (drying the sample in a current of coal-gas after the extraction), as many, if not all, rubber resins form compounds soluble in acetone when treated with nitrogen peroxide.

Analysis of Vulcanised Rubber.—The analysis is carried out according to the usual Henriques-Weber method so far as determinations of oils, resins, waxes, free sulphur, and substitutes are concerned. After the treatment with alcoholic soda, the sample is dried in a current of coal-gas, and weighed. It is then introduced into dry benzene and treated with nitrogen peroxide as already described.

The mineral constituents mostly settle well from the acetone solution, but the sulphides of antimony, mercury, and zinc remain suspended in the acetone, and to a great extent pass through the filter. This can be avoided by adding to the turbid acetone solution a small quantity of a solution of ammonium thiocyanate in acetone.

The acetone solution is precipitated in the case of vulcanised rubber by pouring it into a 10 per cent. aqueous solution of ammonium chloride, since if poured into water, the nitro addition product is thrown down as a thick yellow oil. The empirical formula of the product in the case of hot vulcanised goods may be taken as $C_{10}H_{16}N_2O_4.S^1_n$, and in the case of cold vulcanised articles as—

$$C_{10}H_{16}N_2O_4.S^1_nCl^1_n.$$

The percentage of sulphur (and chlorine) give the "vulcanisation coefficients," and must be determined also to obtain he amount of rubber in the nitro product.—J. K. B.

Starch in Pressed Yeast; Simple Method for the Determination of ——. N. Wender. Verh. d. Vers. deutsch. Ntf. u. Aerzte, 1902, 96—98. Chem. Centr., 1903, 2, [15], 852.

The author has constructed an "amylometer" which consists of a small hand centrifugal machine with two metal receptacles, into which fit the amylometer tubes, *viz.*, tubes which at one end are drawn out and provided with a scale. The tubes are so calibrated that the percentage of starch (in the form of potato starch containing 20 per cent. of water) can be read off directly. 1 or 2 grms. of the yeast are introduced into a mixing vessel (with marks at 5, 10, and 11 c.c.) containing 10 c.c. of water and 1 c.c. of iodine solution; the whole is mixed together uniformly by means of a glass rod, shaken, introduced into the amylometer tubes, and the mixing vessel rinsed with 5 c.c. of water. The tubes are closed, placed in the metal receptacles of the amylometer, the apparatus screwed on to the bench, and worked for three minutes. The tubes are hen removed and the volume of the dark blue layer of starch iodide read off.—A. S.

Glycerin in Wine; Determination of ——, *by Means of the "Iodide Method."* S. Zeisel and R. Fanto. Zeits. anal. Chem., 1903, **42**, [9 & 10], 549—578.

This method is based upon the conversion of the glycerin into isopropyl iodide and the determination of the combined iodine as silver iodide by the authors' method (this Journal, 1902, 992).

Preliminary Treatment of Wines.—Sulphur compounds, volatile alcohols, esters, and acetal must be removed. For this purpose, in the case of wines poor in sugar, 100 c.c. of wine are mixed with tannin and a slight excess of barium acetate; 70 c.c. of the mixture are then distilled off, cork connections only being employed.

The cooled residue, together with the precipitate, is made up to a volume of 50 c.c., filtered, and 5 c.c. are measured off for the determination. In the case of sweet wines, the 30 c.c. of residue are diluted to 100 c.c. instead of 50, and 5 c.c. are taken for analysis. The presence of sugar, although it does not introduce any appreciable error, considerably prolongs the reaction, and wines rich in sugar must be boiled for four hours before all the glycerin is converted into isopropyl iodide.

The only constituent of normal wines, treated in the above manner, which really introduces an error, is isobutylene glycol, which yields a volatile iodide, but the quantity of this body compared with that of the glycerin is small. Mannitol also yields a volatile iodide, and if this body be present, as in the case of certain abnormal wines, it prevents the accurate determination of the glycerin.—J. F. B.

Analysis [Mechanical Wood Pulp]; A New Quantitative Method of ——. N. Teclu. Zeits. anal. Chem., 1903, **42**, [9 & 10], 603—606.

The image of an object under the microscope loses its sharpness when the distance between the object and the objective is increased. At a certain distance the details of the image entirely disappear, this distance being strictly proportional to the quality of the object.

This observation is capable of being applied as a basis of comparative analysis in certain cases, the focussing screw of the microscope being furnished with a pointer and graduated dial. The two points of an observation are, first, the position at which the image is absolutely sharp, and, secondly, the position to which the objective has to be raised to cause total disappearance of the details. This latter point is determined by keeping the object in continuous motion by a clockwork arrangement and using a wired eye-piece; the reading is taken when the motion of the object ceases to be discernible. So far, this method has only been applied to the determination of mechanical wood-pulp in paper. Several samples of paper with known percentages of wood-pulp having been obtained, pieces of these are soaked in a mixture of alcohol (50 c.c.) and concentrated hydrochloric acid (25 c.c.). They are then mounted and examined under the microscope with simultaneous reflected and transmitted illumination (power 140). Far each sample a value is determined for the motion of the objective between the two points specified above. These values depend on the characters of the individual papers. Each sample is then moistened with the acid-alcohol reagent, to which 1 grm. of phloroglucinol has been added, and the two positions of the objective are again observed in the same way as before. The difference between the second observation and the first is proportional of to the red coloration produced by the action of the reagent on the wood fibres. The percentage of the latter being known, an average empirical constant C can be calculated for the expression $x = \frac{C}{D}$ for the analysis of unknown samples, where x = the percentage of wood and D = the difference between the second and first observation. From examples quoted, the method appears to be accurate to within 1 per cent.—J. F. B.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radium: Decrease in Weight of ——. F. Dorn. Physikal. Zeits., 1903, **4**, 530. Chem.-Zeit., 1903, **27**, [85], Rep. 262.

Contrary to an assertion of Heyweiller (Physikal. Zeits. 1902, **4**, 81) that 5 grms. of radium bromide lost 0·02 mgrm. in weight per day, the author found a decrease in weight on 30 mgrms. of radium bromide of less than 0·001 mgrm. in three months. The radium bromide was contained in a sealed tube, which was balanced by a similar tube containing sand. Two vessels containing radium were placed beneath the balance to eliminate any errors due to electrostatic charges.—A. G. L.

Melting Point Determinations at High Temperatures W. Hempel. Zeits. f. Electrochem., 1903, **9**, [43] 850—851.

An electric furnace of special construction was used, th heating arrangement consisting of a number of thin carbo rods, arranged in zigzag fashion, through which a curren was sent. The furnace was embedded in a mixture o infusorial earth and coal, to exclude the air.

The following melting points, which are all probably a littl below the true value, were determined:— Bone-ash a 1,450°, platinum at 1,670°, magnesite at 1,825°, alumina a 1,880°, lime at 1,900°, and magnesia at 2,250° C.

The following substances soften at the temperatur stated:—Berlin porcelain at 1,550°, quartz at 1,670°, an specially prepared Meissen porcelain at 1,850° C.—L. F. G

Bismuth Compounds; Series of ——. G. Urbain and H. Lacombe. Comptes rend., 1903, **137**, [15], 568—569.

By dissolving in hot nitric acid of sp. gr. 1·3 the theoretica quantities of bismuth nitrate and of the nitrate of one o the metals magnesium, zinc, nickel, cobalt, or manganese crystals are obtained, on cooling, of a double salt of th formula $3M(NO_3)_2.2Bi(NO_3)_3.24H_2O$. These salts are al very deliquescent, though they lose water in absolutely dry air, and are decomposed by water like other bismuth salts Their principal interest lies in the fact that they are isomorphous with the double nitrates of the magnesium metal and the rare earth metals (their crystallisation can be starte by seeding with magnesium didymium nitrate), thus indicating a relationship between these rare-earth metal and bismuth.—J. T. D.

Chemical Reaction between Salts; Influence of Smal Quantities of Water in bringing about ——. E. P Perman. Brit. Assoc., Southport, 1903. Chem. News 1903, **88**, 197.

Two grms. of potassium iodide and an equivalent weigh of lead chloride were dried for 48 hours over strong sulphuric acid, and then mixed and kept in a sealed flask o 100 c.c. capacity. After one week, a faint yellow colou appeared, which gradually deepened, until, after some months, it became a bright yellow. In the presence o about 0·5 mgrm. of water, reaction occurred immediately Similar results were obtained with mixtures of lead formate and nitrate with potassium iodide; lead sulphate react much more slowly, even when exposed to the air, and lea carbonate and oxide very slowly indeed. Mercuric chloride and potassium iodide under similar conditions gave a immediate reaction, but after drying the salts over specially prepared phosphoric anhydride, the mixture was kept fo some months without change. No reaction occurred wit mercuric cyanide and potassium iodide, whilst mercuric chloride and potassium chromate reacted very slowly even when exposed to the air.—A. S.

Glass and on Paraffin; Action of Alkalis on —— F. Jones. Mem. Manchester Lit. and Phil. Soc., 1902 **47**, 1—17.

The author enclosed solutions of calcium, barium, an strontium hydroxides (1) in plain glass bottles; (2) i bottles containing 0·1 grm. of silica; and (3) in bottles containing 1 grm. of powdered glass. In the plain glas bottles, the calcium hydroxide solution had lost 13 per cent of its alkalinity after six months, but the solutions o barium and strontium hydroxides remained unaltered. I the bottles containing silica and powdered glass, the calcium hydroxide was almost completely neutralised in the course of a few months, and the alkalinity of the other solutions was also considerably reduced. A coating of paraffin-wa on the inside of the bottles did not prevent the action o the alkali on the glass; in fact, the action was ultimately greater than on plain glass. On leaving alkaline solutions in contact with paraffin-wax shavings for five months, th alkalinity of the calcium hydroxide solution was reduce by 22 per cent., that of strontium hydroxide solution b 30 per cent., and that of barium hydroxide solution by 2 per cent.; the solutions contained no organic matter, bu the alkali was found to be associated with the paraffin-wax. —A. S.

Philothion and the Production of Sulphuretted Hydrogen by Extracts of Organs and Albuminoid Matters generally. E. Pozzi-Escot. Bull. de l'Assoc. Chim. Sucr. Dist., 1903, **21**, [3], 278—280.

Abelous and Rigaut have attacked the author's conclusions as to the existence of the sulphur-reducing enzyme hilothion (see this Journal, 1903, 812), and contend that his property is common to albuminoids generally, even when they have been heated for some time at 130° C. The uthor now shows that an active extract of yeast in presence of chloroform will evolve large quantities of sulphuretted ydrogen in a few hours at the ordinary temperature if ulphur be added. In the absence of sulphur, no sulhuretted hydrogen can be detected in 12 hours, provided he must be free from sulphates. If the extract be boiled or three minutes, and sulphur be added after cooling, no ulphuretted hydrogen is produced. Boiling in presence of artaric acid has no influence on the evolution of this gas. The ddition of formaldehyde to an active extract prevents the roduction of sulphuretted hydrogen from sulphur. If an ctive extract be boiled in presence of sulphur, an immeiate evolution of sulphuretted hydrogen takes place; but f, after cooling, all the sulphuretted hydrogen be expelled y a current of carbon dioxide, no further production of ulphuretted hydrogen occurs.

An active extract of yeast produces a considerable uantity of sulphuretted hydrogen if sodium bisulphite be dded, and the quantity of sulphurous acid is diminished. imilarly, growing yeast will produce sulphuretted hydrogen hen sulphites, bisulphites, or sulphates are added to the ort. This is observed in the fermentation of worts of elasses containing sulphites, and sulphur is precipitated the process. All these facts confirm the enzymic nature f the reduction of sulphur, although it is quite possible at certain albuminoids containing sulphur may lose part f the latter, when boiled, by a purely chemical process.
—J. F. B.

lutamic Acid: Optical Rotation of ——. K. Andrlík. Zeits. Vereins deutsch. Zuckerind., 1903, **53**, [572], 948—958.

he optical rotation of glutamic acid from molasses waste es at 20° C. for $\alpha_D = 12{\cdot}04$.

This rotation is influenced by inorganic and organic acids well as by alkalis. Strong acids with increasing concenation produce an increase of dextro-rotation tending wards a maximum optical activity; weak acids, such as ric and acetic acids, scarcely affect the rotation. Bases oduce first a change from dextro- to lævo-rotation, the aximum occurring with the production of the acid salt. urther quantities of base convert the lævo-rotation again to dextro-rotation. There is an exception in the case of ad hydroxide, the lævo-rotation first produced being aintained.

Small quantities of basic lead acetate cause a diminution the optical activity of glutamic acid; larger quantities ange this into a lævo-rotation, which is greatly increased further additions of the reagent.

Betaïne in a 1·5 per cent. solution was without influence the optical activity.—L. J. de W.

etones; New Method of Preparing ——. [Reaction of Mixed Organo-Magnesium Compounds on Amides.] C. Béis. Comptes rend., 1903, **137**, [15], 575—576.

mides, in reacting on the mixed organo-magnesium comunds of Grignard (this Journal, 1902, 286), may do so rough either the NH_2 or the CO group. The latter action occurs when the amide is heated for some hours the water-bath with great excess of the organo-magnesium mpound, and the resulting substance is treated with water, e ultimate product being a ketone—

$$R.CONH_2 + 2MgR'X + 2OH_2 = R.CO.R' + NH_3 + R'H + MgX_2 + Mg(OH)_2.$$

e author discusses the probable mechanism of the stages the reaction, and enumerates the compounds which he thus prepared.—J. T. D.

New Books.

Instruction in Mining and Metallurgy in Germany and the German Mining and Metallurgical Industries. Foreign Office Miscellaneous Series, No. 597. Price $2\frac{1}{2}$*d.* Messrs. Eyre and Spottiswoode.

Contents:—Freiberg Mining High School; Berlin Mining High School; Clausthal Mining Academy; Aix-la-Chapelle Technical University; Mining Industry in Germany during the latter half of the 19th Century; Metallurgical Industry.

Industrial Uses of Water. By H. De la Coux, Professor of Applied Chemistry and Expert to the Prefecture of the Seine, &c. Translated from the French and Revised by Arthur Morris. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. D. van Nostrand Co., 23, Murray Street, New York. 1903. Price 10*s.* 6*d*

8vo volume, containing 347 pages of subject-matter, illustrated with 135 engravings, and followed by an alphabetical index. The matter is subdivided as follows:—Part I. Water: (i) Its Chemical Action in Nature and in Industrial Use. (ii) Composition; Origin of Substances contained. (iii) Solubility of certain Salts considered from the Industrial side, &c. Part II. Effects of Water in the Industries. Difficulties with Water, and Remedies: (i) Boiler Feed-water. (ii) Water in Dyeworks, Print Works, and Bleach Works. (iii) In the Textile Industries, &c. (iv) Water in Soap Works. (v) In Laundries and Washhouses. (vi) In Tanning. For Dyewood Extracts. In Paper Making, Photography, Sugar Refining, Brewing and Distilling, &c. Part III. Preliminary Treatment and Apparatus: Industrial Sterilisation by Physical and Chemical Action. Part IV. Residuary Waters and their Purification: (i) Soil Filtration. (ii) Purification by Chemical Processes. (iii) Recovery of Glycerin. Part V Analysis: (i) Qualitative Analysis of Substances in Solution in Water. (ii) Hydrotimetric Analysis. (iii) Quantitative Determination of Substances in Solution.

Fractional Distillation. By Sydney Young, D.Sc., F.R.S., Professor of Chemistry in University College, Bristol. Macmillan and Co., Ltd., London. The Macmillan Company, New York. 1903. Price 7*s.* 6*d.*

8vo volume, containing 268 pages of subject-matter, an appendix and tables filling three pages, and followed by the alphabetical index. The text contains 72 illustrations. The subject-matter is subdivided as follows:—I. Apparatus required. II. The Boiling Point of a Pure Liquid. III. Vapour Pressures of Mixed Liquids. IV. Boiling Points of Mixed Liquids. V. and VI. Composition of Liquid and Vapour Phases. Experimental Determinations. Also the same considered Theoretically. VII. Directions for a Fractional Distillation. VIII. Theoretical Relations between the Weight and Composition of Distillate. IX. Relation between the Boiling Points of Residue and Distillate. X. Modification of the Still-Head. XI. Dephlegmators. XII. "Regulated" or "Constant Temperature" Still-Heads. XIII. Continuous Distillation. XIV. Fractional Distillation with an improved Still-Head. XV. Distillation on the Manufacturing Scale. XVI. Fractional Distillation as a Method of Quantitative Analysis. XVII. Methods by which the Composition of Mixtures of Constant Boiling Point may be determined. XVIII. Indirect Methods of Separating Components of a Mixture of Constant Boiling Point. XIX. Purposes for which Fractional Distillation is required. Interpretation of Results. Choice of Still-Head, &c., &c.

An Essay towards Establishing a Normal System of Paper Testing. By C. F. Cross, E. J. Bevan, Clayton Beadle, and R. W. Sindall. Wood Pulp, Ltd., 10, Godliman Street, London, E.C. 1903. Price 2*s.* 6*d.* nett; 2*s.* $7\frac{1}{2}$*d.* post free. Pamphlet.

Analytical Tables for Complex Inorganic Mixtures. Arranged by F. E. Thompson, Teacher of Chemistry at Science and Art Institute, Walsall; Municipal Technical School, Dudley, &c. Chronicle Press, 19, Greengate Street, Stafford. 1903. Price 1*s.* 6*d.*

A series of tables filling seven pages, large 8vo.

Journal de Chimie Physique. Electrochimie, Thermochimie, Radiochimie, Mécanique chimie, Stoechiometrie. Par Philippe-A. Guye, Professeur de Chimie à l'Université de Genève. Avec la collaboration de MM. Amagat, Arrhenius, Roozeboom, Berthelot, Ciamician, Cohen, Crafts, Curie, Héroult, van't Hoff, Le Chatelier, Maquenne, Mond, Nasini, Nernst, Ostwald, W. Ramsay, &c., &c. Henry Kündig, 11, Corraterie, Genève. Gauthier-Villars, 55, Quai des Grands Augustins, Paris. 1903. Will appear in 8 to 10 parts, so as to form a volume of 600 to 700 pages. Price Frs. 25. Carriage paid, price Frs. 30.

The issue has just commenced with the July and August numbers, Vol. 1, Nos. 1 and 2, the appearance of which is herewith announced.

Trade Report.

I.—GENERAL.

American Investments in Canada.

U.S. Cons. Rep., June 1903.

The United States Consul-General in Montreal devotes a recent report to a list of the investments of American capital in Canadian enterprises during the early months of the present year. He says the industrial outlook in Canada is very bright, that new and great enterprises are being undertaken and existing ones being enlarged. Most of these are being aided by American capital. Nickel mines in Northern Ontario have been secured for Mr. Edison; 34,000 acres of timber, with mills and equipment, in the Gaspé Basin have been purchased for pulp making by Americans from Buffalo; 125,000 shares in the Granby Copper Co. have been acquired by American capitalists, four of whom have become directors; a company of paint manufacturers from Cleveland have purchased land in Montreal for the erection of large paint works. Asbestos and mica companies and properties have been purchased by American companies, while copper mines, weaving mills, dyeing works, aluminium, iron and steel works, incandescent burners, coal and iron mines, and gold mining, are amongst the Canadian enterprises either commenced or purchased by American capitalists, or in which they have taken a large number of shares during the brief period to which the report refers. The Consul-General, who gives the details of all the above undertakings, with names of the persons concerned, places, amounts, &c., concludes his statement by saying that there are doubtless many more investments of American capital in Canada which have escaped his notice. "In every great enterprise projected, American capital is solicited, and investors are readily obtained. The rapid development of Canada is largely due to enormous investments of American capital and to the energy of Americans."

Crete; Trade of ——, in 1902.

Foreign Office Annual Series, No. 3097.

The trade in minerals, chemicals, &c. in Crete, during the years 1901—1902, was as follows:—

Article.	Import.		Export.	
	1901.	1902.	1901.	1902.
	£	£	£	£
Vegetable dyestuffs and tanning products	2,060	2,352	5,632	9,978
Minerals and metals	26,730	23,004	1,174	1,993
Drugs and chemicals ...	15,498	11,150	11,150	32,595
Sugar, &c.	19,170	16,237	..	..

Bosnia and the Herzegovina; Trade of ——, during 1902.

Foreign Office Annual Series, No. 3094.

The appended table shows the trade in various articles in Bosnia and the Herzegovina during the last two years, the figures representing metric tons:—

Article.	Import.		Export.	
	1901.	1902.	1901.	1902.
Sugar....................	3,713	8,276	712	571
Fatty substances	1,191	1,043	43	179
Oils......................	981	913	14	17
Minerals.................	8,555	7,771	49,883	52,537
Drugs and perfumery...	7	9	..	11
Dyestuffs	598	25	2,616	2,730
Gums and resins	1,667	306	16	64
Mineral oil, tar, &c.	4,897	2,939	7,585	7,392
Glass	1,142	1,128	32	43
Salt	3,737	1,050	4,481	4,482
Chemicals	1,410	1,205	32,198	36,610
Paints and varnishes ...	438	465	17	43
Soap and candles	803	849	12	18
Matches and explosives .	1,132	953	23	18

II.—FUEL, GAS, AND LIGHT.

Gas; Natural ——, in Sussex.

H. B. Woodward. "Summary of Progress," Geological Survey, 1902.

It is concluded that the available information indicates that a certain amount of gas is pent up in the lower Wealden beds and in the Purbeck beds. The bore-holes that have been sunk have not, however, penetrated any thick masses of porous strata such as might be supposed capable of storing a vast accumulation of gas. What has been obtained must have been stored in comparatively thin layers of sandstone and sand interlaminated with the Wealden clays and in the harder bands of the Purbeck. It appears probable, therefore, that gas is derived from Purbeck shales, and that it may be stored over a considerable area in the thin porous beds. Below these beds, however, there is evidence of important beds of sand and sandstone (Portland beds) 50ft. to 60ft. in thickness, and capable of storing a great quantity of gas. At present these strata have not been penetrated by any of the bore-holes sunk in search of natural gas, and it would seem necessary to bore from 300 ft. to 320 ft. deeper than has yet been done at Heathfield to reach this horizon. It is possible, however, that gas from these lower strata has been indirectly tapped through crevices and fault planes. Mr. Woodward also recalls the facts that, in 1875, experiments on several tons of the leathery shales which occur in the upper part of the Purbeck beds yielded tar and by subsequent processes oil naphtha, and paraffin, and that at the sub-Wealden boring a hard, light-coloured bed very rich in petroleum was passed through at depths of about 600 ft. in the Kimmeridge clay which at Heathfield underlies the Portland beds, bituminous shales again occurring at from 960 ft. to 1,000 ft.

Coal Production of United Kingdom in 1902.

A Parliamentary Return relating to the coal production and consumption of the principal countries of the world shows that the United Kingdom in 1902 produced 227,095,042 tons, this being the largest amount on record exceeding, by 1,913,742 tons, the production of 1899, an by 8,048,097 tons that of 1901; this increase is due largel to the greater number of persons employed, and, to a smalle extent, to the increase of 5 tons in the yield per under ground worker. The production of the United States wa 268,688,000 tons, and of Germany, 107,436,000 tons Great Britain exported 60,400,000 tons, Germany 18,961,000 tons, and the United States, 6,127,000 tons The British and German exports were the greatest recorded The figures do not include the production of the Britis Colonies and Dependencies, the total for which in 1902 wa 18,480,000 tons, exclusive of New South Wales and Victori or which no figures are given. The amount of coal used or locomotive purposes in the United Kingdom was 1,336,522 tons, and of the total production 15,447,474 ons were brought to the Metropolis.

COAL MINES IN PARANA (BRAZIL); DISCOVERY OF ——.

Bd. of Trade J., Oct. 29, 1903.

The monthly Bulletin of the International Bureau of the American Republics, for September, reports that there has been discovered in Brazil, at a place called Cedro, in the ownship of Imbituba, State of Parana, a great deposit of coal. The coal-bearing area extends over 3,000 hectares 7,000 acres), and the samples taken from the upper strata were classified as "fat pit coal."

These coalfields run through the centre of Parana due north and south, and seem to be the continuation of the vein that traverses the States of Rio Grande do Sul and Santa Catharina.

The situation of the fields is most convenient, being only 0 kilometres from the São Paulo-Rio Grande Railway, hat forms a junction at Ponta Grossa with the Parana Railway, which runs to the seaports of Paranaguá and Antonina. As a consequence of the preliminary analysis, he Governor of the State of Parana has informed the Minister of the Interior of the fact that by this discovery he fuel problem for the railways of the interior of Brazil will be solved.

An analysis of the samples taken from the upper strata yielded favourable results, and the coal was pronounced to be of a good quality.

MAGNESIUM RODS: U.S. CUSTOMS DECISIONS.

Oct. 16, 1903.

Merchandise invoiced as above, but composed in fact of lay, and used as supports for incandescent mantles, was eld to be dutiable at 20 per cent. *ad valorem*, as "manuactured articles unenumerated," under section 6 of the resent Tariff Act. The assessment of duty at 35 per cent. *d valorem*, uuder paragraph 97, was overruled.—R. W. M.

IX.—BUILDING MATERIALS, Etc.

ABRASIVE MATERIALS; PRODUCTION OF ——, IN THE UNITED STATES IN 1902.

Iron Age, Sept. 3, 1903.

Bd. of Trade J., Oct. 22, 1903.

According to the annual report of the United States Geological Survey, the output of abrasive materials in the United States in 1902 exceeded that of any previous year oth in quantity and value. The total value of these roducts in 1902 was 1,322,894 dols., as compared with ,194,772 dols. in 1901, and 1,208,073 dols. in 1900. While he aggregate amount of these abrasives produced each ear is increasing, there is a notable variation in the prouction of the different kinds of material.

Corundum and Emery.—There is a constant increase in he demand for such abrasives as corundum and emery. There was no production of corundum in the United States n 1902, except of the emery variety, and the production f emery was confined to the same localities as for 1901. The total production during 1902 was 3,497 tons, valued t 95,135 dols., as compared with 1,305 tons, valued at 46,040 dols. in 1901.

Carborundum.—There was a slight decrease iu the moant of carborundum produced in 1902 as compared ith that of 1901, the figures being 3,741,500 lb. and ,838,175 lb. respectively.

Crushed Steel.—The production of crushed steel in 1902 mounted to 735,000 lb., as compared with 690,000 lb. in 901.

Artificial Corundum.—The manufacture of artificial corundum from bauxite, which was recently started, has een carried on during most of the year 1902. Thus far he manufactured product has been used entirely by the manufacturers, and none has been put on the market as aw material. This artificial corundum is reported to give atisfaction.

Adamite.—Another artificial abrasive that has recently been introduced to the market is adamite, which at the present time is being manufactured at Vienna. This material makes a hard and tough abrasive, but no comparative tests as to its abrasive efficiency are as yet available.

ASBESTOS IN THE UNITED STATES.

United States Geological Survey.

The production of asbestos in the United States in 1902 showed an increase of about 35 per cent. over the output of the previous year, and practically all of the product was consumed in the manufacture of fireproof paints, cements, wall-plaster, and packing. Nearly all the asbestos used in the manufacture of felt, boards, tubes, ropes, &c., is of the fibrous variety, as yet but little produced iu the States, and is imported from Canada.

The production of asbestos in the United States during 1902 was chiefly from the mines of Sall Mountain, White County, Ga., with smaller amounts from near Hinsdale, Berkshire County, Mass.

The following table shows the quautity and value of the annual production of asbestos in the United States during the past 10 years:—

——	Short Tons.	Value.
		Dols.
1893	50	2,500
1894	325	4,463
1895	795	13,525
1896	501	6,100
1897	580	6,450
1898	605	10,300
1899	681	11 740
1900	1,054	16,310
1901	747	13,498
1902	1,005	16,200

X.—METALLURGY.

MINERAL PRODUCTION OF WESTERN AUSTRALIA IN 1902.

Bd. of Trade J., Oct. 29, 1903.

The following table shows the quantity and value of minerals produced in Western Australia in the years 1901 and 1902:—

——		1901.		1902.	
		Quantity.	Value at the Mines.	Quantity.	Value at the Mines.
			£		£
Black tin (raised)	stat. tons	734	40,000	620	[illegible]
Coal (raised)	,,	117,836	68,561	140,884	86,188
Cobalt ore (export)	,,	..	..	2	41
Copper ore (raised)	,,	9,960	69,900	2,262	8,000
Gold (export and mint)	oz. fine	1,703,417	7,235,653	1,871,037	[illegible]
Ironstone (raised)	stat. tons	20,569	13,246	4,800	2,040
Limestone (raised)	,,	18,210	4,318	5,080	[illegible]
Plumbago ore (export)	,,	..	..	1	6
Precious stones (export)	carats	†	1,000	..	..
Silver (export)	oz. fine	60,869	[illegible]	[illegible]	[illegible]
Silver lead ore (raised)	stat. tons	21	152	36	277
Total Values		..	7,440,169	..	8,091,617

† Weight not stated.

The above table gives the total quantity and value of minerals produced during the years 1901–2, and it will be seen that, notwithstanding the large falling-off in total value of copper ore raised, the production for the year shows an increase of 651,148*l.* as compared with 1901, and is the largest yet recorded for the State.

MINERAL PRODUCTION OF CALIFORNIA IN 1902.

Eng. and Mining J., Oct. 17, 1903.

The yield and value of mineral substances of California for 1902 is as follows, as per returns received at the State Mining Bureau, San Francisco :—

——		Quantities.	Value.
			Dols.
Asphalt	Tons	34,511	349,344
Bituminous rock	„	33,490	43,411
Borax and boric acid	„	17,202	2,234,994
Cement	Bbl.	171,000	423,600
Chrome	Tons	315	4,725
Chrysoprase	Lb.	50	500
Clays:—			
For pottery	Tons	67,933	74,163
For brick	M.	169,851	1,306,215
Coal	Tons	88,460	248,622
Copper	Lb.	27,860,162	3,239,975
Fuller's earth	Tons	987	19,246
Glass sand	„	4,500	12,225
Gold		..	16,910,320
Granite	Cb. ft.	257,650	255,239
Graphite	Tons	42	1,680
Gypsum	„	10,200	53,500
Infusorial earth	„	422	2,532
Lead	Lb.	340,440	12,230
Lithia mica	Tons	822	31,880
Lime	Bbl.	448,664	369,616
Limestone	Tons	71,422	90,524
Macadam	„	500,939	418,548
Manganese	„	870	7,140
Magnesite	„	2,830	20,655
Marble	Cb. ft.	19,305	37,616
Mica	Tons	50	2,500
Mineral paint	„	589	1,533
Mineral water	Galls.	1,701,142	612,477
Natural gas	M. cb. ft.	120,968	99,443
Paving blocks	M.	3,502	112,437
Petroleum	Bbl.	14,356,910	4,692,189
Platinum	Oz.	39	468
Pyrites	Tons	17,525	60,306
Quicksilver	Flasks	29,552	1,276,524
Rubble	Tons	1,555,076	830,981
Salt	„	115,208	205,876
Sandstone	Cb. ft.	212,123	142,506
Serpentine	„	512	5,065
Silver	Tons	..	616,412
Soda	„	7,000	50,000
Slate	Squares	4,000	30,000
Soapstone	Tons	14	288
Tourmaline		..	150,000
Turquoise	Lb.	510	11,600
Total Value		..	35,069,105

In the previous year the total product was valued at 34,355,981 dols., so that the increase for 1902 is 713,124 dols.

MINERALS IN NOVA SCOTIA.

Dept. of Public Works and Mines, Halifax, N.S.

During the year ended Sept. 30, 1902, 192,076 tons of gold ore were crushed, at a yield of 5 dwt. 13 grs. per ton, giving a total yield of 28,279 oz. 4,366,869 tons of coal were produced during the same period. 700 to 800 tons of barytes are produced annually. About 3,000 tons of antimony ore were exported from a mine near Rawdon last year. The export of gypsum to the United States is about 150,000 tons per annum. Iron ore of all kinds, pyrites, and manganese ores are also produced in considerable quantity. A deposit of diatomaceous earth at Bass River has been worked for some years, and a 12-in. vein of celestite occurs at Sydney R., C.B.

ANTIMONY ORE: U.S. CUSTOMS DECISIONS.

Oct. 8, 1903.

Sulphide of antimony ore, crushed and broken so that the resulting particles varied from one-fourth of an inch to a coarse powder, was decided to be free of duty under paragraph 476 of the present Tariff Act, as "antimony ore, crude sulphide of." Duty had been assessed at 20 per cent. *ad valorem* as a "manufactured article unenumerated," under section 6, following a decision of the Board to this effect. The United States Circuit Court, however, reversed this decision, holding the merchandise to be free of duty, and, the Treasury Department having acquiesced, the above decision is now final.—R. W. M.

MINERAL EXPORTS OF TASMANIA.

Bd. of Trade J., Oct. 22, 1903.

The following statement, taken from official sources, shows the value of mineral products exported from Tasmania in 1902. They do not greatly vary from those of 1900 and 1901, the differences being due to a considerable extent to the fluctuations in prices :—

	£
Gold	170,968
Silver ore	193,905
Silver-lead bullion	191,034
Tin	237,828
Copper ore	59,835
Copper, blister	583,795
Copper, matte	53,362
Other minerals	28,233
	1,518,960

COPPER IN ST. DOMINGO.

Eng. and Mining J., Oct. 17, 1903.

The island of Santo Domingo, in the West Indies, is becoming the scene of some mining activity. In the San Cristobal district there have been found copper deposits large enough to warrant the erection of a smelter having a capacity of 50 tons per day. It is expected that the first matte ever shipped from the island to the United States will reach New York City early next January.

COPPER AND MOLYBDENUM MINE IN THE ISLAND OF VIRGIN GORDA.

Bd. of Trade J., Nov. 5, 1903.

Tenders will be received by the Government of the Leeward Islands up to the 1st December 1903, at the office of the Colonial Secretary, Antigua, for a concession to mine in the island of Virgin Gorda, in the Virgin Islands British West Indies, on lands formerly the property of the Virgin Gorda Mining Company, and now the property of the Government of the Virgin Islands. The mine consists of several "stringers" of chalcopyrite carrying copper and, possibly, gold. Molybdenum exists in quantities worth mining, and grey copper ore is also said to exist.

XI.—ELECTRO-CHEMISTRY, Etc.

LEAD GRIDS: U.S. CUSTOMS DECISION.

Oct. 12, 1903.

Lead grids for electric batteries, consisting of large leaden plates 14 ins. wide and 31½ ins. long, and perforated in the form of a grid, were decided to be dutiable at 45 per cent. *ad valorem* under paragraph 193 of the present Tariff Act, as "manufactures of lead." The action of the Custom authorities at Boston, Mass., who had assessed duty at 2⅛ cents per lb. under paragraph 182, as "lead in any form," was overruled, on the ground that the grids had been manufactured beyond the condition of mere lead.—R. W. M.

XII.—FATS, FATTY OILS, Etc.

OLIVE OIL: U.S. CUSTOMS DECISION.

Sept. 28, 1903.

Olive oil containing 8·40 per cent. of free fatty acids and having a strong acrid taste, was held to be free of duty under paragraph 626 of the Tariff Act. The fact that oil of this character is used for edible purposes by the poorer classes of Italians, was not considered of sufficient weight to establish the fact that the oil was fit for other than mechanical or manufacturing purposes.—R. W. M.

TALLOW: CHINESE VEGETABLE ——: U.S. CUSTOMS DECISION.

Sept. 28, 1903.

The Board decided that a substance of the above name, obtained from the white brittle fat of the seeds of the *Stillingia sebifera*, or tallow or wax tree, was dutiable as "tallow" at ¼ cent per lb., under paragraph 279 of the Tariff Act. The importers claimed it to be free of duty as "vegetable wax," under paragraph 695. An analysis of the article showed it to be a true fat and not a wax.

—R. W. M.

XIII. B.—RESINS, VARNISHES, Etc.

Paper- and Wall-Coating; New ——.

U.S. Cons. Reps., Oct. 19, 1903.

A new German composition for coating or impregnating pasteboard and similar material for roofing and other purposes, also applicable for coating the walls of buildings, &c., consists chiefly of a combination of resins and fats which are practically non-saponifiable, such, for instance, as the cholestrin fats, the composition being applied in a molten condition or dissolved in a volatile liquid, such as benzine, turpentine, &c. Linseed oil, carnauba wax, and magnesium oxychloride are added to the mixture. In a recipe given, the following proportions are recommended:—60 parts of colophony, 25 of neutral yolk, and 5 each of carnauba wax, linseed oil, and magnesium oxychloride. The material under treatment is immersed for about 10 minutes in the fused composition and passed between heated rollers.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Tree Planting in the East.

U.S. Cons. Reps., Oct. 19, 1903.

The recent report of Mr. Stanley Arden, of Selangor, contains valuable information about rubber cultivation in the Far East, and records the assured success of the Para-rubber tree in the Malay Peninsula, thus extending the field available for the production of the world's best grade of rubber.

While the initial planting of *Hevea* in India proved a complete failure, better results were obtained from the beginnings made in Ceylon and the Malay States, where the seedlings rapidly developed into vigorous trees. But, as Mr. Arden says, very little interest was taken in rubber by planters, presumably on account of the high prices then ruling for coffee. With a decline in the price of coffee, planters began to look for other sources of profit. During the season 1896–97, the planting of rubber was taken up seriously. Since then its cultivation has received great attention, and there are at the present time, in the Malay Peninsula alone, at least 12,000 acres planted with *Hevea*, representing about 1,500,000 trees, presumably the whole being the progeny of the trees originally introduced by the Government of India (in 1876).

The opinion has prevailed, and quite naturally, that any rubber species would require, for its successful cultivation, the conditions of soil, climate, &c., peculiar to its native habitat. The conditions found on the margins of the Brazilian waterways clearly do not exist in the Malay States, but this fact has not interfered with the satisfactory growth there of *Hevea*.

Rubber in the French Colonies.

(*Translated in the U.S. Bureau of Statistics from La Quinzaine of Sept.* 10, 1903.)

An industrial school for the exploitation of caoutchouc was established in the Sudan in 1902. The funds necessary for its operation were supplied by the colony in order to teach natives the best methods of culture, how to increase and preserve the trees, and the best methods of gathering and coagulating the juice. The school has been attended since the beginning by more than 150 pupils. These students, arranged into groups, have gone into the various rubber districts, particularly where the trees yield an abundance of juice. The system of education is practical, and yet simple. It gives a simple, scientific knowledge of the rubber plant, the best means to secure its preservation, the best methods of making incisions in the bark, instructions about the coagulation of the juice, and the making of it into balls.

In a report of June 28, 1903, the Government delegate in the colony confirms the good results obtained by the school. The merchants find useful auxiliaries among the natives, who now take care of the plants instead of destroying them. Instructions were also given to the overseers of the district to impress upon the people that caoutchouc is a source of considerable revenue. The attention of the Government has been attracted to the abuses which have grown up in the rubber trade, notably to the practice of augmenting the weight of crude rubber by the introduction of foreign materials. Restrictive measures have been imposed. In February 1902 the Lieutenant-Governor of Guinea published a decree forbidding the exportation of adulterated rubber. This measure has secured for Guinea an export product of good quality, and one feels assured that the rubbers now received from Conakry are of good quality and homogeneous. A decree has also been formulated which forbids the sale of balls of adulterated rubber.

XVII.—BREWING, WINES, SPIRITS, Etc.

Spirit Utilisation and Fermentation Industries; International Exhibition, Vienna, 1904.

Representatives of the Austrian spirit industries have been holding meetings recently to decide as to their participation in the International Exhibition to be held next year in Vienna. It has been decided to organise a collective exhibit to represent the spirit industry and yeast manufacture, and the Exhibition authorities have set apart the East Transept for this purpose. A special committee, with Dr. Anspitzer as general secretary, has been appointed: it is represented on the Executive Council of the Exhibition by Messrs. Kraus and Glaser.

Alcohol; Duty on ——, in U.S.A.

A case recently decided by the Board of General Appraisers is of interest as showing the duties which are applied to merchandise containing alcohol. Certain fruit in spirits was imported at New York, to the value of which the importer added on entry an amount sufficient to cover the French national alcohol tax. The appraising officers added further an amount equal to the "octroi" or "droit de ville." Following previous decisions of the Board and of the United States Courts, it was held that this latter addition was erroneous.—R. W. M.

Alcohol; Drawback on Imported ——, in U.S.A.

Oil Paint and Drug Reporter, Washington, Oct. 16, 1903.

The Treasury Department has prepared regulations for the allowance of drawback of duty paid on imported alcohol used in the production of certain manufactured medicinal preparations. The regulations, which provide for an allowance for wastage, are as follows:—

"On the exportation of the medicinal preparations known as 'Liquid Peptonoids,' 'Iodo-Peptonoids,' and 'Liquid Peptonoids with Creosote,' manufactured, by a certain American firm of druggists, in part of imported alcohol, and bottled and shipped in wooden cases, a drawback will be allowed equal in amount to the duties paid on the alcohol so used, less the legal deduction of 1 per cent.

"The preliminary entry must show the marks and numbers of the shipping packages, and, separately, the number and sizes of the bottles, the quantity of each preparation, and the quantity of alcohol appearing therein, and in the entire shipment.

"The drawback entry must show the quantity of each kind of preparation exported, the quantity of alcohol used in the manufacture thereof, and the quantities of alcohol appearing in each preparation exported. Said entry must further show, in addition to the usual averments, that the preparations were manufactured of materials and in the manner set forth in the manufacturers' sworn statement.

"Samples may be taken, or sworn samples furnished, as ordered by the collector, and submitted to the appraiser for determination as to the sizes of the bottles and the percentages of alcohol appearing in the respective products.

"In liquidation, the quantities of imported alcohol consumed, which may be taken as the basis for allowance of drawback, may equal the quantities declared in the drawback entry, provided that in no case shall it exceed the minimum percentages shown in said sworn statement or the average test of the samples furnished the appraiser representing the shipments covered by such entry. Allowance for wastage shall in no case exceed the minimum declared on entry or shown for the several preparations in the manufacturers' sworn statement."

XVIII. C.—DISINFECTANTS.

Disinfectant: U.S. Customs Decision.

Sept. 30, 1903.

An alkaline preparation of crude phenols and resin soap, made from dead or creosote oil, was held to be dutiable at 25 per cent. *ad valorem* under paragraph 3 of the Tariff Act as a "chemical compound." The Board voted that a duty of 20 per cent. *ad valorem* as a "coal tar preparation" under paragraph 15 was in accord with decisions of the United States Court, but the importer having failed to make this claim, the assessment of duty as above was allowed to stand. The importer claimed the article to be free of duty as "dead or creosote oil" under paragraph 524. This was overruled, as the addition of soap and alkali brought it beyond the condition of the dead or creosote oil of commerce.—R. W. M.

XX.—FINE CHEMICALS, Etc.

Flower Culture for Distilling in Southern France.

U.S. Cons. Reps., No. 1771, *Oct.* 10, 1903.

The quantity of Roses de Mai distilled annually in Nice is about 120,000 lb. The price per kilo. has varied for years between 10 and 18 cents—this last price in 1901. This year the price was 13 cents.

The following table shows the annual production and the prices paid per kilo. in the Nice district during the years 1901—1903 :—

Description.	1901.		1902.		1903.	
	Production.	Price.	Production.	Price.	Production.	Price.
	Lb.	Dols.	Lb.	Dols.	Lb.	Dols.
Violets	38,000	0·43	30,000	0·43	24,000	0·48
Acacia	2,000	1·06	1,600	1·15	In October.	
Jonquil*	..	..	..	..	..	..
Mignonette	4,000	0·21	5,400	0·19	6,800	0·19
Orange flowers.	180,000	0·18	290,000	0·10	230,000	0·10
Jasmine	16,000	0·49	2,000	0·57	(†)	(†)

* About 1,400 lb. annually, at 57 to 95 cents per kilo.

† Harvest in progress.

Tuberoses, about 6,000 lb. annually, at contract price of 39 cents per kilo.

Pink or carnation, 35,000 to 50,000 lb. annually, at an average price of 6 cents per kilo.

Orange leaves, 150,000 to 200,000 lb. annually, at about 1·90 dols. per 100 kilos.

There is but one distillery in Mentone, and the only products distilled are orange leaves and flowers. The average price paid for young leaves is 8 cents per kilo. and 10 and 12 cents for the flowers. The aggregate crop of both may be calculated at about 350,000 lb., and the entire output of the distillery is used in the manufacture of eau de Cologne.

Rose Geranium Leaves for Distilling Purposes.

This crop has attained large proportions in this district, and the annual production now reaches not less than 3,300,000 lb. One hectare (2·471 acres) will produce 55,000 to 66,000 lb. of leaves, which are sold at from 1·11 to 1·33 dol. per 220 lb. The product in pure essence is about 0·1 per cent. A small quantity is annually imported into Grasse from Italy, about 65,000 lb. are brought from Africa, and 55,000 lb. from Île de la Réunion, near Mauritius.

Perfumes; Manufacture of ——, in Grasse.

U.S. Cons. Reps., No. 1771, *Oct.* 10, 1903.

At present 35 concerns making essences of flowers are in operation in Grasse. The average consumption of roses for that purpose is about 2,650,000 lb. and that of orange flowers about 660,000 lb. per year. The annual sale of these essences amounts to 1,000,000 dols. Vallauris has nine such factories.

Essential Oils containing Alcohol: U.S. Customs Decision.

Oct. 17, 1903.

Essential oils used for flavouring, to which, according to statements of the importer, about 10 per cent. of alcohol had been added for preservation, are dutiable at 60 cents per pound and 45 per cent. *ad valorem*, as "alcoholic compounds," under paragraph 2 of the tariff.—R. W. M.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 22,596. Nowell. Rotary hydro-extractors. Oct. 20.

" 22,845. Boutcher. Means of expelling acids, &c., from carboys and like receptacles by pneumatic pressure. Oct. 22.

" 23,091. Austin. Centrifugal separators. Oct. 26.

" 23,099. Rawson. Continuous vacuum drying apparatus. Oct. 26.

" 23,183. Sellenscheidt. Decanting fluids under pressure. Oct. 26.

" 23,368. Simpkin. Apparatus for grinding or regrinding ores and other material. Oct. 28.

[C.S.] 75 (1903). Güttner and Baeger. Centrifugal separators. Nov. 4.

" 19,962 (1903). Meyer (Meyer and Arbuckle). Means of evaporation for the concentration or condensation of saccharine syrups, brine, &c. Oct. 28.

II.—FUEL, GAS, AND LIGHT.

[A.] 22,547. Hertzog. Process and apparatus for producing power gas.* Oct. 19.

" 22,692. Monfort. Furnaces.* Oct. 20.

" 22,946. Deegen. Gas retort furnace.* Oct. 23.

" 23,045. Good and Spencer. Apparatus for the purification of coal gas. Oct. 24.

" 23,166. Rudemann. Production, by means of liquid hydrocarbons, of a gaseous mixture which is as dry as possible, and apparatus therefor.* Oct. 26.

" 23,213. Bond. *See under* VII.

" 23,382. Pearson. Manufacture of coke. Oct. 28.

" 23,398. Mavor, Mavor, and Coulson, Ltd. The coking of coal. Oct. 28.

" 23,556. Woodall and Duckham. Manufacture of gas. Oct. 30.

" 23,616. Heenan. Apparatus for the manufacture of crude gas from coal or other material. Oct. 31.

" 23,635. Duncan. Gas producers. Oct. 31.

" 23,659. Thompson (Best). Furnaces.* Oct. 31.

[C.S.] 23,407 (1902). Lefèvre and Blum. Artificial fuel. Oct. 28.

,, 25,547 (1902). Kowitzke. Furnaces. Oct. 28.

,, 25,747 (1902). Stiles. Inclined gas retorts. Oct. 28.

,, 26,035 (1902). Carolan (General Electric Co.). Photometers. Oct. 28.

,, 18,166 (1903). Boullier. Manufacture of mantles, &c., for incandescent gas lighting. Nov. 4.

,, 20,677 (1903). Holmes. Apparatus for extracting tar from illuminating gas. Nov. 1.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 23,074. Adiassewich. Distillation of oils and apparatus for use therein. Oct. 24.

[C.S.] 28,251 (1902). Wilton and Wilton. Apparatus for the distillation of ammoniacal liquors. Oct. 28.

,, 16,349 (1903). Cress. Chemical product of the series of phenols, bye-products and process for making same. Nov. 4.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 22,856. Newton (Bayer and Co.). Manufacture of new colour lakes. Oct. 22.

,, 22,966. Cosway and The United Alkali Co., Ltd. Manufacture of sulphur dyes and of an intermediate product. Oct. 23.

,, 23,179. Johnson (Badische Anilin und Sodafabrik).. Production of colouring matters of the anthracene series and of intermediate products relating thereto. Oct. 26.

,, 23,188. Imray (Soc. Chem. Industry in Basle). Manufacture of sulphurised dyestuffs. Oct. 26.

,, 23,392. Imray (Meister, Lucius und Brüning). Manufacture of dyestuffs derived from anthracene and of intermediate products therefor. Oct. 28.

[C.S.] 23,992 (1902). Imray (Meister, Lucius und Brüning). Manufacture of a new benzene derivative and of an azo dyestuff therefrom. Oct. 28.

,, 26,372 (1902). Johnson (Badische Anilin und Sodafabrik). Manufacture of indigo white and indigo. Oct. 28.

,, 1864 (1903). Johnson (Badische Anilin und Sodafabrik). Manufacture of colouring matter of the naphthalene series. Nov. 4.

,, 4340 (1903). Lake (Oehler). Manufacture of dyes. Oct. 28.

,, 20,223 (1903). Thompson (Möller und Linsert). Products of condensation from dioxybenzenes with formaldehyde and ammonia. Nov. 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 22,697. Haddan (Oliva). *See under* XIV.

,, 22,701. Mellor. Machine for gum-extracting, dyeing, and finishing silk piece goods. Oct. 21.

,, 22,789. Castle. Manufacture and waterproofing of leather, leather cloths, and all kinds of animal and vegetable fabrics. Oct. 21.

,, 22,869. Beutner. Dyeing apparatus. Oct. 22.

,, 23,105. Fraukenburg, Ltd., Frankenburg and Rowe. Manufacture of waterproof cloths. Oct. 26.

,, 23,174. Fanchamps-Phillippe. Dyeing fabrics, felts, &c. Oct. 26.

,, 23,310. Rovira. Continuous bleaching apparatus. [Fr. Appl., Sept. 29, 1903.]* Oct. 27.

[A.] 23,524. Ward and Kenworthy. Apparatus for dyeing and similarly treating textile fabrics. Oct. 30.

[C.S.] 23,722 (1902). Printing Arts Co., Ltd., Mowbray and Black. Multicolour printing machines. Oct. 28.

,, 27,847 (1902). Hardman and Hardman. Apparatus for degreasing cotton waste and other like fibrous material. Nov. 4.

,, 28,174 (1902). Bucher. Colouring woollen and like goods. Oct. 28.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[A.] 23,563. Ransford (Cassella and Co.). The dyeing of leather. Oct. 30.

VII.—ACIDS, ALKALIS, SALTS, Etc.

[A.] 22,500. Hill. Manufacture of hypochlorites or substances capable of yielding same. Oct. 19.

,, 22,729. Rahtjen. Method of preparing copper suboxide from copper metal. Oct. 21.

,, 22,743. McKim and McKim. Apparatus for cleaning barytes ores. Oct. 21.

,, 23,189. Gilman. *See under* XIII. A.

,, 23,213. Bond. Apparatus and process for treating gas lime, also other calcium compounds, and clinker. Oct. 27.

,, 23,550. Hemingway. Kilns applicable for use in the manufacture of oxide of iron. Oct. 30.

[C.S.] 24,767 (1902). Tcherniac. Manufacture of sulphocyanides. Nov. 4.

,, 19,242 (1903). Dolbear. Process of manufacturing caustic soda. Nov. 4.

,, 20,497 (1903). Kowalski and Moscicki. *See under* XI.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 22,575. Page and Wadsworth. Method and apparatus for manufacturing sheet glass.* Oct. 19.

,, 23,492. Kent. Manufacture of silica glass, and means to be employed therein.* Oct. 29.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 22,632. Cheflins and Mackenzie. Kilns. Oct. 20.

,, 22,769. Perpignani and Caudlot. Kilns for burning cement, lime, &c. Oct. 21.

,, 22,870. Jagger. Fireproof composition and method of producing the same. Oct. 22.

,, 23,399. Wouldham Cement Co. (1900), Ltd., Fennell and Lewis. Manufacture of cement. Oct. 28.

,, 23,441. Pearson. Cement-making process. Oct. 29

[C.S.] 25,397 (1902). Briggs and Briggs. Kilns for burning limestone and the like. Oct. 28.

,, 25,569 (1902). Fielding. Apparatus for making artificial stone slabs and blocks. Oct. 28.

,, 25,807 (1902). Garchey. Manufacture of artificial granite. Oct. 28.

,, 28,422 (1902). Hebblethwaite. Manufacture of bricks. Nov. 4.

,, 18,623 (1903). Canaris. Process for producing cement or the like from blast furnace slag. Nov. 4.

,, 19,016 (1903). Gresly. Manufacture of hydraulic cements. Oct. 28.

X.—METALLURGY.

[A.] 22,767. Talbot. Manufacture of ingot iron and steel. Oct. 21.

,, 23,115. Guhrs and Guhrs. Treatment of zinc. Oct. 26.

[A.] 23,299. Fitzmaurice. Treatment of metals. Oct. 27.

[C.S.] 23,042 (1902). Stevenson and Marquard. Manufacture of steel applicable for use in the production of tin plate and sheets. Oct. 28.

,, 23,042A (1902). Stevenson and Marquard. Alloy for use in the manufacture of steel, and in the production of tin plate and sheets. Oct. 28.

,, 25,973 (1902). Hadfield. Treatment of steel. Oct. 28.

,, 28,112 (1902). Evans, Jones, and Richards. Process for the treatment of copper ores. Oct. 28.

,, 6201 (1903). Payne and Gillies. Process for the treatment of ores containing copper. Oct. 28.

,, 13,750 (1903). Kington. *See under* XI.

,, 20,655 (1903). Evans (Electrochem. Werke). *See under* XI.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 23,151. Koller and Askenasy. Method and apparatus for producing a suitable circulation of the electrolyte in electrolytic processes.* Oct. 26.

[C.S.] 21,021 (1902). Atkins. Electrodes of electrolytic apparatus and the like. Nov. 4.

,, 23,243 (1902). Sefton-Jones (Isola-Werke A.-G. in Oerlikon). Insulating material for electrical purposes. Nov. 4.

,, 12,032 (1903). Johnson (Ford). Electrolytic apparatus such as secondary batteries. Nov. 4.

,, 13,750 (1903). Kington. Electro-deposition of gold. Nov. 4.

,, 20,497 (1903). Kowalski and Moscicki. Electric plant for the synthetic production of nitric products by means of electric discharges in gaseous mixtures. Nov. 4.

,, 20,655 (1903). Evans (Electrochemische Werke). Electrolytic production of metals of the earthy alkalies and more especially of metallic calcium. Nov. 4.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 22,580. Geissler and Bauer. Manufacture of non-caustic soaps having an antiseptic and bleaching effect.* Oct. 19.

,, 23,541. Southey. Process and means for diluting oleaginous substances with water. Oct. 30.

[C.S.] 28,310 (1902). Stephenson. Process and apparatus for extracting oil from seeds and other oleaginous substances and materials. Nov. 4.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, ETC.

A.—Pigments, Paints.

[A.] 22,567. Armbruster and Morton. Pigments and processes of making the same.* Oct. 19.

,, 23,189. Gilman. Process of making lithophone and glauber salts. (U.S. Appl., Oct. 30, 1902.)* Oct. 26.

,, 23,550. Hemingway. *See under* VII.

[C.S.] 28,931 (1902). Hardingham (Soc. Minere e Fonderie d'Antimonio). Manufacture of paint. Nov. 4.

B.—Resins, Varnishes.

,, 17,451 (1903). Tüschel. Varnish compositions for furniture. Oct. 28.

C.—India-rubber, &c.

[A.] 22,919. Service. Compound capable of being used for insulating, waterproofing, and other purposes.* Oct. 23.

,, 22,986. Seguin and de Sales. Method of manufacturing artificial caoutchouc. Oct. 23.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 22,697. Haddan (Oliva). Manufacture of glue or size especially adapted for the warp threads of fabrics.* Oct. 20.

,, 22,789. Castle. *See under* V.

,, 22,872. Page (Universal Leather Co.). Grain leather, and process for its production.* Oct. 22.

XV.—MANURES.

[A.] 22,799. Steyaert. Manufacture of fertilisers.* Oct. 21.

[C.S.] 24,157 (1902). Monson. Fertilisers, and apparatus for distributing the same. Nov. 4.

XVI.—SUGAR, STARCH, GUM, ETC.

[C.S.] 26,856 (1902). Barratt. Manufacture of sweetmeats. Nov. 4.

XVII.—BREWING, WINES, SPIRITS, ETC.

[A.] 22,542. Nowak. Process for producing alcoholic beverages and the like.* Oct. 19.

,, 23,066. Chotteaa and Disse. Ferment for the manufacture of wine vinegar.* Oct. 24.

,, 23,327. Blaxter, Blaxter, jun., and Chaloner. Apparatus for producing non-deposit beer, &c., and for clarifying and carbonating liquids. Oct. 29.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[C.S.] 28,543 (1902). Donard and Labbé. Manufacture of albuminoid substances from maize or maize residues or materials. Nov. 4.

,, 16,302 (1903). Ramage. Manufacture of food products. Oct. 28.

B.—Sanitation; Water Purification.

[A.] 22,501. Bond. Material for use in the filtration and purification of water. Oct. 19.

,, 22,630. Holmes. Process and apparatus for purifying water.* Oct. 20.

XIX.—PAPER, PASTEBOARD, ETC.

[A.] 22,970. Bachrach. Compounds of nitro-cellulose and similar substances.* Oct. 22.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 22,967. Newton (Bayer and Co.). Manufacture of pyrimidine derivatives. Oct. 23.

[C.S.] 18,279 (1903). Ellis (Chem. Fabr. von Heyden Akt.-Ges.). Manufacture of a new chemical body. Nov. 4.

,, 19,356 (1903). Lake (Parke, Davis, and Co.). Vaccine, and process of purifying the same. Oct. 28.

XXII.—EXPLOSIVES, MATCHES, ETC.

[A.] 22,970. Bachrach. *See under* XIX.

,, 23,472. O'Donnell (Frank). Process of manufacturing a safety explosive. Oct. 29.

[C.S.] 24,934 (1902). Curtis, Peachy, Metcalfe, Smith, and Hargreaves. Explosives. Oct. 28.

,, 28,245 (1902). Bichel. Manufacture of explosives. Oct. 28.

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Notice is hereby given that Mr. William H. Nichols has been nominated to the office of President for 1904–5 under Rule 8.

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The various Sections of the Society are now at liberty to make use of the Society's meeting room for Sectional purposes, when not required by the Council, by making arrangements beforehand with the General Secretary.

SUBSCRIPTIONS FOR 1904.

Foreign and Colonial Members are reminded that the subscription of 25*s.* for 1904, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1904.

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Members who contemplate attending the next General Meeting, in New York, are requested to communicate with the General Secretary as soon as possible, in order that suitable travelling arrangements may be made.

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Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

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London Section.

Meeting held at Burlington House, on Monday, November 2nd, 1903.

MR. WALTER F. REID IN THE CHAIR.

ON THE APPLICATION OF THE X RAYS TO THE EXAMINATION OF "SAFETY FUZES."

BY C. NAPIER HAKE, CHIEF INSPECTOR OF EXPLOSIVES, MELBOURNE, AUSTRALIA.

The term "Safety Fuze," as defined in the Explosive Act, 1875 (O. in C., No. 1), means :—

"A fuze for blasting which burns and does not explode, and which does not contain its own means of ignition, and which is of such strength and construction and contains an explosive in such quantity that the burning of such fuze will not communicate laterally with other like fuzes."

This definition has been officially adopted in Australia.

The chief points to be noted in testing safety fuzes are therefore—

The rate of burning.

Whether they explode while burning.

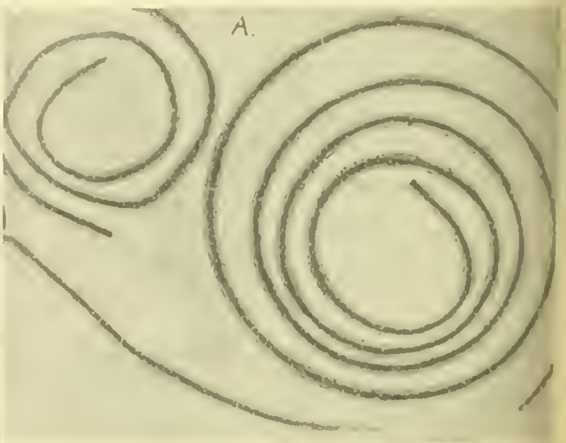
Whether while burning they are capable of igniting a similar kind of fuze laterally.

A fuze which burns too rapidly or too slowly or irregularly, or which explodes or communicates great heat laterally, is a dangerous fuze, in so far as either a premature or a delayed explosion of a charged bore-hole may result therefrom, both being a fruitful source of accidents in mines. The above faults are rarely noticed in the best brands of fuze, but are not at all unknown in the cheaper qualities, and it is part of the duty of an inspector under the Act to detect such defects and to stop the sale of the fuze in the interest of public security.

The above-noted defects arise either from initial faults in the manufacture, such as the presence of foreign matter in the powder core, or the employment of an unsuitable class of powder, or the occurrence of a break in the continuity of the powder core, &c., &c., or from climatic influences after manufacture, or a combination of all or any of these conditions.

Although the ordinary method of examination may disclose a defect, the cause of such defect is not always determinable with certainty.

It occurred to me that an examination of fuzes by means of the X rays might to some extent solve the difficulty. I accordingly made a number of experiments in this direction, the results of which are, I think, of sufficient interest to communicate to this Society.



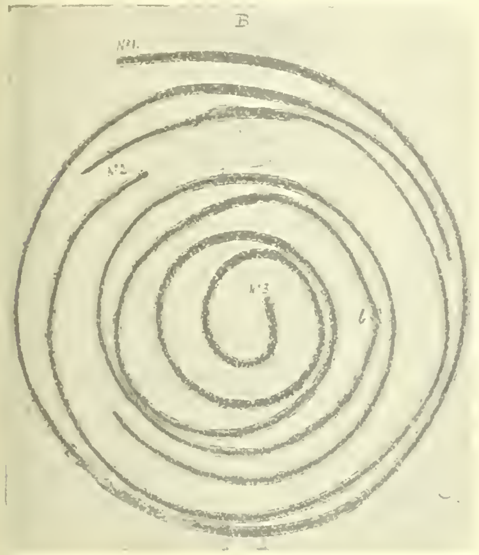
Perfect fuze which has been hammered and twisted.

Passing a length of fuze between a Crookes' tube and the luminous screen, I found that the powder column in the fuze is very sharply defined between a faint outline of the jute covering, and that even the cotton threads passing through the powder column are discernible. The slightest break or irregularity in the powder column can thus be detected, and a considerable length of fuze can be examined in a few minutes without destroying or altering its original condition.

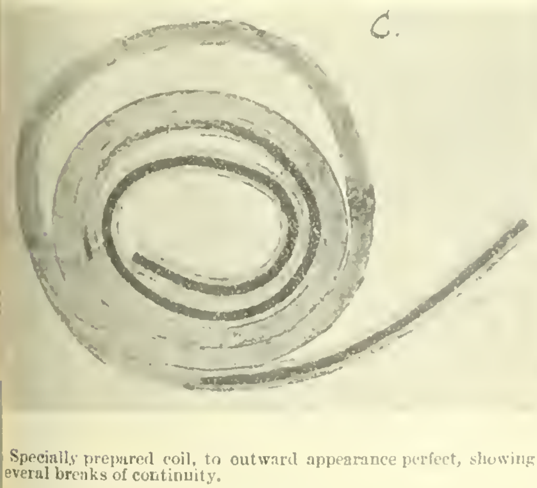
It is obviously equally possible to make a permanent record of any given examination by means of photography, and the accompanying photographs illustrate this method.

The experiments were carried out in the laboratory of Dr. Clendinnen, of Melbourne, whose kind assistance I take his opportunity of acknowledging.

The description below the photographs will, I think, be sufficiently clear without further comment on my part.



Outer coil (No. 1): continuity of powder core broken. Intermediate coil (No. 2) perfect. Central coil (No. 3) shows twisting at *b*.



Specially prepared coil, to outward appearance perfect, showing several breaks of continuity.

DISCUSSION.

Prof. HODGKINSON said that the burning part in these fuzes was largely gunpowder, though not ordinary gunpowder; he had tried several experiments with cordite, which were failures. A slender filament of cordite burned very well, but it could easily be blown out, and it often went out at a place where it had been touched, so that such a fuze could not be used naked. He had also tried it in glass tubes, but it generally went out. Using a thicker core of cordite it occasionally burnt continuously, but the flame was weak, and sometimes went out after a short time. In ordinary cases the fuze was coated with jute, and then wrapped round with a waterproof material, and he thought that would have on cordite the same effect as a glass tube.

Another objection to cordite was that the flame was much hotter than that of an ordinary gunpowder fuze, and it would probably destroy the coating material, even if in other respects it was satisfactory.

The CHAIRMAN said that this discovery of Mr. Hake's was one of very great importance, for though it seemed a small matter in itself, many lives depended upon it. When a misfire occurred in mining operations through a break of continuity in the fuze, the first thing the workmen did, in spite of all laws and regulations to the contrary, was to try to draw the shot, in order to save the explosive which he had put into the bore hole, and many lives were sacrificed annually from this cause. If a certainty existed beforehand that there was no break in the continuity of the thread of powder, one very prolific source of accident would be eliminated. They were, therefore, much indebted to Mr. Hake for having introduced the only test he knew of for such a break of continuity in the powder.

SCARLET PHOSPHORUS: A NEW CHEMICALLY ACTIVE VARIETY OF RED PHOSPHORUS, AND ITS USE IN THE MANUFACTURE OF MATCHES.

PART I.

BY W. MUIR.

The following observations sum up the results of experiments commenced by myself five years ago, to make a strike-anywhere match without white phosphorus.

After working on the substances that usually appeal to inventors, I tried the so-called red sulphides of phosphorus described by Berzelius, and found that they made good matches. I showed the matches prepared from those compounds to Mr. Boor, who took the matter up very heartily, and induced Dr. Marquart, of Messrs. Marquart and Schulz, Bettenhausen, Cassel, to make these sulphides (so-called) in large quantities. Matches also were made, but difficulties and doubts arose. We could not get the so-called red sulphides free from the ordinary yellow sulphides. The residue left, after extracting as much of the yellow sulphides as was possible, showed on analysis very little sulphur left, but it was unchanged in appearance and still made fair matches.

At this point we noticed in this Journal an account of a peculiar form of phosphorus made by Prof. Schenck of Marburg, with whom we got into communication through Dr. Marquart, and learned from him definitely, what we had already suspected, namely, that the so-called red sulphides of phosphorus are merely solid solutions of the ordinary yellow sulphides in some form of red phosphorus, and Dr. Schenck advised us that he had produced a new bright red preparation of phosphorus in his laboratory without the aid of any sulphur at all. I obtained quantities of this material which we call Schenck's phosphorus and made good matches. The result of our friendly intercourse, was that we all joined our several discoveries and our practical knowledge together for the production of matches with this new scarlet preparation of phosphorus (specimens of the compound and of matches made from it were exhibited).

We find that Schenck's phosphorus is a satisfactory basis for the production of strike-anywhere matches. It is not poisonous if swallowed, and it does not fume in working. It abolishes the special ills that have troubled match makers, and can be used with the ordinary glue mixture that is used with ordinary phosphorus. The matches made with it stand even better than those made with ordinary phosphorus. We have sent such matches to the most trying climates in the world, and have damped them and dried them 12 times without harming them.

PART II.

BY R. SCHENCK, PH.D., AND P. MARQUART, PH.D.

You are all aware of the great importance of the two varieties of phosphorus as agents in many of our industries, and especially in the manufacture of explosives and matches. We now introduce a third form to you, which in some of its properties is intermediate between them.

The manner in which considerable quantities of our new form of phosphorus may be obtained has lately been demonstrated by one of us, who has also described its characteristics (this Journal, 1902, 368. See also this Journal, 1903, 494). A very good sample of the new substance is obtained by heating a 10 per cent. solution of white phosphorus in phosphorus tribromide to boiling, and on this basis the firm of Marquart and Schulz, Chem. Fabrik, Bettenhausen, Cassel, have succeeded in working out a process which allows of the application of this new invention on a large scale.

The product is a fine powder of bright scarlet colour, containing, however, still many impurities, as is shown by its weight, which may much exceed that of the white phosphorus used.

Its propensity to take up foreign matters from the solvents is very great. Michaelis and Pietsch tell us that red phosphorus formed by the effect of light on a solution of phosphorus in carbon bisulphide contains a large percentage of carbon and sulphur, and we, ourselves, have observed that foreign substances like iodide of phosphorus and sesquisulphide of phosphorus, which may be dissolved in phosphorus tribromide, together with the white phosphorus, are precipitated with it. This strong tendency to form solid solutions permits of the conclusion that the red phosphorus in the products is amorphous, as crystalline bodies rarely possess the capacity of dissolving foreign matters, except in cases of isomorphism.

On being raised to higher temperatures in an indifferent current of gas, Schenck's phosphorus becomes darker (while phosphoretted hydrogen is formed by the decomposition of the phosphorous acid), and finally turns black, recovering, however, its former redness on cooling down after some time. This reversionary alteration of colour through change in the temperatures is a purely physical process, which has a good many analogies. Scarlet phosphorus that has been kept for a long time at high temperature retains, when cooled down, a deep red colour.

The great chemical activity of this form of phosphorus is shown by the violence with which it becomes oxidised by diluted nitric acid; it is shown also when treated with hot caustic soda solution which causes a generation of phosphoretted hydrogen, and a solution of the scarlet powder into the subphosphorous acid. Ordinary amorphous phosphorus is hardly attacked by hot caustic soda solution; it may be indeed freed from small quantities of white phosphorus by being boiled down with this liquid. A weak solution of indigo in sulphuric acid is decolorised if boiled with scarlet phosphorus

A particular characteristic of scarlet phosphorus is its action towards ammonia and bases of medium strength, such as dilute piperidine and diethylamine. They turn its bright red colour black, phosphoretted hydrogen being formed to a small extent. Acids will reproduce the scarlet product from the black. The black products seem to be salts, and successful experiments have been made to fix the nature of their acids. The salts are those of a solid polyphosphoretted hydrogen, which certainly is not usually regarded as an acid.

Difficulties which have not been removed yet by industrial science, have prevented the introduction of the amorphous red phosphorus, which at first seemed predestined for the preparation of non-poisonous strike-anywhere matches, and the hopes entertained in that direction have not been realised. The mixtures of amorphous phosphorus with oxidising substances, such as chlorates, and with other bodies, such as filling and cementing agents, which are used at present to form match heads, possess the objectionable quality of being highly explosive, so that great losses are incurred through their employment, and the workman is exposed to considerable danger.

If, therefore, in the tips of matches, the scarlet phosphorus be substituted for the white phosphorus, an article will be obtained, which, while non-explosive, after drying will easily ignite on any rough surface. A technical problem of long standing will thus have been definitely solved.

DISCUSSION.

Sir WM. RAMSAY said he had recently visited Marburg, and had been shown a cat which had swallowed about 50 grms. of this phosphorus without suffering any harm. This substance had a slight smell resembling that of ordinary phosphorous, which appeared to indicate that it formed the oxide of phosphorus, P_4O_6, discovered by Dr. Thorpe, some years ago, which was the cause of the "phosphrus" smell. It was a curious fact that yellow phosphorus was an unstable substance, or, more correctly, a *meta-stable* substance; it was in the same condition as water cooled below zero, which yet did not freeze. Yellow phosphorus changed so slowly that it could not be seen to change under ordinary circumstances; even when kept below water, its transformation into the red variety was very slow, but if it were dissolved the rate of transformation increased very greatly, and on that depended the merit of this discovery, dissolving the phosphorus in the bromide. He saw the experiments which had been described, and it occurred to him whether this new form was not conceivably a solid solution of hydride of phosphorus, P_4H_2, in red phosphorus, or a mixture of the two. This was suggested by the action on ammonia and certain bases described. No doubt these formed compounds which strongly resembled polysulphides. A precipitate was obtained which turned red, which Dr. Schenck said was hydride of phosphorus, mixed with ordinary phosphorus. In the same way if an acid were added to polysulphide of sodium a precipitate of sulphur was formed, with the difference that in this particular instance a solid sulphuretted hydrogen was not obtained, but merely sulphuretted hydrogen gas; whereas, in the case of phosphorus, the solid hydride P_4H_2, remained mixed with the precipitate of phosphorus. He was not clear whether Dr. Schenck thought the substance was really this mixture of hydride and red phosphorus, or the latter only. So much for theory; on the practical side, it occurred to him that there must be a considerable loss, if the phosphorus tribromide adhered so strongly as only to be decomposed by boiling water. It was possible that the hydrobromic acid might be recovered, and also the phosphorus, but he should have thought there was a considerable amount of loss possible from the fact of having to decompose a large amount of phosphorus tribromide which had to be reconverted from its elements before they could be again utilised. That loss might not be sufficient to negative the gain, but it must be reckoned with. The differences might be got over, but he should have thought, owing to the waste, that it was an uneconomical operation. He should be glad if Mr. Muir could give any information on this point.

Mr. L. G. BOOR said that, with regard to the practical side, what they had done so far, was to provide a match which could be made with the ordinary 20 per cent. gelatin composition, and would stand any climate. They tried it with the idea of producing a match which would strike anywhere. They simply substituted this red phosphorus for the common yellow, so that the match maker could use the same composition which he had used for years without altering his plant or his process. With regard to the cost it would always be higher than that of yellow phosphorus, the same as amorphous phosphorus, but with the question of prohibition looming in the future, and matches at a 1*s.* a gross, he did not think an extra ¼*d.* a gross would prevent the use of this kind of phosphorus.

Mr. BALL asked the price of this particular compound

Mr. BOOR said, as produced at present in small quantities, it worked out about 2*s.* 3*d.* per lb.; but he believed that, when made in large quantities, the price of this red phosphorus would be brought down to about the same as that of amorphous, about 1*s.* 9*d.*

Mr. CLAYTON asked the ignition point of the new phosphorus, and if the substance described in the first paper was the same as that prepared by Dr. Schenck.

Dr. Divers remarked upon the interesting fact that a body which has been known to every chemist from the time of Thénard and even before it, should only quite recently have been shown by Dr. Schenck to be very stable and apparently very useful. It seemed important that its non-poisonous character should be further tested upon herbivorous as well as upon carnivorous animals; parts of the human alimentary tract secreted alkaline fluids which might act upon this body and generate poisonous products.

Prof. Mills asked if any figure could be given as to the yield of this phosphorus from a definite quantity of common phosphorus and also, as phosphorus tribromide was rather expensive, whether the trichloride could not equally well be used under pressure.

The Chairman said one point appeared to him to require some further experiments, namely, the action of the phosphorus itself on the cementing material, which Mr. Boor said was gelatin or glue. He asked Mr. Muir whether any experiments over any length of time had been made on the action of phosphorus on this organic material. Of course, it was a very great advantage, not only from the point of view of the swallowing of matches, but also of their contact with the skin that the phosphorus was inert. If an absolutely non-poisonous phosphorus were introduced into the match trade it would eliminate much serious suffering. The poorer classes of operatives engaged in the match trade suffered very seriously, in spite of all that had been done by legislation for their protection; in fact, so great was this evil that the use of ordinary phosphorus for this purpose had been prohibited in many European countries.

Mr. Muir, in reply, said he found the ignition point was about 170° C. A good deal would depend on the rapidity in the rise of temperature. The substance mentioned in both papers was the same. The matches shown were made with it; they were produced from material sent over by Prof. Schenck. He had tried phosphorus trichloride, and he thought under pressure it might give some results. They had had matches in stock which were two years old, and they were as good now as when they were made.

DENSITIES OF CONCENTRATED NITRIC ACID AT DIFFERENT TEMPERATURES.

BY V. H. VELEY, F.R.S., AND J. J. MANLEY.

In the present communication it is desired to place upon record numerous determinations of the densities of concentrated nitric acid at different temperatures in a series of tables as it appears that such numbers may supply a long felt want and facilitate calculations.

As we have fully described our methods in previous publications (Phil. Trans. (A), Vol. 191, 365 (1898), and Proc. Roy. Soc., Vol. 69, 86 (1901)), we only give a short summary of them herein, and allude briefly to the more especial points of interest

Historical. — Kirwan, in 1790 (Irish Acad. Trans., Vol. 4, 3), published the first tables of specific gravities of nitric acid in terms of percentages; he deduced these by mixing weighed quantities of acid of the highest specific gravity (1·55) obtainable with water, neutralising with sodium carbonate, taking the specific gravity of the sodium nitrate solution formed and preparing a solution of the same gravity from weighed quantities of sodium nitrate.

Ure (Quart. Jour. Sci., Vol. 4, 291 (1818)) obtained his numbers by mixing known weights of water and nitric acid of specific gravity 1·5, which he regarded as that of anhydrous nitric acid, HNO_3.

These tables were reproduced in the earlier manuals of chemistry, but both were regarded as inaccurate.

Thénard and Payen also published sets of tables, which failed to attract attention.

Kobb (Ann. Chim. Phys. [4], Vol. 10, 140 (1867)) published a more complete and accurate set of tables; he purified the acid by distillation over silver and barium nitrates and subsequently by fractional distillation; he analysed the several mixtures of acid and water by the addition of a known weight of calcium carbonate in excess, and subsequently determined this excess. His results, which were those of densities, as distinguished from specific gravities, were for several years regarded as the most accurate, and were reproduced more or less fully in the various text-books of chemistry.

Lunge and Rey (Zeits. f. angew. Chem., 1891, 167, and 1892, 10) published the most complete table of densities taken at 15° C., referred to water at 4° C., and corrected for air displacement; they also gave certain corrections to be applied for presence of nitrogen peroxide and temperature between 13° C. and 17° C. Their process of purification consisted in distilling concentrated nitric acid, with sulphuric acid *in vacuo*, their analytical methods were not widely different from those herein described. Their results, to which further allusion will be made, are now more generally quoted in technical manuals and and calendars.

In the course of our work, carried on from 1894 to 1901, on the physical properties of nitric acid we made about 250 determinations of densities at the temperatures 4°, 14·2°, and 24·2° C. respectively.

Purification of Acid.—For acids below 68 per cent., purified acid of approximately this concentration was fractionally distilled in vacuo in an apparatus constructed wholly of glass. For acids from 68 to 99·5 per cent., acid of the former concentration was distilled quickly with an equal volume of sulphuric acid, the distillate redistilled over silver and barium nitrates. The acid thus obtained was fractionally distilled in vacuo in a special apparatus, also constructed of glass. The nitrogen peroxide came over in the first portion; the second portion consisted of acid of 98 to 99·5 per cent., while the greater part of the water was left in the residue.

The sample of acid thus obtained, was quite colourless and free from all but insignificant quantities of hydrochloric and sulphuric acids, it was used for most determinations being diluted, as required, with recently melted ice, obtained by freezing water frequently redistilled

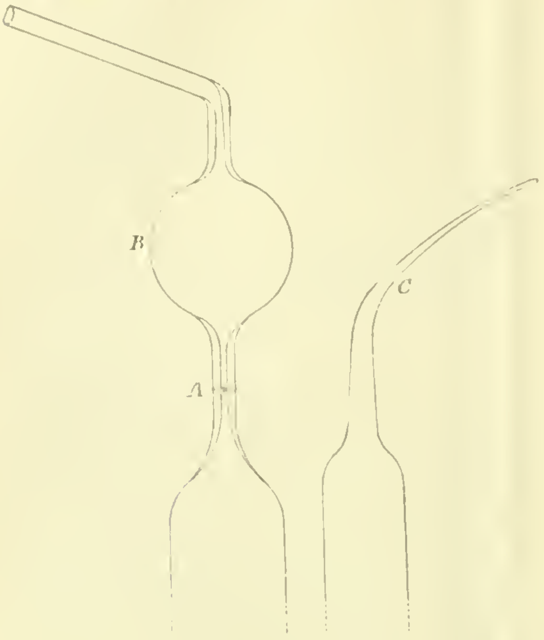
In order to obtain anhydrous acid, namely, 100 per cent. HNO_3, the 99·5 acid was fractionally distilled in an apparatus, based upon the principle of Carré's ice machine, and, after several trials, acid of 99·97 per cent. was obtained, which, so far as we are aware, appears to be the most concentrated sample as yet prepared in a colourless condition.

Analytical Methods.—Unfortunately concentrated nitric acid cannot be kept owing to the formation of nitrogen peroxde, so the more accurate method of mixing weighed quantities of acid and water is not available; the less accurate analytical methods were therefore applied. Suitable quantities of the acid solutions were weighed out with water, and the amount of acid determined by standard soda solutions (prepared from sodium), which were standardised against solutions of hydrochloric and sulphuric acids; the strength of the former was ascertained by (i) sodium carbonate, (ii) metallic silver, of the latter by (i) sodium carbonate, (ii) barium sulphate, and (iii) in some cases by density determinations. But it is doubtful if volumetric methods can be carried beyond an accuracy of ± 1 part in 1,000 parts, when as density determination can be carried to an accuracy of ± 1 part in 75,000 parts.

Density Methods.—Various modifications of the Sprengel U tube were tried to meet the difficulties of the high coefficient of expansion (in round figures 27 times as great as water) of the concentrated acid, and its hygroscopic character; finally the following form was adopted:—A piece of thick-walled capillary tubing was sealed on to one limb of the U on which the fiducial mark A was etched. the upper portion was blown out into a bulb B; the other limb was drawn out as shown at C.

From a number of such tubes made from the same batch of glass, a pair could be selected, the weight of which did not differ from one another by more than a fraction of a gram: the lighter was used for a counterpoise. The advantage of this method is that the liquid only is weighed against glass or platinum, and as the external areas are practically equal, the weighings are independent of the hygrometric state of the air, and change in barometric pressure. The weighings were corrected to a vacuum according to the data given in manuals on physics and the densities reduced to 1 by the values given for the density of water at the three temperatures in Rossetti's tables

The temperatures were recorded by a thermometer, graduated to 0·1°, and standardised against (i) a Kew standard, and (ii) a standard by Baudin.



Results.—As stated above, the results were obtained at 4°, 14·2°, and 24·2° C., but in the present communication those at the second temperature have been corrected to 15°, by the value of *k* obtained from an equation $D_4 = D_{14 \cdot 2}(1 + kt)$, and those at the third temperature corrected to 25° C. in like manner. The densities have been plotted out in terms of percentages, the former as ordinates, the latter as abscissæ upon a scale of 1 mm. for 0·001 in density and 0·1 in percentages. The results have been smoothed by drawing mean straight lines with a flat glass ruler, but for the irregular portion from 93 per cent. to 100 per cent. curves were drawn freehand, a method at its best unsatisfactory, but the only one available. The figures in the first, third, and fifth columns in the table below have been ascertained by the readings on the squared paper. The figures for 10° in the second column and for 20° in the second column have been obtained by interpolation, but adjustments were in some few cases necessary to meet differences arising from slight variations in the co-efficients of expansion. Our observations on the physical properties of nitric acid have shown that variations occur at 63·6 per cent. (HNO_32H_2O), at 70 per cent. ($2HNO_33H_2O$), and 77·9 per cent. (HNO_3H_2O); hence the differences between two successive figures in the percentages column are not constant. We have recently (Chem. Soc. Trans., 1903, 1015), called attention to the irregular portion from 94 per cent. to 100 per cent., and compared our observations with those of Knietzsch (Ber., 1901, **34**, 4069) on sulphuric acid.

The densities in the table have been commenced from 1·400 at 4°/4° C. as it is understood that for technical purposes acids of lower density need not be considered. It is probable that the figures given in the table could be made applicable for results at 30° C. by means of the following corrections:—

Values to be subtracted from Values at 25°/4° C.	Percentages.
0·007	62— 65
0·008	65— 85
0·009	85— 93
0·008	93— 98
0·010	98—100

It is, however, to be remarked that we observed that acids of concentration of 90 per cent. and upwards could not be heated above 25° C. without the composition setting in with formation of nitrogen peroxide, though there are not sufficient data for determining whether the result is due entirely to heat, or, as more probably, partly to heat and partly to light.

Densities.					Percentages.
At 4°/4°	10°/4°	15°/4°	20°/4°	25°/4°	
1·400	1·392	1·385	1·378	1·371	62·3
1·401	1·393	1·386	1·379	1·372	62·5
1·402	1·394	1·387	1·380	1·373	62·7
1·403	1·395	1·388	1·381	1·374	62·9
1·404	1·396	1·3895	1·382	1·375	63·1
1·405	1·397	1·391	1·383	1·376	63·3
1·406	1·398	1·392	1·384	1·377	63·5
1·407	1·399	1·393	1·385	1·378	63·7
1·408	1·400	1·394	1·386	1·379	63·9
1·409	1·401	1·395	1·387	1·380	64·1
1·410	1·402	1·396	1·388	1·381	64·3
1·411	1·403	1·397	1·389	1·382	64·5
1·412	1·404	1·398	1·390	1·382	64·7
1·413	1·405	1·399	1·391	1·383	64·9
1·414	1·406	1·3995	1·392	1·384	65·1
1·415	1·407	1·400	1·393	1·385	65·3
1·416	1·408	1·401	1·394	1·386	65·4
1·417	1·409	1·402	1·394	1·386	65·6
1·418	1·410	1·403	1·395	1·387	65·8
1·419	1·411	1·404	1·396	1·388	66·0
1·420	1·412	1·405	1·397	1·389	66·2
1·421	1·413	1·406	1·398	1·390	66·4
1·422	1·414	1·4065	1·399	1·391	66·6
1·423	1·415	1·407	1·400	1·392	66·8
1·424	1·416	1·408	1·401	1·393	67·0
1·425	1·417	1·409	1·402	1·394	67·2
1·426	1·418	1·410	1·402	1·394	67·4
1·427	1·419	1·411	1·403	1·395	67·6
1·428	1·420	1·412	1·404	1·396	67·8
1·429	1·421	1·4125	1·405	1·397	68·0
1·430	1·422	1·413	1·406	1·398	68·2
1·431	1·423	1·414	1·407	1·398	68·4
1·432	1·423	1·415	1·408	1·399	68·6
1·433	1·424	1·416	1·408	1·400	68·8
1·434	1·425	1·417	1·409	1·401	69·0
1·435	1·426	1·418	1·410	1·402	69·2
1·436	1·427	1·419	1·411	1·403	69·4
1·437	1·428	1·420	1·412	1·404	69·6
1·438	1·429	1·4205	1·413	1·405	69·8
1·439	1·4295	1·421	1·414	1·406	70·0
1·440	1·430	1·422	1·415	1·407	70·2
1·441	1·431	1·423	1·416	1·408	70·4
1·442	1·432	1·424	1·417	1·409	70·6
1·443	1·433	1·425	1·418	1·410	70·8
1·444	1·434	1·426	1·419	1·411	71·0
1·445	1·435	1·427	1·420	1·412	71·2
1·446	1·436	1·428	1·421	1·413	71·4
1·447	1·437	1·429	1·422	1·414	71·7
1·448	1·438	1·430	1·423	1·415	72·0
1·449	1·439	1·431	1·424	1·416	72·3
1·450	1·440	1·432	1·425	1·417	72·5
1·451	1·441	1·433	1·426	1·418	72·7
1·452	1·442	1·434	1·427	1·419	73·0
1·453	1·443	1·435	1·428	1·420	73·3
1·454	1·444	1·436	1·429	1·421	73·5
1·455	1·445	1·437	1·430	1·422	73·7
1·456	1·446	1·438	1·431	1·423	74·0
1·457	1·447	1·439	1·432	1·424	74·2
1·458	1·448	1·440	1·433	1·425	74·5
1·459	1·449	1·441	1·434	1·426	74·7
1·460	1·450	1·442	1·435	1·427	74·9
1·461	1·451	1·443	1·436	1·428	75·2
1·462	1·452	1·444	1·437	1·429	75·5
1·463	1·453	1·445	1·438	1·430	75·7
1·464	1·454	1·446	1·439	1·431	75·9
1·465	1·455	1·447	1·440	1·432	76·2
1·466	1·456	1·448	1·441	1·433	76·5
1·467	1·457	1·449	1·442	1·434	76·8
1·468	1·458	1·450	1·4425	1·435	77·0
1·469	1·459	1·451	1·443	1·436	77·3
1·470	1·460	1·452	1·444	1·437	77·6
1·471	1·461	1·453	1·445	1·438	77·9
1·472	1·462	1·454	1·446	1·439	78·2
1·4725	1·4625	1·4545	1·4465	1·4395	78·5
1·473	1·463	1·455	1·447	1·440	78·8
1·474	1·464	1·456	1·448	1·441	79·1
1·475	1·465	1·457	1·449	1·442	79·4
1·476	1·466	1·458	1·450	1·443	79·7
1·477	1·467	1·459	1·451	1·444	80·0
1·478	1·463	1·460	1·452	1·445	80·3
1·479	1·469	1·461	1·453	1·446	80·6
1·480	1·470	1·462	1·454	1·4465	80·9
1·481	1·471	1·463	1·455	1·447	81·2
1·482	1·472	1·464	1·456	1·448	81·5
1·483	1·473	1·465	1·457	1·449	81·8
1·484	1·474	1·466	1·458	1·450	82·1
1·485	1·475	1·467	1·459	1·451	82·4

Densities.					Percentages.
At 4°	10°/4°	15°/4°	20°/4°	25°/4°	
1·487	1·476	1·468	1·460	1·452	82·7
1·488	1·477	1·469	1·461	1·453	83·0
1·489	1·478	1·470	1·462	1·454	83·3
1·490	1·479	1·471	1·463	1·455	83·6
1·491	1·480	1·472	1·464	1·456	83·9
1·492	1·481	1·473	1·465	1·457	84·2
1·493	1·482	1·474	1·466	1·4575	84·5
1·494	1·483	1·475	1·467	1·458	84·8
1·495	1·484	1·476	1·468	1·459	85·1
1·496	1·486	1·477	1·469	1·460	85·4
1·497	1·487	1·478	1·470	1·461	85·7
1·498	1·488	1·479	1·471	1·462	86·0
1·499	1·489	1·480	1·472	1·463	86·3
1·500	1·490	1·481	1·473	1·464	86·6
1·501	1·491	1·482	1·4735	1·465	86·9
1·502	1·492	1·483	1·474	1·466	87·2
1·503	1·4925	1·4845	1·475	1·4665	87·5
1·504	1·493	1·485	1·476	1·467	87·8
1·505	1·494	1·485	1·477	1·468	88·1
1·506	1·495	1·486	1·478	1·469	88·4
1·507	1·496	1·487	1·479	1·470	88·7
1·508	1·497	1·488	1·480	1·471	89·0
1·509	1·498	1·489	1·481	1·472	89·3
1·510	1·499	1·490	1·482	1·473	89·6
1·511	1·500	1·491	1·4825	1·474	89·9
1·512	1·501	1·492	1·483	1·475	90·2
1·513	1·502	1·493	1·484	1·476	90·5
1·514	1·503	1·494	1·485	1·477	90·8
1·515	1·504	1·495	1·486	1·4775	91·1
1·516	1·505	1·496	1·487	1·478	91·4
1·517	1·506	1·497	1·488	1·479	91·7
1·518	1·507	1·498	1·489	1·480	92·0
1·519	1·508	1·499	1·490	1·481	92·3
1·5195	1·5085	1·4995	1·4905	1·482	92·6
1·520	1·509	1·500	1·491	1·483	93·0
1·520	1·509	1·500	1·492	1·484	93·5
1·520	1·509	1·500	1·492	1·485	94·0
1·521	1·510	1·501	1·493	1·485	94·5
1·522	1·511	1·502	1·494	1·486	95·0
1·523	1·512	1·503	1·495	1·487	95·5
1·524	1·513	1·504	1·496	1·488	96·0
1·525	1·514	1·505	1·497	1·489	96·5
1·527	1·516	1·507	1·498	1·490	97·0
1·528	1·517	1·508	1·499	1·491	97·2
1·529	1·518	1·509	1·500	1·492	97·5
1·530	1·519	1·510	1·501	1·4925	97·8
1·531	1·520	1·511	1·502	1·493	98·0
1·532	1·521	1·512	1·503	1·494	98·3
1·533	1·522	1·513	1·504	1·495	98·6
1·535	1·524	1·516	1·506	1·496	98·9
1·537	1·526	1·517	1·507	1·497	99·2
1·538	1·527	1·518	1·508	1·498	99·5
1·540	1·529	1·520	1·509	1·4985	99·8
1·542	1·530	1·521	1·510	1·499	100·0

We append below a selected comparison of our figures with those of Lunge and Rey.

Density, 15°/4°	Percentages.	
	L. and R.	V. and M.
1·390	63·23	63·1
1·400	65·30	65·1
1·410	67·50	67·4
1·420	69·80	69·6
1·430	72·17	72·0
1·440	74·68	74·5
1·450	77·25	77·0
1·460	79·98	80·3
1·470	82·90	83·3
1·480	86·05	86·3
1·490	89·60	89·6
1·500	94·09	94·0
1·510	98·10	97·8
1·520	99·67	99·8

It will be observed that the differences in the percentage alues do not amount in most cases to more than 1 part in 00 parts, which could readily be accounted for by differnces in instruments and methods, all acting in the same irection. The greatest differences, approximately 1 part n 220 parts, occur within the limits 77 per cent. and 86 per ent.; it would appear on plotting out Lunge and Rey's esults by our method, that there is a variation at 83 per ent., whereas we found in our study of the physical roperties such a variation to occur at 77·9 per cent., hich corresponds to the composition of the hydrate HNO_3,), or H_3NO_4, the analogue of ortho-phosphoric acid H_3PO_4; our conclusions are in conformity with those of W. H. Perkin, sen. (Chem. Soc. Trans., 1889, 724, and Trans., 1893, 65), Pickering (Chem. Soc. Trans., 1893, 436) and Hartley (Chem. Soc. Trans., 1893, 663). However, the general accordance of the two sets of results obtained at different times, with different instruments, and with slightly different methods by two independent sets of observers can be regarded as satisfactory.

In conclusion, we cannot but express the hope that our table of densities may prove of service to manufacturers of nitric acid, and of products obtained therefrom.

DISCUSSION.

Mr. **GUTTMANN** said the manufacturers of nitric acid had every reason to thank Prof. Veley for presenting his valuable paper to this Section. He would have liked to have seen the tables extended beyond 25° C. Prof. Veley had given the reason that above 25° nitric acid always decomposed either by heat or by light. That was true, but these tables did not go beyond the first place of decimals, and he doubted whether the decomposition would go on at a greater rate. The manufacturer was very much interested to know when he got from his still a certain quantity of nitric acid at a temperature generally beyond 50° C., what that would correspond to at 15°/4° C. He could neither weigh nor cool it, and he could not give the foreman the means of testing it, but he wanted a rough-and-ready way of comparing it with the standard table. He hoped that Prof. Veley would continue his investigations, and, perhaps, work the other way down, starting, say, at 50° C., and cooling the acid down, and so determining the densities at different temperatures. In that way he might get a useful table within practicable limits.

Prof. **HODGKINSON** said he should like to know whether the particularly pure acid mentioned by Prof. Veley had any extra solvent power on guncotton and such like substances.

The **CHAIRMAN** said he did not understand whether, in each case, the chemical composition of the acid had been tested. That had been the weak point of some tables published hitherto. Having had occasion for years to consult these sp. gr. tables, he knew that they were incorrect, especially with regard to the strongest acid, and he was very glad they had now Prof. Veley's table, which would, he hoped, be more accurate than its predecessors.

Mr. **DE MOSENTHAL** asked how Prof. Veley determined the refractive indices. He had found considerable difficulty in that matter.

Dr. **VELEY**, in reply, said that these determinations were made with the view of ascertaining the contractions and to solve the question whether they were or were not hydrates of nitric acid. Unfortunately, as nitric acid would not keep, one had to have recourse to the less accurate method of analysis. Every sample of nitric acid was determined by a solution of soda standardised against solutions of sulphuric acid and hydrochloric acid. The sulphuric acid was standardised by barium sulphate, sodium carbonate, and density; the hydrochloric acid solution, either by sodium carbonate or as against refined silver. But, however carefully volumetric analysis might be performed, it might be taken that it could not be carried beyond an accuracy of 1 in 1,000, whereas density determinations could be carried to an accuracy of 1 in 75,000 without any difficulty. As a matter of fact, these determinations were taken to the fifth place of decimals, but, as he understood, it was only the third that was necessary for ordinary purposes. With regard to the determination of the refractive indices of nitric acid, he had only to refer to a paper which he and his colleagues published in the proceedings of the Royal Society, in which the methods were described in full. All he need say now was that they used a prism constructed entirely of quartz, and the walls of the prism were cemented together by paraffin which had been purified by frequent boiling with concentrated nitric acid. All the methods and the various sources of error were discussed fully in the paper. As a matter of fact, he had made some few elementary experiments on the reaction of this nitric acid on cotton, and succeeded in obtaining a guncotton or, rather, he would say, a cotton which was just as inflammable as ordinary guncotton; but he did not pursue those experiments, because he was not particularly interested in explosives. It was probable that the amount of nitrogen peroxide formed above 30° C. or 40° C. would not affect the density much within the fourth place of decimals. The results obtained by Prof. Lunge at 15° C., the only temperature at which he worked, compared with water at 4° C. in a vacuum, and themselves, for the most part did not differ by 1 in 300; the maximum difference occurred at about 77 to 82 per cent., where there was approximately a difference of 1 in 250; In order to ascertain wherein this difference arose he had plotted out Lunge's results on squared paper, and found that he assumed a variation at 82 per cent. concentration, whereas they found the variation to take place at 77 per cent. Their results were in accordance with those of W. H. Perkin, sen., and Pickering.

COMPARISON OF DIFFERENT TYPES OF CALORIMETER.

BY J. S. S. BRAME AND WALLACE A. COWAN.

The question of the calorific power of fuels in relation to boiler economy and other engineering problems has given rise during the last twenty years to the introduction of a large number of calorimeters, for each of which some special advantage has been claimed. Of these various forms there are but few in general use, and the differences between the results obtained with these instruments seriously militate against any great confidence being placed in such determinations. It is, therefore, of importance to ascertain exactly how the results obtained with a particular type of calorimeter will compare with those determined with another form, which may be very different in principle.

One is struck at the outset with the small amount of published information available, and even where tests have been recorded, the number of determinations and the extreme results are seldom given, so that the figures are of little value, for, as will be seen later, the limit of error with some commonly used calorimeters is considerable.

The importance of a proper comparison has been recognised by Kent (Trans. Amer. Soc. M. E. XVII.), who stated that "the variations in the calorimetric tests of coal throw doubt upon all calorimetric work, until a sufficient number of tests shall have been made by different experimenters and with different calorimeters upon similar samples, and until tests so made show a reasonable degree of uniformity."

The results of tests of two coals in three calorimeters, quoted in the paper showed great differences, as will be evident from the summarised figures below :—

—	Coal No. 1.	Coal No. 2.
	Calories.	Calories.
Carpenter calorimeter	7316	8445
Thompson " (Boston) ..	6618	7260
" " (St. Louis)	6607	7515
Barus..........................	7058	8178·5

Unfortunately no form of bomb calorimeter was employed, but had one been used a still greater difference would undoubtedly have been noted.

In another set of tests, however, very close agreement was found :—

—	Coal No. 1.	Coal No. 2.
	Calories.	Calories.
Carpenter calorimeter	7611	7666
Mahler "	7705	7760
Thompson "	7604	7660

In the discussion of a paper by Adams (this Journal, 1901, **20**, 1084), Archbutt gave some comparative results obtained with the Mahler bomb and Lewis Thompson calorimeters. Unfortunately it was not stated whether the latter results were corrected for unburned coal. Presumably such a correction had been made, for otherwise it is difficult to understand why the Staffordshire coal gave a higher result in the Thompson calorimeter than in the bomb. With the other three samples of coal it will be seen that the agreement is far from satisfactory, the Lancashire, Monmouthshire, and Glamorganshire coals, with the Thompson instrument giving results about 2·4, 5·5, and 6 per cent. too low respectively.

In view of the great differences which have been observed, and the extreme importance of the matter from an industrial point, the authors, at Professor Lewes' suggestion, undertook the investigation of some selected coals with typical calorimeters, and carried out the work in as careful a manner as possible, so that from a large number of experiments reliable data might be obtained, not only between one calorimeter and another, but also on the limit of error which might be expected when a series of experiments were made with the same coal in the same instrument.

Starting from an anthracite the experiments were made with five coals with gradually increasing amounts of volatile matter. Unfortunately it was not possible to obtain one in which the volatile lay between about 20 and 33 per cent., although through the kindness of colliery proprietors and agents several specimens were examined.

The calorimeters were the more common used representatives of certain types :—

(1) Where combustion is effected by admixture with a solid oxidising agent (Lewis Thompson).

(2) Combustion with oxygen gas at constant pressure—

- (*a*) Where temperature of escaping gases is undetermined (William Thomson).
- (*b*) Where temperature of escaping gases is under control (F. Fischer).

(3) Combustion with oxygen at constant volume (Mahler's bomb).

With the exception of Parr's calorimeter in which sodium peroxide is used and the products absorbed, such a selection of calorimeters covers most types. There is no reason to suppose that any great difference in the results would be found with other individual calorimeters in each class.

Details of Experimental Work.

Several hundred grms. of each coal were crushed and thoroughly mixed, and then some 200 grms. further reduced until it all passed through a 30-mesh sieve. In order that variations in the moisture should not interfere with the determinations the coal was always used after drying at 100° C. A careful ultimate and proximate analysis was made of each sample.

Lewis Thompson Calorimeter.—This instrument is too well known to need any description, and it is probably more often employed than any calorimeter since it is cheap and experiments are easily conducted even by an unskilled person. It has long been recognised that the results obtained are but approximations to the truth, and the unscientific addition of 10 per cent. for losses should at once condemn it. Nevertheless it is contended that it gives comparative results of a satisfactory character. This, however, as will be seen from the figures given can only apply with coals of a very similar nature.

Wm. Thomson (this Journal, 1886, **5**, 581) summarises most of the objections to its use. Scheurer Kestner (Bul. Soc. Ind. Mulhouse, 1888, 506) compared it with a Favre and Silbermann calorimeter, and states that for scientific purposes it is inadequate, but with 15 per cent. addition for losses the results agree within a maximum of 4 per cent. In no case did he find the ratio of coal, 1 part, to oxidising mixture 10 parts, sufficient, and therefore he used from 11·5 to 14 parts of the latter.

J. W. Thomas (Chem. News, 1881, p. 135) gives much valuable information as to the use of this instrument. His results show that the more bituminous a coal the better are the results, and further, that when a coal does not yield more than 86 per cent. of coke full values are obtained. With anthracite, dry steam, and bastard anthracites the results were unsatisfactory. Thomas does not appear to have estimated the unburnt coal.

In working with the instrument the authors adopted the recommendations of Thomas, the coal being sieved through a 60-mesh sieve and the chlorate-nitrate mixture through one of 30 mesh. The weighed coal and chlorate mixture were transferred to a large corked tube and there thoroughly mixed, the charge being afterwards packed into the crucible with a glass rod. Every care was taken that the initial temperature of the water was satisfactory—a point of importance according to Thomas. The water was not weighed, but accurately measured from a graduated flask.

In every case the amount of unburnt coal was determined by evaporating down the water and washings from the calorimeter with hydrochloric acid, taking up the residue with acid water, filtering through asbestos on a Gooch filter, which was then washed, dried, and weighed. The crucible was heated in a muffle till all carbonaceous material was burnt, and the loss of weight taken as unburnt coal.

Two gauze discs were fixed on the bell of the instrument (as in Wm. Thomson's calorimeter) and were found to be very successful in breaking up the large gas bubbles and giving better results generally; this modification was adopted for all the experiments recorded later.

In view of the very large amount of unburnt coal in many cases, it was considered desirable to ascertain that the dryness of the chlorate coal mixture was not causing imperfect combustion. Samples of the mixed materials were put under a bell jar with water over night, and determinations made on the following day, when results in good agreement with those from the dry material were obtained.

William Thomson Calorimeter (this Journal, 1886, **5**, 581).—With this instrument the oxygen was obtained from a cylinder, but in view of incomplete combustion said to result from the gas being too dry (Adams, this Journal, 1901, **20**, 972) it was first passed through a Muencke's wash bottle containing water, and then through a calcium chloride tower filled with thoroughly moistened pumice.

The water value of the instrument was determined by weighing the parts and calculating from the specific heats; experimental controls were made with known weights of warm water.

In all the experiments the water (2,000 grms.) was weighed out.

The thermometer used was one supplied with the instrument and was graduated in Fahrenheit degrees, each degree being divided into tenths and occupying about one centimeter on the stem. With a lens it could easily be read to $\frac{1}{50}$ which would correspond to $\frac{1}{90}$° C. Assuming however that an error of $\frac{1}{50}$ C. were made it would have affected the result by some 40 calories, and a plus and minus error of this order in the same experiment would never exceed 80 calories or 1 per cent. That the error due to thermometer readings was very small is shown by the results with the Fischer calorimeter, where with four of the coals this same thermometer was used, the results being in close agreement.

The results were corrected for losses by radiation taking place during the experiment.

F. Fischer Calorimeter (Dingl. Polyt. J., 1885, **258**, 330, and Zeits. f. angew. Chem., **12**, 351).—In this instrument the coal is burnt in the form of a pastille in a small platinum gauze basket. The products of combustion are cooled in a special chamber and led out by a wide metal tube. A thermometer in this tube enables the rate of combustion to be so regulated that no loss of heat occurs through the gaseous products. Fischer states that the issuing gases when charcoal was used show both carbon monoxide and hydrogen, so that combustion is not perfect. In our experiments a thin smoke was always observed.

The oxygen used was rendered moist by passing through the wash bottle and tower previously mentioned. For the experiments 1,500 grms. of water were weighed out and the water value of the instrument taken into account. The coal was ignited electrically.

For the experiments made with coal E a special centigrade thermometer reading to [illegible] C. was employed, but unfortunately it got broken, and for the other four coals the Fahrenheit thermometer was used.

The results were corrected for losses by radiation taking place during the experiment.

The pastilles were easily made from bituminous or semi-bituminous coals, but were too fragile to be handled from anthracitic coals. To overcome this difficulty a solution of gum tragacanth, 1 grm. per litre, was made and 5 c.c. of this mixed with 10 grms. of the coal, the pastilles moulded and then thoroughly dried in the water oven. This small amount of gum held the material perfectly and had no measureable influence on the result.

Mahler's Bomb Calorimeter (Bull. de la Soc. d'Encouragement pour l'Industrie, 1892, **91**, 317).—The water value was determined from the specific heats of the various parts and was checked by determinations with naphthalene which yielded results in close agreement with Berthelot's. The amount of water weighed into the calorimeter vessel was 2,450 or 2,448 grms. according to the thermometer employed, thus giving a convenient factor (3,000) for the calculation of results.

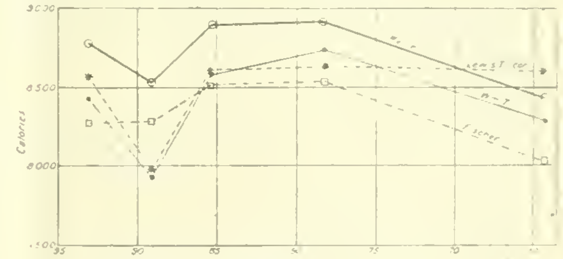
The correction for cooling used was the simple one which Mahler recommended, based on Newton's law, this being sufficiently accurate for almost all calorimetric work where the time between the ignition and the maximum temperature is small.

The correction for nitric acid formed was obtained by titrating the washings from the bomb with standard sodium carbonate (3·706 grms. per litre). Each c.c. of this solution represents 1 calorie in the correction. Since sulphuric acid is also formed and is titrated with the nitric acid, allowance was made for this, the titrated liquid being made acid and precipitated with barium chloride. The heat of formation of its equivalent in nitric acid was then subtracted from the number of c.c. of alkali used. The weight of barium sulphate obtained multiplied by 100 gives this correction directly.

Ignition of the coal was made by means of fine platinum wire, so that no further correction was necessary.

Discussion of Results.

A summary of the results will be found in Table V., and the general comparison based on the mean results of all the experiments is given in a diagram.



% of fixed carbon in combustible, dry & ash free coal

Lewis Thompson Calorimeter.—The recognised deficiencies of this much used instrument have already been alluded to, and although a great deal has been written on the subject, no information has hitherto been available, so far as the authors can find, on the actual amount of coal which escapes combustion. If a charge be fired in a crucible in the open air, particles of ignited coal are thrown up to a height of several inches. Clearly if the bell were over the crucible such particles would be thrown back and extinguished. That the amount of unburnt coal largely depends upon the proportion of oxidising material employed in fact is roughly proportional to it, is well shown with the four coals (A, B, C, D,) in which the ratio was varied. Thomas (*loc. cit.*) states that "the quantity which appears to be best adapted is not that which always gives the most trustworthy results." That this is due to the unburnt coal is clear, for the mixture which burns most vigorously is invariably that in which a high ratio of coal is employed and which gives the greatest amount of unburnt coal. It would appear desirable, therefore, to use as large an amount of chlorate mixture as possible, but a practical limit is soon reached for with the high proportions the combustion is very difficult to start, and more frequently than not the charge goes out, apparently owing to the mass of fused chloride, &c., in the crucible. The instruction often given to first find out the proportions in which the mixture burns most readily and then adopt them is therefore misleading.

It was assumed in making the correction for the unburnt coal, that its calorific value would be the same as that of the burnt coal, but there is little doubt that such is not the case with a coal containing much volatile matter, for at the temperature in the crucible, the hydrocarbons would practically all be distilled out and burnt, so that it would probably be more correct to take the unburnt coal as determined and apportion to it a calorific value nearer to that of charcoal. That the correction in the above form is not satisfactory is evident from the results with coal E, where the mean result is actually higher than the bomb determination.

The amount of unburnt coal with anthracite and semi-anthracite is, perhaps, the most striking feature of the experiments for even with what are regarded as the normal proportions (1 – 11), the mean values for the unburnt coal amounted to 31·8, 23·3, 12·3, 4·3, and 5·7 per cent. for A, B, C, D, and E respectively.

Generally speaking, the corrected results agree fairly well with those obtained with Wm. Thomson and Fischer instruments (except E); but the estimation of the unburnt coal is so tedious an operation, and one which would be seldom carried out in practice, that most observers would rely on the uncorrected figure, and this would be so far from the truth, except with a highly bituminous coal, as to be quite valueless.

William Thomson Calorimeter.—The results obtained with this instrument were certainly disappointing, the limit of error for a particular coal being higher than we anticipated. It will be seen, however, that the mean results more closely follow those obtained in the bomb than do the mean results with the other instruments. Great care had to be exercised to get complete combustion in the crucible, for towards the end of the experiment the cooling effect of the platinum seemed to extinguish particles of coal in contact with it. We found it best to suspend the crucible in the brass cup with a fine platinum wire ring. Possibly better results would be obtained if, instead of a crucible, a basket of fine platinum gauge were employed, and the coal compressed into small cylinders, as with the Fischer instrument.

The possible sources of error may be (*a*) error in thermometer reading which has already been referred to, (*b*) incomplete combustion of the coal in the crucible itself, (*c*) escape of products of combustion at a higher temperature than the water, (*d*) loss by the gases themselves, due to carbon monoxide, smoke, &c.

This latter probably leads to the greatest error. for, however carefully the experiments were conducted, there was always more or less thin smoke at the top of the jar. Thomson, in the discussion on Adams's paper, stated that he had failed to find carbon monoxide in the products; but, on the other hand, several chemists, including Favre and Silbermann, Fischer, and Berthelot, have always found it present under such circumstances.

The result of our experiments have an important bearing on Adams's work, already referred to, where he claims to have shown that oxygen direct from the cylinder gave lower results than when the oxygen was saturated with aqueous vapour. Adams gives only two "careful" determinations with moist oxygen, and these are certainly in very close agreement, and one with cylinder gas direct. The moist oxygen gave a value some 220 calories higher; but, with some other experiments not so carefully conducted with cylinder gas, the difference was only 126·4 calories. Seeing that in our experiments there was a difference of from 200 to 300 calories with the same coal under the same conditions, it seems desirable, before condemning the cylinder oxygen, to make a more extended series of experiments with the oxygen under both conditions, and even then a definite result can only be arrived at by an analysis of the gaseous products from every experiment. It is so little trouble, however, to run the oxygen through water before use, that it might easily be arranged for in every laboratory, and this also would minimise any small error due to evaporation of water.

Fischer Calorimeter.—This instrument gave very concordant results with each coal individually, the experimental error only amounting on the average to about 1 per cent., but the mean results as compared with the bomb were disappointing. In four cases they were the lowest obtained with either instrument, and differed considerably from the correct value. Coal B was, however, an exception, and it gave a mean result which was higher than the means from either the Lewis Thompson or Wm. Thomson calorimeters. On the five coals examined, the average error, as compared with the bomb, amounted to some 4 per cent.

A curious result, and one for which we have not found a satisfactory explanation, was repeatedly observed during the experiments. By allowing the oxygen to pass through slowly, the thermometer which indicated the temperature of the escaping gases could easily be made to register nearly a degree lower than the temperature of the water in the calorimeter. It was thought that the expansion of the oxygen on leaving the cylinder caused a lowering of temperature, and that a cold stream of gas escaped through the outer spaces in the combustion chamber, but that this was not the case was proved by taking the temperature of the oxygen at the top of the pumice tower. Here the gas was invariably at the room temperature.

Mahler Calorimetric Bomb.—This gave most satisfactory results, and, seeing the close agreement obtained, it was unnecessary to make more than three determinations with each coal. The greatest difference between any two results with the same coal was 26 calories.

The advisability of making any correction for the nitric acid formed has been much discussed, and, therefore, we have included in Table IV. the uncorrected values and the corrected. An increase of temperature during the combustion will lead to the formation of more nitric acid, and since with a higher final temperature the radiation correction will be greater, the omission of this latter correction will tend to counterbalance any error caused by neglecting the nitric acid formed. Taking the mean results by both methods of calculating, for the five coals the mean value uncorrected is only some 50 calories lower than the corrected results, the greatest difference with any coal amounting to some 62 calories. For all technical purposes, therefore, the simpler form of calculation is sufficiently accurate.

General Conclusions.—The Lewis Thompson calorimeter is the only one in general use relying on a solid oxidising material, and with this instrument the experimental error is very large. For bituminous coals it might give a rough comparison, but in every case the amount of unburnt coal should be determined and such determinations are laborious, and far exceed the trouble of arriving at a correct result with a bomb calorimeter.

The experimental error with a Wm. Thomson calorimeter is also high, and whilst the Fischer calorimeter gives concordant results for the same coal, these results are far from the truth. There seems no reason to suppose that other calorimeters of either of these types should give much better results, for in every case of burning coal with oxygen under atmospheric pressure there is the trouble of incomplete combustion.

The conclusion arrived at by all who have had experience with some form of bomb calorimeter as to its marked superiority is amply confirmed by our results. The only objection to its use is the question of expense. It is easy to manipulate when once the details have been mastered, and determinations can be made with fair rapidity; it is not, however, an instrument suited to the rough and ready methods of an engineering shop. Calorimetric results are f little value unless they are fairly accurate, and the equisite degree of accuracy can only be arrived at when erfect combustion can be assured, as in the bomb.

Calculation of Results from Ultimate Analyses.—This uestion has been frequently discussed, and has given rise contradictory opinions. From the results given in this aper it is clear that a comparison can only be obtained ith determinations made with a bomb calorimeter; or, if ith some form of instrument where combustion takes lace at ordinary pressures, the products of combustion are nalysed and corrections made for unburnt gases. Even hen so corrected the results are not perfect, for several easons; and Scheurer Kestner (Comptes rend., 112, 233) as shown that the bomb method gives from 1 to 3 per ent. lower results than the corrected Favre and Silbermann lorimeter.

Mahler, in his exhaustive research, gives calculated and etermined values for a large number of coals, the extreme lculated values relatively to the determined values on e coal dry and free from ash for the different classes ing:—

	Calories.	
Anthracites	+ 206	− 123
Fat and semi-fat	+ 95	− 285
Fat gas coals.........	+ 286	− 191
Flaming coals (lignitic)	+ 24	− 190

Lord and Haas (Amer. Inst. Min. Eng., XXVII., 259) und a close agreement between the calculated and termined values for some forty coals, there being only a aximum difference of 2 per cent. and a minimum of 1 per cent., and they conclude that "it seems certainly ssible that the differences between calculated and served values are within the limits of experimental ror."

Lord, however (Eng. News, Feb. 16th, 1899), in the case five other coals, found a good agreement in three cases, t with the other two specimens, the calculated values re 2·7 and 3·1 per cent. low, respectively. Lord sugsted that this may be due to errors in analysis arising om unburnt carbon. Clearly the boat and ash could not ve been heated after the first weighing to ensure that no rther loss took place—a precaution which should always taken when dealing with coals.

From the results given in this paper it will be seen that th two of the coals (B, C) the calculated values are over per cent. lower than the determined, and with coal E s difference amounted to little below 5 per cent. There no reason to doubt the analytical results, since they are mean of duplicates in good agreement. The result th coal E may in a large measure be due to the someat exceptional nature of the coal, containing as it does ·57 oxygen + nitrogen. Mahler recognised that the ordinary Dulong formula is not satisfactory when the oxygen and nitrogen are high, and proposed a formula:—

$$Q = \tfrac{1}{100}\,[8140C + 34500H - 3000(O + N)].$$

It is impossible to generalise on such a few experiments with individual coals which have been made by the authors, but, taking everything into consideration, there does not at present appear to be that close agreement between calculated values and determined values in certain forms of bomb calorimeter which some writers have claimed. That a fairly close agreement exists with a large number of coals may be granted, but exceptional cases arise, and these, being always liable to occur, make calculated results of doubtful value. It is only because of the renewed interest in the question which has arisen since the introduction of the bomb calorimeter that the matter has become of importance, for there is every reason to neglect the older controversy on this relationship because of the doubtful accuracy of many of the calorimeter determinations with which comparisons were made.

TABLE V.

Summary of Calorimeter Results.

Coal.	Lewis Thompson (Corrected).	Wm. Thomson.	Fischer.	Mahler.
A.—Mean...............	8418(8)	8284	8139	8629(3)
Highest	8602	8490	8172·5	8639
Lowest.............	8082	8120	8090	8613
Per cent. error	6·4	4·4	1·0	0·3
B.—Mean...............	7235(7)	7178·0	7509	7713(3)
Highest	7436	7303·5	7561	7727
Lowest	7029	7090·5	7485·5	7706
Per cent. error	5·8	3·0	1·27	0·27
C.—Mean	8331	8324(7)	8243	8617(3)
Highest	8442·5	8425	8287·5	8631
Lowest.............	8173	8162	8187	8606
Per cent. error........	3·1	3·2	1·2	0·3
D.—Mean	8144	8233	8049·7	8394·5(3)
Highest	8250	8304	8087·5	8402·5
Lowest.............	8063	8156	8007·5	8389·0
Per cent. error........	2·3	1·8	1·0	0·16
E.—Mean..............	8178	7882(8)	7627	8026·5(3)
Highest	8316	7997	7648	8037
Lowest	7997	7755	7598	8018
Per cent. error........	3·9	3·1	0·6	0·24

Figures in brackets show number of experiments from which the mean was obtained. When no figures are given the number of experiments was 6.

TABLE VI.

Analysis of Coals (dry) and Calculated Values.

Coal.	C.	H.	S.	Ash.	O + N.	Fixed Carbon.	Volatile Matter.	Calcrific Values.		Per Cent. low of calculated.
								Calculated.	Determined.	
....	90·09	3·85	0·77	1·68	3·61	91·48	6·84	8567	8629	0·7
....	81·02	3·23	0·64	9·50	5·61	80·80	9·70	7527	7715	2·4
....	87·79	4·09	0·59	3·14	4·39	82·79	14·08	8425	8617	2·2
....	84·67	4·51	0·685	5·69	5·045	73·81	20·50	8241	8394·5	1·8
....	78·29	4·76	1·48	4·90	10·57	61·10	34·00	7658	8026·5	4·8

Formula for calculated values: $Q = \tfrac{1}{100}\,[8140\,C + 34500\,(H - \frac{(O + N) - 1}{8}) + 2220\,S]$.

Nottingham Section.

Meeting held on Friday, October 23rd, 1903.

CHAIRMAN'S ADDRESS.

THE RECENT PROGRESS OF TANNING AS A CHEMICAL INDUSTRY.

BY J. T. WOOD.

I need scarcely say how much I appreciate the honour you have conferred upon me by electing me chairman of your Section. I assure you that it will be my endeavour to merit this honour, and to do all I can to promote the interests of the Section. In opening the session I was in some doubt as to what I could say that would be of interest or value. In Plato's "Charmides," Socrates is made to say, "If everybody did what they have most the science of, we should no doubt have everything done most scientifically," and as I suppose I have more of the science of tanning than anything else, it seems to me better to talk about that, even at the risk of trying your patience, than to venture upon the unknown ground of a general introductory address.

Eight years ago (October 5th, 1895) I had the honour to deliver the introductory address to a course of lectures on tanning to the students of the Goldsmiths' Institute, in which I endeavoured to set forth some of the advances which this great industry owed to science. The subject of technical education, which I touched upon in my previous address, is too wide to be discussed here to-night. A little knowledge is said to be a dangerous thing, but I would like to say that if a man takes an interest in his work, if he loves it, he must and will want to know all there is to be known about it; whether such knowledge will be of practical use to him depends entirely upon the character of the man, but it is ridiculous to suppose that it can be hurtful to him. I propose to-night briefly to review the progress made during the past eight years, and, perhaps, to indicate the probable course of discovery in the near future. I may say that much of the ground I am about to traverse has been covered by the valuable Cantor Lectures of Prof. H. R. Procter, delivered in April and May 1899, and by his "Leather Industries Laboratory Book (1898)," and quite recently his "Principles of Leather Manufacture (1903)." Only last year two new tanning schools have been opened, one in Turin, through the exertions of Signor Andreis, very completely equipped with machinery and appliances for illustrating known methods or for putting into practice new ideas; the other in Lyons by the Syndicat General de l'Industrie des Cuirs et Peaux.

Taking the operations of tanning in their natural order our knowledge of the preliminary operations has received considerable additions.

Liming.—Payne and Pullman's indirect process (Eng. Pat. 2873; this Journal, 1899, 504) is of considerable scientific interest. It consists in chemically producing calcium hydrate in the substance of the skin itself instead of working the skin in lime liquors. The hides or skins are treated with a solution of caustic soda (sp. gr. 1,024) in a drum for three or four hours, and afterwards in a solution of calcium chloride (sp. gr. 1,020) for one to two hours. A double decomposition takes place according to the following formula:—

$$2NaOH + CaCl_2 = Ca(OH)_2 + 2NaCl,$$

the caustic lime being formed in the fibres of the skin. In this way the same amount of lime is introduced in four to six hours as by the usual method in seven to ten days. It is curious that the process does not loosen the hair of the skin in the same way as ordinary liming unless a certain amount of bacterial action has taken place in the soaks—*i.e.*, if the hide is treated antiseptically the hair remains fast in the skin, and there is no doubt that the absence of bacteriological changes in this process is the chief reason why it has not been adopted for all branches of the trade. The *rôle* of bacteria in the liming process ought to be studied in our research laboratories in the same systematic way that the bacteria in tan liquors, bates, and drenche have been investigated by Andreasch, Wood, and Popp an Becker. The various species growing in the liquors shoul be isolated, and their life history and action on skin worke out. In such a way the process of liming as carried ou in practice would be thoroughly illuminated. I remembe Lord Allerton, then the Right Hon. W. L. Jackson, thoroughly practical tanner, saying that in his opinio the leather is made before ever it goes into the tan liquors and in my opinion this applies in an equal degree to limin as to puering.

Bating.—Passing from liming to bating, the action o the dung bate, which is used on almost all light leather to prepare them for the tanning process proper, has bee investigated by the author, and some of the results publishe (this Journal, 1898, 1010; 1899, 990) under the title o "Notes on the Constitution and Mode of Action of th Dung Bate in Leather Manufacture." In these papers th lines on which a culture of bacteria might be practicall applied to the bating of skins were indicated. Such bacterial bate has now been put upon the market b Dr. Popp and Dr. Becker, of Frankfort-on-Maine, unde the name of Erodin. These authors have independentl investigated the bacteria of dog dung, and have tried th action of pure cultures of over 100 different species o skin. Calf, sheep, and goat skins are now being successfully bated with Erodin on a very large scale.

Pickling Process.—One of the most interesting operation in the course of preparing skins is pickling, in which th raw skins, when ready for tanning, are treated instead i a bath of sulphuric acid and salt. As far as I am aware this process has been investigated in its scientific aspec by Procter only ("Principles of Leather Manufacture," p. 89; Cantor Lectures, 1899, p. 19), but I believe that systematic and thorough study of the physical behavio of skin, under the influence of acids and salts, will prov a fertile field of discovery in the future. I might occup the whole evening with the consideration of this proces but will mention only one instance of its importance i the direction I have indicated. Pickled skin will directl absorb basic chrome salts from a concentrated solutio without damage to the fibre of the skin. If chromiun sulphate be used it appears to displace the hydrochlori acid on the fibres; this can then be washed out, and th chrome remains fixed in the skin. I may, perhaps, expres the hope that some of our research laboratories will tak up the study of the process, and publish the results.

Bacteriology of Tan Liquors.—The bacteriology o vegetable tan liquors was thoroughly studied by the lat Prof. Andreasch, of Vienna, his work "Gährungs-Erscheinungen in Gerbebrühen" (this Journal, 1896, 910) bein the most important hitherto carried out in this field. H isolated and described a large number of organisms growin in tan liquors, and showed the various changes brough about by them. A few of the more important results o his researches may be briefly summarised. 1. Putrefacti bacteria from the hides, bates, drenches, &c., accommodat themselves to the acidity of tan liquors, they dissolv certain nitrogenous constituents of the hide, and thereb furnish the chief nutriment for the more specific acid producing bacteria. In liquors which are in use, th production of acid is proportional to the hide substanc present. 2. Acetic acid, which, in fresh tan liquors is th chief acid, is always formed by two separate processes (*a*) the production of alcohol by yeasts from the glucose of the non-tannins, and (*b*) the fermentation of the alcoh by acetic bacteria. In tan liquors, acetic acid is neve formed directly from carbohydrates. 3. Lactic acid produced by several species of bacteria both from th sugars and other carbohydrates of tan liquors, and from th sugars alone by a yeast. A good supply of nitrogenou nutriment is necessary for its production, the greater pa of which is furnished by the hides. 4 Butyric acid occu in traces only in sound tan liquors.

Tanning by Concentrated Extracts.—In the tannin process proper the principal change is the large increa in the use of strong extracts, the most important bein quebracho. Solid extracts made from this wood contai from 60 to 70 per cent. of tannin, and are cheap, th price of the tannin per pound averaging 3*d*., as against 6 r the tannin of gambier, and 3·80*d.* for sumach tannin. is especially of value for the tannage of light leathers. ne of the sources of loss in the use of these solid extracts, z., the insoluble matter (difficultly soluble tannins), has en done away with by the patent process of Lepetit, ollfuss, and Gannser (Eng. Pats. 8582 of 1896 and 2603 1898; this Journal, 1897, 46; 1899, 285), by which the ood is treated with bisulphites of soda. The extracts ep the leather soft, and act more quickly than those epared in the usual way. Parker and Gannser (this ournal, 1901, 1085) have shown that the sodium bisulphite the extract is not absorbed by the leather, and that no lphuric acid is formed. I may call attention, however, the fact that extracts prepared in this way cannot be ed to tan pickled skins, owing to the acid decomposing e salts which hold the difficultly soluble tannins in lution. In connection with the vegetable tanning process would suggest a great problem for our organic chemists, whom we have some distinguished representatives here -night—a problem not only of importance to tanners, but great interest to botanists in the study of the physiology plants—I mean the synthetic production of tannin on alogous lines to the synthetic production of indigo. This ing is not a manufacturer's business; it is purely a estion for the organic chemist. So far back as 1867, llotannic acid was synthesised by Löwe, by the action silver nitrate on barium gallate ("Leather Industries aboratory Book," Procter, p. 60), and it seems to me ssible, considering the great advance which has been ade in organic chemistry since that date, to produce mmercially a pure gallotannic acid. Procter has shown, d I have fully confirmed his conclusions, that leather n be made by means of gallotannic acid, and if this can produced synthetically I foresee many important uses leather tanned with it.

Valuable contributions in this department are the Society Arts Committee's report on Leather for Bookbinding, d Dr. Gordon Parker's paper on the same subject (Jour. c. Arts, 50, [2558], 25, 32), in which the causes of cay in bookbindings are clearly specified and remedies inted out. Parker's paper on the "Application of jeldahl's Method of Estimating Nitrogen in the Tanyard a means of controlling the Tanning and Finishing of le Leather," is also of value as pointing out to the tanner way in which he may gain an exact knowledge of the mposition of his leather in every stage of the process.

Chrome Tanning and its Chemistry.—In chrome tanning ere has been a great advance in the quantity of leather oduced; indeed, it has almost displaced the older sorts leather for the uppers of fine shoes. I do not know of y great discoveries, but a notable contribution to the rking of the process is Procter's description of a cheap e-bath chrome liquor (Leather Trades' Review, Jan. 12, 97; this Journal, 1897, 152). Bichromate of potash is luced by means of glucose and the calculated quantity acid sufficient to form the required basic salt. Skins tanned with this liquor as with the one-bath chrome uor of Martin Dennis. Lepetit, Dollfuss, and Gannser ve recently patented a process for tanning and colouring ins in the same bath and at one operation.

In the chemistry of chrome tanning much research has en done, one of the chief points elucidated being the te in which the chromium exists in the skin. In the e of the two-bath process it was supposed that the omium existed as the oxide, on or in combination th the fibre of the skin. Krutwig and Dalimier (this urnal, 1900, 58) found that normal chromium sulphate, $_2(SO_4)_3$, was absorbed by skin in an unchanged condition. e salt used in practice is more basic, and Procter and iffith have ascertained the relation of chromium to acids th in the leather and in the residual liquors in the one- th process (this Journal, 1900, 225), using a tanning uor made by adding 25c.c. of normal sodium carbonate =1·328 grm. of Na_2CO_3) to 100 c.c. of 10 per cent. chrome m solution. The chrome in this liquor is represented the formula $Cr_2(SO_4)_{1\cdot 5}$. In the leather produced the ation or ratio of chromium and acid corresponded to formula $Cr_2(SO_4)_{1\cdot 21}$, that in the residual liquor to $(SO_4)_{2\cdot 6}$, showing that the chromium fixed in the leather is more basic than that in the original liquor. This result is not in agreement with Krutwig's (Collegium, 1902, 2[illegible]–161), who found not only the normal salt, but also a basic salt, $Cr_2O_3 2Cr_2(SO_4)_3 + Aq$, were absorbed unchanged. Fahrion (Coll., 78, 278) considers that both Procter's and Krutwig's conclusions are correct, but that their different results are due to the different way in which they prepared the skin for tanning.

Stiasny (Der Gerber, 1901, 235; 1902, 121) has shown that in the two-bath process, although hydrochloric acid is used both in chroming and reducing, a basic chromium sulphate is formed on the fibre of the skin. The SO_3 is furnished by the thiosulphate used for reduction, while the Cl is washed out in the form of sodium chloride. He further showed that chromium sulphates possess more powerful tanning properties than the chlorides.

Wünsch (this Journal, 1902, 1544) has patented a one-bath tanning process in which a precipitated chromium hydroxide is dissolved in chrome alum solution in such proportions that one-fourth of the whole sulphuric acid is combined with sodium or potassium oxide, and the rest with excess of oxide of chromium.

Amend (this Journal, 1903, 37) in America has patented the use of nitrites of chromium in combination with alkaline nitrites for tanning, but I have not heard that the process is in use.

Titanium and Formalin Tanning.—Lamb and Spence (Eng. Pat. 11,092, June 30, 1902) have recently patented the use of titanium salts for tanning, these being used in the same way as chrome salts (this Journal, 1902, 1286). If I were to enumerate all the patents which have been taken out for chrome tanning I should only weary you to little purpose.

By the advance of chemical industry two other bodies, once of laboratory interest only, have been rendered available for the tanner. I refer to formaldehyde and formic acid. Formaldehyde is sold commercially in the form of a 40 per cent. solution under the name of "formalin." It has the property of rendering gelatin insoluble, and several processes have been patented for its use in tanning—Burckhardt, Tullis, Combret, and notably Payne and Pullman (this Journal, 1899, 381; 1900, 915; 1899, 504). The last of these is being worked by Messrs. Pullman, of Godalming, on a large scale in the production of buff leather. The skins or hides are treated in a drum with a mixture of formalin and sodium carbonate; the alkali is subsequently removed by treating the skins in a solution of ammonium sulphate. The leather produced almost exactly resembles chamois leather both in appearance and constitution. Procter (Cantor Lectures, 28) considers the tanning action of fish oils which are used in the dressing of chamois leather to be due to the direct tanning action of aldehydes which are produced by the oxidation of the oil.

Formic acid has given the leather dyer a strong and cheap organic acid, which can be used in place of sulphuric acid, and which has no injurious action on the leather. Lamb, at Herold's Institute, has made a number of careful experiments on the use of this acid, the results of which are published in the Journal of the Society of Dyers and Colourists, September 1903, and should prove of use to manufacturers. Eight years ago there were people who predicted that aniline dyes would entirely displace the old wood colours. This, however, has not been the case. On the contrary, the wood colours have been given a new lease of life by the introduction, on the one hand, of their extracts in a handy and concentrated form, and, on the other hand, by the application of titanium salts as mordants for these wood extracts. Lamb in England and Dreher in Germany (this Journal, 1902, 1286; 1903, 906) have done some valuable work on this subject, and I am able to show you a number of colours dyed with the help of titanium in the dyeing laboratory of Herold's Institute by Mr. M. C. Lamb.

I have already referred to the patented process of Lepetit, Dollfuss, and Gannser, by which skins are dyed and tanned in one bath. This is accomplished by adding to a chrome liquor, dyestuffs which do not precipitate—such as Logwood Lake, Indigo Substitute, Naphthol

Black, Orange 2 B, Naphthol Yellow S. The tanning proceeds in the same way as in the one-bath chrome process.

Machinery-Degreasing and Theory of Tanning.—The construction of machinery for leather work has made enormous strides during the past eight years, and although this has nothing to do with chemistry, I cannot let the occasion pass without mentioning a few points. Although the shaving machine invented by Rood in America was in use at the time, it has since almost driven out hand-shaving, and in some cases does work which it was impossible to do by hand. The Vaughan striking-out machine, the principle of which is also applied to unhairing, has been modified and improved by Turner (again in America). He has increased the number of tables to five, and the machine will unhair from 3,000 to 4,000 skins per day with one operator. The striking-out machine, with two operators, will put out 3,000 skins per day.

The degreasing of leather has attained very great importance. The process of extracting the grease from leather by means of benzoline was introduced into this country from the United States in 1878 by Sir John Turney, the head of the firm to which I belong. It consisted in dipping the skins in a vessel filled with benzoline and leaving them until the grease had dissolved out by diffusion; when the solvent became so far saturated with grease as to be of no further use it was run into a still, and the spirit distilled off and used again. The process was expensive on account of the loss of solvent from the skins, which were simply dried in the open air. Mr. F. N. Turney, a brother of Sir John's, after numerous e periments, succeeded in constructing a plant by which t whole of the solvent was completely recovered both fro the greasy residue and from the skins. There are no large plants at work in London, Paris, Nottingha Stourbridge, New York, and elsewhere.

I have no time left for any consideration of the theo of tanning, but it presents problems of great interest the chemist and physicist. Körner (Jahresb. Deutsc Gerbersch., 1899, 1900, 1903) has contributed three i portant papers in which the tanning process is discuss in the light of modern theories of physical chemistr Körner comes practically to the same conclusions as Kna did 45 years ago in his classical research on the nature tanning, *viz.*, that leather is animal skin in which t fibres are prevented in any way from sticking together drying. In other words, tanning is a physical and not chemical process. Körner's conclusions are adverse criticised by Fahrion (Zeits. f. angew. Chem., 1903, 28—2 in another most valuable and instructive paper, in which h endeavours to show that tanning is a chemical process, an that leather is a salt in which the hide can function eith as base or acid. I consider these papers of great in portance to the science of tanning, as bringing togeth varying and apparently conflicting views of the proces and, as it were, crystallising the scattered knowledge of They show, too, the interest that tanning is exciting in t minds of purely scientific workers.

All these things can have only one result—the advanc ment of the industry to which I am proud to belong.

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Patent Specifications may be obtained by post by remitting as follows:—

English.—8*d.* each, to the Comptroller of the Patent Office, C. N. Dalton, Esq., Southampton Buildings, Chancery Lane, London, W.C.

United States.—1*s.* each, to the Secretary of the Society.

French.—1 fr. 25 c. each, to Belin et Cie., 56, Rue des Francs-Bourgeois, Paris (3^e).

I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Compression of Air or other Gases; Apparatus for the ——. H. Hollington, Manor Park, Essex. Eng. Pat. 21,334, Nov. 6, 1902.

The compressor comprises one or more cylinders, in each of which a hollow piston moves. Each cylinder contains a quantity of water or other liquid, which forms a liquid seal with the piston and so prevents leakage, the inlet and outlet pipes being disposed in the cylinder with their orifices above the level of the sealing liquid. The pipe are provided with suitable valves, and the outlet pipe ma lead to a gasometer or other accumulator.—R. A.

Temperatures of Liquids; Apparatus for Exchangin ——. [*Sterilising, Refrigerating, Condensing, &c.*] I Desmaroux, Paris. Eng. Pat. 26,073, Nov. 26, 1902.

The apparatus is of the type in which a parallel circulatio of the liquids, in reverse directions or otherwise, is employed It is constructed of interchangeable parts, and consists o a series of superposed chambers formed of metal plate fixed to end-bars and blocks, which are reversely arrange between successive plates, thus forming two series of alternating chambers having the chambers of each series in communication. Separate inlets and outlets for the two series are provided at the ends of the apparatus.—R. A.

Temperature of Liquids, particularly of Water, in Central Condensing Plants and the like; Process for Regulating the ——. H. Balcke, Bochum, Germany. Eng. Pat. 19,623, Sept. 11, 1903.

The fluctuations of temperature are transmitted to a liquid which easily expands or evaporates, and the expansion or evaporation of this liquid is employed to control, through pistons, floats, or the like, the supply of water or other iquid to the condenser, &c. (See also Eng. Pat. 20,549 of 1901; this Journal, 1902, 904.)—R. A.

Clarifying Waste Liquid extracted from Coal, Ore, and the like; Process of and Apparatus for ——. F. Baum, Herne, Westphalia. Eng. Pat. 762, Jan. 12, 1903.

The materials are delivered, first, on to an inclined perforated bottom plate or strainer, through which the water and finer materials pass; secondly, on to an endless perforated feeding band; and are then returned, preferably hrough a second perforated plate, on to the layer of oarse materials which has been delivered from the inclined training plate on to the band, so that the finer materials orm on the coarser materials a permeable layer for filtering r clarifying subsequent supplies of water. The second erforated plate serves to distribute the water and finer aterials close over the layer of materials on the feeding and. (Compare with Eng. Pat. 18,779 of 1902; this ournal, 1903, 41.)—R. A.

Freezing; Methods of ——, and Apparatus therefor. G. Wollers, Essen-on-the-Ruhr, Germany. Eng. Pat. 17,793, Aug. 17, 1903.

Bodies of any kind are frozen by a current of compressed as or air, conveyed from a source through a supply tube to he place in which the freezing is to be effected, the current eing discharged through a pressure-reducing valve. The xpanded gas or air is conveyed back through a tube urrounding the supply tube, for the purpose of further ooling the gas or air therein, and is then returned to the ource of supply through a tube coated with insulating aterial. The compressed gas may be dried before passing o the supply tube, and a second pressure-reducing valve ay be provided in the return tube.—R. A.

United States Patent.

Crystallising Apparatus. H. Winter, Charlottenburg, Germany. U.S. Pat. 742,544, Oct. 27, 1903.

he apparatus consists of a horizontal cylindrical vessel, aving a centrally supported rotating shaft, carrying adial arms which support secondary shafts, on which are rums receiving rotary motion from blades when the central haft is revolved. The blades are pivoted to discs at the nds of the drums, means for limiting the movements of hich are provided.—E. S.

French Patents.

Distillation; Apparatus for ——. O. Perrier. Fr. Pat. 328,074, Sept. 1, 1902.

long, rectangular, horizontally-inclined chamber is vided into a number of compartments by transverse artitions fixed to its bottom, and extending nearly to the p. Another series of partitions fixed to the top of the hamber dip into each compartment alongside the other artitions, reaching within a short distance of the bottom. he chamber is filled with liquid to a certain height, each ompartment communicating with the adjoining lower one hrough an overflow weir and a channel penetrating the viding partition. On heating the chamber, the vapours ass from the top of one compartment, through the space etween two partitions, into the next compartment, ntering at a level below the surface of the liquid, and merge beneath a perforated false bottom, which breaks em up into bubbles, and thus forces them to stir the quid.—L. F. G.

Concentrating Liquids in Evaporating Apparatus; Process and Plant for ——. M. Ekenberg's Aktiebolag. Fr. Pat. 332,484, May 5, 1903.

See Eng. Pat. 10,124 of 1903; this Journal, 1903, 878.
—T. F. B.

Separating Solids from Liquids; Process for ——. W. Schuler. Fr. Pat. 332,535, May 20, 1903.

A coarse-grained sandstone serves as a support for a layer of fine sand, 10 mm. in depth, through which the liquid to be filtered is forced under pressure. The coarse-grained stone is grooved on its lower surface to allow of the ready discharge of the liquid.—L. F. G.

Storing Compressed Gases or Liquids; Cartridge for ——. Soc. Anon. d'Applications des Gaz Liquéfiés. Fr. Pat. 332,588, April 28, 1903.

Into the open end of a metal cartridge is screwed a short tube provided with a central hole and seating for a valve, and screwed on the outside so that it can be connected to the receiver for the compressed gas. The other end of the cartridge is rounded, and has a small circular opening. Into this hole is dropped from inside the cartridge a short hollow piece of metal, closed at the end which is inside the cartridge, and provided with a flange, with which it rests on the rim of the hole. Over the part projecting outside the cartridge is slipped an india-rubber ring, and the hollow part of the piece of metal is hammered down all round, tightly closing up the hole.—L. F. G.

II.—FUEL, GAS, AND LIGHT.

English Patents.

Clarifying Waste Liquid extracted from Coal, Ore, and the like; Process of and Apparatus for ——. F. Baum. Eng. Pat. 762, Jan. 12, 1903. I., adjoining column.

Peat-Blocks for Fuel; Manufacture of ——, and Compression and Drying of other Substances. W. P. Thompson, Liverpool and London. From F. White, Toronto, and G. A. Griffin, Guelph, Ontario. Eng. Pat. 17,514, Aug. 12, 1903.

Peat, from which the water has been drained, is put in an enclosed and perforated mould heated to about 300°—350° F. by suitable heating jackets. The peat is subjected to a pressure of about 10 lb. per sq. in., and this pressure is increased, stepwise, by 10 lb. per sq. in. every minute, till, after 25 minutes, the maximum pressure of 250 lb. per sq. in. is reached. The heating is then continued for a few minutes, the pressure being gradually diminished, and the peat-block thus allowed to shrink away from the sides of the mould. The block is then removed, and may still be air-dried if desired.

The moulds are placed in a travelling carrier, and at each movement of the carrier the pressure on them is increased by 10 lb. per sq. in. The pressure is applied by means of levers actuated by stationary cams, which act on the moulds. A carrier contains 64 moulds, each holding 64 peat-blocks.—L. F. G.

Gas Producers. W. H. Beanes and Werner, Pfleiderer and Perkins, Ltd., London. Eng. Pat. 24,878, Nov. 12, 1902.

A water-bottom producer having a metallic ring arranged at the bottom of the fuel chamber, is provided with a central extension that dips into the water, and a central conical fuel support extending upwards through the ring and downwards into the seal. This apparatus heats the air before it comes into contact with the fuel. At the upper end of the producer is a regenerative chamber of chequer-work, the heat of which may be used to warm air, to raise steam, or for any other purpose. Above the hearth the producer has a lateral inspection door closed by a plate. A rocking shaft enables the fuel support and its appurtenances to be agitated so that clinker and ash may be removed without breaking the water-seal.—F. H. L.

Producer-Gas Plant. J. Robson, Sunderland. Eng. Pat. 25,560, Nov. 21, 1902.

The plant includes a gas producer, condenser, hydraulic box, and sawdust scrubber. The producer consists of a combustion chamber, surrounded by two annular spaces, through the inner of which the air passes, and from the outer the producer gas is withdrawn. The air is supplied by means of a fan, to a central annular space, round the coal-hopper, where it is partially heated, and from which it passes through pipes at the top of the combustion chamber into the annular space surrounding the combustion chamber, taking up water vapour from dishes into which water drips through thistle funnels, placed in the pipes. This air and steam is introduced beneath the fire-bars of the grate. Some pipes are arranged in the annular air-heating space, in which ammonia or other volatile fluid is vaporised to drive a motor for working the fan. The gas passes into the lowest trough of the hydraulic box, then into the trough above, and so on, and through a sponge filter to the sawdust scrubber and a bell gas-holder, the bell being constructed to control the action of the motor for driving the fan. The vapour from the engine passes into a condenser contained in a water tank, the water-feeding apparatus of which supplies the hydraulic box, and also the dishes arranged in the air-supply pipes of the generator. The hydraulic box consists of a number of troughs one above another, the water of each upper trough overflowing into the one below. The air-supply being controlled by the fluctuations of the bell gas-holder, it is stated that gas is produced only as required.—W. C. H.

Gas; Purification of Iron-making Blast-Furnace ——, or any Combustible Gas of Analogous Character. B. H. Thwaite, London. Eng. Pat. 24,152, Nov. 4, 1902.

An amplification of Eng. Pats. 8670, 1894; 15,684 and 23,597, 1896; 4225 and 15,595, 1901; and 14,771, 1902 (this Journal, 1895, 663; 1896, 724; 1897, 806; and 1902, 1029).—F. H. L.

French Patents.

Coal Products ["Burrow"]: Process of Utilising Waste ——, for Industrial Purposes. D. Janko, J. Kiss, and K. Stirling. Fr. Pat. 332,401, May 26, 1903.

See Eng. Pat. 12,776 of 1903; this Journal, 1903, 1040. —T. F. B.

Fuel Compound; Manufacture of an Emulsified ——. The Fuel and Gas Manufacturing Co. Fr. Pat. 332,402, May 26, 1903.

See U.S. Pat. 728,855 of 1903; this Journal, 1903, 735. —T. F. B.

Briquettes; Manufacture of Coal ——, without Resin or Bituminous Products. A. Denisty and E. Gilson. Fr. Pat. 332,501, May 11, 1903.

Coal dust is mixed with molasses, and some hardening material, such as cement, hydraulic lime, or plaster, and the briquettes dried at a temperature of 400° to 500° C. —L. F. G.

Substances mixed with Liquids [Carbonisation of Peat, &c.]; Heating Apparatus for —— M. Ekenberg. Fr. Pat. 332,600, May 12, 1903.

The process is adapted for converting into coke the organic substances present in peat, wood waste, powdered bones, &c., or for producing coke from coal. It is of special use for the carbonisation of peat (see also this Journal, 1903, 1122). The mixture of solids and liquid, or solids to which the requisite amount of water has been added, is introduced into long tubes, which are heated in a furnace. The mixture is moved along these tubes by suitable means, such as an endless screw or a pump. The tubes may be enlarged in cross-section at the part where they are exposed to a high temperature, in order to retard the movement of the material in this part, and thus ensure longer heating. —L. F. G.

Gas Retort and Producer. Deutsche Heizungs-Industrie Meininghaus Bachrodt and Co. Fr. Pat. 332,522 May 18, 1903.

This combined apparatus for simultaneously making illuminating gas from coal and fuel gas from coke, consists of a vertical furnace with firebars at the base and a charging orifice on top, centrally through which extends a metal retort having also a charging aperture at its top and a discharging orifice beneath. Coke is fed into the furnace proper, where it is imperfectly consumed, so as to yield a power gas, which passes off through a suitable conduit, while the heat generated during the process raises the central retort to a temperature sufficient for the carbonisation of the coal put therein. When the coal has been coked, it is drawn off from the bottom of the retort, and immediately introduced into the surrounding furnace. —F. H. L.

Calcium Carbide; Manufacture of ——. A. Badoil and J. Seron. Fr. Pat. 332,416, June 2, 1903.

Lime or chalk is mixed with powdered carbon, and the whole is made up into briquettes with the aid of tar or pitch. These are heated in a combustion furnace to a temperature of 1,000° C., and then thrown without loss of heat into the electric furnace to effect the necessary reaction. The claim is essentially for an economy in electrical energy.—F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

United States Patent.

Lampblack; Process of Making —— [from Tar]. R. A. Sembdner, Porz, Germany. U.S. Pat. 741,726, Oct. 20, 1903.

Tar is introduced into one end of a cylindrical, rotating furnace, heated to between 300 and 400° C. The interior wall of the furnace is provided with a spiral ridge, so that the tar is gradually led along to the further end of the furnace, where it is removed. An outlet for the volatilised products is also provided.—T. F. B.

French Patents.

Distilling Mineral Oils and Similar Substances; Process and Apparatus for ——. A. J. Kornfeld. Fr. Pat. 328 051, Aug. 6, 1902.

The apparatus is so designed that the oil, &c., is at once heated to a high temperature, and the vapour is kept under pressure until it reaches the condensers.

The oil is pumped into the lower ends of a series of vertical, or slightly inclined tubes, heated in any suitable manner. The products of distillation pass up these tubes into a horizontal tube, and thence into the condensers, by way of an orifice, the size of which can be regulated to keep the vapours at any desired pressure. The condensers are of worm form, placed horizontally, each loop being supplied at its lowest point with an exit pipe, thus allowing a large number of fractions to be taken.—T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

p-Halogen-o-nitrobenzaldehydes. F. Sachs and R. Kempf. Ber., 1903, **36**, [13], 3299—3303.

p-Chloro-*o*-nitrobenzaldehyde is obtained from *o*-nitro-*p*-aminobenzaldoxime by treatment with aqueous ferric chloride solution. The yield is 60 per cent. of that required by theory. The corresponding *p*-bromo- and *p*-iodo-*o*-nitrobenzaldehydes are obtained in an analogous manner, the yield in the latter case being small. *o*-Nitro-*p*-aminobenzaldoxime is obtained by reduction of *o*-*p*-dinitrobenzaldoxime with ammonium sulphide. *p*-Chloro- and *p*-bromo-*o*-nitrobenzaldehyde were also prepared from the minonitrobenzaldoxime by diazotising and employing Sandmeyer's reaction. The *p*-halogen-*o*-nitrobenzaldehydes losely resemble the mother-substance in properties. They readily form halogenised indigos with acetone and alkali, nd are transformed by the action of light into the orresponding *o*-nitrosobenzoic acids.—E. F.

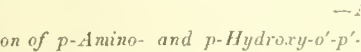
n-Azoxybenzaldehyde and its Analogues A. Human and H. Weil Ber., 1903, **36**, [13], 3469—3475.

By reduction of *m*-nitrobenzaldehyde with ferrous sulphate nd caustic soda, a 70 per cent. yield of *m*-azoxybenzaldehyde is obtained. This compound reacts in the normal vay with substituted ammonias, such as phenylhydrazine, ydroxylamine, aniline, hydrazine, &c. Both aldehyde groups always take part in the reaction. By oxidation with ermanganate in sodium carbonate solution, *m*-azoxybenzoic cid, $N_2O(C_6H_4.COOH)_2$, is produced. On heating with trong sulphuric acid, a wandering of the azoxy oxygen tom takes place, and *m*-benzaldehyde-azobenzoic acid—

$$HOOC.C_6H_4.N:N.C_6H_4.CHO,$$

formed. This reaction does not take place if the aldehyde groups are combined with ammonia residues, &c.

On heating *m*-azoxybenzaldehyde with dimethyl- or iethylaniline and sulphuric acid, leuco compounds are btained which on oxidation give dyestuffs of the character f the malachite greens, but not showing notable dyeing roperties. Dimethylaniline gives *m*-Azoxyleucomalachite reen—



$$O\left\langle\begin{array}{l}N.C_6H_4.CH.[C_6H_4N(CH_3)_2]_2\\ |\\ N.C_6H_4.CH[C_6H_4N(CH_3)_2]_2\end{array}\right.$$

On oxidation with lead peroxide this gives a dyestuff of rather yellower shade than Malachite Green.

p-Azoxybenzaldehyde and *p*-benzaldehyde-azobenzoic cid can be prepared in a similar manner to the meta compounds. The salts of *p*-benzaldehyde-azobenzoic acid react ith substituted ammonias; the compound with phenylydrazine sulphonic acid—

$$HOOC.C_6H_4.N:N.C_6H_4.CH:N.NH.C_6H_4.SO_3H,$$

yes wool in an acid bath, just like a true azo dyestuff, a ne orange-brown colour. The corresponding hydrazine ompound shows the properties of a substantive dyestuff. —A. B. S.

hlorination of p-Amino- and p-Hydroxy-o′-p′-dinitrodiphenylamine by Means of Sodium Chlorate and Hydrochloric Acid. F Reverdin and P. Crépieux. Ber., 1903, **36**, [13], 3262—3271.

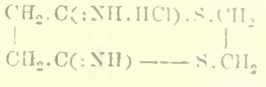
ARIOUS derivatives of *o-p*-dinitrodiphenylamine were eated in acetic acid solution with sodium chlorate and ydrochloric acid. *p*-Amino-*o′*-*p′*-dinitrodiphenylamine elds, according to the conditions, either *m*-*m*-dichloro-*p*-ydroxy-*o′*-*p′*-dinitrodiphenylamine, the corresponding chloroquinonedinitrophenylimide, or a trichloro-*p*-inone-*o′*-*p′*-dinitrophenylimide. *p*-Hydroxy-*o′*-*p′*-nitrodiphenylamine yields identical products. *p*-Acetoxy-*p′*-dinitrodiphenylamines yield, under similar conditions, acetoxy-*o*-chloro-*o′*-*p′*-dinitrodiphenylamine, which is sily saponified to the corresponding hydroxy derivative. n further oxidation with hydrochloric acid and sodium lorate, this yields a trichloroquinonedinitrophenylimide. Alkoxy-*o′*-*p′*-dinitrodiphenylamines yield *p*-quinone-*o′*-*p′*-nitrodiphenylimide, whereas the corresponding *o*-alkoxy-rivatives yield *o*-alkoxydichloro-*o′*-*p′*-dinitrodiphenylnines. α-Naphthyldichloro-*o′*-*p′*-dinitrodiphenylamine elds, on similar treatment, a dichloro-derivative. The rresponding β-naphthyl compound yields a monochloro rivative, together with a more highly chlorinated product. romine derivatives of *p*-hydroxy-*o′*-*p′*-dinitrodiphenylnine are also described.—E. F.

ercaptans and Nitriles; The Reaction between ——. W. Autenrieth and A. Bruning. Ber., 1903, **36**, [13], 3464—3469.

NNER and Klein (Ber., **11**, 1825) found that on leading y hydrochloric acid gas into a cooled mixture of benzotrile and amylmercaptan, the hydrochloride of benzimidothioamyl ether is produced. The authors have studied the reactions between thiophenol, ethylene sulphydrate and xylylene sulphydrate on the one hand, and various mono- and dinitriles on the other, and they conclude that the reaction expressed by the equation—

$$R.CN + R.SH + HCl = R.C(:NH)(.SR), HCl$$

holds good in general. By the action of ethylene cyanide on ethylene sulphydrate they obtained a dark green powder of the formula—



$$\begin{array}{l}CH_2.C(:NH.HCl).S.CH_2\\ |\qquad\qquad\qquad\qquad\quad |\\ CH_2.C(:NH)\text{———}S.CH_2\end{array}$$

The salt dissolves in cold water, but the solution decomposes, especially on warming. The aqueous solution dyes wool and silk a bright green in the cold, which is fast to light, but is turned yellow by alkalis owing to the liberation of the free base. The green colour returns on immersing in acid.

The salt is fairly stable in the dry state.—A. B. S.

Polythiosulphonic Acids of p-Diamines. A. G Green and A. G. Perkin. J. Chem. Soc. (Trans.), 1903, 1201—1212.

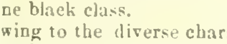
THIS work is the continuation and completion of a series of researches conducted by one of the authors in conjunction with the Clayton Aniline Co., Ltd. (See Eng. Pats. 21,832, 22,460, 22,847 of 1898; 5039 and 18,658 of 1891; and 4792 of 1900.) Starting from Vidal's opinion that the black sulphide dyestuffs are polythiazines, they attempted to synthesise these colours from polythiosulphonic acids. By the oxidation of a mixture of the, at the time unknown dithiosulphonic acid of *p*-phenylenediamine and a monamine, a number of black and brown dyestuffs were obtained, having the general properties of sulphide colours, but chemically distinct from any known member of this class, and having less affinity for cotton. Probably these are not polythiazines, but sulphydro- (SH) or thio sulpho- ($S.SO_3H$) derivatives of insoluble bodies of the aniline black class.

Owing to the diverse character of the bodies which, by the action of polysulphides, give sulphide dyestuffs, it is probable that their peculiar dyeing properties depend, not on their nucleal structure, but on the presence of SH groups. This group renders soluble the insoluble parent substance, and cotton is dyed by atmospheric oxidation of the soluble —SNa compound to the insoluble —S—S— compound.

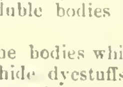
All these dyestuff matters are amorphous powders which cannot be purified, but the intermediate products, the polythiosulphonic acids of *p*-phenylenediamine, crystallise well. The polythiosulphonic acids were prepared by Bernthsen's method, only with a larger proportion of thiosulphate and oxidising agent.

The dithiosulphonic acid (I.) was prepared by acidifying a cooled solution of *p*-phenylenediamine, sodium thiosulphate (2 mols.), and sodium chromate. The potassium salt forms yellow needles; the free acid, nearly colourless prisms, very soluble in water. Owing to the presence of $S.SO_3H$ groups in the ortho positions to the amino groups, this acid shows several characteristic condensations. Nitrous acid gives a stable bisdiazosulphide (II.), which forms colourless prisms melting at 224°—226° with decomposition—

(I.)



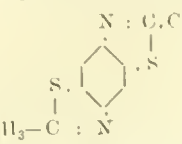
(II.)



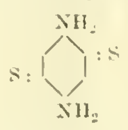
With organic acid anhydrides, or with aldehydes, anhydro derivatives are formed. Thus, acetic anhydride gives diethenyl-2:5-disulphydro-*p*-diaminobenzene (III.), and benzaldehyde gives a similar benzenyl compound. The former forms colourless needles, m. pt. 98°—100° C.; the latter, pale yellow needles, m. pt. 232°—234° C. By the action of hydrochloric acid on the potassium dithiosulphonate the hydrochloride of 2:5-disulphido-*p*-phenylenediamine

(IV.) is formed by the splitting off of sulphuric and sulphurous acids. The free base forms minute garnet-red prisms, m. pt. 234°—235° C., soluble in sodium sulphide.

(III.)



(IV.)

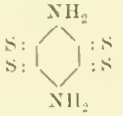


On reduction with zinc dust the dithiosulphonic acid gives 2:5-disulphydro-*p*-phenylenediamine—

$$C_6H_2(NH_2)_2(SH)_2.$$

From these condensations it is evident that each $S.SO_3H$ group in the acid occupies an ortho position to a different amino group, and the $S.SO_3H$ groups are probably in the para position to each other.

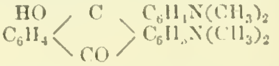
The tetrathiosulphonic acid is prepared in a similar manner to the di-acid, except that double the quantity of sodium thiosulphate and of chromate are employed. It forms a tetrazo compound and a tetrasulphide—



The latter is insoluble in the usual solvents, but dissolves in aqueous sodium sulphide solution.

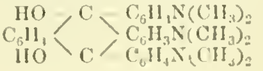
Tetramethyldiaminodiphenylhydroxyanthranol with Benzene, Toluene, and Dimethylaniline; Condensation Products of ——. A. Haller and A. Guyot. Comptes rend., 1903, **137**, [16], 606—610.

Benzene, toluene, and dimethylaniline react with tetramethyldiaminodiphenylhydroxyanthranol—

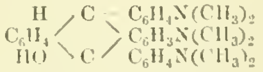


not, as might be expected, with elimination of a molecule of water, but with formation of addition products, which, in the form of the free base, are colourless compounds, but form highly coloured salts, and react with 1 mol. of phenylhydrazine or hydroxylamine with elimination of 2 mols. of water.

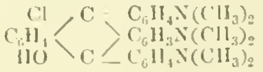
The properties of these compounds point to their being derivatives of γ-dihydrodiphenyl anthracene, *e.g.*, that from dimethylaniline (Phthalic Green base) would be—



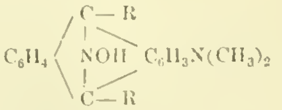
the leuco base being—

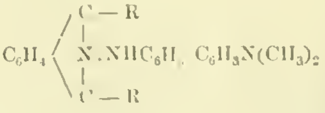


and Phthalic Green (the hydrochloride)—



Similarly the compounds with hydroxylamine and phenylhydrazine may be regarded as—





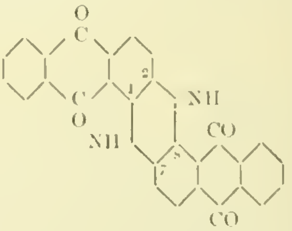
R representing C_6H_5, $CH_3.C_6H_4$, or $(CH_3)_2N.C_6H_4$.
—T. F. B.

Azo Dyestuffs derived from α-Aminoanthraquinone; Fast ——. C. Lauth. Comptes rend., 1903, **137**, [17], 661—664.

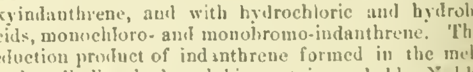
Diazotised α-aminoanthraquinone, when coupled with phenols and their sulphonic acids, gives, usually, very fast dyestuffs. Diazotisation is preferably carried out in dilute sulphuric acid solution, the solution being allowed to stand with sodium nitrite for about 20 hours, and the reaction being judged complete when a sample of the liquid gives no red coloration with sodium carbonate. This diazo solution is added to the phenol, &c., dissolved in sodium carbonate solution, and the dyestuff is finally salted out. *Red* dyestuffs were obtained by coupling with 2.4, 2.6, 2.7, and 2.8-naphtholmonosulphonic acids, and 2.3.7 and 2.3.8-naphtholdisulphonic acids. An *Amaranth* was obtained from α-sulphonaphthol (Piria's salt) and chromotrope acid (1.8-dihydroxynaphthalene-3.6-disulphonic acid). *Brown* dyestuffs resulted from using α-naphthol, resorcinol, *m*-aminophenol, *o*- and *m*-cresotinic acids, 2.6-naphthylamine monosulphonic acid, toluylene diamine, β-naphthylamine, diphenylamine, and salicylic acid; and *violet* dyestuffs from α-naphthylamine and H-acid (8-amino-α-naphthol-3.6-disulphonic acid). All these dyestuffs dye wool from baths containing sodium sulphate and sulphuric acid. The shades obtained from the dyestuffs derived from naphthol sulphonic acids and aminonaphthol sulphonic acids are very fast to fulling and light; the others are more or less fugitive. Aminoanthraquinone sulphonic acids, when diazotised and coupled, give similar dyestuffs, which are more easily soluble than those from aminoanthraquinone. The shades obtained may be modified by means of solutions of metallic salts, *e.g.*, treatment with copper salts, and potassium bichromate gives shades ranging from violet to brown.—T. F. B.

Indanthrene and Flavanthrene. R. Scholl and H. Berblinger. Ber., 1903, **36**, [13], 3410—3445.

The analysis and molecular weight determination of Indanthrene (see Fr. Pat. 309,503 of 1901, also Supplement; this Journal, 1902, 42, 911) correspond to the formula $C_{28}H_{14}O_4N_2$, and the author's further investigations lead him to consider Indanthrene to be N-dihydro-1.2.8.7-anthraquinone-azine.



It is exceptionally stable, and a very weak base. It can be oxidised to the corresponding azine containing two hydrogen atoms less (anthraquinone-azine), which is a greenish-yellow base, considerably more basic than Indanthrene. It abstracts hydrogen from other substances with extraordinary avidity, to re-form Indanthrene, being reduced to the latter even by nitrobenzene. Anthraquinoneazine combines with ammonia and with aniline to form amino- and anilino-indanthrene. With caustic alkalis it forms oxyindanthrene, and with hydrochloric and hydrobromic acids, monochloro- and monobromo-indanthrene. The blue reduction product of indanthrene formed in the melt and in the alkaline hydrosulphite vat is probably N-dihydro-1.2.2′.1′-anthraquinoneanthrahydroquinoneazine—



With zinc-dust and alkaline hydrosulphite solutions a brown solution is obtained which probably contains the corresponding dihydro-anthrahydroquinone. Both these substances are readily reoxidised to Indanthrene by the action of the air. With phosphorus and hydriodic acid, three further, more highly reduced, derivatives of Indanthrene are formed; these are, anthraquinoneazine, $C_{28}H_{16}O_2N_2$, the N-dihydro derivative of this compound, $C_{28}H_{18}O_2N_2$, and, finally, 1.2.2′.1′-anthrazine, $C_{28}H_{16}N_2$, which is an azine of anthracene, and is also formed by distilling Indanthrene with zinc dust. The fact that Indanthrene has a far deeper colour than the corresponding azine, of which it is a reduction product, is accounted for by the formation of two strongly auxochromic imino groups from very weakly basic nitrogen atoms. Many analogous cases amongst other classes of compounds are cited in support of this view. The great stability of the hydrogen of the imino groups in Indanthrene is accounted for by the influence of the four negative carbonyl groups.

R. Bohn has found that if β-aminoanthraquinone is heated with potassium hydroxide to 330°—350° C., a yellow dyestuff, Flavanthrene, is formed instead of Indanthrene. M. Kunz has found that if β-aminoanthraquinone is treated with acid oxidising agents, both Indanthrene and Flavanthrene are formed. Monochloro-indanthrene, obtained by the action of hydrochloric acid on anthraquinone-azine, is somewhat more soluble, and lighter and more brilliant in colour, than Indanthrene. In distinction to the latter, it is not attacked by cold hypochlorite solution. Halogen derivatives of Indanthrene are also obtained by direct chlorination and bromination. Indanthrene C, which is obtained in this way, is a mixture of dibromo- and tribromo-indanthrene. Amino indanthrene gives, with alkaline hydrosulphite solution, a dark blue solution indistinguishable from that produced by Indanthrene, but the dyeings produced by the same are greenish blue, and become green with bleaching-powder more rapidly than Indanthrene dyeings. Anilido-indanthrene is reduced more slowly by alkaline hydrosulphite solutions. The dyeings produced by it on cotton are also greenish-blue, and less stable to bleaching-powder than Indanthrene dyeings.

—E. F.

United States Patents.

Colouring Matter [*Anthraquinone Dyestuff*]; *Blue* ——. R. Bohn, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 739,579, Sept. 22, 1903.

See Fr. Pat. 319,018 of 1902; this Journal, 1902, 1451.

—T. F. B.

Disazo Colouring Matter [*Azo Dyestuff*]. E. Schleicher and A. Dorrer, Assignors to the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 741,936, Oct. 20, 1903.

The dyestuff obtained by coupling two molecules of diazotised naphthionic acid with 1.5-dihydroxynaphthalene dyes wool, from acid baths, violet shades, which are converted, on subsequent treatment with potassium bichromate and acetic acid, into violet-black shades.—T. F. B.

Azo Dyes [*Dyestuffs*]; *Process of Making* ——. F. Scholl, Assignor to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine. U.S. Pat. 741,552, Oct. 13, 1903.

Diazotised orthoaminophenol is coupled with 1.8-aziminonaphthalene-4-sulphonic acid in alkaline solution.

—T. F. B.

Sulphur [*Sulphide*] *Dyestuff; Blue* ——, *and Process of Making same.* R Herz, Assignor to L. Cassella and Co., Frankfort-on-the-Maine. U.S. Pat. 742,189, Oct. 27, 1903.

See Addition to Fr. Pat. 317,219 of 1901; this Journal, 1903, 792.—T. F. B.

French Patents.

Oxidising Organic Substances; Process of ——. Cie. Parisienne Coul. d'Aniline. Fr. Pat. 328,069, Aug. 25, 1902.

See Eng. Pat. 19,178 of 1902; this Journal, 1903, 945.

—T. F. B.

Basic Dyestuffs [*Acridine Dyestuffs*] *from Formylated Compounds; Preparation of* ——. J. R. Geigy and Co., Switzerland. First Addition, dated May 11, 1903, to Fr. Pat. 330,487 of March 21, 1903; this Journal, 1082, 1903.

Formylated derivatives of aromatic bases, such as aniline, the naphthylamines, aminophenol-ethers, *p*-diamines, and bases of the benzidine series, are melted at high temperatures with *m*-diamines in presence of ammonium salts or salts of organic bases. Basic dyestuffs are so obtained, dyeing tannin-mordanted cotton and leather in golden-yellow to orange-yellow and yellowish-brown shades distinguished by fastness to light. The *m*-diamines may be replaced by their alkylated derivatives.—E. F.

Substantive Dyestuffs [*Sulphide Dyestuffs*]; *New Black* ——. Soc. Anon. des Mats. Colorantes et Prods. Chim. de St. Denis. Fourth Addition, dated May 19, 1903, to Fr. Pat. 292,400, Sept. 8, 1899.

According to the second supplement to this patent, dyestuffs are obtained by heating, finally to 200° C., the products obtained by the action of sulphur chloride on phenol or cresol with substituted diphenylamines. According to the third supplement, fast cotton dyestuffs are also obtained if the heating is only carried to 160° C., the diphenylamine derivatives suitable for this invention being derived from *p*-phenylenediamine and phenol or *o*-cresol (see this Journal, 1902, 40). It is now found that all the diphenylamines mentioned in the above-mentioned second supplement are without exception equally capable of yielding blue sulphide dyestuffs, dyeing unmordanted cotton, by subjecting them to the process described in the third supplement.—E. F.

Dyestuffs of the Anthracene Series [*Anthracene Dyestuffs*] *and Intermediate Products for such Production; Production of New* ——. Soc Anon. des Prods. F. Bayer et Cie. Fr. Pat. 332,321, May 23, 1903.

1.5- and 1.8-dinitroanthraquinones are converted into 1.5- and 1.8-nitroalphylaminoanthraquinones by heating with mono- or dialkylated aromatic amines. These latter are converted by treatment with bromine or with agents which liberate bromine into 1-alphylamino-2.4-dibromo-5-nitro-anthraquinone and 1-alphylamino-2.4-dibromo-8-nitro-anthraquinone respectively. On condensation with primary aromatic amines, these dibromo-compounds yield 1-amino-2-bromo-4.5-dialphylaminoanthraquinone or 1-amino-2-bromo-4.8-dialphylaminoanthraquinone respectively. These are converted by sulphonating agents into dyestuffs which dye unmordanted or mordanted wool in blue, bluish-green, or greenish-blue shades.—E. F.

Sulphide Dyestuff, Blue, derived from p-hydroxy p′-amino-m′-methyldiphenylamine; Production of ——. Sandoz et Cie., Switzerland. Fr. Pat. 332,560, May 28, 1903.

p-Hydroxy-*p′*-amino-*m′*-methyldiphenylamine is heated with sulphur, with or without addition of chromium hydroxide, to 170°—210° C. The product dyes unmordanted cotton in indigo-blue shades. In presence of chromium hydroxide, a product is obtained which dyes in brighter and slightly redder shades than that obtained in absence of this substance.—E. F.

Disazo Dyestuffs [*Azo Dyestuffs*] *Directly Dyeing Wool; Production of Primary Black* ——. Oesinger et Cie. First Addition, dated Oct. 10, 1902, to Fr. Pat. 327,938 of June 12, 1902 (this Journal, 1903, 1041).

One molecule of aminonaphtholsulphonic acid H is combined in an acid medium with a diazo compound derived from a simple mono- or polychlorinated aromatic amine (chlorinated derivatives of aniline, of its homologues, or of the naphthylamines). The resulting mono-azo compound is combined in an acid medium with a second molecule of a simple mono- or polychlorinated amine, or of a non-chlorinated amine (aniline, its homologues, or the naphthylamines), and the resulting compound treated with sodium carbonate. The dyestuffs obtained in this way dye wool from an acid bath in black shades, fast to alkalis and to light, which are bluer than those obtained from dyestuffs prepared according to the original patent.—E. F.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Mercerised Cotton; Test for ——. H. Lange. Färber-Zeit., 1903, **14**, [20], 365—369.

Mercerised and unmercerised cotton may be distinguished from each other by immersing them, after removing from them any substances, *e.g.*, finishing materials, which might interfere with the test, for about three minutes in a solution prepared by dissolving 5 parts of potassium iodide in 12—24 parts of water, adding 1—2 parts of iodine, and then 30 parts of zinc chloride dissolved in 12 parts of water. The cotton is then washed. Unmercerised cotton very quickly loses its colour, while mercerised cotton remains blue for some time. The test may be employed for cotton dyed pale or medium shades; cotton dyed dark shades of colour should first be bleached.—E. B.

Reserves under Aniline Steam Colours or Alizarin Colours; Aniline Colour ——. E. Bettig. Rev. Gen. Mat. Col., 1903, **7**, [83], 325.

The cotton cloth is prepared with Turkey-red oil, 1 : 20, dried, padded in a 2 per cent. solution of tannin, and passed through the hot flue. The goods are then printed with a reserve which contains tartar emetic and a basic aniline dyestuff; *e.g.*, a Safranine Red reserve would be made up as follows:—600 grms. of Safranine are dissolved in a hot mixture of 11 litres of thick starch solution and 5 litres of acetic acid, and, whilst the liquid is still hot, 1,400 grms. of tartar emetic are added. After printing with this reserve, the goods are reprinted with a two-colour design containing, for example, a dark and light shade of Methylene Blue. A Methylene Blue reserve would have the following composition:—18 litres of thick starch solution, 0·5 litre of acetic acid, 70 grms. of Methylene Blue, and 900 grms. of tartar emetic. A green reserve can be made by mixing Methylene Blue and Auramine to form a resist for alizarin colours; citric acid or a citrate is added so as to resist both the mordant and the tannin, as follows:—10 litres of sodium citrate solution of 32° B., thickened with starch, 1 kilo. of tartar emetic, and 10 litres of thick starch solution. The Alizarin Red which is to be resisted should contain less nitrochloride of tin and less of the tin salt of the sulphonated oil than usual. After steaming, the goods are passed through tartar emetic solution, washed, and soaped.—R. S.

English Patents.

Dyeing Yarns or Threads; Impts. in ——. J. W. Shackleton and I. Barraclough, Keighley. Eng. Pat. 26,725, Dec. 4, 1902.

In order to prevent certain parts of a hank of yarn from being dyed, the hank is passed through a tube, and a plug or wedge is pushed into the latter, so as to press the yarn closely against the tube and prevent the enclosed portion of yarn from being dyed, when the whole hank is immersed in the dye-bath.—A. B. S.

Fibres, Yarns, Fabrics, or other Materials; Apparatus for Treating ——, *with Heated Liquids.* J. Gebauer, Berlin. Eng. Pat. 28,100, Dec. 19, 1902.

It is claimed that by this apparatus the treatment of the material is rendered uniform and regular. The apparatus consists of a vessel fitted with a central vertical perforated pipe and an inner perforated wall a short distance from the outer one. The central pipe is connected with a pump, which sucks liquid through the perforations and forces it, by a pipe enclosed in the central one, to the top of the apparatus, where the liquid is sprayed over the material packed between the central pipe and the perforated inner wall of the vessel. The liquid fills the space between the two walls, and is sucked through the material in a radial direction by the pump. The apparatus is continuous in action. To avoid loss of heat, the heating arrangement is also placed in the central channel.—A. B. S.

United States Patent.

Waterproof Fabric. A. Müller-Jacobs, Assignor to himself, C. Müller-Jacobs, J. G de Styak, and H. B. Roberts, all of N.Y. U.S. Pat. 742,212, Oct. 27, 1903.

The fabric is impregnated with a solution of an alkali bicarbonate and a soluble soap, as sodium stearate, and then passed through an acid solution of a metallic salt, for instance, an acetic acid solution of aluminium chloride, the metal combining with the fatty acid to form an insoluble soap. The insoluble aluminium soap mixed with aluminium hydroxide, and occluding carbon dioxide, is thus claimed to be "chemically precipitated upon the constituent fibres in a finely-divided, discrete, and distributed state."
—B. N.

French Patents.

Scouring and Bleaching Wool; Process of ——. J. A. Regraffe and P. F. Poujol. First Addition, dated April 18, 1903, to Fr. Pat. 329,928, March 3, 1903. (See this Journal, 1903, 1043.)

Ammonium phosphate or ammonium sulphate is added to the sodium carbonate solution for scouring purposes; this solution may be superseded by one of sodium phosphate.
—T. F. B.

Reserves on Tissues Dyed with Sulphide Dyestuffs; Process for Producing ——. Manuf. Lyon de Mat. Col. First Addition, dated May 4, 1903, to Fr. Pat. 311,644, June 10, 1901.

The process of making reserves on tissues, described in the principal patent (this Journal, 1902, 51), is applied also to spun fibres, such as warp, yarn, &c.—T. F. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Carbon Monoxide; Velocity of Decomposition of ——. A. Smits and L. K. Wolff. Zeits. physik. Chem., **45**, 199—215. Chem. Centr., 1903, **2**, [18], 987.

The authors have investigated the reaction expressed by the equation $2CO = CO_2 + C$. They find that in presence of finely-divided nickel, the reaction is a monomolecular one at 256°, 310°, 340°, and 445° C. (compare Schenck and Zimmermann, this Journal, 1903, 630). They find further that, contrary to Boudouard's statement, the reaction is already notably reversible at 445° C.—A. S.

Ozone; Contribution to the Study of ——. L. Gräfenberg. Zeits. anorg. Chem., **36**, 355—378. Chem. Centr., 1903, **2**, [16], 863.

For the decomposition of water by fluorine, regarded as an ionic reaction, two equations can be given—(1) $O'' + 2F = 2F' + O$; (2) $OH' + F = F' + OH$. For the decomposition of water by chlorine, only the first equation can apply, as the potential of chlorine (1·36), though above that of oxygen ions (1·1), is below that of hydroxyl ions (1·67). In the case of fluorine, however, both equations come into account, as the potential of fluorine (1·96), is sufficiently above that of hydroxyl ions. Since, in the reaction with chlorine, only oxygen is formed, whilst in the case of fluorine, ozone also is produced, the formation of the latter must be due to the discharge of hydroxyl ions, and probably follows according to the equation $6OH' = O_3 + 3H_2O + 6\pm$.
—A. S.

Ammonia Solution; Vapour Pressure of Aqueous ——. *Part II.* E. P. Perman. Proc. Chem. Soc., 1903, **19**, [270], 204. (See also this Journal, 1902, 116.)

The partial pressures of the ammonia and water-vapour evolved by an aqueous ammonia solution have been found by aspirating a known volume of air through the solution and determining the amounts of ammonia and water withdrawn. The experiments were made at temperatures ranging from 0° to 60° C., and the concentration of the solutions employed varied from 0 to 22·5 per cent. of ammonia.

It was found that the sum of the partial pressures was equal to the total pressure determined by the statical method, and also that the relationship between the partial pressures and the concentration of the solution is that deduced by Duhem and others for binary mixtures of liquids.

Anodes, Unalterable; Behaviour of ——, specially in the Electrolysis of Hydrochloric Acid. R. Luther and F. J. Brislee. XI. A., page 1248.

Nitric Acid in Metallic Nitrates; Electrolytic Reduction of ——, to Ammonia. W. H. Easton. XXIII., page 1258.

Boric Acid on Iodides; Action of ——, and its Use for Separating Iodides from Bromides and Chlorides. H. Baubigny and P. Rivals. XXIII., page 1257.

Perchlorate; Electrolytic Formation of ——. W. Oechsli. XI. A., page 1248.

Persulphates; Oxidation of Organic Substances by ——, in Acid Solutions [Determination of Halogens]. M. Dittrich. XXIII., page 1257.

Carbon Dioxide in presence of Chlorine; Determination of ——. C. Offerhaus. XXIII., page 1257.

Argon in the Atmosphere; Determination of ——. H. Moissan. XXIII., page 1256.

English Patents.

Catalysis [Sulphuric Anhydride Manufacture]; Impts. in ——. V. Hölbling, Vienna, and H. Ditz, Brünn, Austria. Eng. Pat. 24,256, Nov. 5, 1902.

See Fr. Pat. 326,321 of 1902; this Journal, 1903, 796.
—T. F. B.

Alkaline Prussiates; Manufacture of ——. G. E. Davis, Knutsford. Eng. Pat. 26,566, Dec. 2, 1902.

Ammoniacal gas-water is added in slight excess to solution of a ferrous salt, and the precipitate ("sulphide mud") of ferrous sulphide and carbonate is filter pressed and mixed with sodium carbonate solution, 5 mols. of which are taken for every 4 mols. of the ferrous salt from which the "sulphide mud" was derived. The mixture, or "alkali cream," thus formed, is used to wash gaseous mixtures (such as crude coal gas) containing hydrocyanic acid or ammonium cyanide, until it ceases to absorb cyanogen compounds. The mixture then contains insoluble ammonium ferrous ferrocyanide and some ferrous sulphide in suspension in a solution of sodium ferrocyanide and carbonate. This product is passed through a heater and still, such as that described in Eng. Pat. 16,349 of 1888, whereby the mixture can now be filtered with replacement of the basic ammonium by sodium. The sodium ferrocyanide is obtained from the solution by usual processes. The filtered-off residue of sodium-ferrous ferrocyanide is agitated in the cold with rather less than sufficient caustic soda to remove the basic iron, whereby ferrous oxide and sodium ferrocyanide are formed, and are reserved for treatment in the cycle of operations.—E. S.

United States Patents.

Sulphuric Anhydride and Sulphuric Acid; Process of Making ——, by the Contact Process. M. Schroeder, Hamborn, Germany, Assignor to the New Jersey Zinc Co., New York. U.S. Pat. 742,502, Oct. 27, 1903.

Furnace gases containing sulphur dioxide and oxygen are purified from foreign matters that would otherwise deposit upon the catalytic material, then reheated by means of the hot furnace gases, and passed into contact with catalytic material for the production of sulphuric anhydride and sulphuric acid.—E. S.

Acetate of Soda; Process of Making ——. W. M. Grosvenor, Edgewater Heights, Assignor to General Chemical Co., New York. U.S. Pat. 741,243, Oct. 13, 1903.

Sodium sulphate is heated, in solution, with excess of calcium acetate, and the solution precipitated by sodium carbonate, filtered, and the filtrate evaporated; the crude sodium acetate is then fused and recrystallised.

The mother liquors, containing sodium acetate, are evaporated to dryness, and the residue fused and heated with sulphuric acid "to expel the mineral acids," the sodium sulphate being used for a further operation.
—T. F. B.

Bromine from Brine; Process of Extracting ——. H. H. Dow, Assignor to the Dow Chemical Co., Midland, Mich. U.S. Pat. 741,637, Oct. 20, 1903.

The process, which is continuously carried out in a series of connected vessels, consists, as to its main features, in dividing the brine into two portions, of which one portion is oxidised sufficiently to set free all its contained bromine, which, together with any excess of chlorine, is carried forward by an air current into the second portion, in which the chlorine is utilised in setting free bromine. The "oxidising" bromine-laden air current is then brought into contact with a solution of sodium carbonate, and then into contact with a natural brine (containing bromide) and a reducing agent. The claims include many details. Compare U.S. Pats. 733,466 and 733,467, July 14, 1903; this Journal, 1903, 908.—E. S.

French Patents.

Hydrocyanic Acid and Metallic Cyanides; Process of Manufacturing ——. H. C. Woltereck. Fr. Pat. 332,305, May 23, 1903.

See Eng. Pat. 19,804 of 1902; this Journal, 1903, 1129.
—T. F. B.

Soda or other Caustic Alkalis by the Electrolysis of Corresponding Sulphates or Bisulphates; Manufacture of ——. Soc. des. Prod. Chim. de Marseille l'Estaque. Fr. Pat. 332,510, May 18, 1903.

Basins, arranged in steps one above the other, have horizontal anodes covered with lime, or vertical anodes within sacks filled with lime, the latter fixing the liberated acid as calcium sulphate. A spiral sheet-iron cathode is placed in the upper part of each basin, each cathode being in contact with sulphate of soda solution kept circulating in its upper portion. The undecomposed sulphate of soda is separated from the caustic liquor by crystallisation. Porous partitions of cotton may also be used to form anode and cathode compartments, milk of lime saturated with sulphate of soda being circulated through the former, and caustic soda through the latter.—B. N.

Ammonia; Process of Producing ——, by Synthesis. H. C. Woltereck, England. Fr. Pat. 332,591, April 30, 1903.

A mixture of air and steam at between 300° and 400° C., is passed over iron in a state offering a large surface, similarly heated. Ammonia is thus formed, the iron oxidising. The iron oxide may be reduced intermittently to renew the process; or a small proportion of a reducing gas, such as hydrogen or carbon monoxide, or both, may be mixed with the air and steam used. Iron is preferably used, but other metals, bismuth for instance, may be taken instead. See also Eng. Pat. 2461 of 1902; this Journal, 1903, 695.—E. S.

Evaporation of Solutions, Saline or Saccharine; Recovery of Matters Mechanically Removed by the Steam during the ——. Soc. Xhignesse and A. Macherez. Fr. Pat. 332,663, May 30, 1903.

The particles of solutions mechanically carried off by the steam during violent ebullition owing to "priming" are recovered by drying and superheating the vapours by means of plates or tubes heated by suitable means. The salts, sugar, or other bodies are deposited on the heating apparatus and are recovered in the form of a powder. The process is also applicable in the manufacture of zinc, and for the recovery of the precious metals, *e.g.*, thallium.—J. F. B.

Air; Apparatus for Liquefying ——, and Separating it into its Constituents. H. Damars. Fr. Pat. 332,662, May 30, 1903.

See Eng. Pat. 11,125 of 1903; this Journal, 1903, 1015.
—T. F. B.

VIII.—GLASS, POTTERY, ENAMELS.

Metallic Oxides with Fused Boric Anhydride; Behaviour of ——. C. H. Burgess and A. Holt, jun. Proc. Chem. Soc., 1903, **19**, [270], 221.

The authors have investigated the action of fused boric anhydride on many metallic oxides, and find that only a limited number dissolve. Lithium, sodium, potassium, cæsium, and rubidium, as carbonates, readily dissolve in boric anhydride in all proportions up to saturation, giving clear glasses, and thallium behaves in the same way. With a very large amount of alkali, however, the glass becomes opaque.

Calcium, strontium, barium, zinc, cadmium, magnesium, manganese, lead, and bismuth oxides are insoluble in small quantities, but, on gradually increasing the amount, dissolve to clear glasses; with a further addition of oxide, the mass again becomes opaque except in the cases of lead and bismuth, which yield pale yellow, very fusible glasses.

The oxide of mercury appears to be soluble, and those of antimony and arsenic slightly so. The oxides of aluminium, beryllium, zirconium, tin, cerium, thorium, niobium, and silicon, are all quite insoluble. The oxides which colour the borax bead, namely, those of chromium, copper, molybdenum, uranium, iron, nickel, and cobalt, are all insoluble in the fused anhydride, the manganese oxides in this respect behaving exceptionally.

The last series of oxides can, however, be dissolved in boric anhydride containing lithium, potassium, cæsium, rubidium, and thallium, and the clear glasses obtained with large amounts of the coloured oxides were similar to the borax beads, although the colours were sometimes modified.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Calcium Sulphate; The first Anhydrous Modification of ——. P. Rohland. Zeits. anorg. Chem., **36**, 332—339. Chem. Centr., 1903, **2**, [16], 866. (See also this Journal, 1903, 906.)

Overburnt plaster of Paris is obtained by igniting gypsum at above 600° C.; it is worthless technically. Technical overburnt plaster of Paris is that modification obtained by heating to above 130° C.; it undergoes hydration, but is not suitable for casts. The velocities of hydration of both overburnt plaster of Paris and of the second anhydrous modification, flooring plaster of Paris (compare this Journal, 1903, 629), are influenced by the catalysers, sodium chloride and potassium bichromate, but in a different way. The effects of the addition of various catalysers indicate that the first anhydrous modification is a transition product between the hemihydrate and the second anhydrous modification. A means of distinguishing between the two modifications is afforded by their behaviour on hydration. The former is hydrated and becomes hard within 16 hours, whilst the latter only hardens a long time after hydration. Natural anhydrite will harden in presence of a positive catalyser (sodium sulphate).—A. S.

Sand, and Fireproof Stones made therefrom; Relations between the Composition of ——. O. Mühlhaeuser. Zeits. angew. Chem., 1903, **16**, [44], 1055—1060.

The author has previously shown (this Journal, 1903, 996) that fireproof stones made from pure classes of sand exhibited relations of density which only slightly differed. The stones possessed approximately equal porosity and density, but showed the greatest differences as to penetration by water. The present article deals with the effect of the composition of the diluting material on density, &c. The following results were arrived at:—With regard to the water-content of the bodies, the contraction on drying, baking, and complete burning (temperature of zinc ovens) is regulated by the composition of the sand added as diluting material. A high density of the sand mixture corresponds with a large amount of water in the blocks prepared from it, and the stones, on drying and burning, show a large contraction. The densest mixtures give, on burning, stones which do not differ very much from one another in respect of density, but a gradual increase of the density of the stone is observed as the density of the sand mixtures increases, whilst, on the other hand, the rise of the density of the sand causes a fall in the porosity. The water penetration of the stones is in direct relation to the size of the sand grains employed. The smaller the number of large grains of sand present in a cubic centimetre of the stone, the less is the penetration of the potsherd. The penetration decreases on this account with the rise of the density of the sand mixtures used in the bodies.

—W. C. H.

Stonework; Cracking of ——, *by Cementing the Connecting Iron Rods with Sulphur.* L. de Gaetani. Giorn. del Genio civile, Rome, 1902, 425; Proc. Inst. Civil Eng., 1903, **153**, [3], 57.

In two groups of statuary, of sound, close, white limestone, surmounting the entrances to the Bank of Italy, in Rome, a number of cracks were observed a few years after erection. The component pieces of the statues had been put together by means of tinned-iron rods, secured by cotters, and with the surrounding spaces filled with molten sulphur. The cracks were caused by the expansion produced by the formation of sulphide of iron. The tin-plating of the rods was found to have completely disappeared, and the latter were covered with a thin coating of ferrous sulphide, whilst in some places the iron was coated with rust.—A. S.

Portland Cement; Hydration of ——. P. Rohland. Zeits. angew. Chem., 1903, **16**, [44], 1049—1055.

In hydration-reactions, which accompany the hardening processes, the action of catalytic substances may change, *e.g.*, from an accelerating to a retarding effect, when the concentration of the solutions reaches a certain limit depending upon the hydrating bodies and the acting catalytic agent. Also catalytic bodies, which in dilute solutions are inert, may, in stronger solutions, have a positive or negative effect. In the case of Portland cement, aluminium chloride exerts first an accelerating and afterwards a retarding action upon the rate of hydration, the change in effect occurring with a solution containing about 7 per cent. of the salt. E. Candlot observed that dilute solutions of calcium chloride retarded the velocity of reaction in combining with water; but the author finds that solutions over about 10 per cent. have an accelerating influence. Solutions of sodium carbonate up to about 4 per cent. have an accelerating influence, but stronger solutions again retard. The acceleration of setting produced by a quantity of sodium carbonate in solution, was found to be less than that produced by an equal quantity when added in the solid state, the acceleration produced being due presumably to the portion which passed into solution, the remainder being inactive. The cause of the acceleration of the rate of hydration, being the formation of complex ions, the result must be preceded by the most complete solution possible of the catalytic agent. The time of hydration of one cement tested, was 220 minutes, which was reduced by the addition of dilute sodium carbonate solutions, but increased again with stronger solutions, but did not reach its original value, since solutions over about 10 per cent. again brought about an acceleration of the process of hydration. The points at which these changes of catalytic effect occur are, first, when an addition of 1·5 per cent. of sodium carbonate has been made to the cement; and, secondly, an addition of 4·5 per cent. Caustic soda solutions of about 4 and 9 per cent. respectively, produced an equal effect, and the explanation suggested of the anomalous action of the sodium carbonate solutions, is, that hydrolytic dissociation occurs thus:—$Na_2CO_3 + 2H_2O \rightarrow H_2CO_3 + 2NaOH$, the amount of sodium hydroxide formed from dilute solutions of the carbonate being too small to affect the velocity of hydration, and in stronger solutions the effect of the hydroxide formed, masks that of the carbonate.

The catalytic effect of sodium carbonate, which at first is positive and then becomes negative, is the same for "slow-" and "quick-setting" cements, but in the case of of the latter, the effect is produced by solution of about one-tenth of the strength required for the former. There-ore the sense in which the catalytic agent acts, depends not only on the concentration of the agent, but also on he value of the velocity of hydration of the cement, and it seems probable that the smaller this value is, the larger must be the amount of the catalytic agent added in order to bring about this change of sense. The simplest explanation of this would be that a quick-setting cement already contains so much sodium carbonate or alkali in another form that a very slight concentration of the catalytic solution added, is enough to reach the limit beyond which a retardation of the velocity of hydration occurs.

With quick-setting cements no substance could be found which acted first as a negative and then as a positive catalytic agent; but sodium chloride up to about a 4 per cent. solution is inert, and with higher concentration acts as a retarding agent. Potassium sulphate in dilute solution has an accelerating effect, but a retarding action when the solution approaches the saturation point.

It is worthy of note that raw materials, rich in alumina, yield quick-setting, but materials rich in the less easily soluble silicious compounds yield slow-setting cements. Temperature, atmospheric moisture, and also fineness of grain affect the velocity of hydration, a smaller solution pressure belonging to coarser- than to finer-grained bodies. If the effect upon the velocity of hydration alter, there must also be a difference in the solution tension.

It is suggested that from the parallel between the increase and decrease of solubility on the one hand, and acceleration and retardation of velocity of hydration on the other, some knowledge may be gained of the composition of the components of Portland cement clinker, and of the setting and hardening processes.—W. C. H.

English Patents.

Wood [Fireproofing]; Process of Rendering ——, Uninflammable. C. Gautsch, Munich, Germany. Eng. Pat. 27,345, Dec. 11, 1902.

The wood is treated *in vacuô* at a temperature below 100° C., and preferably below 60° C., with a solution of ammonium sulphate, ammonium borate, and ammonia.
—A. G. L.

Concrete; Apparatus for Mixing Materials used for ——, and for other Purposes. T. M., J. H., and A. Mason Leicester. Eng. Pat. 16,466, July 27, 1903.

The apparatus consists of a trunk or box supported in a horizontal or inclined position, with a hopper at one end, and provided inside with a series of inclined shelves, hinged to the inside of the box, the inclination of the shelves being adjusted by means of levers. The materials are said to be mixed by falling from one shelf to the next, and so on, to the bottom of the box.—W. C. H.

Portland Cement; Manufacture of ——, and Apparatus therefor. H. K. G. Bamber, Greenhithe. Eng. Pat. 26,078, Nov. 26, 1902.

To the wings usually fixed longitudinally in the upper end of a rotary kiln a number of plates with spaces between are fixed so as to connect the pairs of diametrically opposite wings. These plates may be at right angles to the axis of the kiln, but are preferably arranged diagonally, adjacent sets sloping in opposite directions. A better drying of the fuel is thus ensured.—A. G. L.

Cement; Manufacture of —— [from Slag]. R. W. James, London. From H. Passow, Hamburg. Eng. Pat. 26,683, Dec. 3, 1902.

See Fr. Pat. 324,687 of 1902; this Journal, 1903, 630.
—T. F. B.

Blast-Furnace Waste; Utilisation of ——. H. Schulte-Steinberg. Eng. Pat. 17,183, Aug. 7, 1903. X., page 1247.

French Patents.

Building Materials; Artificial ——. A. Seigle. First Addition, of May 20, 1903, to Fr. Pat. 321,750, June 9, 1902.

A mixture of calcined calamine and powdered slaked lime is mixed with sand or other silicious material. The whole is moulded into a brick, after adding a little water, and exposed to the action of steam at a pressure of from 9 to 11 kilos. The calcined calamine may be replaced by an equivalent quantity of zinc oxide.—A. G. L.

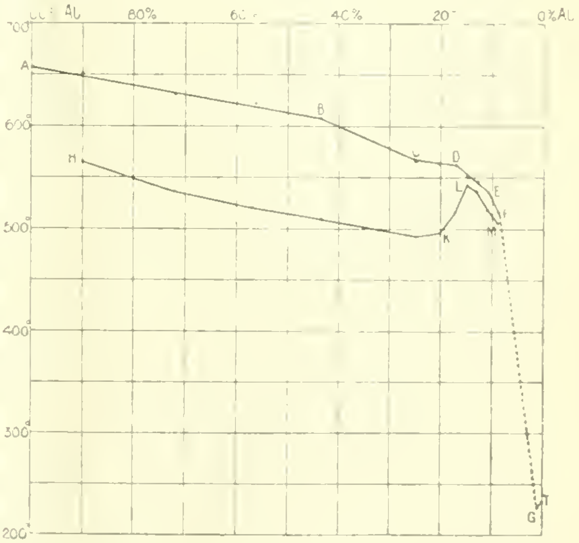
Slag-Bricks, Colouring of ——, so as to permit of their being used for Ornamental Work in Constructions. H. Favrel. Fr. Pat. 332,579, May 29, 1903.

To correct the disagreeable colour of bricks made from 89 per cent. of blast-furnace slag and 11 per cent. of lime, the bricks are immersed in a bath of iron sulphate. On exposing them to the air subsequently, a yellow colour is developed, owing to the oxidation of the iron salt. The process may also be used after having treated the bricks with a solution of sodium silicate, which, reacting with the lime, gives them a polished surface, which may also be stained or varnished.—A. G. L.

X.—METALLURGY.

Aluminium-Tin Alloys; Properties of ——. W. Carrick Anderson and G. Lean. Proc. Roy. Soc., 1903, 72, 277—284.

By fusing together aluminium and tin in small crucibles of baked carbon, packed, by means of asbestos, inside fireclay crucibles, alloys were obtained containing only traces of silicon and iron. The cooling curves of the alloys showed, above the eutectic limit, two breaks, the first of which was lower the higher the percentage of tin. The second break, which marked the solidifying point of the eutectic, occurred at 228°—228·5° C., agreeing well with the 228·73° C. observed by Heycock and Neville (J. Chem. Soc., 1890, 376). In the figure, the curve A B C D E F shows the position of the first break in the cooling curves of the alloys containing from 9 to 100 per cent. of aluminium, whilst the curve H K L M shows the points of temperature at which the rate of cooling again became normal after the break. The temperature at which the first break occurred was almost constant at 561° C. in the case of alloys containing from 17·43 to 24·8 per cent. of aluminium.



Aluminium-tin alloys decompose water, with evolution of hydrogen, even at the ordinary temperature. Microscopic examination of the alloys showed that when the amount of aluminium is greater than 0·48 per cent. (the amount present in the eutectic), two constituents are always visible in the solidified alloy, of which one is the eutectic, the other is the part of the alloy to which the decomposition of water is due. In fluid mixtures containing larger percentages of tin than 18·5 (corresponding to the compound AlSn), there separates, at successively lower temperatures, a substance, or series of substances, containing aluminium and tin in the proportions Al_xSn_y, where the value of x is at first greater than y, but is gradually approximating to it, the final member of the series being the compound AlSn. From mixtures containing 18·5 per cent. of aluminium, and lower proportions than that, the compound AlSn separates from a fluid medium which contains excess of tin atoms, and the solution is thereby greatly impoverished in respect of aluminium, until at the eutectic point, 228·73° C., it retains only about 0·48 per cent. of that constituent.—A. S.

Antimony-Lead Alloys: Appearance of ——, after Solidification, and the Difficulty of obtaining an Average Sample. H. Nissenson and P. Siedler. Berg. Hüttenm.-Zeit., 1903, **62**, 421—424. Chem. Centr., 1903, **2**, [16], 868.

The authors find that blocks of antimonial lead consist essentially of an outer silvery, finely-crystalline, brittle portion, and an inner soft amorphous portion, between which is a layer of a dark grey colour and amorphous appearance. This intermediate layer frequently contains hollow spaces. In order to obtain a fair sample, the block should be sawn diagonally, a uniform sample of the cuttings taken, pounded up, and separated into two parts, of which the coarser material is richer in lead and the finer in antimony. These two portions are analysed separately. (See also Stead, this Journal, 1903, 340.)—A. S.

Metals in Sea Water; Corrosion of ——. Diegel. Verhandl. des Ver. zur Beförd. des Gewerbfleisses, 1903, 93, 119—152. Proc. Inst. Civil Eng., 1903, **153**, [3], 62—65.

In continuation of his former work (this Journal, 1900, 52), the author has now investigated the corrosive action of sea-water on malleable copper-nickel alloys; and the influence of impurities, *e.g.*, arsenic and phosphorus, on the resistance to corrosion of metals by sea-water. Test-bars of the materials to be examined were riveted to plates of different metals and alloys, in contact with which it was desired to test them, and they were immersed in sea-water. The nickel-copper alloys were corroded less when in contact with other metals than when alone. Contact with copper- and tin-bronze afforded only slight protection, but contact with iron completely prevented corrosion An addition of 15 per cent. of nickel to copper-zinc alloys made the latter considerably less liable to corrosion, but also destroyed the malleability of the alloys.

Contrary to the view generally held, pure metals are corroded more quickly than metals containing impurities. An addition of phosphorus to zinc-bronze and to iron improved the resistance to corrosion of these metals. Pure copper immersed in sea-water for 28 months, showed a loss of weight nearly 13 times greater than that of copper containing 6 per cent. of arsenic, under similar conditions. Annealed copper was corroded twice as quickly as the cold-rolled metal. Galvanised copper resisted corrosion for a short time, but after the zinc coating was destroyed, the metal was acted upon more rapidly than ordinary copper. Contact with iron protected copper from corrosion, but not completely. In experiments with brass and copper tubes, the above results were confirmed, and it was also found that the presence of cupric oxide favoured corrosion. The most probable sources of the corrosion of copper are stated to be—(1) the use of purer copper than formerly; (2) the action of a galvanic couple formed by the copper and the products of its corrosion in sea-water; and (3) in the case of condensing-water pipes, the action of an electric current generated by the working of the pumps.—A. S.

Platinum; Oxidation of ——. L. Wohler.
Ber., 1903, **36**, [13], 3475—3502.

The existence of oxygen in platinum black was shown by its power of oxidising potassium iodide in solution. Direct experiment proved that platinum black, completely freed from this oxygen, absorbed oxygen again when heated in air or oxygen. The amount absorbed was, at 100° C., 1·92 per cent.; at 300° C., 2·35 per cent., of the weight of the platinum. This oxidised platinum was attacked by dilut hydrochloric acid, from 10 to 18 per cent. of it going int solution; and determinations of the amount so dissolved and of the oxygen remaining in the residue, showed tha platinum and oxygen had disappeared from the origina substance in the proportions required for platinous oxide PtO, while the solution showed all the reactions of platinou salts. Moreover, the oxidising action of oxidised platinu black on many organic substances and on arsenious oxid was exactly analogous to that of platinous oxide. Th retention of water at high temperatures by platinum blac is explained by the fact that platinous hydroxide only begin to dissociate at 400° C.; platinic oxide, on the other hand decomposes at 300° C. into platinous oxide and oxygen Spongy platinum and thin platinum foil also absorbe oxygen when heated to 420°—450° C. in the gas, becoming converted (the foil on the surface only) into black platinou oxide. Platinum black dissolves in potassium cyanid solution—much more rapidly in presence of free oxygen o of hydrogen peroxide than when alone.—J. T. D.

Gold in very Dilute Aurocyanide Solutions; Rapid Metho of Determining ——. XXIII., page 1257.

Gold in Cyanide Solutions; Colorimetric Determination of ——. H. R. Cassel. XXIII., page 1257.

Zinc in Zinc Ores; New Method of Determining ——. F. W. Küster and F. Abegg. XXIII., page 1258.

English Patents.

Spring Steel; New or Improved ——. A. Reichwald, London. From the firm of F. Krupp, Essen, Germany. Eng. Pat. 3822, Feb. 18, 1903.

The spring steel is characterised by a silicon content of between 1 and 4 per cent., with a carbon content of from 0·4 to 1 per cent. It may be produced from ordinary Martin steel, to which, before casting, the required proportion of silicon is added, preferably as ferrosilicon. This steel is stated to considerably exceed other kinds of spring steel in tensile strength, elasticity, and toughness. —E. S.

Malleable Cast-Iron, particularly applicable for the Constructional Parts of Dynamo Machines and the like. A. Reichwald, London. From the Firm of F. Krupp, Essen, Germany. Eng. Pat. 3823, Feb. 18, 1903.

To produce a malleable cast-iron, possessing great strength as well as high magnetic permeability, ferrosilicon is added to the best quality of malleable cast-iron before casting, in such proportion as to give a silicon content in the product of from 1 to 4 per cent.—E. S.

Cast Iron of High Tensile Strength; Manufacture of ——. A. Zenzes, Chemnitz. Eng. Pat. 4345, Feb. 24, 1903.

See Fr. Pat. 328,381 of 1903; this Journal, 1903, 953. —T. F. B.

Hardened Steel [Armour] Plates; Method of Locally Softening or Annealing ——. C. P. E. Schneider, Le Creusot, France. Eng. Pat. 19,167, Sept. 5, 1903.

Armour plates, which for constructional purposes need to be pierced or planed on the surface of impact, are locally softened by application of a molten fusible metal, confined within a prescribed space by a frame or bottomless receptacle of sufficient depth, such metal being maintained at a fitting temperature for as long as may be necessary, by electrical or other means.—E. S.

Metals; Separating —— from their Ores. J. B. Scammell, London. Eng. Pat. 15,280, July 9, 1902.

The finely-powdered ore suspended in water, is run in a continuous stream into a revolving dasher or churn, together with oil or grease, with which a small proportion of sulphur chloride has been mixed. After agitation and settling in pans, the floating metallic particles entangled by the sulpho-chlorinated oil are skimmed off, and the oil is separated for repeated use.—E. S.

Metals or Matters in Fusion; Apparatus for the Treatment of ——, with Sodium or Alkaline Compounds. P. L. Hulin, Clavaux par Rioupéroux. Eng. Pat. 27,543, Dec. 13, 1902.

See Fr. Pat. 327,982 of 1902; this Journal, 1903, 1052.
—T. F. B.

Clarifying Waste Liquid extracted from Coal, Ore, and the like; Process of and Apparatus for ——. F. Baum. Eng. Pat. 762, Jan. 12, 1903. I., page 1237.

Blast-Furnace Waste; Utilisation of ——. H. Schulte-Steinberg, Düren, Germany. Eng. Pat. 17,183, Aug. 7, 1903.

The invention relates to the treatment of blast-furnace waste, containing more or less iron, so that it can be again ubmitted to metallurgical treatment. Blast-furnace slag is powdered, and subjected to the action of steam under a ressure of from three to twelve atmospheres, for the urpose of "fluxing" the lime constituent, and is then mixed with about an equal proportion of untreated powdered lag or with "top dust," and the mixture is formed into briquettes. Blocks of slag sandstone may be formed, without addition of lime or cement, by mixing the blast-urnace slag, after the described treatment, with a powdered ilicious material, the mixture being then moulded. The ubsequent hardening may be greatly hastened by submitting the blocks to a high steam pressure for several ours.—E. S.

Zinc and other Sulphides; Extracting ——, from their Ores. G. D. Delprat, Australia. Eng. Pat. 19,783, Sept. 14, 1903.

A solution of sodium bisulphate, preferably hot, and of bout sp. gr. 1·4, is used to cause the sulphides in the nely-divided ore fed into it, to rise to the surface, so that they may be skimmed off. Compare Eng. Pat. 26,279 and Fr. Pat. 326,867, both of 1902, and U.S. Pat. 735,071 of 903; this Journal, 1903, 913, 871, and 1001 respectively.
—E. S.

United States Patents.

Lead, Silver, or Zinc Ores; Process of Treating ——. S. Ganelin, Berlin. U.S. Pat. 741,653, Oct. 20, 1903.

ee Eng. Pat. 24,469 of 1899; this Journal, 1900, 1118.
—T. F. B.

Refractory Ores; Process of Treating ——. E. C. Pohlé and S. Croasdale, Denver, Colo., Assignors to Metal Volatilisation Co., Philadelphia, Pa. U.S. Pat. 741,712, Oct. 20, 1903.

ee Eng. Pat. 23,477, Dec. 22, 1900; this Journal, 1901, 68.—E. S.

Heavy Metals; Process of Extracting ——, by the Use of Chlorine [from Sulphide Ores, &c.]. J. Savelsberg, Papenburg, Germany. U.S. Pat. 741,840, Oct. 20, 1903.

Ores, mattes, and the like, containing sulphur, are powered and suspended in water, to which is added iron oxide nd a salt "capable of reacting with sulphuric acid to bind he sulphuric acid formed during the process," such as an lkali chloride or calcium chloride; chlorine gas is then assed into the solution, and, with addition of more raw material, air is blown through, to transform ferrous chloride into ferric oxide. The cleared solution is then electrolysed to recover the metals contained in it, and the chlorine set free is collected for re-use.—E. S.

French Patents.

Ferric Oxide, Zinc, and its Compounds; Manufacture of ——, by the Aid of Spent Acid [of Galvanising Works]. H. E. Howard and G. Hadley, England. Fr. Pat. 332,143, May 28, 1903.

Spent acid from galvanising works or the like, is brought into intimate contact with air, *e.g.*, by percolation through owers, in which the liquor is received on large surfaces, to onvert the ferrous into ferric chloride. The solution is then treated with scrap zinc or with crude zinc oxide, whereby ferric oxide is precipitated together with any lead that may be present. Chlorine is passed through the liquor, either at this or at the first stage of the operations. After separation of the precipitate in a filter-press, the zinc chloride solution is concentrated and treated to obtain zinc oxide; or zinc by electrolysis, in which latter case, the chlorine evolved is available in the process. Compare U.S. Pat. 715,801, Eng. Pat. 9327, and Fr. Pat. 321,546, all of 1902; this Journal, 1903, 97, 498, and 551 respectively.
—E. S.

Silicon from Silicates; Manufacture of ——. C. H. Homan. Fr. Pat. 332,583, March 23, 1903.

See U.S. Pat. 723,410 of 1903; this Journal, 1903, 866.
—T. F. B.

Ores of Nickel, Copper, Zinc, &c.; Desulphurising —— by the Wet Way, and forming Hydroxides of their Metals, with a view to their Extraction. M. Malzac, France. Fr. Pat. 332,596, May 6, 1903.

The sulphide ores of copper, zinc, nickel, cobalt, cadmium, and silver are powdered, and moistened, in a battery of closed filtering vessels, with ammonia water, and air is passed through until oxidation is effected, when ammonia solution is admitted to dissolve the hydroxides formed. Provision is made for applying pressure when needful. Various methods are described, modified according to circumstances, for recovery of the metals, with fractional separation, from the solution, before or after the expulsion (and recovery) of the ammonia by action of a vacuum, boiling or otherwise. Such separation is effected by methods based on the principle of the differing degrees of heat disengaged by the metals on passing from the state of a sulphide to that of a hydroxide. Carbonate ores of the metals referred to, may be similarly treated.—E. S.

New Metallic Alloy [of Lead]. Soc. Routin et Mourraille. Fr. Pat. 332,605, May 25, 1903.

The alloy is composed of 1,000 parts of lead, 15 parts of antimony, and 1 part of sodium; but the proportions may be varied up to the limit of 5 per cent. of antimony and $\frac{1}{2}$ per cent. of sodium of the total weight of the alloy.
—E. S.

Zinc [Soft]; Manufacture of ——. The Firm L. Gührs, Veuve. Fr. Pat. 332,657, May 30, 1903.

Equal parts by weight of aluminium and of zinc are melted with a small proportion of bismuth. To ordinary molten zinc, heated to from 500° to 600° C., this alloy is added until volatilisation ceases. The zinc thus produced is of about 99 per cent. purity, and is stated to be soft and to possess advantageous physical properties.—E. S.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Platinum; Discharge of Electricity from Hot ——. H. A. Wilson. Proc. Roy. Soc., 1903, **72**, 272–276.

The main object of the investigation was to determine the influence on the discharge of electricity from hot platinum wires, exerted by the nature of the gas in which the wire is immersed. Pure platinum wire was mounted like the filament of an incandescent lamp, in a glass tube, and was heated by passing a current through it. A platinum cylinder surrounded the wire, and the current passed from the wire to the cylinder. At low pressures, with wire not specially cleaned, a large but variable negative leak was obtained, but the leak measured, is not the leak in air, but that in the hydrogen evolved by the wire. With wire very carefully freed from occluded hydrogen, the leak was only about one part in 250,000 of its ordinary value. In general it may be accepted that the negative leak is due to the emission of negative ions by hydrogen occluded in the platinum. A negative leak is also produced by phosphorus pentoxide and alkali salts. With air and nitrogen no negative leak is produced capable of being measured by a galvanometer. The positive leak from clean platinum wires is due to ionisation of the gas molecules at the surface of the platinum.—A. S.

Anodes, Unalterable ; Behaviour of ——, especially in the Electrolysis of Hydrochloric Acid. R. Luther and F. J. Brislee. Zeits. physik. Chem., 45, 216—234. Chem. Centr., 1903, 2, [18], 977.

If an increasing E.M.F. be applied to platinum anodes in hydrochloric acid, and the current measured, no uniform increase of the current with increasing E.M.F. takes place after the first decomposition point, corresponding to the irreversible evolution of chlorine, is passed, but a stage is reached in which, with increasing E.M.F., the current remains constant. The strength of this current is proportional to the square of the concentration of chlorine ions, if other conditions are the same. If, when the period of constant strength of current is attained, the E.M.F. is allowed to fall and then again increased, the horizontal portion of the current-strength curve is not obtained, but the current increases uniformly with the increasing E.M.F. In this case, however, the point of irreversible decomposition of chlorine ions is not attained. The point is attained with iridium anodes. According to the author, platinum anodes with which the point of irreversible decomposition of chlorine ions is no longer obtained, have been rendered "passive," probably owing to the formation of a compound. Mercury cyanide, even in small quantities, will make platinum anodes passive. In no case is the evolution of chlorine due to a primary action, but with "active" platinum and iridium anodes, the intermediate reactions proceed so rapidly that practically irreversible equilibrium is attained.
—A. S.

Perchlorate ; Electrolytic Formation of ——. W. Oechsli. Zeits. Elektrochem., 1903, 9, 807—828.

From the results of his investigation the author concludes that the view hitherto expressed that the electrolytic formation of perchlorate is due to simple oxidation of ClO_3 ions to ClO_4 ions is open to considerable doubt, and that the more probable cause of the formation of perchlorate is the spontaneous decomposition of discharged ClO_3 ions into ClO_4 and ClO_2 ions, the chlorous acid produced being immediately oxidised to chloric acid. One of the chief facts in support of this theory is that whilst, in the electrolysis of neutral solutions of sodium chlorate, the formation of perchlorate is favoured by a high potential at the anode, yet on electrolysing solutions of sodium chlorate to which small but increasing amounts of alkali are added, the yield of perchlorate continuously decreases notwithstanding a high and fairly constant potential at the anode. It is known that OH ions are discharged more easily than ClO_3 ions; therefore as the proportion of alkali, and consequently of OH ions, in the electrolyte is increased, the discharge of ClO_3 ions and the formation of perchlorate will be diminished. Among other facts in accord with the author's theory, the following may be noted:—The yield of perchlorate is much less with platinised than with polished anodes, owing to the fact that, by reason of the larger surface offered by the former, the OH ions are more readily discharged. As the temperature is increased, the concentration of OH ions in water also increases considerably, whilst the yield of perchlorate is diminished.

The results of the numerous experiments carried out are given in a series of tables and curve-diagrams.—A. S.

Nickel from Phosphate Solutions ; Electrolytic Precipitation of ——. W. T. Taggart. XXIII., page 1258.

Nitric Acid in Metallic Nitrates ; Electrolytic Reduction of ——, to Ammonia. W. H. Easton. XXIII., page 1258.

Silver from Antimony ; Separation of ——, by Electrolysis. A. Fischer. XXIII., page 1258.

Manganese ; Electrolytic Determination of ——, and its Separation from Iron and Zinc. G. P. Scholl. XXIII., page 1258.

English Patents.

Accumulators ; Impts. in Electric ——. P. Schmitt and C. Fabre, both of Paris. Eng. Pat. 21,901, Oct. 8, 1902.

A strip of lead is bent so as to form three sides of a frame, and horizontal sheets of antimonide of lead are soldered to the vertical side of the frame, the opposite ends of the sheets being bent at right angles so as to form the fourth side of the frame. The front and back of the frame are closed by double perforated cheeks or walls of ebonite wood treated with paraffin, lead, &c., the cheeks being held parallel by perforated horizontal partitions; and the frame which is perforated, is similarly covered, before filling, with perforated plates. The perforations in the adjacent plates forming the double walls, are not opposite to each other and thus the active material is retained without interfering with the passage of the electrolyte. The active material is prepared in granular form by making a paste from the metallic oxide with 15 per cent. of water, 40 per cent. of glycerin, and 45 per cent. of sulphuric acid; then kneading, drying by a cold process, and compressing; afterwards pounding and sifting.—B. N.

Malleable Cast-Iron, particularly applicable for the Constructional Parts of Dynamo Machines and the like. A. Reichwald. Eng. Pat. 3823, Feb. 18, 1903. X., page 1246.

Saccharin ; Manufacture of ——. B. J. B. Mills. From H. Barbier. Eng. Pat. 9322, April 24, 1903. XX., page 1256.

United States Patent.

Alkaline Salts ; Electrolytic Decomposition of ——. M. Wildermann, London. U.S. Pat. 741,864, Oct. 2[illegible], 1903.

See Eng. Pat. 9803 of 1902; this Journal, 1903, 702.
—T. F. B.

French Patents.

Soda or other Caustic Alkalis by the Electrolysis of Corresponding Sulphates or Bisulphates ; Manufacture of ——. Soc. des Prod. Chim. de Marseille-l'Estaque. Fr. Pat. 332,510, May 18, 1903. VII., page 1243.

Liquids ; Apparatus for [Electrically] Purifying and Sterilising ——. R. C. Turner. Fr. Pat. 332,623, May 29, 1903.

See Eng. Pat. 12,191 of 1903; this Journal, 1903, 1077.
—T. F. B.

(*B.*)—ELECTRO-METALLURGY.

Vanadium and its Alloys ; Process for the Electrolytic Production of ——. G. Gin. Zeits. f. Elektrochem., 1903, 9, [42], 831—832.

Vanadium trioxide and retort-carbon are worked up into a plastic mass with tar, sintered, and crushed in ball mills. The powder is then made up into blocks in the same way as ordinary carbon electrodes are prepared. These vanadium-carbon electrodes should carry a current density $\frac{3}{10}$ths of that used with carbon electrodes. They are used in a bath, in which the electrolyte is iron fluoride dissolved in fused calcium carbide, and the cathode is fused steel. The deposited vanadium dissolves in the steel, and the vanadium fluoride formed at the anode gradually displaces the iron fluoride from the bath, so that it is only necessary to add a little at intervals to make up for the small amount of fluorine lost during the process. For alloys with over 25 per cent. of vanadium, the area of the cathode must be considerably greater than the active surface area of the anode. A good yield and a satisfactorily fluid bath are obtained by employing a mean density of 2 ampères per sq. cm. of anode surface, and 6 ampères per sq. cm. of cathode area, the pressure under these conditions being 11 or 12 volts. To prepare vanadium alloys with metals other than iron, the fluoride of the required metal is used initially as electrolyte, and the metal to be alloyed is employed as cathode. A fairly pure vanadium, unalloyed, may also be prepared, but its fusing point is so high that it would be necessary to take it from the furnace in the solid condition, instead of tapping it from time to time, as in the case of the alloys.—W. G. M.

United States Patents.

Furnace ; Electric ——, H. Harmet, St. Etienne, France. U.S. Pat. 742,315, Oct. 27, 1903.

See Fr. Pat. 318,283 of 1902; this Journal, 1902, 1459.
—T. F. B.

urnace ; Electric ——. H. Harmet, St. Etienne, France. U.S. Pat. 742,419, Oct. 27, 1903.

:e Addition of Aug. 30, 1902, to Fr. Pat. 318,283 of 1902 ;
is Journal, 1903, 638.—T. F. B.

on and Steel ; Electro-metallurgy of ——. H. Harmet. U.S. Pat. 742,316, Oct. 27, 1903.

ɜe Fr. Pat. 318,283 of 1902 ; this Journal, 1902, 1459.
—T. F. B.

Metals ; Process of Electro-depositing ——.
V. M. Johnson, Conn. U.S. Pat. 742,442, Oct. 27, 1903.

ɜe electrolyte is subjected as a whole, or in the region of
e cathode, to such a pressure as will remove the contained
ses, and the metal is deposited simultaneously in a reguline
rm ; or the deposition may take place after the removal of
e gases, the electrolyte being kept under such pressure as
ill remove the gases from the region of deposition. For
is purpose the electrolyte is circulated between an electro-
tic tank, a filtering vessel, and an external vessel, a
minished pressure being maintained in each of these while
e electric current is passing.—B. N.

lectrolytic Apparatus. W. M. Johnson, Conn. U.S. Pat. 742,443, Oct. 27, 1903.

closed electrolytic tank is provided with a soluble anode
d a suitable cathode, and a circulation of electrolyte is
aintained between this vessel and an elevated supply tank,
th being provided with means for exhausting the liberated
ses. The electrolyte is thus supplied to the electrolytic
nk in a gas-free condition, and the gases formed during
e deposition of the metal are rapidly withdrawn from the
ectrolyte. The supply tank is provided with a distribut-
g plate, and a filtering device for the liquid returned to
and a filtering device is also interposed in the connections
tween the supply and electrolytic tanks.—B. N.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

ils from the Seeds of the White and Yellow Acacia and Red and White Clover ; Characteristics of ——. V.
Jones. Mitt. d. kaiserl. königl. techn. Gewerbe-Museum
in Wien, 1903, **13**, [10—12], 223—227.

he white acacia (*Robinia pseudacacia*) and the yellow
acia (*Caragena arborescens*) are extensively cultivated
r fodder in South Russia, but their seeds have not been
ed as a source of oil. The same remark applies to the
eds of the different species of clover, of which the author
s selected two, *viz.*, white clover (*Trifolium repens*) and
d clover (*T. pratense perenne*), for examination.

In each case the seeds were crushed and extracted with
troleum spirit, and the oils thus obtained, dried in a current
hydrogen. The following results were obtained :—

Oil from Seeds of	Yield of Oil.	Un-saponifiable Matter.	Acid Value.	Saponification Value.	Acid Value of Fatty Acids.	Mean Molecular Weight of Fatty Acids.
	Per Cent.	Per Cent.				
hite acacia..	13·3	0·20	2·42	192·4	200·1	280·4
llow acacia .	12·4	0·14	2·91	190·6	199·0	281·9
d clover....	11·1	0·19	1·63	189·9	198·1	283·2
hite clover..	11·8	0·16	1·91	189·5	197·6	283·8

Oil from Seeds of	Reichert-Meissl Value.	Hehner Value.	Iodine Value.	Iodine Value of Fatty Acids.	Acetyl Value.
hite acacia..	1·2	94·32	161·0	167·0	9·4
llow acacia .	2·7	93·94	128·9	131·7	14·9
d clover....	3·3	93·62	124·3	126·2	7·7
hite clover..	3·5	93·24	119·7	122·2	8·6

The chemical composition of these oils was also determined by the usual methods, and the following conclusions drawn from the results of the investigation :—

1. *White Acacia-Seed Oil* has strong drying properties, and resembles linseed oil in this respect. It contains 3·7 per cent. of solid fatty acids of high molecular weight, including stearic and erucic acids, whilst the liquid fatty acids consist of a mixture of oleic, linolic, and linolenic acids, in which the linolic acid predominates. This oil oxidises readily on exposure to the air.

2. *Yellow Acacia-Seed Oil* is also a drying oil, and may be classified with hempseed, nut, and poppy oils. It contains about 8·74 per cent. of solid fatty acids (palmitic, stearic, and erucic acids), and the liquid fatty acids consist of linolic and oleic acids. This oil is more stable than that of the white acacia.

3. *Red Clover-Seed Oil* is a semi-drying oil. The solid fatty acids contain palmitic and stearic acids, whilst the liquid fatty acids consist of oleic and linolic acids, the former predominating.

4. *White Clover-Seed Oil* is very similar to red clover-seed oil in composition, but contains a higher proportion of oleic acid.—C. A. M.

Kapok Oil. E. Durand and A. Baud. Ann. Chim. anal. appl., **8**, 328—330. Chem. Centr., 1903, **2**, [17], 959.

The oil examined by the authors was obtained by extracting the seeds of *Eriodendron anfractuosum* with ether ; yield, 24·8 per cent. Above 30° C. the oil formed a clear yellowish liquid having a pleasant taste and odour. Sp. gr. at 10° C., 0·8613 ; refraction at 40° C., 51·3 ; m. pt., 29·6° C. ; m. pt. of fatty acids, 32° C. ; iodine value, 68·5 ; saponification (Köttstorfer) value, 205. With Welman's phosphomolybdic acid reagent, the oil gives a green colour, changing to blue on addition of ammonia ; with Halphen's reagent (amylic alcohol and carbon bisulphide containing 1 per cent. of sulphur. Mixture with the oil then heated) it behaves like cotton-seed oil, giving a red coloration.

The residue of the seeds, after extraction of the oil, contained 12·18 per cent. of water, 6·41 per cent. of ash, 0·76 per cent. of fat, 4·82 per cent. of nitrogen, 30·12 per cent. of proteid, 50·53 per cent. of woody fibre and carbohydrates, 2·04 per cent. of potassium oxide, and 2·34 per cent. of phosphoric anhydride. (See also this Journal, 1902, 1336.)—A. S.

Glycerin in Soap ; Determination of ——. E. Martin. XXIII., page 1259.

English Patent.

Fatty Matters and the like from Liquid or Semi-Liquid Material ; Process for the Extraction and Recovery of ——. J. Garfield, Bradford. Eng. Pat. 25,876, Nov. 25, 1902.

Sludge or other material containing grease is distilled (preferably after concentration) in a closed vessel, and the vapours bearing the grease are collected in the condenser.
—C. A. M.

Oil from Fish Livers or the like ; Extraction of ——. A. Johnson, Kingston-upon-Hull. Eng. Pat. 26,728, Dec. 4, 1902.

The material is heated in a kettle provided with a hopper, forming a baffle at the top, and with a steam jacket. When the temperature is sufficiently high to prevent condensation, steam is introduced into the kettle by means of a pipe connected with the steam jacket, so that the oil-cells are ruptured and the oil rises to the surface, whence it can be drawn off.—C. A. M.

United States Patents.

Fatty Substances ; Process of Making ——. O. Liebreich, Berlin. U.S. Pat. 741,584, Oct. 13, 1903.

See Ger. Pat. 136,91[illegible] of 1900 ; this Journal, 1903, 149.
—C. A. M.

Glycerin and Acidylated Derivatives of Aromatic Bases; Process of Producing ——, and the Product thereof. O. Liebreich, Berlin. U.S. Pat. 741,585, Oct. 13, 1903.

Glycerides of fatty acids are heated with aromatic bases and the resulting products separated. The derivatives of the bases which are produced, are useful as raw materials for the manufacture of candles, salves, unguents, &c.
—C. A. M.

French Patent.

Soap Substitute; Vegetable Powder as a ——. A. F. Ribard. Fr. Pat. 332,561, May 22, 1903.

The fruit of the Algerian tree *Sapindus*, when dried at a temperature not exceeding 90° C. and pulverised, yields a brown powder with an odour of acetic acid. This is soluble in water in all proportions, and claim is made for its use in place of soap.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

English Patents.

Pigments [Zinc Sulphide and Barium Sulphate]; Processes of Making ——. W. J. Armbruster and J. Morton, St. Louis. Eng. Pat. 19,537, Sept. 10, 1903.

See U.S. Pat. 740,072 of 1903; this Journal, 1903, 1200.
—T. F. B.

Pigments [Zinc Sulphide and Barium Carbonate]; Processes of Making ——. W. J. Armbruster and J. Morton, St. Louis. Eng. Pat. 19,538, Sept. 10, 1903.

See U.S. Pat. 740,073 of 1903; this Journal, 1903, 1200.
—T. F. B.

United States Patent.

Lampblack; Process of Making —— [from Tar]. R. A. Sembdner. U.S. Pat. 741,726, Oct. 20, 1903. III., page 1238.

(*B.*)—RESINS, VARNISHES.

Colophony [Rosin]; American ——. A. Tschirch and B. Studer. Archiv der Pharm., 1903, **241**, [7], 495—522.

The ethereal solution of American colophony was exhausted by repeated shaking with 1 per cent. ammonium carbonate solution, the solution of the acid thus extracted was warmed on the water-bath till free from ether, and the acid precipitated by pouring into dilute sulphuric acid. The acid was then washed carefully till free from sulphuric acid, and dried on the filter at the ordinary temperature.

Two acids were obtained, one of which, α-abietic acid, forms an insoluble lead salt, and the other, β-abietic acid, forms no lead salt. Another acid, γ-abietic acid, was obtained by extracting the ethereal solution, already free from the α- and β-acids, with 1 per cent. sodium carbonate solution. This product yielded an insoluble lead salt.

The resin and ethereal oil were separated by distillation *in vacuo*.

Fahrion (this Journal, 1902, 127) considers that the part of colophony soluble in light petroleum spirit consists of the resin acids proper, whilst the insoluble portion contains oxidation products of the resin acids. The insoluble part increases in weight by oxidation, due to the action of light and air, and this action is called by him "autoxidation of the resin acids."

The authors find that all resin acids and every kind of colophony are more or less soluble in light petroleum spirit. The more insoluble the acid is, the higher the saponification value; for example, α-abietic acid gives a high saponification value, but requires 500 parts of petroleum spirit for solution; γ-abietic acid has the saponification value = 0, and requires only 100 parts of petroleum spirit for solution.—J. K. B.

English Patent.

Oils. Drying; Process for the Boiling of ——, for the Purpose of Lacquer and Varnish Manufacture. W. Leppert, Warsaw, and M. Rogovin, Vienna. Eng. Pat. 17,035, Aug. 5, 1903.

The oils, with or without the addition of rosin, india-rubber, &c., are boiled in a vessel from which air is excluded, and the resulting vapours withdrawn by creation of a vacuum or by passing a current of indifferent gas, or superheated vapours, through the apparatus.—C. A. M.

(*C.*)—INDIA-RUBBER.

Gutta-percha; Albane from ——. A. Tschirch. Archiv der Pharm., 1903, **241**, [7], 481—495.

The author compares the group of albanes obtained from a very old oxidised sample of gutta-percha with those from a fresh commercial sample.

The samples were extracted first with hot, strong alcohol, some 16 extractions being made, and the residue was dissolved in chloroform and poured into alcohol to precipitate the "gutta"; on allowing the solution to stand, the "albanan" is deposited in fine, small crystalline needles.

From the old sample three albanes were obtained:—"spherite albane" (the amorphous variety), carbon, 82·52, hydrogen, 10·05 per cent.; crystalline albane, carbon, 84·74, hydrogen, 9·41 per cent.; and albanan, the yield of which was too small to allow of an analysis being made. The new sample yielded rather more albanan, but no crystalline albane, and, on the other hand, a quantity of "iso-spherite albane," carbon, 82·26, hydrogen, 10·27 per cent. The albanan contained carbon, 86·07, and hydrogen, 10·57 per cent. The albanan group is nearest to the hydrocarbon, then comes the albane group, whilst fluavil is the most highly oxidised. If formulæ of the albanes are constructed, assuming them to belong to the oxypolyterpenes, a glance shows that the number of possible oxypolygutta-terpenes is very great. (See also Ramsay, Chick, and Collinridge, this Journal, 1902, 1367.)—J. K. B.

Guayrule Rubber in Recovered Rubber. C. O. Weber. Gummi-Zeit., 1903, **18**, [5], 83.

The author found in a sample of recovered rubber about 18 per cent. of Guayrule rubber, easily detected by the very characteristic resin contained in this brand, about which very little is known. The resin-free substance forms a very soft, inferior rubber, capable of vulcanisation, but only very slowly, and yielding a poor product. C. Harries has demonstrated that the nitrosite is identical with that of Para rubber in composition, but the author found that the bromine compound contained 45 per cent. of bromine only, whereas the Para rubber bromine compound contained 70 per cent. of bromine, from which he concludes that Guayrule rubber must contain a considerable quantity of oxygen.
—J. K. B.

French Patent.

Rubber-coated Threads; Manufacture of ——. C. H. Gray and T. Sloper. Fr. Pat. 332,290, May 22, 1903.

Apparatus is described in which the thread that is to be coated with rubber is led through two consecutively arranged tubes having a diameter somewhat larger than that of the thread itself. In the first portion it encounters a mass of rubber travelling, under hydraulic pressure, in a direction opposite to itself; and in the second portion, which may be longer than the first, it travels with the rubber. This arrangement is effected by connecting the middle of the entire tube with the store of rubber. For convenience in introducing the thread, the actual tube may be made of a much wider diameter, being filled with separate liners, tightly pressed together by a nut against a shoulder, of the internal diameter required. Or, an identical result may be obtained by building the tube out of a number of separable sections, each fitted with male and female screw threads. Modifications are described for the simultaneous coating of several threads, suitable guides or plates being put into the tube with a central orifice for the passage of the rubber mass.—F. H. L.

IV.—TANNING; LEATHER, GLUE, SIZE.

English Patents.

eather, Raw Hide, Ivory, and other Materials; Manufacture of Products or Materials for Use in lieu of ——, in the Manufacture of Various Articles. C. Marter, D. Hanbury, and C. S. Gardner, London. Eng. Pat. 22,729, Oct. 18, 1902.

E Fr. Pat. 329,816 of 1903; this Journal, 1903, 1056.
—T. F. B.

lue and Gelatin and the like; Manufacture of ——. Rheinische Patent-Leim und Gelatin Industrie G. m. b. H., and R. Arens, Ruhrort. Eng. Pat. 27,053, Dec. 8, 1902.

E U.S. Pat. 721,852 of 1903; this Journal, 1903, 429.
—T. F. B.

United States Patents.

anning, Bleaching, Scouring, and Oiling Leather; Apparatus for Continuously ——. W. T. Forbes, Collegepark, Ga., U.S.A. U.S. Pat. 742,115, Oct. 20, 1903.

its apparatus consists of several communicating chambers ith horizontal skeleton supports arranged internally, and in ch compartment, save one, spraying devices above and low the supports; also a vat for each compartment, a rce pump in connection with the compartments and the raying devices, conduits joining the vats and comartments, and a leather-rolling mechanism placed at the d of one compartment.—R. L. J.

elatin, Vegetable; Process of Manufacturing ——. A. L. Martin, Assignor to A. C. Tenney, both of Clinton, Iowa, U.S.A. U.S. Pat. 742,124, Oct. 20, 1903.

oss is washed, bleached, comminuted, boiled in water, en strained, and the resulting product is boiled to a jelly, aporated, and shredded.—R. L. J.

XV.—MANURES, Etc.

otassium in Aqueous Solutions [Soil Extracts]; Determination of Small Amounts of ——. F. R. Cameron and G. H. Failzer. XXIII., page 1259.

English Patent.

roteïds from Non-Nitrogenous Bodies; Process of Separating ——. J. Carstairs, Ilkley, Yorks, and the Allrich Guano Co., Ltd., London. Eng. Pat. 7776, April 3. 1903.

HE crude material is heated with mixtures of fatty and omatic alcohols, *e.g.*, "phenyl alcohol" (phenol) (9 parts) d benzyl alcohol (1 part) dissolved in ethyl or methyl cohol, and the solution of fat, oil, &c., is decanted off, aving the proteïd matter behind.

The method can be used in the manufacture of fish guano.
—R. L. J.

XVI.—SUGAR, STARCH, GUM, Etc.

entosans; Hydrolysis of —— by Dilute Acids and "Sulphite" Liquors, and the Isolation of Pentoses. R. Hauers and B. Tollens. Ber., 1903, **36**, [13], 3306—3322.

herry Gum.—The authors have studied the velocity of e hydrolysis of this gum by sulphuric acid and hydrolorie acid respectively, of different strengths when heated ith them in the proportion of 1:8 on a boiling water-bath. he cupric reducing power of the solutions increased with crease of the strength of the acids, and of the time of eating, up to a certain point, and then decreased owing to e formation of "reversion" products. Hydrochloric acid as far more powerful, weight for weight, than sulphuric cid; the maximum points were reached after eight hours' eating with 20 per cent. sulphuric acid, and after 10 hours ith 8 per cent. hydrochloric acid.

Gum from La Plata.—This gum yielded furfural corsponding with 55·31 per cent. of pentosans, and mucic acid corresponding with 0·62 per cent. of galactan. From the products of hydrolysis, both arabinose and xylose were isolated, indicating the presence of araban and xylan in approximately equal proportions.

Gum from East Africa.—This gum showed 29·53 per cent. of pentosans and 22·58 per cent. of galactan; the pentosan consisted apparently entirely of araban.

Myrrh Gum.—The gummy residue from the preparation of tincture of myrrh contained 14·44 per cent. of pentosans and 12·14 per cent. of galactan. On hydrolysis both arabinose and xylose were isolated; the quantity of xylan in the gum was much greater than that of the araban.

Hydrolysis of Organic Substances by "Sulphite" Liquors.—The solution of calcium bisulphite, as used for the manufacture of wood pulp, may be employed for the hydrolysis of substances containing pentosans, by boiling under pressure in the autoclave. For the gums, however, this method offers no advantages over simple hydrolysis with acids; in both cases the hydrolysed solutions always contain gummy matters precipitable by alcohol. Calcium bisulphite liquors have been employed by the authors for the preparation of arabinose from cherry gum and beetroot residues, of xylose, and a little arabinose from straw, of xylose from beech-wood, and of a very small quantity of arabinose from pine-wood. The temperatures generally most suitable for digestion are between 115° and 135° C.; at lower temperatures, hydrolysis is incomplete, and at higher temperatures, the formation of decomposition products soluble in alcohol is too great for the isolation of the pentoses.—J. F. B.

Diffusion Process [Sugar Manufacture]; Naudet's ——. E. Silz. Zeits. Ver. deutsch. Zucker-Ind., 1903, **53**, [573], 1015—1027.

Each diffuser in the battery can be isolated from the rest, so that as soon as it has been filled and mashed or settled, it can be connected to a set of pipes leading from the bottom of the diffuser to a centrifugal pump, and thence to a heater, and back to the top of the diffuser. The juice is thus forced through until the chips and issuing juice have been brought to the required temperature, when the diffuser is again connected to the battery circuit. In order to prevent the compression of the pulp on the sieve bottom of the diffuser, a large cylindrical vessel, termed a compensator, is introduced, so that the pump draws from this instead of directly from the diffuser. The volume of juice held in the compensator also serves to equalise the temperature of juice passing to the heater. Not only is the working quicker, but very pure, heavy, and hot juice is obtained. The array of heaters and accessories are rendered superfluous. The work of the attendant is simplified and facilitated. A considerable saving of fuel and of lime is effected, and the evaporation and boiling are accelerated by about 30 per cent.
—L. J. de W.

Sugar Industry; Use of Lime in the ——. A. Aulard. Zeits. Ver. deutsch. Zucker-Ind., 1903, **53**, [573], 1027—1040.

Milk of lime is added to the cold juice, the limed juice is stirred in the cold for an hour, then warmed slowly and stirred another hour to allow full time for the lime to act on the protein and albumin substances dissolved in the diffusion juice. After saturation, such juice will be found purer than the second saturation juice of the ordinary process. With the present purity of the beetroot, a second saturation during two or three months of the season is absolutely unnecessary. Only the early unripe beetroots and those later touched by frost, need the further treatment.
—L. J. de W.

Melibiose. D. Loiseau. Zeits. Ver. deutsch. Zucker-Ind., 1903, **53**, [573], 1050—1061.

Melibiose crystals contain 9·5 per cent. of water, which is only given up completely when the substance is finely powdered and heated slowly and gradually at from 70—110° C. It becomes fluid at 120° C. After drying, the powder or small crystals readily absorb moisture from the air. Freshly-prepared solutions of the crystals have a lower rotatory power than melibiose which has been deprived of its water of crystallisation. The solutions ultimately reach a polarisation about 1·926 times that of sucrose. Acids and alkalis produce the final polarisation at once. Basic acetate of lead diminishes the polarisation without producing any precipitate. On the careful addition of potassium sulphate to this solution, the melibiose is almost completely precipitated.

At ordinary temperatures water dissolves about double its own weight, as with cane sugar, but the solubility increases more rapidly with rise of temperature, so that at 75° C., melibiose dissolves in all proportions, and at this temperature it melts in its water of crystallisation. 95 per cent. alcohol at 15° C. dissolves 2—2·4 per cent., 33 per cent. alcohol 5—6 times as much.

Melibiose has only one-third to one-fourth the sweetness of cane sugar.—L. J. de W.

Starch; Hydrolysis of ——, *by Acids.* G. W. Rolfe and H. W. Geromanos. J. Amer. Chem. Soc., 1903, **25**, [10], 1003—1011.

The authors refer to a paper by Rolfe and Defren published in 1896 (this Journal, 1897, 167), in which it was concluded, from a large number of analyses of acid-hydrolysed starch products, that a constant relation exists between the optical rotation and the cupric reducing power of such products, independent of the conditions of hydrolysis, *i.e.*, that products of the same rotation had the same reducing power and were identical in composition. These numbers have now been re-calculated, and are given again, together with further, more recent determinations. The present results are calculated on a basis of absolute values for dissolved solids, corrected for the mineral matters present; a slight change has been made in the optical values in accordance with the definition of the Landolt standard D ray. The results of the specific rotation and reducing power K are expressed graphically in the form of a curve. This shows that the reducing values do not lie on a straight line, as they should do if dextrose were the only sugar present, and the authors are thus led to suspect that maltose is also produced in the hydrolysis of starch by acids.—J. F. B.

Starch Products; Presence of Maltose in Acid-Hydrolysed ——. G. W. Rolfe and I. T. Haddock. J. Amer. Chem. Soc., 1903, **25**, [10], 1015—1019.

A series of alcoholic fractional precipitations was made with a commercial glucose prepared by hydrolysis with hydrochloric acid, under a pressure of two atmospheres. This sample had the constants $[\alpha]_D = 126{\cdot}5°$ and $K = 0{\cdot}575$, nearly corresponding, according to the authors' table, with the point for maximum maltose-content. The determination of the constants of the various fractions (precipitates and filtrates) showed in general a relationship between the optical rotation and cupric reducing power in practical agreement with that noticed in the case of the homogeneous acid-hydrolysed products. A special investigation was made of the alcoholic filtrates, in order to determine the actual presence of maltose. The results showed definitely the presence of this sugar, together with dextrose, two distinct osazones being isolated, one of them being glucosazone and the other having the solubility and the crystalline form of maltosazone.—J. F. B.

Foodstuffs; Application of Yeast in the Analysis of [Determination of Carbohydrates in] ——. E. Prior. XXIII., page 1260.

English Patent.

Evaporating Liquids [Sugar Solutions]; Apparatus for ——. G. Stade, Grosswusterwitz, Germany. Eng. Pat. 1298, Jan. 19, 1903.

The evaporator is provided with one or more annular heating bodies or elements, the bottoms of which are conical or otherwise inclined, the bottom of each being connected to the central cylindrical part on a plane which is also inclined. With this arrangement the condensed steam gravitates to the lowest part of each element, where provision is made for its withdrawal. The heating elements are also formed with oblique heating tubes, and the lowest element is fixed to the lower end of the central circulating tube, which can be elongated or the reverse by telescopic adjustment. Air, or any gases carried over by the steam, can be discharged from the heating elements through pipes provided for that purpose.—R. A.

Erratum.—This Journal, 1903, page 876, col. 2, line 5 from top, add after "Eng. Pat." the number "9078."

United States Patents.

Sugar Making; Process of ——. M. H. Miller, Assignor to D. Huether, A. H. Hough, A. McNeill, and R. M. Fisher, Wiarton, Canada. U.S. Pats. 741,689 and 742,127, Oct. 20, 1903.

See Eng. Pat. 14,182 of 1903; this Journal, 1903, 1142.
—T. F. B.

Starch; Process of Making Soluble ——. C. H. Meyer, Assignor to L. Blumer, Zwickau. U.S. Pat. 742,469, Oct. 27, 1903.

See Fr. Pat. 332,206 of 1902; this Journal, 1903, 310.
—T. F. B.

Adhesives; Process of Making —— *[from Starch]*. C. D. Ekman, Northfleet. U.S. Pat. 742,174, Oct. 27, 1903.

See Eng. Pat. 8331 of 1901; this Journal, 1902, 358.
—T. F. B.

French Patents.

Grains [Sugar]; Process for the Total Conversion of a Massecuite into ——. A. Ollier. First Addition, dated May 5, 1903, to Fr. Pat. 307,640, Jan. 30, 1901.

This process depends on the fact that for a massecuite of sugar, there exists a degree of concentration such, that when the masse passes from a low vacuum to a high vacuum, it will, under the action of a rational malaxing and without the aid of external heat, give up the whole of its water by evaporation. Knowing the initial and final degrees of vacuum, this degree of concentration can be calculated. The form of malaxeur with a vertical axis described in the original specification, or any other form, may be employed, and a description is given of a horizontal cylindrical modification traversed by a rotatable axle fitted with arms.—T. H. P.

Sugar Juices; Apparatus for Purifying ——. J. W. de Castro. Fr. Pat. 332,677, June 2, 1903.

See U.S. Pat. 729,920 of 1903; this Journal, 1903, 811.
—T. F. B.

Evaporation of Solutions, Saline or Saccharine; Recovery of Matters mechanically removed by the Steam during the ——. Soc. Xhignesse and A. Macherez. Fr. Pat. 332,663, May 30, 1903. VII., page 1243.

XVII.—BREWING, WINES, SPIRITS, Etc.

Wort and Beer in the Fermentation Tuns; Biological Control of ——. M. Wahl. Woch. f. Brau., 1903, **20**, [41], 522—524.

The freedom or otherwise from infection of the wort and fermenting beer in the course of its passage through the brewery may be advantageously checked by adopting a scheme of microscopic examination of droplet cultures, prepared from samples taken at all the various stages. About 24 droplet cultures should be prepared from each sample, and the nature of the predominant colonies which develop in each and the number of infected droplets should be noted. The remainder of the sample may be kept on the forcing tray, and the time which elapses before a cloudiness or a film is developed, observed. The organisms may be roughly classified as culture yeasts, wild yeasts, mycodermae, and bacteria. When only a few foreign organisms are noticed in some of the droplets, without constituting an appreciable proportion of the total cells present, the test is noted as passably pure.

The author gives examples of a good series and an unsatisfactory series of samples, both worts having left the cooling apparatus in a sterile condition. The infection of the second series took place on entering the pitching vessel, the suppression of the wild yeast infection and the increase of the mycoderma and bacteria infections are clearly illustrated by the results of the examination of further samples taken after pitching, after one day in the fermentation tun, and subsequently after 6, 9, and 11 days' fermentation, the beer being casked on the eleventh day. The sample of beer last taken, developed a strong film after seven days on the forcing tray, whereas the corresponding sample from the good series kept well for three weeks. This method affords a ready means of tracing any sources of nfection which may be suspected owing to uncleanliness of any portion of the plant.—J. F. B.

Yeast ; Application of ——, in the Analysis of Foodstuffs. E. Prior. XXIII., page 1260.

Fusel Oil [Isoamyl Alcohol] in Rectified Spirits ; Quantitative Determination of ——, by means of Salicylic Aldehyde. A. Komarowsky. XXIII., page 1259.

French Patents.

Grain ; Process of Softening ——. V. Lapp. Fr. Pat. 332,448, May 28, 1903.

See Eng. Pat. 11,749 of 1903 ; this Journal, 1903, 1144.
—T. F. B.

Beer ; Manufacture of a Non-Alcoholic ——. V. Lapp. Fr. Pat. 332,403, May 26, 1903

See Eng. Pat. 11,223 of 1903 ; this Journal, 1903, 921.
—T. F. B.

Alcohol ; Apparatus for the Continuous Rectification of ——. E. A. Barbet. Twelfth Addition, dated April 1, 1903, to Fr. Pat. 296,750, Feb. 1, 1900. (See also this Journal, 1903, 164, 434, 815, and 923.)

A simplified apparatus is described which has only one heating arrangement at the base of the apparatus, and only ne exit for the residuary spent liquors. It also avoids the objection, present in the earlier forms, that all the alcoholic apours of the phlegms or wines are obliged to be scrubbed hrough plates on which the fusel oils are at a maximum degree of concentration and contamination.—J. F. B.

Distillation and Continuous Rectification ; Revolving Apparatus for ——. J. G. A. Appé. Fr. Pat. 332,670, June 2, 1903.

The apparatus consists of a steam heater, inside the dome f which is coiled an open spiral trough, wound conically rom the centre downwards. This does not completely fill he dome, so that it leaves a narrow annular channel etween the outside of the spiral and the inside of the eam heater. The various convolutions of the spiral rough are tightly cemented together. A socket in the ome of the steam heater supports two concentric hollow hafts, around which three chambers are arranged. The nner chamber communicates with the open spiral trough, hich serves as heater for the liquid to be distilled, which run into its centre through a pipe leading from the outde of the apparatus, the inflow of liquid being regulated y a cock. The inner chamber is surrounded by the second nd third chambers, which leave a narrow annular space etween each other. Inside the top of the inner chamber placed a hollow Archimedean screw, through which the ot vapours from the top of the inner chamber flow downards, a current of cold liquid being simultaneously rculated round the screw in the opposite direction, the quid serving as cooler, and being thereby preheated.

The apparatus works as follows :—The water in the steam ater is boiled, and heats the liquid run into the socket in e centre of the open spiral heater. The liquid rises rough the central shafts, becomes warmed by circulating ound the Archimedean screw, and rises to the top of the ner chamber. It is now at such a temperature that the hers and light alcohols are volatilised, and these pass into e space between the second and third chambers, where ey condense, and the liquid produced is drawn off at the ttom. The heated liquid returns from the top of the ner chamber, through the other hollow shaft, to the centre the open spiral trough, and flows in this from the centre the circumference, being heated in its passage by the steam given off from the steam heater, which flows over it in the opposite direction. The open trough therefore acts as a dephlegmator, and all the alcohol is boiled off. Any water remaining, falls into the steam heater from the end of the spiral trough. The alcoholic vapours rise to the top of the inner chamber, and enter the Archimedean screw, through which they flow from the top downwards. They are here cooled by the current of liquid circulating round the screw, and fractional condensation takes place. At various parts of the circumference of the Archimedean screw are holes communicating through pipes with a distributor, and the various fractions of the distillate are thus separated and drawn off.—L. F. G.

Alcohol ; Process for Denaturing ——. Soc. Verrieux père et fils. Fr. Pat. 332,620, May 29, 1903.

The denaturing agent is composed of a mixture of the essential oils of turpentine, 1,500 c.c. ; thyme, 100 c.c. ; rosemary, 100 c.c. ; and spike, 100 c.c. The mixture is added in the proportion of 1,800 c.c. to 98·2 litres of alcohol.—J. F. B.

XVIII.—FOODS ; SANITATION ; WATER PURIFICATION, & DISINFECTANTS

(A.)—FOODS.

Cheese-Ripening ; Rennet Enzyme as a Factor in ——. L. L. van Slyke, H. A. Harding, and E. B. Hart. New York Agric. Exp. Stat., Bull., 1903, [233], 67—96.

Experiments were carried out for the purpose of ascertaining to what extent the formation of soluble nitrogen compounds in cheese-ripening is due to the rennet extract used in cheese-making. Where necessary, all milk enzymes were destroyed by heating the milk, and other organisms were rendered inactive by the addition of chloroform. Acid, when desired to be present, was added in the form of pure lactic acid The action of rennet extract in cheese was studied by comparison with commercial pepsin. They were found to act essentially alike in forming soluble nitrogen compounds when compared with each other in the case of milk, cheese, and paracasein dilactate. The products formed by both consisted mainly of paranuclein, caseoses, and peptones, with small amounts of amines, and no ammonia. In every experiment made, the presence of acid was necessary for action to take place. Rennet enzyme is stated to be really a peptic ferment. Its action does not appear to extend to the formation of compounds that produce the flavour of cheese.—W. P. S.

Cheese-Curing at Different Temperatures. L. L. van Slyke, G. A. Smith, and E. B. Hart. New York Agric. Exp. Stat., Bull., 1903, [234], 97—121.

Cheese cured at 40° F. was superior in quality to the same kind cured at higher temperatures. The difference in quality was confined, in most cases, to flavour and texture, the colour and finish undergoing little or no change. Covering the cheese with solid paraffin also improved its quality, and, by preventing loss of moisture, led to a larger yield of finished product. The amount of water-soluble nitrogenous compounds, such as caseoses, peptones, amines, and ammonia, was found to increase with the age of the cheese and with the temperature at which it was cured.
-W. P. S.

Cheese-Ripening ; Conditions Affecting Chemical Changes in ——. L. L. van Slyke and E. B. Hart. New York Agric. Exp. Stat., Bull., 1903, [236], 133—163.

The following are some of the more prominent conditions which influence the chemical changes taking place in cheese during the ripening process :—

Time.—The soluble nitrogenous compounds increase as the cheese ages ; about two-thirds are formed during the first three months, and over 90 per cent. in the first nine months of an 18-month period of ripening.

Temperature.—Soluble nitrogenous compounds slowly increase in proportion to increase of temperature. Amino compounds and ammonia are more abundantly formed at higher temperatures.

Moisture.—A cheese containing more moisture generally contains larger amounts of soluble nitrogenous compounds.

Size.—Ripening takes place more quickly in large than in small cheeses.

Salt.—Increasing quantities of salt retard ripening.

Different Amounts of Rennet.—Larger quantities of soluble nitrogenous compounds, such as paranuclein, caseoses, and peptones, are produced in a given time, in the presence of increasing amounts of rennet extract.

Acidity. — Although a certain amount of acidity is necessary for ripening to take place, the exact relation of acidity to ripening has not been determined.

Influence of Products of Proteolysis. — The accumulation of soluble nitrogenous compounds in cheese appears to diminish the action of the agents causing the changes, so that the cheese ripens less rapidly after the first period.

High temperatures in cheese-ripening favour the production of a crumbly, dry, mealy texture, and also the formation of holes. Excessive moisture with a moderate temperature, results in a pasty, soft cheese. Excessive use of rennet also produces a pasty texture. Large amounts of salt, or excess of acid, cause dryness, harshness, and hardness. These latter faults may be overcome, to some extent, by storing the cheese for a long time in a moist atmosphere, at a temperature between 40° and 50° F. —W. P. S.

Cheddar Cheese; The Rôle of the Lactic Acid Bacteria in the Manufacture and in the Early Stages of Ripening of ——. H. A. Harding. New York Agric. Exp. Stat., Bull., 1903, [237], 165—180.

The lactic acid bacteria which are always present in factory milk check the growth of other forms by breaking up the sugar into acid, chiefly lactic acid. They finally make up more than 90 per cent. of the total number of bacteria present in the milk and cheese. The acid produced by these bacteria hastens the curdling action of the rennet, and combines with paracasein to form at least two different compounds—paracasein monolactate and paracasein dilactate. The former compound is found in large quantities. This formation is necessary for the activity of the rennet pepsin. It is shown that all the observed changes, up to the point where the digestion by the rennet ceases, are either the direct result of the action of these bacteria or are largely influenced by bacterial action.—W. P. S.

Milk; Determination of Formaldehyde in ——. B. H. Smith. XXIII., page 1260.

Foodstuffs; Application of Yeast in the Analysis of ——. E. Prior. XXIII., page 1260.

English Patents.

Proteids from Non-Nitrogenous Bodies; Process of Separating ——. J. Carstairs and The Allrich Guano Co., Ltd. Eng. Pat. 7776, April 3, 1903. XV., page 1251.

Bran or other Material Produced from the Skins or Fibrous Tissues of Wheat and other Cereals; Conditioning or Improving the Quality and Colour of ——. E. Cooper and J. Westgate, Liverpool. Eng. Pat. 8091, April 7, 1903.

A regulated supply of an oxidising, bleaching, or sterilising gas, *e.g.*, sulphur dioxide or chlorine, is made to act upon the material in a conveyor or other apparatus, so that each particle receives the same amount of treatment. —C. A. M.

United States Patent.

Milk; Process for Making Dry Condensed ——. H. S. Hopkins Bainbridge, N.Y., Assignor to Casein Co. of America, N.J. U.S. Pat. 742,322, Oct. 27, 1903.

Skimmed milk is reduced to a dry or powdered state, and is then mixed with a suitable percentage of butter-fat from which the casein and other foreign substances have been removed by heating and aeration.—W. P. S.

(B.)—SANITATION; WATER PURIFICATION.

English Patents.

Fatty Matters and the like from Liquid or Semi Liquid Material [Sewage Sludge, &c.]; Process for the Extraction and Recovery of ——. J. Garfield. Eng. Pat. 25,876, Nov. 25, 1902. XII., page 1249.

Waters; Process for the Sterilisation and Purification of Potable and Residuary ——. M. Duyk, Ixelles, Brussels. Eng. Pat. 15,425, July 11, 1903. Under Internat. Conv., July 11, 1902.

See Fr. Pat. 328,304 of 1903; this Journal, 1903, 960. —T. F. B

United States Patents.

Garbage; Process of Treating ——. E. S. Peck, Newburg, Ohio. U.S. Pats. 742,224 and 742,225, Oct. 27, 1903.

The garbage is cooked in an air-tight receptacle by means of radiated and direct heat Water and volatile matters are removed from the receptacle through an exhaust pipe. After passing a heated gas through the cooked garbage, the latter is withdrawn, and compressed to remove the remaining liquid portion. The oleaginous matter is extracted from this liquid, which is then re-mixed with the residue and the mixture dried. The expressed liquid, obtained from cooked garbage according to the process just described, is evaporated to "stick," which is then added to the pressed residue and the resulting product dried.—W. P. S.

Garbage; Process for Treating ——. E. S. Peck and W. M. Scott, both of Newburg, Ohio. U.S. Pat. 742,226, Oct. 27, 1903.

The process consists in cooking raw garbage with the expressed liquid from tank residues (see U.S. Pat. 742,224, above) in an air-tight receptacle. The volatile matters are drawn off by an exhaust pipe, and the residue removed from the receptacle, compressed and dried.—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

United States Patent.

Pyroxylin Compound. R. C. Schüpphaus. Brooklyn, N.Y. U.S. Pat. 741,554, Oct. 13, 1903.

Soluble pyroxylin is gelatinised by treatment with a solvent and one of the following compound ethers:—methyl-isobutyl ether, ethyl-isobutyl ether, methyl-isoamyl ether, ethyl-isoamyl ether. "Pyroxylin compositions" are also prepared by mixing pyroxylin with one or more of the following compound ethers:—ethyl-isobutyl ether, ethyl-isoamyl ether, ethyl-isopropyl ether, propyl-amyl ether, propyl-butyl ether, butyl-amyl ether.—T. F. B.

French Patents.

Nitrocellulose and its Compounds; Process for Diminishing or Preventing the Inflammability of ——. P. Noguès and H. M. Proveux. Fr. Pat. 328,051, Aug. 9, 1902.

Nitrocellulose is treated with an aluminium salt (preferably the acetate). When the resulting compound is incorporated with camphor, a non-inflammable, celluloid-like substance is obtained, to which the name *apiroid* is given.—T. F. B.

Nitrocellulose and its Compounds; Process for Diminishing or Preventing the Inflammability of ——. P. Nogues and H. M. Proveux. First and Second Additions, dated Aug. 30, 1902, and Feb. 25, 1903, respectively, to Fr. Pat. 328,054, Aug. 9, 1902.

Pure alumina, especially in alcoholic solution, is substituted for the aluminium salt of the principal patent (see preceding). The second addition claims the addition of barium chloride (10 to 20 per cent. of the total weight) to the mixture of nitrocellulose and alumina. This is said to facilitate mixing.—T. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

ilopyrine and Phenylmethylanilinopyrazole. A. Michaelis and E. Hepner. Ber., 1903, **36**, [13], 3271—3279.

E authors have found that the bodies, described as imino-rine and anilopyrine, obtained by Michaelis and Gunkel is Journal, 1901, 502) by heating the chloride of anti-ine with ammonium carbonate and aniline respectively, re wrongly named. They differ from the true bodies of se names by containing CH_2 less, and are correctly cribed as 1-*phenyl-3-methyl-5-aminopyrazole* and 1-*nyl-3-methyl-5-anilinopyrazole.* It is inferred that the e imino- and anilo-pyrine are first produced, but that se are decomposed at the temperature of the reaction, h elimination of CH_2 in the form of methyl chloride. en the methyl iodides of these two amino-pyrazoles are ated with caustic soda, they are converted into the imino-azoles, *i.e.*, *iminopyrine* and *anilopyrine* respectively. aversely anilo-pyrine is converted into the corresponding uilinopyrazole by heating with ammonium chloride. ilopyrine has a strong basic reaction, and combines dily with methyl iodide.—J. F. B.

1-*Phenyl-2.3-dimethyl-5-iminopyrine.* F. Stolz. Ber., 1903, **36**, [13], 3279—3290.

E above body, termed for brevity *iminopyrine*, is obtained heating antipyrine chloride with aqueous ammonia at ° C.; the reaction proceeds, however, slowly at the inary temperature. Iminopyrine is a strong secondary e which absorbs carbon dioxide from the air, forming a ple carbonate. The hydrogen of the imino group may replaced by alkyl or acyl groups. The alkyl derivatives y be prepared by treating antipyrine chloride with alkyl nes. The acyl derivatives are generally strongly basic. responding iminopyrines may be prepared by treating chlorides of substituted antipyrines with ammonia.

—J. F. B.

chonicine; New Isomerisation of ——. Z. H. Skraup and W. Egerer. XXIV., page 1262.

risticin; Constitution of ——. H. Thoms. Ber., 1903, **36**, [13], 3446—3451.

W. Semmler attributed to myristicin, which he isolated n mace oil in 1890, the constitution of a (1)-butenyl 4)-methylenedioxy-(5)-methoxybenzene. Subsequent estigation, however, inclined him to substitute an allyl up for the butenyl nucleus in the myristicin molecule. he author has confirmed the presence of the allyl group nyristicin, which may therefore be represented by the nula—

$$C_6H_2.(CH_2.CH:CH_2)(1).O_2CH_2(3.4).OCH_3(5).$$

prolonged heating in alcoholic solution with alcoholic ash, myristicin was converted into isomyristicin, m. pt. —45° C., which has the constitution of a (1)-propenyl-methylenedioxy-5-methoxybenzene—

$$C_6H_2.(CH:CH.CH_3)(1).O_2CH_2(3.4).OCH_3(5).$$

—J. O. B.

rsley Oil, French; The Phenol Esters of [Presence of Iyristicin in ——]. H. Thoms. Ber., 1903, **36**, [13], 451—3456.

ol is easily obtained from German parsley oil by ling, when it readily crystallises out. With French sley oil, however, separation by this means is not easy, e the oil frequently fails to show any signs of stallisation at low temperatures. The author finds that difference is due to the presence of a large amount of isticin—

$$C_6H_2.C_3H_5(1).O_2CH_2(3.4)OCH_3(5),$$

ompanied by a relatively small quantity of apiol—

$$C_6H.C_3H_5(1).OCH_3(2).O_2CH_2(3.4)OCH_3(5),$$

rench parsley oil, whilst in the oil of German parsley, l is in preponderance.

he French parsley oil examined had the sp. gr. 1·017, the $[\alpha]_D = -5·7°$. Treatment with sodium carbonate removed 0·0804 per cent. of an acid, m. pt. 62° C., which was probably palmitic acid. Caustic potash solution removed 0·0516 per cent. of a substance resembling cresol in odour, which was probably a mixture of several phenols. The oil was then fractionated, below 160° C. at normal pressure: above that temperature, under reduced pressure. Under these conditions 300 grms. of the oil gave 70 grms. boiling between 158°—160° C. under 760 mm. pressure; 40 grms. under 17 mm. at 153° C.; 58 grms. under 17 mm. at 153°—157° C.; 40 grms. under 17 mm. at 158°—170° C.; 14 grms. under 2 mm. at 153°—160° C.; and 15 grms. under 1·4 mm. at 160°—180° C. The higher boiling fractions were found to be poorer in hydrocarbons, but richer in methoxyl, than those obtained at lower temperatures. The larger high boiling fractions approach more and more nearly without, however, exactly attaining the constitution of apiol. The first fraction was proved to consist mainly of pinene, identified by its optical rotation, and the formation of the nitrosochloride melting at 105° C. From its bromo-derivatives, and its methoxyl content, the third or major fraction was found to consist chiefly of myristicin, which was converted into isomyristicin by treating a portion of the fraction with alcoholic potash. The isomyristicin thus obtained, m. pt. 44°—45° C., was proved to be identical with that derived from mace oil. The presence of myristicin in French parsley oil thus demonstrated, accounts for the formation of myristicinic acid on oxidation, as shown by Bignani and Testoni, who probably worked with parsley oil of French origin. The last fraction, when "sown" with a crystal of apiol, gave a crop of crystals of that body.

—J. O. B.

Phaseolunatin, the Cyanogenetic Glucoside of Phaseolus lunatus. W. R. Dunstan and T. A. Henry. Proc. Roy. Soc., 1903, **72**, 285—294. (See this Journal, 1903, 1207.)

Phaseolunatin, which is not contained in the seeds of the cultivated plant, but only in those of the semi-cultivated and wild plants, was found to have the composition $C_{10}H_{17}O_6N$, and to be the dextrose ether of acetone cyanhydrin. It has an optical rotation, $[\alpha]_D = -26·2°$. On hydrolysis with acids, it decomposes according to the equation—

$$C_{10}H_{17}O_6N + H_2O = \underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Acetone.}}{(CH_3)_2CO} + HCN.$$

When phaseolunatin is heated with an aqueous solution of alkali, ammonia and a new acid glucoside, *phaseolunatinic acid*, which is the dextrose ether of α-hydroxyisobutyric acid, are formed—

$$(CH_3)_2C(CN)O.C_6H_{11}O_5 + 2H_2O =$$
$$(CH_3)_2C(COOH).O.C_6H_{11}O_5 + NH_3.$$

The latter undergoes hydrolysis by acids according to the equation—

$$(CH_3)_2C(COOH)O.C_6H_{11}O_5 + H_2O =$$
$$(CH_3)_2C(COOH).OH + C_6H_{12}O_6.$$

—A. S.

Larixinic Acid; Identity of ——, *with Maltol.* A. Peratoner and A. Tamburello. Ber., 1903, **36**, [13], 3407—3410.

The authors show that the substance isolated in 1861 from the bark of the larch by Stenhouse, and termed by him larixinic acid, is identical with the maltol isolated by Brand (see this Journal, 1894, 1215) and by Kiliani and Bazlen (see this Journal, 1895, 378) from roasted malt, and afterwards shown by Feuerstein (this Journal, 1901, 826) to exist in the needles of the white fir.—T. H. P.

Cinnamomum Pedatinervium of Fiji; The Constituents of the Volatile Oil of the Bark of ——. E. Goulding. Proc. Chem. Soc., 1903, **19**, [270], 201.

On distillation with steam, this bark yields nearly 1 per cent. of a volatile oil which is almost colourless when first distilled, but gradually assumes a yellowish-brown colour. It has a sweet aromatic odour, a pungent spicy taste, sp. gr. 0·964 at 15°/15°, $[\alpha]_D = -4·96$ and $n_D = 1·4963$. Its chief constituents are: a *terpene*, $C_{10}H_{16}$, having a sp. gr. of 0·8659 at 15°/15°, $[\alpha]_D = -17·72°$; linalool; safrol; and eugenol. Approximately the proportions are as follows:—terpene, 15—20 per cent.; alcohols, 30 per cent.; esters, 1·5 per cent.; safrol, 40—50 per cent.; eugenol, 1 per cent.; and apparently about 3 per cent. of eugenol methyl ether.

Bismuth; Colorimetric Determination of ——. P. Plânes. XXIII., page 1259.

Formaldehyde; Comparative Study of Methods of Determining ——. B. H. Smith. XXIII., page 1260.

Malonic Acid and its Salts; Determination of ——, *by Potassium Permanganate.* E. Durand. XXIII., page 1260.

English Patent.

Saccharin; Manufacture of ——. B. J. B. Mills, London. From H. Barbier, Lyon-Monplaisir, France. Eng. Pat. 9322, April 24, 1903.

o-Toluene sulphonamide is converted into saccharin by electrolytic oxidation in presence of permanganate. A solution of potassium permanganate and caustic alkali is placed in the anode compartment of the cell, and heated to 40—50° C. A solution of *o*-toluene sulphonamide, also mixed with caustic alkali, is then added in successive portions to the permanganate solution, "a current of 300 ampères below 2 volts" being maintained. The addition of the amide solution is so regulated that the permanganate is regenerated by the action of the current as fast as it is reduced, the proportion of permanganate used being only one-sixth of that necessary to effect the oxidation unaided.—J. F. B.

United States Patents.

Glycerin and Acidylated Derivatives of Aromatic Bases; Process of Producing ——, *and the Product thereof.* O. Liebrich. U.S. Pat. 741,585, Oct. 13, 1903. XII., page 1250.

Acetic Acid; Process of Making ——. J. G. Behrens and A. Behrens, jun., Bremen. U.S. Pat. 741,615, Oct. 20, 1903.

See Eng. Pat. 22,096 of 1902; this Journal, 1903, 110.
—T. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

English Patents.

Photographic Emulsions; Manufacture and Production of Sensitive ——. H. E. Newton, London. From The Farbenfabr. vorm. F. Bayer and Co, Elberfeld. Eng. Pat. 25,821, Nov. 24, 1902.

See Fr. Pat. 326,468 of 1902; this Journal, 1903, 820.
—T. F. B.

Photographs in Natural Colours on Paper, according to the Three-Colours Process; Process for the Manufacture of Unfading ——. W. Reichel, Hamburg-Uhlenhorst. Eng. Pat. 6356, March 19, 1903.

Three prints are made from the negative on a silver chloride paper containing also strontium or magnesium chloride.

A yellow print is obtained by bleaching one of the above prints in a solution of potassium ferricyanide (1 part) and a soluble lead salt (*e.g.*, the acetate, 1·5 parts). The print is washed in dilute acid and immersed in a solution which will give a yellow precipitate with lead ferricyanide (*e.g.*, chromate or vanadate); 0·6 part of potassium chromate may be used.

The red print is made by immersing a second positive in a solution of gold thiocyanate (1 part), sodium iodide (1·2 parts), and potassium carbonate (2 parts). The blue print is prepared by treating the third positive with a slightly acid solution of ferric chloride (1 part) and potassium ferricyanide (1·65 parts).

The three prints are transferred successively to a waxed glass plate, from which the complete photograph is transferred to paper or any other support.—T. F. B.

United States Patent.

Photographic Plate, and Process of Making same. A. Eichengrün, Elberfeld, and J. Precht, Hanover, Assignors to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 742,405, Oct. 27, 1903.

See Eng. Pat. 22,727 of 1901; this Journal, 1902, 1411.
—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Phosphorus; Schenck's Scarlet ——, *and its Application in the Manufacture of Matches.* Marquart. Zeits. Electrochem., 1903, **9**, 892. (See this Journal, 1902, 568; 1903, 494.)

The bright red or scarlet modification of phosphorus is readily formed in the presence of solvents which act at the same time as catalysers. The most suitable solvent is phosphorus tribromide. The scarlet phosphorus carries down with it some of the solvent and other foreign substances, and, if sulphides of phosphorus be present, the product obtained appears to be identical with the so-called red phosphorus sulphides of Berzelius. The product is converted by ammonia into a black substance, which, however, again changes to red phosphorus when boiled with water or acid. With alcoholic potash a dark red solution is obtained, just as in the case of white phosphorus. Scarlet phosphorus, which is perfectly non-poisonous, is stated to form an efficient substitute for white phosphorus in the production of "strike-anywhere" matches (see Eng. Pat. 11,503 of 1902; this Journal, 1903, 760). The author points out that nearly all the so-called compounds of phosphorus which have been proposed as substitutes for white phosphorus will answer the usual tests for the latter substance.—A. S.

Phosphorus Sesquisulphide; Further Experiments with ——. E. G. Clayton. Proc. Chem. Soc., 1903, **19**, [270], 231—234.

In a previous communication (this Journal, 1902, 1042 it was shown that commercial phosphorus sesquisulphide of good quality had been found to give no reaction with Mitscherlich's test. With the object of studying under what conditions oxidation, or a similar change, is promoted, and whether, by keeping, this compound acquires the property of yielding a luminous vapour when distilled with dilute sulphuric acid, the author has exposed specimens, which had previously given negative results, for various periods under different conditions, the products being then subjected to Mitscherlich's test.

From the results of his experiments, it is evident that good commercial phosphorus sesquisulphide undergoes little change if preserved in air of average dryness in nearly filled, well-closed vessels, but that the progress of the oxidation is appreciable in a damp atmosphere or in imperfectly closed vessels; this action takes place particularly rapidly in air saturated with moisture, and perhaps to the greatest extent in the presence of acid vapours, especially such as nitrogen peroxide.

Comparative experiments were made with yellow phosphorus, from which a luminous vapour passed over almost as soon as distillation began. With phosphorus sesquisulphide, on the other hand, the phosphorescence in most cases was seen only after the pressure had been diminished by the removal of the lamp, and after a considerable proportion of the liquid had distilled over. The author's experiments confirm J. Mai and F. Schaffer's observation (this Journal, 1903, 511) that the glow differs from that of yellow phosphorus.

XXIII.—ANALYTICAL CHEMISTRY.

INORGANIC—QUANTITATIVE.

Argon in the Atmosphere; Results of Determination of ——. H. Moissan. Comptes rend., 1903, **137**, [16] 600—606.

The amounts of argon found varied between 0·9318 and 0·9492 per cent., both these limits being found in the air from above the Atlantic Ocean. Other results were:—

London, 0·9325 per cent.; Paris, 0·9319 and 0·9337 per cent.; Berlin, 0·9323 per cent.; the top of Mont Blanc, 0·9327 and 0·9352 per cent.—T. F. B.

Boric Acid on Iodides; Action of ——, and its use for Separating Iodides from Bromides and Chlorides. H. Baubigny and P. Rivals. Comptes rend., 1903, **137**, [17], 650—653.

Pure boric acid liberates hydriodic acid from iodide solutions in the cold, while it only decomposes hot, saturated solutions of bromides and chlorides. These facts are applied to the separation of iodine from a mixture of halogen salts as follows:—100 c.c. of the salt solution are heated with 10 grms. of boric acid and 0·2—0·4 grm. of the paste ("Mn_2O_4, H_2O") formed by reducing a solution of a permanganate with alcohol, washing the precipitate, and drying at 30°—40° C. The iodine is collected in a solution of alkali, containing a small quantity of sodium sulphite (to decompose any hypoiodite present), and the iodine estimated as silver iodide.—T. F. B.

Carbon Dioxide in the Presence of Chlorine: Determination of ——. C. Offerhaus. Zeits. angew. Chem., 1903, **16**, [43], 1033—1034.

As electrolytic chlorine always contains carbon dioxide, sometimes as much as 5 per cent., the following methods are described for determining the latter:—The mixed gases were stored in a glass gasometer, and were led through concentrated sulphuric acid before passing into the Bunte's burettes in which the analyses were carried out.

1. A known volume of the gas was treated in a burette with potassium iodide solution and the liberated iodine titrated as usual, the necessary corrections for temperature and pressure being made. In a second burette, the chlorine and carbon dioxide were both absorbed by N/5 sodium hydroxide solution. On measuring the unabsorbed residue, the volume of the chlorine and carbon dioxide together was obtained, the carbon dioxide being then found by difference. Allowance was made for the fact that the residue of gas was measured when moist.

2. The carbon dioxide and chlorine were absorbed in a burette by exactly 45 c.c. of a N/5 sodium hydroxide solution, the amount of carbonate in which had been previously determined. The alkaline solution was then shaken with 5 to 10 c.c. of 3 per cent. hydrogen peroxide solution, to convert the hypochlorite into chloride ($NaOCl + H_2O_2 = NaCl + H_2O + O_2$). After making the solution up to a known volume with water free from carbon dioxide, the amount of carbonate in it was determined.

The author states that chlorine cannot be determined by absorbing the gas in sodium hydroxide solution and titrating the hypochlorite formed, as some chlorate is always produced, even when dilute sodium hydroxide solution is employed.—W. P. S.

Persulphates; Oxidation of Organic Substances by ——, in Acid Solutions [Determination of Halogens]. M. Dittrich. Ber., 1903, **36**, [13], 3385—3387.

Besides complex cyanides (this Journal, 1903, 883), many other organic substances, especially of the aliphatic series, are destroyed by ammonium persulphate, leaving any metals they contain in a form suitable for analytical determination; aromatic compounds react less easily. In particular, many compounds containing halogens, both aliphatic and aromatic derivatives, are destroyed by persulphate in acid solution when heated, evolving the halogen; and if silver nitrate be added to the solution before reaction, the whole of the halogen is retained as silver compound, and can be accurately determined. The method is being further worked out.—J. T. D.

Gold in very Dilute Aurocyanide Solutions; Rapid Method of Determining ——. James Moir. J. Chem. and Metallurg. Soc. of South Africa, Sept. 1903.

The present method of determining gold in working cyanide solutions by evaporation and fire-assay is too slow for practical use; even the precipitation methods which have been introduced in order to hasten the process, require two hours for completion. The following process takes only about 20 minutes, and is as accurate as the fire-assay if worked with equal care.

100 c.c. of the solution are boiled for two minutes with about 1 grm. of sodium peroxide, to destroy cyanides. Next, two drops of 10 per cent. lead acetate solution are added, and about 0·2 grm. of aluminium powder is stirred in. Metallic lead is thus precipitated, and the gold is also extracted by the galvanic action. The whole is filtered when the aluminium has dissolved (the filtrate being free from cyanide as well as gold). The black precipitate is dissolved in 10 c.c. of boiling 60 per cent. *aqua regia*, and treated carefully with stannous chloride solution until the yellow colour is bleached, whereupon the purple tint (purple of Cassius) develops, and is constant after a minute. It is then compared with a set of artificial standards, after making the liquid up to 15 c.c. in a tube of fixed diameter. The standard tubes are filled with a permanent imitation of "purple of Cassius," made by mixing copper and cobalt salts in the required proportion. They are standardised empirically. The shade is easily visible with solutions carrying 1 part of gold per million, and by looking down the tubes (as in Nesslerising), 2 grains per ton (1 in seven millions) can be detected. Of course, even less than this can be recognised, if more than 100 c.c. of solution be used at the beginning.

The *rationale* of the process is to make the stannous chloride test (1) available for aurocyanides, (2) sufficiently sensitive, (3) independent of the customary impurities, such as zinc ferrocyanide.

If sodium peroxide be not obtainable, a 30 per cent. solution of sodium hydroxide, containing 0·1 per cent. of lead oxide, is made. 10 c.c. of this are added to 100 c.c. of the solution, and boiled for five minutes, since the destruction of cyanide by hydrolysis and reduction is slower. Part of the cyanide is reduced to methylamine. The rest of the process is the same.

Gold in Cyanide Solutions; Colorimetric Determination of ——. H. R. Cassel. Eng. and Mining J., 1903, **76**, 661.

The author finds that the "purple of Cassius" test can be used for the colorimetric determination of gold in cyanide solutions, if the cyanogen group be first destroyed. This elimination of the cyanogen can be effected by means of: (1) potassium bromate and concentrated sulphuric acid; (2) potassium bromide, sodium or potassium peroxide and sulphuric acid; and (3) successive additions of strong ammonia solution and concentrated sulphuric acid. The best method of carrying out the test is as follows:—10 c.c. of the cyanide solution are treated with 0·5 grm. of potassium bromate, and concentrated sulphuric acid is added gradually until action begins. When the reaction is complete, a saturated solution of stannous chloride is added, drop by drop, till the solution is colourless, and the whole allowed to stand. The purple colour which forms is most intense after about half a minute.—A. S.

Antimony Lead Alloys; Appearance of ——, after Solidification, and the Difficulty of obtaining an Average Sample. H. Nissenson and P. Siedler. X., page 1246.

Selenium from Tellurium; Quantitative Separation of ——. G. Pellini. Gaz. chim. ital., 33, [1], 515—518. Chem. Centr., 1903, **2**, [17], 965.

To a solution faintly acid with hydrochloric acid and containing from 0·1 to 0·5 grm. of selenium and tellurium oxides, 50—100 c.c. of a saturated solution of ammonium tartrate are added, and the liquid heated with hydrazine sulphate for 1—2 hours at 50°—60° C. By this method the selenium is reduced, but not the tellurium. When the reduction is complete, the liquid is heated to a somewhat higher temperature and the precipitated selenium collected on a tared filter or in a Gooch crucible, washed first with warm water, then with a little absolute alcohol, dried at 105° C. and weighed. In the filtrate the tellurium is precipitated by hydrogen sulphide, the precipitate washed on a small filter with water, and the paper and precipitate treated with fuming nitric acid of sp. gr. 1·52. The excess of nitric acid is expelled by heating on the water-bath, the residue dissolved in hydrochloric acid, the sulphuric acid formed by oxidation removed by means of barium chloride, the tellurium precipitated by hydrazine hydrochloride (see this Journal, 1902, 1558), filtered off, washed first with water and then with absolute alcohol, dried at 105° C. and weighed. In five test analyses the results showed an average error of −0·001 per cent.—A. S.

Zinc Ores; New Method of Determining Zinc in ——. F. W. Küster and F. Abegg. Zeits. f. Elektrochem., 1903, **9**, [42], 836—837.

The authors have previously (see this Journal, 1902, 1557) shown that zinc may be very accurately determined volumetrically by Volhard's process; they now show how the zinc may conveniently be extracted from the ore for the purpose of this determination. From 0·1 to 0·2 grm. is weighed into a porcelain boat and moistened with water. The boat is then placed in a hard glass tube about 20 cm. long, and open at both ends, and this tube is inserted in a combustion tube lying in a combustion furnace. A slow current of perfectly dry hydrochloric acid gas is then passed over the ore in the cold. When the reaction is complete, the furnace is heated so that the whole tube is gradually warmed to a temperature of 150° C. When the mixture in the boat is dry, the temperature of the whole inner tube is raised to about 500 C. The zinc chloride distils off and deposits completely and nearly pure in the longer combustion tube, which is still kept at 150° C. The inner tube serves to retain any material that spirts or comes over mechanically from the boat. Finally, the hydrochloric acid gas throughout the apparatus is displaced by hydrogen, and the contents of the tube are cooled in an atmosphere of that gas. The inner tube and boat are removed, and the zinc chloride is rinsed out of the combustion tube and titrated. It is well to mix about one-tenth of its volume of hydrogen with the hydrochloric acid gas during the treatment, so that any iron present may be in the form of the less volatile ferrous chloride. Both the hydrochloric acid and the hydrogen must be quite dry and free from any admixture with air, otherwise some zinc oxide will be formed, and this will not again be chloridised under the conditions of the experiment. The zinc chloride depositing in the combustion tube is nearly pure, containing, at the worst, only a little cadmium chloride. Results are accurate. —W. G. M.

Nitric Acid in Metallic Nitrates; Electrolytic Reduction of ——, to Ammonia. W. H. Easton. J. Amer. Chem. Soc., 1903, **25**, [10], 1042—1044.

Nitric acid can be reduced to ammonia quantitatively by electrolysis only in the presence of copper sulphate.

The electrolysis is effected in a platinum dish under the following conditions:—Potassium nitrate, 0·5 grm.; copper sulphate, 0·5 grm.; cathode, platinum or copper plate of 100 sq. cm. area; ampères, 0·15 to 3·0; time 1¼ hours for 3 ampères, 8½ hours for 0·15 ampère; volts, from 3 to 8 according to current strength; dilution, 150 c.c.; sulphuric acid, sp. gr. 1·062, 30 c.c. For a current of 1 ampère, 2½ hours is a sufficient time. When the reduction is complete, the liquid is evaporated to a small bulk and the ammonia is distilled off in the usual way.—J. F. B.

Nickel from Phosphate Solutions; Electrolytic Precipitation of ——. W. T. Taggart. J. Amer. Chem. Soc., 1903, **25**, [10], 1039—1041.

Nickel, free from phosphorus, can be completely precipitated from a solution of nickel sulphate containing disodium hydrogen phosphate and free phosphoric acid. The deposit obtained under the conditions enumerated in the paper is equal to that precipitated by any other known method. The time factor can be reduced by raising the temperature to 88° C. The success of the process depends greatly on keeping the electrolysing dish covered and washing down its side frequently to supply loss by evaporation and to prevent nickel phosphate from separating out on the dish. Nickel cannot be separated from manganese, iron, aluminium or chromium in phosphoric acid solutions by this process. Chromium salts in presence of the electrolytes here employed are oxidised to chromates.—J. F. B.

Silver from Antimony; Separation of ——, by Electrolysis. A. Fischer. Ber., 1903, **36**, [13], 3345—3350.

The only work yet published on this subject is that of Freudenberg, who bases his process on the principle of variation of electromotive force. The author has examined and improved Freudenberg's process. The most suitable conditions with a nitric acid solution are (for about 0·3 grm. of each metal), a total volume of 160 c.c., containing 5 grms. of tartaric acid and 2 c.c. of nitric acid of sp. gr. 1·4, and a voltage of 1·35 volts, which should be raised after 3 hours to 1·45 volts. The operation can be carried on either at the ordinary temperature or at 50°—60° C.; the complete precipitation of the silver requires, in the first case, 18 hours, with a current decreasing from 0·05 to 0·01 ampère, and in the second case 8—9 hours, with a current decreasing from 0·12 to 0·02 ampère. The deposited metal must be washed without interrupting the current. The liquid from which the silver has been removed, is concentrated, made alkaline with pure sodium hydroxide, treated with 89 c.c. of concentrated sodium sulphide solution, and electrolysed at 60°—70° C., with an E.M.F. of 1·3—1·6 volts, and a current of 1—1·5 ampères (preferably with addition of potassium cyanide; see this Journal, 1903, 926).

In potassium cyanide solution, the antimony must be present in the pentavalent condition, or the two metals will be deposited together. The very purest cyanide obtainable must be used, and must be freshly dissolved for the operation. In 150—160 c.c. of liquid there should be 3—5 grms. of potassium cyanide, and 0·5—1·0 grm. of tartaric acid. The voltage must not exceed 2·6, and the operation will require at the ordinary temperature 18—19 hours (0·1—0·02 ampère), or, at 40°—50° C., 8 hours (0·18—0·04 ampère). If quickly done, the washing of the deposited silver can be carried out after breaking the current. The determination of the antimony is carried out in 2—3 hours, exactly as in the case of the nitric acid solution.

When the antimony present is in excess of the silver, nitric acid is the preferable solvent; but with low antimony concentration, potassium cyanide is suitable.—J. T. D.

Manganese; Electrolytic Determination of ——, and its Separation from Iron and Zinc. G. P. Scholl. J. Amer. Chem. Soc., 1903, **25**, [10], 1045—1056.

Manganese may be deposited quantitatively under the following conditions:—Manganese sulphate equivalent to 0·11 grm. of the metal, 5 c.c. of formic acid, sp. gr. 1·06, 1 grm. of sodium formate diluted to 130 c.c. The mixture is electrolysed in a roughened platinum dish as anode, in which 130 c.c. cover an area of 100 sq. cm., a flat platinum spiral serving as the cathode. Starting at the ordinary temperature, the deposition is complete in 1½ hours with a current ND_{100} = 1·4 ampères at the anode; the temperature rises of its own accord. The voltage required is 12 at first, decreasing to 8·6 volts towards the end. When the deposit is complete, the liquid in the dish is replaced by water before interrupting the current. The deposit of manganese peroxide is black and lustrous; it has to be ignited before weighing, until it is converted into the protosesquioxide.

Separation of Manganese and Iron.—The following process was found to give most satisfactory results:—Manganese sulphate and ferric ammonium sulphate, equivalent to 0·1 grm. of each of the metals, are mixed with 5 c.c. of formic acid sp. gr. 1·06 and 10 c.c. of a solution of ammonium acetate and diluted to 130 c.c. The roughened platinum dish serves as the anode, whilst the cathode is a perforated "basket" of the same shape as the anode and carefully adjusted equidistant from the latter at all points. Current ND_{100} = 1·1 ampères at the anode; voltage, 3·9; time, 5 hours, starting at the ordinary temperature. After the deposition is complete, the liquid is replaced by water, the current is broken, and both electrodes are washed. The iron on the cathode is dissolved in dilute sulphuric acid and determined by titration with permanganate; the manganese peroxide on the anode is ignited and weighed.

Separation of Manganese and Zinc.—To a mixture of the sulphates containing about 0·1 grm. of each of the metals are added 10 c.c. of formic acid sp. gr. 1·06 and 5 c.c. of a solution of ammonium formate, prepared by neutralising the acid of 1·06 sp. gr. with ammonia; the mixture is diluted to 130 c.c. Electrolysis is effected with the same electrodes as in the case of the iron; current $ND_{100} = 1·0$ ampère at the anode; voltage, 5·4; time, 11 hours, starting at the ordinary temperature. The zinc is deposited on the cathode, and the manganese peroxide on the anode.—J. F. B.

Potassium in Aqueous Solutions [Soil Extracts]; Determination of Small Amounts of ——. F. K. Cameron and G. H. Failyer. J. Amer. Chem. Soc., 1903, **25**, [10], 1063—1073.

Small quantities of platinum salts when treated with potassium iodide develop a pink or rose coloration which deepens on standing. This coloration may be applied for the indirect determination of minute quantities of potassium after conversion into the platinochloride. The solution to be tested must first be freed from ammonium salts and organic matter, by evaporation to dryness with a few drops of sulphuric acid and ignition of the residue. To the latter are added a few drops of hydrochloric acid and an excess of platinic chloride; the substance must be protected from all contamination with ammonia. The solution is evaporated to dryness on the water-bath, the dish containing the residue is cooled, and the excess of platinum chloride washed out. This is effected on an asbestos filter, with gentle suction, using six or eight small portions of 95 per cent. alcohol, care being taken to drain thoroughly between each washing. After the removal of all soluble platinum salts, the potassium platinochloride is dissolved and washed through the filter with a little hot water. When cold, one drop of strong hydrochloric acid is added, and then a decided excess of a solution of potassium iodide (not less than five times the amount calculated for the formula K_2PtI_6). It is desirable that the red coloration should be developed in a strong solution, any necessary dilution being effected about four hours later. The test solution is then compared in a suitable apparatus with a standard prepared in the same way; in no case should any reading be taken until the coloration has been developed for at least four hours, nor until more than an hour has elapsed since the last dilution. It has been found that any alcohol left in the filter and washed through with the potassium platinochloride solution causes a yellow tint in the pink coloration, which is undesirable. The method is especially applicable for the analysis of extracts of soils, but it is not recommended for solutions containing more than 50 parts of potassium per million. (See also Hill, this Journal, 1903, 1152.)

—J. F. B.

Bismuth; Colorimetric Determination of ——. Planès. J. Pharm. Chim., 1903, **18**, [9], 385—389.

If an acid aqueous solution of bismuth be treated with a solution of potassium iodide, a brown precipitate of bismuth iodide is produced. If, however, the bismuth solution is added to the potassium iodide, an orange-yellow coloration is produced, and it is only on adding an excess of the bismuth solution that a precipitate of bismuth iodide is formed. The author has found that the formation of a precipitate is in both cases entirely prevented by the addition of glycerin. Moreover, if the glycerin be present in large amount, it prevents the formation of basic salts of bismuth, thus permitting the use of feebly acid solutions.

For the colorimetric determination of bismuth, two standard solutions are necessary—(1) a strongly glycerinated solution of bismuth, (2) a similar solution of potassium iodide. One grm. of pure bismuth was dissolved in a mixture of 3 c.c. of pure nitric acid (sp. gr. 1·39) and 2·8 c.c. of water, according to the method of the French Codex, and the solution made up to 100 c.c. with glycerin. Five grms. of potassium iodide were dissolved in 5 c.c. of water and made up to 100 c.c. with glycerin. This solution must be protected against the light.

In applying the method to commercial samples, the solutions compared, should contain approximately the same amounts of bismuth. Thus, in examining a specimen of the subnitrate, 1·5 grms. was dissolved in a flask in just sufficient nitric acid and water; to this, 10 c.c. of glycerin and 10 c.c. of the standard solution of potassium iodide were added, and the whole made up to 50 c.c. with glycerin and water. In another flask, 10 c.c. of the standard solution of bismuth and 10 c.c. of the iodide solution were mixed and made up to 50 c.c. with glycerin and water. These solutions then had only to be compared by varying the thickness, or by dilution in graduated tubes. The method can also be applied to determine the amount of iodide in a solution.—F. S.

Hydrogen Peroxide; Contribution to the Study of the Reactions of ——. J. McLachlan. Proc. Chem. Soc., 1903, **19**, [270], 216.

When solutions of hydrogen peroxide and potassium bichromate are mixed and boiled with sulphuric acid, the volume of oxygen evolved is not equal to twice the available oxygen of the hydrogen peroxide. The available oxygen in the peroxide solution was estimated by iodometry, and it is essential that the solution of the peroxide should be dilute, and the sulphuric acid solution not stronger than 1 in 5. When stronger solutions of sulphuric acid are added to a solution of potassium iodide, a considerable quantity of iodine is set free before the peroxide solution is added.

The proximate cause of the ready production of iodine when stronger solutions of sulphuric acid (other acids have a similar effect) are added to a solution of pure potassium iodide is believed to be dissolved oxygen. If, in such a solution containing some starch paste, the blue colour be destroyed by a drop or two of a centinormal sodium thiosulphate solution, the coloration reappears after a definite number of minutes.

The determination of the available oxygen in a solution of peroxide of hydrogen by an acidified solution of potassium permanganate is said by the author to be utterly untrustworthy.

ORGANIC—QUALITATIVE.

Mercerised Cotton; Test for ——. H. Lange.
V., page 1242.

ORGANIC—QUANTITATIVE.

Glycerin in Soap; Determination of ——. E. Martin.
Monit. Scient., 1903, **17**, 797.

The author suggests that the glycerin be determined by oxidation with bichromate in acid solution.—A. S.

Fusel Oil [Isoamyl Alcohol] in Rectified Spirits; Quantitative Determination of —— by Means of Salicylic Aldehyde. A. Komarowsky. Chem.-Zeit., 1903, **27**, [88], 1086—1087.

Further experiments with the method outlined in a previous paper (this Journal, 1903, 1017) have shown that furfural does not give the rose coloration with all samples of spirit, but sometimes gives an orange tint; the author has therefore confined his attention to salicylic aldehyde, with a view to making the method quantitative. He finds that the intensity of the coloration is liable to vary with the quantity of sulphuric acid and salicylic aldehyde employed; the presence of mere traces of fusel oil may be made plainer by increasing the quantity of salicylic aldehyde.

The constituents of fusel oil other than isoamyl alcohol yield garnet-red colorations similar to the latter, but differing in intensity. For instance, the coloration developed by three parts of isoamyl alcohol is equivalent to those given by one part of isobutyl alcohol and by nine parts of *n*-propyl alcohol per 100 000 of spirit, but the proportion of these latter alcohols, compared with that of isoamyl alcohol, is so small that the differences are negligible. For quantitative tests a standard series of solutions containing from one to nine parts of isoamyl alcohol per 100,000 of pure spirit is prepared. Since, however, the presence of acetaldehyde increases the intensity of the colorations, several series of standards are required containing the above series of isoamyl alcohol mixtures in presence of 0, 0·5, 1, 1·5, 2, 2·5, and 3 parts of acetaldehyde respectively per 100,000 of spirit. The proportion of acetaldehyde in the spirit to be tested must first be determined, and the corresponding acetaldehyde series must be employed as the standard for comparison. The process is then as follows:—To 10 c.c. of the test spirit and to 10 c.c. of each of the members of the series containing the same proportion of acetaldehyde, are added 25—30 drops of salicylic aldehyde solution (1 : 100 of alcohol) and 20 c.c. of concentrated sulphuric acid. Since it is very important that all the tests should be shaken up at the same time, the sulphuric acid is added so gently that it sinks to the bottom of the test bottle. All the tests are then shaken up and compared after cooling.—J. F. B.

Yeast; Application of ——, in the Analysis of Foodstuffs. E. Prior. Zeits. Unters. Nahr.- und Genussmittel, 1903, **6**, [20], 916—922.

The difficulties met with in the determination of carbohydrates in such complicated mixtures as the foodstuffs may be shortly summed up as follows:—The action of a yeast on a carbohydrate depends both upon its physiological condition and upon the composition of the liquid in which it is to be grown. With a mixture of several fermentable sugars in certain proportions and under certain conditions, it is possible for readily fermentable sugar to remain in the liquid after the completion of fermentation. Also maltose cannot be completely fermented away from a liquid containing dextrins which either do not ferment at all or do so but slowly. Further, the dextrins reduce Fehling's solution, and in the inversion of cane-sugar or dextrin in a solution by acid, the levulose formed from the sugar or previously present in the liquid is always partially destroyed.

In spite, however, of all these disturbing influences, it is possible, by employing suitable methods, to determine approximately the amounts of the various constituents present in a mixture of carbohydrates.

As is well known, different types of yeast secrete different enzymes, and are hence capable of fermenting different sugars. The yeasts of most importance in the analyses of complex carbohydrate mixtures are: (1) *Saccharomyces Marxianus*, which secretes invertase, but no maltase, and is hence able to ferment cane-sugar, dextrose, and levulose, but not maltose. (2) *Saccharomyces octosporus*, secreting maltase, but not invertase, and hence capable of fermenting maltose, dextrose, and levulose, but not cane-sugar. (3) *Saccharomyces apiculatus*, which ferments dextrose and levulose, but not maltose or cane-sugar. (4) Most of the top yeasts which secrete invertase, decompose raffinose into levulose and melibiose, but only ferment the levulose. (5) Bottom yeasts secreting invertase and melibiase, which completely ferment raffinose. (6) Bottom yeasts of the Saaz type ferment all the sugars mentioned, as also do those of the Frohberg class, but while the first of these yeasts does not ferment the dextrins, certain of the latter compounds are attacked by Frohberg yeasts. (7) Logos yeast ferments completely, or nearly so, those dextrins which are nearly allied to the sugars; by its means, then, the fermentable dextrins may be separated from the non-fermentable ones.

These various yeasts are generally kept in pure culture in 10 per cent. cane-sugar solutions, in which they remain alive for some years. Before using, they must be brought into a vigorous condition, and this is best done by inoculating a little of the yeast into a nutrient medium obtained by boiling well-washed beer-yeast with water and filtering the decoction. The solution under examination must be mixed with some of this yeast water and the whole aërated, the subsequent fermentation being carried on in a thermostat at a temperature of 25° C. All these operations must take place under aseptic conditions.

The analysis of a liquid containing cane-sugar, dextrose, levulose, maltose, and dextrins is carried out as follows:—(*a*) In an aliquot part of the solution, the Fehling's solution reduced is determined by the ordinary method for invert sugar. (*b*) After inversion of the cane-sugar by Clerget's method, the reduction is again determined. From the increase of invert sugar, the amount of cane-sugar originally present is calculated. (*c*) Another portion of the original liquid is mixed with yeast-water, aërated, and fermented by means of *Saccharomyces Marxianus*, which removes the cane-sugar, dextrose, and levulose; the reduction of the fermented solution is then determined, and calculated as invert sugar. Subtraction of the latter from the value obtained in (*a*) gives the amounts of the dextrose and levulose together. To obtain the proportions of these sugars separately, polariscopic readings of the original liquid and that fermented by *Saccharomyces Marxianus* are necessary. (*d*) In a small portion of the residual fermented and filtered solution, the reduction due to the maltose and dextrins is estimated; after addition of yeast-water and fermentation with Frohberg yeast, the reduction due to the dextrins alone is measured, and from this and the previous reduction, the amount of maltose can be obtained. (*e*) The residual liquid now contains only the dextrins, which are inverted by Sachsse's process and determined as dextrose. (*f*) If it be required to estimate the quantity of fermentable dextrins, which may be of value in some cases, *e.g.*, in the examination of honey, the residual solution from (*d*) is fermented with Logos yeast.

The maltose and dextrin determinations are the least accurate, as a small portion of the former remains unfermented, and so increases the amount of dextrin found. In the breaking down of the dextrins by Logos yeast, the small quantity of maltose not fermented by the Frohberg yeast is here removed; but, on the other hand, some of the dextrin is always left unattacked by the Logos yeast, and these two errors in the dextrin estimation hence partially neutralise one another.—T. H. P.

Formaldehyde; Comparative Study of Methods of Determining ——. B. H. Smith. J. Amer. Chem. Soc., 1903, **25**, [10], 1028—1035.

As the result of a comparison of various methods for the determination of formaldehyde, the author concludes:—That the Blank and Finkenbeiner method (acidimetric titration after oxidation by alkaline hydrogen peroxide) is very satisfactory for strong solutions. The Legler method (alkalimetric titration of excess of ammonia over that which combines with the formaldehyde), whilst not giving such high results as the former, is fairly satisfactory. The gravimetric ammonia method is practically worthless. The iodometric and the potassium cyanide methods give good results with dilute solutions. The latter is best adapted to the determination of very small quantities of formaldehyde. In the author's hands the aniline volumetric method failed to show a definite end-point.—J. F. B.

Milk; Determination of Formaldehyde in ——. B. H. Smith. J. Amer. Chem. Soc., 1903, **25**, [10], 1036—1038.

The removal of formaldehyde from milk by distillation is difficult and incomplete. Much time and trouble may be saved by distilling 100 c.c. of milk in a 500 c.c. Kjeldahl nitrogen flask, using a round, flat evaporating burner. The addition of a little sulphuric acid to the milk has a considerable effect in increasing the quantity of formaldehyde carried over in the first portions of the distillate. The maximum effect in this direction is obtained by adding 1 c.c. of dilute sulphuric acid (1 : 3) to 100 c.c. of milk. Milk containing from one part of formaldehyde in 5,000 to one part in 50,000 may be kept in a cool place for 48 hours without any decrease in the quantity of formaldehyde found in the first portion of the distillate. The proportion of formaldehyde found in the first 20 c.c. of distillate from 100 c.c. of milk, when sulphuric acid has been added in the proportion stated above, is for all practical purposes 33·3 per cent. of the total quantity present.

When, however, the milk has been subjected to a warm and varying temperature for 48 hours, the first 20 c.c. of the distillate may contain only 18 to 20 per cent. of the total formaldehyde originally added.—J. F. B.

Malonic Acid and its Salts; Determination of ——, by Potassium Permanganate. E. Durand. Ann. Chim. anal. appl., **8**, 330—332. Chem. Centr., 1903, **2**, [17], 968.

Malonic acid is oxidised by potassium permanganate in hot sulphuric acid solution according to the equation—

$$CH_2(COOH)_2 + 3O = 2CO_2 + H_2O + H.COOH.$$

The reaction is complete when the pink coloration remains permanent for 10—15 minutes. The formic acid produced is said not to react with the permanganate until after about half an hour.—A. S.

Hydroxylamine; Determination of ——. H. O. Jones and F. W. Carpenter. Proc. Chem. Soc., 1903, **19**, [270], 228.

The methods hitherto described for the estimation of hydroxylamine were found to be very untrustworthy in the presence of substances such as neutral metallic salts, although these compounds would not be expected to affect the reactions involved. The following process has been devised, which is free from these objections, and is simple and accurate.

Ten to 20 c.c. of the hydroxylamine solution (which should not contain more than 0·5 per cent. of the base) are added to a hot solution of copper potassium carbonate or copper potassium tartrate, which is well stirred during the addition. The mixture is raised to the boiling point, the cuprous oxide at once collected in a Gooch crucible, washed with hot water, and dissolved in ferric sulphate solution in an atmosphere of carbon dioxide, the ferrous salt produced being titrated with potassium permanganate solution, as recommended by Wood and Berry (Proc. Camb. Phil. Soc., 1903, **12**, [2], 97). Four mols. of the permanganate correspond with 10 mols. of hydroxylamine.

The foregoing reactions are not affected by the presence of foreign substances, provided that these do not reduce the copper solutions, and the method may be applied to mixtures containing sodium, potassium, ammonia, cobalt, nickel, and zinc salts, carbon dioxide, alcohol, acetic acid, and ketoximes.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Luminosity; Phenomena of ——, *and their possible Correlation with Radio-activity.* H. E. Armstrong and T. M. Lowry. Proc. Roy. Soc., 1903, **72**, 258—264.

The authors discuss the possibility of regarding luminous manifestations generally—including radio-activity—as the outcome of oscillatory changes in molecular structure. The subject is treated under the following headings :—Triboluminescence; fluorescence; phosphorescence; and radio-activity.—A. S.

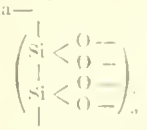
Sulphur and Bismuth; Fusibility of Mixtures of ——. H. Pélabon. Comptes rend., 1903, **137**, [17], 648—650.

Sulphur and bismuth combine rapidly, with evolution of heat, at about 320° C. When three atoms of bismuth are heated with more than four atoms of sulphur, combination is incomplete. When less than four atoms of sulphur are employed, combination is complete, and the liquids formed will solidify, on cooling, without loss of sulphur. For all proportions of the substances, the solidification is complete at about 260° C., *viz.*, the melting point of bismuth; he initial temperature of solidification varies with the proportion of sulphur present. It appears that the sulphide BiS forms homogeneous liquids when melted with bismuth, having solidifying points between 255° and 685° C., this atter being the solidifying point of BiS.—T. F. B.

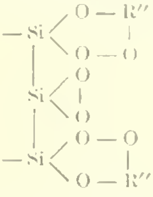
Silicates; Constitution of Certain ——. C. Simmonds. Proc. Chem. Soc., 1903, **19**, [270], 218.

Silicates of lead, copper, iron, cobalt, and nickel are educed when heated to redness in hydrogen, and as a rule . silicate containing *x* atoms of lead or copper yields *x* toms of oxygen. A few naturally occurring ferruginous ilicates behave exceptionally under these conditions, some giving up only a portion of the corresponding oxygen, whilst others yield none. The reduced silicates are black owders which, except in the case of lead orthosilicate, do not ppear to contain any notable amount of the reduced lement in the metallic state.

The following conclusions have been deduced :—(*a*) The ilicon atoms are in direct combination with one another, nd not joined by means of oxygen. (*b*) To the chain of silicon atoms thus formed, the oxygen corresponding with $(SiO_2)_n$ is attached, giving rise to a mode of grouping denoted by the formula—



(*c*) The oxygen valencies still unappropriated are those by which the basic oxides (PbO, CuO, &c.) become attached to the silica complex. (*d*) The conception of silicate structure to which these deductions lead is that of a chain, either closed or open, of the following type:—



The two free silicon valencies would presumably unite, the silicate thus acquiring a closed chain or ring structure. Or they may possibly be connected by another molecular group—Al_2O_3, for instance—also giving rise to a ring. They might also conceivably be attached to any univalent atoms or groups, thus forming an open chain.

Whether the above type of structure is the rule or the exception is at present uncertain, but that some diversity exists is shown by the behaviour of those ferruginous silicates (for example, staurolite, augite, and epidote) which are not reduced by hydrogen at a red heat.

The natural silicates which have, so far, been found to undergo practically complete reduction (in the sense already explained) are dioptase, chrysocolla, garnierite, connarite, chloropal, glauconite, cronstedtite, and thuringite. Ilvaite and stilpnomelane show considerable, but not complete, reduction, this action being much less marked in the case of hypersthene.

Formaldehyde and Silver Nitrate; Reaction between ——, *in presence of Strong Bases.* L. Vanino. Ber., 1903, **36**, [13], 3304—3305.

Bechard and Lea (Zeits. anal. Chem., **36**, 719) have shown that formaldehyde reduces silver solutions, in presence of ammonia, with formation of formic acid, which decomposes into carbon dioxide and water. The author finds that, in solutions made alkaline with sodium hydroxide, not only silver, but gold, bismuth, and copper are precipitated quantitatively from solution. Silver is precipitated quantitatively by mixing solutions of 4 mols. of silver nitrate, 6 mols. of sodium hydroxide, and 2 mols. of formaldehyde. The filtrate reacts neutral, and its reducing properties show that it contains formic acid.

If only sufficient alkali be used just to produce a precipitate of silver, the reduction is incomplete, even after prolonged heating. If, however, the alkali and formaldehyde be in large excess, and the solution be agitated, copious evolution of hydrogen takes place, according to the following equation: $H.COH + HONa = H.COONa + H_2$.
—T. F. B.

Cholesterol; Derivatives of ——. J. Mauthner and W. Suida. Monatsh. f. Chem., 1903, **24**, [8], 648—668.

Action of Nitrous Acid on Cholesterol and its Derivatives.—On saturating an ethereal solution of cholesterol with nitrous acid gas and immediately shaking the liquid with dilute potassium hydroxide solution, white crystals are obtained, which, when purified, melt at 94°—95° C., begin to decompose at 120° C., and have the composition $C_{27}H_{43}NO_2$. Cholesteryl acetate and chloride remain unchanged when thus treated. When, however, cholesteryl acetate is dissolved in nitric acid and the solution saturated with nitrous acid, a crystalline compound (m. pt. 101°—102° C.) with the formula $C_{29}H_{45}NO_4$ is obtained. This compound, which the authors term nitrocholesteryl acetate, yields, on reduction, a compound, $C_{29}H_{46}O_3$, which the authors regard as the acetate of cholestanon-ol, $C_{27}H_{44}O_2$.

Action of Chlorine on Cholesteryl Chloride and the Hydrocarbon $C_{19}H_{28}$ in the presence of Iodine.—In this reaction a mixture of the chlorides $C_{27}H_{35}Cl_{11}$ and $C_{27}H_{34}Cl_{12}$ was obtained. The hydrocarbon $C_{19}H_{28}$, formed as a decomposition product on heating cholesteryl chloride, can also be converted in this way into compounds rich in chlorine.

Decomposition of Cholesteryl Chloride on Distillation.—The nature of the products formed, varies considerably with the manner of heating. When the substance is heated over a naked flame, hydrochloric acid is first separated, leaving a residue of a substance resembling cholesterilene, and this, on continuing the heating, is partially decomposed into volatile hydrocarbons (C_8H_{16} and C_8H_{18}) and the hydrocarbon $C_{19}H_{28}$, which can be separated from the unaltered cholesterilene by distillation under reduced pressure.

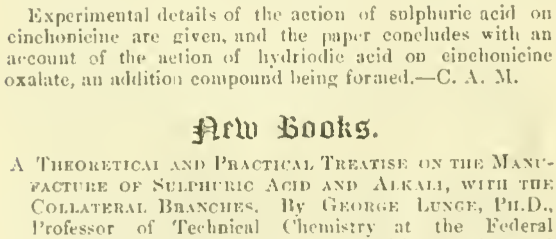
When a metal bath is used for the distillation, the chloride is decomposed in quite a different manner.

Compounds of Cholesterol with Acids.—Cholesterol forms a neutral oxalate, melting (not sharply) at 200° C., and decomposed by hot water. The cholesteryl esters of oxalic and sulphuric acids were also prepared.

Conversion of Cholesteryl Chloride into Cholesterilene. Cholesterilene (m. pt. 79° C.) is formed when cholesteryl chloride is distilled with lime and also by heating cholesteryl chloride with quinoline or cholesterol with anhydrous copper sulphate. The products obtained by different methods have the same composition, $C_{27}H_{42}$, but differ in optical rotation.—C. A. M.

Cinchonicine; New Isomerisation of ——. Z. H. Skraup and W. Egerer. Monatsh. f. Chem., 1903, **24**, [8], 669—680.

After having found that *β-i*-cinchonine and its isomeride *β-i-pseudo*-cinchonicine yielded the same oxidation product, *β-i*-meroquinenine, the authors expected to obtain this oxidation product from cinchonicine, but found that it yielded quite different derivatives. It is known that cinchonine is converted by the action of sulphuric acid into the successive isomeric products *α-i*-cinchonine, *β-i*-cinchonine, and *allo*-cinchonine, whilst, on the other hand, each of these alkaloids is converted into an isomeride of cinchonicine when heated with dry potassium bisulphate. Hence the further question arose as to whether cinchonicine could be successively converted by the action of sulphuric acid into the same isomerides yielded in the bisulphate reaction. Direct proof of such formation has only been obtained in the case of *β-i*-cinchonicine, but, in the authors' opinion, it is highly probable that the same reaction takes place in the case of *α-i-* and *allo*-cinchonicine. The relationship of these different isomerides is shown in the following scheme :—


Conversion by the action of concentrated or somewhat dilute sulphuric acid.
Conversion by heating with dry bisulphate.
Cinchonine
α-i-Cinchonine.
β-i-Cinchonine.
allo-Cinchonine.
Cinchonicine
α-i-Cinchonicine.
β-i-Cinchonicine.
allo-Cinchonicine.
Conversion by the action of somewhat dilute sulphuric acid.

Experimental details of the action of sulphuric acid on cinchonicine are given, and the paper concludes with an account of the action of hydriodic acid on cinchonicine oxalate, an addition compound being formed.—C. A. M.

New Books.

A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches. By George Lunge, Ph.D., Professor of Technical Chemistry at the Federal Polytechnic School, Zürich. Third Edition, Revised and Enlarged. Vol. I.—Parts I. and II. Sulphuric Acid. Gurney and Jackson, Paternoster Row, London. 1903. Price 2*l*. 12*s*. 6*d*.

Two 8vo volumes, containing, Part I., 574 pages of subject-matter, with 256 illustrations; and Part II., 620 pages, with 249 illustrations. At the close of Part II. is the alphabetical index of Subjects, &c. The matter of these two volumes is treated under the following headings :—I. Historical and General Notes on the Manufacture of Sulphuric Acid. II. The Raw Materials of the Sulphuric Acid Manufacture (including Nitric Acid). III. Properties and Analysis of the Technically employed Oxides and Acids of Sulphur. IV. Production of Sulphur Dioxide. V. Construction of the Lead Chambers. VI. Recovery of the Nitrogen Compounds. VII. The Chamber Process. VIII. Purification of Sulphuric Acid. IX. Concentration of Sulphuric Acids. X. Arrangement of a Sulphuric Acid Works on the Chamber Plan; Yields and Costs. XI. Manufacture of Nordhausen or Fuming Oil of Vitriol and of Sulphuric Anhydride. XII. Other Processes for Manufacturing Sulphuric Acid. XIII. By-products of the Manufacture of Sulphuric Acid. XIV. Applications of Sulphuric Acid, and Statistics. Addenda.—(i) Brimstone as Raw Material for Sulphuric Acid Making, and Statistics, &c. (ii) Pyrites; Occurrence and World's Production, &c. (iii) Sulphuric Acid from Hydrogen Sulphide. (iv) Nitrate of Soda, and Statistics. (v) Hydrates of Nitric Acid; Apparatus, Manufacture, and Recovery, &c. (vi) Sulphur Sesquioxide. (vii) Acid Smoke. (viii) Specific Gravities of Sulphuric Acid, &c. (ix) Herreshoff Furnaces. (x) Mechanical Furnaces for Blende. (xi) Cooling Chamber Gases. (xii) Reaction Towers and Pipe Towers, &c. (xiii) Fan-Blasts for Draught in Chambers, &c.

Methods of Analysis adopted by the Association of Official Agricultural Chemists, Nov. 11, 12, and 14, 1898. Harvey W. Wiley, U.S. Dept. of Agriculture, Division of Chemistry. Bulletin No. 46. Revised Edition. Government Printing Office, Washington, U.S.A. 1899.

Hypochlorite und Electrische Bleiche. (Monographien über angew. Elektrochem., Bd. VIII.) Von Viktor Engelhardt. Obering. und Chefchemiker der Siemens und Halske A.-G., Wien. Wilhelm Knapp's Verlag, Halle a/S., Germany. 1900. M. 12.

8vo volume, containing 273 pages of subject-matter, and an alphabetical index of names. The pages are illustrated with 266 engravings and 64 tables, and the following are the leading themes :—A. Direct Electric Bleaching. B. Indirect Electric Bleaching. (*a*) Without formation of Hypohalogen. (*b*) With External Hypohalogen Formation. (*c*) With Internal Formation of Hypohalogen. (C) Assistant Processes. (*a*) Special Materials for Electrodes and forms of Electrodes. (*b*) Chemical Additions. (*c*) Differences of Temperature. (*d*) Mechanical Arrangements. (*e*) Miscellaneous. D. Summary. E. Appendix.

Laboratory Guide to Qualitative Analysis with the Blowpipe. By F. W. Martin, Ph.D. John Wiley and Sons, New York, U.S. America. 1903. Price 2*s*. 10*d*. Chapman and Hall, Ltd., London.

Small treatise, 41 pages, with alphabetical index, laboratory guide for students and others.

The Analytical Chemistry of Uranium. By Henry Brearley. Longmans, Green, and Co., 39, Paternoster Row, London. New York and Bombay. 1903. Price, 2*s*.

Small 8vo volume, containing 45 pages of subject-matter arranged under the following heads :—I. Modes of Determining Uranium. II. Determination of Uranium as Phosphate. III. Separation of Uranium from Iron; from Nickel, Cobalt, and Zinc; Manganese; Alkalis and Alkaline Earths; Copper and other Metals precipitated by Hydrogen Sulphide. From Silica; Molybdenum; Tungsten; Chromium; Vanadium; Titanium; Aluminium. IV. Analysis of Uranium Ores (Pitch blende; Carnotite); Metals and Alloys.

Thermodynamics and Chemistry. A Non-Mathematical Treatise for Chemists and Students of Chemistry. By P. Duhem. Professor of Theoret. Physics at the University of Bordeaux, &c. Authorised Translation by George K. Burgess, Instructor in Physics, University of

California. John Wiley and Sons, New York. 1903. Price 17*s.* nett. Chapman and Hall, Ltd., London.

8vo volume containing 433 pages of subject-matter with 140 illustrations, and alphabetical indexes of names and subjects. The classification of subjects treated of, is as follows:—I. Work and Energy. II. Quantity of Heat and Internal Energy. III. Chemical Calorimetry. IV. Chemical Equilibrium and the Reversible Transformation. V. The Principles of Chemical Statics. VI. The Phase Rule. VII. Multivariant Systems. VIII. Monovariant Systems. IX. Multiple Points or Transformation Points. X. Displacement of Equilibrium. XI. Bivariant Systems. The Indifferent Point. XII. Ditto. Transition and Eutexia. XIII. Mixed Crystals. Isomorphous Mixtures. XIV. Ditto. Optical Antipodes, Metallic Alloys. XV. Critical States. XVI. Chemical Mechanics or Perfect Gases. XVII. Capillary Actions and Apparent False Equilibria. XIX. Unequally Heated Spaces. XX. Chemical Dynamics and Explosions.

METALLURGICAL ANALYSIS AND ASSAYING. A Three Years Course for Students of Schools of Mines. By W. A. MACLEOD, B.A., B.Sc., Director, Government School of Mines, Charters Towers, (Queensland, and Chas Walker, Lecturer in Chemistry and Metallurgy, &c. Chas. Griffin and Co., Ltd., Exeter Street, Strand, London. 1903. Price 12*s.* 6*d.*

8vo volume, containing 315 pages of subject-matter, illustrated with 109 engravings, and the alphabetical index.

The subject is treated as follows:—PART I. Qualitative Analysis and Preparation and Properties of Gases. PART II. Qualitative and Quantitative Analysis. PART III., SECTION I. Reagents; The Assay Laboratory; Manipulation; Preliminary Examination of Ores. Introductory Experimental Work. Assay of Tin Ores, of Lead Ores, and of Gold in its Ores and Products. Assay of Silver and Copper in their Ores and Products. SECTION II. Technical Analysis. Water; Furnace Gases. Laboratory Ore Tests. Analysis of Coal and Coke and of Fireclays and Cements. Partial Examination of Shale Oil, Petroleum, and Lubricating Oil, also of Iron and Steel, and of Copper and Lead Slags.

LA GRANDE INDUSTRIE CHIMIQUE MINÉRALE. Par E. SOREL, ancien Ingénieur des Manufactures de l'État. C. Naud, 3, rue Racine, Paris. 1904. Price 15 Frs.

8vo volume, containing 671 pages of subject-matter, with 127 illustrations. The treatise deals chiefly with the production of the following substances:—Soda, Potash, Chlorine, Iodine, and Bromine. I. Common Salt. II. Seawater; Stassfurt Salts, &c. III. Potash from Vegetable Matters, and from Suint. IV. Iodine and Bromine Industries. V. and VI. Sodium Sulphate in Nature, and Manufactured. VII. Hargreaves and Robinson's Process. VIII. Properties of Hydrochloric Acid, &c. IX. Condensing Acid Fumes. X. Apparatus for Condensing Hydrochloric Acid Vapours. XI. Generalities on Soda and Alkali Salts. XII. Leblanc's Process. XIII. Lixiviation of Black-ash. XIV. Soda Crystals, Bicarbonate and Caustic, by Leblanc's Process. XV. Ammonia-Soda Process. Theory. XVI. Practical Data, Processes, &c. XVII. Production of Chlorine. XVIII. Utilisation of Manganese Chloride. XIX. Manufacture of Chlorine without Manganese Peroxide. XX. Chloride of Lime and Hypochlorites. XXI. Chlorates.

SUBJECT LIST OF WORKS ON THE MINERAL INDUSTRIES AND ALLIED SCIENCES IN THE LIBRARY OF THE PATENT OFFICE. [Patent Office Library Series, No. 13.] [Bibliographical Series, No. 10.] Printed for His Majesty's Stationery Office. Darling and Son, Ltd., 34—40, Bacon Street, E. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1903. Price 6*d.*

Trade Report.

I.—GENERAL.

COMMISSIONERS OF CUSTOMS; REPORT OF THE ——.

Ch. of Comm. J., Nov. 1903.

According to the report of the Commissioners of Customs for the year ended March 31st last, the gross Imperial Customs Revenue amounted to 35,499,723*l.*, or, after deduction of drawbacks, and repayments, to 34,410,685*l.* This is 3,414,125*l.* more than in 1901–2, but 739,315*l.* less than the Budget estimate for the year. The Customs Revenue has thus brought in 2·1 per cent. less than was anticipated, but nearly 11 per cent. more than it produced in 1901–2, and very much more than was ever raised in this country before, by Customs duties, in any one year. The receipts were affected by abnormal clearances, in anticipation of fiscal changes, both at the beginning and the end of the year (*i.e.*, excessive clearances of sugar were made before the Budget statement of 1902 to forestall any possible increase of duty, and early in 1903 clearances of tea and sugar were postponed in view of anticipated reductions on these commodities in the Budget of 1903, neither of which anticipations was realised). Had not this been the case the total receipts would probably have reached 36,000,000*l.*

Coal.—The gross receipts from coal, &c., duty amounted to 2,266,163*l.*, and the net receipts to 1,991,767*l.*, compared with 1,859,410*l.* and 1,311,706*l.* in 1901–2. The exports of coal, coke, cinders and fuel amounted to 45,943,614 tons, and shipments of bunker coal to 15,592,908 tons, as against 44,064,249 and 13,966,882 tons respectively in the previous year; the total thus showed an increase of 3,505,391 tons over 1901–2, and of 4,465,561 over 1900–1.

Cocoa.—Cocoa of all sorts yielded in duty 225,816*l.*, a decrease as compared with 1901–2 of 29,485*l.* (11·5 per cent.), chiefly in raw cocoa, the clearances of which were 8,041,652 lb. smaller; foreign manufactured cocoa again showed a substantial increase, but the clearances of cocoa butter were the lowest since a duty was placed on the importation of this article. The clearances last year were as follows:—raw cocoa, 37,181,180 lb.; cocoa, husks and shells, 1,989 cwts.; cocoa, prepared, 8,363,755 lb.; cocoa butter, 239,362 lb.

Foreign Spirits.—The net yield of the duties upon foreign spirits was 4,739,781*l.*, an increase of 158,261*l.*, or 3·5 per cent. Clearances increased from 8,981,830 galls. in 1901–2 to 9,785,976 galls. last year; the principal increase was in spirits delivered for methylation, the quantity of which has increased enormously during the last three years on account of the great reduction in the price of foreign plain spirits.

Sugar.—The net receipts from the sugar duties in 1902–3 were 4,478,707*l.*, as against 6,399,228*l.* in 1901–2, a decrease of 1,920,521*l.*, or 30 per cent., due mainly, as previously stated, to forestalments or postponements of clearances in anticipation of changes of duty. It is probable that the normal yield of these duties on present rates will be 5,900,000*l.* The average consumption of sugar in the United Kingdom during the last five years has been about 31,150,000 cwt. per annum. The quantity of molasses imported free of duty and sent direct to distilleries was 390,202 cwt., compared with 145,283 cwt. in 1901–2.

RUSSIAN CHEMICAL WORKS DIVIDENDS.

Novoe Vremya; through Chem. and Druggist, Oct. 24, 1903.

Out of fifty enterprises in Russia dealing with acids, alkalis, salts, animal-products, fats, vegetable oils, artificial colours, extracts, perfumery, and pharmaceutical goods, those manufacturing artificial manures yielded the smallest dividends. Of six, 3 per cent. was paid by three, two showed losses, and the other came out even. Manufactures of vegetable oils, lacquers, and colours show the following results:—Four paid from 1 per cent. to 6 per cent. and over, three paid no dividend, and one made a loss. Out of the six fairly large chemical works, two paid no dividends, one made a loss, and three paid from 3 per cent. to 13 per cent. One perfumery factory paid nothing, and the other three paid 5 per cent. to 7 per cent. Of five factories manufacturing pharmaceutical products, only one was as low as 8 per cent.; the rest paid 10 per cent. to 15 per cent. Branches of foreign colour works, such as the Berlin Aniline Factory, gained in 1900, 1901, and 1902, 65, 56, and 136 thousand roubles net profits respectively, and the Baden Aniline and Soda Factory for the same years yielded 34, 119, and 130 thousand roubles, with a small outlay.

Forest Products in the United States.

U.S. Dept. of Agriculture, Bulls. Nos. 23 *and* 33, 1903.

The following tables show the values and quantity of the exports and imports of various forest products of the United States during the last five years. The values of exports were as follows:—

Articles Exported.	Annual Average. 1898–1902.	Year ended June 30— 1898.	1899.	1900.	1901.	1902.
	Dolls.	Dolls.	Dolls.	Dolls.	Dolls.	Dolls.
Bark and extracts for tanning	350,136	329,994	369,693	376,712	386,238	288,012
Charcoal	3,758	2,577	5,524	1,598	4,164	4,920
Naval stores:						
Rosin	4,034,552	3,689,252	3,741,581	3,796,367	4,712,457	4,202,104
Tar	66,616	86,475	86,002	77,082	77,669	55,854
Turpentine and pitch	47,908	48,611	54,953	45,823	45,795	44,356
Turpentine, spirits of	7,036,185	5,380,806	6,100,419	8,554,922	7,715,029	7,431,248
Total	11,185,361	9,135,144	9,982,955	12,474,194	12,580,950	11,733,562

The quantities of exports were as follows:—

Naval stores:							
Rosin	barrels	2,499,065	2,206,203	2,563,229	2,369,118	2,820,815	2,535,962
Tar	,,	29,625	19,316	36,903	36,535	32,135	23,236
Wood pulp	lb.	46,958,460	50,428,161	55,932,270	28,554,801	61,528,437	38,342,632
Turpentine and pitch	barrels	19,835	19,225	22,945	20,246	18,391	18,370
Turpentine, spirits of	galls.	18,724,379	18,351,140	17,761,533	18,090,582	20,240,851	19,177,788

The values of imports were as follows:—

Articles Imported.	Annual Average. 1898–1902	Year ended June 30— 1898.	1899.	1900.	1901.	1902.
	Dolls.	Dolls.	Dolls.	Dolls.	Dolls.	Dolls.
Charcoal	*a* 2,404	2,404	(*b*)	(*b*)	(*b*)	(*b*)
Cinchona bark (*c*)	571,436	273,228	346,576	565,065	1,025,546	649,764
Cork wood or cork bark	1,458,194	1,152,325	1,147,802	1,444,825	1,729,912	1,816,107
Dyewoods—						
Logwood	711,112	741,455	546,274	628,464	864,986	774,380
Other	203,257	174,386	222,967	233,998	213,812	171,129
Total dyewoods	914,369	915,841	769,241	862,462	1,078,798	945,509
Extracts and decoctions	221,120	256,176	219,192	221,182	195,647	213,404
Total dyewoods and extracts	1,135,489	1,172,017	988,433	1,083,644	1,274,445	1,158,904
Gums, not elsewhere specified:						
Arabic	185,548	114,943	116,382	113,041	241,669	341,714
Camphor, crude	497,621	365,652	322,100	485,071	738,875	576,405
Chicle	*d* 601,883	(*b*)	363,051	354,720	753,686	936,065
Copal, cowrie, and dammar	*d* 2,156,858	(*b*)	1,844,779	2,598,194	1,923,251	2,261,206
Gambier, or terra japonica	934,650	1,021,341	754,197	910,639	821,539	1,162,233
Shellac	1,325,459	939,361	1,397,635	1,408,103	1,277,128	1,605,068
Other	*d* 956,685	2,599,391	1,070,321	1,014,936	879,990	861,492
Total	6,135,196	5,040,688	5,868,765	6,884,704	6,639,139	7,744,183
Hemlock bark	84,958	106,306	62,504	86,639	65,418	103,930
Gutta-joolatong, or East Indian gum	*d* 288,472	(*b*)	166,419	237,214	248,838	501,418
Gutta-percha	177,772	159,381	167,577	178,616	130,957	252,329
India rubber	28,365,024	25,386,010	31,707,630	31,376,867	28,455,383	24,899,230
Total	28,773,574	*e* 25,545,391	32,041,626	31,792,697	28,835,178	25,652,977
Ivory, vegetable	166,637	155,934	88,479	243,548	179,735	165,489
Naval stores:						
Tar and pitch (of wood)	10,331	8,733	8,684	13,922	11,520	8,796
Turpentine, spirits of	*f* 4,931	(*b*)	(*b*)	7,547	4,441	2,814
Total	*f* 16,347	(*b*)	(*b*)	21,469	15,961	11,610
Palm leaf, natural	*d* 10,900	(*b*)	10,483	15,128	7,085	10,905
Sumac, ground	162,119	120,205	183,136	228,177	133,363	145,776
Tanning materials, n.e.s.	32,998	31,695	13,099	26,219	46,477	47,000
Wood pulp	1,464,854	601,642	671,506	2,405,630	1,586,402	2,039,022

a Statistics for 1898 only. *b* Not stated. *c* Including other bark from which quinine may be extracted.
d Annual average, 1899—1902. *e* Exclusive of gutta-joolatong. *f* Annual average, 1900—1902.

The quantities of imports were as follows :—

Articles Imported.		Annual Average. 1898—1902.	Year ended June 30—				
			1898.	1899.	1900.	19	1902.
Cinchona bark (*a*)	lb.	3,781,328	2,935,1[illegible]	3,281,977	4,107,358	4,858,[illegible]	3,723,305
Dyewood—Logwood	tons	47,922	46,596	37,375	48,188	54,795	52,657
Extracts and decoctions	lb.	3,306,615	4,084,672	3,183,861	3,350,768	[illegible],922,11[illegible]	[illegible],991,631
Gums, not elsewhere specified :							
Arabic	,,	1,883,325	942,239	928,089	961,366	2,31[illegible]	[illegible],271
Camphor, crude	,,	1,930,369	2,047,231	1,807,889	1,789,580	2,17[illegible],78[illegible]	[illegible]
Chicle	,,	*b* 3,114,607	(*c*)	2,445,061	2,297,992	3,140,708	4,[illegible]
Copal, cowrie, and dammar	,,	*b* 20,161,244	(*c*)	18,126,228	23,829,342	18,16[illegible]	[illegible]
Gambier, or terra japonica	,,	34,921,679	42,334,590	38,123,478	38,882,944	26,815,587	[illegible]
Shellac	,,	9,221,898	6,984,395	9,830,111	10,621,151	9,608,745	[illegible],014,789
Hemlock bark	cords	21,845	27,033	17,845	22,780	16,794	24,971
Gutta joolatong, or East Indian gum	lb.	*b* 10,349,386	(*c*)	6,473,882	8,701,753	9,371,087	16,8[illegible],821
Gutta percha	,,	477,884	636,477	518,939	427,678	28[illegible],560	527,767
India rubber	,,	50,436,942	46,055,497	51,063,066	49,377,138	55,275,529	50,118,181
Total	,,	59,191,335	*d* 46,691,974	58,055,887	58,500,569	61,927,176	67,790,089
Ivory, vegetable	,,	13,650,913	15,158,128	8,864,257	16,073,595	13,461,461	14,699,215
Naval stores :							
Tar and pitch (of wood)	barrels	1,969	1,671	1,580	2,829	2,107	1,660
Turpentine, spirits of	galls.	*e* 14,757	(*c*)	(*c*)	22,183	13,630	8,457
Sumac, ground	lb.	9,627,142	8,301,235	12,975,970	10,335,984	7,539,606	9,182,917
Wood pulp	tons	51,956	29,843	33,319	82,141	46,757	67,416

a Including other bark from which quinine may be extracted. *b* Annual average, 1899—1902. *c* Not stated.
d Exclusive of gutta-joolatong. *e* Annual average, 1900—1902.

INTELLIGENCE OFFICE FOR CUSTOMS TARIFF MATTERS IN GERMANY.

Ch. of Comm. J., Nov. 1903.

The commercial world frequently complained that it was impossible to obtain accurate and authentic information with reference to Customs duties before the goods had been actually imported, so that the accurate calculation of contracts was often impossible. Besides, it would often happen that the charges made by the different Custom-houses varied, as the interpretation of the Customs tariff is a prerogative, not of the Empire, but of the various federated States. Moreover, once the duties had been erroneously levied, a remedy could be obtained only by way of petition, and not in the ordinary courts of law. When the new Customs tariff was under discussion, it was therefore proposed, says the British Consul-General at Frankfort a/M., to establish "intelligence offices" for Customs matters, and to transfer any differences arising thereout to the ordinary courts of law. This latter part of the motion was negatived, but the following was incorporated in the wording of the Bill: "An office is to be established in each Customs district which, upon application, is to give information as to the rates of duty at which merchandise or articles are admitted into the territories protected by the German Customs dues." Such intelligence offices have been informally established for some years; they are often consulted, and by their aid it is hoped to bring about a tariff uniform in its application throughout the German Empire. British merchants who propose to export goods to Germany, and are in doubt as to the respective custom rates, are at liberty to profit by this institution. In such cases the inquiries ought to be addressed to the Customs Intelligence Office of the port of entry.

PATENT LAW ADMINISTRATION.

Ch. of Comm. J., Nov. 1903.

The following is the official text of a resolution passed at the Fifth Congress of Chambers of Commerce of the Empire, convened by the London Chamber of Commerce, and held at Montreal on August 17th to 21st, 1903, under the presidency of the Right Hon. Lord Brassey, K.C B :—

"That this Congress, impressed by the difficulties arising from the diverse systems of patent law administration in the various parts of the Empire, and the heavy cumulative cost of securing patent rights therein, recommend to all Chambers (1) that they should severally consider the question of assimilating such law and administration and reducing the cost; and (2) that the result of their deliberations hereupon be forwarded to the Manchester Chamber before the end of the present year, with a view to the preparation of a scheme of reform to be afterwards submitted to each constituent Chamber for its approval."

II.—FUEL, GAS, AND LIGHT.

WATER-GAS AND ITS POSSIBILITIES IN CHEMISTRY AND METALLURGY.

O. Nagel. Eng. and Mining J., Oct. 24, 1903.

Water-gas has been lately introduced into Europe in several chemical and metallurgical industries, especially for purposes where purity of the flame, exact regulation of the temperature, high heat, reducing or oxidising effect is required. The Badische and Bayer companies have erected water-gas plants, and are using this gas for heating the contact furnaces in the sulphuric acid manufacture on account of the cheapness of the gas and the easy regulation of the temperature. A Swedish and an Italian incandescent lamp factory are using water-gas for glass-blowing in the manufacture of incandescent lamps, and for carbonising the filaments. Several German and English glass factories apply this gas for glass melting in tank-furnaces, for plate-glass, window-glass, and bottles, the result being better, quicker, and cheaper work.

Some German iron ores, which are too soft, or friable, for direct treatment in the blast furnace, are very economically caked to hard and solid lumps in rotary kilns heated with water-gas. Experiments are in progress for the reduction of metals and for sulphide roasting by means of water-gas; for the manufacture of coloured enamels, for burning lime, magnesite, cement, and plaster of Paris. Some tests are also being made of the use of water-gas for chemical work, where intense heat is required, and where, at the same time, the superheated steam is used as a chemical agent; as, for example, the decomposition of salt or magnesium chloride.

III.—TAR PRODUCTS, PETROLEUM, Etc.

ACCIDENTS IN TAR WORKS.

Home Office, *October*, 1903.

The attention of the Home Office has been directed by the reports of the Inspectors of Factories, and by the occurrence of fatal accidents, to the serious risks incurred by persons employed in works in which is carried on the distillation of tar for the production of naphtha, light oil, creosote oil, and pitch.

In the last three years 11 fatal accidents have occurred in tar works. Five of these fatalities were due to suffocation, probably by sulphuretted hydrogen, in cleaning out the stills, and two to the accidental inhalation of sulphuretted hydrogen. Ten non-fatal accidents resulted from the inhalation of the same gas, in three instances during the cleaning out of stills. There have also been other cases of gassing.

It is thorght desirable, pending a revision of the existing Special Rules for chemical works, to urge upon the occupiers concerned the following recommendations, which are for the most part based upon the precautions actually in use in certain works. Those specified in paragraph 2 are specially important.

1. All uncovered tar reservoirs, wells, and tanks, unless constructed so as to be at least three feet in height above the ground or platform, should be securely fenced, with either a brick wall or double rails, to the height of three feet.

2. During the process of cleaning, every tar still should be completely isolated from adjoining tar stills either by disconnecting the pipe leading from the swan neck to the condenser worm, or by disconnecting the waste gas pipe fixed to the worm end or receiver. Blank flanges should be inserted between the disconnections. In addition, the pitch discharge pipe or cock at the bottom of the still should be disconnected.

3. Every still should be ventilated and allowed to cool before persons are allowed to enter.

4. Every tar still should be inspected by the foreman or other responsible person before any workman is allowed to enter.

5. No person or persons should be allowed to enter a tar still or tank unless provided with a belt securely fastened round the body, with a rope attached, the free end to be left with two men outside whose sole duty should be to watch and draw out any man in the tank should he appear to be affected by gas.

6. A bottle of compressed oxygen, with mouthpiece, should be kept at all times ready for use, and printed instructions as to the use of this bottle, and the method to be employed for resuscitation by means of artificial respiration, should be kept constantly affixed. A draft of such instructions is appended.

7. A supply of suitable chemical respirators properly charged and in good condition should be kept ready for use in case of emergency arising from sulphuretted hydrogen or certain poisonous gases. (Granules of carbon saturated with a solution of caustic soda readily absorb sulphuretted hydrogen, and may be used for charging respirators.)

8. The use of naked lights should be strictly prohibited in any portion of the works where gas of an inflammable nature is liable to be given off.

9. Each still should be provided with a proper safety valve, which should at all times be kept in efficient working condition.

(Signed) B. A. Whitelegge,
Chief Inspector of Factories.

Gassing.

When a person becomes insensible or seriously affected by gas he should be removed into fresh air, kept as warm as possible, and oxygen should be administered. Medical aid should be sent for at once. If the breathing has stopped, artificial respiration must be resorted to without the slightest delay, and oxygen should also be administered as speedily as possible. Instructions are appended.

Artificial Respiration.—Place the person on his back, slightly raising the shoulders with a folded coat; remove everything tight about the chest and neck; draw the tongue forward and maintain it in that position. Grasp the arms just above the elbows and draw them steadily above the head, keeping them on the stretch for two seconds, then reverse the movement, and press the arms firmly downwards against the sides of the chest for two seconds; repeat these movements about 15 times a minute for at least half an hour, or until natural breathing has been initiated. It is well to continue artificial respiration for a short time, even after natural breathing has been established.

Administration of Oxygen.—The cylinder should be provided with a piece of rubber gas-tubing, at the end of which is a glass or metal mouthpiece. The glass tube must always be taken out of the mouth if any alteration in the pressure of the gas has to be made.

Turn on the valve gradually until the oxygen flows in a gentle stream sufficient to allow of its being inhaled without admixture of air. Fix the rubber-tubing to the nozzle of the cylinder, place the glass tube to the mouth and allow the oxygen to be breathed until relief is obtained.

If the person is unconscious, the nostrils should be closed during inspiration, so that the oxygen may be inhaled as pure as possible through the mouth.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

"Artificial Silk" Manufacture in Germany.

U.S. Cons. Reps., No. 1784, Oct. 26, 1903.

The works of Fürst Henckel von Donnersmark, near Stettin, built exclusively for the manufacture of viscose-cellulose textiles, is at present turning out 50 lb. of skein "lustra-cellulose" a day, which product can be increased in quantity to 2,000 lb. The material is soft in texture and of high lustre and translucency. Each thread is made up of 18 single strands; the dimensions of the ultimate fibre are approximately those of natural silk. In tensile strength it is 50—70 per cent. that of "boiled off" silk. Woven goods are said to have a lustre equal to that of real silk. The wearing qualities, including resistance to laundrying, are also said to be satisfactory. The manufacturing process consists of (1) preparation of viscose, and (2) spinning this by various processes. The viscose is forced through very fine tubes by hydraulic pressure, not exceeding two atmospheres.

VII.—ACIDS, ALKALIS, Etc.

Nitrate Production and Trade of Chile.

U.S. Cons. Reps., No. 1789, Oct 31, 1903.

The following statistics are taken from the report of the Nitrate Association, whose headquarters are at Valparaiso:—

The stock on hand on January 1, 1902, amounted to 313,747 tons, and the output during the year was 1,494,209 tons—a total of 1,808,956 tons. From this total 27,387 tons, used by the producers for powder, and 1,504,472 tons exported, were deducted, leaving a stock on the coast on December 31, 1902, of 277,097 tons. On the same date, the stock abroad amounted to 824,113 tons, leaving a total on the coast and abroad of 1,101,210 tons.

For 1902–3, the exportation quotas amounted to 1,668,486 tons. On March 31, 1903, the stock on the coast was given at 269,923 tons, and that abroad at 518,136 tons—a total of 788,059 tons.

In course of the half year five new works joined the association, making in all twenty-four "oficinas," or producing plants, operating under the combination.

The world's consumption of nitrate in the years ended March 31, 1901–2 and 1902–3, was as follows:—

Consumption in	1901-2.	1902-3.
	Tons.	Tons.
Europe	1,175,207	1,296,694
United States:		
East Coast	175,649	229,288
West Coast	29,636	30,706
Chile	1,445	1,891
All other countries	19,155	19,464
Total	1,399,092	1,578,042

These figures show that the exportations, as fixed by the association, for 1902–3 exceeded those of 1901–2 by 178,950 tons, and that the quota for 1903–4 is in excess of that for the previous year by 47,009 tons.

Rock Phosphate in New Zealand.

Bd. of Trade J., Nov. 5, 1903.

A discovery of this material was reported from Clarendon,)tago, in the spring of the year 1902, and since that time levelopments have progressed rapidly.

The deposit occurs in proximity to the limestone rocks, vhich are so abundant in the locality. A company acquired in area of from 1,300 to 1,400 acres of freehold land embracing the best-known phosphate deposits, and large quantities of rock were got out and placed on the market. Concurrently with this, further prospecting was done and leposits of phosphate were found, which justified the aying-down of tramways. From these quarries 2,000 to ,000 tons have already been mined, and indications point o many thousands of tons being obtainable from the resent workings without opening out deposits that exist in ther portions of the property. The rock makes an xcellent superphosphate.

IX.—BUILDING MATERIALS, Etc.

Cement Industry; New Technical Features in the ——.

Eng. and Mining J., Oct. 24, 1903.

The manufacture of Portland cement in the United States has been developed to a high degree of perfection, ot only from the chemical standpoint, but also from the nechanical. The fine grinding of hard material is best ffected by gradual comminution in a series of machines. The cement makers are coming to the use of ball and ube mills for that purpose to an extent that has not een approached in any other industry. There is still a ifference of opinion as to their relative merits as comared with the Griffin mills, which they are displacing, nd some new plants are installed with ball and tube mills. thers with Griffin mills, and others with both. For the linkering, there is unanimity of opinion in favour of the otary kiln, which is an adaptation of the cylindrical oasting furnace used in metallurgy; but in cement manuacture it has been developed to mammoth size, kilns of 0 ft. diameter and 130 ft. in length having been erected, lthough that is considered excessive and non-advantageous, he standard kiln being of 6 ft. diameter and 60 ft. in length. n Kansas these kilns are fired with natural gas, but elsehere coal-dust firing has become the accepted practice, and 1 the development of this the cement industry is leading the ay. Although coal-dust firing has long been advocated as pplicable to almost all the purposes for which producer as-firing is, it is only in cement manufacture that it as found any general use on a large scale. The ement makers have found that a bituminous coal conaining upward of 30 per cent. volatile matter is the most uitable, and the finer the coal is ground the more effective is. In producing a barrel (380 lb.) of cement the onsumption of coal in the kiln is 80 to 140 lb., averaging bout 110 lb. The hot clinker from the kilns is being ooled artificially, by blowing air over it in special pparatus, the air thus heated being used for other puroses; but this has not yet become standard practice. The storage and handling of the great quantities of material 1 cement manufacture is a serious problem. Rectangular ins built up with solid partitions of 2 by 8 in. plank, piked together, grain-elevator style, and of cylindrical anks of steel plate, are both commonly used.

X.—METALLURGY.

Mineral Production of the United Kingdom in 1902.

3d. of Trade J., Nov. 12, 1903. (*See also this Journal*, 1903, 385.)

The following table, showing the quantity and value of inerals produced in the United Kingdom in 1902, as ompared with 1901, is taken from the General Report and Statistics on Mines and Quarries, 1902, Part III. recently published by the Home Office :—

Description of Mineral.	1901.		1902.	
	Quantity.	Value at the Mines and Quarries.	Quantity.	Value at the Mines and Quarries.
	Tons.	£	Tons.	£
Alum shale	3,954	494	[illegible]	[illegible]
Arsenic	3,361	39,454	[illegible]	19,322
Arsenical pyrites	2,578	4,375	829	[illegible]
Barytes	27,613	27,810	23,608	22,414
Bauxite	10,191	2,903	9,017	[illegible]
Bog ore	2,606	651	4,905	[illegible]
Chalk	4,328,344	196,451	4,395,673	193,757
Chert and flint	130,567	19,887	99,344	17,413
Clay	14,161,877	1,597,482	15,304,136	1,758,884
Coal	219,046,945	102,486,552	227,095,042	93,521,467
Copper ore	6,467	25,766	5,662	14,715
Copper precipitate	385	2,551	450	3,565
Fluorspar	4,214	2,226	6,287	3,186
Gold ore	16,374	13,920	29,953	12,621
Gravel and sand	1,958,929	149,188	2,067,745	157,741
Gypsum	200,766	68,930	224,669	78,969
Igneous rocks	5,049,312	1,323,325	5,466,964	1,400,266
Iron ore	12,275,198	3,222,460	13,426,004*	3,288,161
Iron pyrites	10,238	4,764	9,168	4,154
Lead ore	27,976	224,109	24,606	175,962
Limestone (other than chalk	11,180,579	1,257,381	12,172,851	1,382,132
Manganese ore	1,646	894	1,278	682
Mica	3,165	1,266	8,542	3,047
Natural gas	..	..	c.ft. 150,000	30
Ochre, umber, &c.	14,542	13,917	16,963	22,406
Oil shale	2,354,356	589,162	2,107,534	500,804
Petroleum	8	19	25	60
Phosphate of lime	79	136	86	109
Salt	1,783,056	572,990	1,893,881	577,333
Sandstone	5,115,675	1,637,021	5,483,130	1,798,879
Slate	488,772	1,304,647	517,363	1,501,789
Strontium sulphate	16,651	16,651	32,281	32,281
Tin ore (dressed)	7 288	478,559	7,560	513,872
Uranium ore	79	2,923	52	2,028
Wolfram	21	408	9	273
Zinc ore	23,752	70,764	25,060	91,207
Total values	..	115,360,039	..	107,134,554

* Exclusive of 213 tons for micaceous iron ore, used for paint, and placed under the heading "Ochre, umber, &c."

The decrease of 8,000,000*l.* in the value of the minerals produced in 1902, compared with that in the preceding year, was owing to the reduced prices paid for coal.

Mineral Production of Austria in 1902.

Eng. and Mining J., Oct. 31, 1903.

The final returns of the mineral and metallurgical production of Austria in 1902 have just been made public by the Minister of Agriculture. The value of the entire output, after allowing for certain duplications, such as coal used in making coke, iron ore converted into pig iron, &c., was 288,050,869 crowns, or approximately 57,610,174 dols.

The production of coal is reported, as below, in metric tons, the figures for 1901 being given for comparison :—

——	1901.	1902.
Coal	22,473,509	22,139,683
Brown coal (lignite)	11,748,840	11,045,039
Totals	34,222,349	33,184,722

It will be observed that there was a marked falling off in the output of both coal and lignite, the decrease for the former amounting to 6 per cent., and for the latter, 1·5 per cent. This was largely due to labour troubles and the general depression that has prevailed throughout Austria for some time past. The decline was reflected in the production of coke, which fell from 1,275,889 tons in 1901, to 1,160,846 tons in 1902.

The production of iron in 1901 and 1902 was as follows:—

—	1901.	1902
Pig iron	884,844	831,544
Re-melted iron	145,355	160,282
Totals	1,030,199	991,826

The production of ores and metals other than those mentioned above was as follows in metric tons and kilograms:—

—		1901.	1902.
Gold	Kilos.	47	7
Silver	„	10,205	39,544
Quicksilver	Tons	525	511
Copper	„	776	914
Lead	„	10,161	11,264
Spelter	„	6,974	7,711
Tin	„	49	50
Antimony	„	43	4
Iron ore	„	1,963,246	1,744,298
Pyrites	„	4,910	3,720
Manganese ore	„	7,796	5,646
Graphite	„	29,992	29,527
Asphalt rock	„	541	897
Mineral paints	„	1,700	1,485

This table shows increases in the production of lead, copper, spelter, tin, and asphalt rock, but decreases in the other substances. In iron ore there was a falling off of 11 per cent.

In addition to the items mentioned, there were small outputs of copperas, litharge, nickel, cobalt, zinc dust, uranium salts, copperas, sulphuric acid, and alum.

TIN IN THE TRANSVAAL; DISCOVERY OF ——.

U.S. Cons. Rep., *No.* 1785, *Oct.* 27, 1903.

The *British South African Export Gazette* of Sept. 4, 1903, states that much interest has been excited by the recent discovery of tin in the Transvaal. The tin-bearing property is situated on the eastern border of the Transvaal, on the edge of the high South African plateau. It is stated that the underlying formation of the whole district is granitic. In places overlying this granite formation are the uplifted remnants of different schistose rocks. Tin-bearing veins are found at the contact of these schists with the granite. Three lodes have been discovered. A sample taken from one of them yielded 3·5 per cent. of white metal, indicating a value of 22·50 dols. per ton. The tin oxide yielded 67 per cent. of tin. The Transvaal Government's railway department is surveying the property with a view to connecting it with a railway under the general railway extension scheme.

AUSTRALIA; MINERAL PRODUCTION OF ——.

Bd. of Trade J., *Nov.* 5, 1903.

The output of minerals other than gold and coal for 1902 exceeded that of the previous year by a value of 13,813*l.* Ten tons of tin ore were obtained at Beechworth in connection with gold dredging operations; 400 tons of infusorial earth were raised at Talbot; at Lake Boga, Boort, and other places in the Mallee, 3,227 tons of gypsum were obtained, while the 47,603 ozs. of silver shown in the returns were extracted from gold at the mint.

By treatment with cyanide, 43,802 ozs. 15 dwts. of gold were extracted from 504,212 tons of tailings, the average per ton being 1 dwt. 17 grs., and the value of the gold 148,399*l.*

XII.—FATS, FATTY OILS, Etc.

EARTH-NUTS ["PEA NUTS"] IN THE WEST INDIES.

W. G. Freeman. *West Indian Bull.*, 1903, **4**, 101—110

The author points out that, although in almost all the West Indian islands the earth-nut is known and cultivated to a small extent, in no case is it an important crop, nor are the most valuable properties of the plant made use of. A description of the method of cultivation is given, and it is stated that in an experimental trial in the island of St. Kitt's, the cost of cultivation was 1*l.* 9*s.* 6*d.* per acre, whilst the returns, taking the selling price as 11*s.* per barrel, were 5*l.* 10*s.* per acre, exclusive of the value of the vines as fodder. For the uses, &c., of earth nuts, see this Journal, 1894, 530, 819, 1118; 1895, 1022; 1898, 1200; 1900, 1055.—A. S.

COCOANUT OIL FOR MARGARINE INDUSTRY IN THE NETHERLANDS.

Bd. of Trade J., *Nov.* 12, 1903.

The report for 1902 of the Rotterdam Chamber of Commerce draws attention to cocoanut oil as a raw material of the margarine industry. Small quantities of the commodity have been used in the past, for the purpose, but since the success of the attempts to neutralise the cocoanut oil and render it all but scentless and flavourless, its consumption has increased exceedingly, especially as the margarine industry found itself compelled to look out for cheaper raw materials, owing to the prevalent dearness of those it had hitherto used. Quotations ranged between 55 fl. and 50 fl. per 100 kilos., but had already given way to 36 fl. at the date of the report. The article is imported chiefly from Marseilles, London, Aarhuus, and Termonde (Belgium) under various denominations, such as "cocosine," "vegetaline," &c.

XIII. C.—INDIA-RUBBER, Etc.

RUBBER EXPORTS FROM BRAZIL.

U.S. Cons. Reps., *No.* 1786, *Oct.* 28, 1903.

On July 7, 1903, United States Consul Kenneday, at Para, Brazil, sent the following figures showing the amount and destination of exports of rubber from the principal Brazilian rubber-producing sections during the season of 1902–3, which closed on June 30:—

From—	To Europe.	To United States.
	Lb.	Lb.
Manaos	16,619,381	18,425,657
Para	13,422,609	13,686,142
Iquitos	3,578,739	..
Serpa	22,583	..
Total	33,643,312	32,111,799

RUBBER TAX LAW IN BRAZIL.

U.S. Cons. Reps., *No.* 1786, *Oct.* 28, 1903.

The Congress of Representatives of the State of Amazonas has granted to the Banco Amazonas, in Manaos, a right, for 10 years, to levy a tax of 100 reis ($1\frac{1}{4}$*d.*) per kilo. on all rubber of every quality, and 80 reis (1*d.*) per kilo. on all caouchouc placed upon the market and belonging to the State, said right to be established by special law.

The tax mentioned many believe excessive. The amount of rubber coming into Manaos in a crop year amounts, approximately, to 16,000 tons. A tax of, say, 100 reis a kilo. on 16,000 tons is equal to 1,600 contos de reis*—say, 80,000*l.* a year. This tax is on rubber coming into Manaos from the interior of this State (Amazonas), and does not apply to rubber going out of this port to foreign markets.

Many people at Manaos think that the law is unconstitutional, as they say the tax, instead of reverting to the benefit of the entire State, goes to the gentleman mentioned in the law and the officers of the bank, who are unknown as yet, to be used in an experimental enterprise. At certain times in the year many native houses require money to tide them over until they receive rubber from upriver. At such times, in the past, it has been customary to borrow money from the foreign houses here. This bank seems to be organised and run as an accommodation to the native business houses, thus taking these loans from the hands of the foreigners, but many think that a "corner" in rubber is to be attempted with the aid of this tax. It would result seriously to the American rubber trade if a corner could be managed controlling the rubber produced in this State. The rubber manufacturing trades of England and the continental manufacturers would also suffer.

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* 1 contos of reis = 1,000 milreis.

XVI.—SUGAR, STARCH, Etc.

BEET-SUGAR PRODUCTION; GERMAN ——.

U.S. Cons. Reps., No. 1789, *Oct.* 31, 1903.

For the 13 months ended Aug. 31, 1903, the German sugar refineries consumed in the manufacture of sugar 12,381,552 tons of raw beets. During the same period in 1901–2 the consumption of raw beets amounted to 17,614,152 tons, showing a decrease of 5,232,599 tons in the year ended Aug. 31, 1903. The amount of sugar produced during the 13 months ended Aug. 31, 1903, was 1,663,193 tons, as compared with 2,246.237 tons during the 13 months ended Aug. 31, 1902, a decrease of 583,044 tons. The kind and quantity of sugar produced in the comparative periods were as follows:—

Description.	Year ended August 31—	
	1903.	1902.
	Tons.	Tons
Crystallised sugar	583,127	587,774
Granulated sugar	15.748	15,220
Sugar candy	136.116	145.172
Loaf sugar	228,107	213,045
Flat bar and cubicle sugar.	30.983	26,390
Lump and crump sugar	350.651	327.818
Refined and powdered sugar	52.423	56.833
Farine (moist sugar)	2.860	2.171
"Liquid refined sugar" including sugar goods	1,594.560	1,576.896
Syrup	6.092	5.984
Other sugar products	478,615	563.718

The compilation of these statistics has been made for 13 months, because, owing to the new regulation for taxing sugar, the business year has been changed from the 1st of August to the 1st of September.

XVII.—BREWING, WINES, SPIRITS, Etc.

POTATO SPIRIT IN GERMANY.

Zeits. Spiritusind.; through Chem. and Druggist, Nov. 7, 1903.

According to official figures relating to the output of potato spirit in Germany during the season October, 1902, to September, 1903, the total production amounted to 130,210,000 proof galls., as compared with 163,210,000 proof galls. for the corresponding period of 1901–2. Of this quantity 89,863,000 proof galls. were retained for home consumption, or 1,711,000 proof galls. less than in the previous season. The amount of duty-free spirit manufactured was 14,807,000 proof galls., compared with 15,727,000 proof galls. for the season of 1901–2, and the quantity taken for methylation purposes was 7,653,000 proof galls. more than in 1901–2, being 34 821,000 proof galls., against 27,171,000 proof galls. An important fact to be noted is that the stock on September 30 showed a considerable reduction, being only 11,564,000 proof galls., against 38,878,000 proof galls. on September 30, 1902. These figures show a reduction of one-third, and consequently prices have advanced by one-third. It may be mentioned that the duty-free spirit was used for manufacturing purposes in the drug and chemical industries, while the methylated spirit was chiefly used for lighting.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 23,812. Rennerfelt. Centrifugal liquid separators.* Nov. 3.

,, 23,909. Harvey Crucible furnaces. Nov. 4.

,, 23,964. Tone. Method for reducing elements which are reduced and volatilised at nearly the same temperature.* Nov. 4.

,, 24,149. Löffler and Weidle. Filters.* Nov. 6.

,, 24,262. Duff. Washing or (and) cooling towers.* Nov. 9.

,, 24,316. Fournier. Liquid vaporising apparatus.* Nov. 9.

,, 24,379. Schneller and Kolleman. Apparatus for bringing gas and liquid into intimate contact. Nov. 10.

,, 24,415. Niclausse. Separating liquids of different density. (Fr. Appl., Dec. 10, 1902.)* Nov. 10.

,, 24,801. Tabourin, Girard, and Portevin. Manufacture of solid and fluid mineral lubricants. (Fr. Appl.. Nov. 15, 1902.)* Nov. 11.

[C.S.] 27,658 (1902). Thompson (Soc. l'Air Liquide). Liquefaction of gases. Nov. 11.

,, 28,259 (1902). Maybach. Condensers and cooling apparatus. Nov. 18.

,, 361 (1903). Normandy and Normandy. Apparatus for evaporating or distilling liquids. Nov. 11.

,, 512 (1903). Morgan Crucible Co., Ltd., and Speirs. Apparatus for mixing mineral and other dry substances. Nov. 18.

,, 3561 (1903). Guillaume. Stills and the like. Nov. 18.

II.—FUEL, GAS, AND LIGHT

[A.] 23,751. Kiderlen. Gas-generating apparatus. (Belgian Appl., Jan. 3, 1903.)* Nov. 2.

,, 23,771. Lymn. Gas-testing apparatus. Nov. 3.

,, 23,869. Walker. Acetylenic gas compound, and process for its production. Nov. 3.

,, 23.989. Hills and Lane. Production of ethylene. Nov. 5.

,, 24,068. Gielis. Gas retorts. Nov. 5.

,, 24,326. Hanmer. Treating peat and turf to obtain valuable products. Nov. 10.

,, 24,588. Settle and Padfield. Manufacture of coal-gas. Nov. 12.

,, 24,625. Hartridge. Manufacture of artificial fuel. Nov. 12.

,, 24,669. Allison. Recovering bye-products from coke-ovens. Nov. 13.

,, 24,670. Allison. Manufacture of coke. Nov. 13.

,, 24,815. Maisch. Manufacture of incandescent mantles.* Nov. 14.

,, 24,828. Armstrong. Furnaces for heating, reheating, or melting purposes. Nov. 14.

[C.S.] 24,194 (1902). Crossley and Rigby. Production of gas from bituminous coals and the like. Nov. 11.

,, 27,348 (1902). Myers (Cook). Liquid fuel furnaces. Nov. 18.

,, 28,614 (1902). Beilby and Christison. Removing tar and solid particles from fuel-gas. Nov. 11.

,, 28,877 (1902). Hislop. Gas-producers. Nov. 11.

,, 1090 (1903). Clauss. Generating water-gas. Nov. 18.

,, 1091 (1903). Clauss. Generating water-gas. Nov. 18.

,, 1182 (1903). Boyd. Process and apparatus for purifying and cooling gas-producer gases. Nov. 11.

,, 7831 (1903). Hopfelt. Process for manufacturing electrodes for arc lamps. Nov. 11.

,, 8194 (1903). Lühne. Production and carbonisation of gas for heating, lighting, motive power, or the like. Nov. 18.

,, 12,001 (1903). Lake (Fuel and Gas Manufacturing Co.). Manufacture of fuel compounds used in generating gas. Nov. 18.

,, 21,642 (1903). Gayley. Extracting moisture from the air for blast furnaces or converters. Nov. 18.

,, 21,967 (1903). Dahmen and Hagyi-Ristic. Process of manufacturing carbonaceous substances. Nov. 18.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 23,763. Imray (Meister, Lucius und Brüning). Manufacture of monoacet-triamidobenzene, and dyestuffs therefrom. Nov. 2.

,, 24,113. Oberlander and The Alliance Chemical Co., Ltd. Production of *o*-toluene sulphonic acid. Nov. 6.

,, 24,409. Ransford (Cassella and Co.). Manufacture of *o*-nitro-*o*-amido-*p*-acetamidophenol, and dyestuffs therefrom. Nov. 10.

,, 24,690. Read Holliday and Sons, Ltd., and Turner. Manufacture and dyeing of colours for wool and silk fast to milling. Nov. 13.

[C.S.] 633 (1903). Imray (Meister, Lucius und Brüning). Manufacture of monazo dyestuffs for wool. Nov. 18.

,, 953 (1903). Imray (Meister, Lucius und Brüning). Manufacture of azo dyestuffs from 1.8-azimidonaphthalene-4 sulphonic acid. Nov. 18.

,, 1235 (1903). Abel (Act.-Ges. f. Anilinfabr.). Manufacture of red lakes. Nov. 11.

,, 1326 (1903). Imray (Meister, Lucius und Brüning). Manufacture of phenylglycine-*o*-carboxylic acid. Nov. 18.

,, 2503 (1903). Abel (Act.-Ges. f. Anilinfabr.). Manufacture of red lakes. Nov. 18.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 23,770. Schrader. Process for mordanting wool. Nov. 2.

,, 23,889. Ickringill. Preparation and spinning of fibres. Nov. 4.

,, 24,222. Perkin, jun., and Whipp Bros. and Todd, Ltd. Treatment of raw cotton and flax, and cotton and linen goods, to reduce the inflammability thereof. Nov. 7.

,, 24,289. Forster. Metallisation of textile fibres, and products therefrom, also of paper, leather, &c.* Nov. 9.

[A.] 24,311. Sharp, Sharp, and Sons, Ltd., Krais, and The Bradford Dyers Assoc., Ltd. Manufacture of printing composition suitable for printing upon textile and other materials. Nov. 9.

,, 24,313. Raabe. Manufacture of yarns and of a liquid substance for use therein. Nov. 9.

,, 24,327. Marshall and The Times Coloured Spinning Co., Ltd. Apparatus for dyeing and similarly treating textile material upon bobbins or the like. Nov. 10.

,, 24,641. Roberts and Crossley. Carbonising or destroying cotton or silk in woollen and worsted rags. Nov. 13.

,, 24,666. Tomlinson (Haas and Haas). Apparatus for treating textile piece goods with air or other gases, for drying, bleaching, carbonising, or other processes. Nov. 13.

,, 24,690. Read Holliday and Sons, Ltd., and Turner. *See under* IV.

[C.S.] 24,136 (1902). Kellner. Manufacture of yarns and threads. Nov. 11.

,, 25,108 (1902). Kershaw. Apparatus for dyeing, mordanting, or similarly treating slubbing, yarn, and other fibrous material. Nov. 18.

,, 26,982 (1902). Stoerk. Manufacture of artificial silk. Nov. 18.

,, 28,364 (1902). Strehlenert. Machines for the manufacture of artificial silk, &c. Nov. 11.

,, 7060 (1903). Dargue, Dargue, and Dargue. Apparatus for dyeing or washing fibrous materials. Nov. 18.

,, 10,925 (1903). Rott and Müllen. Textile printing machines. Nov. 18

,, 14,483 (1903). Lilienfeld. Producing glossy silk-like effects on fabrics or other material. Nov. 18.

,, 21,671 (1903). Heide (McClure). Colour printing process. Nov. 18.

VII.—ACIDS, ALKALIS, SALTS, ETC.

[A.] 23,687. Parker. Production of salts of sodium, potassium, and other metals. Nov. 2.

,, 23,918. Keogh and Broughton. Processes of making alumina and by-products. Nov. 4.

,, 23,919. Keogh and Broughton. Manufacture of alumina and by-products. Nov. 4.

,, 24,148. Weiller and Weiller. *See under* X.

,, 24,297. Price. Processes for manufacturing nitrate, nitrite, or sulpho-nitrate or nitrite of lime, soda, or potash. Nov. 9.

,, 24,332. Donnachie. Appliances for the manufacture of nitric acid. Nov. 10.

,, 24,619. Schwab, and H. Greene and Sons, Ltd. Manufacture of vitriol. Nov. 12.

,, 24,639. Parker. Production of Glauber salts, ferrous carbonate, ferrous hydrate, and ammonia from nitre cake.* Nov. 12.

,, 24,806. Hinz. *See under* XI.

[C.S.] 22,135 (1902). Gilmour. *See under* XI.

,, 24,237 (1902). Bronn. Manufacture of soluble glass. Nov. 11.

,, 72 (1903). Paul. Manufacture of hydrocyanic acid and of cyanide salts therefrom. Nov. 11.

,, 519 (1903). Stinville. Manufacture of sulphuric acid. Nov. 11.

,, 2204 (1903). Johnson (Badische Anilin und Sodafabr.). Manufacture of hydrosulphite salts. Nov. 18.

,, 13,119 (1903). Thompson (Savon Frères et Cie.). Production of carbonate of soda, caustic soda, carbonate of potash, caustic potash, &c., and apparatus therefor. Nov. 11.

[C.S.] 14,303 (1903). Pictet. Apparatus for separating gases from their mixtures, especially oxygen and nitrogen from air. Nov. 18.

„ 19,168 (1903). Ellis (Chem. Fabr. von Heyden A.-G.). Manufacture of colloidal salts of heavy metals. Nov. 11.

„ 21,122 (1903). Jaubert. Preparation of oxygen. Nov. 11.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 23,786. Gare. Solutions for treating wood and other fibrous and porous materials and compounds. Nov. 3.

„ 24,041. Bach. Process for manufacturing fire-bricks, crucibles, retorts, and other refractory articles.* Nov. 5.

„ 24,065. Okum. Method of manufacturing corundum. Nov. 5.

„ 24,074. Schünemann. Kilns for burning Portland and Roman cement, lime, &c. Nov. 6.

„ 24,553. Schünemann. Cement kiln for burning loose or powdered cement raw material. Nov. 12.

„ 24,618. Silbiger. Building and decorating materials. Nov. 12.

[C.S.] 21,480 (1902). Alexander. Kilns or ovens for burning plaster, cement, or lime. Nov. 11.

„ 24,023 (1902). McClenahan. Process for manufacturing stone. Nov. 11.

„ 914 (1903). Hesketh. Brick, lime, and like kilns. Nov. 18.

„ 21,799 (1903). Justice (Aktieselskabet Venezuela-Asfalt Kie.). Manufacture of artificial asphalt. Nov. 18.

X.—METALLURGY.

[A.] 23,764. Gröndal. Furnace for burning ore briquettes.* Nov. 2.

„ 23,848. Alzugaray. Treatment of complex ores. (Fr. Appl., July 30, 1903.)* Nov. 3.

„ 23,855. Wild. Methods for extracting metals from ores, concentrates, tailings, and the like. Nov. 3.

„ 23,861. Soc Anon. la Neometallurgie. Alloy. (Fr. Appl., Nov. 6, 1902.)* Nov. 3.

„ 24,026. Akester. Treatment of iron sand for the purpose of separating the metal therefrom. Nov. 5.

„ 24,027. Akester. Extraction of sulphur from auriferous or other ores. Nov. 5.

„ 24,148. Weiller and Weiller. Production of metals, alloys, oxides, and high temperatures. Nov. 6.

„ 24,277. Anderson. Treatment of ores. Nov. 9.

„ 24,493. Savelsberg. Process for effecting the desulphurisation of lead ores. Nov. 11.

„ 24,825. Imbert. Process for extracting, from their sulphides, zinc and lead, and generally all metals whose affinity for sulphur is less than copper. Nov. 14.

[C.S.] 26,782 (1902). Rushton. Furnaces for roasting ores. Nov. 11.

„ 704 (1903). Mills (Lecarme). Cementation of iron, steel, and cast-iron. Nov. 18.

„ 18,593 (1903). Scott. Manufacture of tinplate, and articles therefrom. Nov. 11.

„ 20,709 (1903). Hilpert and Pauli. Producing a bright coating of silver and other metals on paper, leather, or the like. Nov. 18.

„ 21,665 (1903). Oxnam and Oxnam. Process of hardening copper and extracting metals from matrices. Nov. 18.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 23,712. Nehmer. Manufacture of dry batteries. Nov. 2.

„ 23,881. Lucas. Insulating materials and artificial substitutes for ebonite, &c. Nov. 4.

„ 24,472. Ruhstrat and Grimmer. Electric furnaces. Nov. 11.

„ 24,806. Hinz. Electrolytic manufacture of peroxides of magnesium and zinc. Nov. 14.

[C.S.] 22,135 (1902). Gilmour. Electrolytic decomposition of alkaline chlorides. Nov. 18.

„ 8679 (1903). Hubert. Apparatus for electroplating. Nov. 11.

„ 16,988 (1903). Steenlet. Partitions or diaphragms for electrolytic and electro-plating purposes. Nov. 18.

XII.—FATS, FATTY OILS, WAXES, AND SOAP.

[A.] 24,215. Haller. Treatment of acid liquors containing glycerin. Nov. 7.

„ 24,240. Reiss. Production of readily resorbent medicated soaps.* Nov. 9.

„ 24,628. Castle. Manufacture of soap. Nov. 12.

„ 24,801. Tabourin, Girard, and Portevin. *See under* I.

[C.S.] 21,373 (1903). Connont. Scented toilet soap. Nov. 11.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 24,031. Zander. Water-colour printing inks and paints. Nov. 5.

„ 24,114. Koehler. Hygienic quick-drying ink for superimposing printing and painting. Nov. 6.

[C.S.] 1235 (1903). Abel (Act.-Ges. f. Anilinfabr.). *See under* IV.

„ 18,300 (1903). Eberson. Method of removing paint or varnish from surfaces. Nov. 11.

B.—Resins, Varnishes.

[C.S.] 19,235. Clausen. Linoleum-like material. Nov. 11.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[A.] 23,752. Fell (The Casein Co.). Casein-cellulose compound, and process for producing same.* Nov. 2.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 23,703. Bate. Drying starch from rice or other amylaceous products. Nov. 2.

[C.S.] 28,186 (1902). Deutsch. Apparatus for whitening sugar in centrifugal machines by means of steam. Nov. 18.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 24,291. Jensen (Deissler). Process for freeing yeast from bitter principles. Nov. 9.

[C.S.] 1073 (1903). Hoffmann. Continuous process and apparatus for purifying beer wort. Nov. 18.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 24,692. Posternak. Process for obtaining the assimilable phospho-organic matter contained in vegetable foodstuffs. Nov. 13.

,, 24,807. Jensen (Deissler). Process of manufacturing an alimentary extract. Nov. 14.

[C.S.] 639 (1903). Evenden and Daw. Compressed fruit essences, juices, or flavours. Nov. 18.

B.—Sanitation; Water Purification.

[A.] 23,748. Reeves. Precipitant, disinfectant or deodoriser, especially suitable for the treatment of sewage. Nov. 2.

,, 21,054. Ostwald. Process and apparatus for utilising and disposing of town refuse. Nov. 5.

,, 24,711. Scott. Means and apparatus for the continuous treatment of waste materials, and obtaining volatile and other products therefrom. Nov. 13.

[C.S.] 17,097. Pfeiff. Sterilising apparatus. Nov. 11.

,, 17,905. Simundt. Apparatus for effecting permanent disinfection or sterilisation. Nov. 11.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 23,752. Fell (The Casein Co.). *See under* XIV.

[C.S.] 21,030 (1903). Viscose Syndicate, Ltd., and Cross. Method of refining or purifying viscose. Nov. 11.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 24,631. Fourneau. Preparation of amino alcohols and their derivatives. Nov. 12.

[A.] 24,723. Imray (Meister, Lucius und Brüning). Manufacture of compounds of the active substance of suprarenal glands. Nov. 13.

[C.S.] 705 (1903). Lake (Chuit, Naef, and Co.). Process of preparing hydrolysed pseudo-ionone and its homologues, and for their transformation into cyclic ketones. Nov. 18.

,, 848 (1903). Barge and Givaudan. Separating ortho- and paratoluene sulphamide. Nov. 18.

,, 1579 (1903). Newton (Bayer and Co.). Production of methylene citric acid. Nov. 18.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 23,722. Newton (Bayer and Co.). Sensitising photographic emulsions with the aid of dyestuffs. Nov. 2.

[C.S.] 27,896 (1902). Gros and Ostwald. Reproducing pictures or the like. Nov. 18.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 24,194. Stock. Matches. Nov. 7.

,, 24,511. Yonck. Explosives. Nov. 11.

[C.S.] 456 (1903). Kynoch, Ltd., and Ashley. Kneading and like machines employed in the manufacture of explosives. Nov. 18.

,, 457 (1903). Kynoch, Ltd., and Ashley. Manufacture of explosives. Nov. 18.

,, 21,365 (1903). Schnebelin. Explosive powder. Nov. 11.

,, 21,518 (1903). Du Buit. Charges of powder. Nov. 18.

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Notices.

ANNUAL GENERAL MEETING, 1904: NOMINATION OF PRESIDENT.

Notice is hereby given that Mr. William H. Nichols has been nominated to the office of President for 1904–5 under Rule 8.

THE SOCIETY'S COUNCIL ROOM.

The various Sections of the Society are now at liberty to make use of the Society's meeting room for Sectional purposes, when not required by the Council, by making arrangements beforehand with the General Secretary.

SUBSCRIPTIONS FOR 1904.

Foreign and Colonial Members are reminded that the subscription of 25*s*. for 1904, payable on January 1st next, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1904.

ANNUAL GENERAL MEETING, NEW YORK, 1904.

Members who contemplate attending the next General Meeting, in New York, are requested to communicate with the General Secretary as soon as possible, in order that suitable travelling arrangements may be made.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

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CHANGE OF ADDRESS REQUIRED.

Zahn, Edw.; l/o 117, Sherwood Avenue, Syracuse, N. U.S.A.

Deaths.

Bramwell, Sir Frederick, Bart., F.R.S., 5, Great Geo Street, Westminster, S.W. Nov. 30.

Schad, Julius, 33, Mosley Street, Manchester. Oct. 23.

Liverpool Section.

Meeting held on Wednesday, November 25th, 1903.

MR. FRANK TATE IN THE CHAIR.

The CHAIRMAN said that he was extremely sorry to have announce that Dr. T. Lewis Bailey had resigned the office Honorary Secretary to the Liverpool Section, an office had filled with so much ability for many years. e had proved himself to be a splendid organiser and indefatigable worker. In connection with the General eeting of the Society in Liverpool, in 1902, he spared pains to perfect every detail in the arrangements which oved so satisfactory. Mr. W. R. Hardwick had consented fill the vacancy.

Dr. CAMPBELL BROWN said that Dr. Bailey had for many ars performed the heavy duties of Honorary Secretary the Section in a manner which had been of material vice alike in the Section itself and in promoting its erests on the Council of the Society. He had given a eat deal of thought to the work, and by his good judgment d increased the efficiency of the Section. He begged to ve that the cordial thanks of this Section be accorded him for his admirable services.

Mr. ALFRED SMETHAM said that in the eulogies so ably pressed by Mr. Tate and Dr. Campbell Brown the opinion the whole Section had been fitly voiced, and he was quite re that not only the members of the Section, but all those io attended the last General Meeting of the Society in verpool, must have been struck with the great tact and ill displayed by Dr. Bailey. He had much pleasure in onding the resolution.

In acknowledging the vote of thanks Dr. BAILEY pressed his gratitude for the expression of appreciation. e work of Secretary had been very congenial to him, d he regretted that his residence outside Liverpool made impossible for him to retain the position. He would, wever, be still resident in the district, and an active mber of the Section.

THE VAPOUR PRESSURES OF CONCENTRATED SOLUTIONS OF SULPHURIC ACID AT HIGH TEMPERATURES.

BY B. BRIGGS, D.SC. (VICT.).

The only measurements of the vapour pressures of phuric acid solutions hitherto carried out are those of gnault, which extend only to 35° C., and those of E. Sorel is Journal, 1890, 175), who extended Regnault's investi- ions up to 95° C., using a similar method to the one cribed in this communication.

n connection with the manufacture of sulphuric acid, is desirable to know the vapour pressure of more centrated solutions at higher temperatures. The con- tration of acid made in the lead-chamber process varies m 124° Tw. (chamber acid) to 152° Tw., the acid collected at the base of the Glover tower, the temperature of the Glover tower usually varying from 120° C. to 135° C. At the suggestion of Prof. J. Campbell Brown, measurements with more concentrated acid and at higher temperatures were attempted. It was decided to adopt the dynamical method of aspirating a measured volume of air through the acid and weighing the water carried over; this method having been applied successfully by J. Walker (Zeit. Phys. Chem., 1888, 2, 602) to various salt solutions, and by Will and Bredig (Ber., 1889, 22, 1084) to alcoholic solutions. The arrangement of the apparatus is shown in the accompanying sketch. The acid under investigation was contained in a series of Mohr's bulbs. These were kept at a constant known temperature by means of the air bath D, constructed of sheet iron with an air space 1½ ins between the inner and outer walls, the external measurements being 18 ins. by 9 ins. by 9 ins. Through two small holes at the top of the bath were inserted a mercury thermostat R, and an accurate thermometer T. The bath was heated by two parallel Fletcher burners controlled by the thermostat. The Mohr's bulbs were fused directly to the glass spiral B, contained in the bath, through which the air circulated before passing through the acid. In this way the air was brought to the temperature of the bath before coming in contact with the acid. The leading tubes from the spiral and bulbs left the bath through the holes *h*, *h*, bored through the hardwood plugs covered with asbestos, which closed the ends of the bath. The absorption apparatus consisted of two small U tubes E, containing pumice and sulphuric acid; these were weighed before and after each experiment. Air, previously dried and purified by passing through two large U tubes, the first filled with alternate layers of calcium chloride and fresh soda lime, and the second with pumice and sulphuric acid, was drawn through the apparatus by the aspirator G, which had a capacity of about 8 litres, and was connected to the bulbs through a drying tube containing pumice and sulphuric acid, a mercury manometer F, being also interposed to measure the decreased pressure in the apparatus. The temperature of the air in the aspirator was read from time to time by the thermometer. The sulphuric acid was pure sulphuric acid (free from arsenic and lead) obtained from J. W. Towers, Widnes. Solutions of the following strengths were made up:—

Acid.	Specific Gravity.	Percentage of H_2SO_4.
A	1·704	77·51
B	1·724	79·17
C	1·751	81·81
D	1·778	84·26
E	1·803	87·32
F	1·826	91·22

The specific gravity in each case was accurately determined at 15° C., and from this the concentration was obtained by reference to Lunge's tables (Alkali Makers' Handbook). The figures were checked by gravimetric analyses. Preliminary experiments were carried out to ascertain the maximum rate at which air could be drawn through the acid and still attain complete saturation. It was found that saturation was attained if the rate did not exceed 1 litre per hour. It was also found that no sulphuric acid vapour was carried over, even at 200° C. Measurements were now made at temperatures from 100°C. to 200° C., the vapour pressure being calculated from the formula $p = 62290 \times \frac{w\,T}{M\,v}$, where w = weight of water carried over; T, absolute temperature of acid; M, mol. weight of water; v, volume of air in c.c. aspirated through the liquid corrected to N.T.P. The following table gives complete data for a series of experiments at 100° C.

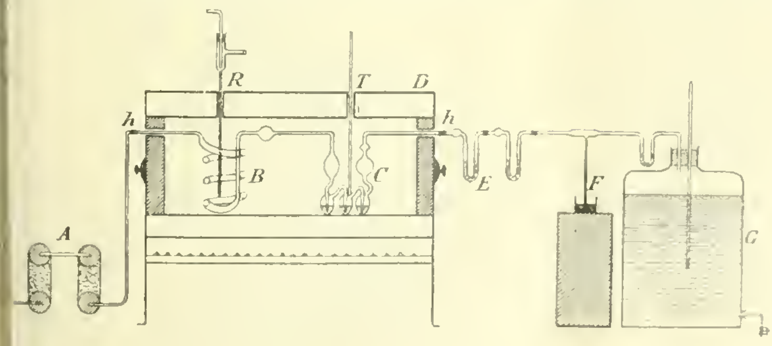


TABLE I.

Temp.	Acid.	v	w.	Vapour Pressure calculated.	Mean Vapour Pressure.
					Mm. of Mercury.
100° C.	A	11,760 7,584	0·1842 0·1188	20·21 20·19	20·2
	B	15,816 13,841	0·1752 0·1536	14·29 14·32	14·3
	C	14,581 16,220	0·0986 0·1032	8·73 8·21	8·5
	D	17,190 15,405	0·0707 0·0620	5·31 5·20	5·3
	E	16,384 12,661	0·0298 0·0236	2·35 2·40	2·4
	F	Vapour pressure too small to be determined.			

It will be seen that the volume of air, and hence the duration of experiment (all being carried out at the rate of 1 litre per hour), was varied considerably. Experiments were also carried out at 125° C., 150° C., 175° C., and 200° C., the results being given in the following table:—

TABLE II.

Temp.	Acid.	v.		Vapour Pressure calculated.	Mean Vapour Pressure.
					Mm. of Mercury.
125° C.	A	2,606 1,302	0·1717 0·0858	90·84 90·78	90·8
	B	2,582 1,291	0·1240 0·0616	66·13 68·90	67·5
	C	2,797 3,111	0·0716 0·0912	39·56 40·38	40·0
	D	5,974 4,877	0·1000 0·0822	23·05 23·21	23·1
	E	6,656 6,601	0·0564 0·0501	10·67 10·45	10·5
	F	3,907 5,955	0·0141 0·0215	4·97 5·05	5·0
150° C.	A	1,411 1,419	0·2950 0·2858	306·6 294·1	300·0
	B	1,472 1,463	0·2110 0·2103	209·6 210·3	210·0
	C	1,443 1,553	0·1256 0·1332	127·4 125·5	126·5
	D	1,447 2,905	0·0720 0·1599	72·8 80·6	76·7
	E	3,286 3,481	0·0972 0·1038	43·3 43·6	43·5
	F	7,604 3,745	0·0766 0·0384	15·1 15·0	15·0
175° C.	D	1,323 1,449	0·1951 0·2106	229·7 230·1	230·0
	E	1,334 1,510	0·0991 0·1078	115·2 110·7	113·0
	F	1,419 1,473	0·0474 0·0480	57·8 50·5	51·0
200° C.	E	1,540 1,565	0·3480 0·3532	364·5 369·3	367·0
	F	1,552 1,552	0·1458 0·1370	153·8 144·5	149·0

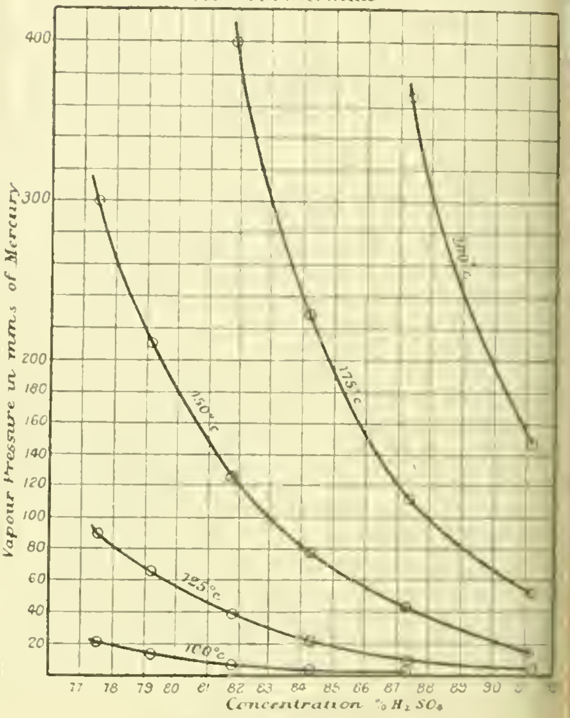
The mean results obtained were plotted to scale, and from the smoothed curves shown below, the following table was constructed by graphic interpolation:—

TABLE III.

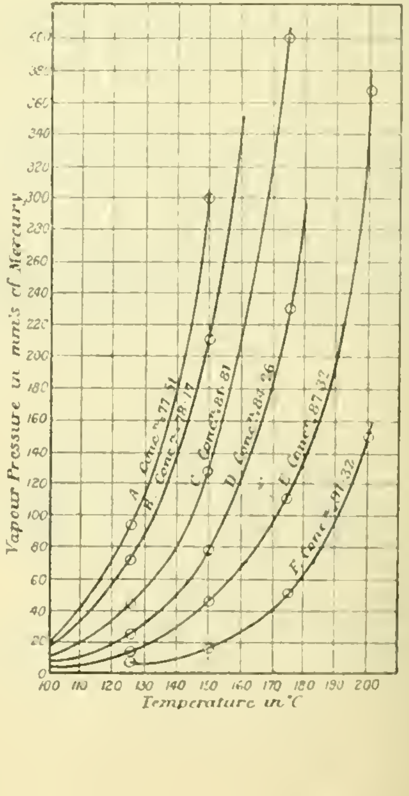
Vapour Pressures in Mm. of Mercury.

Acid.	Concentration of Acid.	Temperature, Degrees C.												
	Percentage of H_2SO_4.	100.	110.	120.	125.	130.	140.	150.	160.	170.	175.	180.	190.	200.
A	77·51	20·2	42·5	71·0	90·8	112·5	168·5	300·0	..	..	..	..	..	..
B	79·17	14·3	33·8	56·2	67·5	86·2	132·0	210·0	335·0	..	..	..	..	..
C	81·81	8·5	18·8	32·5	40·0	51·0	75·7	126·5	207·5	322·5	400	..	..	..
D	84·26	5·3	11·1	18·5	23·1	29·5	46·0	76·7	118·5	180·0	230	282·5	..	..
E	87·32	2·4	5·0	8·7	10·5	15·0	26·3	43·5	63·8	92·5	113	132·5	191·0	367
F	91·22	..	..	..	5·0	6·9	10·0	15·0	25·6	40·6	51	62·0	92·5	149

(a) Isothermals



(b) Pressure Temperature Curves



In conclusion, attention may be drawn to the following points:—The method is particularly useful in its application to the measurement of very low vapour pressures, there being practically no limit to the duration of the experiment. When high vapour pressures are to be measured two difficulties arise: (i.) The concentration of the acid in the bulbs rises throughout the experiment. (ii.) The volume of air aspirated, being necessarily much smaller, cannot be measured with the same degree of accuracy. The conditions necessary to reduce these errors lie in opposite directions, since the greater the volume of air aspirated the greater is the change in concentration of the acid. Hence the method is most applicable to the determination of the vapour pressures of solutions at moderate temperatures.

The author wishes to express his indebtedness to Prof. J. Campbell Brown, at whose suggestion the work was undertaken, for the kind interest he has taken in it throughout; his thanks are also due to Mr. B. C. Burt, B.Sc., for kindly revising the figures and curves.

London Section.

Meeting held on Monday, November 2nd, 1903.

MR. WALTER F. REID IN THE CHAIR.

NEW COMPOUNDS OF PHOSPHORUS FOR THE PRODUCTION OF MATCHES.

BY FRED BALE.

When hydrocarbons, especially naphthalene, are heated with yellow phosphorus, in presence of water, substances are btained which may be used for the production of strike-nywhere matches, the hydrocarbon vapour being stated o reduce the noxious effects of the phosphorus and its xidation products. (See Eng. Pat. 10,655 of 1902; this ournal, 1903, 512.)

A discussion followed, in which Prof. Hodgkinson, Drs. Messel and Thorne, Messrs. Boor, Clayton, Muir, Reid, Watson Smith, and the author took part.

ERRATA.

This Journal, 1903, 1226, col. 2, l. 11 from top, *for* "phosphorous" *read* "phosphorus"; also *ibid.*, l. 14 from op, *for* "phosphrus" *read* "phosphorus."

Manchester Section.

Meeting held on Friday, November 6th, 1903.

CHAIRMAN'S ADDRESS.

MUNICIPAL CHEMISTRY.

BY J. CARTER BELL, A.R.S.M., ETC.

By municipal chemistry I understand all those things in hemistry upon which the chemist to a municipal corporaion has to advise. I only name a few things which belong o such a department. It should include the analyses of ood and drugs, of those chemicals which a corporation s a body is in the habit of using, such as disinfectants, ils, paints, cements, &c.; also analyses of waters, sewages, nd effluents; lastly the analysis of gas and air. No one nan could do all this work, but if he had skilled assistants under him, such as the borough engineer, the treasurer, and the medical officer have, such chemical work could be carried out very much to the benefit of the corporation. Therefore, in my opinion, a chemical department should be formed in every large corporation, with a man at the head who should thoroughly understand and be able to perform all the analyses that would be required. As I have had 30 years' experience in the above kind of work, it may not be out of place if I offer a few remarks and suggestions whereby improvements may be effected.

Let us take the Food and Drugs Act first. As many of you are aware, when the inspector buys any article of food, or drug, he has to divide the sample into three parts, giving one to the vendor, another to the analyst, and keeping the third himself. Here is a treble expense, and often the very object is defeated upon which the inspector set out. For, as a rule, he is well known, and special articles are kept for him, which, naturally enough, will be perfectly pure. This is strikingly shown by the Local Government Board Report. Samples obtained by the inspector showed only 10 per cent. of adulteration, whereas samples bought by private purchasers showed over 30 per cent. of adulteration. As an instance of how the inspectors may be deceived, a curious case of fraud is reported from Birmingham. A sample of butter was marked pure Danish butter, but contained 87 per cent. of foreign fat. Another sample, taken from the same piece, was pure butter, and the inspector found that a small piece of butter had been carefully fitted into one end of a large lump of margarine. When the case was heard, the assistant who sold the butter said that she was told by her employer to serve ordinary customers from the margarine end, but anyone she was suspicious about was to be served from the end which consisted of pure butter.

To illustrate further what I understand by municipal chemistry, let us take the question of various cements and mortars. The examination of these is a most important chemical question, and a corporation may easily lose hundreds and thousands of pounds by not submitting these articles to chemical analysis, and sometimes a great injustice may be done to the cement manufacturer, for he may have his goods rejected by the clerk of works in favour of another. An instance of this was brought before my notice some time since, in which the clerk of works had tested the cement and said the breaking power was only 270 lb. I examined the sample and found it to be of first-class quality. It was then sent to a London expert, who gave the breaking strain at 400 lb., and the manufacturer had certified for 380 lb. It seems absurd to refer such a question to a clerk of works when the whole thing requires an experimental chemist, who must have been properly trained to do the work.

Then take such a simple question as the slaking of lime. We all know that when lime is well slaked and mixed with water, a milk of lime should be obtained without any lumps and needing no grinding; but I know, at the present time, of a place where expensive machinery has been put up to grind the lime after it has been well slaked. If a chemist had been asked for his advice upon this subject he certainly would never have put up such an expensive plant for such a purpose. Take the various disinfecting powders which are submitted to corporations, and which, in many instances, are almost worthless. In my younger days, when I was more enthusiastic, a pink powder was submitted to me for analysis. It was said to contain 15 per cent. of pure carbolic acid, and the price was 10*l*. 10*s*. a ton. Practically, it contained no carbolic acid, but was simply a mixture of lime and heavy tar oils.

How are such defects to be remedied? My answer is: By having a good technical laboratory specially devoted to municipal chemistry, fitted up with all the most modern appliances. To some, the very name of technical chemistry savours too much of the "rule of thumb." A greater mistake could not be made in holding such an idea. In the work in which I am engaged, there is as much accuracy and care required as in ordinary research work. I think it would try the skill of the student, and make him none the worse chemist, if he were to estimate accurately and quickly the following:—Tannin in tea, boric acid in milk, alumina in bread and flour, copper in pickles, tin in sugar, fatty acids in butter, fusel oil in whisky, olive stones in pepper, arsenic in beer, benzoic acid in wine, glucose in jam. After making full analyses of waters and effluents, and being able to write a good report upon them, with the addition of a little general knowledge, I should then say that this student was fit to enter the laboratory of a public or any other analyst. I know some will not like the word "quickly": I am afraid that the modern student spends too much time over one analysis, whereas he might conduct three or four in the same period that he is doing one; it would certainly improve him, and make him more useful in after life.

If one compares the adulteration of to-day with that of forty years ago, one cannot but admire the good which the Act has accomplished. Tea contained various colouring matters more or less poisonous; coffee was conspicuous by its absence; the bread contained alum, sulphate of copper, and plaster of Paris; sugar, sand and colouring matter; butter, a mixture of various fats; and of the milk, very little had come from the cow. In fact, there was not an article upon the breakfast table which was pure.

Now all this is changed, and the difficulty is to find adulteration, though now and then we find sensational articles written upon the adulteration of the food of the working man. I certainly am no advocate for the introduction of metals into articles of food, but if, as doctors say, metallic salts are so poisonous, then a ban should be placed upon all tinned foods; for I doubt whether you could find any tinned fruit from which tin is absent. In the case of preserved meats which have been examined, tin has been found as high as 1 part in 10,000, which means that 1½ lb. of meat will contain about 1 grain of tin. In these cases, where these high amounts have been recorded, the tin boxes had been very much corroded. Again, one has to consider the length of time the meat has been sealed up: for the greater the time the greater is the action upon the metal. When the meat has only been one year in tin, the amount of metal absorbed by the meat is as low as 1 in 50,000, or about 1 grain in 7 lb. of meat. This would be an infinitesimal dose. Practically speaking, we may look upon tin as one of the non-poisonous metals.

As regards the real adulteration of sugar it is practically nothing; thus in five years, from 1882 to 1886, no sample was found adulterated; in the next ten years it was about 4 per cent. Then the Local Government Board reported in a Blue Book the following:—"After a good many years, in which the adulteration of sugar had apparently ceased, it has again come under notice in a curious form. Of the 246 samples examined nearly one-seventh were reported as having been coloured with an aniline dye of an amber tint, in order to make white crystals of beet sugar imitate the more valuable Demerara. The quantity of the dye used, however, is very minute."

If we turn our attention to tea, we shall find as little adulteration there as there was in sugar. In former days a most formidable list of adulterants was brought against tea; but now the adulteration has ceased, and for years past, practically speaking, no adulterated teas have been sold. Thus, in 1901, 492 samples were bought, and not one was sophisticated, and for a previous five years, out of 1,000 samples bought by the inspectors, only one was adulterated. One of the reasons for the above low adulteration is that the tea is examined in bond, and if last year's Government report is read, it will be seen that 1,288 samples were examined, and of this total 1,085 samples were satisfactory. The remaining 203 samples were of doubtful character, and were reported to the Board for their decision, who decided that this tea should be for exportation or for the manufacture of caffeine. Though the adulteration in tea is, practically speaking, *nil*, yet there is no doubt that the public are very much imposed upon by advertisers of tea under high-sounding, fanciful names, and statements that they are free from tannin.

We will examine a third article of the breakfast table, and that is bread. A few years since, it was largely adulterated with alum, sulphate of copper, magnesia, &c. According to some, the first two would not be looked upon as adulterants, for in those times it was thought bread could not be made without the use of alum or sulphate of copper. What is the action of these chemicals upon flour, and why were they used? If flour becomes damp, it acquires a musty flavour, and bread made from such flour is dense and heavy. In such flours acetic and lactic acids are formed, which act upon the gluten, causing it to be soluble in water. Alum and sulphate of copper seem to combine with the gluten, causing it to be insoluble in water. A small quantity of lime-water added to damaged flour produces the same action upon the gluten without any dangerous results.

During the last ten years the adulteration of bread and flour has been under 1 per cent.; thus, of 932 samples of bread and flour bought in England in the year ending 1901, only six samples were reported as adulterated. What a contrast this is to the early years of last century, when every other sample of bread and flour was adulterated! I myself can speak of over 30 years' experience in Salford, and nearly that number of years for the county of Chester; and when one compares the first years with the latter, the change is something marvellous; thus in the years 1875 to 1902 the percentages of adulterated samples were:—

Year.	For Salford.	For the County of Chester.	Year.	For Salford.	For the County of Chester.
1875	66·6	..	1889	10·1	11·4
1876	40·3	..	1890	5·1	7·1
1877	27·4	45·6	1891	6·1	8·7
1878	29·9	26·2	1892	7·4	4·7
1879	12·0	20·1	1893	6·6	4·6
1880	20·2	13·0	1894	1·2	6·4
1881	16·3	15·0	1895	2·3	5·6
1882	15·5	10·0	1896	4·1	6·1
1883	6·6	9·2	1897	4·3	5·7
1884	7·1	9·1	1898	1·9	4·2
1885	5·2	9·1	1899	3·9	5·0
1886	3·9	6·8	1900	3·7	4·5
1887	8·7	11·6	1901	1·7	5·0
1888	6·3	9·9	1902	1·1	3·3

These figures compare very favourably with those from the whole of England. Thus from—

1877 to 1881 the percentage of adulteration was 16·2
1882 „ 1886 „ „ „ „ 13·9
1887 „ 1891 „ „ „ „ 11·7
1892 „ 1896 „ „ „ „ 10·6
1897 „ 1901 „ „ „ „ 9·0

Even these numbers might be lowered if some analysts would not persist in calling everything adulterated if it does not come up to the highest standard of purity. As an instance of this over-zeal to return samples adulterated, an analyst called three samples of lard adulterated because they contained 0·1, 0·3, 0·4 per cent. of water. It is ludicrous to call such samples adulterated, but it has a serious side, and that is, a respectable tradesman may be worried with a summons for such a trivial thing.

It will be interesting to take a few more things for examination, and ascertain the amount of adulteration which exists at the present day. Coffee has always been a favourite subject with the adulterator, and here is an instance where the Government returns do not actually show the real amount of adulteration, because, if the inspector is known, the grocer very obligingly grinds a special lot of coffee for him. Even then the coffee need not be genuine, though it is in the berry. For there is a process of coating the berries with sugar, thus increasing the weight. This is done in the process of roasting. Still the percentage of adulteration is not very serious. Whereas in the five years 1877 to 1881 it was 18·6 per cent., it had fallen to 8·2 in the five years 1897 to 1901. When the grocer puts the chicory into the coffee he does not, as a rule, do it with a sparing hand, for out of 137 samples in 1901 the average percentage of chicory was over 44.

I cannot dismiss the subject of the breakfast table without saying a few words about butter and milk. These two will always remain the great holdfast of the adulterator. According to the latest report, "there was a marked increase in the extent of adulteration detected. During the year nearly 12,000 samples were examined, of which rather more than a tenth were reported against, as compared with 7·8 per cent. in the previous year. In London and the 20 next largest towns taken together, the rate of butter adulteration was 12·2, and in the rest of the country 8·3 per cent. In Salford it was less than 2 per cent. In some districts the proportion of adulterated samples of butter from exceptional causes is considerably above the average. In Lancashire 197 samples were examined; over 17 per cent. were condemned. Most of the adulterated samples were taken by a special inspector, who, by devoting himself particularly to butter, acquired great skill in the detection of adulteration by appearance, and who only submitted for analysis samples which he believed to be adulterated."

I have already spoken of the fallacy of "digestive tea," and equally fallacious is "ferruginous wine." This ferruginous wine contained practically no iron, for the quantity found was a mere trace, or 1 part in 150.000. I consider this a cruel deception. I have paid particular attention to the subject of iron in wine, and I have never yet found a pure grape juice containing enough iron to justify the term "ferruginous."

The following list gives the names of the pure grape juices which I have analysed :—

Description of Grapes.	No. of Parts of Juice to 1 part of Iron.	No. of Gallons of Juice to 1 grain of Iron.
1. Black English hot-house ...	1,750,000	25·0
2. White „ „ ...	730,600	14·3
3. Almeria, 1879..............	1,372,000	19·6
4. „ 1880..............	1,050,000	15·0
5. French cluster, chiefly used in the production of *vin ordinaire*................	127,400	1·8
6. Portuguese cluster..........	100,100	1·4
7. Bordeaux..................	406,000	5·8
8. Oporto, from the Alta Dour	280,000	4·0
9. Pineau, from the Côte d'Or.	70,000	1·0
10. Folly Blanc Cognac........	98,000	1·4
11. Blanquette, from Perpignan	154,000	2·2
12. Grenache „ „ No. 1	168,000	2·4
13. „ „ „ No. 2	56,000	0·8
14. „ „ Tarragona	168,000	2·4
15. Clairette „ „	44,800	0·64
16. Congress, from Vineland, U.S.A....................	210,000	3·0
17. Madeira Videilho...........	280,000	4·0
18. „ Tinta..............	77,000	1·1

So that some of the wines in this list have far more right to the term ferruginous than the wine which is so largely advertised.

Only a few weeks since a report appeared that sweets were being mixed with pounded glass and being sold as glittering sweets. A number of these were sent to me, and many of them had a silky look giving the idea that they were coated with glass. Not a particle of glass could be found in the sweets.

Although there are over 200 counties and boroughs requiring analysts for the particular work I have mentioned, yet to my knowledge there is no public laboratory in the kingdom which is devoted to municipal chemistry.

The examination of food and drugs is of national importance, and the study of this particular branch should be carried on in some national laboratory to which public analysts might have access, and from which information might be obtained as to the new adulterant which was most fashionable, for, even in such a thing as this, there is an amount of fashion present which for a time runs its course, and then dies out, owing to the analyst being too familiar with the new adulterant. In the case of pepper, some time since ginger fibre, from which the valuable portion had been taken away by ginger-beer manufacturers, was dried and ground up with peppercorns; that has gone out of favour, and olive stones have taken the place of ginger fibre; that, in its turn, is being driven out, and, for a time, pepper is pure. What is sadly wanted is some central bureau in which information might be gathered, and then disseminated amongst the analysts. It may be said there is Somerset House, but I can safely say, that for 30 years I have never received any official information from that department. Very different is it with the Board of Agriculture, who do give information to their official chemists, for not long since I received notice that there was a large importation into this country of parchment coffee husk, which the Board had reason to believe was to be used for the adulteration of bran, bran meal, and other feeding stuffs for cattle. A sample of the coffee husk was sent.

I cannot see why a municipal laboratory should not be established in every large town, with a chemical officer at the head, who should rank with the medical officer, borough engineer, and other chief officials; and samples of everything which was required by the corporation should be sent to the laboratory, and from time to time examined to see that they were equal to the original samples sent in by the contractor at the time of making the contract. I am sure corporations would gain immensely by such a system, and they would find that their chemical officer was the most economical one of the staff. In many towns that I know of, chemicals, oils, &c., are bought, and never examined to see whether the bulk comes up to the original sample.

Though in Manchester we have a most magnificent school fitted up with almost gorgeous luxury, with highly skilled and trained men for each department, yet I do not think there is a place in which a young chemist who has finished the ordinary college course could find special instruction in the work of a public analyst. I know you will say that such instruction can be got in any public analyst's laboratory. That may be so, but the public analyst of the present day has no time for this special teaching, and his instruction would not be equal to that which would be given by a professor who devoted the whole of his time to this object. As Manchester always likes to be in the van, she could not do better than start a laboratory for public analysts and for work connected with municipal chemistry. If that were done I think chemists would come from all parts of the kingdom to study in this special laboratory. In conclusion, I will repeat some words from a writer in the *Edinburgh Review* 74 years ago. He says: "That genius alone, without practical skill, cannot be expected to succeed. We therefore hope that the business of practical instruction will be vigorously prosecuted and extended in all our great seminaries. If it shall be otherwise, Britain must, we fear, descend from her eminence in chemical science, and be content to receive from others that information and instruction which she was wont to communicate from her own stores."

Nottingham Section.

Meeting held at Leicester, on Wednesday, November 25th, 1903.

MR. J. T. WOOD IN THE CHAIR.

EXAMINATION OF METHODS EMPLOYED IN ESTIMATING THE TOTAL ACIDITY OF GASES ESCAPING FROM THE CHAMBER PROCESS FOR THE MANUFACTURE OF SULPHURIC ACID.

BY H. J. WATSON.

The methods employed at present for estimating the total acidity of chamber escapes depend on the absorption of the escaping gases in solutions of either sodium carbonate, sodium hydrate, or hydrogen peroxide, the two latter reagents being sometimes used in solution together.

Having had his attention drawn to the results of some comparative bellows tests of chamber escape gases, made by one or his staff of inspectors, Mr. Carpenter, in conjunction with Mr. Linder, made an examination of the methods employed (this Journal, 1902, 1490). On p. 1507 they say: "We do not venture at present to put forward any opinion on the relative merits of neutral or alkaline peroxide as absorbents; either is clearly preferable to alkali alone, as the sum of the acidities of *x*-sulphurous and *y*-nitrous is given on titration, as $x + y$ in terms SO_3, as nearly as possible under the circumstances. Much depends on the point of view; from that of the manufacturer, who would naturally wish, in applying a simple titration test, to include among the losses he is endeavouring to estimate, some of that due to nitric oxide, the alkaline peroxide will doubtless commend itself. We have shown how, at the last, the amount absorbed is a balance merely. In this case the precaution as to use of Methyl Orange that we give (if this be the indicator chosen) should be observed to ensure accurate results."

In March 1902 the inspector visited the works at which I was engaged, and made the usual test with hydrogen peroxide as absorbent. He found an escape equal to 1·6 grains of sulphuric anhydride per cubic foot, our test earlier in the day being 1·72 grains per cubic foot, using the same absorbent. On the same day the inspector commenced a comparative test, using alkaline peroxide as absorbent, but the test was not completed, owing to an accident. He, however, told me of having made comparative tests at other works with these absorbents, and invariably finding a higher test with alkaline hydrogen peroxide. From that day until early in February 1903, I made comparative bellows tests with these two absorbents, and always found that the alkaline hydrogen peroxide gave a higher result than neutral hydrogen peroxide, the difference varying in amount from 0·5 grain with ordinary working conditions to 3 grains of sulphuric anhydride per cubic foot at a period of disorganisation. After having performed so many experiments and over so long a period, with results, without exception, pointing in favour of alkaline peroxide, I decided to go into it more minutely. I, however, found that to go into it thoroughly required more time than was at my disposal, and ultimately, having accepted other work where it is not possible to continue these experiments, I have had to abandon them altogether. I obtained sufficient results, however, to make one think it worth while to place them before the Society. It was 29th May 1903 before a real start was made, and afterwards experiments were performed on different days, sometimes at intervals of several days. On 29th May, eight experiments were performed, details of which are now given. Eight 8-oz. Erlenmeyer flasks were fitted with I.R. stoppers having inlet and outlet tubes; the inlet tube, reaching to bottom of the flask, was drawn out to a narrow bore. I used four of these flasks as absorbing vessels in train, and, by having two sets, one at work absorbing gases, while the other was being titrated and prepared for next experiment, as little time as possible elapsed between experiments when performed on the same day. In all experiments 1 cb. ft. of water was run from a leaden aspirator, the time taken being 40 minutes. The solutions used in the experiments were: half-normal solutions of sodium hydrate, hydrochloric acid, and sodium nitrate, hydrogen peroxide 10 volumes, a 1 per cent. solution of metaphenylenediamine. Phenolphthalein was used as indicator. In experiments where hydrogen peroxide was not present during absorption it was added before titration.

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
1	1	200 c.c. H_2O + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	2·8	2·8	0·86		
	2	" "	"	..	"	0·1	0·1	0·03		
	3	" "	Neutral	..	"	0·0	0·0	..		
	4	" "	"	..	"	0·0	0·0	..	2·9	0·89
2	1	" "	Acid	..	"	2·9	2·9	0·89		
	2	" "	"	..	"	0·1	0·1	0·03		
	3	" "	Neutral	..	"	0·0	0·0	..		
	4	" " + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	6·1	3·9	1·20	6·9	2·12
3	1	" "	Acid	..	N/2 NaOH	3·2	3·2	0·98		
	2	" "	"	..	"	0·1	0·1	0·03		
	3	" " + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	5·8	4·2	1·29		
	4	" " "	"	..	"	8·9	1·1	0·33	8·6	2·64
4	1	" "	Acid	..	N/2 NaOH	3·2	3·2	0·98		
	2	" " + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	5·9	4·1	1·26		
	3	" " "	"	..	"	8·9	1·1	0·33		
	4	" " "	"	..	"	9·8	0·2	0·06	8·6	2·64
5	1	" " "	"	..	"	3·3	6·7	2·06		
	2	" " "	"	..	"	8·7	1·3	0·40		
	3	" " "	"	..	"	9·8	0·2	0·06		
	4	" " "	"	..	"	10·0	0·0	..	8·2	2·52
6	1	" + 10 c.c. N/2 NaOH ...	"	5 c.c.	"	5·4	4·6	1·41		
	2	" " " ...	"	"	"	9·0	1·0	0·30		
	3	" " " ...	"	"	"	9·6	0·4	0·12		
	4	" " " ...	"	"	"	9·9	0·1	0·06	6·1	1·87
7	1	" + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	3·7	3·7	1·14		
	2	" + 10 c.c. N/2 NaOH ...	Alkaline	5 c.c.	N/2 HCl	8·8	1·2	0·37		
	3	" " " ...	"	"	"	9·2	0·8	0·24		
	4	" " " ...	"	"	"	9·8	0·2	0·06	5·9	1·81
8	1	" + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	3·8	3·8	1·17		
	2	" "	"	..	"	0·1	0·1	0·03		
	3	" + 10 c.c. N/2 NaOH ...	Alkaline	5 c.c.	N/2 HCl	9·3	0·7	0·21		
	4	" " " ...	"	"	"	9·5	0·5	0·15	5·4	1·57

"These results in a more decisive manner confirm the results of the inspector and my own bellows tests. They also show the superiority of sodium hydrate alone over hydrogen peroxide alone, and that a mixture of the two is better than either, the highest results being obtained with hydrogen peroxide alone in the leading absorbing vessels and a mixture of sodium hydrate and hydrogen peroxide in third and fourth vessels. It will be noticed, on examining the results of the foregoing experiments, that wherever alkaline hydrogen peroxide follows hydrogen peroxide alone, whether it be fourth, third, or second vessel, the increase of acidity in these vessels is approximately the same, *i.e.*, giving increase in c.c. of N/2 NaOH neutralised: in fourth flask 3·9 c.c., in third flask 4·2 c.c., in second lask 4·1 c.c. The increase when alkali alone follows hydrogen peroxide alone is not so great, showing that hydrogen peroxide must necessarily be present to obtain the highest results.

The question now arose as to the causes for this increase of acidity when alkali or alkaline peroxide followed hydrogen peroxide alone. In my next experiment flasks Nos. 1 and 2 contained 200 c.c. of H_2O + 5 c.c. of H_2O_2; No. 3, 200 c.c. of H_2O + 10 c.c. of N/2 $NaNO_2$; and No. 4, 200 c.c. of H_2O + 5 c.c. of H_2O_2 + 10 c.c. of N/2 NaOH. Sodium nitrite was introduced with a view to finding out if all SO_2 was oxidised in Nos. 1 and 2; if it was not, nitrous acid would have been liberated and acidity shown on titration. The following is the result:—

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
9	1	200 c.c. H_2O + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	3·1	3·1	0·95		
	2	,, ,, ...	,,	..	,,	0·1	0·1	0·03		
	3	,, + 10 c.c. N/2 $NaNO_2$...	Neutral	5 c.c.	..	0·0	0·0	..		
	4	,, + 5 c.c. H_2O_2 + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	6·9	3·1	0·95	6·2	1·91

No acidity was found in No. 3, and yet there was an ncrease in acidity in No. 4. Evidently increase was not lue to SO_2; it must then be due to nitrogen compounds r—as Carpenter and Linder have shown to be present in hamber escape gases—some sulphazotised bodies. It was hought that some nitre compounds might be escaping bsorption in Gay-Lussac tower, and possibly would ccount for this increase in acidity in flask containing lkaline peroxide; therefore, before entering No. 1 flask, he gases were caused to pass through three Drechsel's ottles, tall form, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84; any gases escaping absorption in tower would then be trapped before entering first flask. Six experiments were performed in this way on different days, the contents of the Drechsel's bottles being the same for all six experiments. In each experiment the first two flasks contained 200 c.c. of H_2O + 5 c.c. of H_2O_2, and the last two 200 c.c. of H_2O + 5 c.c. of H_2O_2 + 10 c.c. of N/2 NaOH. The results were quite similar to experiments, without Drechsel's bottles, with sulphuric acid. I give the mean of the six experiments:—

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
Mean of six.		A, B, C, three Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
	1	200 c.c. H_2O + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	1·9	1·9	0·58		
	2	,, ,, ...	,,	..	,,	0·2	0·2	0·06		
	3	,, ,, + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	8·5	1·5	0·46		
	4	,, ,, ,,	,,	..	,,	9·6	0·4	0·12	4·0	1·23

Upon testing some of the acid from each of the Drechel's hottles with metaphenylenediamine, A gave a brown o yellow coloration; B, a very faint coloration; C, no oloration, showing some nitrous acid was escaping tower, ut was all absorbed in first two Drechsel's bottles, and till there was an increase of acidity in No. 3 flask, ontaining alkaline hydrogen peroxide. A few days ater the following experiment was performed. The aspirated gases were caused to pass through two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84; two absorbing flasks, each containing 200 c.c. of H_2O + 5 c.c. of H_2O_2; an absorbing flask containing 200 c.c. of H_2O + 1 c.c. of metaphenylenediamine; and then two flasks, each containing 200 c.c. of H_2O + 5 c.c. of H_2O_2 + 10 c.c. of N/2 NaOH. The following is the result:—

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
6		A, B, two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
	1	200 c.c. H_2O + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	3·7	3·7	1·14		
	2	,, ,, ...	,,	..	,,	0·2	0·2	0·06		
	3	,, + 1 c.c. metaphenylenediamine.	Neutral	5 c.c.	,,	0·0	0·0	..		
	4	,, + 5 c.c. H_2O_2 + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	9·0	1·0	0·30		
	5	,, ,, ,,	,,	..	,,	9·4	0·6	0·18	5·5	1·69

There was a fairly deep brown coloration in No. 3 flask, ontaining metaphenylenediamine, showing presence of itrous acid. I found it quite possible, in presence of his coloration, to titrate with sodium hydrate; and, using henolphthalein as indicator, as soon as excess of alkali ppeared the colour was darker. The result of this experiment appears to be very curious. We have two Drechsel's bottles containing strong sulphuric, to absorb any nitrous acid which may be escaping absorption in Gay-Lussac tower; then two flasks containing hydrogen peroxide, which Carpenter and Linder have shown in their paper to oxidise nitrous acid to nitric, and yet its presence is shown in No. 3 flask; also an increase of acidity in Nos. 4 and 5, containing alkaline peroxide. In order to see if any nitrous acid was present upon leaving Drechsel's bottles, I performed the following experiment. The escape gases were caused to pass through two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84; then through an absorbing flask containing 200 c.c. of H_2O + 1 c.c. of metaphenylenediamine; then two flask each containing 200 c.c. of H_2O + 5 c.c. of H_2O_2; the an absorbing flask containing 200 c.c. of H_2O + 1 c.c. c metaphenylenediamine; then a Drechsel bottle containin 200 c.c. of H_2SO_4, sp. gr. 1·84; and finally through tw absorbing flasks, each containing 200 c.c. of H_2O + 5 c.c. c H_2O_2 + 10 c.c. of N/2 NaOH. The following is the result:—

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grain of SO_3 pe Cubic Foot.
		A, B, two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84								
17	1	200 c.c. H_2O + 1 c.c. metaphenylenediamine.	Acid	5 c.c.	N/2 NaOH	3·8	3·8	1·17		
	2	" + 5 c.c. H_2O_2	"	..	"	0·9	0·9	0·27		
	3	" "	"	..	"	0·2	0·2	0·06		
		C, Drechsel's bottle containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
	4	200 c.c. H_2O + 1 c.c. metaphenylenediamine.	Neutral	5 c.c.	N/2 NaOH	0·0	0·0	..		
	5	" + 5 c.c. H_2O_2 + 10 c.c. N/2 NaOH.	Alkalino	..	N/2 HCl	8·4	1·6	0·49		
	6	" " "	"	..	"	9·7	0·3	0·09	6·8	2·09

In No. 1 flask there was only a very faint coloration. Drechsel's bottle C, following H_2O_2 flasks, was tested, 1 c.c. giving a fairly deep brown with metaphenylenediamine. In No. 4 flask there was a brown inclined to yellow coloration. I think that the result of this experiment clearly shows that no nitrous acid was present in No. 1, and that the nitrous acid shown to be present is liberated or formed between Drechsel's bottles B and C. It will be noticed that there is the usual increase in acidity in flasks containing alkaline peroxide. I am of opinion that the nitrous acid shown to be present is due to decomposition, by water, of some sulphazotised body, which compound, passing through sulphuric acid undecomposed, is decomposed by the water in first flask; it is not necessary for H_2O_2 to be present, as will be shown in next experiment, the sulphur part of the compound being absorbed in first and second flasks, while the nitrous is oxidised and absorbed simultaneously by the alkaline peroxide in the flasks which follow, causing the increase of acidity in the vessels containing these reagents. Some further experiments appear to confirm this opinion.

It was the nitrous smell of the gases discharged from th bellows aspirator that led the inspector to make experiment with alkaline peroxide. Carpenter and Linder account fo the nitrous smell by the following reaction: H_2O_2 + $4HNO_2 = 2HNO_3 + 2NO + 2H_2O$, a reducing reactio occurring concurrently with the oxidation of nitrous aci to nitric. My opinion is that it is due to the decompositio of some sulphazotised body. The following experiment were performed on the same day:—

Experiment No. 18.—Two Drechsel's bottles, each containing 200 c.c. of H_2S,O_4, sp. gr. 1·84; two absorbin flasks, each containing 200 c.c. of H_2O alone; then tw absorbing flasks, each containing 200 c.c. of H_2O + 5 c.c of H_2O_2 + 10 c.c. of N/2 NaOH.

Experiment No. 19.—Two Drechsel's bottles, each con taining 200 c.c. of H_2SO_4, sp. gr. 1·84; two absorbing flasks each containing 200 c.c. of H_2O + 5 c.c. of H_2O_2; then two absorbing flasks, each containing 200 c.c. of H_2O + 5 c.c. o H_2O_2 + 10 c.c. of N/2 NaOH. The following are the results:—

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
		A, B, two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
18	1	200 c.c. H_2O	Acid	5 c.c.	N/2 NaOH	2·2	2·2	0·67		
	2	"	"	"	"	0·4	0·4	0·12		
	3	" + 5 c.c. H_2O_2 + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	8·9	1·1	0·33		
	4	" " "	"	..	"	9·5	0·5	0·15	4·2	1·29
		A, B, two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
19	1	200 c.c. H_2O + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	2·2	2·2	0·67		
	2	" "	"	..	"	0·1	0·1	0·03		
	3	" " + 10 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	8·7	1·3	0·40		
	4	" " "	"	..	"	9·6	0·4	0·12	4·0	1·23

About three hours elapsed between the performance of these experiments, and may to some extent account for the acidity with H_2O_2 being less than with water alone, but I might here say that in some further experiments I found water alone to be very little inferior as an absorbent to water with H_2O_2 present. The latter is slightly more active in decomposing and oxidising the compound present, which appears to break up in leading flasks. It will be observed that the No. 3 following H_2O_2 in experiment 19 is higher than No. 3 following water experiment 18, and that No. 4 in experiment 19 is lower than No. 4 in experiment 18, possibly due to the partial oxidation in No. 2 of experiment 19, and therefore more ready absorption in No. 3, leaving less for No. 4. The next experiment was performed with a special view to testing the comparative value of the absorbents used. The escape gases were caused to pass through the following:—Two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84; two absorbing flasks, each containing 200 c.c. of H_2O alone; two absorbing flasks, each containing 200 c.c. of H_2O + 5 c.c. of H_2O_2; two absorbing flasks, each containing 200 c.c. of H_2O + 10 c.c. of N/2 NaOH; two absorbing flasks, each containing 200 c.c. of H_2O + 5 c.c. of H_2O_2 + 10 c.c. of N/2 NaOH; a Drechsel's bottle containing 200 c.c. of H_2O + 1 c.c. of metaphenylenediamine. The following is the result.

No. of Experiment.	No. of Absorbing Vessel.	Absorbent.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
20		A, B, two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
	1	200 c.c. H_2O	Acid	5 c.c.	N/2 NaOH	2·3	2·3	0·70		
	2	„	„	„	„	0·3	0·3	0·09		
	3	„ + 5 c.c. H_2O_2	„	..	„	0·2	0·2	0·06		
	4	„ „	„	..	„	0·1	0·1	0·03		
	5	„ + 10 c.c. N/2 NaOH	Alkaline	5 c.c.	N/2 HCl	9·6	0·4	0·12		
	6	„ „ „	„	..	„	9·8	0·2	0·06		
	7	„ „ „ + 5 c.c. H_2O_2	„	..	„	9·1	0·9	0·27		
	8	„ „ „ „	„	..	„	9·7	0·3	0·09		
	C	Drechsel bottle, 200 c.c. H_2O + 1 c.c. metaphenylenediamine.	Neutral	5 c.c.	N/2 NaOH	0·0	0·0	..	4·6	[illegible]

There was a very faint coloration indeed in Drechel's bottle C. This experiment gives the absorbents in the order of their relative merits, commencing with the poorest. Water alone is very little inferior to water containing H_2O_2, alkali and alkaline peroxide both being superior to hydrogen peroxide alone. Alkaline peroxide is the best, only a very small quantity of nitrous acid escaping absorption.

In my next experiment I aspirated 7 cb. ft. of escape gases through four absorbing vessels, each containing the following reagents:—Two containing 200 c.c. of H_2O + 5 c.c. of H_2O_2, and two containing 200 c.c. of H_2O + 5 c.c. of H_2O_2 + 10 c.c. of N/2 NaOH. Before entering absorbing vessels the gases passed through two Drechsel's bottles, each containing 200 c.c. of H_2SO_4. The following is the result:—

No. of Experiment.	No. of Absorbing Vessel.	Absorbents.	Behaviour to Indicator.	H_2O_2 added before Titration.	Titrated with	C.c. required.	Acidity in c.c. of N/2 NaOH.	Acidity in Grains of SO_3 per Cubic Foot.	Total Acidity in c.c. of N/2 NaOH.	Total Acidity in Grains of SO_3 per Cubic Foot.
21		A, B, two Drechsel's bottles, each containing 200 c.c. of H_2SO_4, sp. gr. 1·84.								
	1	200 c.c. H_2O + 5 c.c. H_2O_2	Acid	..	N/2 NaOH	16·6	16·6	0·73		
	2	„ „	„	..	„	5·1	5·1	0·22		
	3	„ „ + 100 c.c. N/2 NaOH.	Alkaline	..	N/2 HCl	2·0	8·0	0·35		
	4	„ „	„	..	„	6·4	3·6	0·14	33·3	1·46

The contents of Nos. 1 and 2 were mixed together, and the sulphuric acid estimated gravimetrically after precipitating with barium chloride. It was found to be equal to 0·884 grain SO_3 per cubic foot; the acidity of Nos. 1 and 2 by titration is equal to 0·954 grain of SO_3 per cubic foot. The small increase of acidity in titration test over gravimetric is probably due to oxidation of some nitrous to nitric acid.

The contents of Nos. 3 and 4 were also mixed together, after acidifying with HCl raised to boiling point, and a boiling solution of barium chloride added; only a slight cloudiness was formed, the small quantity of barium sulphate not being estimateable.

The result of this experiment leaves no doubt as to the absence of SO_2 in third and fourth flasks, and I think also proves that the acidity registered in these flasks must be due to oxidation, by alkaline peroxide, of some nitrous compound set free in the leading flasks, but not capable of being absorbed by water or neutral hydrogen peroxide.

I am extremely sorry that I have not been able to go into these experiments more thoroughly, especially regarding the compound which appears to be decomposed in leading flasks, containing water alone or with hydrogen peroxide present; but the results I have obtained are interesting, and as I have no opportunity at present to follow them up, I thought it better to place them before the Society, for the benefit of those who are particularly concerned in sulphuric acid making. I think it is proved without doubt that hydrogen peroxide alone as an absorbent for estimating the total acidity of chamber escape gases is very inferior to alkali or alkaline peroxide, the latter reagent being the best. When making a bellows test to obtain the highest results, alkaline peroxide ought to be used. In aspirating the gases through a train of absorbing vessels with a water-aspirator, I would suggest that five vessels be used; in the first two to have hydrogen peroxide, and in the last three alkaline peroxide, as giving a maximum test, and also as a method for the estimation of the nitre lost, through the compound which appears to exist in chamber escape gases, and which has not before been taken into account. Take experiment 21 as example. The acidity of Nos. 1 and 2 by titration is equal to 0·954 grain of SO_3 per cubic foot. Now, if we take Nos. 3 and 4 together, and calculate the acidity in them to nitric acid, we get 0·805 grain of HNO_3 per cubic foot. Therefore, the result of an escape by this method would be stated thus: 0·954 grain of SO_3 and 0·805 grain of HNO_3 per cubic foot. This is rather a high nitric acid escape, and possibly a larger amount of the sulphazotised body was present in the escape experimented with than is present in some other processes, but I think that the results of the alkali works inspector point to the presence of the same compound in other chamber escapes.

Before concluding, I would like to give the results of some experiments made with dilute solutions of sodium nitrite, sulphuric acid, and hydrogen peroxide mixed. Two solutions were made up as follows:—(1) 150 c.c. of H_2O, 2 c.c. of N/2 $NaNO_2$, 2 c.c. of N/2 H_2SO_4, 2·5 c.c. of H_2O_2; (2) 150 c.c. of H_2O, 2 c.c. of N/2 $NaNO_2$, acid omitted, 2·5 c.c. of H_2O_2. Immediately on mixing, 20 c.c. of each solution was taken and tested with metaphenylenediamine: (1) Brown coloration; (2) No coloration. 20 c.c. of each, tested one hour after mixing: (1) Light yellow coloration; (2) No coloration. The result of No. 1 confirms Carpenter and Linder, but No. 2 does not (see this Journal, 1902, 1492). Two solutions were made up as follows:—(1) 150 c.c. H_2O, 2 c.c. N/2 $NaNO_2$, no acid, 1·0 c.c. H_2O_2; (2) 150 c.c. H_2O, 2 c.c. N/2 $NaNO_2$, no acid, 1·5 c.c. H_2O_2. Immediately on mixing, 20 c.c. of each solution were tested with metaphenylenediamine: (1) No coloration; (2) No coloration. 17 hours after mixing 20 c.c. of each were tested: (1) No coloration; (2) No coloration. Added to each of the solutions remaining, 1·5 c.c. of N/2 H_2SO_4, 20 c.c. of each taken out and tested: (1) Deep brown coloration; (2) Deep brown coloration. Two hours after adding acid, 20 c.c. of each was tested: (1) Brown inclined to yellow coloration; (2) Light yellow coloration. Two solutions were made up as follows:—(1) 150 c.c. H_2O, 2 c.c. N/2$NaNO_2$, 2 c.c. N/2 H_2SO_4, 2·5 c.c. H_2O_2; (2) 150 c.c. H_2O, 2 c.c. N/2 $NaNO_2$, acid omitted, 2·5 c.c. H_2O_2. After mixing they were allowed to stand one hour, and then titrated with N/2 NaOH, using phenolphthalein as indicator: (1) Required 2·2 c.c. N/2 NaOH before showing alkaline reaction; (2) Showed alkaline with one drop of N/2 NaOH. A solution was then made up as follows:—150 c.c. H_2O, 2 c.c. N/2 $NaNO_2$, 2 c.c. N/2 H_2SO_4. After standing one hour, was titrated with N/2 NaOH; required 2 c.c. to neutralise. I have not been able to account for No. 1 in last experiment requiring 0·2 c.c. more alkali than ought to have been required, but I think the results clearly indicate that there is no nitrous acid present when sodium nitrite and hydrogen peroxide are mixed in solution, as Carpenter and Linder show as a result of their experiments.

Yorkshire Section.

Meeting held on Monday, November 2nd, 1903.

MR. JAMES BEDFORD IN THE CHAIR.

Mr. F. **Branson** showed apparatus and experiments illustrating some properties of radium salts. The spinthariscope of Sir William Crookes shows the brilliant luminous effects produced by the α-rays given out by radium when a screen of Sidot's zinc blende is placed near a minute portion of any radium salt. A screen coated with barium platinocyanide brought near a radium salt, with certain substances intervening to stop the α-rays, shows the β-rays. The action of rays from radium in discharging a charged electroscope was also shown, as well as the apparatus by which the heat continually given out by radium compounds may be determined. The spectrum of helium and that of argon were shown through a series of spectroscopes. There were also shown some of the effects produced by ultra-violet and by Röntgen rays, which are similar to those produced by the rays from radium.

Mr. **William Ackroyd**, of Halifax, spoke of the colour changes effected by radium rays. He showed the colour changes produced in haloid salts, such as common salt, when left in contact with sealed glass tubes containing radium bromide.

Mr. **Fairley** showed that the radium rays resemble the Röntgen rays, and also a charged electrified body, in their action on invisible vapours near their condensing point, in causing the immediate condensation into mist or droplets of the previously invisible vapour. He also described the process used by Mdme. Curie, and others, for the extraction and purification of radium from the uranium ore.

The thanks of the Section were given to the authors for their interesting exhibits; and a discussion followed, in which Messrs. Cobb, Littlewood, Pocklington, Richardson, Rawson, Wallace, Ward, and the authors took part.

Obituary.

SIR FREDERICK BRAMWELL, Bart., F.R.S., &c.

Frederick Joseph Bramwell was born in 1818, and was the third son of Mr. George Bramwell, partner in the firm of Dorrien and Co., bankers, of Finch Lane, and was thus the younger brother of Lord Bramwell, the judge, who died in 1892. In Frederick Bramwell the love for things mechanical was inborn. At the age of nine he was taken to St Katharine's Docks, and, fascinated by the winding machinery there, he endeavoured to make a model of what he had seen. In 1834, he was apprenticed to one John Hague, an engineer of the old school, and remained with him as chief draughtsman for some years after his apprenticeship had expired. His extensive and varied information was the outcome of personal observation and experience. Close study was uncongenial to him, but his retentive memory rarely lost its hold of any detail which he had seen or had described to him. After some years' experience with various employers, he commenced practice on his own account as a civil engineer, and the following year became a member of the recently-established Institution of Mechanical Engineers. Bramwell was elected an Associate of the Institution of Civil Engineers in the year 1856. He rapidly made his mark, and, in 1862, attained full membership. Besides being possessed of much natural humour, he was also gifted in legal matters. As an arbitrator his judgments were clear, judicial, and marked by rare legal acumen. In 1874 he was chosen President of the Institution of Mechanical Engineers, and in his address he discussed the question of the exhaustion of our coal supplies. Eleven years later, as President of the Institution of Civil Engineers, he delivered an able address. He had just been appointed by the King, then Prince of Wales, Chairman of the Executive Council of the Inventions Exhibition. Choosing as his subject the scope of that exhibition, he confined himself to an enumeration of the chief factors in past progress. It is interesting for the strong advocacy which it contained of the treatment of large steel forgings by hydraulic pressure in place of steam hammers. This method now for heavy forgings, almost entirely prevails. After acting as president of "G," the Mechanical Science Section, in 1872, of the British Association, and again at Montreal in 1884, he was appointed President of the Association for the Bath meeting in 1888. In 1873 Sir Frederick Bramwell was elected a Fellow of the Royal Society. In 1881 he was appointed one of the two lay members of the Ordnance Committee, and in that capacity assisted in the framing of the rules under which iron and steel for the construction of large ordnance are tested before acceptance. As early as the year 1883 he joined the Society of Chemical Industry in membership.

Always cordially lamenting the lack of facilities for technical education in his youth, he was a warm supporter of the movement for its advancement in this country. On the foundation of the City and Guilds of London Institute, he was appointed by the Goldsmiths' Company one of its representatives on the governing body. A knighthood was conferred upon him in 1881 for his services in this direction. He received the honorary degree of D.C.L. from the Universities of Oxford and Durham, and that of LL.D. from Cambridge and McGill. In 1889 Queen Victoria bestowed a baronetcy upon him. Sir Frederick Bramwell's death occurred on December 1st, after a few days' illness, from cerebral hæmorrhage.

Journal and Patent Literature.

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.—PLANT, APPARATUS AND MACHINERY.

ENGLISH PATENT.

Separators; Centrifugal —— [*Sewage, Brewers' Mash, &c.*]. M. Güttner, Chemnitz, and R. Baeger, Ehrenberg, Germany. Eng. Pat. 75, Jan. 1, 1903.

'HE separating apparatus comprises a series of centrifugal askets having a planetary motion, radially arranged sieve-lates being provided on the inner circumference of the askets, so that a number of chambers are formed, which re in communication below with the supply-conduits for he material to be treated, and above, with a collecting hamber. A filter-cloth may be employed, the rotary speed of which about the main shaft may be equal to or different rom the speed of the shaft, so that the material, on leaving he baskets, is subjected to a centrifugal filtering action. To facilitate the filtering action, a siphon arrangement is mployed to produce a difference of pressure between the paces outside and inside the filter-cloth. Stirring and vashing arrangements are also provided. (See also Eng. 'at. 693 of 1903, and Fr. Pat. 327,786; this Journal, 1903, 85 and 942.)—R. A.

UNITED STATES PATENTS.

Vacuum-Pan. E. N. Trump, Syracuse, N.Y. U.S. Pat. 743,351, Nov. 3, 1903.

'HE pan is connected near the bottom with a circulating ystem, through which a portion of the richer liquor is vithdrawn by suitable mechanical means, and returned gain to the pan. Means are provided for withdrawing portion of the liquor from the circulating system, which as also a connection with the vacuous space of the pan. On the intake side of the pump, a mill is provided to egulate the size of the solid bodies (crystals) carried by he liquor through the pump.—R. A.

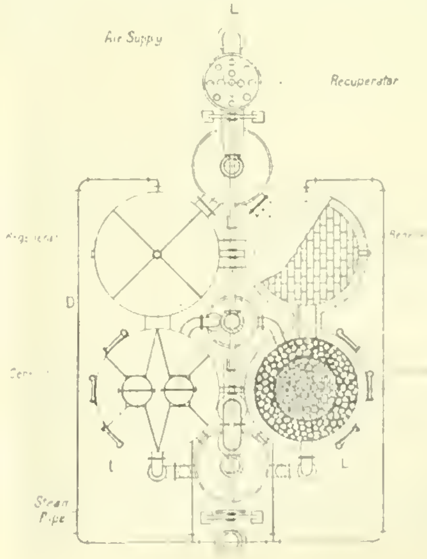
Evaporating Liquor; Process of ——. E. N. Trump, Syracuse, N.Y. U.S. Pat. 743,352, Nov. 3, 1903.

'HE claims are mainly for the process carried on by the pparatus claimed in the preceding patent.—R. A.

II.—FUEL, GAS, AND LIGHT.

Water-Gas Process of Kramers and Aarts. A. Steger. J. f. Gasbeleuchtung, 1903, 46, [45], 921—927.

AFTER discussing the reasons which render the continuous process of water-gas production impracticable, the author points out that in the discontinuous method the highest efficiency is attained if, during the blast period, carbon dioxide and not carbon monoxide is the product, since the combustion of carbon to the dioxide yields 97,600 cal., as against 29,400 cal. by combustion to the monoxide. In the Kramers and Aarts process, in which this principle is applied, two generators and two regenerators are provided, side by side, the regenerators opening into a common recuperator, and being in continuous connection with each other (see figure, which shows a plan view of the apparatus)



During the blast period, air from the air-supply pipe L enters the recuperator, where it is heated by the outflowing waste gases, and then passes into the generators, a primary air supply entering at the bottom of each, and a secondary supply being admitted above the bed of fuel. The fuel in the generators is of little depth, say 700 mm., and the blast pressure is such as to lead to the production of carbon dioxide mainly. A small proportion of carbon monoxide, however, is always formed, and the combustion of this to the dioxide is effected by the secondary air-supply. The hot gases from each generator flow into its corresponding regenerator, and thence out through the recuperator; during the blast period, therefore, the two generators are worked in parallel. During the "make" period, the plant is worked in series. Steam is supplied beneath the incandescent fuel in one of the generators; the gas produced, containing some undecomposed steam and some carbon dioxide, flows in succession through the two hot regenerators, wherein it mingles with further steam supplies, and by the reaction of the steam on part of the carbon monoxide present, hydrogen and a further proportion of carbon dioxide are produced. Finally, the gas is led down through the fuel in the second generator, wherein all the carbon dioxide is reduced to monoxide, and the gas flows into the main. After an intervening blast period, the plant is again connected in series for the production of water-gas, but this time the gases flow in the reverse direction, the producing generator of the former period now becoming the reducing generator. By this arrangement carbon dioxide and steam are eliminated almost entirely from the gas, the heat stored up in the regenerators is very fully utilised, and the speed of the steam supply becomes largely optional. The alternate upward and downward flow of the gases through the fuel has a beneficial action in the prevention of clinker; and bituminous fuels may be used, as the volatile products are decomposed by the steam in the regenerators, and the oxidation products are reduced in the final generator. A fortnight's test of the process, with a production of 146 cb. m. of gas per hour, gave a yield of 2·74 cb. m. of gas, of 2,626—2,871 cal. heating value, per kilo. of coal used, the steam consumption being 60 kilos. per 100 cb. m. The coal used contained 83·5 per cent. of carbon, and 4·5 per cent. of hydrogen, whence the heating value of the gas produced is calculated to be 85·5 per cent. of the heat consumed in its manufacture.—H. B.

Incandescent Mantles and Burners; Tests of ——. E. Sainte-ClaireDeville. J. de l'Éclair au Gaz; through J. Gas Lighting, 1903, **84**, 424.

The author made comparative tests with an Auer, a thorite, and a cerite mantle. In each case the supply of air was so regulated that the maximum illuminating power compatible with the amount of gas burnt, was obtained. The coal-gas used, was of rather poor quality (4,830 calories). The results shown in the following table are those obtained under such conditions that the maximum useful effect was attained with each mantle:—

——	Auer Mantle.	Thorite Mantle.	Cerite Mantle.
Consumption of gas, litres.........	216·00	232·00	208·00
„ „ heat, calories.....	1043·00	1120·00	1004·00
Absolute intensity, carcels........	18·75	6·77	1·07
Density per 100 litres of gas, carcels	8·67	2·92	0·51
„ „ 1,000 calories, carcels..	17·95	0·04	1·07
Proportion of air at the base of the Bunsen burner..................	4·70	4·66	5·23

With the Auer and thorite mantles the light was white, whilst with the cerite mantle a very feeble red light was produced. In the case of the thorite mantle, however, the light was bluish-green with an insufficient quantity of air, and red with an excess of air. The results of the tests lead the author to adopt Féry's theory of incandescence (this Journal, 1903, 145). The author also found that the mixture of gas and air formed naturally in a Bunsen burner, is sufficiently homogeneous to give the maximum illuminating effect. Comparative tests were made with an ordinary Bunsen burner, and a burner in which the straight Bunsen tube was replaced by one of similar length and diameter, at the base of which was a mixing chamber consisting of a cylindrico-conical cavity with four wire gauze diaphragms, with a very small space between them. The averages of the results obtained in both cases for the maximum luminous intensity per 1,000 calories, were 18·37 carcels with the mixing chamber, and 18·57 carcels with the Bunsen tube.—A. S.

Coal and Coke; Determination of Sulphur in ——. R. Nowicki. XXIII., page 1309.

ENGLISH PATENTS.

Fuel; Artificial ——. C. Lefèvre, Paris, and G. Blum, Mannheim. Eng. Pat. 23,407, Oct. 27, 1902. Under Internat. Conv., March 12, 1902.

See Fr. Pat. 319,523 of 1902; this Journal, 1902, 1525. —T. F. B.

Regenerating or Heat-recovering Apparatus for Gas-Producers and other Furnaces. A. Wilson, Doxey, Stafford. Eng. Pat. 23,998, Nov. 3, 1902.

The hot gases escaping from the gas-producer or furnace are passed through a chamber, in which stacks or sets of pipes are located so as to be heated externally by the gases. An intermediate chamber containing water is arranged between and connected to the stacks of pipes, so that air, forced by a blower or the like through one stack, becomes heated therein, and is then delivered in a heated condition into the intermediate chamber. From the water in this chamber, the heated air generates steam, and, becoming mixed therewith, the mixture passes into the next stack, where its temperature is further raised, while the escaping gases which heat that stack are correspondingly cooled. In a modification, the intermediate chamber is dispensed with, water being caused to pass through some of the tubes, and air through the remainder. In this case a steam drum is arranged above and connected to the water-heating and steam-generating tubes.—R. A.

Gas Retorts; Inclined ——. H. Stiles, Rochdale. Eng. Pat. 25,747, Nov. 22, 1902.

A recess, formed in the mouthpiece end of the retort, receives removable firebrick slabs or tiles on which the coal-stopper rests, so as to avoid the continual wearing away of the lower part of the mouthpiece.—T. F. B.

Sulphocyanides [Thiocyanates]; Manufacture of ——. J. Tcherniac. Eng. Pat. 24,767, Nov. 11, 1902. VII., page 1292.

Tar from Illuminating Gas; Apparatus for Extracting ——. E. D. Holmes, Huddersfield. Eng. Pat. 20,677, Sept. 25, 1903.

A modification of Eng. Pat. 25,493 of 1901 (this Journal, 1903, 18), in which the counterbalanced drums there referred to, are provided with relief valves normally kept closed by springs or weights, which, however, open when the drums descend too far.—F. H. L.

Electrodes for Arc Lamps; Process for Manufacturing ——. R. Hopfelt, Berlin. Eng. Pat. 7831, April 4, 1903.

See Fr. Pat. 322,371 of 1902; this Journal, 1903, 358. —T. F. B.

Mantles and the like for Incandescent Gas Lighting; Manufacture of ——. J. A. E. H. Boullier, Paris. Eng. Pat. 18,166, Aug. 22, 1903. Under Internat. Conv., Aug. 23, 1902.

See Fr. Pat. 323,959 of 1902; this Journal, 1903, 487. —T. F. B.

Photometers; Impts. in ——. E. A. Carolan. From the General Electric Co. Eng. Pat. 26,035, Nov. 26, 1902. XXIII., page 1308.

Photometrical Apparatus [Flicker Photometer]. J. F. Simmance and J. Abady. Eng. Pat. 4693, Feb. 28, 1903. XXIII., page 1308.

United States Patents.

Gas ; Apparatus for Manufacturing ——. A. M. Gow. Assignor to G. Westinghouse, Pittsburg, Pa., U.S.A. U.S. Pat. 742,411, Oct. 27, 1903.

THIS apparatus consists of two producers, the tops of which re connected with the top of a stove or heat-conserving pparatus. The bottoms of the producers are connected, ith suitable valves and checker chambers, with a steam oiler. Means are provided for blowing air into one roducer, to form generator gas, and for injecting steam nto either checker chamber for the production of water gas n the producer to which it is connected, and for causing current of gas already made to travel from the stove to ither producer to carry heat to it, to distil off the volatile ortions of a fresh charge of fuel.—W. C. H.

Gas; Method of Manufacturing ——. A. M. Gow, Assignor to G. Westinghouse, Pittsburg, Pa., U.S.A. U.S. Pat. 742,412, Oct. 27, 1902.

THE body of fuel in one gas producer is blown to incandescence, and the heat of the gas thus produced, stored in stove, and steam is then injected into the producer to orm water-gas ; this gas is mixed with water-gas and ther gas previously made, and the mixture is made to istil off the volatile portions from fuel in a second producer. The direction of flow is afterwards reversed, roducing water-gas in the second, and distilling off olatile constituents from the first bed of fuel.—W. C. H.

Gas ; Process of Manufacturing ——. R. Dempster, Marietta, Ohio. U.S. Pat. 743,468, Nov. 10, 1903.

OPPOSING jets of heated air and of previously mingled air nd oil are forced as spray into a heated retort, and the apours are driven through a mass of finely-divided heating naterial, the heavier impurities separated by this filter eing oxidised by a portion of the air blown into the retort. —F. H. L.

Gas ; Apparatus for Purifying ——. C. I. Tenney, Mason City, Iowa, Assignor to Practical Gas Construction Co., North Chicago. U.S. Pat. 743,591, Nov. 10, 1903.

AN inverted bell is placed inside an open tank. Gas is led nto the inner vessel, and is forced to travel a circuitous oute through the presence of a "downwardly-depending nterrupted diaphragm." A layer of charcoal or similar iltering material is also put into the apparatus.—F. H. L.

Electrode for Arc Lamps. H. Bremer, Neheim. U.S. Pat. 743,236, Nov. 3, 1903.

SEE Eng. Pat. 21,637 of 1899 ; this Journal, 1900, 136. —T. F. B.

French Patents.

Briquettes from Sawdust or other Waste Cellulose. P. A. Dumesny. Fr. Pat. 332,793, June 5, 1903.

40 PARTS of coal-tar are mixed with 3·5 parts of caustic oda dissolved in 15 parts of water, and 21·5 parts of nelted colophony added to the mixture; 25 parts of glue issolved in 250 parts of water are then added, and finally solution containing 35 parts of quicklime in 550 parts of vater. The resulting solution is then mixed with 1,250 parts of wood-waste, and the mass pressed into briquettes nd dried.—L. F. G.

Briquettes without Resin ; Manufacture of ——. F. Bague. Fr. Pat. 332,945, June 10, 1903.

COALS rich in distillation products, are mixed with noncaking material, such as anthracite, demi-anthracite, or coke ; or these latter are mixed with a binding material, such as bitumen, asphalt, petroleum, or naphtha residues, and the nixture is dried in moulds at a temperature of 300° C. for eight hours.—L. F. G.

Coke ; Process for Increasing the Cohesion and Density of ——, *particularly of Metallurgical Coke.* F. Bague. Fr. Pat. 332,946, June 10, 1903.

COALS which readily cake are mixed with some form of carbon which does not cake, such as demi-anthracite, anthracite, coke dust, &c. To make coke for metallurgical purposes, calcareous stones or a flux is admixed, the admixed material preventing fissuring and disintegration of the coke. Conversely, to non-caking materials, such as anthracite, demi-anthracite, coke dust, &c., a binding material, such as bitumen, asphalt, naphtha residues, &c., is added before coking.—L. F. G.

Briquettes [Coal] ; Manufacture of ——. I. Loewenthal and B. Lippert. Fr. Pat. 332,96[illegible], June 11, 1903.

SEE Eng. Pat. 23,503 of 1902 ; this Journal, 1903, 138. - T. F. B.

Gas and Air under Pressure for Illuminating Purposes ; Preparation of Mixtures of ——. "Selas" G. m. b. H. Fr. Pat. 333,033, June 13, 1903.

THE gas supplied from a main passes through a pipe controlled by a cock to an injector jet, where it draws into a prolongation of the pipe a certain proportion of air. The mixture so produced, is drawn along by a rotatory pump, and finally delivered through a non-return valve into a holder. The pump is driven electrically, the leads being attached to the holder in such fashion that when the bell rises, the current is cut off. The spindle of the motor carries a centrifugal governor, which is connected with the cock on the gas-inlet pipe, so as to choke the latter when necessary. In an alternative arrangement, the mixture of gas and air passes into a preliminary rising holder, the bell of which controls the gas-inlet cock ; and from this holder the mixture travels through the pump to the final storage holder, where the electric motor is governed as before. Stress is laid on the fact that the original pressure in the main effects the introduction of air into the gas. —F. H. L.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

Petroleum ; Roumanian ——. L. Edeleanu and I. Tanasescu. Monit. Int. Petrol. Roumains, 1903, **4**, [19], Supplement.

THE authors describe in detail the several oilfields of Roumania, as well as the properties and composition of the oil. The colour of crude Roumanian oil ranges between olive brown and blackish brown, except that from Predeal, which is of a light reddish tinge, and that of Campeni-Parjol, which is light yellow ; all of them exhibit a characteristic greenish fluorescence. Some occurrences of pale oils have been observed in other places than those just mentioned, but the quantities are small, and the decolorisation is attributed to filtration through porous clays. The sp. gr. of the crude oil is somewhat irregular, varying not only in the same oilfield, but also in the same well. Classifying the oils according to density, the first class, of sp. gr. 0·770—0·820, is furnished by Campeni-Parjol (0·763), Tetzcani, Cachin, some of the Baicoi wells, and Poiana. The yield is generally small. Oil of the second class, sp. gr. 0·830—0·860, is found at Bushtenari, Campina, Solontzi, Glodeni, and Colibash, and forms the largest proportion of the total output of the country. The third and heaviest class of oil, sp. gr. 0·860 and over, is found at Sarata-Monteor, Tega, Tsintea, Lucaceshti-Deal, and Gura-Ocnitsei, this latter centre furnishing the heaviest oil of all (density 0·935). The majority of Roumanian crude oils have an agreeable, slightly ethereal odour, except a few that smell like garlic, *e.g.*, those of Sarata-Monteor, Glodeni, and Apostolache.

Flashing Point.—The flashing point is generally below 0° C., owing to the presence of light fractions and gas in solution. In the case of the denser oils, such as those of Ocnitza, Sarata, and Tega, which flash at 25° C. and above, the volatile fractions have escaped by prolonged exposure to the air.

Viscosity.—The viscosity of the light crude oils from Campeni-Parjol, Tetzcani, and Cachin is from 0·92 to 1·1, but in the heavier oils from Gura-Ocnitsei and Tega, the viscosity is between 2 and 4. The oil from the No. 3 well of the former field, which furnishes 13,000 kilos. of oil per diem, has the viscosity 6 ; and the No. 12 well furnishes an oil with the highest viscosity known in the country, *viz.*, 18·9. The great bulk of the oil, however, ranges in viscosity from 1·1 to 1·6.

Boiling Point.—Except in the case of the denser oils, the average boiling point of the crude oil is "between 25 and 60° C."

Distillation Products.—In general the lighter crude oils furnish on distillation, 38 to 47 per cent. (weight) of fractions boiling below 150° C., whilst in the heavier oils the maximum does not exceed 20 per cent Though the oils from the two chief producing centres, Campina and Bushtenari, are of a similar density, they differ considerably in their content of light fractions, Bushtenari oil giving 35 per cent. of products boiling below 150° C., whereas Campina oil yields only 20 per cent. of the same. With regard to fractions distilling between 150° and 300° C., these are generally most abundant in the oils rich in light fractions, the crude oil of Campeni-Parjol, Tetzcani, Cachin, Berca, and part of Baicoi, for example, furnishing 35—50 per cent. of distillate sufficiently light to be classed as lamp oil. The medium crude oils give a smaller yield, 30—35 per cent.; but whilst this proportion is also maintained in the case of the denser crude oils—Tega oil, which is devoid of any petroleum spirit, gives as much as 48 per cent.—the sp. gr. of the distillate is usually too high for it to be classed as lamp oil. On fractionating the distillates at intervals of 10° C., the authors found that the greater portion of the light spirit from Roumanian oils consists of products boiling between 100° C. and 150° C. Nevertheless in Tetzcani, Lucaceshti, Cachin, Colibash, and Poiana oils, the fractions distilling up to 80° C. form 29 per cent. of the total quantity of the light products, though from Campina and Bushtenari oils they do not exceed 12 per cent.

Lamp Oils.—In the crude oils with very heavy and viscous higher fractions, the limits of boiling point for the lamp-oil fractions are more restricted than in the crude oils furnishing specifically lighter and less viscous higher fractions. Thus, in the case of the Bushtenari crude, a lamp oil of sp. gr. 0·805—0·810 and of the regulation flashing point is confined to the fractions between 130° and 260° C., whereas the limits for the same product from Glodeni oil are 130°—320° C., and consequently a higher yield is obtained. The largest percentages (40—60 per cent.) of good lamp oil are furnished by the crude oils of Campeni-Parjol, Tetzcani, Cachin, Glodeni, and Baicoi; but the yield from the largest producing centres, Campina and Bushtenari, is different, being only 45 per cent. and 30—35 per cent. respectively; and the heavier crude oils, *e.g.*, Gura-Ocnitsei, yield only 20 per cent. as a maximum. Both colour and smell of Roumanian lamp oils are stated to be good, and the viscosity usually varies between 0·98 and 1·08. The portion of the lamp-oil fractions boiling above 270° C., is of low sp. gr., and burns more readily than the corresponding constituent of Baku oil. The low density of the fractions 270°—320° C. in Campeni-Parjol, Tetzcani, Cachin, Glodeni, and some Baicoi oils, renders the lamp-oil more like the American product, and causes it to burn better than Bushtenari and similar oils.

Photometric Tests of six hours' duration, were made in Ditmar and Wild & Wessel lamps, the intensity of the light being measured by the Weber photometer, fitted with a Brodbun-Lummel prism, the Hefner-Alteneck amyl acetate flame being adopted as the standard. The results showed that, with the Ditmar lamp (10‴ Jupiter burner), the candle-power is between 10·5 and 12 Hefner, the best figures being furnished by oil from Campeni-Parjol, Cachin, Tetzcani, Campina, Baicoi, and Glodeni. The intensity of the light varies with the lamp used, being higher with the Ditmar lamp than with that of Wild & Wessel (10‴ Cosmos burner), and depends largely on the suitability of the air supply to the kind of oil. The amount of oil consumed is proportional to the intensity of light produced, the Ditmar lamp consuming 32 grms. per hour, on the average, whilst the Wild & Wessel lamp consumes only 28—30 grms.

Residuum.—The percentage of residuum from Roumanian oils varies considerably, the extreme limits being 17 per cent. in the case of Baicoi and Campeni-Parjol oil, and 68 per cent. in the case of Gura-Ocnitsei oil. This residuum is now largely used for fuel purposes in Roumania, the oil industry itself consuming about 4,000 loads per annum. The following results were obtained in tests of calorific power, made with the Mahler bomb and Berthelot calorimeter. Bushtenari residuum, 10,896 cal.; Campina, 11,070; Baicoi, 10,936; Gura-Ocnitsei, 10,793; Solontsi, 10,850; Lucaceshti, 10,956 cal.

Paraffin.—The following percentages of paraffin were obtained by distilling the residues, at reduced pressure, between 300° and 400° C.:—Campeni-Parjol, 18 per cent. Teteani, 11·7; Moineshti, 12·4; Campina, 12; Predeal, 12; Cachin, 10·5; Apostolache, 9·2; Solontsi, 7·5; Lucaceshti-Deal, 5·9; Baicoi, 5; and Bushtenari, 0·3 per cent.

Lubricating Oils.—The experiments conducted with a view to ascertaining the oils most suitable for the production of lubricating oils, showed that products similar to Russian lubricating oils are furnished by those from Tega and Gura-Ocnitsei, a good oil being also obtained from Tsintea residuum. These results were obtained by distilling the residuum with superheated steam, concentrating the crude distillate by redistillation, and refining the product. The nett yield of lubricating oil was 59·5 per cent. from Tsintea oil, 64 per cent. from Gura oil, and 70 per cent. from Tega oil. The refined product is reddish yellow in colour, of sp. gr. 0·931—0·945, and of the following viscosity at 20° C. Tega oil, 78; Gura, 84; and Tsintea, 140, the last high figure being attributable to the presence of paraffin, which also raises the solidification point. The flashing point ranges between 178° and 182° C.

Sulphur Content.—Bushtenari crude oil contains 0·18 per cent. of sulphur; Campina, 0·13; Baicoi, 0·09; Solontsi, 0·17; and Lucaceshti oil, 0·28 per cent., the greater part of which is left in the residuum on distillation.—C. S.

Petroleum from the Bonanza, Cottonwood, and Douglas Oil Fields, Wyoming; Analyses of ——. E. E. Slosson. Bull. School Mines, Univ. Wyoming. Petroleum Series, No. 6, 1903, 25—30.

Bonanza Oil.—The crude oil is of very low sp. gr. (0·845—0·850) and flashing point (19° C.), burning continuously if heated a few degrees above ordinary temperature. The colour is red by transmitted light, with a bright green fluorescence. The calorific value is 10,927 calories per grm. of oil; "1 lb. of the oil will convert 23 lb. of water into steam," this representing the highest steam-raising power of any Wyoming oil; sulphur content, 0·0149 per cent. Distillation furnishes about 20 per cent. of a series of very light fractions with little or no coloration, and easily refined, and 6—10 per cent. of a non-asphaltic residuum which resembles vaseline in consistency, and cannot be distilled without complete decomposition. The 10 per cent. fractions have the following boiling points, sp. grs., and flashing points respectively:—60°—157° C., 0·762, below 15° C.; 157°—200° C., 0·792, 18° C.; 200°—237° C., 0·822, 38° C.; 237°—273° C., 0·843, 82° C.; 273°—297° C., 0·853, 108° C.; 297°—329° C., 0·867, 121° C.; 329°—371° C., 0·876, 46° C.; 371°—391° C., 0·861, below 15° C.; 391°—400° C., 0·849, below 15° C. The percentage of burning oil is over 40 per cent. When exposed to the air, the crude oil loses a considerable proportion of its lighter products, the lowest fraction then boiling at 185°—200° C. (sp. gr. 0·810, flashing point 40° C.).

"*Cottonwood*" *Oil.*—The crude oil is brownish red with a dark green reflection, has the sp. gr. 0·902, and an odour of ordinary burning oil. Of the 80 per cent. of distillate obtainable between 60° and 360° C., about one-half is suitable for burning; and the proportion could be increased by "cracking."

Douglas Oil is very heavy (sp. gr. 0·9610) and viscous, and quickly decomposes in the course of distillation, furnishing mixtures of decomposition products (b. pt. 170°—350° C.) with a large amount of coke and gas. Its chief value is as a source of heavy lubricating oils, prepared by the reducing process. A sample freed from water by dilution with light oil and contact with calcium chloride, was distilled in a vacuum of 25—40 mm. (after removing the light oil), and furnished 90 per cent. of reduced oil, of sp. gr. 0·963, flashing point 168° C., and ignition point 223° C.

Douglas Oil Sand.—A sample of this sand was distilled in an iron retort until the vessel attained red heat. It furnished 4 per cent. of oil, 0·5 per cent. of water, and 1·3 per cent. of gas and loss; leaving 94·2 per cent. of sandstone as residue. The oil was of sp. gr. 0·921, and furnished on distillation 10·8 per cent. of fractions boiling below 170° C.; 14·5 per cent. between 170° and 220° C.; 16 per cent. between 220° and 270° C.; 13·3 per cent. between 270° and 290° C.; and 10·8 per cent. between 290° and 320° C.; the specific gravity increasing progressively from 0·816 to 0·925. The residuum formed 34·6 per cent. of the total.—C. S.

Petroleum; Italian ——. L. Balbiano and P. Zeppa. Gaz. chim. ital., **33**, [2], 42—50; Chem. Centr., 1903, **2**, [19], 1085. (See this Journal, 1902, 1229.)

The fraction of Valleia petroleum distilling at 87°—102° C. contains no olefines, but from the oxidation products obtained by the action of nitric acid, the authors conclude that it contains benzene, cyclohexane, methylcyclopentane, and 1.3-dimethylcyclopentane.—A. S.

Naphtha Residues; Dry Distillation of Alkaline ——. A. P. Lidow. Westnik shirow. Weschtsch., 1903, [4], 128. Chem.-Zeit., 1903, **27**, [89], Rep. 288—289.

The residues are dried and then submitted to dry distillation. From 40—60 per cent. of distillate of sp. gr. 0·865 is obtained. Distillation begins below 100° C., a light, yellowish mobile liquid, having an agreeable aromatic odour, coming over first. It is mostly a mixture of ketones and hydrocarbons, formed by the decomposition of naphthene-acid salts. The fraction distilling over between 110°—150° C. has a sp. gr. of 0·799 at 20° C., is a good solvent of resins, and could, it is stated, be used as a substitute for turpentine. The fraction distilling over between 150°—200° C. has a sp. gr. of 0·8424, a flashing point of 35° C., and is easily purified by means of sulphuric acid and caustic soda, giving a good burning oil for ordinary kerosene lamps. The black residue contains 30 per cent. of carbon; it burns easily, enabling the soda contents to be recovered. The recovery of soda from the purification of lubricating oils, is more difficult, on account of the difficulty of the elimination of the water.—C. A. B.

Sulphur [in Asphalt, &c.]; Determination of ——, by means of Barium Peroxide. H. Schillbach. XXIII., page 1309.

English Patent.

Ammoniacal Liquors; Apparatus for the Distillation of ——. T. Wilton, Beckton, and G. Wilton, London. Eng. Pat. 28,251, Dec. 22, 1902.

The still, which is especially suitable for use in small works, consists of a number of superimposed, horizontal cylindrical chambers or tubes, the ends of which are provided with movable caps, in which are fitted the various onnections. These chambers are arranged in a suitable asing, so that a furnace, beneath the lower chamber, will heat the latter, and the furnace gases will heat the upper hambers. The liquor is introduced into the top chamber, nd passes down through each chamber in turn, till it eaches the lowest one, whilst the steam, generated from he liquor in the lowest chamber, passes, by means of a erforated pipe, into the liquor in the second chamber, whence it passes, together with the steam generated there, to the third chamber, and so on to the top chamber. In modification, the top chamber is fitted with, or extended into a small vertical continuous plate still of the usual attern; in such a form. the steam generated in the orizontal chambers will suffice to supply the vertical still. —T. F. B.

United States Patents.

Ammonia Still. E. A. Moore. U.S. Pat. 740,678, Oct. 6, 1903. VII., page 1292.

Asphaltic Paving Compositions; Process of Producing ——. J. H. Amies, Assignor to Amies Asphalt Co. U.S. Pat. 743,051, Nov. 3, 1903. IX., page 1293.

French Patents.

Acetone Oil; Process of Manufacturing ——. F. Karaseff. Fr. Pat. 332,310, 1903. XVII., page 1303.

Tar Distilling; Apparatus for ——, with Internal Furnace. C. Weÿl. Fr. Pat. 332,427, May 27, 1903.

A horizontal still is provided, in its lower half, with a number of horizontal tubes, through which the furnace gases pass, thus effecting a more rapid distillation. —T. F. B.

Lampblack; Process of Manufacturing —— from Tar and other Carbonaceous Substances. G. Wegelin. Second Addition, dated June 2, 1903, to Fr. Pat. 294,306, Nov. 14, 1899.

See Eng. Pat. 13,827 of 1903; this Journal, 1903, 1190. —T. F. B.

Pitch; Process of Manufacturing ——. C. G. von Wirkner. Fr. Pat. 333,011, June 13, 1903.

Tar, tar oils, or similar substances are heated with sulphuric acid to 180° C., or above, until the acid is completely decomposed. For instance, 300 parts of anthracene oil (sp. gr. 1·12—1·125) are heated with 102—108 parts of sulphuric acid (60° B.), to about 300° C. until evolution of sulphur dioxide ceases—about 1½ or 2 hours—or until a product of the desired consistency is obtained.—T. F. B.

Greases [Soluble] Consisting of Mineral Oil; Process of Preparing ——. Ges. z. Verwertung der Boleg'schen Wasserlöslichen Mineralöle u. Kohlenwasserstoffe Ges. m. b. H. Fr. Pat. 332,324, May 23, 1903.

Mineral oils, soluble in water, are oxidised, in presence of 2—4 per cent. of a solution of alkali (36°—40° B.), by means of compressed air, or ozone, at a temperature of 70°—105° C., for ½ to 1½ hours, until, on cooling, a homogeneous, transparent product is obtained, which is then intimately mixed with one-half to twice its weight of hot water, or, preferably, a hot solution of soap or gelatin; the quality of the lubricant may be further improved by the addition of 2—3 per cent. of ceresin or paraffin wax, previously treated with a hot 1 to 2 per cent. alkali solution. —T. F. B.

Asphalt; Synthetic ——. A. Montupet. Fr. Pat. 332,772, June 4, 1903.

Finely-powdered pure calcium carbonate is mixed with specially chosen natural hydrocarbons, and the mixture heated for some time to 140° to 150° C. in a vessel which can be rotated.—A. G. L.

[Paraffin Wax] Compositions for Candles, Wax Matches, Wax Flowers, &c. A. Berger. Fr. Pat. 333,301, June 23, 1903. XII., page 1300.

IV.—COLOURING MATTERS AND DYESTUFFS.

English Patents.

Benzene Derivative [p-Nitraniline-homosulphonic Acid]; Manufacture of a New ——, and of an Azo Dyestuff therefrom. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 23,992, Nov. 3, 1902.

See U.S. Pat. 724,743 of 1903; this Journal, 1903, 548. —T. F. B.

Indigo White and Indigo; Manufacture of ——. J. Y. Johnson. From the Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhine, Germany. Eng. Pat. 26,372, Nov. 29, 1902.

Phenylglycocoll, tolylglycocoll, or xylylglycocoll, is melted with caustic alkali containing the oxide of an alkaline-earth metal and caustic potash, as free from water as possible. It is claimed that in this way much better yields

(50 per cent. and over) of leuco indigo are obtained than by the process previously followed (see Eng. Pat. 8726, 1890; this Journal, 1891, 633).—E. F.

Naphthalene Series; Manufacture and Production of Colouring Matter of the ——. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 1864, Jan. 26, 1903.

See Fr. Pat. 328,768 of 1903; this Journal, 1903, 992.
—T. F. B.

[Sulphide] Dyes; Manufacture of ——. H. H. Lake, London. From K. Oehler, Offenbach a/Main. Eng. Pat. 4340, Feb. 24, 1903.

See U.S. Pat. 729,874 of 1903; this Journal, 1903, 791.
—T. F. B.

United States Patents.

Monazo Dye, and Process of Making Same. R. Gley and O. Seibert, Assignors to Act.-Ges. f. Anilinfabr., Berlin. U.S. Pat. 743,071, Nov. 3, 1903.

See Fr. Pat. 332,145 of 1903; this Journal, 1903, 1192.
—T. F. B.

Anthraquinone-a-Sulphonic Acid. R. E. Schmidt, Elberfeld, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 743,664, Nov. 10, 1903.

See Fr. Pat. 333,144 of 1903 and Fr. Pats. following these.—T. F. B.

[Nitro] Dye; Yellow ——, and Process of Making Same. J. Turner, Huddersfield. U.S. Pat. 743,778, Nov. 10, 1903.

See Fr. Pat. 331,399 of 1903; this Journal, 1903, 1126.
—T. F. B.

French Patents.

Sulphonic Acids, Organic; Manufacture of ——. R. Wedekind and Co. Fr. Pat. 332,709, June 2, 1903.

Organic compounds are sulphonated in presence of mercury or its compounds. In this way sulphonic groups are introduced into the molecule in positions in which they cannot be introduced by sulphonating in the ordinary manner. For example, anthraquinone, when sulphonated in presence of mercury, readily yields anthraquinone α-sulphonic acids, whereas in the ordinary way β-sulphonic acids of this compound are obtained. Several other examples are given, all being anthraquinone derivatives.—E. F.

Disazo Dyestuffs [Azo Dyestuffs]; Manufacture of Primary ——. Kalle and Co. Fr. Pat. 332,714, June 2, 1903.

Primary disazo dyestuffs prepared from peri-amino-naphthol-sulphonic acids, and containing a *p*-nitraniline radicle in the nucleus containing the amino group, are treated with alkaline reducing agents. The nitro group is thus reduced to an amino group, and greenish-black dyestuffs are obtained, which are especially suitable for printing on wool. The same dyestuffs are obtained by saponifying primary disazo dyestuffs obtained by the successive combination of diazotised acetyl-*p*-phenylenediamine and a diazotised primary amine with peri-aminonaphtholsulphonic acids. They are also obtained by combining diazo compounds of the usual amines with dyestuffs of the general formula $(1)NH_2.C_6H_4.N_2(4).X$, in which X represents a peri-aminonaphtholsulphonic acid radicle, the amino group of which is in the position ortho to the azo group.—E. F.

Quinonephenolimines (the Simplest Indophenols); Manufacture of ——. Soc. pour l'Ind. Chim. à Bâle. Fr. Pat. 332,884, June 8, 1903.

Simple indophenols are produced by condensing one molecule of a nitrosophenol with one molecule of a phenol in presence of moderately concentrated sulphuric acid at temperatures below 40° C. The products so obtained are converted into leuco-indophenols by reducing agents, such as zinc dust and acetic acid or alkali polysulphides.—E. F.

Monazo Dyestuffs for Wool; Production of ——. Soc. pour l'Ind. Chim. à Bâle. Fr. Pat. 332,885, June 8, 1903.

See Eng. Pat. 14,113 of 1903; this Journal, 1903, 1081.
—T. F. B.

Sulphide Dyestuff from Dinitrophenol ($HO:NO_2:NO_2$ = 1:2:4); *Production of a Black* ——. Soc. pour l'Ind Chim. à Bâle. Fr. Pat. 333,096, June 12, 1903.

See Eng. Pat. 13,035 of 1903; this Journal, 1903, 946.
—T. F. B.

Triphenylmethane Series [Pyrone-Dyestuffs]; Production of New Dyestuffs of the ——. Soc Anon. des Prods. F. Bayer et Cie. Fr. Pat. 332,926, June 9, 1903.

See U.S. Pat. 738,227, Sept. 8, 1903; this Journal, 1903, 1125. The claim is more general, as nitrobenzaldehydes may be employed.—E. F.

Anthraquinone-a-Sulphonic Acids [Anthracene Dyestuffs]; Preparation of ——. Soc. Anon. des Prods. F. Bayer et Cie. Fr. Pat. 333,144, June 17, 1903.

Anthraquinone-α-sulphonic acid (corresponding to erythrohydroxyanthraquinone) is prepared by treating anthraquinone with sulphonating agents in presence of mercury or of its compounds. By sulphonating more energetically in an analogous manner, a mixture of anthraquinone-1.5-disulphonic acid (corresponding to anthrarufin) and anthraquinone-1.8-disulphonic acid (corresponding to chrysazin) is obtained. These acids can be separated in various ways; for instance, by the relative insolubility of the 1.5-disulphonic acid in cold sulphuric acid.—E. F.

Azo Dyestuffs; Preparation of New Intermediate Products and New ——. G. Nuth, H. Hold, and H. Ruegg. Fr. Pat. 333,212, June 19, 1903.

On condensing benzidine (37 kilos.) with β-naphthol (29 kilos.) in presence of calcium chloride (22 kilos.) for about 12 hours at 200°—250° C., and washing the product successively with water, dilute hydrochloric acid, and dilute sodium hydroxide solution, a grey product is obtained, consisting of a mixture of substances; its solution in aniline deposits dinaphthylbenzidine on cooling, and a new product melting at 245°—252° C. can be precipitated from the mother liquors by addition of dilute hydrochloric acid. On sulphonation at moderate temperatures (*e.g.*, 90°—100° C., with 10 parts of concentrated sulphuric acid), a product is obtained which can be diazotised and coupled with phenols, amines, &c., giving azo dyestuffs which dye wool various shades from acid baths. For instance, coupling with salicylic acid gives fast golden-yellow shades; α-hydroxynaphthoic acid, brown shades; R salt, violet; naphthionic acid, reddish-violet; aminonaphtholsulphonic acid H, a blue-violet; and so on.—T. F. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Oxycellulose; Effect of Mercerisation on ——. P. de Micheli. Zeits. f. Farben- u. Textil-Chem., 1903, 2, 437—438.

Cotton mercerised after bleaching is much harder than that which has not been bleached before mercerisation. This is apparently due to the formation of oxycellulose in the bleaching. If cotton which has been tendered by strong bleaching is mercerised, its strength is increased.
—A. B. S.

English Patents.

Yarns and Threads; Manufacture of ——. C. Kellner, Vienna. Eng. Pat. 24,136, Nov. 4, 1902.

See Fr. Pat. 327,176 of 1902; this Journal, 1903, 905.
—T. F. B.

Degreasing Cotton Waste and other Fibrous Materials; Apparatus for ——. R. B. Hardman and G. D. Hardman, Bury. Eng. Pat. 27,847, Dec. 17, 1902.

The material is fed through a series of vessels by means of an immersed bed of parallel longitudinal bars fitting closely together, and provided each with a continuous series of teeth, inclined in the direction of travel of the material. In each vessel alternate bars are connected at the same end to a transverse bar, which is reciprocated longitudinally by an eccentric, and the remaining bars are connected at the other end to a similar bar and eccentric, so that the two transverse bars alternately approach and recede from one another. One set of teeth, therefore, feeds the material forward, while the adjacent set moves backward, ready at the end of its stroke to engage with the material, and feed during its forward movement. The superfluous liquid is removed and returned to its own vessel at the exit by wringing rollers. The machine is fed from a hopper, provided with similar alternately moving bars, the motions of the latter being obtained by transverse bars connected one to each end of a rocking lever actuated by an eccentric. The outlet is provided with similar reciprocating bars, and, after passing through rollers, the material passes direct into drying chambers provided with condensing arrangements for recovering the escaping vapour of the solvent.—B. N.

Colouring Woollen and like Goods. C. Bucher, Gera, Germany. Eng. Pat. 28,174, Dec. 20, 1902.

The fabric is printed with a suitably thickened caustic alkali; it is then mordanted with a metallic salt, which fixes a metallic hydroxide on the printed parts, and is finally dyed.—A. B. S.

United States Patents.

Printing Black; Process of ——. E. Ullrich and V. Fussgänger, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst-on-the-Maine. U.S. Pat. 742,530, Oct. 27, 1903.

See Fr. Pat. 313,035 of 1901; this Journal, 1902, 114.
—T. F. B.

Discharging [Dyed Material] with Hydrosulphite Paste; Process of ——. L. H. Dehoff, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. U.S. Pat. 744,501, Nov. 17, 1903.

See Eng. Pat. 3288 of 1900; this Journal, 1901, 247.
—T. F. B.

French Patents.

Hair; Artificial ——, *and its Manufacture.* F. Schauman and A. W. Larsson. Fr. Pat. 333,246, June 20, 1903.

Fine threads of silk, cotton, &c., are coated with collodion by immersion in an alcohol-ether solution of nitrocellulose (about 16 grms. per 100 c.c.); it is preferable to add to his solution a solution of shellac (5—15 grms. per 100 c.c. of solution), and also 3—4 per cent. of castor oil to increase he elasticity of the product. The threads are then passed hrough a coagulating solution (*e.g.*, water), and finally rendered less combustible by any desired process. This product is said to closely resemble natural hair, being stiff, but not brittle.—T. F. B.

Mercerising Yarn at Uniform Tension; Machine for ——. L. Cippolina. Fr. Pat. 333,078, April 28, 1903.

See Eng. Pat. 9683 of 1903; this Journal, 1903, 993.
—T. F. B.

Multi-coloured or Shaded Dyeing; Method of ——, *called "Spectalographe."* Stückfärberei Zürich. Fourth Addition, dated May 25, 1903, to Fr. Pat. 274,791, Feb. 7, 1898.

The method of printing in colours, described in the Third Addition (this Journal, 1903, 1083), is applied to printing on a single colour.—T. F. B.

Gelatin on Fabrics; Method of Applying ——. P. V. Renard. Fr. Pat. 332,671, June 2, 1903.

A solution of gelatin ("about 60 per cent.") is applied to fabrics. The gelatin may be coloured before or after its application, and it may also be rendered insoluble by means of formic acid or its derivatives. An apparatus for effecting the application of the gelatin solution is described.
—T. F. B.

Water and Fireproofing Fabrics, Paper, &c; Process for ——. Mme. M. Garin (*née* Blanc). Fr. Pat. 333,298, June 23, 1903.

The fabric, &c., is coated with a solution ("5 to 10 per cent.") of gelatin, which is rendered insoluble by treatment with a 10 per cent. solution of formaldehyde, or by treatment with a bichromate solution; the process is completed by immersion in a solution of an alkali silicate, which may contain a small quantity of aluminium silicate and glycerin.
—T. F. B.

Printing and Colouring Designs, Embossed or in Relief, on Textile Fabrics; Apparatus for ——. The Calico Printers' Association, Ltd. Fr. Pat. 332,822, June 5, 1903.

The fabric passes from a guide roller round a friction roller, which turns in a direction opposite to that of the material, and thus takes out any folds or wrinkles. After passing over the main printing cylinder, the fabric passes over guide rollers and over a special carrying roller, which is turned by the movement of the fabric. The surface of this carrying roller is maintained parallel to, and a fixed distance from, the surface of the roller for printing the embossed portions of the material. This latter roller, which may be smooth or engraved, is supported in a bearing made of two parts, one or both being adjustable by screws, so that the distance apart of the carrying and printing rollers may be made exactly equal to the thickness of the embossed part of the fabric; this latter portion, therefore, only receives the colour. The fabric afterwards passes between the main printing cylinder and a second friction roller, the latter pressing the colour into the threads of the design. The method of printing is also made adaptable to multi-colour printing.—B. N.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphur; Occurrence of Iron in ——. R. v. Hasslinger. Monatsh. f. Chem., 1903, **24**, [9], 729—736.

All commercial sulphur, whether distilled or recrystallised, deposits, on boiling, a black precipitate, which only contains carbon and iron. This precipitate is insoluble in sulphur and all solvents for sulphur, is not identical with so-called "black sulphur," and can be artificially prepared by distilling pure sulphur—obtained from sulphuretted hydrogen—with iron and hydrocarbons.—L. F. G.

Hydroxyl Ions; The Iodo-Tannin Reaction for the Detection of ——. W. Vaubel. XXIII., page 1309.

Iodine; Separation of ——, *as Cuprous Iodide, from a Mixture of Alkali Chlorides, Bromides, and Iodides.* H. Baubigny and P. Rivals. XXIII., page 1309.

English Patents.

Nitric Products; Electric Plant for the Synthetical Production of ——, *by Discharges of Electricity in Gaseous Mixtures.* J. von Kowalski and J. Mosciçki. Eng. Pat. 20,497, Sept. 23, 1903. XI. A., page 1297.

Caustic Soda; Process of Manufacturing ——. C. E. Dolbear, Terminal Island, California. Eng. Pat. 19,242, Sept. 7, 1903.

The material ("alkali earth") is treated with water, and to the solution caustic lime is added to obtain a solution of sodium hydroxide, which, after separation from the precipitate, may be dried, after, in some cases, removal of sodium chloride by crystallisation. Should it be desired to remove magnesium salts, in case these are present, the original solution is boiled, to break up the sodium-magnesium carbonate; or, sufficient sodium carbonate may be added to the causticised solution to form magnesium carbonate, which precipitates.—E. S.

Ammoniacal Liquors; Apparatus for the Distillation of ——. T. and G. Wilton. Eng. Pat. 28,251, Dec. 22, 1902. III., page 1289.

Sulphocyanides [*Thiocyanates*]; *Manufacture of* ——. J. Tcherniac, Freiburg, Germany. Eng. Pat. 24,767, Nov. 11, 1902.

Crude coal-gas, or a mixture of gases containing a cyanogen and a sulphur compound, is passed through water containing magnesia or magnesium carbonate in suspension. Another process consists in passing through milk of magnesia a gas containing carbon bisulphide and ammonia, or these reagents may be heated together. When ammonia is present in the gas used, a solution of a suitable magnesium salt may replace the milk of magnesia. The magnesium thiocyanate obtained by any of these processes, may be used as a source of an alkali or other thiocyanate. Compare Eng. Pat. 17,976 of 1902; and Fr. Pat. 330,308 of 1903; this Journal, 1903, 1045 and 1087.—E. S.

Saccharine, Syrups, Brine, or other Fluids; Improved Means of Evaporation for the Concentration or Condensation of ——. F. Meyer. From J. W. Meyer and J. W. Arbuckle. Eng. Pat. 19,962, Sept. 16, 1903. XVI., page 1301.

Oxygen: Preparation of ——. G. F. Jaubert, Paris. Eng. Pat. 21,122, Oct. 1, 1903. Under Internat. Conv., Oct. 27, 1902.

See Fr. Pat. 325,627 of 1902; this Journal, 1903, 743.
—T. F. B.

United States Patents.

Nitric and Sulphuric Acids; Apparatus for Making Mixtures of ——. F. I. Du Pont, Wilmington, Del. U.S. Pat. 743,922, Nov. 10, 1903.

The retort in which the nitric acid is generated is connected to an absorber containing sulphuric acid, by circulating conduits, one of which conveys the nitric acid vapour to the absorber, whilst the other conduit, by aid of a blower, returns the unabsorbed gases. The absorber is fitted with an agitator.—E. S.

Cuprous Magnetic Oxide; Process of Making ——. W. J. Knox, West Fairlea, Vt., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 743,732, Nov. 10, 1903.

Molten copper is oxidised in the presence of magnetic iron oxide in a basic or neutral-lined vessel; or magnetic iron oxide is dissolved in a bath of molten cuprous oxide.
—E. S.

Chemical Compound [*Cuprous Magnetic Oxide*]. W. J. Knox, West Fairlea, Vt., Assignor to G. Westinghouse, Pittsburg, Pa. U.S. Pat. 743,733, Nov. 10, 1903.

A new chemical compound consisting of cuprous oxide carrying magnetic oxide of iron in "homogeneous molten solution." (See preceding abstract.)—E. S.

Ammonia Still. E. A. Moore, Philadelphia. U.S. Pat. 740,678, Oct. 6, 1903.

A vertical cylindrical still is divided vertically into sections, jointed together by means of flanges, and arranged so that any section can be removed without disturbing the remainder of the apparatus; a number of horizontal plates fit into grooves in the walls of the still, the joints being made tight with packing, and are provided with openings (up which the ammonia passes) with vertical flanges, over which are placed hoods in the usual manner. The plates are also provided with pipes, down which the liquor flows, and which are alternately in the centres and near the edges of the plates. The liquor is introduced through inlets between each pair of plates, and at the top of the still. Steam pipes and means whereby the still can be rotated are also included.—T. F. B.

Sodium Sulphite; Process of Obtaining ——. H. H. Wing, New Brighton, N.Y. U.S. Pat. 743,209, Nov. 3, 1903.

A matte, such as copper-nickel matte, is mixed with sodium sulphate and carbon (or the matte may be omitted), and the mixture is smelted and run into suitable receptacles, from which, after cooling, the "tops" are separated from the "bottoms," and are ground, leached, and agitated in the presence of copper oxide; the solution of sodium hydroxide thus obtained, is cleared from the deposit, and is saturated with gases containing sulphur dioxide. The sodium sulphite produced, is crystallised out. The "bottoms" of the smelted mixture may be similarly treated.—E. S.

Liquefying Air; Apparatus for ——, *and Separating Oxygen therefrom.* E. C. Thrupp, Walton-on-Thames. U.S. Pat. 743,349, Nov. 3, 1903.

See Eng. Pat. 18,913 of 1900; this Journal, 1901, 1018.
—T. F. B.

Ozone; Method of and Apparatus for Converting Oxygen into ——. F. S. Blackmarr and J. L. Wilford. U.S. Pats. 743,431, 743,432, and 743,433, Nov. 10, 1903. XI. A., page 1298.

French Patents.

Sulphuric Acid; Manufacture of ——, *by the Chamber Process.* R. E. J. Delplace. Fr. Pat. 333,285, June 23, 1903.

The circulation and mixture of the gases in the leaden chambers of the sulphuric acid manufacture are assisted by the use of "accelerating pipes," of any desired form. A number of such pipes may be arranged externally to the chambers, which they enter, near to, but not at the bottom, and re-enter immediately under the roof. These are cooled externally by a water-spray or otherwise, and steam may be injected internally. Channels are formed for the flow of dilute sulphuric acid.—E. S.

Hypochlorites; Manufacture of ——. J. T. Conroy, J. H. Shores, and The United Alkali Co., Ltd. Fr. Pat. 332,705, June 2, 1903.

See Eng. Pat. 18,947 of 1902; this Journal, 1903, 907.
—T. F. B.

Oxygen; Process for the Separation of ——, *from the Nitrogen of Liquid Air.* Soc. pour l'Exploitation des Procédés G. Claude. First Addition, dated June 5, 1903, to Fr Pat. 328,215 of Jan. 3, 1903. (See this Journal, 1903, 950).

To compensate for the loss occurring between the quantity of liquid air which evaporates and that which condenses, in the process described in the main patent, the cold produced by the expansion of the gaseous residue is utilised to produce a supplementary liquefaction or reliquefaction, after the entry of the gas into the separating apparatus.—E. S.

Nitrogen; Process and Apparatus for Preparing Pure ——. Ges. f. Linde's Eismaschinen Akt.-Ges. Fr. Pat. 332,811, June 5, 1903.

See Eng. Pat. 11,221 of 1903; this Journal, 1903, 907.
—T. F. B.

Sulphur; Process and Apparatus for the Extraction of ——, *by Continuous Working.* E. L. Lalbin. Fr. Pat. 333,094, June 12, 1903.

Matters containing sulphur, whether earthy, tarry, or ligneous, are fed into the upper end of a retort set in the flues of a furnace sloping at an angle from the vertical. Immediately below the feeding arrangement, a pipe enters the retort from the external air, through which the "atomic quantity necessary" of air for destroying or preventing the formation of sulphur sub-products, such as carbon bisulphide and hydrogen sulphide, is introduced. A branch leads from the lower part of the retort to a connected chamber, immediately before entering which the vapours are condensed by admission of a jet of water pulverised by the compressed gas conveying it, the expansion of the gas chilling the water particles and the vapours. The sulphur collects in "flowers" in the chamber. By suppresion of the tube admitting air to the retort, and by hydraulically sealing the discharge end, with some other modifications, the apparatus may be adapted to the manufacture of carbon bisulphide.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Porcelain Bodies. G. C. Müller. Sprechsaal, 1903, [36], 1557; Chem.-Zeit., 1903, **27**, [89], Rep. 288.

The composition of porcelain-bodies is modified according to the properties aimed at.

1. *A very Translucent Porcelain.*—52·5 parts by weight of "Kronach sand" (containing per cent.: quartz, 62·52; felspar, 29·09, and clay 8·39), and 47·5 parts by weight of "Zettlitz kaolin." The mixture is fired at "Seger Cone No. 13."

2. *A Glaze for the above.*—Crushed or ground pot, 45; felspar, 20; quartz, 15; marble, 20 parts by weight.

3. *A very Durable Porcelain.*—Zettlitz kaolin, 55; "Hohenbocka sand" (pure silica), 25; Norwegian felspar, 20 parts by weight. "Fired" at "Seger Cone Nos. 14—15." For articles to be turned on the wheel or moulded, from 2 per cent. to 5 per cent. of crushed pot is added to he last-named mixture.

4. *A Glaze for the latter.*—Hohenbocka sand, 35·5; Norwegian felspar, 25·0; levigated kaolin, 10·0; calcspar, 3·25; broken pot, 24·25 parts by weight.

5. *For Insulators.*—Bohemian kaolin, 30; Hohenbocka sand, 40; white fireclay, 20; felspar, 10 parts by weight.
—C. A. B.

English Patent.

Furnace for Melting Vitreous Matters; Combined ——. A. M. Clark, London. From Fellner and Ziegler, Bockenheim, Germany. Eng. Pat. 27,048, Dec. 8, 1902.

A rotary furnace is combined with a stationary reverberatory furnace in such a manner that the waste gases from he latter pass through the former, into which the materials o be fused are charged. In this way the raw materials are eated almost to a sintering temperature before they reach he reverberatory furnace in which the actual fusion is ffected.—A. G. L.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Clay; Progressive Dilution of ——, *with Fire-clay Sand.* O. Mühlhaeuser. Zeits. angew. Chem., 1903, **16**, 1107—1110.

The author has determined the influence of the amount of and (ground fire-brick), used as diluting material, upon the quality of the stone prepared from St. Louis clay. Tests were made with mixtures containing 0, 10, 20, 30, 40, 50, and 60 per cent. respectively of sand. It was found that the greater the proportion of sand incorporated with the clay, the smaller the amount of water required for forming masses of definite shape, and consequently the smaller the amount of water lost on drying; the contraction on drying is also smaller the greater the amount of diluting material. On burning the material at a temperature at which cone 14 melts, *i.e.*, on expelling the chemically-combined water, the contraction is smaller the greater the proportion of and, but the porosity and volume-weight are approximately he same in all cases. On firing at higher temperatures, viz., at the fusing point of cone 9 (the heat of zinc furnaces), also, the contraction is smaller the higher the proportion of sand, but the porosity and volume-weight are greater, and the less dense are the bricks. It was also observed that masses containing large proportions of diluting material shrink more during drying than during burning, whilst with smaller proportions of sand, the contraction is greater during burning than during drying. The permeability to water of the finished material increases with the proportion of diluting material. (See also this Journal, 1903, 556, 996, and 1244.)—A. S.

Fire-Brick Industry; Notes on the New Jersey ——. H. Ries. Trans. Amer. Inst. Min. Eng., Feb. 1903.

The following table gives the composition of a number of New Jersey fire-bricks, mostly moulded by hand or in soft-mud machines, the bricks being usually re-pressed after moulding, and burned in a down-draught kiln at a temperature lying between fusing points of cones 10 and 12:—

—	SiO_2.	Al_2O_3.	TiO_2.	Fe_2O_3.	CaO, MgO, Alk by Diff.	Cone of Fusion.
						No.
1	77·30	18·99	1·05	2·[illegible]	0·60	31—32
2	82·45	14·86	0·90	1·54	0·25	32
3	68·70	26·50	2·65	1·25	0·90	27
4	77·15	19·46	0·95	1·99	0·45	27
5	82·30	11·84	0·71	1·70	0·45	31
6	75·20	21·09	1·72	1·37	0·62	33
7	77·70	19·51	1·86	1·11	..	28—29
8	79·84	18·06	1·53	1·65	..	31

These figures agree with the view that if the ratio of silica to base increase beyond a certain limit, the fusing point of the material will be lowered. Titanic oxide also lowers the fusing point appreciably. The following table shows the composition of some English and German fire-bricks:—

—	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO, MgO, Alk.	Cone of Fusion.
Saarau, Ger.	52·20	45·90	1·00	0·90	35—36
Saarau, Ger.	69·65	28·71	1·20	0·44	below 33
Lucas, Eng.	61·24	30·48	3·20	4·89	below 31
Stourbridge, Eng. .	63·40	31·70	3·00	1·90	30—31

—A. G. L.

English Patents.

Granite; Manufacture of Artificial ——. L. A. Garchey, Paris. Eng. Pat. 25,807, Nov. 24, 1902.

See Fr. Pat. 325,475 of 1902; this Journal, 1903, 697.
—T. F. B.

Kilns for Burning Limestone and the like. J. Briggs, Manchester, and T. S. Briggs, Harrogate. Eng. Pat. 25,397, Nov. 19, 1902.

To prevent the collapsing of the horizontal flues which are usually built in the kiln from the limestone itself, horizontal flues are constructed of fire-bricks or other refractory blocks. Small or large spaces may be left between these blocks.—A. G. L.

Furnace for Melting Vitreous Matters; Combined ——. A. M. Clark. From Fellner and Zeigler. Eng. Pat. 27,048, Dec. 8, 1902. VIII., col. 1.

Cements; Manufacture of Hydraulic ——. J. Gresly, Liesberg, Switzerland. Eng. Pat. 19,016, Sept. 3, 1903. Under Internat. Conv., Jan. 28, 1903.

See Addition, of Jan. 28, 1903, to Fr. Pat. 325,661 of 1902; this Journal, 1903, 998.—T. F. B.

Cement or the like from Blast-Furnace Slag; Process for Producing ——. C. Canaris, jun., Duisberg-Hochfeld, Germany. Eng. Pat. 18,623, Aug. 29, 1903.

The molten slag, preferably in the form of spray, is conducted into a vessel containing 2 or 3 per cent. of milk of lime. The whole is kept in continuous movement by any suitable stirring arrangement, and the finished material is continuously removed by means of an elevator, dried, and ground as usual. Other alkaline substances may be substituted for the lime, of which only a very small quantity is taken up by the slag.—A. G. L.

United States Patents.

Paving Composition; Process of Producing Asphaltic ——. J. H. Amies, Assignor to Amies Asphalt Co., both of Philadelphia, Pa. U.S. Pat. 743,051, Nov. 3, 1903.

Two parts of powdered asphalt are mixed with 1 part of crude petroleum oil. The mixture is allowed to stand until it has become reduced to a paste, when it is heated in a

closed or open vessel to about 180° F., and the resulting liquid mixed with sand previously heated to 215° F.
—A. G. L.

Portland Cement; Manufacture of ——. H. K. G. Bamber, Greenhithe. U.S. Pat. 743,218, Nov. 3, 1903.

See Eng. Pat. 22,735 of 1902; this Journal, 1903, 1196.
—T. F. B.

French Patents.

Emery; Artificial ——. A. Gacon. Fr. Pat. 332,770, June 4, 1903.

To produce 1,000 kilos. of emery, 769 kilos. of bauxite, preferably ferruginous, 769 kilos. of coke, and 96 kilos. of any suitable flux, preferably calcium carbonate, are mixed and burnt together in any appropriate furnace. Sodium or potassium carbonate may be used instead of calcium carbonate.—A. G. L.

Asphalt; Synthetic ——. A. Montupet. Fr. Pat. 332,772, June 4, 1903. III., page 1289.

Building Materials; Artificial ——. A. Seigle. First Addition, of June 4, 1903, to Fr. Pat. 323,666, Aug. 11, 1902. (See this Journal, 1903, 497.)

Sand is mixed, for 5 to 10 minutes, with 5 to 15 per cent. of quicklime, to which zinc oxide may have been added, after which a solution of calcium chloride, which may also contain zinc chloride, is added, and the mixing continued for another 10 or 15 minutes, the mixing being continued for a longer or shorter time, according as to whether the outside of the apparatus becomes hot or not. In no case will the mixing require a longer period than 30 to 40 minutes. The moulding and hardening of the mixture obtained are carried out as previously described.—A. G. L.

Stone; Artificial ——. H. Seifarth. Fr. Pat. 332,795, June 5, 1903.

To a mixture of 10 parts of ground silicious sand, 10 parts of residue from the ammonia-soda or Leblanc process, and 2 parts of slaked lime, 60 to 70 per cent. of water is added, the whole well mixed and moulded under pressure into bricks, which are placed on trucks, and dried by passing the trucks through a number of pipes, in which they are gradually heated to 30° or 40° C. After 10 or 12 hours, the bricks are sufficiently dry to be hardened by treating them with superheated steam.—A. G. L.

X.—METALLURGY.

Bessemer Process; Development of ——, *for Small Charges.* B. Stoughton. Trans. Amer. Inst. Min. Eng., 1902.

The author gives a historical review of the introduction and development of small converters for the production of steel castings, from Clapp-Griffiths about 1884 to Tropenas in 1891. Numerous advantages are claimed by Tropenas over the open-hearth process for steel-casting. Amongst his claims is one to the effect that the metal is of better quality. It is freer from blow holes and gas cavities, as it is so very hot and fluid when poured; also it has greater softness, due to a smaller proportion of "impurities"—carbon and silicon. Whether this claim can be upheld, however, when average Tropenas steel is compared with average steel from the open-hearth or the ordinary Bessemer process, is somewhat doubtful. It is further stated that the metal is extremely hot and fluid. It pours in a thin and mobile stream, and fills small moulds accurately and sharply. In the ordinary converter the metal could not be made hot enough to allow of the whole contents being poured into small castings, whilst to do it in the open-hearth furnace would mean a prohibitive cost in repairs to roof and lining. The author has modified the Tropenas converter by making it taller, so as to reduce the spitting, thickening the lining considerably on the tuyère side, so as to allow very long tuyères, and providing it with a movable bottom. A single converter with a spare bottom can be made to work continuously, and thus to replace three fixed-bottom converters of the same size.—J. T. D.

Cast-Iron; Change in ——, *by Continued Heating.* F. Wüst. Stahl u. Eisen, 1903, [23], 1136. Chem.-Zeit., 1903, **27**, [89], Rep., 291.

The samples for experiment were taken from various parts of an oil-gas retort; the total carbon was 3·39 per cent. (0·48 per cent. of graphite), 86 per cent. of which was combined carbon. Ignoring the graphite, the composition of the casting resembled that from an annealed casting, the action of the retort producing gaseous oxidation products (oxygen, carbon dioxide, water, and sulphur dioxide), whereas the annealing process produced iron oxides. By continued heating at 800°—850° C., the combined carbon separates out as amorphous carbon, and is then volatilised by oxidising gases. In four samples, the amorphous carbon rose from 0 to 14, 56, and 84 per cent. of the absolute amount of combined carbon present. In sample No. 3, 0·35 per cent. of the carbon volatilised, whilst in sample No. 4, 82 per cent. volatilised. The latter sample was malleable, from which it is argued that the reactions producing it are similar to those in the "puddling process." Contrary to general belief the author found that the graphite disappeared by repeated annealing at 1,000°—1,050° C. For a refractory casting, one must choose a fine-grained cast-iron, containing from 1—2 per cent. of manganese, in order to retard the separation out of amorphous carbon.—C. A. B.

Iron and Steel; Condition and Action of Carbon in ——. H. E. Field. Trans. Amer. Inst. Min. Eng., Oct. 1903.

According to the author's theory of the action of carbon, the hardness of steel must be regarded as due to (1) the hardness of the carbon atoms; (2) their position; and (3) the attraction between the atoms. Of these, the first two are not wholly new, while the third is claimed as original. It avoids the objections advanced by the adherents of the allotropic theory, in that it does not rely upon the hardness of, say, 1 per cent. of carbon to produce the result, but does rely upon the strong attraction existing between the atoms. On the other hand, this theory meets all the criticisms of the "carbonists," in that it does not assume any mystic condition of the iron wholly unexplained by fact or theory.
—J. H. C.

Sulphur in Iron; Influence of Silicon and Carbon upon ——. F. Wüst and A. Schüller. Stahl u. Eisen, 1903, [23], 1128. Chem.-Zeit., 1903, **27**, [89], Rep. 290.

From a series of smeltings carried out by the authors, the silicon in the charge varying from 1·37—50·16 per cent., and the sulphur from 0·43—7·55 per cent., it was proved that silicon exerted no practical desulphurising power, as a 6 per cent. silicon-content was still associated with a sulphur-content of 3 per cent. A 20 per cent. silicon-content, however, eliminated practically all the sulphur, the compound SiS being formed. This body was proved to be volatilised by working in an atmosphere of nitrogen and securing the volatilised products; it is decomposed by the least trace of moisture. It is a common belief that the sulphur and carbon in iron volatilise and combine in the form of carbon bisulphide. This is not the case; only the carbon volatilises as carbon monoxide and carbon dioxide. In iron with 26 per cent. of sulphur, only 0·17 per cent. of carbon can be present, as two elements do not occur simultaneously in large amounts in iron. The following experiment proved this:—A highly carburised iron was melted along with iron sulphide, when the mass separated into two sharply defined layers; the lower (white) one contained 2·74 per cent. of carbon and 2·59 per cent. of sulphur, whilst the upper (brown) layer contained 0·17 per cent. of carbon and 26·13 per cent. of sulphur. Carbon is therefore not a direct desulphurising agent.—C. A. B.

Manganese Ore as a Desulphuring Agent in Cupola-Furnaces. F. Wüst. Stahl u. Eisen, 1903, [23], 1134. Chem.-Zeit., 1903, **27**, [89], Rep. 290—291.

P. Rensch recommended an addition of manganese ore as an excellent desulphurising agent in cupola furnaces, and the author confirms this from independent experiments. 600 kilos. of cast iron, 36—38 kilos. of coke, 5 kilos. of manganese ore, and 6 kilos. of limestone were taken for experiment, and the mean of 33 castings showed that the iron contained:—silicon, 2·18; manganese, 0·75; and sulphur, 0·0595 per cent. On using 2·5 kilos. of manganese ore, the iron contained:—silicon, 1·75; manganese, 0·65; and sulphur, 0·0865 per cent. The mean result with a manganese ore flux was 0·064 per cent. of sulphur, whereas the mean percentage of sulphur in 185 castings without this flux was 0·111. Spiegeleisen can replace the manganese-ore flux, if care be taken that the manganese addition represents 1 per cent.—C. A. B.

Steam Cylinder Castings; Composition and Mechanical Properties of ——. F. Wüst and P. Goerens. Stahl u. Eisen, **23**, 1072—1077. Chem. Centr., 1903, **2**, [19], 1093.

Test pieces of 41 different castings were examined with respect to tensile strength and resistance to bending and to shock. The percentage of silicon in the test pieces varied from 0·92 to 2·23 per cent.; manganese, 0·20—1·27; phosphorus, 0·12—1·22; sulphur, 0·054—0·180; total carbon, 3·20—3·60; combined carbon, 0·52—1·46; and graphite carbon, 2·06—3·24 per cent. In the case of specimens with a high silicon content, the tensile strength was higher the lower the content of total carbon; with a decrease in the content of silicon, the amount of total carbon may be increased without injurious effects. Two specimens with a low silicon content (1·14 and 1·09 per cent.) and a relatively low percentage of carbon (3·45 and 3·20 per cent.), gave particularly good results. The proportions of sulphur and phosphorus had practically no influence on the tensile strength, but the resistance to bending decreased with increase of the amounts of these constituents. The resistance to bending was diminished by a very high content of combined carbon (over 0·90 per cent.). The resistance to shock increased as the proportion of phosphorus was reduced, but was scarcely affected by the amount of combined carbon. In the ten specimens which answered all the tests satisfactorily, the amount of silicon varied between 0·92 and 2·13 per cent.; manganese, 0·56—1·21; phosphorus, 0·23—0·69; sulphur, 0·078—0·123; total carbon, 3·36—3·62; combined carbon, 0·63—0·87; and graphite carbon, 2·53—2·86 per cent. In general it may be stated that a casting is better the less sulphur and phosphorus it contains.—A. S.

Cyanide-Plant. Practice at the Ymir Mine, British Columbia. E. C. Holden. Trans. Amer. Inst. of Min. Eng., Oct. 1903.

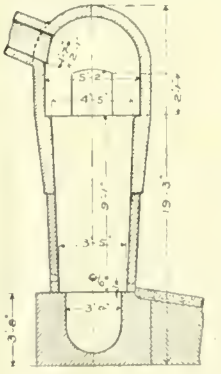
The ore consists of quartz with from 8 to 12 per cent. of sulphides; the mill-feed sometimes contains from 10 to 25 per cent. of slate. During the last three months of 1902, it carried 0·3977 oz. of gold and 1·903 oz. of silver per ton of 2,000 lb.; also 2·65 per cent. of lead and 2·92 per cent. of zinc. After crushing to pass a 2-in. "grizzly," it is stamped through a No. 9 or 11 diagonal slot screen. The saving on the plates reaches 61·9 per cent. of the gold and 9·4 per cent. of the silver. The plate-tails from each 10 stamps are put over three frue-vanners, yielding concentrates containing 16 per cent. of the gold, 35·4 per cent. of the silver, and 42 per cent. of the lead. The vanner tailings during the quarter ending Jan. 1903, assayed 0·0882 oz. of gold and 1·1051 oz. of silver per ton, with lead 1·3 and zinc 2·2 per cent.; 65 per cent. of these would pass a 100-mesh screen. For the cyaniding, the author, after experimenting, adopted the system of direct filling. The leaching vats are of steel, 32 ft. diameter and 6 ft. deep, the distributors are of the usual type: with all the stamps dropping, a vat is filled in from 28 to 32 hours; the average charge is 185 tons weight and the average time of treatment 10½ days. After levelling and adding dry lime, two 5-ton doses of weak solution (0·1 to 0·05 per cent. of potassium cyanide) are successively given, and afterwards four or five 10-ton doses of strong solution (0·2 per cent.) at five-hour intervals. After this the charge is drained six hours; 20 tons of strong solution are now run in under the filter, this occupies six to eight hours. After three to six hours the charge is drained, and a 10-ton top treatment follows. Top and bottom treatment thus alternate until 160 tons of strong solution have been applied. Then follows weak treatment applied on top in 5-ton doses, as rapidly as they disappear, to a total of 40 or 50 tons; this is followed by wash-solution (0·05 to trace only of potassium cyanide), 40 tons; last of all by water as required to preserve the balance of solutions or secure low end-filtrates; no solution is run to waste. While top treatment only was employed, the extraction was 50 per cent. of the gold; by means of the combined bottom and top treatment, it was raised to over 80 per cent. The cyanide consumption is high owing to the length of time during which the ore is under treatment. The costs per ton while treating only 78 tons per day amounted to 0·545 dol. With the works treating 200 tons per day, the cost is reduced to 38·6 cents.—J. H. C.

Smelting; Hot-Blast ——, *for the Elimination of Arsenic, Antimony, Lead, and Zinc from Copper Mattes, and for the Production of Lead.* S. E. Bretherton. Trans. Amer. Inst. of Min. Eng., Oct., 1903.

The subject is discussed under two heads, *viz.*, hot-blast copper matte smelting and hot-blast lead smelting. The author considers that a blast-temperature of 500° F. is the highest that can be used for technical economy and that even a temperature of 200° F. results in a great saving of fuel. He concludes with the following general propositions as to the use of heated blast in the treatment of sulphides in the blast furnace:—(1) That the heat required for effecting what may be called the "net" reduction of the raw material of the charge into metal or matte, and for effecting and maintaining the fusion of the metal, matte, slag, &c., may be furnished by the fuel actually put into the furnace and burned by the blast; or by the pre-heating of the blast; or by the oxidation of sulphur, &c., in the charge. (2) That of these sources of effective heat, the first two cost money, while the third does not. (3) That the third can be more effectively utilised if the second also be called into play (that is to say, if the blast be pre-heated). (4) That the economic limits of this measure of economy in smelting must be determined in each case after due consideration of all the conditions, including not only the difficulty and cost of securing a suitable ore-mixture, but also the local cost of coke and other materials involved in the problem.—J. H. C.

Lead Smelting in Spain. H. Eriksson. Eng. and Mining J., 1903, **76**, 734.

The following is a description of a typical lead smelting works in Spain, where iron and machinery are expensive, whilst manual labour is very cheap. The furnace (see Fig.) was built of uncalcined brick made of a black graphitic clay, up to a height of about 4 ft. above the tuyères, of which there were three; the upper part of the furnace was of common red brick. The entire cost of the furnace was less than 100 dols. The flue was connected to a gallery of rough stone lined with plaster (10,000 ft. long, 3·5 by 7 ft. inside). Both ore-smelting and matte-smelting furnaces are worked. The slag and matte from the ore-smelting furnace are re-smelted together with dry silver ore in the matte-smelting furnace, the product obtained being a matte containing 150 oz. of silver per ton and 25—35 per cent. of the lead charged. This is roasted and then smelted with the ore in the ore-smelting furnace. The ores worked, are galena containing from 5 to 83 per cent. of lead and about 250 oz. of silver per ton of lead, dry silver ores containing up to 120 oz. of silver per ton, and sufficient Linares carbonate ores to keep the silver



below 120 oz. per ton in the lead. The flux consists of iron carbonate with sufficient limestone to obtain 12 per cent. of lime in the slag. The charge for the ore-smelting furnace consists of 55 per cent. of ore and roasted matte, 13 per cent. of flux, and 32 per cent. of slag. The amount of coke used, is 11 per cent. on the charge; it is piled up, by hand, in the centre of the furnace, and the ore charge fed in between it and the walls. Each furnace has a capacity of 10—15 tons of charge per 24 hours. The slag produced, contains less than 35 per cent. of ferrous oxide, 0·5—0·75 per cent. of lead, and 1·5 oz. of silver per ton. The output of the furnace is 76—85 per cent. of the lead, and 84—90 per cent. of the silver. Total loss of lead and silver never exceeds 4 per cent. The cost of smelting per ton of ore is as follows:—Coke, 1·47 dols.; fluxes, 0·04; labour, 0·65; coal for power, 0·10; and general expenses, 0·17; total, 2·43 dols.—A. S.

Tin in Tailings and Slimes; Determination of ——.
G. L. Mackenzie. XXIII., page 1310.

English Patents.

Steel applicable for Use in the Production of Tin Plate and Sheets; Manufacture of ——. J. Stevenson, jun., and F. F. Marquard, Sharon, Pa. Eng. Pat. 23,042, Oct. 22, 1902.

See U.S. Pat. 721,142 of 1903; this Journal, 1903, 557.
—T. F. B.

Alloy for Use in the Manufacture of Steel and in the Production of Tin Plate and Sheets. J. Stevenson, jun., and F. F. Marquard, Sharon, Pa. Eng. Pat. 23,042A, Oct. 22, 1903.

See U.S. Pats. 714,618 of 1902, and 724,140 and 724,141 of 1903; this Journal, 1903, 32 and 557.—T. F. B.

Steel [for Armour-Piercing Projectiles]; Treatment of ——. R. A. Hadfield, Sheffield. Eng. Pat. 25,973, Nov. 25, 1902.

The steel is first heated to from 850° to about 1,000° or 1,100° C. (according to the hardness required), allowed to cool either completely, say to the external atmospheric temperature, or only partially, say to about 300 to 400° C., when it is re-heated up to from 500° (or 600° C. for hardness or when toughness is required) to a maximum of about 720° C., and is then cooled. The invention is specially applicable to the treatment of hard nickel-chromium steel for use in the manufacture of armour-piercing projectiles. Eng. Pat. 7778 of 1902 (this Journal, 1903, 557) is referred to. Compare also Eng. Pats. 27,753 of 1897, and 16,131 of 1901; this Journal, 1899, 49, and 1902, 1280.—E. S.

Copper Ores; Treatment of ——. A. J. Evans, T. H. Jones, and J. R. Richards, all of Swansea. Eng. Pat. 28,112, Dec. 19, 1902.

Ores containing copper as oxychloride or basic sulphate, are reduced to small lumps, and are leached with a two or three per cent. solution of hydrochloric or sulphuric acid, or both, and the liquor is precipitated by hydrogen sulphide. The copper sulphide is separated, and the solution, containing regenerated acid, is re-used. In case the ore contains salts of copper (chloride or sulphate), wholly or partially soluble, it is leached with water, the solution is treated with hydrogen sulphide, and the now acid liquor, after freeing from the precipitate, is used for further leaching.—E. S.

Ores containing Copper; Treatment of ——. W. Payne and J. H. Gillies, both of Orange, New South Wales. Eng. Pat. 6204, Mar. 17, 1903.

Crushed copper ores are mixed with from 1 to 5 per cent. of their weight (according to the proportion of copper present) of pyrites, and the mixture is saturated with the ferrous sulphate liquors remaining from a preceding working of the process. The mixture is then dried and brought to a dull-red heat in a suitable furnace, whereby the copper present is converted into sulphate. The product is leached with the weak wash solution remaining from the treatment of the previous batch of ore. Copper is precipitated by scrap iron from the solution obtained, and the resulting ferrous sulphate solution is utilised as described.—E. S.

Furnace Regenerator for Metal Heating Purposes. W. F. Mason, Manchester. Eng. Pat. 28,734, Dec. 30, 1902.

To obtain a continuous action in the furnace, which is provided with air and gas ports, it is formed with a number of narrow flues for the products of combustion, a number of narrow passages for air, and narrow partitions or dividing walls between these flues and passages. A partial second roof or partition is provided within the furnace, to obtain a more equable distribution of the heated gases.—R. A.

United States Patents.

Steel; Manufacture of ——. R. A. Hadfield, Sheffield, England. U.S. Pat. 743,715, Nov. 10, 1903.

In the process of steel-making by the pneumatic method, the oxidation of the molten metal during its conversion into steel, is controlled by making successive additions of manganese at short intervals to the charge during the blow.
—E. S.

Steel; Composition for Hardening ——. G. Kolb, Mannheim. U.S. Pat. 744,208, Nov. 17, 1903.

See Eng. Pat. 2115 of 1902; this Journal, 1902, 552.
T. F. B.

Metals, Precious; Process of Extracting ——, from Cyanide Solutions. J. A. Ogden, Assignor to S. W. Russell, both of Deadwood, S.D. U.S. Pat. 743,550, Nov. 10, 1903.

The process is claimed of treating "gold, silver, or other metals" from a cyanide or "primary solution," which consists in mixing in a receptacle a given quantity of the cyanide or "primary" solution with a given quantity of a "secondary" solution, having a metal base, and capable of liberating the metals in the "primary" solution. The mixture is passed into a second receptacle, in which it is agitated, whence it is led into a settling tank, from which the precipitate is collected, pressed, and melted into bullion.
—E. S.

Metals, Precious; Apparatus for Extracting ——, from Cyanide Solutions. J. A. Ogden, Assignor to S. W. Russell, both of Deadwood, S.D. U.S. Pat. 743,551, Nov. 10, 1903.

The process described in the preceding abstract is conducted in apparatus comprising a combination of "primary" and "secondary" solution tanks from which the respective solutions are run through valved measuring columns into a mixing receptacle provided with an agitating device, from which receptacle the liquor is passed into a settling tank, and thence into a clear-solution tank.—E. S.

Quicksilver-Ore-Reducing Apparatus. F. C. Meyer, Kansas City, Mo. U.S. Pat. 742,887, Nov. 3, 1903.

The first claim is for "the combination of a furnace for the reduction of ores, a water-tank having a discharge pipe, a cupola having its lower edge submerged in the water of the tank and provided at its front end with an opening containing an absorbent packing in contact with the water, and at its rear end with a gate-controlled opening and vent-pipe, a fan-casing having a spout projecting into the cupola through the packed opening, a pipe connecting the furnace and the casing, and a driven fan in the latter to draw the ore fumes and products of combustion from the furnace and discharge them through the spout on to the water in the tank."—E. S.

Amalgamator. H. Hoeschen, G. Marks, and H. Eisele, Omaha, Nebr. U.S. Pat. 743,871, Nov. 10, 1903.

The amalgamator comprises a horizontal rotating cylinder, having an internal spiral amalgamating and conveying plate, secured by shafts to one of the end plates, and rotating with the cylinder. The end plates are adapted to contain a quantity of mercury, which flows through openings in the outer edge of the spiral plate. Some of the shafts which pass through the convolutions of the spiral plate, carry mixing paddles, whilst other shafts carry perforated fabric-covered collecting-blades. A settling chamber for separation of the pulp from the mercury is arranged at one end of the cylinder, a valved discharge from which is automatically controlled.—E. S.

Metallurgical Process. [*Zinc, Calcium Carbide, and Carbon Bisulphide.*] O. W. Brown, Bloomington, and W. F. Oesterle, Marion, Ind. U.S. Pat. 742,830, Nov. 3, 1903.

Metallic zinc and a carbide are simultaneously produced by adequately heating a mixture of zinc ore with carbon and the oxide of a metal having greater affinity for carbon than the zinc. For instance, zinc blende is mixed with carbon and lime or limestone, and is sufficiently heated to obtain zinc and calcium carbide. Carbon bisulphide is also one of the products. Among the claims, is one for a mixture consisting of two molecular weights each of zinc blende and of lime, with seven of carbon, to be heated in an electric furnace, the products being as described. —E. S.

Alloy [*Aluminium-Copper-Cadmium*]. W. Rübel, Berlin. U.S. Pat. 743,566, Nov. 10, 1903.

See Eng. Pat. 16,453 of 1903; this Journal, 1903, 1090. —T. F. B.

Chromium [*Compounds*] *from Chrome Iron Ore; Extracting* ——. R. Suchy and H. Specketer, Assignors to Chem. Fabr. Griesheim Elektron, Griesheim-on-the-Main. U.S. Pat. 743,668, Nov. 10, 1903.

See Eng. Pat. 5902 of 1903; this Journal, 1903, 950. —T. F. B.

Furnace. D. R. Steele, Curtis Bay, Md., Assignor to H. D. Harvey, Baltimore, Md. U.S. Pat. 743,947, Nov. 10, 1903.

A smelting furnace is formed of a cylindrical firebrick shell with a casing mounted on trunnions, to admit of tilting, in which a crucible is mounted on a supporting baffle block, square in cross section, presenting one edge opposite an opening in front of which a burner is stationed for mixing air and oil, and forcing the ignited mixture through the opening, so as to impinge against the block edge, whereby the flame is distributed through the furnace. The crucible is so mounted that its molten contents may be poured without dislodging it from the furnace, the latter being then removed so as no longer to face the burner.—E. S.

Metallic Coatings on Metallic Objects; Process of Depositing ——. A. Darlay, Paris. U.S. Pat. 744,170, Nov. 17, 1903.

See Eng. Pat. 15,383 of 1899; this Journal, 1900, 750. —T. F. B.

French Patents.

Iron and Steel; Cementation of ——. C. Lamargese. Fr. Pat. 333,076, March 11, 1903.

The invention consists in the use of a mixture of soot and of vegetable charcoal in the cementation of iron and steel. Preferably, the charcoal is produced from the bark of the pine or other resinous tree, to which, before carbonising in closed vessels, resins or mineral or vegetable oils, or the ike, are added, the soot formed in the process, being ollected for the purpose of the invention.—E. S.

Coke; Process of Increasing the Cohesion and Density of ——, *particularly of Metallurgical Coke.* F. Bague. Fr. Pat. 332,946, June 10, 1903. II., page 1287.

Minerals; Treatment of [*Agglomerating*] *Sandy and Friable* ——, *to Prepare them for the Furnace.* J. Loewenthal and B. Lippert. Fr. Pat. 332,970, June 11, 1903.

See Eng. Pat. 10,659 of 1903; this Journal, 1903, 1001. —T. F. B.

Solder; Liquid ——. J. Callmann and R. Bormann. Fr. Pat. 333,201, June 19, 1903.

See Eng. Pat. 13,557 of 1903; this Journal, 1903, 1052. —T. F. B.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Benzyl Chloride, &c., Pyrogenetic Syntheses from ——, *by means of the Electric Current.* W. Loeb. Zeits. Electrochem., 1903, **9**, [46], 903—908.

The decomposition of benzyl chloride is analogous to that of chloroform (this Journal, 1901, 1119): two molecules separated hydrochloric acid, and yielded *stilbene*, $C_6H_5CH:CH.C_6H_5$. 25 grms. of benzal chloride (benzylene dichloride) were similarly treated for $1\frac{1}{2}$—2 hours. On fractionating the resulting brown magma at 15 mm., 8—10 grms. of α- and β-tolane dichlorides, $C_6.H_5.C(Cl):C(Cl).C_6H_5$, distilled over at 170°—180°, leaving a slight residue.—W. A. C.

Electro-Deposition in Photography.
J. Rieder. XXI., page 1307.

English Patents.

Poles or Electrodes of Electrolytic Apparatus and the like. G. J. Atkins, Tottenham. Eng. Pat. 21,021, Sept. 26, 1902.

See Fr. Pat. 330,849 of 1902; this Journal, 1903, 1092. —T. F. B.

Batteries; Impts. in Secondary ——. J. Y. Johnson. From H. B. Ford, New York. Eng. Pat. 12,032, May 26, 1903.

The negative electrode consists of a thin copper plate coated with zinc, and enclosed between plates of a highly electro positive element, such as zinc, the compound plate being corrugated vertically, and enclosed in a porous cup containing mercury. The positive electrode consists of a lead or copper support, perforated and corrugated, with peroxide of manganese covering. The negative electrodes are supported a little above the bottom of the containing vessel, and the positive electrodes have projecting lugs dipping into this space so as to keep contact with the materials detached and shed from the positive plates. Dilute sulphuric acid, 25° B., is used as the electrolyte.—B. N.

Carbonate of Soda, Caustic Soda, Carbonate of Potash, Caustic Potash, and the like; [*Electrolytic*] *Process for Producing* ——, *and Apparatus therefor.* W. P. Thompson, London. From Savon Frères et Cie, Marseilles. Eng. Pat. 13,119, June 11, 1903.

See Fr. Pat. 330,924 of 1903; this Journal, 1903, 1086. —T. F. B.

Nitric Products; Electric Plant for the Synthetical Production of ——, *by Discharges of Electricity in Gaseous Mixtures.* J. von Kowalski and I. Moscicki, both of Fribourg. Eng. Pat. 20,497, Sept. 23, 1903.

The electric plant consists of a transformer with primary and secondary coils, and in the circuit of the latter several discharging sections are introduced "in derivation," each section containing a condenser and self-induction coil without iron core, in series with the discharging electrodes. A self-induction coil of larger size is also introduced "in derivation" in the induced circuit, thus ensuring the high tension necessary to produce an arc of sufficient length. The mutual reaction of the different condensers induces, in each discharging section, electric oscillations of very high frequency, but the self-induction coil of each section limits the frequency to a number of periods comprised between that of the induced circuit and that which tends to produce the mutual reaction of the condensers. The discharging sections are also grouped, each group, consisting of several sections, being derived from a self-induction coil of larger size containing an iron core, which, by its inductional resistance, prevents the electric oscillations, caused by the condensers from one and the same group, from being diffused into the winding of the transformer. At the same time the grouping of several discharging sections renders possible the mutual reaction of the condensers in any one group, and thus secures the high frequency necessary to produce a good yield of nitric compounds.—B. N.

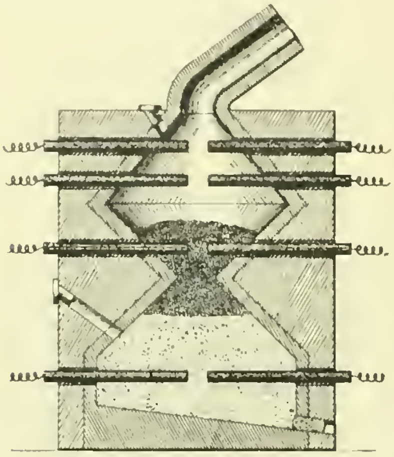
United States Patents.

Insulating Material; Manufacture of Electrical ——. C. Jung and A. Kittel, Assignors to A. Brecher, Vienna. U.S. Pat. 742,997, Nov. 3, 1903.

See Eng. Pat. 5755 of 1900; this Journal, 1900, 911.
—T. F. B.

Chlorides of Carbon; Process of Producing ——. F. J. Machalske, Brooklyn, Assignor to C. H. Lyon, Chicago. U.S. Pat. 742,340, Oct. 27, 1903.

An electric furnace, containing three or more sets of electrodes, is charged with a mixture of an alkali chloride and silica, which is heated by the lowest set of electrodes; above this is charged a quantity of broken carbon heated by the second set of electrodes to a temperature sufficient for the combination. The carbon chlorides, as they leave the furnace, are subjected to further heat from electric arcs. Sulphur may be added to the mass of carbon if a mixture of sulphur chlorides and carbon chlorides be required. (See also U.S. Pat. 737,123; this Journal, 1903, 1063.)—T. F. B.



Electrolytic Process. E. Hannon, Brussels, Assignor to the Solvay Process Co., Syracuse, New York. U.S. Pat., 742,864, Nov. 3, 1903.

The current is passed through an electrolyte and an adjacent fluid electrode, the latter being removed from its surface only, and the electrolyte is moved along the adjacent surface of the fluid electrode during the time, and in the direction, of the removal.—B. N.

Electrolytic Process. E. Hannon, Brussels, Assignor to the Solvay Process Co., Syracuse, New York. U.S. Pat. 742,865, Nov. 3, 1903.

The electrolyte is in electrical contact with a fluid electrode, the latter being supplied with fresh material at its under surface, and removed by gravity from the opposite surface in contact with the electrolyte, without mixing the adjacent surfaces of electrode and electrolyte, and without agitating the remainder of the electrode.—B. N.

Ozone; Method of Converting Oxygen into ——. F. S. Blackmarr and J. L. Willford, Minneapolis. U.S. Pat., 743,431, Nov. 10, 1903.

An induced electric current is applied to the inner and outer surfaces of a tube, formed of dielectric material, by means of terminals each of which is at all points in contact with one of the surfaces or walls of the tube, and air or oxygen is passed through the tube in proximity to the inner terminal.—B. N.

Ozone; Apparatus for Converting Oxygen into ——. F. S. Blackmarr and J. L. Willford, Minneapolis. U.S. Pat. 743,432, Nov. 10, 1903.

The circumference of a tube or cylinder, formed of a dielectric material, is covered with a series of wires in contact at all points with the outer surface, and forming one terminal of an induction coil; the second terminal is connected to a series of wires arranged longitudinally upon, and in contact with, the inner surface of the cylinder. A fan, operated by suitable means, draws a current of air or oxygen through a filter, then through the tube, deflectors in the latter causing the gas to pass along the inner wall in proximity to the internal wires.—B. N.

Ozone; Apparatus for Converting Oxygen into ——. F. S. Blackmarr and J. L. Willford, Minneapolis. U.S. Pat. 743,433, Nov. 10, 1903.

Tubes or cylinders, each formed of a dielectric material, are arranged in a series, one tube inside another, so as to leave air or oxygen passages between them, and electric conductors or electrodes, connected with the terminals of an electric generator for producing an interrupted current, are arranged in these passages, one or more of the electrodes being in contact with the inner surface of one tube, and the outer surface of the adjacent one. The electrodes may be in the form of corrugated plates, spring plates, or plates provided with spring tongues, so as to make close connection with the surfaces of the tubes, and also retard and deflect the air passing through. Alternate electrodes are connected to the opposite poles of the generator, and there is also an arrangement for cutting out one or more of the electrodes from the circuit.—B. N.

French Patents.

"X" or Cathode Rays; Employment of ——, *in Chemical Actions brought about by Electric Discharges.* A. de Montlaur. Fr. Pat. 332,744, June 3, 1903.

The gases, to be subjected to the electric discharge, are submitted to a preliminary or simultaneous action of X or cathode rays, the ionisation of the molecules making the gases better conductors. The X rays may be generated inside a perforated aluminium cylinder, surrounded by a second concentric cylinder enveloped in lead, the latter serving to reflect the rays and thus utilise them more completely. The gases enter the aluminium cylinder and pass between the two metallic surfaces. The discharge may also be produced between two electrodes, one on the axis of the tube through which the gases are being passed, and the second against the interior wall of the tube. The electrodes may be such a distance apart that the discharge will not pass, but on projecting the X rays into the tube along its axis, the current passes in the form of a luminous cone around the inner electrode. The X rays may be produced either by the discharge or by a special current.
—B. N.

Electrical Energy by the Direct Utilisation of the Chemical Energy of a Combustible Substance; Process of Generation of ——. H. Tourneur. Fr. Pat. 332,952, June 11, 1903.

A solution of a metallic sulphide, such as potassium sulphide, is circulated through the positive compartments of a vessel for generating the electric current, these compartments being separated from the negative ones, containing the circulating depolariser (such as nitric acid), by semi-permeable membranes. The electrodes are carbon rods suitably connected in series and dipping into the exciting and depolarising liquids. The sulphide is oxidised to sulphate, which is separated by crystallisation, reduced to sulphide by the action of a combustible in an appropriate furnace, and then again used in the generator. The depolariser is treated in a suitable manner with a current of air so as to regenerate the nitric acid.—B. N.

Cellulose from Wood; Manufacture of ——, by Chlorine developed by the Electrolysis of Metallic Chlorides. C. Kellner. First addition of June 18, 1903, to Fr. Pat. 326,313, Nov. 13, 1902. XIX., page 1304.

(*B.*)—ELECTRO-METALLURGY.

English Patents.

Electroplating; Apparatus for ——. P. Hubert, Paris. Eng. Pat. 8679, April 16, 1903.

See Fr. Pat. 320,351 of 1902; this Journal, 1903, 101.
—T. F. B.

Gold; Electro-deposition of —— W. Kington, Birmingham. Eng. Pat. 13,750, June 20, 1903.

A hard durable alloy of gold is deposited upon base metals by using an alloyed anode, preferably in a cyanide solution. The anode-alloy may consist of about 3 oz. of gold with 40 oz. of copper and 6 oz. of German silver.
—W. G. M.

Earthy Alkali Metals, especially Calcium; Process for the Electrolytic Production of ——. W. E. Evans, London; from Elektrochem-Werke, G. m. b. H., Bitterfeld, Germany. Eng. Pat. 20,655, Sept. 25, 1903.

The electrolyte, fused anhydrous calcium chloride, or other compound, is placed in a suitable vessel, and a vertical cathode with flat bottom is lowered so that it just touches the surface of the molten bath. The alkaline earth metal is deposited in a fused state on this flat surface, and the electrode is then slightly withdrawn; the deposited metal solidifies and, adhering to the cathode, forms a continuation of it. Thus fresh metal is deposited on the new surface, and the slow withdrawal of the cathode being continued, a continuous rod of alkaline earth metal is gradually built up. This is protected from atmospheric oxidation by a sheath of solidified electrolyte which forms upon its surface.
—W. G. M.

United States Patent.

Furnace; Electric ——. W. S. Franklin, Assignor to F. Conlin, both of Bethlehem, Pa. U.S. Pat. 742,852, Nov. 3, 1903.

The furnace consists of a suitable structure having a chamber containing a "molten conductor" in contact with one electrode, the second electrode projecting through an opening in the upper part of the chamber, and is above the conductor so as to form an arc. A reciprocating motion is given to the upper electrode, which is provided with downwardly-projecting teeth, and the material to be treated is thus fed as required through the opening.—B. N.

French Patents.

Electric Furnaces; Process of Introducing Substances into ——. La Société Trolhättans Elektriska Kraftaktiebolag. Fr. Pat. 331,337, April 18, 1903.

See Eng. Pat. 9932 of 1903; this Journal, 1903, 1054.
—T. F. B.

Metallic Combinations; Process for Reducing ——, or for Fusing Metals, especially Nickel and Iron, in the Electric Furnace. Soc. Siemens et Halske Akt.-Ges. Fr. Pat. 333,218, June 20, 1903.

In the reduction of metallic oxides, or in fusing metals in the electric furnace, and particularly in the case of nickel and iron, there is liability of the metal to take up carbon from the electrodes. To obviate this, a layer is formed, covering the lower electrode, of a material that will conduct electricity when fused, either as a liquid or as a semi-fluid, but which will prevent contact between the metal and the electrode. A mixture of magnesia with fluorspar, or with an oxide of titanium, for instance, meets these requirements.—E. S.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Grape-Seed Oil; Expression of ——. Chem. Rev. Fett.- u. Harz-Ind., 1903, **10**, [10], 219—221.

The author calculates that each barrel of wine of 600—700 litres corresponds to 30 kilos. of grape seeds, yielding at least 4 kilos. of oil, and then he gives an outline of the best methods of recovering what is usually a waste product. The freshly-expressed grapes consist approximately of 25 per cent. of stalks, 50 per cent. of skins, and 25 per cent. of seeds, and contain on the average the following proportion of constituents:—Water, 54·2; proteids, 7·1; fat, 5·6; nitrogen-free extractives, 24·4; fibre, 7·0; and ash, 1·4 per cent For the extraction of the oil, the kernels must be separated. Seeds from dark Italian grapes gave the following results on analysis:—Oil, 16·8; proteids, 13·7; nitrogen-free extractives, 46·0; fibre, 21·9; and ash, 1·6 per cent. calculated on the dry substance. The seeds from white grapes are richer in oil than those from black grapes, whilst grapes containing little sugar yield seeds poorer in oil than sweet grapes do. The largest yield of oil is given by the seeds from vigorous varieties of the vine at the full harvest. If the seeds be stored, the amount of oil decreases to a remarkable extent. The finely-ground mass, obtained by crushing the dried seeds, is subjected first to cold and then to hot expression, an addition of 10 to 12 per cent. of water being made to the mass for the first pressing, and of 25 per cent. for the second pressing. The oil obtained by cold expression from fresh seeds is golden yellow and sweet, whilst seeds that have been stored for some time yield a somewhat darker oil with a slightly bitter flavour. Oil of the second expression is brown and has a pronounced bitter taste. The cold-drawn oil is edible, whilst that obtained by hot expression can be used as a lamp oil after refining with sulphuric acid. The expressed seeds are valuable as foodstuffs. The press-cakes are friable and have a mild taste and characteristic odour. A sample from Italian grape-seeds examined by the author gave the following results on analysis:—Water, 15·9; oil, 8·5; proteids, 14·5; nitrogen-free extractives and fibre, 54·5; and ash, 6·6 per cent.—C. A. M.

Sprat Oil and Cod-Liver Oil; Cause of Odour of ——. L. Servais. Chem. Rev. Fett- u. Harz-Ind., 1903, **10**, [10], 231.

From a series of experiments described in detail the author concludes that the substances which give to these and other fish oils their characteristic odour are mainly of an aldehydic nature, and are produced by the action of atmospheric oxygen on the glycerides of the unsaturated fatty acids in the oils.—C. A. M.

Flours; The Fatty Matters and Acidity of ——. Belland. XVIII. A., page 1303.

English Patent.

Oil from Seeds and other Oleaginous Substances and Materials; Process and Apparatus for Extracting ——. E. Stephenson, Kingston-upon-Hull. Eng. Pat. 28,310, Dec. 23, 1902.

The crushed seed is conveyed through a series of extractors by means of revolving elevator buckets, and is extracted by a solvent in its passage. From the last extractor the meal is carried by a screw or other conveyor into revolving kettles, whence, after evaporation and recovery of the solvent, it is discharged into a cooling tower. The oil and solvent in the extractors pass into separators, where the solvent is evaporated and condensed.—C. A. M.

United States Patent.

Soapsuds; Process of Treating Hot Refuse ——. S. Turner, Sowerby Bridge, and F. W. Akeroyd, Batley, England. U.S. Pat. 743,959, Nov. 10, 1903.

The soapsuds are first reduced to a density slightly higher than that of water, then oxidised by a current of cold air, which also reduces the temperature, and finally "curdled" by the addition of an acid, with or without the previous addition of finely-divided material.—C. A. M.

French Patent.

[*Wax*]; *Compositions for Candles, Wax Matches, Wax Flowers, &c.* A. Berger. Fr. Pat. 333,304, June 23, 1903.

Mixtures, which chiefly consist of paraffin wax (80—95 per cent.) with only small proportions of stearine (2—10 per cent.) or ceresin (2—5 per cent.), are made to closely resemble real stearine, as regards opacity, &c., by the addition of ketones of the acetone series (5—10 per cent.) or mineral oil (5—8 per cent.).—R. L. J.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

English Patents.

Paint; Manufacture of ——, G. G. M. Hardingham, London. From Soc. Miniere e Fonderie d'Antimonio, Genoa. Eng. Pat. 28,931, Dec. 31, 1902.

See Fr. Pat. 330,224 of 1903; this Journal, 1903, 1096.
—T. F. B.

Lakes; Manufacture of Red ——, [*From Azo Dyestuffs.*] C. D. Abel, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 1235, Jan. 17, 1903.

See Fr. Pat. 328,575 of 1903; this Journal, 1903, 992.
—T. F. B.

United States Patent.

Pigment, and Process of Making same. W. J. Armbruster and J. Morton, St. Louis. U.S. Pat. 743,802, Nov. 10, 1903.

A pigment consisting of barium carbonate and aluminium hydroxide is produced by precipitating a solution of barium hydroxide, with or without another soluble barium salt, with sodium carbonate, and adding the resulting mixture to a solution of aluminium sulphate; if a solution of barium sulphide be added to the final mixture, a pigment is obtained consisting of barium carbonate, aluminium hydroxide, and barium sulphate.—T. F. B.

French Patents.

Pigment [*Barium Sulphate and Zinc Hydroxide*]; *Process of making a* ——. W. J. Armbruster and J. Morton. Fr. Pat. 332,995, June 12, 1903.

See Eng. Pat. 13,102 of 1903; this Journal, 1903, 1055.
—T. F. B.

Colours for Painting, and Process of making them. N. Hirschfeld. Fr. Pat. 333,130, June 17, 1903.

See Eng. Pat. 14,385 of 1903; this Journal, 1903, 1055.
—T. F. B.

Pigment; Process of Manufacturing a ——. W. J. Armbruster and J. Morton. Fr. Pat. 333,257, June 22, 1903.

See U.S. Pat. 731,152 of 1903; this Journal, 1903, 874.
—T. F. B.

Pigment and its Manufacture. W. J. Armbruster and J. Morton. Fr. Pat. 333,258, June 22, 1903.

See Eng. Pat. 13,813 of 1903; this Journal, 1903, 1066.
—T. F. B.

(*B.*)—RESINS, VARNISHES.

United States Patent.

Oil-Varnish; Process of Manufacturing ——. W. Traine, Wiesbaden. U.S. Pat. 744,263, Nov. 17, 1903.

See Eng. Pat. 5261 of 1903; this Journal, 1903, 752.
—T. F. B.

(*C.*)—INDIA-RUBBER, &c.

Rubber; Vulcanisation by means of Recovered ——. Gummi-Zeit., 1903, **18**, [8], 153.

Good results are obtained in vulcanising low-grade articles containing recovered rubber, such as packing, mats, threads, &c., if the vulcanisation be effected by the sulphur almost invariably left in commercial recovered rubber. Such mixings contain up to 10 per cent. of fresh rubber, and would require 0·7 per cent. of sulphur for vulcanisation (being 7 per cent. of the weight of the raw rubber). This would be added in the form of 15 per cent. of recovered rubber, allowing 2 per cent. of its original 7 per cent. of sulphur to have been actually used up in its vulcanisation. Such goods last better than if extra sulphur were added.
—J. K. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

English Patent.

[*Leather Substitute*] *Coriaceous Material; Manufacture of an Improved* ——. A. Menesdorffer, Melbourne, Australia. Eng. Pat. 20,488, Sept. 23, 1903.

Marine cryptogamic plants, such as various kinds of *fucus*, are collected, cleaned, and sorted, immersed for 1—30 days in dilute sulphuric or nitric acid (2 per cent.) until of a dark green colour, washed free from acid, and then placed in dilute alkali solution. The surface is brushed or scraped, and the seaweed is then well washed, dried on a rack or stretcher to avoid shrinkage, and dressed with glycerin containing carbolic acid (3—5 per cent.).—R. L. J.

French Patents.

Skins [*with the Hair on*]; *New Process for Preparing.* J. B. Dolat. Fr. Pat. 333,187, June 18, 1903.

Instead of the usual order of treatment, furs and other haired skins are dyed immediately after the fulling or cleansing process, and fleshed and degreased afterwards.
—R. L. J.

Gelatin and Glue from Bones; Process of Extracting —— H. Hilbert and Bayerische Akt.-Ges. f. Chem. und Landwirthschaftliches-chem. Fabr. Third addition, dated June 18, 1903, to Fr. Pat. 324,432, Aug. 20, 1902; (this Journal, 1903, 563 and 1056).

See Eng. Pat. 13,682 of 1903; this Journal, 1903, 1007.
—T. F. B.

Glue; Manufacture of ——. O. Schneider. Fr. Pat. 333,277, June 23, 1903.

The crushed bones are extracted by the help of oxygen or compounds which yield oxygen with acids, *e.g.*, permanganates, and with sulphurous acid; similar agents are used to clarify the liquors before concentration. In macerating the crushed bone the treatment with permanganate takes place, and is preferably conducted under a pressure of about 4 atmospheres.—R. L. J.

XV.—MANURES, Etc.

Fertilisers and the Preparation of Potato Land in Germany. U.S. Cons. Reps., Oct. 17, 1903.

The three essential elements to be provided by artificial fertilisation are phosphoric acid, potash, and nitrogen. The first is obtained through the application of mineral phosphate, Thomas slag, phosphate meal, or bone dust. Thomas meal is applied in the proportion from 1,000 to 1,200 lb. per acre, but being sparingly soluble it acts very slowly on the growing crop, and in dry seasons hardly at all. It is most effective in moist soils and in seasons of abundant rainfall. Steamed bone dust is used—300 to 400 lb. per acre—by being strewn over the land in late autumn and ploughed in. Superphosphate fertilisers are used in the spring, and are deposited and covered with the seed at planting time. Far more important, however, for potato culture are the potash-salts, kainite, and carnallite. The development of potato production in Germany during the past 30 years has been due to an unlimited supply of potash minerals. Many of what are now the best potato lands were 20 years ago deficient in potash, for the reason that the potato consumes that element in large proportion. But neither kainite nor carnallite could be used raw and directly as a manure for the growing crop without impairing the quality of the potato. To produce the best effect these salts have to be assimilated with other elements in the soil. To secure this result they are applied during the preparatory process, one or two years before the land is planted to potatoes, and serve to nourish clover, lupin, or other fallow crops that are grown and ploughed under as manure. By this method the potash salts are transformed and mingled thoroughly with the soil, which is also enriched by the nitrogen of the buried vegetation. Nitrogen is applied in the form of stable manure worked into the soil during the one or two years previous to potato planting, and of nitrate of soda, which is used as a top dressing applied directly while the plants are growing. Nitrate of soda, as a top dressing, has an immediate effect in stimulating a crop, but it should never be applied to the soil in autumn nor in the spring before the potato sprouts have appeared above ground. The secret of success in potato cultivation consists in the scientific preparation of the soil, not only by the restoration of its exhausted elements, but by enriching it by deep cultivation and the ploughing in of green manure crops, which have taken up and transformed the crude mineral fertilisers. Land thus prepared will yield three or even four crops of potatoes before they begin to deteriorate. Where a farmer cannot advantageously raise any other crop, he may continue to plant potatoes on the same ground 10 or 12 years, but a change of cereals, beets, or clover is advisable after the fourth successive season of potatoes.

XVI.—SUGAR, STARCH, GUM, Etc.

Reducing Sugar in the Cane; Disappearance of ——. H. W. Wiley. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [4], 363—365.

During the earlier period of growth, the ratio of reducing sugar to sucrose in the juice of the cane is very high, but reaches a minimum at maturity. This theory is confirmed by the analyses of four samples of cane from Florida which contained not a trace of glucose. They were cut in May, 1903, seventeen months after planting. This is regarded as an example of a complete cycle of vegetation of the cane, probably a cycle which has not been realised in a more southern region. It is evident that the cold nights of winter contributed to complete the period of development while at the same time preventing the commencement of the second vegetation, which would certainly have reversed the metabolic activities in the interior of the cane and have produced inversion of a portion of the sucrose.—L. J. de W.

Beetroot Juice; Lehmkuhl Process for Purification of ——. J. Zamaron. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [4], 414—420.

From experiments made with a model diffusion battery, the author is led to think that the quantity of albumin separated in the scums by the Lehmkuhl process is not greater than that obtained in the ordinary process, for if basic sulphate of alumina, added to the diffusion juice in the proportions indicated by the inventor, really produced a coagulation of part of the organic matters, the filtered juice should be purer than untreated juice, and analysis shows this is not the case. There was also found to be a sensible inversion of sugar at 75° C., and the use of so-called basic sulphate of alumina adds a new non-sugar to the juice. (See also this Journal, 1902, 921; and 1903, 308, 1057).—L. J. de W.

Diffusion Juice; New Process for the Purification of ——, *with the Minimum of Lime.* J. Zamaron. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [4], 420—426.

The process is based on the treatment of diffusion juice by a quantity of gelatinous aluminium hydroxide. Filtration and saturation are greatly facilitated and only two-thirds of the usual lime is required, thus reducing the lime used to 1 per cent. If the alumina could be supplied in the gelatinous state at 10 francs per 100 kilos., the author is of opinion that it could be applied with advantage.
—L. J. de W.

Starch; Coagulation of ——. J. Wolff and A. Fernbach. XVII., page 1302.

English Patent.

Saccharine Syrups, Brine, or other Fluids; Improved Means of Evaporation for the Concentration or Condensation of ——. F. Meyer, London. From J. W. Meyer and J. W. Arbuckle, Trinidad. Eng. Pat. 19,962, Sept. 16, 1903.

In each of the series of vessels in the evaporating apparatus, a sparger or sprinkler rotated by the pressure of the liquid, or by gearing, &c., is employed to distribute the liquid over the usual steam-heated tubes. Before passing from one vessel to the next, the liquid may, if necessary, be returned by a circulating pump, and distributed a second time over the tubes of the former vessel. (See also Eng. Pat. 9078 of April 22, 1903; this Journal, 1903, 876.)—R. A.

French Patents.

Invert Sugar from Beetroots; Manufacture of ——. G. Debayser. Fr. Pat. 333,056, June 15, 1903.

Beet juice is purified by double carbonation and sulphuring in the usual way; the cane sugar is then inverted by boiling with a mineral acid; the acid is neutralised by chalk, and the juice is filtered and decolorised by char. The liquid is then evaporated to a syrup and employed as such, or it is caused to crystallise for the production of solid invert sugar.—J. F. B.

Sugars or Starches from Saccharine or Amylaceous Materials; Mechanical Extraction of ——. G. Péreire. Fr. Pat. 333,110, June 16, 1903.

The raw materials are dried rapidly at a low temperature they are then reduced to an impalpable powder without rise of temperature. The powder is then caused to fall from a height, whilst a powerful current of air is blown at right angles to its course. In this way the various constituents of the powdered materials are deposited in a dust-chamber in an order corresponding with their relative densities, and the products thus separated, are collected and worked up according to their nature.—J. F. B.

Diffusion Process. T. de Lewicki. Fr. Pat. 333,164, June 18, 1903.

The beet chips are exhausted with liquors charged with suitable antiseptics, *e.g.*, ozone. The liquor to which the antiseptic has been added is always introduced into the diffuser which has been freshly charged with chips and is kept in that diffuser until the next diffuser has been emptied and refilled. Thus the chips are disinfected as soon as they enter the battery and the antiseptic strength of the liquor has only to be restored from time to time.—J. F. B.

Saccharine Juices; Separation of Matters useful in Agriculture from ——. T. de Lewicki. Fr. Pat. 333,165, June 18, 1903.

The juice is first neutralised by the addition of lime or other suitable base. The albuminous constituents are then coagulated by heat in a vessel so constructed that the coagulated albumin may be collected at the bottom, whilst fresh juice, introduced near the bottom, encounters the falling clots and enriches the lower layers of the liquid with albumin, clear juice flowing out at the top.—J. F. B.

Beetroots; Separation of the Juice of ——, *in a high Condition of Purity.* O. Friedrich. Fr. Pat. 333,219, June 20, 1903.

Formaldehyde is added either to the water employed for diffusion or to the beet chips in the diffusers, in order to convert the albuminoids and other non-saccharine constituents into insoluble products. If preferred, the formaldehyde may be added to the crude diffusion juice and the precipitated albuminoid matters subsequently removed by filtration. The proportions of formaldehyde required, are "0·002—0·004 per cent. for the juice, and between 0·025—0·005 per cent." for the fresh chips.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Starch; Coagulation of ——. J. Wolff and A. Fernbach. Comptes rend., 1903, **137**, [18], 718—719.

The authors have detected the presence of an enzyme in the green seeds of cereals capable of causing the coagulation of solutions of soluble starch, for which they propose the name *amylo-coagulase*. This enzyme is also met with, in association with amylase, in a large number of ripe seeds, germinating seeds, leaves, &c. The most distinct coagulations are effected by a 10 per cent. maceration of air-dried malt with water; 5 c.c. of such an extract are sufficient to produce coagulation in 100 c.c. of a 4 to 4·5 per cent. solution of starch in 20 to 30 minutes at a temperature of 15°—25° C. (The starch solution is prepared by heating potato starch-paste with steam at 130° C. for two hours.) A voluminous clotted precipitate is obtained with a solution thus produced; if a more concentrated solution of starch be employed, coagulation is more rapid and the starch sets to a coherent mass. In less concentrated solutions the action of the coagulase is neutralised by that of the diastase. Owing to the simultaneous presence of the two antagonistic enzymes, the coagulation of the starch is not complete; it has never been found to exceed 30 per cent. of the total starch present. Minute quantities of free acid or alkali considerably retard the coagulating action. Malt extract loses all its coagulating power when it is exposed to a temperature of 65° C. for five minutes. Starch rendered soluble by means of diastase is not nearly so suitable for coagulation experiments as that prepared by heating under pressure. The coagulated starch redissolves readily in hot water. The principle of antagonistic enzymes, here illustrated, explains the arrest of certain enzyme actions, which has hitherto been referred to phenomena of reversibility, by analogy with Hill's observations with maltase (this Journal, 1903, 505).—J. F. B.

Zymo-lactase and Zymo-butyrase. M. E. Pozzi Escot. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1903, **21**, [4], 396—397.

Pure cultures of lactic and butyric ferments were raised in beer wort to which calcium carbonate had been added. When the fermentation was complete, the liquid was filtered through paper, from a precipitate of "a saline nature," formed in the fermentation flask. The deposition of this precipitate on the paper allowed of the whole of the micro-organisms being collected. The extraction of the diastase by the author's method with sucrose having failed, the albuminoids extracted from the lactic and butyric ferments by means of acetone, were left for 12 hours with a little sugar and water, when the presence of the corresponding acids was clearly indicated. In all the experiments ammonium fluoride was used as antiseptic and in quantity greater than that employed by Buchner. Should these experiments be verified, the author proposes to name these diastases zymo-lactase and zymo-butyrase.

—L. J. de W.

Invertase; Influence of Concentrated Sugar Solutions upon ——. Th. Bokony. Chem.-Zeit., 1903, **27**, [90], 1106.

The observation that cane-sugar syrup ferments less readily with yeast than grape-sugar syrup, suggested that invertase is more sensitive to high concentrations than zymase itself, although invertase is otherwise exceptionally resistant. In the author's experiments, dry cane-sugar on the one hand, and dry grape-sugar on the other, were mixed with compressed yeast, with the addition of very little water or none at all; sugar-concentrations of 26 to 74 per cent. were thus obtained. Up to 41·7 per cent., both sugars fermented well. At 48·8 per cent., the fermentation of grape-sugar took place, but not that of cane-sugar. At 74 per cent., no fermentation was observed in either case. Thus the activity of invertase is inhibited at a sugar-concentration of 48 per cent., that of zymase only at above 58·8 per cent. The author suggests that this is due to the retention of water, which is required for hydrolysis, by the sugar molecules. At the same time the activity of invertase is not permanently destroyed by high concentrations, as is that of zymase.—W. A. C.

Malt Kilns; Steam ——. Barth. Zeits. ges. Brauw. through The Brewer's Journal, 1903, **39**, 645.

According to the author, the use of steam for heating malt-kilns enables the heating appliances to be centralised, and facilitates the regulation of the temperature throughout the kilning. Comparative tests showed that the temperature readings in a steam-heated kiln agree with those obtaining in a kiln with fire heat. The malt produced is of a rich colour, contains 84 per cent. of friable grist constituents, and only 2 per cent. each of semi-steely and hard material, and 12 per cent. of slightly browned substance. The malt was completely saccharified in 20 minutes, and the wort was slightly opalescent, and had a colour-depth = 5·84 (cc. of N/100 iodine solution, referred to 10 per cent. wort); it contained 75·16 per cent. of air-dry extract at 17½° C. (77·41 per cent. referred to dry matter), and a maltose to non-maltose content of 1 : 0·60.—A. S.

Fermenting Tuns; Internal Coating of ——. E. Migula. Woch. f. Brau., 1903, **20**, [47], 565–568.

The views of several practical men as to the best material and mode of treatment for coating the interior of fermentation tuns are here collected. The materials considered, are lacquer, pitch, and paraffin.

Lacquer.—Two of the writers are still satisfied with the old method of painting the tuns with lacquer, and have experienced no trouble from infected beer. It is admitted that at the end of a year's work most of the lacquer has disappeared. This is mainly attributable to the action of the disinfectants, which, if used strong enough to kill the germs, are liable to destroy the lacquer and the wood. Ammonium fluoride is perhaps the least harmful in this respect. In one case fumigation with sulphur has been found to answer better than treatment with antiseptic solutions. In removing old lacquer before re-lacquering, lime should be used rather than soda, since the latter causes the new coating to adhere less strongly. Three coats of lacquer applied once a year are found to be perfectly satisfactory.

Pitch.—The application of a coating of melted pitch by means of a suitable spraying apparatus is recommended by some writers, any bad places being made good by subsequent fusion with a soldering lamp. This gives a brilliant enamel coating, and is very cheap; it can be applied in a few minutes, and the tun can be used at once without causing any abnormal effects on the fermentation. On the other hand, it is urged that the pitch coating is liable to blister, and that, although a good pitch coating has a splendid appearance at first, it is very easily cracked, and is liable to corrosion by the solvent action of unfermented wort, so that it scarcely lasts three months. The glassy surface of pitch is also stated to cause abnormally high attenuations, since the yeast cannot settle on it. The chief cause of damage to any coating, whether lacquer or pitch, is careless treatment by the men engaged in cleaning out the tuns.

Paraffin.—This appears to have given great satisfaction to those writers who have tried lacquer and pitch without success. Only the best paraffin should be used, and it should not lie so thickly on the surface that it can be scraped off. The tuns should be placed bottom upwards and heated to a temperature of about 100° C. by means of a coke fire placed inside them. Melted paraffin should then be applied with a brush, and afterwards caused to penetrate deeply into the wood by fusing with a soldering lamp. Lager casks should be well heated and then closed up with some melted paraffin inside, rolled about, and finally drained. Bungs and taps are very objectionable in using any form of internal coating, owing to the damage done to the latter by hammering; screw valves only should be employed.

Finally, one of the writers advises no coating of any kind, and recommends that the tuns in the wet condition should be lime-washed before use, and the lime brushed and rinsed off after remaining for 6 or 8 hours.—J. F. B.

Arsenic in Malt, Beer, and Foodstuffs; Detection and Approximate Determination of Minute Quantities of——. W. Thomson. XXIII., page 1310.

Horse Chestnut [Æsculus Hippocastanum]; Examination of the Seeds of the ——. E. Laves. XX., page 1306.

English Patent.

Centrifugal Separators [Brewers' Mash]. M. Güttner and R. Baeger. Eng. Pat 75, Jan. 1, 1903. I., page 1285.

United States Patent.

Malting Process. B. Bergt, Chicago. U.S. Pat. 743,810, Nov. 10, 1903.

Currents of moist air, at a temperature of 12°—16° C., are caused to flow through the mass of steeped grain, which is subjected to agitation. The currents of air are reversed in direction at intervals, during 6—12 days, whereby the grain is caused to sprout, moisture being supplied to compensate for evaporation. The temperature of the alternately reversed air currents is then increased, at first gradually from 38°—50° C. during a period of 1—3 hours, to permit the formation of diastase, and then rapidly to about 62° C., to prevent the formation of sugar at this stage. Subsequently the temperature of the moist air currents is gradually increased during 1—3 hours to 72° C., to permit the formation of dextrin. Finally, the malt is withered and cured by means of alternately reversed currents of dry air, starting at a temperature of 35° C., and finishing at 80°—90° C.—J. F. B.

French Patents.

Beer; Preparation of a Clear ——, rich in Carbonic Acid and poor in Alcohol. B. Ludewig. Fr. Pat. 332,731, June 3, 1903.

Fire-kilned wheat malt is mashed by the ordinary process of decoction, and the resulting beer is treated in cask, before racking, with a clarifying agent composed of sulphuric acid, tartaric acid, sodium carbonate, and fish glue in approximately equal proportions.—J. F. B.

Acetone Oil; Process of Manufacturing ——. F. Karaseff. Fr. Pat. 332,310, May 23, 1903.

Amylaceous or sacchariferous substances are heated with water, to 100° C. for half an hour and the product cooled to about 40° C., mixed with calcium carbonate (3 parts to every 8 parts of starch or sugar employed), and subjected to acid fermentation for from six to eight days; the fermented liquid is evaporated to dryness and the residue distilled; the principal products of the fermentation are the calcium salts of acetic, propionic, and butyric acids. If the substances to be treated, contain no nitrogen, 375 parts of animal charcoal and 4 parts of ammonium chloride are added for every 2,000 parts of sugar employed.—T. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Flours; The Fatty Matters and Acidity of ——. Balland. Comptes rend., 1903, **137**, [18], 724—725.

Wheat germs mixed with bran, from a recent milling.—The fatty matters extracted by ether contained about 83·34 per cent. of a fluid oil, and 16·66 per cent. of solid fatty acids. Besides the acids soluble both in ether and in alcohol, the original product contained other acids insoluble in ether.

Flour from soft wheat, for army rations, from an old milling.—The fatty matters were composed of about 18 per cent. of a very fluid oil, and 82 per cent. of mixed fatty acids. The acidity of the flour was due to several acids, some soluble in water, alcohol, and ether, and others insoluble n water and in ether.

Flour from hard wheat, for army rations, from an old milling.—The fatty matters were composed entirely of free fatty acids, which hindered the hydration and extraction of he gluten.

General conclusions.—The fatty matters of freshly milled flour consist of a very fluid oil and solid fatty acids of different melting-points. In course of time, the oil, which is very abundant at first, gradually diminishes and disappears, with a corresponding increase of the fatty acids, so that the ratio of oil to fatty acids is a measure of the age of the flour. The fatty acids themselves disappear in time, and are not found in very old flours. The conversion of the oil into fatty acids is not limited to the flour only, it takes place also in the products isolated by ether. The acidity, which is the first indication of alteration of the flour, is not connected with the bacterial decomposition of the gluten, but is derived directly from the fat. The gluten is not attacked until the fatty acids produced from the oil begin to disappear. The richer the flour is in oil, the more liable it is to alteration—as, for instance, flour from hard wheat. In order to have a flour which will keep well, it is advisable to select a soft wheat with a low percentage of fat.—J. F. B.

Arsenic in Malt, Beer, and Foodstuffs; Detection and Quantitative Determination of Minute Quantities of ——. W. Thomson. XXIII., page 1310.

English Patents.

Albuminoid Substances from Maize or Maize Residues or Materials; Manufacture of ——. E. Donard and H. Labbé, Paris. Eng. Pat. 28,513, Dec. 24, 1902.

See Addition, of Nov. 3, 1902, to Fr. Pat. 320,027 of 1902; this Journal, 1903, 816.—T. F. B.

Food Products; Manufacture of ——. A. S. Ramage, Cleveland. Eng. Pat. 16,302, July 23, 1903.

See U.S. Pats. 735,148 and 735,149 of 1903; this Journal, 1903, 1010.—T. F. B.

United States Patent.

Albuminoid Substances from Maize; Process of Making ——. E. Donard and H. Labbé, Paris. U.S. Pat. 744,510, Nov. 17, 1903.

See Addition, of Nov. 3, 1902, to Fr. Pat. 320,027 of 1902 this Journal, 1903, 816.—T. F. B.

French Patents.

Meat; Process for Preserving ——. J. Schad. Fr. Pat. 332,937, June 10, 1903.

The meat is subjected, for 15 minutes, to the action of sulphurous acid, formed by burning sulphur. A closed receptacle for so treating the meat is described.—W. P. S.

Milk Extract Resembling Meat Extract; Process for Preparing ——. O. Eberhard. Fr. Pat. 333,133, June 17, 1903.

Casein, separated by the addition of a suitable acid to skimmed milk, is treated with either an alkaline solution of trypsin or an acid solution of pepsin, and then neutralised. The whey, obtained by the precipitation of the casein, is evaporated under reduced pressure, the lactose is allowed to crystallise out, and the remaining solution is added to the peptonised casein. After filtration, the mixture is further evaporated. Phosphates may be added to the product. (See also U.S. Pat. 712,271; this Journal, 1902, 1548.)—W. P. S.

Saccharine Juices; Separation of Matters useful in Agriculture from ——. T. de Lewicki. Fr. Pat. 333,165, June 18, 1903. XVI., page 1301.

(B.)—SANITATION; WATER PURIFICATION.

Waters, Natural Saline; Purification of ——, by Means of Barium Carbonate. G. Arth and P. Ferry. Bull. Soc. Chim., 1903, **29**, [20], 1065—1068.

Although the process patented by Kosmann, in 1896, for the employment of barium carbonate as a means of purifying natural brines, appears, at first sight, efficient, the authors do not find, in practice, that the reactions proceed on the lines indicated by theory. One equivalent of barium carbonate is capable of precipitating the whole of the sulphuric anhydride in the brine, after boiling for 120 hours. When a larger excess of barium carbonate was employed, equivalent to 3 mols. to each molecule of sulphuric anhydride present, although none of the latter remained in solution after three hours' boiling, the liquid was found to contain a soluble barium salt equivalent to as much as 3·06 grm. of baryta per litre. This reaction between barium carbonate and brines rich in magnesium salts is a source of danger. Thus, it was found that on boiling together 1 molecular weight of barium carbonate with 500 c.c. of pure saturated sodium chloride solution, the amount of soluble barium salt formed was equivalent to 0·18 grm. of baryta per litre. But when the experiment was repeated with a 0·5 per cent. solution of magnesium chloride, the barium in solution amounted to 2·79 grms. of baryta per litre. Calcium, under like conditions, is easily precipitated. At ordinary temperatures on agitating with 1 mol. of barium carbonate, 86·8 per cent. of the lime disappears in 48 hours; with 2 mols. 94·9 per cent. is precipitated in 24 hours. Magnesium is not readily precipitated under these conditions by barium carbonate. After 72 hours of mechanical agitation in the cold, only 50 per cent. was removed from solution by 2 mols. of barium carbonate, and, on boiling, only 36·6 per cent.

—J. O. B.

Iron and Phosphoric Acid in Waters; Separation and Determination of ——. H. Causse. XXIII., page 1310.

English Patent.

Centrifugal Separators [*Sewage Sludge*]. M. Güttner and R. Baeger. Eng. Pat. 75, Jan. 1, 1903. I., page 1285.

(*C.*)—DISINFECTANTS.

Ichthyol Oil; Crude ——, *and its Preparation.* F. Luedy. Chem.-Zeit., 1903, **27**, [80], 984—985.

Crude ichthyol oil from the Seefeld district, between Southern Bavaria and the Tyrol, has a long standing reputation as an antiseptic remedy. One of the oldest wells from which this crude ichthyol is obtained is known as the "Maximilian-Hütte"; it is worked in the following manner:—The crude "rock oil" is obtained from the shale, or "Stinkstein." This is an asphaltic or bituminous substance of a grey or black colour, which occurs in the upper dolomites. In some places the deposits crop up to the surface, in others they occur in lower strata. The strata show numberless impressions of marine organisms, especially of fish. The amount of oil obtained from the shale varies from 1 to 10 per cent. The preparation of the crude ichthyol oil is by simple distillation of the mineral matter saturated with it. Each still is charged with about 30 kilos. of the shale, broken into pieces the size of the fist, and the process of dry distillation is continued for about six hours, so that two distillations are performed a day. An installation of nine stills yields on an average 15 to 25 kilos. of oil per charge. The distillate is set aside in barrels to allow water and tarry matter to separate; the oil is then packed in barrels for sale. It still contains some adhering water. Since wood is plentiful in the neighbourhood, the cost of fuel is very small, and the crude ichthyol oil can be produced very cheaply. In one distilling works the output of crude oil is over 3,000 kilos. per annum. R. Schroeter proposed to increase the normal sulphur content of the crude oil about 2·5 per cent., by treating it with sulphuric acid, and so sulphonating it. The improved product of Schroeter is the article now so widely known as ichthyol. Unna proposed in 1883 to limit the term ichthyol to the crude Seefeld oil, and to call the manufactured article "sodium ichthyolsulphonate." At the present time the ammonium salt is chiefly used, and is generally known as "ichthyol." Commercial ammonium ichthyol is not a simple substance, but a mixture of ammonium ichthyolsulphonate with about 1 per cent. of powerful-smelling empyreumatic oil, 5 to 7 per cent. of ammonium sulphate, and about 50 per cent. of water. Baumann and Schotten attribute to ichthyolsulphonic acid the formula $C_{28}H_{26}S(SO_2OH)_2$. A few years back commercial ichthyol gave a very turbid solution with water, but that now produced is almost completely soluble, giving a clear solution. It follows from this alteration in the nature of ichthyol that the official characters and tests in various pharmacopœias, based on the variety formerly produced, no longer hold good for the product at present met with in commerce. The present ichthyol is thinner than the old kind, and has a more powerful odour. The amount of water-free residue is still variable between 50 and 55 per cent. Kothmeyer has found that the so-called Austrian ichthyol contains only 45 per cent. of solids free from water. An odourless ichthyol has been prepared by Knorr and Co., which shows all the therapeutic activity of the original strong-smelling product. According to their patent, a current of steam under reduced pressure is passed over the surface of a boiling ichthyol solution, by which means the odorous volatile oil is removed and the residual ichthyol is without odour. Upon the expiration of the German patent in 1900, a large industry in the production of ichthyol sprang up, employing a number of factories. The Seefeld oil is no longer the sole source of the raw material. Shales rich in sulphur from other provinces are also employed.—J. O. B.

XIX.—PAPER, PASTEBOARD, Etc.

Glacé Paper: Preparation of ——. A. Weichelt. Papier-Zeit., 1903, **28**, [91], 3270.

The author gives a formula for a colour-mixture for coating paper intended for the glacé covering of pasteboard. The enamel, when moistened, is softened, but not dissolved, so that adhesive labels can be attached. 15 kilos. of "satin white" and 10 kilos. of china clay are ground up in about 7 litres of water, and mixed with a solution of 2·75 kilos. of casein, 275—300 grms. of borax, and 0·5—0·75 kilo. of soap in 14·5 litres of water. Finally 50—55 grms. of formaldehyde in 500 c.c. of water are gradually added to the mixture. Frothing of the mixture can be prevented by the use of skim-milk or fusel oil.—J. F. B.

United States Patent.

Nitrocellulose or Similar Substances; Compound of ——. D. Bachrach, Baltimore, Assignor to E. Berliner, Washington. U.S. Pat. 743,422, Nov. 10, 1903.

A non-inflammable or slow-burning compound of nitrocellulose is prepared, containing, in addition to the usual constituents, free hydrochloric acid, a suitable insoluble absorbent and water of crystallisation; the free hydrochloric acid may be generated in the mass by the action of sulphuric acid upon a chloride.—J. F. B.

French Patent.

Cellulose from Wood; Manufacture of ——, *by Chlorine developed by the Electrolysis of Metallic Chlorides.* C. Kellner. First Addition, dated June 18, 1903, to Fr. Pat. 326,313, Nov. 13, 1902. (See this Journal, 1903, 817.)

The application of the process is extended to the manufacture of cellulose, whether for textile or paper-making purposes, not merely from wood, but from all suitable vegetable materials.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Iodine; Method for the Preparation of Pure ——. L. W. Andrews. Amer. Chem. J., 1903, **30**, [5], 428—429.

Potassium iodide is pulverised with 1·4 times its weight of potassium bichromate, each salt having previously been fused to insure perfect dryness. The mixture is introduced into a wide tube, closed at one end, and heated to about 200° C. in a current of dry air to expel any possible moisture. A plug of dry glass wool is then placed above the mixture in the tube, and the interior of the upper part of the latter is carefully wiped clean with a piece of cotton wool. A second tube is then slipped over the open end of that containing the mixture, fitting the latter as closely as possible. The tube is fixed at a convenient angle, and the mixture is gradually heated with a small flame, using a screen of asbestos board if necessary. Reaction takes place according to the equation :—$5K_2Cr_2O_7 + 6KI = 8K_2CrO_4 + Cr_2O_3 + 6I$. When the iodine has been sublimed into the upper part of the tube, the latter is cut off at a point 2 or 3 cm. above the glass-wool plug. Determinations have shown that iodine so prepared is free from chlorine and bromine.—J. F. B.

Sparteïne; General Characters of, and Action of Certain Reducing Agents on ——. C. Moureu and A. Valeur. J. Pharm. Chim., 1903, **18**, [11], 502—508.

Pure sparteïne liberated from the official (Codex) sulphate distils at 188° C. under 18·5 mm. pressure; it is a thick colourless oil, with a very bitter taste, and a peculiar odour resembling that of piperidine. It distils at normal pressures in a current of hydrogen, without decomposition, at 325° C. It has the sp. gr., 1·0196 at 20° C., and is lævo-rotatory −16·42° in solution in absolute alcohol. Its solubility in water is only 0·304:100 at 22° C., but it is extremely soluble in alcohol, ether, and light petroleum spirit (benzine). It distils readily in steam. In contact with air it slowly acquires a brownish tint. The authors find that the formula originally attributed to it by Stenhouse, $C_{15}H_{26}N_2$, is correct, and do not support Gerhardt in his contention that the molecule of sparteïne contains 16 atoms of carbon. The base is shown to possess di-acid functions, requiring two molecules of monobasic acid to neutralise one molecule of the alkaloid when helianthin is the indicator; towards litmus and phenolphthalein it behaves as a monacid base. It is therefore a diamine forming both neutral and acid salts. The salt official in the Codex is the neutral sulphate $C_{15}H_{26}N_2H_2SO_4 + 5H_2O$. The authors find that both the amine groups of sparteïne possess tertiary functions. Sparteïne readily forms the iodomethylate $C_{15}H_{26}N_2CH_3I$, when treated with an excess of methyl iodide, the compound thus obtained occurring in fine white lamellæ, which are very soluble in water and in alcohol, but less so in acetone. These crystals melt, with decomposition, at about 240° C. A 12 per cent. aqueous solution indicates $[\alpha]_D = -22° 75$. The iodomethylate is markedly alkaline towards helianthin, the saturation figures showing that the two basic functions of sparteïne are distinct. Both the nitrogen atoms in sparteïne are united in a ternary linkage with an atom of carbon, so that demethylation takes place when the base is heated with hydriodic acid or treated by the method of Herzig and Meyer.—J. O. B.

Colchicine in the Seeds of the Meadow Saffron (Colchicum autumnale). H. Blau. Zeits. Oesterr. Apoth.-Ver., **41**, 1067, 1091, 1119. Chem. Centr., 1903, **2**, [20], 1133.

According to the author, the colchicine in the seeds of he meadow saffron occurs exclusively in the two innermost rows of cells (the pigment layer) of the brown seed husk, directly adjoining the endosperm. Old seeds still contain considerable amounts of colchicine. The colchicine can be completely extracted from the seeds by heating them on the water-bath for 3—4 hours with 85 per cent. alcohol. In the seeds, and also in the official tincture, colchicine undergoes, on keeping, a partial conversion into colchicoresin.—A. S.

Solanine. S. Zeisel and J. Wittmann. Ber., 1903, **36**, 3554—3558.

Contrary to the statement of Hilger and Merkens (this Journal, 1903, 1146), the authors, notwithstanding numerous experiments, have never been able to detect crotonic aldehyde among the products formed by the hydrolysis of solanine by means of 2 per cent. sulphuric acid. Further, dextrose is not the only carbohydrate produced by the hydrolysis, but there are also formed rhamnose, and a third carbohydrate, which reduces Fehling's solution only slightly or not at all, and has a greater optical rotation than rhamnose.
—A. S.

Lavender Oil; English ——. and the B.P., 1898. J. C. Umney. Chem. and Druggist, 1903, **63**, 825.

T is the custom with some English distillers of lavender oil o collect the distillate in two portions, because the last unnings have not such a pleasant odour as the first portion f the distillate. The author has examined in this way oils from Mitcham (Surrey) lavender of the years 1901, 1902, and 1903, and has determined the specific gravity and ester content of the two fractions of the distillate. A charge of $1\frac{1}{2}$ tons of freshly cut lavender was distilled with 1200 gallons of water, and after distillation had proceeded for three hours (the usual time allowed), the receiver was changed, and the last runnings (4—8 per cent. of the total amount of oil obtained) were collected separately. The results were as follows :—

—	Specific Gravity at 15° C. when first examined.	Present Specific Gravity.	Present Percentage of Esters (as Linalyl Acetate).
1901 1st distillate	0·881	0·886	6·2
2nd „	0·884	0·889	7·3
1902 1st „	0·882	0·885	8·1
2nd „	0·887	0·890	12·0
1903 1st „	0·881	0·881	8·2
2nd „	0·889	0·883	12·0

From the examination of oils from lavender grown on (1) a strong clay soil with some chalk at Elsenham; (2) on a strong loam soil on clay at Warlingham; and (3) on a light loam soil on chalk at Mitcham, it appears that the nature of the soil has a distinct influence on the character of the lavender oil. The Elsenham and Warlingham oils had a distinctly higher specific gravity than the Mitcham oil. The author considers that the B.P. limit for specific gravity (0·885) should be lowered to 0·883, but also points out that in judging English lavender oils, it is necessary to take into consideration not only the ordinary physical and chemical characters of the oil, but also the sweetness of odour.
—A. S.

Lavender Oil; Some Constituents of French ——. Schimmel's Report, Oct. 1903, 42—44.

The alcohol previously recorded as occurring in French lavender oil is now identified as isoamyl alcohol accompanied by an isomeride thereof, by means of Marckwald's α-nitrophthalic acid method (this Journal, 1901, 379). Ethyl normal amyl-ketone has also been isolated from the oil, which also probably contains certain esters of isoamyl alcohol. Furfural was detected in the first fractions of the oil.—J. O. B.

Lemon-grass Oils [Mexican and Cameroon]. Schimmel's Report, Oct. 1903, 45—47.

The cultivation of the *Andropogon* grasses is extending in the West Indian Islands, and is also pursued on the South American continent, a parcel of "Te limón" grass having come to hand from Mexico. The oil distilled from this, to the extent of 0·916 per cent., is somewhat lower in sp. gr. and is slightly more soluble than West Indian lemon-grass oil. It is optically inactive; the sp. gr. is 0·8852 at 15° C.; solubility in 80 per cent. alcohol 1 : 1, the solution becoming opalescent with the addition of more alcohol. It gives a clear solution with 98 per cent. alcohol in all proportions. The aldehyde content is about 70 per cent. Strunk has reported on the essential oil of a grass cultivated in the Botanical Gardens at Victoria, Cameroons, under the name of *Andropogon citratus*, which was considered, from a rough chemical analysis, not to be true lemon-grass oil, but citronella oil, derived from *A. nardus*. Mannich (Ber. deutsch Pharm. Ges., 1903, **13**, 86) has re-examined this product, and finds it to contain 70 per cent. of citral, and no geraniol or citronellal. The botanical source is therefore defined as being *Andropogon citratus*, or true lemon grass.—J. O. B.

Neroli [Bitter Orange Flower Oil, from the Volatile Extract of the Blossoms of the Bitter Orange. Schimmel's Report, Oct. 1903, 49—53.

The volatile oil, obtained to the extent of about 12·1 per cent. by the distillation of the volatile crude essential oil extracted from orange blossoms *in vacuo* with steam, had the sp. gr. 0·9293 and the saponification value 91·3, equivalent to 32 per cent. of linalyl acetate and 9·6 per cent. of methyl anthranilate. The remaining portion of the crude oil contained 15 per cent. of anthranilic acid ester. Since

Hesse and Zeitschel found only 6·5 per cent. of this ester in the crude essential oil examined by them, it is evident that the oil varies in composition. In addition to the above-named constituents, the following bodies have been isolated:—Benzaldehyde; lævo-linalool; a basic body with a strong nicotine-like odour; phenylethyl alcohol; geraniol; a nitrile, probably that of phenylacetic acid; indole; a nitrogenous body occurring in sparingly soluble lamellæ melting at 159° C., similar to the substance previously found by Hesse and Zeitschel in the oil of orange flower water; a ketone possessing a jasmine-like odour, probably jasmone, and a sesquiterpene alcohol.—J. O. B

Apopin, or Shu-yu Oil. K. Keimazu. J. Pharm. Soc. Jap., 1903 [253]; through Schimmel's Report, Oct. 1903, 10.

The botanical source of the oil, which is distilled in large quantities by the natives in the district of Apuin, in Formosa, is unknown, but it is certainly derived from a member of the N. O. *Lauraceæ* probably nearly allied to the camphor tree. The oil is used to mix with camphor oil. It is a colourless liquid, becoming brown on exposure to air. It has the sp. gr. 0·9279 at 15° C., and the rotation according to Wild's polarimeter, in a tube of 100 m.m., is one of "17° 19′ to 17° 06′ to the right." It contains camphor, identical with the camphor of *Laurus camphora*, eugenol, safrol, cineol, and dipentene.—J. O. B.

Magnolia Kobus [Kobushi Oil]; Essential Oil of——. Schimmel's Report, Oct. 1903, 78.

The fresh leaves and branches of the Kobushi tree, *Magnolia kobus*, of Central Japan, have yielded about 0·45 per cent. of a bright yellow essential oil with a sassafras-like odour; sp. gr. at 15° C., 0·9642; $[\alpha]_D = -1^\circ 6'$; acid value, 1·5; ester value, 8·87; solubility in 80 per cent. alcohol, 1 : 1·2, opalescent on further dilution. The oil probably contains large quantities of safrol accompanied by a small amount of citral.—J. O. B.

Japanese Wormwood [Yomugi Oil]; Essential Oil of ——. Schimmel's Report, Oct. 1903, 78.

The oil derived from Japanese *Artemisia vulgaris* is bright green in colour, and has a marked odour of cineol. It has the following characters:—Sp. gr. at 15° C., 0·9101; $[\alpha]_D = -13^\circ 16'$; acid value, 1·56; ester value, 29·81. It is incompletely soluble in alcohol; it contains cineol and probably thujone.—J. O. B.

Ajowan Herb; Essential Oil of ——. Schimmel's Report, Oct. 1903, 78.

The yield of oil from the fresh German-grown herb of *Carum ajowan* was 0·12 per cent. The oil was light brown in colour, had the sp. gr. 0·8601 at 15° C., and $\alpha_D = +0^\circ 11'$; solubility in 90 per cent. alcohol, about 1 : 6 with abundant separation of a paraffin. It contains only about 1 per cent. of thymol, also a little phellandrene.
—J. O. B.

Horse Chestnut [Æsculus Hippocastanum]; Examination of the Seeds of the ——. E. Laves. Verh. d. Vers. Deutsch. Natf. u. Aerzte, 1902, **2**, 660—664. Chem. Centr. 1903, **2**, [20], 1133.

The dried seeds contain 8·5 per cent. of nitrogenous substances, 7·0 per cent. of "crude fat" (including the bitter principles), 77·2 per cent. of extract-substances free from nitrogen, 4·7 per cent. of crude fibre, and 2·6 per cent. of ash. The ash is alkaline, and contains about 26 per cent. of phosphoric anhydride and 56 per cent. of potassium oxide. The nitrogenous substances are for the most part soluble in water and sodium chloride solution. The "crude fat" can be separated by treatment with light petroleum spirit into a greenish, tasteless, non-drying oil (yield, 6 per cent. on the weight of the seeds), having an iodine value of 108; and a brown resin, which is almost completely soluble in alkalis, strongly reduces Fehling's solution and probably contains æsculetin. The 77·2 per cent. of non-nitrogenous extract-substances consist of 50 per cent. of insoluble carbohydrates, 14 per cent. of cane sugar, 13 per cent. of glucosides (mainly, aphrodäscin, $C_{52}H_{82}O_{23}$), and 0·2 per cent. of tannin. The alcoholic extract of the seeds, which has some therapeutic value, contains about 36 per cent. of glucosides, 4 per cent. of resin (bitter substance), and 6 per cent. of fat. The author has succeeded in fermenting the ready-formed carbohydrates in the seeds, together with those produced by hydrolysis of the glucosides, and from 100 kilos. of dried seeds obtained 25 litres of spirit having an aroma similar to, but much stronger than that of grain spirit.—A. S.

English Patents.

[Acetyl Paracresotinic Acid] Chemical Body; Manufacture of a New ——. G. B. Ellis, London. From Chem. Fabr. von Heyden, Akt.-Ges., Radebeul. Eng. Pat. 18,279, Aug. 24, 1903.

On acetylating *p*-cresotinic acid or its salts, acetyl-*p*-cresotinic acid, $C_6H_3(CH_3)(OCOCH_3)COOH(1\cdot 4\cdot 5)$, is obtained, of m. pt. 146° C., and possessing therapeutic properties similar to those of acetyl salicylic acid.—T. F. B.

Vaccine, and Process of Purifying the same. H. H. Lake, London. From Parke, Davis, and Co., Detroit. Eng. Pat. 19,356, Sept. 8, 1903.

See U.S. Pat. 737,656 of 1903; this Journal, 1903, 1101.
—T. F. B.

Dioxybenzenes with Formaldehyde and Ammonia; Products of Condensation from ——, and Process of Preparing same. W. P. Thompson, London. From the Firm of Möller and Linsert, Hamburg. Eng. Pat. 20,223, Sept. 19, 1903.

Any one of the dihydroxybenzenes (5·5 parts) is added, in aqueous solution, with stirring, to a freshly prepared formaldehyde-ammonia solution (from 4 parts of concentrated ammonia solution and 6 parts of formaldehyde). A crystalline condensation product, easily soluble in water and alcohol, separates out. It is said to be a dihydroxyphenyl-hexamethylenetetramine, and can be applied for therapeutic purposes.—T. F. B.

Sulphur Baths; Process for Obtaining a Preparation adapted for the Making of ——. W. Matzka, Bohdanec, Bohemia. Eng. Pat. 20,548, Sept. 24, 1903.

"Liver of sulphur" is dissolved in alcohol, and a small proportion of essental oils, such as those obtained by distilling with steam the needles of coniferæ, is added, with or without some turpentine. Or the distillate from the coniferæ needles is used to dissolve the liver of sulphur, and the solution is agitated with alcohol; to the alcoholic solution, separated from impurities, further quantities of the essential oils or of turpentine, or of both, may then be added.—E. S.

United States Patents.

Mercurous Chloride [Colloidal]. C. H. von Hoessle, Assignor to Chem. Fabr. von Heyden Act.-Ges., Radebeul. U.S. Pat. 740,855, Oct. 6, 1903.

A solution of 3 parts of mercurous nitrate in 100 parts of water is added, with agitation, to a solution of 5 parts of peptone, albumose, albumin, gelatin, &c., in 100 parts of water, to which a solution of 1 part of sodium chloride in 5 parts of water has previously been added. Any precipitate formed may be dissolved by addition of alkali. On acidifying the resulting solution, a precipitate of colloidal mercurous chloride is obtained, which may be purified by evaporating its aqueous solution (which must be slightly alkaline), or by precipitation with alcohol. Colloidal mercurous chloride is thus obtained as a white, or slightly grey powder, soluble in water or alcohol; its aqueous solution is neutral and opalescent, and is precipitated by the addition of acid.—T. F. B.

Alkyloxyalkylidene Esters of Salicylic Acid. J. Callsen, Elberfeld, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 740,628, Oct. 6, 1903.

Alkyloxyalkylidene esters of salicylic acid, having the general formula $C_6H_4(OH)CO.OCH(R')OR$, where R, R′ represent alkyl radicles, are obtained by the action of monohalogendialkyl ethers on salicylates. These esters are colourless to yellowish liquids, soluble in the usual organic solvents, the alcoholic solutions being coloured violet by ferric chloride solution, and they exhibit valuable therapeutic (anti-rheumatic) properties. Ethoxyethylidene salicylate, $C_6H_4(OH)CO.OCH(CH_3)OC_2H_5$, obtained by the action of *a*-monochlorodiethyl ether on sodium salicylate, is a yellowish oil, which, on treatment with water, dilute acid, or alkali, decomposes into salicylic acid, acetaldehyde, and ethyl alcohol.—T. F. B.

Trichloro-isopropyl Alcohol; Process of Making ——. F. Hofmann and O. Bonhoeffer, Elberfeld, Assignors to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 742,430, Oct. 27, 1903.

The compound obtained by the action on chloral of the addition compound formed from magnesium, a methyl halide, and an ether, is decomposed, and the trichloro-isopropyl alcohol ($CCl_3.CH(OH)CH_3$) isolated.—T. F. B.

Cotarnine Phthalate, and Process of Making same. H. Vieth, Assignor to Knoll and Co., Ludwigshafen-on-the-Rhine. U.S. Pat. 742,532, Oct. 27, 1903.

Cotarnine phthalates are prepared by the combination of otarnine and phthalic acid; the neutral phthalate forms a a yellow, microcrystalline powder, of melting point 02°—105° C. (irregular), and decomposes rapidly, "when being recrystallised," into the acid salt and cotarnine.
—T. F B.

Trimethyl-cyclohexenoncarboxylic Acid Ester, and Process of Making same. G. Merling, Frankfort, and R. Welde, Höchst, Assignors to Farbwerke vorm Meister, Lucius und Brüning, Höchst-on-Main. U.S. Pat. 743,305, Nov. 3, 1903.

On condensing isopropylidene-ethylaceto-acetic ester with thyl aceto-acetic ester, trimethylcyclohexenone carboxylic cid ethyl ester is obtained as a colourless oil, of feeble romatic odour, boiling point 146°—148° C. (16 mm. ressure), miscible with ether, alcohol, and benzene, but not with water.—T. F. B.

Chlorides of Carbon; Process of Producing ——. F. J. Machalske, Assignor to C. H. Lyon. U.S. Pat. 742,340, Oct. 27, 1903. XI. A., page 1298.

Metallurgical Process [Zinc, Calcium Carbide, and Carbon Bisulphide]. O. W. Brown and W. F. Oesterle. U.S. Pat. 742,830, Nov. 3, 1903. X., page 1297.

French Patents.

Bismuth Oxide; Preparation of Colloidal ——. Kalle et Cie. Fr. Pat. 332,980, June 11, 1903.

A solution of bismuth nitrate (*e.g.*, in glycerin) is added o a solution of sodium "lysalbinate" or "protalbinate" Ger. Pats. 129,031 and 133,587) in water. The precipitate dissolved by the addition of a small quantity of an alkali olution, and the liquid dialysed, and finally concentrated *vacuo*. The same result is obtained by using "bisuthose" (this Journal, 1902, 1241) instead of the other buminous compounds, and treating the resulting solution, hile hot, with dilute alkali solutions, and dialysing. The roducts are yellowish powders, easily soluble in water, nd consist of colloidal bismuth oxide.—T. F. B.

ulphur [and Carbon Bisulphide]; Process and Apparatus for the Extraction of ——, *by Continuous Working.* E. L. Lalbin. Fr. Pat. 333,094, June 12, 1903. VII., page 1292.

ssential Oils from Flowers; Extraction of ——, *for the Manufacture of Perfumes.* A. de Taubé. Fr. Pat. 332,968, June 11, 1903.

lowers are packed in a closed upright cylindrical vessel, here the perfume is extracted by means of a current of some mpressed inert gas (*e.g.*, carbon dioxide), which enters at e bottom of the cylinder, and leaves at the top, passing ence into alcohol through a tube, the end of which is closed by some porous substance, so that the gaseous current enters in extremely attenuated streamlets.—T. F. B.

Flowers; New Process for the Extraction of Perfumes of ——. J. P. Serve. Fr. Pat. 333,251, June 20, 1903.

The flowers are charged into a vessel provided with a tubulure at the bottom and another at the top. The top of the vessel communicates with the bottom of another vessel of similar construction, and so on throughout a series. The first vessel being filled with flowers, all the other vessels of the series are filled with a suitable volatile solvent of the perfume, *e.g.*, light petroleum, carbon bisulphide, carbon tetrachloride or acetone, in which a solid wax or fat may be dissolved, if desired. A current of air is then passed through the series, entering below the flowers and carrying their perfume through the solvent liquid contained in the other vessels. When the solvent has become sufficiently charged with perfume, it is distilled off and the essential oil recovered.—J. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Electro-Deposition in Photography. J. Rieder. Zeits. f. Elektrochem., 1903, **9**, [47], 911—913.

The possibility of a new direction in colour-photography is pointed out, by the application of coloured electrolytic deposits, which can be obtained in various ways (*e.g.*, Nobili's rings). The colour of these deposits is strictly dependent upon the condition of the electrode surface. Hence, if a negative were projected upon a plate of selenium which was simultaneously made to receive a deposit, a polychromatic print would result. The author employs a more practicable material than selenium. A silver daguerrotype plate is dipped in a solution of iodine in light petroleum spirit; when the early reddish, or the later yellow tint appears, the plate is washed in clean solvent and dried. A print from a negative is now made upon it; a yellow plate is insolated until the image just appears, and a reddish one is printed out to full blue. The plate is enclosed in a box over mercury heated to 50° C., development being arrested when a sharp, positive picture appears. After fixing and washing, the plate is made the anode in a solution of litharge in caustic potash, against a large-sized cathode, and momentary currents are sent through until the coloured deposits are satisfactory. This gives a polychromatic picture; but, of course, the colours stand in no relation to those of nature. It was found that the brilliancy of the colours is enhanced by coating the developed daguerrotype, before deposition, with platinum or gold.
—W. A. C.

English Patent.

Photo-Mechanical Printing Surfaces; Preparation of ——. M. Barricelli and C. Levi, Rome. Eng. Pat. 19,434, Sept. 9, 1903.

A photographic negative, obtained and fixed in the usual manner, but dried in the dark, is immersed in a solution of potassium or ammonium bichromate and alcohol, and again dried in the dark. It is now exposed to light, film downwards, on some reflecting surface, *e.g.*, a silvered plate, and soaked in water, thus forming a positive relief picture or "photoarchetype," which may be inked and used direct for printing purposes.—T. F. B.

French Patents.

Photographic Plates; Process of Sensitising ——. G. Sele. Fr. Pat. 332,875, June 8, 1903.

See Eng. Pat. 12,513 of 1903; this Journal, 1903, 1015.
—T. F. B.

Photographic Films with Collodion Basis; Process of Treating ——, *to allow their Separation from the Membranes which they support.* Soc. Anon. Plaques et Papiers Photograohiques A. Lumière et ses Fils. Fr. Pat. 333,266, June 22, 1903.

The invention relates to a method of removing the film of a negative with a collodion support. It is found that the ordinary solvents of nitrocellulose, when diluted with water to a certain point, have no further solvent action, but cause the nitrocellulose to swell and become soft; for instance, if a "film negative" be immersed in a mixture of alcohol (50 parts), ether (50 parts), and water (15 parts), the film can, after a short time, be very easily and safely peeled from the support. Fatty alcohols and ethers and acetone are suitable for this process, provided the solvent is miscible with water.—T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Erratum.

This Journal, 1903, 1102, col. 2, line 23 from top (title), *for* "Drawn up," *read* "Determining."

English Patents.

Explosives; Impts. in ——. T. R. Curtis, A. C. Pearcy, D. J. Metcalfe, and C. L. W. Smith, London, and A. F. Hargreaves, Roslin. Eng. Pat. 24,934, Nov. 13, 1902.

The invention refers to a non-detonating safety explosive of the gunpowder class, for use in dangerous mines. The ingredients are so proportioned that the carbon is converted mainly into the monoxide, thus reducing the temperature of the explosion. The potential, however, remains much the same, since the loss of expansion by heat is largely compensated for by the increased volume of gas obtained. It has been found that the presence of carbon monoxide is not a factor of danger, as previously supposed, provided it is produced in conjunction with non-inflammable gases, such as carbon dioxide, nitrogen, ammonia, or water vapour, which protect it from contact with the air immediately after the explosion. For this purpose copper sulphate and ammonium sulphate are added to the explosive, either mechanically mixed or as the double salt. The explosive is prepared in two parts, and consists of: *a*. Potassium nitrate (75 parts), charcoal (22·5 parts), and sulphur (2·5 parts). *b*. Ammonium sulphate ($33\frac{1}{3}$ parts), copper sulphate ($66\frac{2}{3}$ parts). Each of the foregoing mixtures is separately ground, and made into grains of any suitable size. A blasting pellet is then made by mixing *a* (85 parts) and *b* (15 parts), and pressing the same into a compact form.—G. W. McD.

Explosives; Manufacture of ——. C. E. Bichel, Hamburg. Eng. Pat. 28,245, Dec. 22, 1902.

See Fr. Pat. 327,868 of 1902; this Journal, 1903, 963.
—T. F. B.

French Patents.

Explosives; Impts. in ——. A. Brock. Fr. Pat. 332,659, May 30, 1903.

The explosives which are suitable for blasting, signalling, and other purposes, consist of variable proportions (*e.g.*, 1—5) of aluminium powder mixed with lead oxide or nitrate, barium nitrate or chlorate, or potassium nitrate or chlorate. For blasting purposes, a portion of the aluminium may be replaced by zinc or tin, which may be used in the form of an alloy with aluminium. A small proportion of carbon may also be added to assist combustion. (See also Eng. Pat. 2977 of 1903; this Journal, 1903, 760.)—T. F. B.

Explosive; New ——. A. Vergé. Fr. Pat. 332,882, June 8, 1903.

The explosive consists of potassium chlorate (100 parts), potassium chromate (10 parts), sugar (45 parts), and beeswax (9 parts). The three first ingredients are separately finely ground and sifted to the same size, and are then mixed together and thoroughly incorporated with the beeswax, cut into small pieces.—G. W. McD.

Safety Explosive. A. Choisy. Fr. Pat. 332,805, June 5, 1903.

Claim is made for the use of nitrate of urea, either alone, or, preferably, with other substances, as a safety explosive. A very low heat of decomposition is thus obtained—a point of particular importance in explosives of this class. An example of such a composition is given as nitrate of urea (75 parts), ammonium nitrate (25 parts).—G. W. McD.

Safety Dynamite; Manufacture of ——. Westfälisch-Anhaltische Sprengstoff-Akt-Ges. Second Addition, dated June 18, 1903, to Fr. Pat. 316,569, Dec. 5, 1901.

The addition of metallic halides (preferably sodium or potassium chloride) to the explosive originally claimed, is said to increase its safety when used in fiery mines. (See Eng. Pats. 26,617 of 1901 and 3384 of 1902; this Journal, 1902, 1471, and 1903, 229.)—G. W. McD.

Smokeless Powder and its Manufacture. Internat. Smokeless Powder and Chemical Co. Fr. Pat. 333,259, June 22, 1903.

See Eng. Pat. 13,457 of 1903; this Journal, 1903, 963.
—T. F. B.

[*Wax*] *Compositions for Candles, Wax Matches, Wax Flowers, &c.* A. Berger. Fr. Pat. 333,204, June 23, 1903. XII., page 1300.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

English Patents.

Photometers; Impts. in ——. E. A. Carolan, London. From the General Electric Co., Schenectady, U.S.A. Eng. Pat. 26,035, Nov. 26, 1902.

The apparatus for measuring radiation consists in principle of a series of reflecting devices, so placed that each reflects radiations from the source of average intensity which would exist on one of a series of zones of equal area on the surface of an imaginary sphere surrounding the source. For measuring light, a frame is constructed, supporting a number of mirrors in a circle around its source, the mirrors being secured at equal distances along the axis of symmetry and reflecting the light at right angles to the plane of the circle on to a photometric screen, the direct rays being withheld from the screen.—J. F. B.

Photometric Apparatus [*Flicker Photometer*]. J. F. Simmance and J. Abady, London. Eng. Pat. 4693, Feb. 28, 1903.

The principle upon which this photometer is based, is the following: if the rays coming from two different sources of light, even of different colours, be allowed to fall upon an observing screen in such fashion that they overlap or coincide, and if some arrangement be fitted before the screen to cut off completely first one and then the other light (the alterations being made with sufficient rapidity), when the lights are of unequal intensity, the eye receives a blurred image, but if the lights be equal, the two colours blend into a homogeneous tint. The essential feature of the apparatus consists of a support carrying the observing disc, in front of which is a rotating or oscillating plate provided with suitable perforations, the lights then being arranged at an equal acute horizontal angle with the plane of the screen, as in the table photometer. Another arrangement is to make the moving plate carry a "Ritchie" or a "Jolly" prism; the lights then throwing convergent beams lying in a plane parallel with that of the screen, said beams being bent at right angles towards the latter by internal or external reflection. In another form, two contiguous rectangular blocks of translucent paraffin wax, separated from one another by a sheet of tinfoil, stand on the moving plate; these are diffusely illuminated throughout their masses by the two lights, which stand as in the latter case. Other methods of arriving at a similar result are also mentioned. In use, the two lights are either brought to equality by moving one of them nearer or further away from the screen; or the second (gas) light is regarded as an intermediate standard, and is brought into unison with the light under test by adjusting its supply. In the latter case the illuminating power of this intermediate standard is finally ascertained in terms of a recognised standard by means of a bar photometer fitted as a part of the table.—F. H. L.

Vacuum Tube for the Production of Spectra. F. O. R. Goetze, Leipzig. Eng. Pat. 10,532, May 8, 1903.

The capillary tube *a* (Fig. 1) is made separate from the main tube, and connected with it by a flange *d*; the ends *b* and b^1 of the capillary are sharp, it being stated that this arrangement gives more distinct spectra. In a modification (Fig 2), the end b^1 of the capillary is fused on to *d*, thus leaving only one sharp end at *b*.—T. F. B.

Fig. 1.

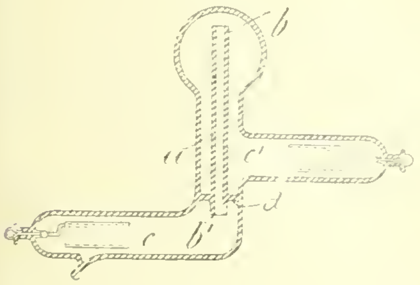
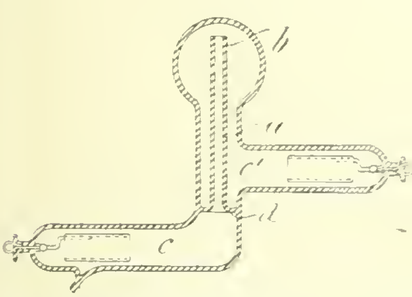


Fig. 2.



INORGANIC—QUALITATIVE.

Hydroxyl "Ions"; The Iodo-Tannin Reaction for the Detection of ——. W. Vaubel. Zeits. angew. Chem., 1903, **16**, [45], 1073.

On adding a crystal of iodine to aqueous solutions of tannic, gallic, or pyrogallic acids in presence of certain salts, a deep red colour is produced, which soon turns to dirty brown. The former is due to iodine as such, the latter to compound molecules containing iodine. The reaction only succeeds with alkaline bodies or such salts as separate hydroxyl, for the detection of which it is, perhaps, the most delicate known method. Several neutral salts giving the reaction are also enumerated, which are thus shown to undergo hydrolytic dissociation. Salts which react with iodine are excluded.—W. A. C.

INORGANIC—QUANTITATIVE.

Vapour Densities; Determination of ——, *at High Temperatures.* F. Emich. Monatsh. f. Chem., 1903, **24**, [9], 717—764.

The author adapted Bunsen's method of measuring vapour densities by the rate of efflux of a gas through a minute opening to the same at high temperatures, by using porcelain, platinum, and platinum-iridium tubes, pierced by a fine hole. The temperatures ranged to 1400° C., and a few experiments were even made at 1900°. For non-dissociable gases, the time of efflux squared, divided by the absolute temperature, equals a constant, was found to hold good.—L. F. G.

Sulphur in Coal and Coke; Determination of ——. R. Nowicki. Stahl u. Eisen. 1903, [23], 1141. Chem.-Zeit., 1903, **27**, [89], Rep., 281.

This process is a modification of Eschka's method. One grm. of finely powdered coal or coke is mixed with 2 grms. of a mixture consisting of sodium carbonate 1 part and magnesia 2 parts, placed in a platinum crucible; a vertical depression is made in the mixed mass, the lower portion of the crucible heated to dull redness, and oxygen passed through the crucible lid. The mass is stirred with a platinum wire every five minutes. The combustion is complete in from 20 to 30 minutes. The contents are then extracted with water, and the usual course followed.—C. A. B.

Sulphur, Determination of ——, *by means of Barium Peroxide.* H. Schillbach. Zeits. angew. Chem., 1903, **16**, [45], 1080.

To determine the sulphur in asphalt, bitumen, or other organic substance free from mineral admixture, the material is mixed with excess of barium peroxide and fired. The ash is freed from barium oxide and carbonate by means of hydrochloric acid, and the residual sulphate is weighed. The reaction between alkali and alkaline-earth peroxides and carbon can also be used for the reduction of metallic salts to metals. For example, with a finely-powdered mixture of barium peroxide, wood charcoal and cuprous chloride, reaction may be started by means of a match, and it then proceeds by itself in a similar manner to Goldschmidt's "thermite" process. Metallic copper is formed according to the equation :—$BaO_2 + C + 2CuCl = BaCl_2 + CO_2 + 2\ Cu$. If calcium carbide be used instead of charcoal, a larger proportion of metal is obtained, the reaction proceeding according to the equation:—$2BaO_2 + CaC_2 + 6CuCl = 2BaCl_2 + CaCl_2 + 2CO_2 + 6Cu$.—W. A. C.

Nitrogen; Determination of ——. Denigès. Bull. des Travaux de la Soc. de Pharm. Bordeaux; through Pharm. J., 1903, **71**, 613.

The substance is heated with sulphuric acid and potassium oxalate until the liquid is decolorised and reduced to a small volume; the residue is cooled, dissolved in water, and exactly neutralised with sodium hydroxide. The nitrogen is now present in the form of ammonium sulphate, and is determined either gasometrically by means of sodium hypobromite, using for comparison a solution of ammonium sulphate of known strength; or in the form of ammonia by boiling the liquid with excess of caustic soda, and titrating back with standard acid. The method is claimed to possess the advantage over Kjeldahl's process, that no distillation is required.—A. S.

Iodine; Separation of ——, *as Cuprous Iodide, from a Mixture of Alkali Chlorides, Bromides, and Iodides.* H. Baubigny and P. Rivals. Comptes rend., 1903, **137**, [19], 753—756.

The solution is precipitated by excess of copper sulphate, and a solution of potassium arsenite (containing about three times as much potassium arsenite as there is potassium iodide present) is added, followed by a small quantity of ferrous sulphate. The whole of the iodine present is thus transformed into cuprous iodide. After standing 10—12 hours, the liquid is filtered, and the chlorine and bromine are determined in the filtrate by any of the usual methods. The cuprous iodide is dissolved in ammonia, converted, by means of air or of hydrogen peroxide, into cupric salt; excess of silver nitrate is added, then excess of nitric acid; the liquid is boiled, filtered, and the silver iodide weighed. To avoid any loss of iodine, the arsenite may be added to the original solution before addition of copper sulphate. In presence of relatively large amounts of alkali chloride and bromide, the iodine results may be low, from the solubility of cuprous iodide in solutions of those salts.—J. T. D.

Chromium from Iron and Aluminium; Separation of ——. G. von Knorre. Zeits. angew. Chem., 1903, **16**, 1097—1107.

A method for the separation of chromium from iron and aluminium can be based upon the fact that chromium salts in a solution containing not too large an amount of free sulphuric acid, can be oxidised to chromic acid by boiling for some time with excess of persulphate. It is best to use ammonium persulphate for the oxidation, but the commercial salt must first be purified in the following manner:—Ammonium persulphate freed from chlorine compounds by recrystallisation is dissolved in water containing some ferric ammonium sulphate, ammonia (or ammonium carbonate) is added till the whole of the iron is precipitated, and the solution is filtered. The method of separation is carried out as follows :—The solution containing the metals as sulphates, is treated in the cold with an amount of the ammonium persulphate solution prepared as described above, equal to 2—3 times that required for the oxidation of the chromium. Sufficient dilute sulphuric acid to prevent the separation of basic ferric sulphate is then added, the solution diluted to 300 c.c., and vigorously boiled for 6—10 minutes. After cooling to about 50° C., a further quantity of ammonium persulphate (about one-half of that added at first), and 20 c.c. of dilute sulphuric acid (sp. gr. 1·16—1·18) are added, the solution is diluted to 300 c.c., and boiled again for 15—20 minutes. The solution is then again cooled, excess of ammonia added, and the precipitated iron and aluminium hydroxides filtered off, and washed with water. The precipitate is dissolved in dilute sulphuric acid, ammonium persulphate added in amount equal to one-half that added at first, the solution boiled for 10—15 minutes, cooled, and the aluminium and iron again precipitated by ammonia. In the united filtrates, the chromium is determined by acidifying, reducing the chromic acid to a chromium salt by sodium bisulphite, expelling the excess of sulphur dioxide by heating, and precipitating the chromium by ammonia.

Volumetric Determination of Iron, Chromium and Manganese in Mixtures.—In one portion of the solution the iron is determined by reduction and titration with permanganate solution, whilst in another portion the chromium is oxidised by persulphate, the excess of persulphate completely destroyed by boiling, and the chromic acid determined by reducing it to a chromium salt with a known excess of a ferrous salt, and titrating the excess of the latter with permanganate solution. If manganese be present, this is precipitated as hydrated peroxide on boiling with persulphate. The precipitate is filtered off, washed, dissolved in excess of a standardised solution of ferrous sulphate, and the excess of the latter titrated with permanganate solution.

Separation of Iron and Chromium by means of Nitroso-β-naphthol (see this Journal, 1887, 384 ; 1888, 236).—As the result of further experience with this method, the author draws attention to the following points :—The precipitation of the iron must be effected in the cold, and the precipitate of ferric nitrosonaphthol must be filtered off after standing for from 8—16 hours in the cold. It is best to precipitate the iron in one portion of the solution by nitroso-β-naphthol, and in a second, the iron and chromium together by ammonia, and to take the amount of chromium by difference.—A. S.

Tin in Tailings and Slimes ; Determination of ——. G. L. Mackenzie. Inst. of Mining and Metall., Nov. 19, 1903.

From 1 to 5 grms. (according to the amount of tin present) of the finely-powdered ore are heated for about 20 minutes (longer if tungsten be present) with *aqua regia*, hot water is added, the mixture is filtered, and the residue is washed well with hot water. If tungsten or silver be present, the residue is then digested for 10 minutes with warm, dilute ammonia solution, and washed well on the filter with the same reagent. It is then dried, detached from the paper, and the latter burnt. The stannic oxide in the residue is now reduced to tin by heating to dull redness for 40 minutes in an atmosphere of coal gas. After cooling, the material is heated nearly to boiling for 20 minutes with strong hydrochloric acid and about 2 c.c. of a 10 per cent. solution of permanganate, a further drop or two of permanganate solution being added towards the end. The solution is filtered, partly neutralised with sodium bicarbonate, and the tin precipitated by sulphuretted hydrogen. After standing for some time, the stannic sulphide is filtered off, washed well with ammonium acetate solution containing a little free acetic acid, dried, and the paper containing the precipitate burnt ; the ash and precipitate are covered with a few drops of nitric acid, dried, and strongly ignited, and the stannic oxide is weighed.—A. S.

Arsenic in Malt, Beer, and Foodstuffs ; Detection and Approximate Determination of Minute Quantities of ——. W. Thomson. Memoirs Manchester Lit. and Philos. Soc., **47**, [6] ; Chem. News, 1903, **88**, 228—231.

In the report of the Joint Committee of the Society of Chemical Industry and the Society of Public Analysts (this Journal, 1902, 94), it is recommended that a piece of wire gauze be wrapped round the tube which receives the arsenic mirror, at the point at which it is heated. The author claims, however, that more distinct and reliable mirrors are obtained by heating the naked tube. Gautier's view (this Journal, 1902, 1472) that it is advantageous to cool the portion of the tube on which the mirror is deposited is confirmed, but the author considers the best results are obtained by allowing water to drop rapidly on to a piece of tissue paper, 3 or 4 inches long by $\frac{3}{4}$ inch wide, folded in the centre and hung over the tube.—A. S.

Iron and Phosphoric Acid in Waters ; Separation and Determination of ——. H. Causse. Comptes rend., 1903, **137**, [18], 708—710.

The iron and phosphoric acid present in natural waters are in combination with the organic matter, and cannot be precipitated in the ordinary way. In order to decompose the complex compounds and precipitate the iron and phosphoric acid, the author recommends the chloro-mercurate of *p*-aminobenzene sodium sulphonate, the active constituent of which is mercuric chloride ; this compound oxidises and precipitates the iron as sesquioxide and the phosphoric acid as mercuric phosphate ; as a result of the oxidation of the iron, mercurous chloride is also precipitated. Two or three litres of the water are treated with from 0·6 to 0·8 grm. per litre of the chloro-mercurate and stirred vigorously. The salt partially dissolves, but the liquid does not become clear until the precipitation of the iron and phosphoric acid is complete ; this requires a period of 24 to 36 hours or longer at rest. The supernatant water is then decanted off ; the precipitate is collected on a filter, washed and then transferred to a tube and treated with hydrochloric acid. If the water were pure, the solution in hydrochloric acid is clear, but if contaminated, a residue of mercurous chloride remains undissolved. The acid solution is evaporated, and the residue is dried and ignited with 1 grm. of dry sodium carbonate. The mass is then treated with nitric acid, dried and calcined to convert the iron into oxide, and then extracted with water, which dissolves the phosphoric acid, whilst the ferric oxide can be filtered off.—J. F. B.

Cast Iron ; Methods of Determining the Constituents of ——. Herbert E. Field. J. Amer. Foundrymen's Assoc., **11**, [2]. [P.O. Box 132, New York City.] April, 1903.

This is a compilation in precise detail of the methods now in use in iron laboratories in America. It was prepared by the author for the Metallurgical Section of the above Association.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radium ; Scintillation of Zinc Sulphide Screens produced by ——, *revivified by Electric Discharge.* T. Tommasina. Comptes rend., 1903, **137**, [19], 745—747.

Scintillating screens, left for some time in a dark place, one glued against glass and the other naked, shewed afterwards phosphorescence, but not scintillation. After being electrified a few times positively or negatively and discharged, and still more after several alternately positive and negative charges, they acquired the power of scintillation, the naked screen in a much higher degree than the other. The action appears to be entirely one of surface, and to have an electrostatic origin.—J. T. D.

Electrolysis of Water ; Contribution to the History of the ——. A. Neuburger. Ber., 1903, **36**, 3572—3574.

The credit of the discovery that the sole products of the electrolysis of pure water are hydrogen and oxygen is generally assigned to Sir H. Davy, whose work on the subject appeared in 1806, but the author claims priority for a Berlin chemist, P. L. Simon, who made the discovery in 1801, and whose work was published in Gilbert's Annalen, 1801, **8**, 41, 492; **9**, 316.—A. S.

Spectroscopic Method; Luminescence at Electrodes, and a New ——. Werner von Bolton. Zeits. Elektrochem., 1903, **9**, [47], 913—922.

When an arc is struck at 110 volts between a carbon as positive pole and dilute sulphuric acid surrounding a copper negative, the carbon glows in a multitude of minute scintillations, and is found, when taken out, to have a highly polished, non-blackening surface. If the carbon be made negative, a dazzling white light, yielding a continuous spectrum, results. On substituting a rod of copper for the carbon, as cathode, a fine blue luminescence arises, which gives essentially the spectrum of copper; the cathode becomes corroded, but does not fuse. This effect can be studied either by applying a platinum cathode to a solution of the metal, or by using a wire of the metal itself as cathode in dilute acid. The method and apparatus used by the author for examining the spectra of metals produced by this method are described. The spectra mostly resemble those obtained by sparking, but are richer in lines and free from admixture of air-spectra; on the other hand, they usually show H α and, when a platinum cathode is used, faint lines of this metal.—W. A. C.

Filamentous Carbon; A Variety of ——. Constant and H. Pélabon. Comptes rend., 1903, **137**, [18], 706—708.

In the manufacture of metallurgical coke by the carbonisation of coal in open furnaces, especially those of the older type, there are found in the mass of the coke, filiform deposits of carbon, which by interlacing of the fibres have the appearance of wool. In the form of furnace in which these deposits are specially found, the air admitted by holes in the door, maintains the combustion of the gases, and the flames are concentrated towards the opening in the roof. In the zone near this opening the maximum temperature exists, and it is here that the deposits of filamentous carbon are most prevalent. Each thread is attached to a fragment of coke, and the general direction of the threads lies in the course of the current of gases. The surface of the fragments bearing the threads appears to be saturated with tarry matters, from which the filamentous carbon is probably produced. The filaments vary from 5 to 8 cm. in length; some of the filaments are grey, and have the appearance of being coated with varnish; others are pure black. At various points are observed small black specks, which are composed of bundles of very fine filaments, apparently originating from some of the larger filaments.—J. F. B.

Manganous and Tungstic Acids; A Complex Double Salt of ——. A. Just. Ber., 1903, **36**, 3619—3622.

To a boiling solution of 100 grms. of sodium tungstate in 100 c.c. of water, 5 grms. of manganese sulphate dissolved in 10 c.c. of water were added, followed, with stirring, by 14 grms. of sodium persulphate. Boiling was continued for about ¼ hour, water being added to replace that lost by evaporation; the deep red solution was diluted with an equal volume of water, and filtered with the aid of the pump. On slowly cooling the filtrate, red crystals separated; these were filtered off, with the aid of the pump, and pressed well between filter paper. Analysis of the crystals indicated the composition, $3Na_2O.5WO_3.MnO_2.18H_2O$. The new salt is tolerably easily soluble in hot water, but the solution decomposes on long boiling, and also, though more slowly, in the cold, manganese peroxide being separated. The salt will not crystallise from water, but does from a solution of sodium tungstate, and this leads the author to consider it as a double salt of sodium-manganese tetratungstate and sodium tungstate, of the constitution $Mn^{IV}(WO_4Na)_4.Na_2WO_4$. The solution of the salt gives precipitates with solutions of metallic salts. Polytungstates and metatungstates, when treated, in the manner described, with manganese sulphate and persulphates, also give red solutions, from which crystallised salts can be obtained.—A. S.

Magnesium Amalgam; Employment of ——, in Organic Chemistry. L. Meunier. Comptes rend., 1903, **137**, [18], 714—716.

Diphenylmethane can be prepared by the interaction of 1 atom of magnesium, in the form of amalgam, 1 mol. of benzyl chloride, and 1 mol. of monobromobenzene. *Ethyl malonate* combines with magnesium in the form of amalgam, yielding a derivative, $(C_2H_5COO)_2 : CH.Mg.CH : (COOC_2H_5)_2$, from which water regenerates ethyl malonate. This magnesium derivative reacts with ethyl iodide, yielding the mono-ethyl derivative of ethyl malonate. Magnesium amalgam confines its action solely to the $-CH_2-$ group of ethyl malonate, and has no action on the ester function of the latter. The organo-magnesium haloid compounds are shown by the author to combine first with the $-CH_2-$ group of ethyl malonate, yielding organo-magnesium haloid derivatives of the latter. Secondarily, however, they react on the ester function, as has been shown by Valeur, producing the bi-tertiary glycol, or rather the dehydration product of the latter.—J. F. B.

Carbon Tetrachloride with Chlorobenzene; Condensation of ——, by the Friedel and Crafts Reaction. J. F. Norris and W. C. Twieg. Amer. Chem. J., 1903, **30**, [5], 392—399.

When carbon tetrachloride is condensed with chlorobenzene by the Friedel and Crafts reaction, only two of the chlorine atoms of the tetrachloride are replaced by benzene rings, with the production of a mixture of dichlorobenzophenone chlorides, whereas when the tetrachloride is condensed with benzene, three chlorine atoms are displaced and triphenylchloromethane is produced. The mixture of dichloroketone chlorides cannot be separated into its components, owing to their proximate boiling points; it is necessary first to convert the chlorides into the corresponding dichlorobenzophenones. This is effected by treating the mixed chlorides with concentrated sulphuric acid, in which they are slowly soluble, with elimination of hydrochloric acid, and pouring the solution into water. The dichloroketones are then extracted with light petroleum spirit, which dissolves everything except the di-*p*- (4.4′) dichlorobenzophenone. From an alcoholic solution of the portion soluble in petroleum, crystals of the *o*-*p*- (2.4′) dichlorobenzophenone are separated, leaving an oily residue which is probably a third isomer (2.2′) of dichlorobenzophenone. The *o*-*p*-dichloroketone may also be isolated by distillation under reduced pressure after the removal of the di-para compound.—J. F. B.

Fluorescence of Naphthalic Anhydride and some of its Derivatives. L. Francesconi and G. Bargellini. Gaz. chim. ital., **33**, [2], 129—133; Chem. Centr., 1903, **2**, [21], 1181.

The authors have previously (this Journal, 1902, 1327) expressed themselves in favour of Meyer's theory of fluorescence, and they still maintain that the fact that naphthalic anhydride fluoresces, whilst phthalic anhydride does not, is not satisfactorily explained by Hewitt's theory (this Journal, 1902, 127). They consider, however, that Meyer's theory requires extending, since fluorescence appears to be dependent not only upon the presence of a special fluorophoric group, but also upon the nature and position of substituting groups. They have previously shown (*loc. cit.*) that the electro-negative groups, OH, Cl, Br, I, NO_2, cause a diminution of fluorescence, and it is probable that electro-positive groups act in the reverse manner, as most amino derivatives show a much more intense fluorescence than the corresponding hydroxy derivatives.—A. S.

Terpenes and Compounds containing the C_3H_5 Group; Reactions of Mercuric Acetate towards ——. L. Balbiano and V. Paolini. Ber., 1903, **36**, [14], 3575—3584. (See also this Journal, 1902, 1293.)

In continuation of their previous work, the authors have proved that the body $C_{10}H_{16}O_2$, produced by the action of mercuric acetate on lævo-pinene, is a hydroxy-derivative of Δ^6-menthene-2-one. *Dextro-pinene* under similar conditions gives the same oxidation product.

Camphene.—On treating 1 mol. of camphene, dissolved in light petroleum spirit, with a saturated aqueous solution of 2 mols. of mercuric acetate for 30 days, the crystalline body $C_{10}H_{16}O(HgC_2H_3O_2)_2$, melting at 188°—189° C., is obtained. From this, a chlorine compound, $C_{10}H_{16}O(HgCl)_2$, can be produced by the action of sodium chloride, which softens at 150° C., but does not melt below 250° C. The acetate, when suspended in dilute hydrochloric acid, is slowly decomposed by sulphuretted hydrogen, camphene being again produced. The chloride, on energetic reduction, likewise yields camphene. As stated in their previous paper, bodies containing the propenyl, $CH_3.CH:CH$, group are oxidised by mercuric acetate, whilst those containing the allyl, $CH_2:CH.CH_2$, grouping form an additive compound with mercuric acetate. This behaviour can be utilised as a test, as follows. 5 c.c. of a saturated solution of mercuric acetate are shaken with a few drops of the substance dissolved in a little benzene. With bodies containing the propenyl group, the characteristic leaflets of mercurous acetate appear in 15—45 minutes. With those containing the allyl group, the liquids separate clearly from each other even after a few days. The additive bodies have the general structure $R.C_3H_5<^{HgC_2H_3O_2}_{OH}$ and a mixture of two isomers is usually formed. By treatment with alkali chlorides, in equivalent amounts, they are converted into the corresponding chlorides. On replacing the mercury radicle with hydrogen by reduction, water is split off, and the original compound reproduced.—F. S.

ERRATUM.

This Journal, 1903, 1021, col. 1, line 18 from bottom, *for* "Allen" *read* "Allan."

New Books.

UEBER DIE BASISCHEN EIGENSCHAFTEN DES SAUERSTOFFS UND KOHLENSTOFFS. Von Dr. JULIUS SCHMIDT. Verlag von Gebrüder Borntraeger. 11, Dessauerstrasse 29, Berlin, S.W. Price M. 3.20.

8vo volume containing 111 pages of subject-matter; with a table of contents. The subjects treated of under the above title are as follows:—THE BASIC PROPERTIES OF OXYGEN. I. Introduction. II. Salts of Pyrone and Dimethylpyrone. III. Founding the Oxonium Theory of Collie and Tickle, by A. v. Baeyer and Villiger. IV. Azoxonium- and Azthionium Salts. V. Carboxonium- and Carbothionium Salts. VI. Physico-chemical Studies on Polyvalent Oxygen. ON THE BASIC PROPERTIES OF CARBON.

FORTSCHRITTE DER THEERFARBENFABRIKATION UND VERWANDTER INDUSTRIEZWEIGE. An der Hand der systematisch geordneten und mit kritischen Anmerkungen versehenen Deutschen Reichs-Patente. Dargestellt von Dr. P. FRIEDLAENDER, Vorstand der chemischen Abtheilung des k. k. technologischen Gewerbemuseums in Wien. Sechster Theil. 1900–1902. Julius Springer's Verlag, Berlin. 1904. Price M. 50.

LARGE 8vo volume containing 1324 pages of subject-matter; 19½ pages of index to German patent numbers in Vols. I. to VI.; 1 page of numbers, with index to American patents; ¾ page of numbers, with index to English patents; a little over 1 page of numbers, with index to French patents. Then follows an index of patent applications, including those refused and withdrawn, filling 3¼ pages. After these come the alphabetical indexes of names of patentees and subjects of patents, filling 26 pages. The body of the work is composed as follows:—Commencing with a brief preface, a table of contents follows, after which comes a brief history of the advance made in the production of intermediate products for the coal-tar dyestuff industry, filling about 14 pages. The remainder, forming the bulk of the work, is devoted to full reports of the patents, practically copies of their specifications. The branches represented by these specifications under the general subjects are the following:—I. Intermediate Products of the Coal-tar Dyestuff Manufacture. II. Triphenylmethane Dyestuffs. III. Anthracene Colours. IV. Acridine and Quinone-imido Dyestuffs. V. Indigo. VI. Dyeing and Printing Processes. VII. Sulphur Dyestuffs. VIII. Azo Dyestuffs. IX. Dyestuffs and Compounds of Different Composition; Dyeing and Printing Methods. X. Pharmaceutical Products.

Trade Report.

I.—GENERAL.

FRANCE; TRADE OF ——, WITH THE UNITED KINGDOM.

Foreign Office Annual Series, No. 3101, *Oct.* 1903.

Return showing Value of certain Articles of Import from the United Kingdom during the Years 1901–2.

Articles.	1901.	1902.
	£	£
Coal	6,781,000	5,234,000
Chemicals and chemical manures	657,000	803,000
Copper	367,000	237,000
Iron, cast iron and steel	407,000	274,000
Skins, dressed	617,000	697,000
India-rubber goods	406,000	385,000
Pottery, glass and crystal wares	214,000	196,000
Rubber	317,000	479,000
Coal-tar	246,000	343,000
Raw hides and peltries	287,000	358,000
Leather goods and dressed peltries	103,000	104,000
Paper, books and prints	267,000	286,000
Total of all articles	24,087,000	22,672,000

Return showing Value of certain Exports from France to the United Kingdom during the Years 1901–2.

Articles.	1901.	1902.
	£	£
Sugar, raw	3,089,000	1,005,000
Dressed skins	1,699,000	1,862,000
Leather goods and dressed peltries	1,121,000	1,324,000
Copper and copper ore	730,000	555,000
Brandy, spirits and liqueurs	894,000	990,000
Raw hides and peltries	1,175,000	1,070,000
Sugar, refined	976,000	526,000
Pottery, glass and crystal wares	861,000	821,000
Chemicals	698,000	583,000
Paper, books and prints	343,000	318,000
Oils, essential	170,000	179,000
„ other	224,000	196,000
Caoutchouc and gutta-percha	225,000	325,000
„ manufactures of	76,000	111,000
Margarine	95,000	131,000
Perfumery	141,000	142,000
Total of all articles	48,029,000	51,204,000

BELGIUM; TRADE OF ——, IN 1902.

Foreign Office Annual Series, No. 3104.

United Kingdom.—Though the imports from the United Kingdom in 1902 had an increase in value of 584,600*l.*, the quantity showed a decrease of 72,211 tons. The totals were 1,241,424 tons, with a value of 11,356,800*l.*, a decrease of 5·5 per cent. and an increase of 5·4 per cent. respectively. Among the chief contributors to this increase in value were resinous and bituminous substances, 300,000*l.*; raw cotton, jute and silk, 280,000*l.*; dyes, paints and chemicals, 100,000*l.* Coal, on the other hand, showed a marked decrease (100,000*l.*), probably owing to the competition of German coal at very low prices. Machinery decreased by 50,000*l.*, and flax and other yarns, cast iron, indigo and vegetable substances by from 30,000*l.* to 40,000*l.* in each case. The exports to the United Kingdom likewise showed a decrease in quantity with an increase in value, the totals being 1,246,878 tons, or a reduction of 4·1 per cent., with a value of 14,356,040*l.*, or a rise of 4·9 per cent. The exports of raw flax increased in value by 280,000*l.*; wool and flax yarns by 520,000*l.*; glass by 140,000*l.*; metals (steel in all states and wrought iron) by 320,000*l.*; and hops by 50,000*l*. On the other hand the sugar trade, owing to the smaller acreage under cultivation, the bad crops and the import duty levied in the United Kingdom, showed a diminution of nearly 800,000*l*. and that in raw hides fell by 130,000*l*.

Canada.—The rise in the imports from Canada of vegetables and wood-pulp—that in the latter being very remarkable—was more than counterbalanced by the heavy fall in the importation of corn. The export returns are also unfavourable, owing to the immense falling-off, to the extent of over 200,000*l*., in raw sugar. Some slight compensation for this loss is to be found in the improvement of the glass export trade by 60 per cent. The new market found in Canada for machinery, papers and chemicals was also steadily enlarged.

India.—The imports from India increased in value by 20 per cent., owing to the large trade in raw cotton, dyes and oil seeds. In the cement industry, the export trade did not show much sign of improvement as regards value, but in the matter of volume it continued to grow, and showed an increase of 10 per cent. as compared with that of 1901. In this development the enormous demand from the United States, amounting to 116,661 tons as compared with 67,633 tons in 1901, and increased demands from Cape Colony and Canada, played the chief part. The exportations of both raw and refined sugar sank very considerably, more especially those of the former, which were in quantity only half those of 1901 and a third of those of 1900, the year of their zenith. As compared with 1901, the value of the raw sugar exported to the United Kingdom fell by 560,000*l*., and of that sent to Canada by 200,000*l*. The chief causes of this were: (1) The reduction of the acreage under cultivation; (2) the poorness of the yield, which was 17 per cent. inferior to that of 1901; (3) the early sharp frosts, which affected the quality of the beetroot crops. In the exportation of chemical products a reduction of 6 per cent. in amount took place, the most important factor being carbonates of soda, the trade in which went down about 45 per cent. The glass exports were well maintained, and surpassing in value those of 1901 by 440,000*l*., regained the high position they held in 1899. This increase was chiefly due to large orders from China, Japan, Canada, the United States and Turkey.

BELGIAN IMPORTS FROM BRITISH COLONIES FOR 1901–02.

Foreign Office Annual Series, No. 3104, *Nov.* 1903.

Articles (Quantities).	Australia.		Canada.		Cape Colony.		India.		Straits Settlements.	
	1901.	1902.	1901.	1902.	1901.	1902.	1901.	1902.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Chemicals	..	..	344	401	..	..	..	..	..	..
Cocoa	..	..	..	..	..	..	10	12	..	..
Copper and nickel	1,115	1,330	..	..	..	..	..	..	..	..
Drugs	7	33	..	..	..	..	557	482	1	22
Dyestuffs	300	54	..	..	..	..	3,742	8,297	572	471
Lard and tallow	127	..	511	31	..	..	..	..	..	..
Lead	7,842	8,760	..	..	..	..	..	..	..	150
Manure	..	..	..	..	2,030	5,330	..	1,201	..	..
Minerals	48,788	30,229	5,907	476	..	..	44,558	23,865	..	..
Oil, seeds	442	140	2,924	1,269	..	..	124,797	153,834	..	..
Oil, cake	543	217	5,815	3,257	..	..	1,594	1,936	..	..
Oils, vegetable	233	31	237	..	..	..	265	128	..	..
Rubber	..	..	..	..	..	..	24	..	25	54
Skins:—										
Unprepared	3,184	5,062	..	..	30	..	344	559	31	6
Prepared	52	168	..	..		..				
Starch	..	..	..	..	..	..	..	..	147	..
Wood pulp	..	..	688	16,840	..	..	..	..	..	..

BELGIAN EXPORTS TO BRITISH COLONIES FOR 1901–2.

Foreign Office Annual Series, No. 3104, *Nov.* 1903.

Articles (Quantities).	Australia.		Canada.		Cape Colony.		India.		Straits Settlements.	
	1901.	1902.	1901.	1902.	1901.	1902.	1901.	1902.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Candles	788	349	..	..	342	194	424	364	104	65
Cement	3,904	3,383	16,516	24,173	6,791	9,862	7,574	6,085	1,603	1,913
Chemicals	613	2,560	524	876	1,676	130	1,307	495	..	..
Coal	8,800	14,600	1,200	2,750	..	..	10,785	11,915	..	..
Copper and nickel	123	154	..	..	..	..	26	41	..	..
Drugs	599	650	56	76	623	648	19	21	100	54
Dyestuffs	328	492	1,051	513	..	..	2,376	2,587	96	115
Glass:—										
Window	4,198	4,714	6,680	9,155	1,050	1,648	4,192	4,495	702	428
Unclassified	1,727	1,956	546	747			2,818	2,436	651	428
Iron and steel	8,810	10,843	344	3,160	6,867	8,385	93,024	65,683	1,909	5,697
Lard and tallow	..	..	20	56	..	..	..	..	..	..
Manure	5,757	1,003	..	..	500	247	..	..	..	..
Minerals	131	330	1,707	898	..	..	1,083	4,203	..	4
Paper	1,983	1,141	183	391	37	74	1,483	1,525	68	129
Pottery and earthenware	22	9	2	3	127	209	542	444	550	279
Resins	..	..	..	..	34	186	42	23	..	..
Skins:—										
Unprepared	7	3	251	470	..	..	..	..	..	..
Prepared			5	49	..	..	..	..	..	..
Starch	213	89	..	94	137	160	..	..	..	..
Sugar	46	6	26,545	1,670	..	..	244	4,137	15	42
Sulphur	..	..	9	9	37	108	..	..	..	..
Zinc	1,468	1,598	809	439	108	536	493	517	141	481

BELGIAN IMPORTS FROM AND EXPORTS TO UNITED KINGDOM DURING 1901–02.

Foreign Office Annual Series, *No.* 3104, *Nov.* 1903.

Articles.	Imports.		Exports.	
	1901.	1902.	1901.	1902.
	Tons.	Tons.	Tons.	Tons.
Candles	381	326	83	108
Chemicals	33,813	38,159	64,386	57,692
Coal	756,041	626,361	13,802	60,199
Cocoa	570	729	..	..
Coke	5,956	72	..	..
Copper and nickel	2,737	2,857	243	165
Drugs	1,765	1,500	3,106	2,750
Dyestuffs (except indigo)	10,685	13,547	8,484	7,892
Glass	..	..	75,927	92,187
Gunpowder	..	..	97	132
Indigo	85	24	..	..
Iron and steel	61,516	56,316	87,754	138,678
Lard and tallow	5,544	5,019	3,145	2,723
Lead	1,618	1,988	2,472	4,135
Manure	929	164	5,361	10,825
Margarine	..	..	244	485
Minerals	105,700	127,241	390,365	387,675
Oak bark	..	..	3,944	4,667
Oil seeds	6,899	5,111	..	..
Oil cake	6,890	7,867	..	..
Oils, vegetable	11,757	13,461	13,450	11,455
Paper	1,109	1,461	15,019	15,161
Pottery and earthenware	498	581	102	147
Rags	7,185	6,270	10,242	11,388
Resins and bitumen	111,367	141,699	4,591	4,809
Rubber	291	448	649	863
Salt	22,411	26,552	..	..
Skins, tanned	764	722	627	516
„ unprepared	5,089	4,608	9,767	5,902
Soaps	2,202	2,482	38	44
Starch	..	..	7,064	7,587
Sugar, refined	982	810	23,821	8,789
„ unrefined			97,352	32,441
Syrups and molasses	325	206	..	.
Tin	218	222	11	14
Wood pulp	..	..	247	46
Yeast	32	6	..	..
Zinc	1,045	32	45,661	42,294

CANADA; CHEMICAL IMPORTS INTO ——, FROM THE UNITED STATES.

U.S. Cons. Reps., *No.* 1793, *Nov.* 5, 1903.

The chemical imports from the United States for the fiscal year ended June 30, 1902, were as follows, the details of the imports for the fiscal year 1903 (the total of which was 137,605,199 dols., or 7,811,052 dols. greater than for 1902) not yet being available:—

	Dols.
Asphaltum and asphalt	91,416
Baking powder	89,107
Bricks, tiles, and clays	498,298
Candles	80,702
Cement	588,510
Coal and coke	13,956,942
Dressing (leather)	54,000
Drugs, dyes, chemicals, &c.	3,041,991
Earthenware and chinaware	241,135
Fertilizers and manures	189,641
Glass	523,820
Glue, &c.	92,389
Grease	361,735
Gutta-percha and india-rubber	2,153,423
Gunpowder, explosives, &c.	307,901
Hops	89,196
Hides and skins, &c.	2,174,764
Ink, writing and printing	118,636
Leather and manufactures	1,456,382
Metals:—	
Brass	944,052
Copper	1,394,542
Gold and silver	242,700
Iron and steel	25,167,427
Tin	593,324
Zinc	56,788
Lead	77,738
Other metals	1,865,752
Oils	1,123,950
Oilcloth	81,514
Paints and colours	560,481
Paper	1,473,666
Rennet	47,482
Resin	147,603
Soap	228,350
Spirits and wines	83,750
Starch	38,176
Sugars	573,125
Molasses	162,039
Sugar candy, &c.	179,239
Turpentine, spirits of	211,767
Varnishes, &c.	102,547
Total of all imports	129 794,147

"FILTER MASS": U.S. CUSTOMS DECISION.

Oct. 22nd, 1903.

Certain filter mass in sheets, invoiced as "blatt filtermasse," was decided to be dutiable at 25 per cent. *ad valorem* as "paper not specially provided for," under paragraph 402 of the Tariff Act. Duty had been assessed under paragraph 397 as "filter paper in sheets," at 5 cents per lb. and 15 per cent. *ad valorem*, while the importer claimed it to be dutiable as "filter mass" at $1\frac{1}{2}$ cents per lb. and 15 per cent. *ad valorem* under paragraph 395. The evidence showed that it was not filter paper, as it dissolved readily, but since it was not in the usual form of "filter mass" the claim was not allowed, and the duty decided as above stated.

—R. W. M.

II.—FUEL, GAS, AND LIGHT.

COAL DISCOVERY IN LUXEMBURG.

Eng. and Mining J., *Nov.* 14, 1903.

A soft coal basin in the province of Luxemburg, north of the city of Liége, was discovered some time ago, and extensive soundings have been made. The deposit underlies many square miles of the northern part of Belgium and the southern part of Holland. One of the veins, at a depth of from 1,000 ft. to 1,500 ft. below the surface, is from 15 ft. to 17 ft. thick, and of a very fine quality of coal. It is estimated that this new field contains more than 500,000,000 tons of good coal.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PETROLEUM IN ROUMANIA.

U.S. Cons. Reps., *No.* 1799, *Nov.* 12, 1903.

The exportation of petroleum during the first six months of 1903 was 15,904,615 galls., against 11,189,394 galls. for the same period in 1902. Of this amount England took 4,156,483 galls., Germany 3,746,363 galls., Austria 3,011,515 galls., France 1,912,727 galls., Holland 1,297,273 galls., Italy 1,188,788 galls., and Bulgaria 331,242 galls. France appears for the first time in the list of importing countries. England, which last year ranked third, this year occupied the first place. The exportation to Italy and Bulgaria has also greatly increased since 1902. The Deutsche Bank of Berlin, which is connected with the Steaua Romana (one of the two principal petroleum companies of Roumania), has recently acquired an interest to the amount of 2,000,000 crowns in a large petroleum concern in Galicia.

PETROLEUM INDUSTRY IN ROUMANIA.

Bd. of Trade J., *Nov.* 19, 1903.

The *Indépendance Roumaine* remarks, in its issue of 10th/23rd October, that the year 1902 was a noteworthy one in the history of the petroleum industry of Roumania, both on account of the increase in the production of oil and the rejection of the offers of the Standard Oil Company, and also by reason of the participation of German capital in the industry. It is pointed out that Germany, with its annual consumption of petroleum valued at 202,831,000 marks, must look to other countries for relief from the influences of the American monopoly now that the Russian petroleum industry is in agreement with the Standard Oil Company. Roumania and Galicia can furnish such supplies.

In 1902 the Roumanian production amounted to 320,000 tons, which, it is estimated, will increase to 400,000 this year; this compares with 76,000 tons in 1895, and 270,000 tons in 1901. The Galician production in 1902 was 573,000 tons.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PARAFFIN; LIQUID ——: U.S. CUSTOMS DECISION.

Nov. 6, 1903.

The Board of General Appraisers has decided that liquid paraffin is free of duty as "paraffin" under paragraph 578 of the Tariff Act.—R. W. M.

MINERAL OIL; WATER-WHITE ——: U.S. CUSTOMS DECISION.

Nov. 4, 1903.

The Board held that an oil of this description was subject to the countervailing duty of 10 marks per 100 kilos., the rate imposed by Germany on similar products from the United States.—R. W. M.

IV.—COLOURING MATTERS AND DYESTUFFS.

ANILINE COLOUR INDUSTRY; RUSSIAN ——.

Oesterr. Handelsmuseum, Oct. 29, 1903. *Chem. Ind.*, 1903, **26**, 576.

The Russian "Gesellschaft für Benzol- und Anilinproduktion," founded in 1901, treats annually from 16,000 to 25,000 quintals* of crude petroleum naphtha for the production of benzol for the manufacture of aniline oil and dyestuffs. The cost of production of 1 quintal of benzol is about 6 roubles, and of 1 quintal of aniline oil about 36 roubles, whilst the price of foreign aniline oil in Moscow is, in consequence of the high duty (13·5 roubles per quintal), from 60 to 72 roubles per quintal.—A. S.

VII.—ACIDS, ALKALIS, Etc.

NITRATE; PRODUCTION AND EXPORTS OF ——, IN CHILE.

Zircular Trimestral del Asociacion Salitrera de Propaganda. Chem. Ind., 1903, **26**, 576.

In the first six months of 1903, 15,214,632 Spanish centners† of nitrate were produced in Chile, as compared with 13,791,858, 13,412,785, and 15,406,717 centners respectively in the corresponding periods of 1902, 1901, and 1900. In the same period the exports of nitrate were 12,142,858 centners in 1903, as against 13,136,997 centners in 1902, a decrease of 994,139 centners. The exports to Europe showed a decrease of 1,203,027 centners, but the exports to the United States increased by 128,094 centners, to other countries by 70,173, and to Chilian ports by 10,621 centners. In the first half of 1901 the exports of nitrate were 12,302,496, and of 1902, 11,798,389 centners. The exports in the first half of 1903 were distributed as follows:—Great Britain and European mainland to order, 3,340,239 centners; Great Britain, direct, 621,025; Germany, 2,656,695; Belgium, 358,223; Holland, 780,065; France, 1,691,717; Italy, 102,866; United States, Atlantic ports, 1,863,131, Pacific ports, 468,613; and Sandwich Islands, 129,935 centners.—A. S.

ALUM MOUNTAIN IN CHINA.

U.S. Cons. Reps., No. 1802, *Nov.* 16, 1903.

German papers report that an "alum mountain" exists in China, which is said to have a circumference, at the base, of not less than 10 miles, and is nearly 1,900 ft. high. The alum is quarried in blocks, is then heated in ovens, and afterwards dissolved in boiling water. From this liquid the alum crystallises in layers of about half a foot in thickness, which are cut up in blocks of 10 lb. each. The Chinese use it mainly for purifying water.

POTASH-MINE; PRUSSIAN STATE ——.

Chem. and Druggist, Nov. 28, 1903.

The Prussian Government has obtained permission to open a State potash-mine at Bleicherode, in the district of Sangerhausen, Harz mountains, Saxony. The Government recently obtained the mining rights to a tract of land of 23,552,317 sq. ft. in area.

X.—METALLURGY.

TIN INDUSTRY OF THE FEDERATED MALAY STATES IN 1902.

Bd. of Trade J., Nov. 26, 1903.

In the annual report for the year 1902 on the Federated Malay States, the Resident General states that the figures of the export of tin and tin ore show the exports of metallic tin (estimated at 68 per cent. of the gross weight) to have been 780,872 pikuls (46,480 tons). The duty collected on export, under a sliding scale, amounted to 8,438,776 dols. The export figures show a decrease of 4,375 pikuls as compared with the preceding year, while the duty collected yielded an additional revenue of 1,470,592 dols., partly due to the low value of the dollar and consequently enhanced dollar value of the metal. The average sterling price per ton was 117*l.* for 1902 and 108*l.* 15*s.* for 1901, the respective figures per pikul being 79 dols. and 67·56 dols. Taking the sterling average prices above mentioned the value of tin and tin ore exported in 1902 was 5,438,160*l.* and in 1901 5,082,975*l.* The figures of the output of tin for each State are as follows:—

State.	1901.	1902.
	Pikuls.	Pikuls.
Perak	385,066	405,878
Selangor	302,598	278,368
Negri Sembilan	75,243	73,512
Pahang	22,340	23,114
Total	785,247	780,872

GOLD PRODUCTION IN SOUTH AFRICA.

U.S. Cons. Reps., No. 1797, *Nov.* 10, 1903.

According to the *South African Gazette*, the output of gold in the Rand, South Africa, was 1,704,410 oz. in 1902; 1,837,134 oz. for the first eight months of 1903; 1,069,166 oz. in 1899; and 4,295,602 oz. in 1898. In 1900, during the war, it was, for January, February, and March, 251,891 oz.; for the last eight months of 1901 the production was 238,991 oz.

MINERAL PRODUCTION OF BRITISH INDIA IN 1902.

Bd. of Trade J., Nov. 19, 1903.

The following table shows the quantity and value of the principal minerals produced in India in the year 1902, as compared with the figures for the preceding year:—

		Quantity.		Value.	
		1901.	1902.	1901.	1902.
				Rs.	Rs.
Salt	Tons	1,189,901	1,099,391	61,35,705	51,49,528
Coal	„	6,635,727	7,424,480	1,98,50,582	2,05,03,639
Gold	Oz.	532,126	517,639	2,89,56,159	2,95,53,156
Petroleum	Galls.	50,075,117	53,607,688	30,65,131	32,67,245
Manganese ore	Tons	120,191	157,780	5,20,373†	4,63,942†
Mica	„	815*	1,021*	10,50,511*	13,13,909*
Tin ore	„	70	100	1,16,595	80,096

* Exports from India in the financial year ended 31st March, the figures of production not being available.

† Estimated value of quantity produced in Madras. Value of production of Central Provinces is not known.

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* 1 quintal = 100 kilos. 1 rouble = 2*s.*

† 1 Spanish centner = 46·0093 kilos. = 101·4 lb.

Nickel Mines of Ontario.

U.S. Cons. Reps., No. 1793, *Nov.* 5, 1903.

Prof. Coleman, of the University of Toronto, who, with an exploring party, has spent the summer in the Sudbury nickel district, investigating the ore deposits for the Ontario government, has just returned. The professor says he found the Sudbury deposit practically a continuation of the southern range, the whole forming a great oval 10 miles long and 20 miles broad. In quantity the Sudbury deposits surpass any other nickel deposits in the world; in percentage of nickel in the ore, however, they are hardly up to the deposits of New Caledonia. The average content of nickel is about 2·5 per cent., though some ore runs as high as 5 per cent. There is more sulphur and copper in the ore than in New Caledonia ores.

Platinum Output of Russia.

Bd. of Trade J., Nov. 19, 1903.

According to the returns of the Russian Department of Mines, published in the *Industrial and Commercial Gazette*, of 12th—25th October, the total output of platinum in Russia was 310 poods 26 funts* in 1900, and 389 poods 3 funts in 1903. (See also this Journal, 1903, 518.)

XII.—FATS, FATTY OILS, Etc.

Olive Oil in California.

U.S. Dept. of Agriculture, Bureau of Chemistry, Bulletin No. 77, 1903.

The average annual importation of olive oil into the United States for the ten years preceding 1901 amounted to 803,716 galls., of which 257,586 galls. came from France and 498,493 galls. from Italy. In 1897, E. Cooper estimated the number of olive trees in California at 2,500,000, capable of producing, besides dried and pickled olives, 2,000,000 galls. of oil, or an amount which would satisfy the entire United States demand. The production at the present time, however, is greatly below the figure quoted, and, in fact, considerably less than the amount imported, owing to the fact that both the French and Italian oils can be imported at a price less than the actual cost of production of the Californian product.—A. S.

Cocoanut Oil in Hungary.

U.S. Cons. Reps., No. 1802, *Nov.* 16, 1903.

Owing to the rise in the price of lard, cocoanut oil in a solid state (cocoa butter) has been declared for entry in large quantities. As a consequence the lard and butter dealers of Budapest have made a complaint to the Department of Finance that the imported artificial butter ought to pay, instead of 1 gold florin (2*s*. 0·1*d*.) per 100 kilos., as "oil for industrial purposes," 10 gold florins as "lard substitute." While it is not probable that this complaint will be sustained, a movement has been started to include, under paragraph 70 of the proposed new tariff, the crude or partly refined cocoa butter, suitable for technical purposes only, and to classify the refined cocoa butter as lard substitute and food, under section 65, with a duty of 10 gold florins. The result of the movement is that the Budapest importers are employing the proposed rate of duty in their calculations with foreign exporters of the article. Hungary imported from the United States in the calendar year 1902 121 metric centners (26,675 lb.) of cocoa oil or butter, valued at 9,075 crowns (368*l*.). The following countries compete in the export of cocoa butter to Hungary :—

	Lb.
China	1,190,983
Austria	840,930
Germany	285,034
Brazil	12,125
Italy	6,333

Cotton-Seed Oil Industry in India.

Ind. Textile J., Oct. 10, 1903. *Bd. of Trade J., Nov.* 26, 1903.

An English firm is about to set up plant in the Central Provinces capable of treating 100 tons of cotton-seed per week. An industry that has done so well in Europe when working on imported seed ought to do well in India at the source of production, and it will also provide in the most wholesome form a supply of vegetable oil that forms one of the staples of food among a vegetarian population.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Production of the World.

Bd. of Trade J., Nov. 26, 1903.

The following table, showing the world's production of rubber in 1902, with comparative figures for 1900, has been compiled from estimates published in *Industrie et Commerce de Caoutchouc* of Nov. 6, 1903 :—

Country of Production.	1900.	1902.
	Tons.	Tons.
Brazil, Peru, and Bolivia	25,000	30,000
Other States of South America	3,500	1,000
Central America and Mexico	2,500	2,000
Straits Settlements and Dependencies	..	1,000
East and West Africa and the Congo country	24,000	20,000
Java, Borneo, &c.	1,000	..
Madagascar and Mauritius	1,000	..
India, Burma, and Ceylon	500	..
Total	57,500	54,000

Rubber Industry of Federated Malay States.

Bd. of Trade J., Nov. 26, 1903.

The Resident-General for the Federated Malay States, in his report for 1902, states that further experience endorses the certainty that the climate and soil in those States adapts them for the cultivation of rubber (Para and Rambong). Export of Para rubber in quantity has not yet commenced, but samples realise high prices in England, and capital is coming in to extend the area of land under cultivation. The chairman of the United Planters' Association of the Federated Malay States writes in his official report for the year 1902:—The Malay Peninsula appears to possess every factor necessary to the successful cultivation of rubber. Climate, soil, transport facilities, the quality of the product, and the yield of the trees leave little to be desired. As regards labour, this country is better off than any other excepting Ceylon and India itself, where, however, other conditions are less favourable. Little is known of the yield over a large area, but it is known what numbers of individual trees have given, and the average yield will be that of any other country. The area under rubber (principally Para) at the end of 1902 is given, approximately, at 16,000 acres. Not much has been done in extending the cultivation of rubber, solely from want of capital. Some old trees on Linsum Estate were tapped, and 133 lb. of rubber sent to England realised 3*s*. 10*d*. per lb., although classed by the exporter as "number two quality."

XVII.—BREWING, WINES, SPIRITS, Etc.

Alcohol Tax in France.

U.S. Treas. Dept., Oct. 30, 1903.

The Treasury Department holds that the entered revenue taxes known in France as "octroi" and "droit de ville," and which are remitted on goods exported from that country, are part of the foreign market value of such goods. The amount of these taxes is directed to be added on appraisal. The Board of General Appraisers, October 19, decided that they were not an element of dutiable value, and from this decision the Treasury Department directs an appeal to the U.S. Courts.—R. W. M.

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*1 pood = 40 funts = 36 lb.

AUTOMOBILES AND ALCOHOL.

Bull. des Halles, Nov. 4, 1903. *Zeits. Spiritusind.*, 1903, **26**, 495.

On Nov. 3 the draft of a Bill having reference to the arrangement of an international exhibition for automobiles and everything connected therewith, in Paris, was presented to the Chamber of Deputies and was referred to the Commission for Trade and Industry. The reporter of the Bill, in drawing attention to the use of alcohol as a source of motive power, stated that official tests have shown that with regard to cost and to consumption alcohol can compete quite well with petroleum, and that it also possesses certain advantages over the latter, *viz.*, the motor does not become so hot, and no unpleasant odours are produced. —A. S.

ALCOHOL; DUTY-FREE ——.

Bd. of Trade J., Nov. 19, 1903.

A meeting of the Board of Directors of the Manchester Chamber of Commerce was held on Nov. 11, with Mr. Ivan Levinstein, the president, in the chair. With regard to the Customs duty on industrial alcohol, a minute of the Chemical Section reverted to the repressive effect upon some branches of the British chemical industry of the existing Customs duty on pure spirit imported for manufacturing purposes. At the meeting of the Association of Chambers of Commerce held in London last March the following resolution, moved by the Manchester and seconded by the London Chamber, was agreed to:—"That the provision of section 8 of the Finance Act, 1902, requiring the payment of duty on imported pure spirit for manufacturing purposes at a rate equivalent to the difference between the Customs and the Excise duty on spirit, adds about 50 per cent. to the original value of such spirit, and that this addition places British manufacturers who use it in a position of serious disadvantage in relation to their Continental competitors, who are able to purchase it entirely duty-free; and that representations be made to the proper Government Department with a view to the removal of this disadvantage." The Chemical section now proposed to again take up this subject and initiate such action as may be deemed best fitted to secure a removal of the disability set forth in the foregoing resolution.

XIX.—PAPER, PASTEBOARD, Etc.

CELLULOSE IN GERMANY.

U.S. Cons. Reps., No. 1792, *Nov.* 4, 1903.

The Silesian Cellulose and Paper Factory at Egelsdorf, near Friedeberg, Silesia, which was destroyed by fire on the night of August 27, 1903, is to be rebuilt, so it is reported. This factory, although small, was doing a good business, as are most of those manufacturing cellulose in this country. During the year 1901, the imports of cellulose and similar articles into Germany amounted to 32,070 metric tons, valued at 1,551,760 dols., and in 1902 to 21,938 metric tons, valued at 966,994 dols. The exports in 1901 were 55,285 metric tons, valued at 3,026,408 dols., and in 1902, 75,454 metric tons, valued at 3,681,384 dols. Sweden, Austria, and Norway are the principal countries from which such articles are imported into Germany, and France, Belgium, England, the United States, the Netherlands, and Italy, the principal countries to which German cellulose is exported. Formerly large quantities went to Russia, but the exports to that country are growing less every year. For example, in 1899 10,393 metric tons of German cellulose were exported to Russia, and in 1902 only 2,076 metric tons.

XX.—FINE CHEMICALS, Etc.

ESSENTIAL OIL CONTAINING ALCOHOL: U.S. CUSTOMS DECISION.

Oct. 17, 1903.

It was decided that an essential oil to which, according to the testimony of the importer, alcohol had been added in the proportion of half a gallon to five gallons of oil, was dutiable as an "alcoholic compound" at 60 c. per lb. and 45 per cent. *ad valorem* under paragraph 2 of the tariff. The alcohol had been added for the purpose of preservation. —R. W. M.

PERUVIAN PRODUCTS.

Foreign Office Annual Series, No. 3079.

According to a British Consular report on the trade of Peru during 1902, there are now 21 small factories for the production of crude cocaine in that country. During 1900 164,864 oz. was produced, and in 1901 the output increased to 376,320 oz. The figures for 1902 do not appear to be available. Of coca leaves 754 tons were exported from Peru last year, against 601 tons in 1901 and 557 tons in 1900. From Salaverry 30,856 oz. of crude cocaine were exported, valued at 5,002*l.*, of which 8,812 oz. were shipped to the United Kingdom last year, and the remainder to Germany and France. Coca-leaves representing 61,096 lb. (1,371*l.*) were shipped from Salaverry during 1902, of which 7,840 lbs. went to Germany, and the remainder to the United States. Among the exports of Bolivian produce from Mollendo were 5,540 cwt. of cinchona (14,540*l.*), 25 cwt. of coca-leaves (51*l.*), and 25 cwt. of rhatany (127*l.*). Included among the Peruvian produce exported from Mollendo were 96,560 cwt. (34,300*l.*) of borate of lime, 170 cwt. of cinchona (453*l.*), 13,940 cwt. of coca-leaves (28,300*l.*), 320 cwt. of rhatany, and 1,232 lb. (14,330*l.*) crude cocaine. The bulk of the exports of coca-leaves from Mollendo is now sent to New York, whereas in former years Hamburg was the chief market.

CAMPHOR OIL; RECENT JAPANESE LEGISLATIVE REGULATIONS CONTROLLING THE PRODUCTION AND COMMERCE OF ——.

Deutsche Japan Post, July 1903; *through Schimmel's Report, Oct.* 1903, 14.

The production of camphor oil may be carried on solely by the holders of a Government licence, which may be cancelled summarily for any infringement of the regulations. Exact accounts of the manufacture, which is controlled by the officials, must be kept. Delivery of all camphor products must be made to the Government, who will allow, at their discretion, compensation for all such products not purchased, the amount of compensation being published beforehand. Producers of camphor oil are debarred from refining crude camphor, this being a Government monopoly. The camphor produced by the Government factories is now generally sold at a fixed price, more rarely by auction. This price, after charging for all expenses, including that of loss of weight by volatilisation, is sufficient to leave a considerable profit. Exportation of camphor is confined to certain ports. The authorities reserve to themselves the right to restrict production when the supply promises to exceed the demand. All crude camphor and camphor oil held by producers or merchants in Old Japan at the period when the Act becomes operative must be surrendered to the Government. Contravention of the regulations of the Act are to be met with heavy fines, and confiscation of all the camphor products implicated. How the new law will affect the position of the holders of the present monopoly is not certain. Although opposition has been raised to the lease being renewed to the present holders, but few other applicants will probably be found to accept the risk connected with such an enormous enterprise. Nor is it certain how the new regulations will affect the price of camphor-oil products.—J. O. B.

SANDAL-WOOD OIL; EAST INDIAN ——, AND THE "SPIKE DISEASE" OF SANDAL-WOOD TREES.

Schimmel's Report, Oct. 1903, 61—54.

The price of sandal-wood remains unchanged since the last Government auctions in 1902, but the price of the oil has dropped to so low a figure in consequence of overproduction that present selling values are no longer remunerative. Butler (Indian Forester, 1903, **29**, Appendix to No 4) considers that the prevailing spike disease is due to a poison in the sap, and that the peculiar bristle-like deformity of the leaves of the affected trees is not, as was first supposed, of diagnostic value, since the same deformity is observed in trees of a morbid condition from other causes, either from age, malnutrition, or root injury. Spike disease does not appear to be due to a parasite or a specific bacterium. It is observed to occur in low-lying districts with a poor soil, especially where strata of "kankur" occur. The disease is not limited to sandalwood, other vegetation in the affected district showing indications of the affection. "Spike disease" is never met with in trees growing on a rich soil. No remedy has yet been discovered for the disease; as a preventive measure, the cutting down of affected trees and the immediate removal and destruction of all waste and chips are recommended. Peter (Pharm.-Zeit., 1903, **48**, 573) calls attention to the widespread adulteration of the sandal-wood oil sold in capsules, certain samples examined showing a great deficiency of santalol.—J. O. B.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 24,931. Huillard. Apparatus for drying pasty and fluid substances. Nov. 16.

,, 25,158. Frederking. Drying apparatus.* Nov. 18.

,, 25,348. Durham. Distilling apparatus. Nov. 20.

,, 25,458. Theisen. Centrifugal apparatus for cooling, heating, absorption, gas purifying, &c. Nov. 21.

,, 25,547. Scheuffgen and Fabr. Explosionisscher Gefässe. Device for preventing explosions in vessels containing inflammable liquids.* Nov. 23.

,, 25,589. Sewell. Evaporating apparatus. Nov. 23.

,, 25,859. Scott and Browne, Ltd. (Timson). Manufacture of emulsions and mixtures, and apparatus for same. Nov. 26.

[C.S.] 25,209 (1902). Hecking. Drying and roasting apparatus. Nov. 25.

,, 26,461 (1902). Goetz. Flasks for volatile and other liquids. Dec. 2.

,, 1194 (1903). Willett. Filter presses. Nov. 25.

,, 2731 (1903). Blair. Evaporators. Dec. 2.

,, 4233 (1903). Martini and Hüneke. Process and apparatus for forcing and drawing off liquids evolving ignitible or explosive gases. Dec. 2.

,, 8313 (1903). Lühne. Process and apparatus for the centralisation of every kind of chemical or industrial treatment of, and operation on, any kind of substance. Dec. 2.

,, 18,751 (1903). Mather. Crucible filling or charging apparatus. Dec. 2.

II.—FUEL, GAS, AND LIGHT.

[A.] 24,935. Schmidt. Process and apparatus for the production of water-gas, producer-gas, &c.* Nov. 16.

,, 24,940. Pourne. Hydrocarbon furnaces. (U.S. Appl., Nov. 17, 1902.)* Nov. 16.

,, 24,957. Denny and Allen. Gas producers. Nov. 17.

[A.] 25,015. Parker. Production of fuel from peat or other like substances. Nov. 17.

,, 25,283. Hinne and Holzmann. Furnaces.* Nov. 19.

,, 25,581. Thomson. Furnaces. Nov. 23.

,, 25,763. Hovine and Breuillé. Manufacture of producer-gas and the like.* Nov. 25.

,, 26,037. Bertrand and Vorbach. Blast - furnace tuyères. Nov. 28.

[C.S.] 26,769 (1902). Holmes (Guldlin). Manufacture of carburetted water-gas. Nov. 25.

,, 28,325 (1902). Nicholson. Purifying oil or spirit used in explosion engines. Dec. 2.

,, 18,526 (1903). Langford. Furnaces. Dec. 2.

,, 20,420 (1903). Ekenberg. Manufacture of fuel from peat, waste wood, coal substances, and the like. Dec. 2.

,, 22,272 (1903). Laurenius. Retort furnaces for charring or coking peat, &c. Nov. 25.

,, 22,692 (1903). Monfort. Furnaces. Dec. 2.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 25,989. Haddan (Mateu). Method for purifying naphthalene.* Nov. 27.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 24,930. Johnson (Badische Anilin und Sodafabr.). Manufacture and production of sulphur colouring matters. Nov. 16.

,, 24,936. Imray (Soc. Chem. Ind. in Basle). Manufacture of nitro-alphylacidylamidonaphthol disulphonic acids, nitro-alphylamidoacidylamidonaphthol disulphonic acids, amido-alphylacidylamidonaphthol disulphonic acids, and amido-alphylamidoacidylamidonaphthol disulphonic acids, and azo dyestuffs therefrom. Nov. 16.

,, 25,144. Newton (Bayer and Co.). Manufacture of new sensitising dyestuffs, and intermediate products for use therein. Nov. 18.

,, 25,464. Johnson (Badische Anilin und Sodafabr.). Manufacture of acid nitriles. Nov. 21.

,, 25,541. Newton (Bayer and Co.). Manufacture of oxyanthraquinone derivatives. Nov. 23.

,, 25,674. Ransford (Cassella and Co.). Manufacture of nitro-acetdiamidophenol sulphonic acid, and colouring matters therefrom. Nov. 24.

,, 25,738. Iljinsky, and Wedekind and Co. Manufacture of o-oxyanthraquinones and of o-oxyanthraquinone-oxy-sulpho acids. Nov. 25.

[C.S.] 543 (1903). Imray (Meister, Lucius und Brüning). Manufacture of *p-p′*-diamidoacidyldiphenylamines and of *p-p′*-diamidodiphenylamine therefrom. Nov. 25.

,, 2302 (1903). Imray (Meister, Lucius und Brüning). Manufacture of anthranilic acid and its derivatives. Dec. 2.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 25,000. Wright, Poulsom, and Mackintosh. Manufacture of compounds for waterproofing textile and other fabrics, and apparatus therefor.* Nov. 17.

,, 25,292. Ward and Kenworthy. Apparatus for dyeing and treating textiles. Nov. 20.

,, 25,394. Rhodes. Preparing, dyeing, scouring, and carbonising wool, slubbing, silk, &c., in the raw and manufactured state. Nov. 20.

[A.] 25,400. Donisthorpe, White, and Ellis. The dyeing of yarns, and fabrics produced therein. Nov. 21.

,, 25,463. Krais and The Bradford Dyers' Assoc., Ltd. Finishing piece goods. Nov. 21.

,, 25,555. Détré. Apparatus for dyeing under pressure. (Fr. Appl., Dec. 2, 1903.)* Nov. 23.

,, 25,611. Donisthorpe and White. Process and means for producing parti-coloured yarns. Nov. 24.

,, 25,615. Mycock. Process and means for producing figured indigo-dyed textile fabrics. Nov. 24.

,, 25,879. Norton. Apparatus for steaming cotton or other fabrics for bleaching or other purposes. Nov. 26.

,, 25,972. Atkins, and Oxychlorides, Ltd. *See under* VII.

[C.S.] 16,549 (1903). Cleff. Apparatus for dyeing, bleaching, mordanting, washing, and drying cloth. Nov. 25.

VII.—ACIDS, ALKALIS, AND SALTS.

[A] 25,265. Howles. Method of manufacture of alumina and the other salts of aluminium. Nov. 19.

,, 25,388. De Wilde. Treatment of regenerated hydrochloric or nitric acid to remove calcium sulphate. (Belgian Appl., Aug. 3, 1903.)* Nov. 20.

,, 25,627. Gutensohn. Recovering metals held in acid solutions. Nov. 24.

,, 25,867. Schütz. Production of carbonic acid. Nov. 26.

,, 25,972. Atkins, and Oxychlorides, Ltd. Preserving the strength and keeping powers of solutions of alkaline chlorides and oxychlorides, employed for bleaching, disinfecting, separation of metals, &c. Nov. 27.

,, 26,007. Brothers. Manufacture of crystalline gypsum applicable for filling purposes. Nov. 28.

[C.S.] 28,077 (1902). Cross and Young. Manufacture of useful products from or by means of nitrates. Nov. 25.

,, 1835 (1903). Dreher. Manufacture or separation of titanium compounds. Dec. 2.

,, 12,377 (1903). Ashcroft. *See under* XI.

VIII.—POTTERY, GLASS, AND ENAMELS.

[C.S.] 25,806 (1902). Garchey. Manufacture of devitrified glass and glass objects, and apparatus therefor. Dec. 2.

,, 1384 (1903). Chambers, and Fulham Pottery and Cheavin Filter Co., Ltd. Kilns or ovens for burning earthenware, pottery, &c. Dec. 2.

,, 22,575 (1903). Page and Wadsworth. Method and apparatus for manufacturing sheet glass. Nov. 25.

X —BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 24,911. Earle (Trachsler). Manufacture of white cement. Nov. 16.

,, 25,393. Niessen. Manufacturing artificial stone suitable for paving, building, and hydraulic purposes.* Nov. 21.

,, 25,686. Stanley and Jeffcote. Process and apparatus for applying glazes, enamels, or bodying material to bricks, tiles, &c. Nov. 24.

,, 25,934. Kilby. Manufacture of cement, and kilns or furnaces for use therein, and for burning lime, bricks, &c. Nov. 27.

[C.S.] 22,162 (1903). Petersson. Furnace or kiln for roasting finely crushed ore, burning dolomite, &c. Dec. 2.

X.—METALLURGY.

[A.] 24,924. Soc. Anon. la Néométallurgie. Metallic alloy or compound. (Fr. Appl., April 17, 1903.)* Nov. 16.

,, 25,032–3. Galbraith and Steuart. Method and apparatus for reducing iron sand, iron oxides, and other substances. (New Zealand Appls., Nov. 18, 1902.)* Nov. 17.

,, 25,248. Rouse and Cohn. Converting powdered iron ore or waste or natural sands into briquettes or lumps. Nov. 19.

,, 25,260. Frith. Toughening or annealing steel, iron, and other metals. Nov. 19.

,, 25,261. Frith. Manufacture and treatment of metals. Nov. 19.

,, 25,627. Gutensohn. *See under* VII.

,, 25,876. Cehak and von Szczytnicki. Treatment of zinc slag or residue for the recovery of values therefrom. Nov. 26.

,, 25,932. Engels. Process of treating iron and steel with carbides.* Nov. 27.

,, 25,950. Cockburn. Method and combination of apparatus for manufacturing steel. Nov. 27.

,, 25,986. Marks (Lamargese). Processes for case-hardening. Nov. 27.

[C.S.] 6724 (1903). Marks (Broken Hill Prop. Co., Ltd.). Apparatus for use in the extraction of sulphides from ores. Nov. 25.

,, 19,504 (1903). Count de Monthy, Trézel, and Coppée. Aluminium alloy, and process of producing the same. Dec. 2.

,, 20,758 (1903). Sörensen. Process for hardening aluminium. Nov. 25.

,, 22,162 (1903). Petersson. *See under* IX.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 24,848. Cowper-Coles and Co., Ltd., and Cowper-Coles. Electro-deposition of zinc. Nov. 16.

,, 24,905. Haddock. Electrolytic cells. Nov. 16.

,, 25,132. Ashcroft. Electrolytic cells. Nov. 18.

,, 25,162. Cowper-Coles and The Metals Corporation, Ltd. Electrolytic refining of metals. Nov. 18.

,, 25,550. Clotten. Electrolytic recovery of tin from materials containing the same, and the simultaneous recovery of other metals. Nov. 23.

,, 25,792. Speed. Method of agitating solutions in order to quicken the electrolytic deposition of metals. Nov. 26.

,, 25,937. Blackman. Accumulators. Nov. 27.

[C.S.] 25,954 (1902). Lorrain (Elect. Act.-Ges. vorm. Schuckert and Co.). Process and furnace for obtaining metals, metalloids, and compounds of the same. Dec. 2.

,, 12,377 (1903). Ashcroft. Process and apparatus for the production of metals of the alkali group by electrolysis. Nov. 25.

,, 23,151 (1903). Koller and Askenasy. Method and apparatus for producing a suitable circulation of the electrolyte in electrolytic processes. Dec. 2.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

[A.] 25,010. Harvey. Manufacture of dry soap powders. Nov. 17.

,, 25,288. Dannert. Substance for cleaning and washing materials. Nov. 19.

,, 25,520. Tucker. Making soaps. Nov. 23.

,, 25,556. Jourdan. Saponifying apparatus. Nov. 23.

,, 25,727. Edgerley. Use of iodoform in the process of soap-making. Nov. 25.

[A.] 25,868. Iveson and Wilson. Cooling melted fats, fatty substances, &c. Nov. 26.

[C.S.] 1515 (1903). Normann. Process of converting unsaturated fatty acids or their glycerides into saturated compounds. Dec. 2.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 25,303. Hills. Method for increasing the durability of paint or varnish. Nov. 20.

[C.S.] 22,567 (1903). Armbruster and Morton. Pigments, and processes of making the same. Nov. 25.

B.—Resins, Varnishes.

[C.S.] 26,371 (1902). Kronstein. Manufacture of linoleum, lincrusta, or the like. Dec. 2.

„ 12,002 (1903). Frenkel. Machinery for manufacturing linoleum. Nov. 25.

„ 21,890 (1903). Lawrence. Apparatus for, and art of extracting and purifying rubber, gums, and like substances. Dec. 2.

„ 22,417 (1903). Barker (Coleman). Anti-fouling coatings, and the manufacture of the same. Nov. 25.

XIV.—TANNING; LEATHER, GLUE, AND SIZE

[A.] 26,049. Dolat. Process for the preparation of skins. (Fr. Appl., June 18, 1903.)* Nov. 28.

[C.S.] 27,597 (1902). Dreher. Titanium solutions and the manufacture of leather. Dec. 2.

„ 22,069 (1903). Martin. Vegetable gelatin, and process of manufacturing same. Nov. 25.

„ 22,872 (1903). Page (Universal Leather Co.). Grain leather, and process for its production. Dec. 2.

XVI.—SUGAR, STARCH, GUM, Etc.

[C.S.] 15,044 (1903). Krivanek. Manufacture of sugar. Nov. 25.

„ 22,370 (1903). Thompson (Bredt and Co.). Process of making soluble starch. Nov. 25.

XVII.—BREWING, WINES, SPIRITS, Etc.

[A.] 24,966. Brudin and Baines. Method of ageing or maturing spirits. Nov. 17.

„ 25,582. Meulemeester. Method and apparatus for the rapid extraction of the wort contained in the malt of breweries, distilleries, and similar industries. (Belgian Appl., Dec. 1, 1902.)* Nov. 23.

„ 25,745. Sunyé. *See under* XX.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 26,066. Adamson. Preservation of organic substances from decay and putrition. Nov. 28.

[C.S.] 26,254 (1902). International Plasmon, Ltd. (Bergheim). Method of rendering tea nourishing and digestible. Dec. 2.

B.—Sanitation; Water Purification.

[A.] 25,729. Candy. Drainage and ventilation of filter or bacterial beds, and materials for use in or in connection with such drainage and ventilation, and material for use in filter or bacterial beds. Nov. 25.

[C.S.] 12,522 (1903). Otto. Purification of water. Dec. 2.

„ 22,630 (1903). Holmes. Process and apparatus for purifying water. Dec. 2.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 25,896. Milne. Paper- and pulp-making machines. Nov. 26.

[C.S.] 851 (1903). Richardson. Treatment of printed or other paper. Dec. 2.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 25,481. Ashworth. Production of saccharin. Nov. 23.

„ 25,516. Verley. Manufacture of protocatechuic aldehyde and vanilline. (Fr. Appl., Nov. 27, 1902.)* Nov. 23.

„ 25,695. Verley. Manufacture of new compounds derived from citrylidine-acetic acid. (Fr. Appl., Nov. 27, 1902.)* Nov. 24.

„ 25,745. Sunyé. Process of making absolute alcohol by means of manganite of lime. Nov. 25.

[C.S.] 26,353 (1902). Majert. Manufacture of dimethyl and diethyl amido-antipyrine. Dec. 2.

„ 1515 (1903). Normann. *See under* XII.

„ 1877 (1903). Barge and Givaudan. Manufacture of toluene sulphonic chloride. Dec. 2.

„ 3563 (1903). Barge and Givaudan. Manufacture of saccharin. Nov. 25.

„ 19,446 (1903). Descamps. Manufacture of products from compounds having an aldehydic function or their analogues. Nov. 25.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 25,151. Pearce. Photographic plates. Nov. 18.

„ 25,390. Hoffsümmer. Process of preparing photographic tissues. Nov. 21.

„ 25,806. Berryman. Development of photographic plates or sensitive gaslight papers, &c., in daylight. Nov. 26.

„ 25,981. Justice (Soc. Anon. Plaques et Papiers Phot. A. Lumière et fils). Manufacture of photographic film cards, papers, and the like.* Nov. 27.

XXII.—EXPLOSIVES, MATCHES, Etc.

[C.S.] 8163 (1903). Salas. Manufacture of fireworks. Dec. 2.

„ 17,659 (1903). Mackenzie (Continental Match Co.). Match-making machines. Nov. 25.

„ 18,079 (1903). Sachs. Safety fuses. Nov. 25.

„ 18,167 (1903). Sachs. Safety fuses. Nov. 25.

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W. J. Pope.
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T. Stenhouse.
H. L. Terry.

Hon. Local Secretary:

Julius Hübner, 24, Delaunay's Road, Crumpsall, Manchester.

SESSION 1903—1904.

Friday, Jan. 8, 1904.—(*a*) Preparation and Compression of Pure Gases for Experimental Work, by J. E. Petavel and R. S. Hutton. (*b*) The Electrolytic Method for the Estimation of Minute Quantities of Arsenic in Malt, Beer, and Foodstuffs, by W. Thomson, F.R.S.E.

Newcastle Section.

Chairman: J. T. Dunn.

Vice-Chairman: W. L. Rennoldson.

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F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

New York Section.

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Vice-Chairman: Russell W. Moore.

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L. Baekeland.
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Wm. H. Nichols.
T. J. Parker.
Clifford Richardson.
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J. M. C. Paton.
A. L. Stern.
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Hon. Local Secretary:

S. R. Trotman, King's Walk Chambers, Parliament Street, Nottingham.

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Jas. Hope.
H. Ingle.
D. S. Jerdan.
W. G. Johnston.
J. Falconer King.
J. G. F. Lowson.
J. S. Macarthur.
J. McCulloch.
M. A. Parker.

Hon. Secretary and Treasurer:

Thomas Gray, c/o Gourlay and Deas, 180, Hope Street, Glasgow.

Sydney, N.S.W., Section.

Chairman: A. Liversidge.

Committee:

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J. F. Elliott.
F. B. Guthrie.
L. Meggitt.
J. Morison.
A. A. Ramsay.
J. A. Schofield.
R. Greig Smith.
H. G. Smith.
T. Steel.

Hon. Local Secretary:

T. U. Walton, Colonial Sugar Co., O'Connell Street, Sydney, N.S.W.

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Vice-Chairman: G. W. Slatter.

Committee:

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John W. Cobb.
W. M. Gardner.
A. J. Murphy.
H. R. Procter.
F. W. Richardson.
Geo. Ward.
H. A. Watson.
Thorp Whitaker.
J. B. Wilkinson.

Hon. Local Secretary and Treasurer:

T. Fairley, 17, East Parade, Leeds.

Notices.

ANNUAL GENERAL MEETING, 1904: NOMINATION OF PRESIDENT.

Notice is hereby given that Mr. William H. Nichols has been nominated to the office of President for 1904–5 under Rule 8.

THE SOCIETY'S COUNCIL ROOM.

The various Sections of the Society are now at liberty to make use of the Society's meeting room for Sectional purposes, when not required by the Council, by making arrangements beforehand with the General Secretary.

SUBSCRIPTIONS FOR 1904.

Members are reminded that the subscription of 25*s.* for 1904, payable on January 1st, 1904, should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of the Society's Journal. Any changes of address to appear in the new List of Members now in course of preparation should reach the General Secretary not later than January 15th, 1904.

ANNUAL GENERAL MEETING, NEW YORK, 1904.

Members who contemplate attending the next General Meeting, in New York, are requested to communicate with the General Secretary as soon as possible, in order that suitable travelling arrangements may be made.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

List of Members Elected

22nd DECEMBER 1903.

Ashley, F. R., Western Chemical Manufacturing Co., Denver, Colo., U.S.A., Manufacturing Chemist.

Battle, A. E., The B. S. A. Asphalt Manufacturing Co., Ltd., Woodstock, Cape Town, South Africa, Works Manager.

Beckwith, E. P., Garrison-on-the-Hudson, N.Y., U.S.A., Chemist.

Boissevain, C. E. H., 92, Van Eeghenstraat, Amsterdam, Holland, Chemical Manufacturer.

Brooks, H. K., c/o Casein Co. of America, Bellows Falls, Vermont, U.S.A., Chemist.

Butler, F., Ash Lane, Hough Green, nr. Widnes, Chemist.

Buttenshaw, E. L., 31, Edge Lane, Chorlton-cum-Hardy, Manchester, Analytical Chemist.

Clark, Dr. W. I., 104, South Canongate, Edinburgh, Manufacturing Chemist.

Davis, Leon K., Room 510, 31, Milk Street, Boston, Mass., U.S.A., Chemical Engineer.

Dole, R. B., U.S. Geological Survey, 618, Boylston Building, Chicago, Ill., U.S.A., Chemist.

Ellis, A. W., 10, Endymion Road, Brixton Hill, S.W., Analytical Chemist.

Hollinshead, P., New Field House, Wimboldsley, near Middlewich, Cheshire, Assistant Chemist.

Leese, J., jun., 392, Dickenson Road, Longsight, Manchester, Technical Chemist.

Lewis, F. J., c/o Moss Chemical Co., 15, Carlaw Avenue, Toronto, Canada, Manufacturing Chemist.

Lumsden, A. A., Forth Chemical Works, Bo'ness, N.B., Technical Chemist.

McCandless, J. M., State Laboratory, Atlanta, Ga., U.S.A., Analytical Chemist.

McCourt, C. D., 52, Victoria Road, Clapham, S.W., Research Chemist.

Nicoll, Frank, 221, Walmersley Road, Bury, Lancs., Chemist.

Pullin, S. R., 10, Newton Grove, Chapeltown Road, Leeds, Assistant Chemist.

Savage, G. M., c/o C. G. Euler, Platt and Gold Street, New York City, U.S.A., Chemist.

Sohlman, R., Bofors, Sweden, Manager.

Stormer, E. J., J. I. Case Plow Works, Racine, Wis., U.S.A., Analytical Chemist.

Taylor, A. M., c/o General Chemical Co., Hudson River Works, Hudson Heights, N.J., U.S.A., Chemist.

Walsh, P. H., P.O. Box 469, Magog, Prov. Quebec, Canada, Analytical Chemist.

Watson, H. M., 22, Coleraine Road, Blackheath, S.E., Paint Manufacturer.

Changes of Address.

When notifying new addresses, members are requested to write them distinctly, and state whether they are temporary or permanent. Multiplication of addresses is also to be avoided as tending to create confusion. When sending subscriptions, the use of the form attached to the application helps in the verification of addresses, on which the safe delivery of the Journal depends.

Atkinson, E. B., l/o Scartho House; Furze Glen, Lambert Road, Grimsby.

Bolton, E. R., l/o Brook Green; 54, Digby Mansions, Hammersmith, W.

Culmann, Dr. J., l/o Lancaster Avenue; 525, Norwood Avenue, Buffalo, N.Y., U.S.A.

Emery, E. G., l/o Erie; c/o Franklin H. Kalbfleisch Co., 31–35, Burling Slip, New York City, U.S.A.

Fairweather, Wallace, l/o Glasgow; 65–66, Chancery Lane, London, W.C.

Fogg, Chas. A., l/o Park Road; Graythorne, Albert Road, Bolton-le-Moors.

Forster, Miss Emily L. B., l/o Battersea; King's College, Strand, London, W.C.

Goetschius, Howard B., l/o Long Island City; Little Ferry, N.J., U.S.A.

Greville, H. Leicester; 51 (*not* 57), Hafton Road, Catford, S.E.

Grossmann, Dr. J., l/o Harpurhey; Northern Assurance Buildings, Albert Square, Manchester, Consulting Chemist and Chemical Engineer.

Hodgkins, D. H., l/o South Street; 19, East Park Street, Newark, N.J., U.S.A.

Hyndman, H. H. Francis, l/o Leyden; 27, Pembroke Square, Kensington, W.

Isakovics, Alois von, l/o New York City; Monticello, N.Y., U.S.A.

Jones, Chas. H., l/o Daiquiri; El Cobre Mines, Santiago de Cuba, Cuba.

Kelf, H. C.; all communications to 85, Warren Road, Leyton, Essex.

Kupferberg, Dr. H., l/o Manchester; 19, Schulstrasse, Mainz, Germany.

Leighton, Arthur E.; Journals to Aruvankad, Nilgiris, India.

Lett, Stephen J., l/o Thornton Heath; 119, Lupus Street, London, S.W.

Liversidge, Prof. A., F.R.S., l/o Sydney; retain Journals.

McCreath, W. D.; Journals to Quantock Vale Cider Works, North Petherton, Bridgewater, Cider Manufacturer.

McEwen, Atholl F., l/o Johannesburg; 1, Northbrook Road, Lee, S.E.

Mathew, W. de Vere, l/o Clapham; Shanklin, Lucien Road, Upper Tooting, S.W.

Myers, E. C., l/o New Franklin; 1107, Paquin Street, Columbia, Mo., U.S.A.

Reid, T. A.; Journals to c/o Johnsen, Jorgensen and Wettre, address as before.

Round, Wm., l/o Bagot Street; Albion Street, Birmingham.

Rust, R. R., l/o Kansas; c/o Mineral Point Zinc Co., North Chicago, Ill., U.S.A.

Sharpley, W. P., l/o Brussels; c/o Jno. Fleming, P.O. Box 1878, Johannesburg, South Africa.

Shields, Dr. Jno., l/o London; Minas de Rio Tinto, Prov. de Huelva, Spain.

Walker, Dr. W. H., l/o Exchange Place; Massachusetts Institute of Technology, Boston, Mass., U.S.A.

Warnes, A. R., l/o Hull; c/o T. L. Willson, 117, Boyson Road, Walworth, S.E.

Wrampelmeier, T. J., Representative of Powder Co.; retain Journals.

Young, Dr. Sydney, F.R.S., l/o Bristol; University Chemical Laboratory, Trinity College, Dublin.

"Zeitschrift für Angewandte Chemie," l/o Berlin; Prof. Dr. B. Rassow, Dörrienstrasse 13, Leipzig, Germany.

CHANGES OF ADDRESS REQUIRED.

Bendixen, J. C.; l/o 61, Trafalgar Road, Old Kent Road, S.E.

Dickerson, E. N.: l/o 15, Wall Street, New York City, U.S.A.

Lange, Dr. Martin; l/o Utrechtsche Weg 40, Amersfoort, Holland.

Death.

White, W. H., The Cottage, Killingworth, Newcastle-on-Tyne.

Canadian Section.

Meeting held in Toronto, November 18th, 1903.

PROF. W. R. LANG IN THE CHAIR.

At the request of the Chairman, Dr. Frank B. Kenrick presented his report on the Fifth International Congress for Applied Chemistry, at which he represented the Canadian Section of the Society. He emphasised the close relation which existed in Germany between the scientist and the manufacturer, and noted, further, the interest shown in the Congress by the German Government. At the close of his remarks he gave a demonstration of the remarkable properties of a specimen of Heraeus' quartz glass. The following papers were then read:—

NOTES ON THE SEPARATION OF GOLD, SILVER, AND PLATINUM.

BY H. CARMICHAEL.

As I had occasion to examine a number of black sands for the platinum group of metals, I made a careful search amongst the leading text-books on assaying and analysis for methods which would aid me; the records of the different chemical societies were also examined, but the data obtained from these sources were of the most meagre description and not very reliable. As an aid to devising some rapid and efficient method of analysis the following experiments were made, which largely speak for themselves.

Osmiridium.—The separation of the osmiridium group from the noble metals does not present any special difficulty if little silver be present. The ore or black sand is fluxed in a crucible in suitable manner and the lead button cupelled; the resulting bead is rolled out and boiled with dilute sulphuric acid (1 to 10), letting the acid gradually grow stronger; then, after washing, by boiling with nitric acid, again washing and dissolving in *aqua regia*, the osmiridium group alone remains, with perhaps a trace of silver chloride, which may be removed by solution in ammonia. The separation of gold, silver, and platinum presents some difficulty, as the following experiments will show:—

Separation of Platinum from Gold.—Alloys of the following composition were made by wrapping the metals in sheet lead and cupelling:—

Alloy.	Mgrms.	Result.
Gold	100	Cupelled, rolled, and boiled in strong HNO_3. Platinum did not part properly.
Platinum	100	
Silver	1,000	
Gold	100	Cupelled, and parted in strong HNO_3: resulting cornet weighed 113·5 mgrms., showing 13·5 mgrms. of platinum retained by cornet. Duplicate, same result.
Platinum	100	
Silver	1,200	
Gold	100	Cupelled, and parted in strong HNO_3: cornet weighed 113·5, showing 13·5 mgrms. of platinum retained by cornet. Duplicate, same result.
Platinum	100	
Silver	1,500	
Gold	100	Cupelled, and parted in strong HNO_3: cornet weighed 112·5 mgrms., showing 12·5 mgrms. of platinum retained by cornet. Duplicate, same result.
Platinum	100	
Silver	2,000	
Gold	100	Cupelled, and parted in strong HNO_3: cornet weighed 95 mgrms., showing that a loss had occurred.
Platinum	100	
Silver	5,000	

NOTE.—In the last experiment the platinum had not all parted out, giving a dull grey colour to the gold cornet; the cornet was also partly broken up and the particles floated as a fine powder on the parting acid. A loss was occasioned in this manner, and also perhaps by the amount of nitrous oxide evolved in the solution of the large amount of silver.

As the foregoing experiments gave negative results as far as method of separation was concerned, a series of alloys were made, gradually decreasing the proportion of platinum to gold.

Alloy.	Mgrms.	Result.
Gold	100	Cupelled and parted first in 21° B. and then in 32° B. HNO_3: resulting cornet weighed 102·7 mgrms., showing 2·7 mgrms. of platinum left in cornet. Duplicate, same result.
Platinum	20	
Silver	300	
Gold	100	Cupelled, and parted twice in 32° B. HNO_3: resulting cornet weighed 101·2 mgrms. Duplicate weighed 100·2 mgrms.
Platinum	15	
Silver	400	
Gold	100	Cupelled, and parted in first 21° B., second in 32° B. HNO_3: resulting cornet weighed 100·8 mgrms. Duplicate weighed 100·4 mgrms.
Platinum	10	
Silver	300	
Gold	100	Cupelled, and parted first in 21° B., second in 32° B. HNO_3: resulting cornet weighed 100·2 mgrms. Duplicate, same result.
Platinum	10	
Silver	500	
Gold	100	Cupelled, and parted in first 21° B., second in 32° B. HNO_3: resulting cornet weighed 100 mgrms., showing that the platinum had all been removed, except perhaps an unweighable trace.
Platinum	5	
Silver	500	

A number of experiments were made with the alloy, with the same result as that given. After finding that platinum would separate out with this low ratio of platinum to gold, a number of experiments were conducted to ascertain how a higher ratio would separate. One of these experiments gives—

Alloy.	Mgrms.	Result.
Gold	100	Cupelled, and parted in first 21° B., second in 32° B. HNO_3: resulting cornet weighed 100·2 mgrms.
Platinum	7	
Silver	400	

With 10 mgrms. to the same amount of gold some of the platinum was left in the cornet, so that 7 per cent. of platinum to gold seems to be the highest ratio that can be successfully parted.

400 mgrms. of added silver were found to part as successfully as 500 mgrms., and at the same time to give a more compact cornet, not so liable to break up.

Alloy.	Mgrms.	Result.
Gold Platinum Silver	200 14 800	Cupelled, and parted in 21° B. and 32° B. HNO_3: resulting cornet weighed 200·3 mgrms., showing 0·3 mgrm. of platinum retained; cornet broke up in parting. Duplicate was parted in 21° B., still more diluted and did not break, and weighed 200·3 mgrms.
Gold Platinum Silver	300 14 900	Cupelled, and parted in 21° B. and 32° B. HNO_3: resulting cornet weighed 300 mgrms. This would show that as a larger quantity of platinum has to be parted, gold must be added in increasing ratio.
Gold Platinum Silver	200 10 600	Cupelled, and parted in 21° B. and 32° B. HNO_3: resulting cornet weighed 200 mgrms.

The action of mass seems to play a part in this separation, as 7 mgrms. of platinum, added to 100 mgrms. of gold, parted successfully, but when double the quantity of both metals was taken, as in the alloy of 14 mgrms. of platinum to 200 mgrms. of gold, the cornet did not part; but by increasing the gold to 300 mgrms. it did part. A number of experiments were then made with a view of separating the silver from alloys of gold, platinum, and silver. The results were as follows:—

Alloy.	Mgrms.	Result.
Gold Platinum Silver	100 100 500	Cupelled, and parted in strong H_2SO_4: resulting cornet weighed 204·7 mgrms., showing 4·7 mgrms. of silver left behind. Duplicate, same result.
Gold Platinum Silver	100 100 500	Cupelled, and parted in strong H_2SO_4; then in strong HNO_3: resulting cornet weighed 204 mgrms. Duplicate weighed 200·6 mgrms.
Gold Platinum Silver	100 5 300	Cupelled, and parted in dilute H_2SO_4: resulting cornet weighed 105·5 mgrms. Duplicate weighed 105·4 mgrms.
Gold Platinum Silver	100 5 300	Cupelled, and parted in dilute H_2SO_4: resulting cornet weighed 105·3 mgrms. Duplicate weighed 105·2 mgrms.
Gold Platinum Silver	50 5 300	Cupelled, and parted in dilute H_2SO_4, washed and parted in strong HNO_3: resulting cornet weighed 55·3 mgrms. Duplicate weighed 55·2 mgrms.
Gold Platinum Silver	25 5 300	Cupelled, and parted in dilute H_2SO_4, washed, and parted in strong HNO_3: resulting cornet weighed 30·3 mgrms. Duplicate cornet weighed same.

NOTE.—This last experiment showed 0·3 mgrm. of silver retained or 0·1 per cent., which was the best result obtainable, while it is not entirely satisfactory; a close assay could probably be made by running through a proof alloy under similar conditions and deducting the surcharge of silver found from the regular assay.

A series of alloys of silver and platinum without any gold were also parted, both in nitric and sulphuric acids, but no satisfactory results could be obtained. A separation of platinum from a gold and silver alloy was also attempted by precipitation as potassium chloro-platinite. This, however, presents many difficulties; the alloy is for practical purposes insoluble in *aqua regia* owing to silver chloride being precipitated on the cornet and preventing further action. This difficulty may to a certain extent be overcome by first parting in sulphuric acid and then taking out the last of the silver with nitric acid, washing, and dissolving in *aqua regia*. To precipitate platinum with potassium chloride requires that the solution be fairly concentrated; in doing this it is difficult to prevent the gold chloride from decomposing and precipitating metallic gold. Potassium chloride is to be preferred to ammonium chloride in precipitating platinum, owing to its being slightly less soluble in alcohol.

I desire to express my thanks to Mr. D. Whittaker, Government Assistant Assayer, for his aid in carrying out these experiments.

DISCUSSION.

Mr. WATSON BAIN said that the separation of gold, silver, and platinum was one of the most difficult problems in assaying. From some experiments made at the School of Practical Science, Toronto, it appeared that the wet method was unreliable with small quantities, and that the separation carried out as described in most text-books yielded only approximate results. The section had reason for congratulation on receiving such a contribution to the knowledge of the subject.

THE ECONOMIC ADMISSION OF STEAM TO WATER-GAS PRODUCERS OF THE LOWE TYPE.

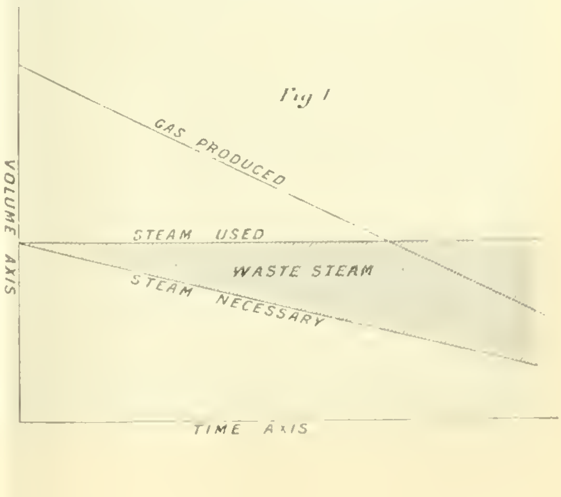
BY G. W. MCKEE.

It is the general practice of water-gas operators to vary the quantity of steam admitted according to the conditions of the producer, these conditions being:—(1) Temperature in the generator judged by the length of the preceding "blow." (2) Depth of the fuel bed. (3) The question as to whether an up or down run is being made. (4) The length of time that has expired since clinkering. The amount of steam admitted is judged by the number of turns given to the valve, sometimes checking the working of the steam line by an observation of the nozzle pressure, taken from a Bourdon's gauge placed on the wall. The important point to which it is desired to call attention is that in every case the steam valve is left open the same amount during the whole run.

If we consider the reaction for the formation of water-gas, *viz.*—

$$\underset{1\text{ vol.}}{C + H_2O} = \underset{1\text{ vol.}}{CO} + \underset{1\text{ vol.}}{H_2}$$

we have one volume of steam yielding two volumes of gas. Of course, above 1200° C. the reaction is complicated by the fact that hydrogen acts directly on carbon, forming CH_4, C_2H_6, C_2H_2, &c.; but, since the percentages of these gases in water are small, we may, for the purposes of the following argument, leave them out of consideration. Of two things we are sure, *viz.*: (1) the volume of steam used should, at corrected temperature and pressure, be approximately one half that of the gas produced; (2) if any undecomposed steam gets through the machine we are not running up to the highest efficiency; for (*a*) it is costly to produce the steam in the boiler room; (*b*) the surplus steam passing through the generator has to be raised to the heat of the coke, and this heat is abstracted from the machine; (*c*) this steam must again be condensed in the condensers, thus necessitating the pumping of extra condenser water; (*d*) furthermore, the following reaction, $H_2O + CO = CO_2 + H_2$, is liable to be set up in the space above the coke, and in the carburetter and superheater settings. This reaction begins at 625° C., and comes to an equilibrium which is in accordance with the temperature prevailing in the machine.



The experiments which follow were conducted in three water-gas machines, two of them being those of the United Gas Improvement Company, and the third of the Western Gas Construction Company of Indiana. The length of blow was six minutes, and the length of run eight minutes. In the first place it was observed from the scale-board in the operating room that by far the greater portion of the gas made during the run was obtained in the first three or four minutes. A $\frac{1}{4}$-in. pet-cock was then attached to the superheater of one of the machines, and a "dry run" was made. A thin-walled glass Leibig condenser was attached to the pet-cock, and it was found possible to condense water out of the gas at the latter part of the eight-minute period. Comparing, then, the gas produced and the quantity of steam employed, Fig. 1 may be expected to represent the condition of affairs.

In order to accurately determine the amount of gas produced at short intervals, and to establish a curve on the lines indicated above, various devices were tried, including Pictet's meter, but the best results were obtained by a direct measurement of the rate from the relief holder. A long rod, A (Fig. 1), was suspended from the railing that went up and down with the relief holder by means of a strap iron hook. At intervals of about 30 c.m., gimlet holes were made in this rod. A second rod, B, of the same dimensions as the above was made, and pointed at one end. The other end was secured to a heavy wooden block placed on the stone coping of the gasometer, and held in place by weights. A third strip, C, was prepared, with a thumbscrew in one end, and strips of heavy paper secured to it by means of tacks. In this way the rod C could be quickly fastened to A in such a way that the upper part of the strip of paper on C would be level with the bevelled point of B. A small hook was screwed in B at the point indicated, and a watch hung on it. All the water-gas machines except one were stopped, and the exhauster pumping from the holder was also stopped. When the machine began "the run" the holder would begin to rise, and, every 15 minutes, marks were made on the strip of paper opposite the point of B. The strips of wood were sufficiently thin to permit of them all being grasped in the left hand at once, and so the above markings could be quickly and accurately made. These measurements were continued over several days with both "dry" and "wet" runs. The best curves were obtained on calm days, as the slight movements of the holder caused by wind showed in the curves which were subsequently plotted. It was also found possible to obtain fairly good curves with the exhauster running by having the engineer maintain it at a constant rate, and by noting the rate from a slip of paper both before and after "the run." Very accurate measurements were taken of the capacity of the holders, and a table prepared for convenience in calculation. The distances between the marks on the strip of paper were transferred to a finely-divided rule with dividers, thus giving the number of inches between the markings, and by consulting the table this was readily transferred to cubic feet of gas produced per 15 seconds.

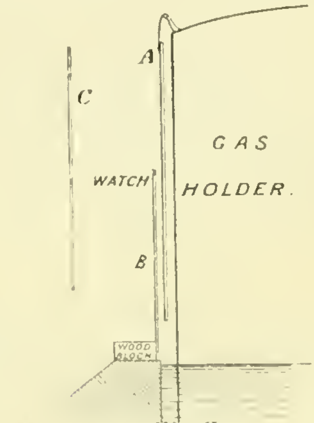


Fig. II.

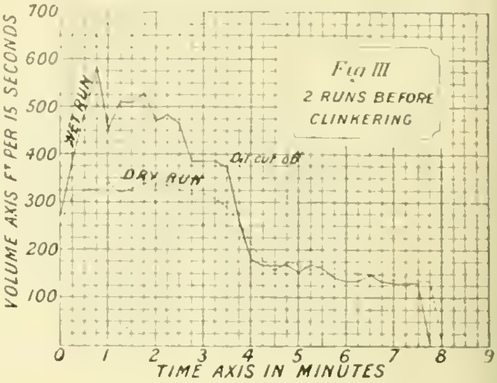


Fig III

2 RUNS BEFORE CLINKERING

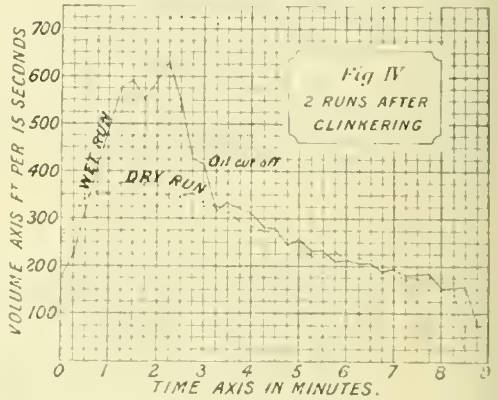


Fig IV

2 RUNS AFTER CLINKERING

In the curves produced we have nearly one minute consumed in reaching the maximum rate of output. This is accounted for by the following facts:—(1) The initial fraction is cooled below its average temperature on entering the condenser. (2) In the case of a wet run a certain amount of time is used up in admitting the oil, the inflow of which gradually rises to a maximum. (3) The mains and the gas already in the holder is further removed from the temperature of the first fraction of the gas than from that formed in the succeeding part of the run. For these reasons the true curve of make conditioned by the internal state of the generator should, without doubt, be parallel to the time axis. This fact would tend to increase the output of the first three minutes above that shown in the curves actually obtained, and, *ipsa causa*, decrease the output of the latter part of the run. This would be an added argument for the method of operating proposed later on.

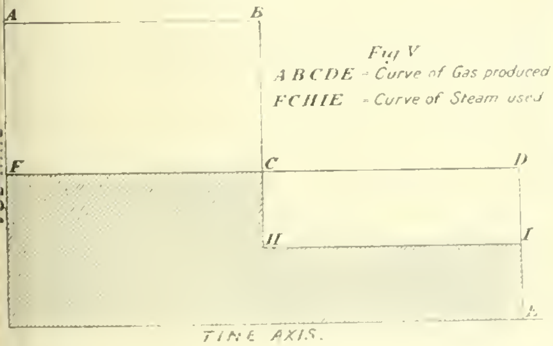
From the curves shown it is apparent that the curve falls off enormously between the third and fifth minute in every case, which is about the time that the oil is cut off in the production of a gas of from 18 to 25 c.p. It would seem to be well, then, to cut the steam supply down to one half directly after cutting off the oil supply. This would be in accord with the convenience of the men in operating the machines. Furthermore, it would be approximately correct, and would allow the machine to have its full capacity during the beginning of the run, thus securing the maximum daily output. This being settled upon, it becomes of importance to know just how much steam passes the inlet valve, and how much it is necessary to close the valve to cut that supply down to one half. A series of experiments were done on globe valves to determine the above, and it was established beyond a doubt that no simple relation exists between the number of turns a globe valve is opened and the amount of steam which passes in a given time. Some better control of the steam is evidently necessary. This is to be found in the nozzle pressure appliances which are attached to most water-gas machines. Rankin, after a consideration of Napier's work on the subject, gives the following empirical formula for the amount of saturated steam escaping from a chamber where the pressure is p, through a short pipe and nozzle into a space where the pressure is p_a :—

(1) Where p = or $> \frac{5}{3} p_a$, $w = \frac{ap}{70}$.

(2) Where $p < \frac{5}{3} p_a$, $w = \frac{a\,p_a}{42} \left(3\,\frac{(p - p_a)}{2\,p_a}\right)^{\frac{1}{2}}$.

In the above formula w = the number of pounds of steam delivered per second, and a is the area of the orifice in square inches. In water-gas practice conditions are somewhat different from the experiments on which the above formulæ were established, insomuch as we have a long steam line, and take the nozzle pressure, not from the boiler, but between the steam valve and the nozzle, at a point past which the steam is moving rapidly. If we apply the above formula, taking p as the indicated nozzle pressure, then p = 30 to 40 lb. per square inch, while p_a is measured in a few inches water pressure, and the first formula applies; from which it follows that the amount of steam delivered in a given time varies directly with the nozzle pressure, and also directly with the area of the orifice. A series of experiments testing the accuracy of the above formula under water-gas conditions would be interesting.

Conclusions.—From actual experiments carried out, extending over more than a month, in which the nozzle pressure was cut down by one half after the fourth minute, a considerable saving in coke was effected, and the composition of the gas was in a measure modified also, its carbon dioxide contents being lowered. Under this system of working the gas and steam curves would resemble Fig. 5, though a curve of this kind was not actually taken from the machines. The above remarks apply where gas coke is used in the generators; modifications may be expected in the case where anthracite coal is employed. From the curves just after clinkering, it is apparent that the machine's capacity could be increased by dividing the blow into three periods, and cutting the steam down to one-third each time. It being possible, therefore, to approximately regulate the amount of steam admitted during the run in accordance with the curves obtained, the yield of gas is increased, and the machine can be run up to its highest efficiency owing to the fact that the conditions causing imperfect working, indicated under (*a*), (*b*), &c., no longer exist.



The author wishes to acknowledge his indebtedness to Prof. W. R. Lang, of the University of Toronto, for the advice and assistance rendered in collating his experimental results.

London Section.

Meeting held on Monday, December 7th, 1903.

MR. WALTER F. REID IN THE CHAIR.

THE MANUFACTURE OF CYANIDES.

BY DR. J. GROSSMANN.

A full account of the bibliography of cyanides up to the year 1902 will be found in an excellent book which appeared during this year, entitled "l'Industrie des Cyanures," by R. Robine and M. Lenglen. Generally speaking, the methods which are used and have been proposed to be used for the manufacture of cyanides are based on the following principles:—

1st. Conversion of ferrocyanide into cyanide by melting with metallic sodium or other substances.

2nd. The production of cyanide by the action of ammonia on charcoal and carbonate of potash, or other potash salts.

3rd. The action of ammonia on metallic sodium.

4th. The production of cyanide by the action of nitrogen on charcoal and carbonate of potash or other potash salts.

5th. The production from sulphocyanides by melting processes.

6th. The production from sulphocyanides in solution by oxidising processes.

7th. The production from "Schlempe." (?)

A few of these processes are more or less well known, and reports on them may be found in the literature and in the patent records of this country; others are still on their trial. In many cases the difficulties of obtaining cyanide have been and are greater than appears on the surface; for it is not only necessary to turn out an article containing cyanide, but the requirements of the market are, that the finished product should contain at least 98 per cent. cyanide of potassium, and be free from certain impurities, particularly sulphide. As it is extremely difficult to obtain raw materials free from sulphate, and as at a melting temperature sulphates are reduced by cyanide to sulphides, it is clear that this particularly objectionable impurity will be found in nearly all cyanides which have been produced by a melting process.

The most important question which at present is occupying the minds of those interested in the cyanide industry is to determine which in the future will be the cheapest source from which to proceed. Will it be cheaper to use the cyanogen recovered from coal gas as the raw material for the manufacture of cyanide, or will synthetic processes prove the cheapest? Mr. Beilby, in his address before the International Congress for Applied Chemistry in Berlin, has gone into this question, and has come to the conclusion that the future lies with the synthetic processes. But though no one is more competent to speak on cyanides than he, I cannot accept the conclusions which he draws from the figures he gives in his address. At the present moment, no doubt the producing power of the different cyanide works is greater than the demand. The Transvaal, which before the war used nearly 3,000 tons per annum, has been out of the market for three years, causing a loss of 8,000 tons to the commonwealth of the producing nations. Even now it only uses one half of what it did before the war, and of that quantity a considerable amount is still supplied, under old favourable contracts and at remunerative prices, by manufacturers who are working old, or comparatively old, methods. The brunt of the competition has so far fallen on the new processes, which have no old favourable contracts to compensate them for the present abnormally low prices, and who have still to write off their plant under exceptionally unfavourable conditions.

The consumption of cyanide in the Transvaal will have to become normal, and more than normal, before it will be possible to judge which principle of manufacture and which individual processes will prove the best and cheapest.

The cyanogen recovered from gas works is either in the form of ferrocyanide or of sulphocyanide. Either of these in the form of the soda compound contains cyanogen equivalent to 21 per cent. of ammonia. Reckoning the ammonia value at 45*l.* per ton, the value of the cyanogen is therefore about 9*l.* 10*s.* per ton of ferrocyanide. The value of the soda, calculated on caustic soda, is about 5*l.* 10*s.* per ton. It therefore follows that the intrinsic value, apart from labour and general charges, is 15*l.* per ton. Now it must be borne in mind that if the gas works were paid for the labour in getting out these products, which, especially in the new processes by Bueb and others, is extremely small, plus the price of the caustic soda used, the difference between the cost of these items and the selling price would represent the amount of profit; and the question, therefore, is whether the synthetic processes could compete on the assumption that the gas works were to turn out sufficient quantities of ferrocyanide or sulphocyanide. As regards sulphocyanides, they may be left out of consideration, as the only economical processes for the recovery of cyanogen compounds from gas are those proposed by Bueb, and similar ones, and these processes do not yield sulphocyanide in any quantity, but chiefly ferrocyanide. As regards the quantity which the gas works could produce, it is far in excess of what is likely to be required for the manufacture of cyanides. The gas works in this country alone could produce sufficient ferrocyanide for the manufacture of 1,000 tons of cyanide per week, and to this would have to be added what could be produced in France, Germany, America, and other countries. If we assume that the possible production of the world from gas works of ferrocyanide would be only double that of the United Kingdom, the amount of ferrocyanide available for the world's consumption would be 150,000 tons per annum; and taking the value of the cyanogen as only equal to that of ammonia, it would represent a yearly value of a million and a half pounds sterling. It is not likely that such a valuable commodity will be wasted for a much longer time; for although the cyanogen compounds recovered by the gas works could not be all sold as such, they could always be converted into ammonia salt. And if ammonia, which at present is considered the most likely raw material for the synthetic production of cyanides could actually be commercially obtained from cyanide products, recovered in the manufacture of coal gas, the methods which are based on the conversion of ammonia into cyanide would become obsolete. In his admirable address, read before the International Congress of Applied Chemistry, in Berlin, June 1903, Mr. Beilby shows that of the total number of cyanide factories more than one half use at present ferrocyanide as a raw product, and convert it into cyanide by melting with metallic sodium, and it is this point which appears to me to be the weakest point in Mr. Beilby's arguments. For the metallic sodium alone, not taking labour and inevitable loss into consideration, costs theoretically more than one penny per pound to produce cyanide from ferrocyanide. The synthetic processes have, therefore, up to the present had to compete only with a process which is extremely expensive. If, therefore, it should be possible to reduce the expense of converting ferrocyanide into cyanide, the whole of these works, consisting of one half of the total producing power, would be thrown out of competition, leaving barely sufficient producing power for the synthetic production of cyanide to cover the world's requirements, especially as the producing power estimated by Mr. Beilby does not give a guarantee that the product obtained is in all cases of commercial and economical value, and a paying venture.

But apart from these considerations, on which the future of the cyanide industry depends, it is well known to cyanide manufacturers that the purification of cyanides is one of the most difficult problems, and one which has never been solved satisfactorily. To purify, for instance, a cyanide containing sulphocyanides, ferrocyanides, sulphides, and carbonates, and similar impurities is a task involving great expense and labour. On the other hand, it is extremely easy to convert an impure cyanide into a very pure ferrocyanide, so that if it were again possible to convert this ferrocyanide cheaply into pure cyanides, the extra price of converting the cyanide back int cyanides through ferrocyanide will still be the cheapest These considerations have led me to give particula attention to the question, whether it is not possible t design a process by which ferrocyanide can be cheapl converted into pure cyanide, and it is the outcome of my work on this subject which I beg to lay before you now.

One of the most interesting features of technical chemistr lies in the fact that some of the simplest processes which have been known for many years, and practised in th laboratory, have not been applied to work on a large scale because for the time being no suitable machinery could b designed. One of these is the process of preparing prussi acid from ferrocyanide by distilling the latter with sul phuric acid. This observation was made by Scheele a far back as 1782, and since then the process has been studied by a great number of investigators; and it can only be attributed to the facts stated above, and to th apparently dangerous nature of the operation, that no one has carried this process through with a view to its technica application for the manufacture of cyanides. Another reason may be that it has been chiefly studied by pharmaceutica chemists with a view to producing an officinal solution o prussic acid, and without consideration as to expense Thus the fact that only part of the available cyanogen was evolved as hydrocyanic acid, did not appreciably effec their work. It became necessary to arrange the cycle of reactions in such a manner as to render the process absolutely quantitative before it became one of technical utility.

Erlenmeyer, on studying the properties of the residue from the distillation of ferrocyanide with acid, found that the insoluble residue of potassium ferro-ferrocyanide could be qualitatively converted into ferrocyanide by heating with caustic potash, and gave the equation—

$$K_2Fe_2Cy_6 + 2KOH = K_4FeCy_6 + 2Fe(OH).$$

But on examining this reaction quantitatively I found that it does not proceed on these lines. The yield was invariably far below theory, ranging only from 70 per cent. to 80 per cent. of the ferrocyanide which should have been obtained. It was, therefore, out of the question that ferrocyanide could be recovered from Everitt's salt by boiling it in the ordinary way in a closed vessel with caustic soda, so as to produce ferrocyanide of soda and ferrous hydrate. But I found that if air was blown through the mass during boiling, so as to oxidise the ferrous hydrate produced to a higher state of oxidation, then the ferrocyanide was recovered quantitatively, clearly showing that whereas ferrous hydrate and ferrocyanide form an insoluble compound, a higher state of iron oxide and ferrocyanide do not form an insoluble compound. I have, moreover, found that even working always under the same conditions, the yield of ferrocyanide is not absolutely constant, though it closely approaches the one half, but that whatever shortage or surplus of prussic acid is obtained is compensated by the larger or lesser quantity of ferrocyanide recovered, and that the process is an absolutely quantitative process.

The reactions upon which my process is based may, therefore, be briefly summed up in the following equations:—

$$(1)\ 2Na_4FeCy_6 + (3 + x)\,H_2SO_4 =$$
$$6HCy + Na_2Fe_2Cy_6 + 3Na_2SO_4 + xH_2SO_4.$$

$$(2)\ 3Na_2Fe_2Cy_6 + 6NaOH + yO =$$
$$3Na_4FeCy_6 + Fe_3O\,(3 + y) + 3H_2O.$$

$$(3)\ NaOH + HCy = NaCy + H_2O.$$

in which x represents any figure up to 3, and y any figure up to 1, or even exceeding it. Although the reactions do not take place absolutely quantitatively if we consider our equations separately, yet if we take the complete cycle of the three reactions, the result is always quantitative. Thus, in a batch in which 133·1 lb. of ferrocyanide of sodium were worked up, the sum of the cyanogen obtained as prussic acid, and that recovered as ferrocyanide of sodium, corresponded to 132·1 lb. of ferrocyanide of sodium, showing an actual yield of 99·3 per cent., and this loss of 0·7 per cent. even includes the loss in boiling to dryness.

As the full particulars of the process will be found in the English Specification No. 36 of this year (this Journal, 1903, 1130, 1194), I need not go into the details of plant and of the strength of solutions of the materials. Broadly speaking, the necessary quantity of sulphuric acid of proper strength is run into a solution of ferrocyanide of sodium, and the evolved prussic acid is absorbed in caustic potash or caustic soda solution, or a mixture of both. The distillation is carried on in a partial vacuum, and the apparatus is arranged in such a manner that no accident could possibly occur to the workpeople, and in the course of the manufacture of many tons of this product I have had no accident, not even a complaint of any inconvenience from the workpeople. The solution of cyanide obtained in the process is boiled down in a vacuum pan of special construction, and the product is delivered in the form of pellets, free from dust, and in a very pure form. I consider that these pellets should be of great advantage in the cyaniding of gold, as the workmen who have to dissolve them need not handle the cyanide at all when it is in that shape. A curious fact is also that these cyanide pellets, being practically a hydrated cyanide, dissolve more easily in water than the melted form. If it is desirable to produce the melted cyanide, this can be easily done by carrying the drying of the cyanide further, and then melting the powder thus obtained; but I consider it far preferable not to melt the cyanide, as I have never come across cyanide produced in that way which does not contain at least traces of sulphide, whereas cyanide made by the wet process is absolutely free from it.

It will be noticed from equation 1 that another by-product, sulphate of soda, is produced during the reaction, and I have based on that fact a process which enables us to produce cyanide of sodium or potassium even more cheaply than in the process stated above. The equations representing this are as follows:—

$$(4)\ 2HCy + Ca(OH)_2 + Na_2SO_4 = 2NaCy + CaSO_4 + 2H_2O.$$

and it can be seen from this equation, which is borne out by facts, that sulphate of soda and cyanide of calcium decompose easily into cyanide of sodium and sulphate of calcium. But the fact that sulphate of soda is obtained as a by-product can be utilised in a different manner, which ultimately should be of great importance to the gold mines using cyanide.

It is well known amongst those conversant with the manufacture of cyanides, that the cost of packages, and the cost of boiling down or melting, form a heavy percentage of total cost, and if these costs could be saved, and if cyanide could be produced in solution by the mines themselves on the spot, where the cyanide is to be used for gold extraction, the saving to the user would be very considerable. At the first glance it would appear that the method which I discussed last, that of using the recovered sulphate of soda in conjunction with lime for the production of cyanide, would fulfil those requirements, but that is not so. In nearly every locality where cyanide is used for gold extraction, the cost of sulphuric acid would be prohibitive, and although lime and coal might be found cheap enough, the extra cost of sulphuric acid would nullify every other saving. But where the cost of transport is great, there should be no great difficulties in the way of electrolysing the recovered sulphate of soda on the spot, and reconverting it into caustic soda and sulphuric acid, so that in the end the cost price of cyanide at the mines would not be much higher than the cost price of the ferrocyanide in proportion to their respective equivalents.

To sum up, it appears probable that the outcome of the reactions which I have laid before you may affect other industries besides the manufacture of cyanides. As regards that industry, it is possible that in the course of time the gold mines may produce their own cyanide in solution, either in each mine or in convenient centres, from which a number of mines could be supplied. It should certainly supersede the processes in which metallic sodium is used for the conversion of ferrocyanide into cyanide. But the process which I have described should be of particular interest to gasworks, as it opens up a question which, to my knowledge, has never been approached, viz., the technical conversion of prussic acid into ammonia.

As far back as 1897 Charles Hunt (J. Gas Lighting, 1897, p. 18) considered that cyanide could be obtained cheaper from gas than by any synthetic method. But the methods for recovering these compounds from crude gas advocated by Knublauch, Foulis, of Glasgow, Wilton, Bueb, and others, have not received the attention in this country which they deserve. This, no doubt, is to some extent due to the commercial reason that if the gasworks were to recover all the cyanogen as ferrocyanide there would be no sale for the greater part of that product. But the fact that I have shown it to be possible to obtain the cyanogen from ferrocyanides quantitatively, and without the least danger, as prussic acid, and the property of prussic acid of being easily converted into ammonia and formic acid, appear to me to put a different complexion on the recovery of cyanogen from gas; as what could not be sold as cyanide or ferrocyanide could be sold in the form of ammonia salts, and as formic acid.

DISCUSSION.

Dr. Colman remarked that it appeared to him, on looking at the equations, that it was by no means certain that the process would be cheaper than the one in which sodium was used. Dr. Grossmann started with Na_4FeCy_6, but sacrificed the whole of that Na_4 by acting on it with sulphuric acid. He was neglecting now the suggestion that the resulting sodium sulphate could be afterwards electrolysed, and the sulphuric acid and caustic soda recovered. A portion of the Na_4FeCy_6 was converted into $Na_2Fe_2Cy_6$. To reconvert this into Na_4FeCy_6 it was necessary to use two more molecules of caustic soda. Altogether six molecules were used, and then another six were required to convert the prussic acid into sodium cyanide, bringing the total up to 12 molecules of caustic soda in place of two atoms of sodium. Although caustic soda was much cheaper than sodium, it would require eight times as much. Further, in the conversion of sodium ferrocyanide into cyanide with metallic sodium, there was no solution to be evaporated, so that the fuel cost of Dr. Grossmann's process must come out higher. Of course there was always a loss of metallic sodium in the manufacture of cyanide; he did not know how much, but that must be taken into account. He did not gather whether the yield of sodium cyanide from the hydrocyanic acid after evaporation was quantitative.

Dr. Grossmann said there was no loss of cyanide during evaporation.

Dr. Colman pointed out that the author had stated no process could be considered in connection with gas works other than the ferrocyanide one; and it was quite true that up to the present the greatest quantity of the cyanides in gas had been recovered in the form of ferrocyanide. This, however, was mainly due to the fact that the demand for ferrocyanide was greater than that for sulphocyanide. There was no reason whatever why sulphocyanides could not be obtained from coal gas equally well, and, he thought, more cheaply, than by any process at present in use for making ferrocyanides. Whether it were better to manufacture ferrocyanides or sulphocyanides would depend on the prices obtainable for the two products, and this in turn would be determined mainly by the relative cost of converting these into cyanide.

Mr. A. G. Bloxam regretted that Dr. Grossmann had not considered more closely the question of recovering cyanogen from coal gas, in the form of sulphocyanide. Eight or nine years ago he made a series of experiments at the South Metropolitan Gas Works, and found that by passing the gas after it left the ammonia scrubbers through polysulphides, sulphocyanide was formed without any loss whatever. All the cyanogen was recovered as sulphocyanide, and the separation of this compound from the remaining polysulphide, if such remained, was quite easy. Then the difficulty came in, was there any market for sulphocyanide? He came to the conclusion at that time there was not, and if anything was to be done it must be by way of winning the hydrocyanic acid directly from the sulphocyanide. But since then, much work had been done on the oxidation of sulphocyanides, particularly with nitric acid, and doubtless in the near future Raschen's process, or some modification of it, would enable them to recover the whole, or practically the whole, of the hydrocyanic acid from the sulphocyanide. The process to which he referred was the oxidation of sulphocyanides by nitric acid, and the recovery of oxides of nitrogen as nitric acid, which was returned automatically to the retort. Unless Dr. Grossman's process were a continuous one, there would be difficulties in getting it adopted. In this case it seemed that they first had to distil with sulphuric acid, and then treat with caustic soda, and so separate the ferrocyanide from the other matters formed by that reaction, and then to distil again with sulphuric acid, so that there did not seem much chance of making the process continuous. What degree of purity was obtained in the final product, and, in evaporating down, was all the prussic acid obtained? The author said he got it all, but was it not necessary to use a large excess of caustic soda to retain it, so that ultimately there would be a mixture of caustic soda and cyanide instead of the cyanide of 98 per cent. obtainable by other processes?

Mr. J. C. Richardson enquired if the author proposed to introduce electrolysis for the recovery of the sodium at the end of the process, why did he not introduce it at the beginning, and so effect the reduction of the salt? With regard to the first reaction, which was said to be a distillation under reduced pressure, had the author applied pressure and obtained any altered or more efficient results? It seemed rather a roundabout way to get about the same results as were already obtained by metallic sodium, the production of which he believed could be done now very economically by means of cheap water power. What electrolytes would be used for the recovery of the sodium, and what apparatus? With regard to the absorption of hydrocyanic acid by means of alkali, and the importance of excluding the presence of sulphides, probably if the alkali were an electrolytic product the sulphides would be reduced to a minimum. Had the author tried the result of blowing in other gases, CO_2 for example, instead of air?

Dr. H. P. Stevens asked if Dr. Grossmann had tried distilling the cyanide with an acid in the presence of an oxidising agent. On one occasion he had tried that experiment with a nitrate in solution in a somewhat large quantity, and the distillation was carried almost far enough to produce red fumes. The whole of the cyanide was in the distillate as hydrocyanic acid. He thought it possible that quite a small quantity of an oxidising agent, perhaps a less expensive one than nitric acid, might be used, and in that way the whole of the cyanogen obtained as hydrocyanic acid in one operation.

Dr. J. Lewkowitsch asked what strength of sulphuric acid was used, because he thought the hydrocyanic acid would come over considerably diluted with steam. Would it be of any advantage to get some of the hydrocyanic acid as a liquid?

The Chairman said that some of the mines in the Transvaal were almost entirely dependent on the use of cyanides for their profits, and therefore the production of cheap cyanides was a very good thing for them, even if not for the manufacturers. There were two legitimate ways of altering prices, either by diminishing production or increasing consumption, and the latter alternative appeared in this case to be the most hopeful. There were many uses for cheap cyanide which would materially increase the demand, and so counterbalance the extra production with depressed prices. In the United States, which was practically excluded from our manufacturers by a tariff wall, there was a large consumption of cyanide for agricultural purposes. He was informed that the extensive orange industry in the Southern States and in California was threatened almost with annihilation by a parasitic scale, but which was now completely destroyed in well-managed plantations by cyanide. A tent was placed over each tree, and within it hydrocyanic acid was evolved. Some of our farmers who complained about blight in hops and similar crops might follow suit. Another thing that rather hampered our manufacturers with regard to potassium cyanide was that potash had to come from abroad, Germany having practically the monopoly of it, and he did not see how they were to avoid that. Sodium cyanide of course was different. With regard to the use of cyanides for other purposes in connection with organic chemistry, Dr. Grossmann had mentioned formic acid; they, however, did not know what use could be made of this acid, because it had never been cheap enough. If it could be produced cheaply, there would probably be a great opening for it, in the same way as with lactic acid, which was now being used for a number of purposes. Those who were engaged in the cyanide industry should do all they could to develop these openings, but in any case the use of cheap cyanide was a very great advance for humanity.

Dr. Grossmann, in reply, said he did not know whether Dr. Colman was quite correct in stating that no solutions had to be evaporated; there was no doubt there was a considerable loss of metallic sodium, which was a far greater expense than evaporation of comparatively strong solutions. The iron residues had to be separated from the melt in the melting process, so that more than a quantitative amount of metallic sodium was used, and a certain amount of cyanide of sodium or potassium which adhered to those iron residues had to be recovered. It was not so clear and simple a process on the large scale as it looked on paper. The claim he made for his process was that it was exactly the reverse. It was a far simpler process on the large scale than it looked on paper. Dr. Colman also said that up to the present time most of the cyanide which had been recovered from gas had been in the form of ferrocyanide, but that the gas works, if they liked, and had an outlet for it, could have made it into sulphocyanide. He could not enter into a discussion of this point. He did not profess to be a gas manufacturer; but on reading the literature, it seemed that the principal processes used now on the continent and in this country in gas works, of which results had been published, dealt with the recovery of cyanogen from gas in such manner that chiefly the ferrocyanide was recovered, and in those processes 95 per cent. of the cyanogen was in the shape of the ferrocyanides and only about 5 per cent. as sulphocyanides. In the old process of recovering cyanides, he always understood the sulphocyanide was a very great nuisance, apart from being unsaleable. He was quite aware of Raschen's process, which was a most ingenious, and, as far as he could judge, a most successful one. At the same time Raschen must use sulphuric acid, and he also used nitric acid, as well as caustic soda or caustic lime, so that he could not see that it altered anything. It simply became a question for the gas works to choose between two methods, one giving them cyanogen in a beautifully crystallised form, which would keep for any length of time, which was not hygroscopic, and which could be transported and might easily be worked up, and any other yielding troublesome substances like the sulphocyanides, which are hygroscopic and difficult to crystallise. He did not know Mr. Bloxam's process for the recovery of the cyanogen as sulphocyanogen, as it had not been published, and he must confess that if he had to choose between two methods, one giving him a crystallisable salt, and another giving him the sulphocyanides, of which he knew all the disadvantages, he should prefer the ferrocyanide. It would, of course, become a question of cheapness and efficiency with the gas works. His process could be made continuous in a very simple manner. There was no difficulty about it on the large scale. It need not be made absolutely continuous, for it could be stopped at a certain time, and the product worked up afterwards in batches. Mr. Bloxam also asked him the degree of purity obtained in the finished cyanide, and to that he could only say that every batch was tested, and there was a very slight loss of hydrocyanic acid in evaporation. Taking everything into account, all the losses came to 0·7 per cent. The process had been tested very carefully, and the results were checked by others more competent in analytical work than himself. There was absolutely no impurity in the cyanide except water, if that could be termed an impurity. In making sodium cyanide they boiled down to the point when the salt was in such a state of hydration that it tested 98—100 per cent., calculated on potassium cyanide. If they wanted to make the so-called commercial cyanide of potassium (which was not cyanide of potassium, as they all knew), they mixed a judicious quantity of potassium cyanide with the sodium cyanide, and stopped at the point when the product tested was 98 per cent. It could have no impurities except those which might get in by the decomposition in the boiling down, and that with proper apparatus could be avoided. Mr. Richardson asked why he did not electrolyse at first. Dr. Grossmann said it would not pay in this country to make caustic soda and sulphuric acid by electrolysing the sulphate of soda, but in the Transvaal the cost of sulphuric acid at the mines was anything from 10*l.* to 20*l.* per ton; the case was different.

Mr. de Mosenthal said these figures were not correct.

Dr. Grossmann said he was informed that that was the price at some mines, and he was also told that the cost of carriage from this country to the mines of any chemical came to from 7*l.* to 10*l.* per ton. Whichever way it was taken, the cost of the sulphuric acid would be a very considerable item. Now, supposing cyanide were made at the mines, then, taking the cost of the packages alone at 3*l.* 10*s.* per ton of cyanide, and the cost of evaporation at about 2*l.*, there was a saving of 5*l.* 10*s.*, which would leave that as the margin for cost of electrolysing. But he had only thrown this out as a hint; it was not a material part of the process, and he should certainly not attempt electrolysing the sodium sulphate in this country. As regards the blowing in of carbon dioxide instead of air, he did not see why he should not use the cheapest material, consequently he always used air. Then a question was asked, if he had tried to work it under pressure? He could only say that anyone who wished to make prussic acid under pressure would find it an extremely dangerous undertaking. With regard to distilling in the presence of oxidising agents, particularly nitric acid, which was referred to by Dr. Stevens, if a process could be obtained which would do that, it might have some advantages, or it might not. The great advantage of working with sulphuric acid was that there was no difficulty whatever with regard to plant. Lead could be used, as it was not attacked by prussic acid; ron could also be used except in presence of sulphuric acid, and there was no danger of any explosive compounds being formed. Nitric acid or nitrates were substances which he greatly objected to in conjunction with cyanides. It was well known that in the Raschen process at the outset there was a serious explosion caused by some compound of an explosive nature, the formatian of which had not been anticipated, through the interaction of nitrous fumes and prussic acid. He had not gone far into these experiments, if for no other reason than that they involved a certain amount of risk, which he had succeeded in minimising in his process. The strength of the acid he used was about 20 per cent. Whether hydrocyanic acid as a liquid would be useful he could hardly say. It could not be used for the extraction of gold, and he did not think it would be of any use, except that it could be easily converted into ammonia and formic acid.

Manchester Section.

Meeting held on Friday, December 4th, 1903.

MR. J. CARTER BELL IN THE CHAIR.

PROGRESS IN THE MANUFACTURE OF SULPHURIC ACID, AND ITS EFFECT.

BY OSCAR GUTTMANN, M.INST.C.E., F.I.C., F.C.S.

With the publication of patents on the "contact" process f manufacture of sulphuric acid by the Badische Anilin ud Soda Fabrik a revolution has set in in this most important industry. A number of apparatus, based on the ame principle, have since been patented, and many factries have adopted one or the other of them. This, gether with the fact that the Badische Anilin und Soda Fabrik and several other factories have gradually pulled down their lead chambers, created something like a scare amongst manufacturers. Their apprehensions became graver when prices were threatened, whilst the smaller manufacturers seemed to be debarred from adopting the new process, it becoming known that the smallest plant with which the contact process would pay was 20 tons of monohydrate per day. Nevertheless, it seemed to me that many difficulties might have to be overcome before the various contact apparatus were a perfect success, and that, however much the old process was in need of improvement, competition would soon bring this about. A number of improvements, some new, some old inventions, are now being applied to the chamber process, and the remarkable results claimed for them may restore it to a more comfortable position. I have, during the last two years, had special opportunities of seeing a good number of modern or modernised sulphuric acid works, and can therefore give an impartial report on the latest developments in this industry.

All the chemical reactions taking place in the chamber process have been carefully studied by Lunge and others, and should be now fully understood. It is, however, the physical and mechanical side of the process that claims more attention, and in which improvement can still be made. Thus the ordinary kilns, which necessitate much labour, have been superseded for large productions by mechanical burners, like the Herreshoff, McDougall, Frasch, and other furnaces. The pyrites for these must be reduced to a very small size, and the result is much dust, necessitating large dust chambers, which do not always work satisfactorily. This has led several factories to abandon them again, whilst others are experimenting with some modifications. The trouble was overcome by some factories erecting tangential dust chambers on the principle of Meyer's acid chambers, which seem to give very good results.

With regard to Glover towers, it is becoming more general to line them with segments of volvic lava, as Delplace did 20 years ago. This gives a small number of joints, and the structure is not liable to collapse or bulge out like brickwork. A perfect filling material has yet to be found. The enquiry instituted in this country by Mr. Spence as to the value of cylinders resulted in their condemnation, and this is now recognised as correct elsewhere. They are, however, better than bricks, if properly built up. Bricks having an opening in the centre and channels on the top, so as to retain a layer of acid, are sometimes used, and act fairly well. In America quartz filling is preferred, because it is easier cleaned from the large quantity of dust produced by the mechanical furnaces. This dust question will have to be tackled sooner or later, because the Glover acid is really spoilt by having to run over accumulated dust sludge, whilst if this were successfully retained by dust chambers, filters, or other means, even perhaps at the expense of reheating the gases, better acid for a good many purposes could be obtained.

The old method of nitre ovens is dying out, and is now practically unknown on the Continent, everybody charging nitric acid through the Glover tower. This certainly enables one to regulate the admission of nitrous gases more accurately and has resulted in much economy.

There is no need to tell you anything about the manufacture of nitric acid, but I take this opportunity to state, with the full approval of my friend Prof. Lunge, that in the new edition of his book on sulphuric acid, which will be a lasting monument to this wonderful worker, my own system of nitric acid manufacture has, without his fault, been explained by incorrect statements and plans, supplied to him without my authority.

The Gay-Lussac towers are much improved already, and more will be accomplished soon. Coke filling has given way almost universally to material which is not attacked by the nitrous vitriol. Rings, saucers, and all kinds of moulded pieces of earthenware are now carefully and symmetrically placed into them, but they generally allow the gases to pass through too rapidly, and therefore high towers are required. Plates and hollow balls are gaining ground for absorption towers, and are certainly more efficient. It becomes a practice now to make two short Gay-Lussac towers instead of one high one, and this is no doubt more rational, since the gas is less likely to follow a straight course and thus better absorption is secured, and also because there is always a tower available should one require repair. A further saving of nitre is accomplished by the employment of a central Gay-Lussac tower, which takes the exit gases of two or more sets, and this is now becoming a general practice.

A good deal has been said and written about intermediate towers. Those who think that these intermediate towers can entirely replace the chambers are, in my opinion, not considering the mechanical effects properly. Intermediate towers, no doubt, show a very high producing capacity per cubic foot, as compared to a chamber. It is, however, not in the production of the bulk of the acid, but in separating out the last portion, that a chamber is efficient. The proper function of an intermediate tower is to promote chemical and mechanical reaction, and of the chamber to give the mist of acid the requisite time and space for separation. All the towers that I have seen, which were arranged on this principle, and whose dimensions and those of their admission and exit pipes were correctly proportioned, acted very well. Mr. Gilchrist (this Journal, 1899, p. 466) said: "So long as there are obstructions for the gases to come in contact (with) there will be additional reaction, causing the formation of sulphuric acid, which is best deposited in the conditions existing in the chamber." Where the gases are still hot, as immediately after the Glover or after a first short chamber, the Gilchrist towers, as described by Mr. Falding in "Mineral Industries," VII., 1899, are very efficient. They are lead towers traversed by a large number of circular or oval lead pipes communicating with the air, and they cool the gases very well. When, however, the temperature does not exceed 80° plate towers are more to be recommended, and hollow balls as filling material will stand a temperature even beyond 100° quite well, whilst the reaction in such towers is undoubtedly more energetic. Intermediate towers have, on account of their high producing capacity, allowed considerable reduction in chamber space, or, in the case of existing plants, large increase of the output.

The chief improvements have been introduced lately in the construction and the working of the chambers, and, in fact, there was, and is, still much room for them. True, in years gone by, glass plates, lead partitions, and such like contrivances were tried, but with indifferent success, since the working of chambers was but imperfectly understood. Acting on Lunge's view that the chief function of the chamber is dissipation of heat, cooling shafts were made through the chambers. One need, however, only work out the small amount of extra cooling surface gained thereby to see that their effect could not be great, although they helped to mix the gases and thus promoted reaction in the chamber. With the same object in view Meyer inserted through the roof of the chamber a large number of cooling pipes in which water circulated, which had, of course, a better effect. It is only within the last four years that somewhat better means were contrived. In the first place the size of the chamber received more attention. Smaller chambers instead of very long ones became the rule, and now the tendency is to make the height greater than the width. Thus Hartmann constructed recently a plant with chambers 5·5 m. wide and 9 m. high, the longest chamber in the set being 25 m. long, whilst the shortest was only 7 m. It was further recognised that efficient mixing of the gases was essential to get a good reaction apart from the cooling action of the chamber. Mr. Porter's experiments with a glass chamber, which he gave in this section a few months ago, showed in a practical manner that the diffusion of gases in a chamber is not at all perfect, and that slight modifications alter the effect considerably. It has, in my opinion, been a fallacy to think that the entrance and exit pipes of a chamber should be rather narrow so as to make the gases travel with an increased velocity. In order to get the same quantity of gas through, the pressure must be increased, and all the more so because on account of the greater friction in narrower pipes there is a loss of speed. As far as the effect of mixing is concerned there is no appreciable difference in a chamber say 30 ft. wide and 80 ft. long, whether a pipe is 2 ft. or 3 ft. in diameter, but anybody looking at Mr. Porter's diagrams, or considering the matter theoretically, will see that three pipes of 21 ins. diameter, entering the chamber a quarter of its width apart, are much more efficient than one pipe of 36 ins. diameter, although the areas are the same. With the same object in view fans were introduced, first in America and later in France and Germany, where they are becoming more and more general. Even inventors and advocates of these fans only claim for them that they make the working of the chamber absolutely uniform and independent of the outside temperature and wind, which seriously affect the usual chimney draught. It has recently been stated that it really does not matter whether a fan is placed in front or at the end of a system, since the pressure in a chamber is only about 2 mm. of water, so that the whole difference between pressure and draught in a chamber could not be more than 4 mm., which is insignificant. I think, however, this view is wrong. A draught of 2 mm. at the exit end of a chamber will only induce a regular quantity of gas at a definite speed, and Mr. Porter's diagrams have shown you how irregularly the gas will then mix in the chamber. As a matter of fact each molecule of gas will be really drawn away from contact with the one before it. When, however, a fan revolving at a high speed throws a volume of gas of high initial velocity and pressure into a large chamber then you may still have no more than an average low pressure in the chamber, but at the entrance the gases are hurled against those comparatively stationary ones in the chamber, and the result must be a great mechanical effect, which is bound to promote both the chemical reaction and the separation of the liquid from the gaseous mist. The molecules of gas are brought into violent contact with each other, and this is important even with a chemical reaction. Naturally this will only take place at the front end of the chamber, and there will be a calm at the back end, which is again quite useful. That my view is correct is proved by the fact that every tower, whether a Glover or intermediate tower, produces large quantities of acid by the mere impact of the current of gas against obstructions in the shape of filling material, but it is still more apparent in fans. Every fan I have seen, when not placed at the end of the set, separated out quantities of sulphuric acid, and even when placed between the burners and the Glover there was a copious production of acid, due almost exclusively to the violent contact and inter-action of the molecules. It is further one of the reasons why a tangential chamber gives better results. The question may well be asked, why the fan should not be placed right at the beginning, namely, blowing into the burners, or between the burners and the Glover tower. As a matter of fact the Americans are doing the latter (Mr. A. P. O'Brien, of Richmond, Va., was first), and also at least two German factories, in one of which it has been working successfully for more than a year. Of course, only an iron fan could stand the heat, but there is also no reason why it should not behave well against the hot sulphurous acid fumes. I have no doubt that properly constructed fans will be forthcoming. As to fans in other positions, for instance between the Glover and the first chamber, or between any two chambers, or between the first and second Gay-Lussacs, the choice lies between lead-lined iron fans, leaden fans, and earthenware ones. There is not much to choose between them, except that the material has to be selected according to the temperature of the gas. Earthenware fans are now made for large volumes of gas, and of such excellent construction that they compete for efficiency and smooth running with the best iron fans, only they must not be subjected to temperatures exceeding 100° C.

I have explained before how, in my opinion, the chemical reaction is promoted by a mechanical impact. This has been shown in a practical way by other means, although people then thought more of condensing surfaces than of impact. Thus glass plates and lead partitions were placed in the chambers, or these were filled with coke. A very efficient means was a checkered brick partition, but unfortunately such walls have a tendency to slip away bodily in the acid and then to collapse. Since these attempts no improvement in the construction of chambers was made until Dr. Meyer made his circular or tangential ambers. They are plain circular chambers, with an out- t for the gas at the bottom, a few inches up, so as to ave room for the acid to collect. The essential feature of ese chambers is that the gases enter at the top tangenti- lly, whereby they travel along the periphery in a down- ard spiral. That this is really the case has been proved y several observers standing in a chamber into which eam was admitted. Here again we have an increased echanical action; each gas molecule pushes others of sser velocity forward and gradually mixes with them, ence a better effect. The chamber must not have too rge a diameter, else there will be a core of comparative st and inactivity; and the shape of the chamber might also e improved, either by making it annular with a tower in e centre space, or by making the lower part conical, ecause as the central outlet draws the gases away so there ust be a fairly large part of the chamber less operative, if ot a dead corner. These circular chambers are a great ccess. Meyer now guarantees a maximum of 11·6 cb. ft. f chamber space per pound of sulphur charged, with a aximum consumption of 2·7 lb. of nitre for 100 lb. of lphur, which is already a great improvement on the usual 6 to 20 cb. ft. for ordinary chambers. I have satisfied yself that Meyer's earliest plants give the guaranteed ield, and Falding, in "Mineral Industries," 1901, states at at Baltimore they work *in the summer* at the rate of 10 11 cb. ft. per pound of sulphur burned. I agree with r. Falding, who, in the same report, says: "I regard this stem not only as being rational, but also as being the rst and only distinct advance in construction of the lead amber proper."

A further improvement in the working of the chamber is e introduction of atomised water instead of steam. Mr. estner (this Journal, 1903, 333—337) explained fully why is better to let the water abstract from the heat liberated the process, rather than to add to it largely by the con- ensation of introduced steam. This introduction of atomised ater is another one of the important inventions of Prof. ermann Sprengel, F.R.S., which was not recognised from e outset, and for which some people will not even give m the credit. True, he sprayed water by means of steam, d with an imperfect apparatus, but his reasons for the vention were the same as are adduced now, and it is idle pretend that the small amount of steam required made y difference in the principle. His first atomisers were at ork in 1875 at Lawes' chemical manure works at Barking d at Mr. Thomas' works in Paris. The Chemische Fabrik riesheim then found that it sufficed to squirt a very fine t of high pressure water against a flat disc, in order to oduce a fine mist, and they accordingly made a platinum zzle with a platinum disc attached. This system has nce been perfected by Messrs. Hartmann and Benker, who troduced it in a number of plants with great success. hey put through the roof of the chamber a number of omisers, which consist of a platinum tube, with a platinum- idium nozzle and a flat platinum disc, whose distance om the nozzle can be regulated. The nozzle tube is sur- unded by a lead tube, and has a water-seal and lead pipe tached, by means of which the nozzle can be taken out d examined. Care has to be taken not to injure this tle apparatus, because if the disc is in the slightest degree splaced, drops of water will be formed instead of a mist, d I have seen this happening. Another atomiser is made Koertings, which is on the principle of their well-known raying nozzle, constructed from hard lead with the nozzle rt made from retort carbon, whilst the little spiral screw side is made of ebonite. The opening in this nozzle can comparatively large and therefore is not easily choked, d the whole is much cheaper than the platinum nozzle. works very well indeed in several works. The use of mpressed air for maintaining a uniform pressure of about lbs. in the pressure vessel has lately also been dispensed ith by an arrangement whereby any excess of water essure delivered by the pump is automatically relieved.

The increase of the work done by atomised water in a amber of a certain size seems astonishing, until one rks out what difference to the cooling power of a amber it must make. In one case the chambers worked the rate of $8\frac{1}{4}$ cb. ft. per lb. of sulphur ($8\frac{3}{4}$ kilos. of acid 53° B. per cubic metre).

Mr. Falding, in "Mineral Industries," 1901, when speaking of Meyer's chambers, and also of fans and atomised water, said: " . . . . on the other hand, if this system were used in connection with the above appurtenances it is difficult to surmise just what the output of such a plant would become." This was exactly in my mind and that of Mr. Cloud, who visited some works in my company, but, strange to say, only one factory had hitherto the idea of adopting all three improvements simultaneously, the fan being between a de-arsenicating plant and the Glover. The result, however, certainly surpasses expectations. The plant consists of two chambers and two plate towers, of course with Glover and Gay-Lussacs. In the first chamber alone 10 kilos. of H_2SO_4 have been produced per cubic metre, which is equivalent to $\frac{5}{8}$ lb. per cubic foot, or 4·90 cb. ft. of chamber space per lb. of sulphur. In consequence, the two plate towers have practically no work left for them, and the whole plant might just as well have more burners attached. For ordinary chamber work Niedenführ found a yield of 2·5 to 3·5 kilos. of H_2SO_4 per cubic metre in the first chamber, and in the first plain tangential chamber at Harburg 4·4 kilos., instead of the above 10 kilos., when atomised water and fans are added to such a chamber. With all that the proprietor of the works, a graduate and a well-known manufacturer, assured me that he had not yet reached the limit of the producing capacity of the chamber; while its temperature was usually 70°, and sometimes as low as 55°.

The old system of filling an acid elevator and pumping by compressed air into a reservoir at the top of the towers was always one that necessitated the constant attention of a man, and ought to have been superseded long ago. Automatic elevators are now in use, like those of Kestner, or the earthenware "automobil" of Dr. Plath, both of which work very well. I have also seen Mr. Frépont's emulsifier at work, as described in the Zeitschrift für angewandte Chemie, 1903, page 915, and it certainly works remarkably well. It consists of a small lead cylinder, into which leads an admission pipe for the acid and a number of smaller lead pipes for the delivery. These latter are, at a distance of about 2 feet from the vessel, surrounded by a jacket into which compressed air is admitted, and this mixes with the rising acid through upwardly slanting holes in the pipes, thus producing an emulsion of acid and air, which is, of course, lighter than a column of acid only. Hence acid can be pumped, according to the air pressure, to a height several times greater than that it starts from, the maximum yield, however, being when the latter is one-half of the former. The apparatus is simply inserted into an earthenware drain-pipe sunk in the ground. When the Gay-Lussac is very high, then a first emulsifier pumps into a small reservoir half-way up, whence the acid flows down automatically into a second emulsifier, which then pumps to the whole height. With these emulsifiers all the complicated distributing apparatus on the top of the tower is done away with. The delivery pipe enters the closed top of the tower, and the mixture of air and acid strikes with great force against a baffle plate, thus producing a fine spray of liquid at a radius of more than 3 feet. I saw quite a number of these emulsifiers working in an admirable manner, without requiring anybody's attention.

You will not expect me to say much about contact plants. What is generally known about them is contained in the various patents and papers by Knietsch and others, all of which have been duly abstracted in the Journal of the Society, and more is to be found in the latest edition of Lunge's book. What is not generally known, and what I have been able to learn, is of a confidential nature, and is so, perhaps, in some cases, because the results are not always quite satisfactory. Broadly speaking, all contact processes have to rely on platinum for the production of the sulphuric anhydride, and they use it in a state of fine division, obtained by evaporating a solution of platinic chloride on a suitable carrier, such as asbestos, pumice stone, or unglazed porcelain. These, however, lose their catalytic power, the more impurities get into them, and the asbestos also by becoming gradually less loose in structure, wherefore it has to be changed from time to time, and then the recovery of the platinum is somewhat troublesome. For this reason soluble salts, like sodium sulphate, are used in some processes, which under certain treatment form quite a loose mass, and allow an easy recovery of the platinum. Other processes perform the catalytic reaction in two stages. In the process of the Verein chemischer Fabriken of Mannheim, which has been introduced into two factories in this country, the first stage is performed over pyrites ashes, and between 55 and 60 per cent. of the total yield are obtained therein, whilst at the same time dust, arsenious acid, &c., are retained. The second stage is done over platinum contact material, after the gases have been re-heated.

Although all the various systems are made in smaller units—the Mannheim one, for instance, in such of a production of 1,600 tons per year, and that of Rabe in still smaller ones—yet it is generally assumed that the large amount of apparatus, labour, and technical supervision connected therewith only pay when the daily output is between 10 and 20 tons of H_2SO_4. The cost of erection of most, if not all, of them is higher than a modern chamber plant, although they take up somewhat less space. The air has to be carefully dried with most processes before entering the kilns, and these have therefore to be of special construction. In some of the processes steam is introduced in the kiln, and the gas has then to be freed from moisture before entering the contact apparatus. In some, again, the sulphurous acid gas must be purified with extreme care, so as to avoid poisoning the catalytic agent. In these intermediate processes, as well when operating in two stages, much heat is lost, so that the gases have generally to be re-heated at a considerable expense of fuel. The process of absorbing the sulphuric anhydride in strong sulphuric acid has to be watched with some care, so as to get a uniform acid, and generally it is recognised that contact apparatus require a very capable chemist for their supervision.

Let us now turn to the all-important practical side of the question. It is nowadays not difficult to get a yield of 300 H_2SO_4 per 100 of sulphur burnt, or about 98 per cent. of the theoretical. With contact apparatus this is as yet not always the case. All of them claim to get a yield of 96 to 98 per cent., but I know of at least two where 90 per cent. is hardly reached. Of course, I do not doubt that in time the contact processes also will all reach a 98 per cent. yield. They are new, enormous difficulties had to be overcome at every stage and with every part of the machinery, and the skill and scientific knowledge brought to bear on them by the inventors will be admired by generations to come. I must, therefore, for the purpose of my investigation attach little importance to the question of yield, and assume both the chamber process and the contact process to come within 2 per cent. of the theoretical.

An important element in the chamber process is the consumption of nitre. You all know from Lunge's book how, especially in France, the production of a given chamber plant has been increased at the expense of a somewhat larger consumption of nitre. As this is given in different terms in different factories I had better bring them all to a common standard, which is, after all, the nitrate one has to buy. Assuming that, with a good nitric acid plant, we get a 99 per cent. yield, and let it be worked with nitre of 96 per cent., then 100 of nitric monohydrate correspond to nearly 142 of nitre, and 1 kilo. of 36° B. nitric acid to 0·75 kilo. of nitre. In ordinary chamber plants with good Glover and Gay-Lussac towers a consumption of 0·75 of nitre for 100 of H_2SO_4 is now frequent. In America, according to Falding and Gilchrist, about 1·05 for 100 of H_2SO_4 is the rule. With Meyer's chambers this is only 0·60, in spite of the greater production. In the contact process, of course, no nitre is used.

The production of acid for a given chamber space is with ordinary chambers now frequently 3 kilos. of H_2SO_4 per cubic metre, but with the intensified working one arrives at 4 kilos. With atomised water and fans in ordinary chambers 5·84 kilos. have been obtained. A set of Meyer's chambers without other improvements produces 4 kilos. (the later ones in Baltimore, according to Falding, from 4 to 4·8 kilos., and, according to Meyer's latest publication, even up to 6·3 kilos.). With fans and atomised water a Meyer set will probably reach 8 kilos. and more; at any rate, the first chamber of a system, which is not worked to its full capacity, produces 10 kilos. and more.

Before I go further I must say a few words about the concentration of sulphuric acid. Little improvement has been made in this within the last years. For concentrating ordinary oil of vitriol of about 95 per cent. very few systems can now compete with the Kessler or Benker plant, which at this concentration deal with very large quantities. For stronger acid, up to 98 per cent., gold-coated platinum stills, or iron ones, are used. The former require an enormous investment, and cause a good deal of expense by loss of gold and platinum. If the concentration is done in iron stills from acid previously treated in lead pans, then the iron stills do not last long, and the acid contains much iron. There are other systems, of course, but many are not economical. Perhaps Zanner's attempt to place earthenware-lined iron pans into the burner flues will bring about a further economy, but for acid of 97 to 98 per cent. it is, in my opinion, as well to concentrate up to 93 per cent. in a Kessler or Benker apparatus, and to let this acid run direct into an iron still, which then requires little fuel and lasts much longer. Possibly the highly refractory and acid-proof corundum material made by the Friedrichsfeld factory from the residue of the Thermite process may become a good substitute for iron in such operations. I think that with such a combined apparatus it would even be possible to make use of a vacuum for the final concentration. The acid from a Kessler apparatus has just the right temperature to be fed into an evacuated iron still, and very little fuel would be required to bring it up to 98 per cent., whilst the water and traces of acid evaporated would amount to so little, as to present no difficulty for their recovery.

I will now attempt to make a comparison of the cost of producing sulphuric acid by the best chamber system and the contact process. In doing this I am aware that calculations were published by Lüty and Niedenführ in the Zeitschrift für Angewandte Chemie of 18th March 1902. These gentlemen, however, did not sufficiently conside existing improvements in the chamber system, and have not stated the cost of production by the contact process quite so well as it could be done now with more experience of these plants. I have endeavoured to get at the average results in this country, such as they prevail, say, in Lancashire, and I have also compared them with results in other countries, partly from my own experience, partly from that of others. I have taken data for a contact plant of good yield, as now erected, and in order to give it a fair chance, I have assumed that all the plants should produce daily 20 tons of H_2SO_4. The object of my comparison is to show how far the contact process is likely to oust the chamber process, and I have therefore assumed a chamber plant with Meyer's chambers, atomised water, fans, and good towers, which I believe to give at present the best results.

Cost of producing Chamber Acid in a Plant composed of Meyer's Chambers with intermediate Towers, Fans, and atomised Water and other Improvements.

The calculation is made per ton of H_2SO_4. The daily production is taken as 20 tons of H_2SO_4, and the yield as 300 for 100 S burnt, or 294 for 100 S charged = 147 H_2SO_4 for 100 pyrites of 50 per cent.

——	Cost per Day.			Cost per Ton H_2SO_4.		
	£	s.	d.	£	s.	d.
13·605 tons of 50 per cent. pyrites at 4½d. per unit	12	15	1	0	12	9
0·160 ton of 72° Tw. nitric acid at 10s.	1	12	0	0	1	7¼
2·800 tons of coal at 7s.	0	19	7	0	0	11¾
Labour	2	16	8	0	2	10
Repairs and renewals	2	0	0	0	2	0
Sinking fund (10 per cent. on plant, 5 per cent. on buildings, power, stores, offices, &c.; total, 15,000*l*.)	3	3	0	0	3	1¾
General expenses, rents, taxes, &c.	2	17	1	0	2	10¼
Total for 20 tons	26	3	5		..	
Cost per ton of H_2SO_4 in chamber acid		..		1	6	2

ost of Sulphuric Acid concentrated to 94·5 per Cent. H_2SO_4 by Kessler's Apparatus.

Production, 20 tons per day.

—	Cost per Day.	Cost per Ton of 94·5 per Cent. acid.
	£ s. d.	£ s. d.
0 tons of H_4SO_2 (including 1 per cent. ss) at 1*l*. 6*s*. 2*d*.	25 0 0	1 5 0
tons of coke at 15*s*.	1 17 6	0 1 10½
au for exhauster, &c.	0 8 4	0 0 5
our	0 16 0	0 0 9½
airs and renewals	0 6 0	0 0 3½
king fund (10 per cent. on plant, 5 per nt. on building: total, 2,000*l*.)	0 8 4	0 0 5
eral expenses, rents, taxes, &c.	0 15 7	0 0 9½
Total for 20 tons	29 11 9	..
Cost per ton of 94·5 per cent. C.O.V.	..	1 9 7

ost of Acid concentrated up to 98 per Cent. in Kessler's Apparatus combined with Iron Stills.

Production, 20 tons per day.

—	Cost per Day.	Cost per Ton of 98 per Cent. Acid.
	£ s. d.	£ s. d.
.9 tons of H_2SO_4 (including 3 per cent. ss) at 1*l*. 6*s*. 2*d*.	26 8 2	1 6 4¾
2 tons of coke at 15*s*.	1 17 6	0 1 10½
os of coal at 7*s*.	0 14 0	0 0 8½
m for exhauster, &c.	0 8 4	0 0 5
our ..	1 4 0	0 1 2½
airs and renewals	0 15 0	0 0 9
cing fund (10 per cent. on plant, 5 per nt. on building; total, 2,500*l*.)	0 10 6	0 0 6¼
eral expenses, rents, taxes, &c.	1 4 2	0 1 2½
Total for 20 tons	33 1 8	..
Cost per ton of 98 per cent. acid	..	1 13 1

Cost of Acid concentrated to 98 per Cent. in Gilt Platinum Apparatus.

Production, 20 tons per day.

—	Cost per Day.	Cost per Ton of 98 per Cent. Acid.
	£ s. d.	£ s. d.
9 tons of H_2SO_4 (including 3 per cent. ss) at 1*l*. 6*s*. 2*d*.	26 8 2	1 6 4¾
s of coal at 7*s*.	2 2 0	0 2 1¼
our	1 4 0	0 1 2½
airs and renewals	0 15 0	0 0 9
of gold and platinum	0 7 6	0 0 4½
ing fund (10 per cent. on plant, 5 per nt. on building, 1 per cent. on platim; total, 20,000*l*.)	1 2 9	0 1 1¾
eral expenses, rents, taxes, &c.	1 5 7	0 1 3¼
Total for 20 tons	33 15 0	..
Cost per ton of 98 per cent. acid	..	1 13 3

t appears, therefore, that at present it is quite possible nake 98 per cent. acid in a chamber plant at 5*s*. 5*d*. ton less than in a contact plant, even when no royalty aid on the latter, and when the best yield is assumed. however, due regard is given to the proper return for money invested, then it will be found that a moderate er cent. increases the cost in the case of a chamber it (on 17,500*l*.) by 2*s*. 5*d*. per ton of 98 per cent. acid, lst in the case of a contact plant this increase (on 000*l*.) amounts to 6*s*. per ton (for the gilt platinum aratus to 4*s*. 11*d*.), so that the real difference amounts 9*s*. per ton, or about 27 per cent. in favour of the mber plant. The conclusion is therefore justified, that a ory burning about 100 tons of pyrites per week, and having a chamber plant equipped with all recent improvements, can successfully compete with a contact plant for even the strongest sulphuric acid in the market. This will still hold good when in about 10 years the contact patents have run out. Although no royalties will then be charged, yet it is not likely that the accumulated experience of the inventors will be had for nothing. Of course, the contest may have given some advantage to the contact process by then, but it is hardly likely to get the chambers quite under. Smaller factories, say such burning 50 tons of pyrites per week, may have to reckon with 4*s*. per ton more, but even they have still a fair chance, especially when they only have to reconstruct their existing plant. For certain manufactures sulphuric anhydride or a mixture with sulphuric acid is indispensable, either for direct use or for the purpose of revivifying used acids. Such factories will always require a contact plant, and will get the anhydride very cheaply.

Cost of Production of Sulphuric Acid Monohydrate by the Contact Process.

Production, 20 tons per day. Yield taken as (*a*) 90 per cent., or 276 H_2SO_4 for 100 S burnt, or 270 for 100 S charged = 135 H_2SO_4 for 100 pyrites of 50 per cent.; (*b*) as 98 per cent., or 300 H_2SO_4 for 100 S, or 294 for 100 S charged = 147 H_2SO_4 for 100 pyrites of 50 per cent.

—	Cost per Day with Yield		Cost per Ton of H_4SO_2 with Yield	
	90 per cent.	98 per cent.	90 per cent.	98 per cent.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
14·815 tons of 50 per cent. pyrites at 4½*d*. per unit.	13 17 9	..	0 13 10½	..
13·605 tons of pyrites	..	12 15 1	..	0 12 9
Coal, 6 tons at 7*s*.	2 2 0	2 2 0	0 2 2¼	0 2 1¼
Labour	4 8 9	4 8 9	0 4 5¼	0 4 5¼
Repairs and renewals	4 0 0	4 0 0	0 4 0	0 4 0
Sinking fund (10 per cent. on plant, 5 per cent. on building; total, 35,000*l*.)	8 6 8	8 6 8	0 8 4	0 8 4
Sinking fund on license and plans for 10 years' duration of patent, 10 per cent. on 8,000*l*.	2 4 10	2 4 10	0 2 3	0 2 3
General expenses, rents and taxes (including superior chemical supervision)	5 8 4	5 7 8	0 5 5	0 5 4½
Total for 20 tons	40 8 4	39 5 0	..	..
Cost per ton of H_2SO_4	..	..	2 0 5	1 19 3
Cost per ton of 98 per cent. acid	..	..	1 19 7	1 18 6

Note.—A royalty of 2*s*. 6*d*. to 3*s*. per ton of pyrites is sometimes charged as an extra, or 1*s*. 10*d*. to 2*s*. 2*d*. per ton of 98 per cent. acid. The loss and cost of recovering the platinum cannot yet be estimated.

Summary.

Cost of production per ton for—	£	s.	d.
Monohydrate as chamber acid	1	6	2
94·5 per cent. C.O.V.	1	9	7
98 per cent. acid—			
By a combined Kessler and iron apparatus	1	13	1
By a gilt platinum apparatus	1	13	3
By the contact process, 90 per cent. yield	1	19	7
Or with extra royalty	2	1	5
By the contact process, 98 per cent. yield	1	18	6
Or with extra royalty	2	0	4

If I may venture to predict the development of the chamber plant in the near future, I imagine one with continuous mechanical burners, good dust chambers and efficient dust filters, a fan to blow well-regulated quantities of air into the burners, and perhaps one to blow the sulphurous gas into the Glover and thence into an improved tangential chamber; then a number of consecutive sets of intermediate towers and tangential chambers with slow speed fans blowing into each intermediate tower; finally, a fan blowing into the first of two Gay-Lussacs, of course atomised water supplied to each chamber, automatic lifting of acids to the towers, and a central Gay-Lussac, when there are several sets of chambers. The concentration would be effected first over the dust chamber, and then in a combined apparatus of the kind described with a vacuum in the stills. The whole of the machinery would be driven electrically, and the power required would be produced in a gas engine fed from a Mond gas producer, which would also supply the fuel for the concentration and possible heating operations. Such a factory may look small and very different from the present ones, but it ought to have a high producing capacity, and therefore all expenses and amortisations would amount to a smaller quota on the cost of manufacture.

It may be rash to predict how the struggle between the two systems may end, but I hope to have shown—with all desire to be impartial—that there is still life in the old dog, the chamber plant, and that one need not fear of its dying out, if our manufacturers are not slow to adopt the improvements at their disposal.

Discussion.

Mr. T. C. **Cloud** said that, with Mr. Guttmann, he had visited a number of works in Germany, and he could in every way substantiate the statements made by him in his paper as to the improvements effected in the chamber process. He thought that, as regards the engineering problem, there could be no doubt that the great point in chamber construction was, that they should be of such a form as to cause the largest possible circulation of the gases within them, and that the amount of "dead" space should be a minimum. This result was certainly attained by Hartman's plan of building the chambers very high in proportion to their width, the cooling effect of the high sides materially assisting the circulation. Still better was this result attained in Meyer's tangential chamber. In this form of chamber the circulation was a most regular and systematic one, and the tendency of the particles of acid mist to be thrown out tangentially and brought into contact with the walls of the chamber, thus keeping them coated with a layer of acid, no doubt accounted for the observed fact that, in spite of the enormous production, the lead was not more acted upon than in the case of an ordinary square chamber working in the ordinary way. The testimony of all those who have tried this form of chamber was very strongly in their favour, and there could be no doubt as to their large acid-forming capacity. It might be argued that ordinary chambers on the forced plan of working could, with care, give as good results, but even admitting this to be so, the point was, that these chambers were not being forced, and did not require any more care or attention than chambers working in the ordinary way, and the wear and tear of the lead was no greater. There was no doubt in his mind that Meyer's chambers, suitably combined with mixing towers, and provided with water spray suitably introduced, together with artificial draught where necessary, would give results, both as regards output, long life of chambers, and low consumption of nitre, that were until recently regarded as almost impossible.

Dr. G. H. **Bailey** stated that there had existed in Manchester for several years chambers of similar height to those referred to by Mr. Guttmann, and experience coincided with the statements made by him as to their success. The description of the emulsifier reminded him of the Mactear process of lifting acid. With the exception of the method of delivery, it was indeed the Mactear process with slight modifications. Mr. Guttmann's belief that pressure-fans should be more efficacious than suction-fans was hardly in accordance with what might be expected on physical grounds. Increase of surface, and anything which promoted contact with surface, were well known to be beneficial in removal of "mist," but in the changes which give rise to the formation of the acid and the production of mist it appeared that the presence of nuclei was essential, and that reduction of pressure was calculated to bring about the formation of vesicles, whilst the increase of pressure tended to dissipate them. This being so, it seemed to him that suction ought to give better results than pressure.

Dr. **Grossmann** endorsed all that Dr. Bailey had said. Mr. Guttmann had tried to compare the contact process with the old chamber process, and in doing so he admitted that it was difficult to do so, as the ultimate products were not of the same strength. It was very gratifying to find that we had not reached the end of the old process of manufacturing sulphuric acid.

Mr. H. **Porter** agreed that the increased height of the chamber in proportion to its length effected an improvement in the currents and circulation of the gases in the chamber, and the admission of gases in the bottom instead of at the top was also an improvement. At one works where these alterations had been made, three chambers instead of four were found sufficient. With regard to the contact process, when first spoken of in this district, several manufacturers were alarmed as to the danger of doing away with the chamber plant, but in view of the recent improvements, he thought the chamber process had a long life before it, where high-strength acid was not important.

Mr. W. **Irwin** asked if Mr. Guttmann had had any experience with gasworks spent oxide as a source of sulphur in sulphuric acid manufacture? One trouble which sometimes occurred in connection with it, was in keeping up the temperature of the Glover tower. There was not as much heat given off as when pyrites was burnt, owing to the fact that spent oxide contained no unoxidised iron. He would like to use dust chambers as recommended by Mr. Guttmann, but was afraid of so doing owing to the probable loss of heat. In this case was it possible to work a Glover tower along with his dust chamber? He (Mr. Irwin) did not think there would be sufficient heat to do so.

Mr. W. H. **Coleman** asked what became of the air of the emulsifier.

Mr. **Herbert Morris** asked from how many processes his figures were obtained where Meyer's chambers were in operation. Lunge had recently severely criticised the figures given by Meyer. With regard to the results said to have been obtained by Meyers' chambers, with fans, towers and atomised water bringing the production as low as 10 cubic feet per pound of sulphur, with the ordinary chambers and Glover and Gay Lussac towers, it was originally supposed that from 16 to 18 cubic feet of space per pound of sulphur was necessary, he (Mr. Morris) had been able by manipulation of the towers to reduce the space to 10 cb. ft. and even lower; it therefore became a question of wear and tear on the plant to a very large extent, and he thought this was a matter which Mr. Guttmann had not taken sufficiently into consideration. What was the life of the plant referred to when working with a very low chamber space per pound of sulphur? He differed entirely with Mr. Guttmann as to the value of Kessler's process for concentrating up to 93 per cent., and he could not recommend anyone to adopt it for many reasons. The suction required to draw the heat through the plates and over the acid to concentrate it was very great, and it was necessary to provide a very high pressure of say 120 to 150 lb. in order to get an ordinary ejector to produce the necessary suction, and if the nozzle of the ejector was not in a perfect condition, then the suction was not maintained, and the acid was concentrated at a slower speed than the makers of the Kessler plant advocated.

Mr. A. **Carey** asked if Mr. Guttmann had seen fans working between the Glover tower and lead chamber. If so, of what material the fans were made, and how long they lasted? He had never been able to see any theoretical reason for the improved production claimed for the Meyer chamber. Could Mr. Guttmann help him? In the old fashioned type of chamber the generally accepted idea as to the circulation of the gases was that they ascended in the centre and descended at the sides, thus forming what was practically a vertical circular movement. In the Meyer chamber the movement claimed was a horizontal circular motion, and he did not see why this should be more efficient than the former. It always seemed to him probable that the increased productions by the Meyer chambers were more due to supplementary arrangements, such as water-cooling pes and water-sprays instead of steam, than to the tangential arrangement for the inlet gases to the chambers.

Mr. **Oscar Guttmann**, in reply, said that the lifting of uids by mixing with air that part which is contained in e leg of a U tube was certainly done by Mactear and many hers, only Frépont's modification was a particularly simple d efficient one. It was, of course, known that the slightest cuum would cause condensation in the presence of nuclei dust, &c., but in a sulphuric acid chamber the liquid was eady formed as a fine mist, and not condensation but paration was wanted. He was sorry he could not help r. Irwin in his trouble, as in order to get rid of dust he uld have to use dust separators, resulting in cooling the s, but it might be worth while to consider how far heating the gases, perhaps by means of some source of ste heat, would pay. The air of the emulsifiers escaped the top of the towers. As far as he knew there were out a dozen Meyer plants at work. He had no doubt at with special arrangements and particular care it would possible to work an ordinary chamber plant with an iciency of 10 cb. ft. per lb. of sulphur, but such chambers uld not have a long life. On the other hand, a series of experiments made to test the relative wear of a Meyer and an inary chamber, which he had seen, proved that the two haved practically alike. Mr. Morris's poor opinion of the ssler plant was not justified, and being himself an inventor concentrating plant, he spoke quite impartially, after ving seen a good number at work under varying conions. The steam pressure of 150 lb. mentioned as cessary by Mr. Morris could only be due to an ejector too small a size. He had seen such ejectors working h 50 lb. pressure, and it was a matter of course, that if ejector had to cope with a larger quantity of gas than it s made for, then one had to resort to high steam pressures, changing a nozzle, when worn, was really of no moment. reply to Mr. Carey, lead fans did not last between the over and the first chamber, and it was also not the place ere he considered them useful. The theoretical reasons the better effect of the horizontal motion of the gases were ly set out in his paper, and this was the case even in such Meyer plant, which had no other appliances in combinan. The fact was that in ordinary chambers the movement the gases was not at all so regular as Mr. Carey described whilst in the circular chamber it obtained a definite rse, giving time and space for the work, without ndrance.

Newcastle Section.

Meeting held in the Durham College of Science, on Thursday, December 3rd, 1903.

DR. J. T. DUNN IN THE CHAIR.

THE GLOVER TOWER: A CORRECTION.

The **Chairman** said "I regret that through an oversight ave accidentally done injustice to our old member . Lunge. I have seemed to attribute to Niedenführ the ggestion of intercalating Lunge plate-towers between the ambers, and thus reducing the chamber space needed for reaction. This suggestion was really due to Dr. Lunge nself, and Niedenführ, in the paper from which I quoted, rely gave a description, and an account of the working, plants which he had constructed in accordance with it. . Lunge has pointed out to me that my address conveys rong impression on this point, and I am happy to have s opportunity of correcting it."

THE ASPHALT INDUSTRY OF TRINIDAD.

Prof. **Henry Louis** gave an account of a recent visit he Trinidad "Pitch Lake," illustrated by lantern slides specimens.

THE DETECTION OF SMALL QUANTITIES OF COMBUSTIBLE GASES IN FLUE GASES.

Mr. **W. H. Sodeau** exhibited and explained the manipulation of a modified Orsat's apparatus devised by him for the examination of flue gases containing small quantities of unburnt hydrogen and other inflammable gases.

New York Section.

Meeting held at Chemists' Club, on Nov. 20th, 1903.

DR. VIRGIL COBLENTZ IN THE CHAIR.

ON VEGETABLE PROTEIN.

BY DR. OSKAR NAGEL.

Albumin.—There can be extracted from certain oil-cakes considerable quantities of an albumin which, in solubility, strength, viscosity, and coagulabilty, is equal to blood albumin. Experiments made on a small scale show that it can be satisfactorily used for cotton-printing. For this purpose I prefer to use sesamé or rape-seed oil-cake, the former yielding about 30 per cent. of very light, the latter about 25 per cent. of a somewhat coloured albumin. Cocoanut cannot be used, as the albumin from it, being coagulated by heat, is easy soluble in acids and therefore unfit for printing purposes. Castor pomace, sunflower seed, and hemp seed yield an inferior quality. The extraction of albumin from pea nut is very much interfered with by a carbohydrate present in the seed—probably inulin. The bye-products obtained in making seed-albumin are 8—10 per cent. of oil, and 20—30 per cent. of starch, which, by treating with acids, can be transferred into a marketable dextrin.

The oil-cake to be used should be fresh and practically free from water. The yield of coagulable albumin from old cakes is very bad, an acid-albumin being formed by the action of free fatty acids on albumin. Any water present has to be removed by drying the material below the coagulation temperature of albumin. The ground oil-cake is extracted in an apparatus with constant regeneration of the benzene, the adhering benzene being removed in the same apparatus from the cake residuum. The separation of oil and benzene is also effected in the same apparatus. The seed, free from fat and benzene, is now digested with water for several hours, filter-pressed and washed free from albumin. The aqueous extract is then evaporated, with or without the use of a vacuum, at a temperature below the coagulation point of albumin.

The oil obtained as a bye-product is very dark, as it contains a good deal of the colouring matters of the seed; owing to its richness in free fatty acids it is an excellent material for the manufacture of soap.

Casein.—For making vegetable casein, which, in its solubility, viscosity, and other properties, is equal to milk casein, I use soy-bean, which, until now, has not been used in chemical industries. This seed, being the richest casein-containing seed produced by nature, and at the same time exceedingly cheap, can be imported from China in any quantity desired. It contains 12—18 per cent. of an excellent edible oil largely used in the Orient, and 30—40 per cent. casein. The richness in fat decreases the expenses of the process considerably. For making casein the finely-ground beans are extracted nearly completely by means of benzene or any other solvent in an apparatus ordinarily in use for that purpose. Hydraulic presses may also be employed for removing the oil, but in this case the residuum will naturally be richer in fat than if worked by extraction. The residue, freed from benzene, is digested at a temperature of 30°—35°, with a 5 per cent. solution of sodium carbonate for several hours, solution being assisted by means of stirrers. The solution is then filter-pressed.

The casein is now precipitated from the filtered alkaline casein solution, with continuous stirring, by means of rennet or a 5 per cent. solution of hydrochloric acid. The precipitated casein is filtered, washed, and dried in a steam-heated room at as low a temperature as possible. The benzene is removed in the extraction apparatus mentioned above, from the solution of oil in benzene, obtained in the first part of the process, and used over again.

Nottingham Section.

Meeting held at Leicester, on Wednesday, Nov. 25th, 1903.

MR. J. T. WOOD IN THE CHAIR.

THE RELATIVE TANNING VALUES OF THE DIFFERENT SPECIES AND GROWTHS OF MYROBALANS.

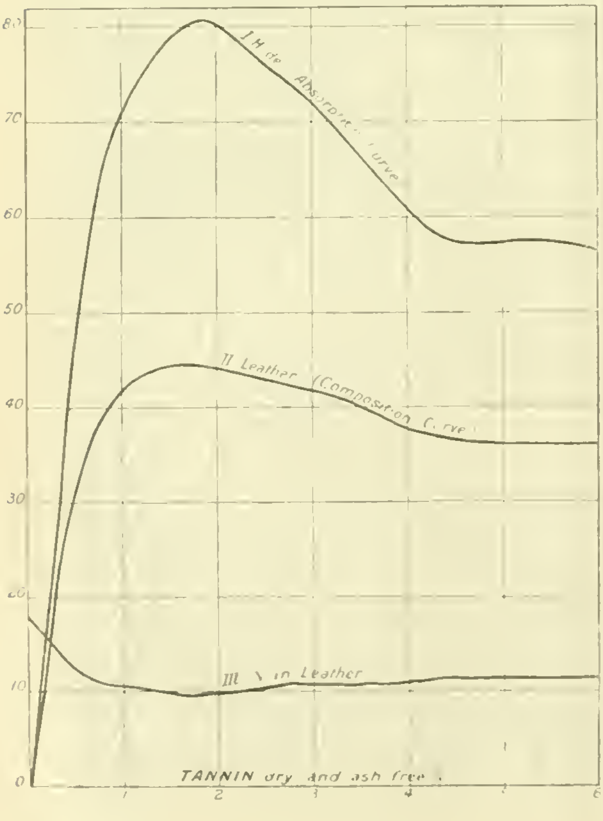
BY DR. J. GORDON PARKER AND F. AUSTYN BLOCKEY.

(This Journal, 1903, 1181—1184.)

DISCUSSION.

The CHAIRMAN said that Dr. Parker had introduced a method of ascertaining the weight-giving properties, or what be called the leather-forming value of material, by actually tanning a small quantity of hide powder and then washing and drying it.

As far back as 1892 Prof. Von Schroeder had introduced a similar method, and he (the Chairman) had been curious enough to draw a number of curves illustrating the absorption of tannin by skin, and which he now laid before the meeting.



He wished to ask Dr. Parker why he used such a strong solution as 5 per cent. of tannin? Such a quantity appeared to him to be far stronger than was actually necessary, seeing that Prof. Von Schroeder's maximum absorption was obtained from a solution of about 1·8 per cent. Why had Dr. Parker weighed the resultant leather instead of estimating the nitrogen as Prof. Von Schroeder suggested? Prof. Von Schroeder gave figures showing that the results of the nitrogen values were exactly the same as the weighing method, and it was a much more reliable way of estimating the amount of tanning matters absorbed. Dr. Parker made experiments to estimate the amount of bloom deposited under tannery conditions by the samples under examination. Large deposits occurred in the liquors made from the Jubblepore and Vingorla samples, while only comparatively small deposits had occurred in the liquors made from the Bhimley, Rajpore, and Madras myrobalans. After filtration the matter which remained was probably ellagic acid. Had Dr. Parker taken any steps to ascertain the quantity of ellagic acid present? Then with reference to the acidity of the liquors, and Dr. Parker did not state the temperature at which the samples were allowed to stand. The temperature of incubation was a most important matter in cases of this sort, because, if the temperature of incubation was not constant, variable amounts of acid would be produced.

Mr. S. R. TROTMAN remarked that the method suggested by Dr. Parker might perhaps ultimately tend to replace the usual process of analysing tanning materials by the hide filter, since the conditions were more similar to those that obtained in the tanyard where skins always absorbed tannin in the presence of excess of the tanning material, while in the hide filter method of analysis the hide must necessarily be in excess. Moreover, from a tanner's point of view, the information gained by Dr. Parker's process was perhaps more useful than a mere knowledge of the percentage of tanning bodies present. At any rate, it seemed that the two methods of analysis might advantageously be simultaneously carried out side by side. With reference to myrobalans, perhaps Dr. Parker had generalised on rather a small number of individual samples and his paper was of more value as showing the possibilities of his method than as drawing a line between the varieties of myrobalans. He agreed with Mr. Wood, that unless the exact conditions under which acidity was allowed to develop were noted, the figures given lost much of their value, since in a bacterial action a very small variation in conditions, such as temperature, would largely influence the result. Further, it did not appear that any precautions were taken to ensure that in the various experiments the bacterial infection was either qualitatively or quantitatively similar. Would not more reliable results be obtained by starting with sterile solutions, solving them with the same volume of an acid culture of myrobalans and then incubating at 22° C.? With reference to the tintometer readings given, he would like to ask whether Dr. Parker could establish any connection between these and the tannin values. There certainly did not appear to be much relation in the present case, except that perhaps the higher ratios of yellow to red or the excess of yellow over orange was a good sign. His own experience was that the tintometer readings depended very largely on the temperature of extraction and the presence of incipient fermentation. If a drop of clove oil were in the extraction over night the tintometer readings in warm weather were thereby considerably reduced.

Dr. J. GORDON PARKER has furnished the following reply to the above criticisms:—The idea of estimating the weight-giving properties of a tanning material by tanning hide powder in excess of tanning material was obtained by reading Prof. Von Schroeder's researches, but in the case of Prof. Von Schroeder's work the material was not hide powder, but prepared calf skin, which not only required much longer time, but at the same time was open to a larger source of error. Prof. Von Schroeder found that the maximum result was obtained with a 5 per cent. solution of tannin, hence the adoption of this standard. Before adopting this method a large number of experiments had been made on hide powder, hide shavings, rasped hide, and picker dust, and fairly coarse hide powder had been found to be the best. He had also carried out a large series of experiments, using all strengths of tanning solutions from ½ per cent. up to 25 per cent., and from these results adopted the 5 per cent. solution as the best. In the former paper (this Journal, 1901, 426—436) the nitrogen test was carried out in each case, and was found, as the Chairman remarked, to agree absolutely with the weight test. No doubt the estimation of nitrogen was a very important and accurate test; it could be used with advantage to check the weights, and should be done in cases where important issues depended on the results. With regard to the Chairman's remarks on the deposition of bloom, the deposits were tested and found to consist largely of ellagic acid, and small traces of other substances were undoubtedly present. Unfortunately the exact temperature of the liquors was not carefully noted in the case of the acid tests, but as the 11 jars containing the liquors were kept in the same room, each jar being covered with a disc of filter-paper, the temperatures were in each case the same, therefore the results should be comparable. The same applied to the paper on Valonia, although in this case the average temperature of the solution was noted with each determination. As to whether this process might be used to replace the usual process of analysis by the hide-filter method, although probably the two processes might be used together and both results reported, he agreed with Mr. Trotman that the method must be of considerable value to the tanner and much more useful than a mere knowledge of the percentage of tannin. A larger number of individual samples might have been obtained, and he intended as soon as possible to test practically all tanning materials by this method, and at a later date to publish the results obtained, so as to fix the standards for the guidance of other chemists. No special precautions were taken in the tintometer readings. The solution for analysis, after filtration, was measured in the ordinary manner and the readings recalculated to a solution containing ½ per cent. of tannin, measured in a centimetre cell. In conjunction with Prof. Procter, he had previously tried to establish the relationship between the tanning matters and the tintometer readings, but found there was no definite relationship. The tintometer readings certainly depended on the temperature of extraction, as the higher the temperature of extraction the more colouring matter was dissolved. Mr. Trotman's suggestion to add a drop of clove oil to the extraction beaker overnight was an interesting one, and he would certainly test it at the first opportunity. He hoped that those interested in the subject would test the methods used, as it was an extremely important matter for the tanner to have a method of estimating the leather-forming qualities of a material by which he could get his results in a few days, whereas at present it took him many months under tanyard conditions, and frequently meant loss of money if the experiments failed. The method had already been in use for some four years, one large tanner buying all his extracts, and basing all his extract contracts on the results obtained by the method given above. Up to now in each case the practical results had borne out the results obtained in the laboratory.

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I.—PLANT, APPARATUS, AND MACHINERY.

English Patents.

Liquefaction of Gases; Impts. in the ——. W. P. Thompson, Liverpool. From La Soc. l'Air Liquide, Paris. Eng. Pat. 27,658, Dec. 15, 1902.

The gas, under pressure, enters the inner tube of a refrigerator, the lower end of this tube being closed, but provided with a draw-off cock. From some distance above the end of the tube, the gas is led by a pipe to an expansion motor, where it is cooled by the expansion, and returns by another pipe to the refrigerator, circulating round the tube containing the gas under pressure, and cooling it sufficiently to cause liquefaction. The liquefied gas is drawn off by the cock. The expansion may be conducted in several stages in several motors, so as to produce a smaller fall of temperature for each stage, thus getting a higher temperature of liquefaction in the refrigerator, and a correspondingly better yield. The light spirit of Russian or American petroleum is used as lubricant in the expansion motors.—L. F. G.

Evaporating or Distilling Liquids [Sea or Salt Water]; Apparatus for ——. A. L. Normandy and F. Normandy, London. Eng. Pat. 361, Jan. 6, 1903.

The casing of the apparatus, to which the liquid to be evaporated is supplied automatically, encloses two steam chambers, to the front of which the evaporating tubes or coils are connected. The tubes or coils are inclined, and are separately removable, a door being provided in the casing, in front of the steam chambers, to permit the inspection and removal of the tubes or coils. A dip pipe is provided for automatically conveying the excess liquid from the bottom of the casing.—R. A.

Stills and the like; Impts. in ——. E. Guillaume, Paris. Eng. Pat. 3561, Feb. 14, 1903.

See U.S. Pat. 732,548 of 1903; this Journal, 1903, 859.
—T. F. B.

Mixing Mineral and other Dry Substances; Apparatus for ——. The Morgan Crucible Co., Ltd., and C. W. Spiers, London. Eng. Pat. 512, Jan. 8, 1903.

The materials are mixed within a stationary horizontal casing, by means of two spiral feeders, which are adapted to move the materials in opposite directions. The feeders may be mounted and driven independently of each other, but are preferably mounted on the same horizontal shaft. In the latter case, they are of opposite and different pitch, and of different diameter, the smaller lying within the larger throughout its entire length. The casing is provided at one end with a discharge aperture closed by a suitable slide.—R. A.

United States Patents.

Still. A. L. C. de Lautreppe, Assignor to H. G. Catlin, both of New York. U.S. Pat. 744,367, Nov. 17, 1903.

The still comprises an exterior casing forming at its lower part the receptacle for the liquid, and "an inner condenser" mounted within the casing, above the liquid receptacle. The condenser is formed with a "series of radial sections," containing "radial partitions," around which the cooling agent is circulated. "The products of condensation, passing downwards from the exterior walls of the radial sections" of the condenser, are collected in a trough provided in the casing and conveyed to an outlet.
—R. A.

Filter Press. A. James, London. U.S. Pat. 744,761, Nov. 24, 1903.

See Eng. Pat. 21,782 of 1902; this Journal, 1903, 136.
—T. F. B.

Extracting Matter from Liquids by Solvents; Process of ——. L. C. Reese, London. U.S. Pat. 744,795, Nov. 24, 1903.

See Eng. Pat. 18,830 of 1902; this Journal, 1903, 734.
—T. F. B.

Concentrating Apparatus. G. R. Tucker, Boston, Mass., and G. W. Goddard, Concord, N.H., Assignors to E. S. Beach, Boston, Mass. U.S. Pat. 744,823, Nov. 24, 1903.

The apparatus comprises a closed casing having a gas inlet and a gas-outlet port, a receptacle within the casing for the liquid to be concentrated, an endless belt for continuously removing sheet-like portions of the liquid material from the receptacle into the chamber of the casing, means for creating and maintaining a current of heated gas through the casing, means for removing concentrated portions of the material from the endless belt, and means for flushing the sides of the casing.—R. A.

Calcining Apparatus. A. Lawrence, Acme, Tex. U.S. Pat. 745,067, Nov. 24, 1903.

The apparatus consists of a furnace, in which is arranged a pan, having its bottom inclined downwards from the sides to the centre. The pan is provided at one side with an outlet opening controlled by a gate, and has a pipe leading from its top. An air-pipe extends into the furnace beneath the pan, and is provided with branches leading into opposite ends of the pan at one side. The branches extend to the centre of the pan, and have their inner ends closed, each branch being provided with a series of perforated tubes, which project to the opposite side of the pan.
—R. A.

Mortar and Muller for Grinding, Crushing, and Mixing Ores, Chemicals, &c. T. Breakell, Wirksworth. U.S. Pat. 745,416, Dec. 1, 1903.

See Eng. Pat. 4479 of 1902; this Journal, 1903, 409.
—T. F. B.

French Patents.

Vacuum Heating Apparatus; Self-stirring ——. A. Neumann and F. Schroeder. Fr. Pat. 333,683, July 9, 1903.

At the bottom of a cylindrical boiling pan is placed an inverted iron funnel, or dome, provided with a circulation tube at its top. This circulation tube is collapsible, telescope fashion. Inside the funnel is placed the heating arrangement, such as a steam coil. The apparatus is filled with liquid to a level below the top of the collapsed circulation tube. When steam is passed into the heating coil the heated liquid inside the funnel, together with the bubbles of gas formed by evaporation, rise in the funnel and circulation tube, and overflow over the top of the latter into the main body of the apparatus, and again enter the funnel at its bottom. Any crystals separating out during the circulation and evaporation of the liquid, adhere to the sides and top of the circulation tube. The circulation tube is gradually drawn out to its full length, more and more liquid being introduced till the apparatus is filled. The liquid remaining in the apparatus is then drawn off, and the crystals separated are taken out.—L. F. G.

Centrifugal Apparatus; Quick Discharge ——, for Sorting out and Enriching Granular Materials, such as Phosphates, Kaolins, &c. L. Beaussart. First addition to Fr. Pat. 324,114, Aug. 29, 1902. VII., page 1348.

II.—FUEL, GAS, AND LIGHT.

Carbon Monoxide and Oxygen; Union of ——, and the Drying of Gases by Cooling. A. F. Girvan. Proc. Chem. Soc., 1903, **19**, [271], 236—238.

The author made a series of experiments to determine whether the drying of an explosive mixture of carbon monoxide and oxygen by exposure to low temperatures was sufficient to prevent chemical union taking place when the gas was sparked after it had regained the ordinary temperature. When the gaseous mixture was dried: (1) with liquid air (− 180° C.), (2) with a mixture of solid carbon dioxide and alcohol (− 80° C.), no explosion took place on passing sparks from an induction coil, although the sparks in the gaseous mixture were usually surrounded with a little ball of blue flame. When the gaseous mixture had been cooled to − 15° C. and allowed to regain the ordinary temperature, the first spark always caused an explosion, but this did not occur after cooling below − 50° C. After cooling between − 50° and − 35° C., faint sparks did not, as a rule, cause the mixture to explode, although powerful sparks always produced this effect; a single powerful spark frequently produced no effect, but an explosion always occurred on passing the second or third spark. In order to determine whether platinum would act catalytically, the terminals between which the spark was produced, were replaced by a coil of platinum wire. With the gaseous mixture dried at about − 35° C., the coil became heated to redness, and brought about a quiet and feeble explosion. When, however, the mixture was dried at temperatures between − 80° C. and − 180° C., although the platinum still acted catalytically and glowed for several seconds, no explosion occurred. Moreover, a test made after the coil had been kept at a white heat for several minutes after the glowing had ceased, showed that combination was yet far from complete. From calculations of the amount of water present in the gaseous mixture after cooling, based upon the vapour pressure of the water at the various temperatures, it would appear that the mixture will not explode when sparked at the ordinary temperature, if here is less than 1 mol. of water vapour present to 24,000 mols. of gas.—A. S.

Flames; Temperature of ——. C. Féry. Comptes rend., 1903, **137**, [22], 909—912.

No measurement of the temperature of a flame which nvolves the introduction into the flame of matter to be heated (the wires of a thermo-electric pyrometer, for nstance) can be accurate, on account of the disturbance to he combustion and the losses of heat. The author has determined the temperatures of various flames by asceraining the moment at which a sodium line in the flame was just reversed by the light from a carbon filament which was gradually raised in temperature by increasing the current through it. The temperature of the filament was measured by means of an absorption pyrometer, depending on the application of a formula of Wien, connecting the ntensity of luminous radiation with the temperature; the correctness of the pyrometer was verified by comparison with the thermo-electric pyrometer up to about 1700° C. The results were as follows:—

	° C.
Bunsen burner, fully aired	1871
„ „ partially aired	1812
„ „ not aired	1712
Acetylene burner	2548
Alcohol, free flame	1705
Denayrouze Bunsen fed with alcohol	1862
„ „ fed with 50 per cent. each of alcohol and petroleum spirit	2053
Hydrogen, free flame in air	1900
Oxy-coal gas blowpipe	2200
Oxy-hydrogen blowpipe	2420

—J. T. D.

Acetylene; Generation of ——. J. M. Morehead. Electro-Chem. Ind., 1903, **1**, [14], 479.

The sources of danger in the use of acetylene made from calcium carbide are discussed in detail. The risk of poisoning, or rather asphyxiation, is practically *nil*, since an atmosphere containing 20 per cent. of acetylene supports ife, and leaks are easily detected by the smell. Overheating in the generator, which might lead to explosion, s circumvented in small generators, *e.g.* bicycle lamps, by acilities for dissipating the evolved heat into the air and in arge ones by taking up the heat in an excess of water; in he U.S.A. one gallon of water is required per pound of carbide, being nearly 20 times the theoretical amount. After-generation of gas, which cannot be entirely avoided, must not be allowed to produce high pressures; hence generators are made of thin materials and provided with water seals. The limits of explosibility of acetylene mixed with air are ·1 per cent. to 24·1 per cent., which is a slightly wider ange than with the other combustible gases of commerce. With regard to its effects, however, an explosion of acetylene and air would be no worse than one of any other gas and air, whilst the small capacity of most generators renders the formation of an explosive mixture in ordinary ooms improbable.—W. A. C.

English Patents.

Fuel Compounds used in Generating Gas; Manufacture of ——. W. R. Lake, London. From The Fuel and Gas Manufacturing Co., New York. Eng. Pat. 12,001, May 26, 1903.

See U.S. Pats. 728,854–5 of 1903; this Journal, 1903, 735. —T. F. B.

Carbonaceous Substances [from Tar, &c.]; Process of Manufacturing ——. F. Ritter von Dahmen and E. Hagyi-Ristic, Vienna. Eng. Pat. 21,967, Oct. 12, 1903.

See Fr. Pat. 329,452 of 1903; this Journal, 1903, 1040. —T. F. B.

Peat and the like; Retort-Furnaces for Charring or Coking ——. C. E. Laurenius, Gothenburg, Sweden. Eng. Pat. 22,272, Oct. 15, 1903.

The apparatus employed consists of four approximately vertical and cylindrical retorts arranged round a common fire, which are fed at the top and emptied at the bottom. Below the charging hopper is a depending tube leaving an annulus, into which the gases given off during the desiccation of the peat pass on their way to washing, condensing, and drying plant. Near the bottom of each retort is an aperture through which the gases evolved during the carbonisation of the peat pass directly to the fire. The essential feature of the claim is that the gases produced in the cool upper portion of the retort are employed to feed the furnace, as well as the gases generated at the higher temperature.—F. H. L.

Furnaces [Steam Generators, &c.]; Liquid-Fuel ——. J. N. Myers, Saltcoats, N.B. From J. Cook, Penang, Straits Settlements. Eng. Pat. 27,348, Dec. 11, 1902.

The liquid-fuel is supplied to the furnace in a vaporised condition, by the action of superheated steam or other superheated gaseous fluid under pressure. The fuel burner comprises a nozzle or ejector, and a pipe arranged to conduct the steam, &c., through the furnace prior to its reaching the nozzle or ejector. The furnace is provided with a fire-resisting retort, in which the vapour or gas burns, the retort serving to absorb and condense the initial flame, to prevent damage of the heating surfaces by fusion. —R. A.

Gas from Bituminous Coal and the like; Production of ——. W. J. Crossley and T. Rigby, both of Manchester. Eng. Pat. 24,194, Nov. 5, 1902.

To avoid the difficulties that arise in working caking bituminous coal in gas producers, and also the deposition of tarry constituents of the volatile products, the fuel is first heated in one or more closed retorts, by the hot gases leaving the producer, or by the radiant heat of the fuel contained in it, and the volatile products, either alone or mixed with other gases, are passed through the producer in order to convert them into "clean incondensable gases," the producer being fed with the caked residue from the retorts. The apparatus described consists of a vertical producer, in the upper portion of which, above the fuel bed, and heated by it, are arranged one or more retorts. The retorts contain hollow spirals, which can be rotated in order to fill or discharge the retorts and to break up the caked fuel residue; independently of the rotation, the spirals can be raised to close the bottom of the retorts, or lowered to open them for the discharge of the caked residue, which falls on to the fuel bed of the producer. The volatile constituents of the fuel pass from the retorts, through pipes, provided with suitable dampers, into the space beneath the grate bars of the producer, and up through the fuel bed, and help to heat the outside of the retorts before entering the gas main.—W. C. H.

Gas Producers; Impts. in ——. G. R. Hislop, Paisley. Eng. Pat. 28,877, Dec. 31, 1902.

The producer consists of a vertical combustion chamber, the bottom of which is provided with inclined or curved gratings, through which air or steam may be directed into the mass of fuel, and through which ash, &c., may fall into ash- and water-pans in the usual way. Between these side gratings is a central rocking hearth plate, which can be turned vertically or rotated to loosen and break up the ash and burnt fuel. To deal with larger quantities of fuel, the side wall between two combustion chambers is removed, the inclined grate-bars of one chamber forming, with those of the adjacent one, a central conical or beehive-shaped grating.—W. C. H.

Carburetted Water-Gas; Manufacture of ——. E. D. Holmes, Huddersfield. From O. N. Guldlin, Fort Wayne, Ind., U.S.A. Eng. Pat. 26,769, Dec. 4, 1902.

Plant for manufacturing carburetted water-gas is described, which contains certain details of construction mainly mechanical in nature. The generator is fitted with a large number of small air inlets, so that the air may be introduced at high pressure (20 to 24 inches of water-column); this brings the fuel to incandescence more quickly and uniformly

than usual, and reduces the proportion of carbon dioxide in the water-gas. The carburetting and fixing chambers are made taller than hitherto, so that they may have a larger extent of heating surface; it is claimed that this permits of a lower temperature being used (a dull red heat), the final gas containing a high proportion of heavy hydrocarbons and less methane, while dissociation is prevented. An ash pocket is provided on the main leading from the generator to the carburettor. Eng. Pat. 22,701 of 1902 is mentioned.
—F. H. L.

Water-Gas; Process of Generating ——. F. Clauss, Meerane, Saxony. Eng. Pats. 1090 and 1091, Jan. 15, 1903.

These are modifications of the process described in Eng. Pat. 8239 of 1899 (this Journal, 1900, 332). In the first, in order to render the operation more convenient on a small scale, the carbonaceous material is introduced into the decomposing chamber by means of a jet of water (instead of steam), the liquid then evaporating naturally within the said chamber. According to the second specification, the powdered carbon is driven into the chamber (1) by a jet of steam or of water, or of both together; (2) is driven in by a jet of water, and meets a jet of steam inside the apparatus; (3) is driven in by a jet of air; or (4) the carbon falls by its own weight into the chamber from a suitably arranged hopper, and is then subjected to the action of a jet of water, air, or steam.—F. H. L.

Gas for Heating, Lighting, Motive Power, or the like; Process and Apparatus for the Production and Carbonisation of ——. J. Lühne, Aix-la-Chapelle. Eng. Pat. 8194, April 8, 1903.

See Fr. Pat. 320,323 of 1903; this Journal, 1903, 1080.
—T. F. B.

Fuel Gas; Method of and Apparatus for Removing Tar and Solid Particles from ——. G. T. Beilby and G. Christison, both of Glasgow. Eng. Pat. 28,614, Dec. 27, 1902.

The method consists in leading gas through a chamber partitioned by a number of perforated plates, and at the same time causing liquid to flow over the surfaces of the plates, so that the gas percolates through successive films of liquid. The perforated plates are set at an inclination at intervals in a chamber provided with an inlet and outlet for the gas. Pipes are arranged to spray the absorbing liquid on to the surfaces of the plates, on which the gas impinges. The bottom of the chamber is open and rests in a trough, in which the open part is luted with the absorbing liquid, and means are provided to carry the overflow of the liquid to separators in which the impurities may settle.
—W. C. H.

Gas-Producer Gases; Process of and Apparatus for Purifying and Cooling ——. H. Boyd, Thornton, Lancs. Eng. Pat. 1182, Jan. 17, 1903.

The sensible heat of the gases issuing from the producer is used to raise steam in a boiler to a pressure sufficient to force in air to the combustion chamber of the producer, and to drive an engine for working a fan and pumps used in the purifying process. The gases pass from the boiler to a vessel in which some of the tar is separated, and then to a fan, by which they are forced, together with water vapour, into a tar separator, and thence to a condenser coil and scrubber. The separating vessels consist of an inner chamber and an outer chamber forming part of a water trough. The gases enter the inner chamber and pass through perforations into the outer chamber, to which the main gas outlet is connected. For the separation of a further quantity of tar, the gases, together with water vapour, are forced by the fan into a box containing perforated plates on which the globules of tar are broken up and fall into a lute box. Water troughs are arranged above and below the evaporator condenser coil, the upper trough being perforated, and the water forced from the lower to the upper by a circulating pump.—W. C. H.

French Patents.

Gas for Heating Purposes, Free from Hydrocarbon; Process for Obtaining ——, *by means of Gas-containing Fuel.* Gasmotorenfabr. Deutz. Fr. Pat. 333,381, June 20, 1903.

See Eng. Pat. 13,748 of 1903; this Journal, 1903, 1039.
—T. F. B.

Gas; Purification of ——. F. Burgemeister. Fr. Pat. 333,726, July 10, 1903.

See this Journal, 1903, 1188—1189.—L. F. G.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM AND MINERAL WAXES.

Petroleum, Louisiana; Hydrocarbons in ——. C. E. Coates and A. Best. J. Amer. Chem. Soc., 1903, **25**, [11], 1153—1158.

The physical characteristics and distillation products of various Louisiana oils are given in the accompanying table, those of Beaumont oil being added for comparison. The absence of concordant measurements observed above 300° C. is attributed to "cracking." The sample of Beaumont oil is heavier than those previously examined, and the fractions have higher boiling points. The Breux Bridge oil was black and viscous, with a smell like turpentine. The final distillate was a dark, heavy, fluorescent oil of unpleasant odour, and the asphalt was hard, black, and lustrous, with a conchoid fracture. The sp. gr. was 1·123, and the mass furnished 71 per cent. of volatile matter, 28·6 per cent. of fixed carbon, and 0·4 per cent. of ash. The illuminating oil fraction could not be refined water-white with the usual reagents, the products quickly turning yellow when exposed to the air. About 15 per cent. of sulphuric acid was used, and the loss of oil amounted to 12 per cent. The Breux oil is best suited for fuel purposes. Great difficulty was experienced in obtaining fractions of constant boiling point, but eventually three were collected, boiling at 110°—115° C., 160°—165° C., and 210°—215° C. The first of these had a pronounced smell of turpentine, and indeed a similar fraction is being sold as a turpentine substitute. The sp. gr. is 0·8479 at 27° C., and the molecular weight, 161, corresponds nearly to the formula $C_{12}H_{22}$. The second fraction had no smell of turpentine. The sp. gr. at 29° C. was 0·8785, and the molecular weight (189) close to that of $C_{14}H_{26}$. The highest fraction had the sp. gr. 0·909 at 29° C., and the molecular weight (233) very near that of $C_{17}H_{30}$. The main constituents of the oil seem to belong to

——	Beaumont (Texas).	Welsh (La.).	Jennings (La.).	Breux Bridge (La.).
Sp. gr. at 25° C.	0·9228	0·9276	0·9093	0·9392
Distillation begins at	150° C.	230° C.	200° C.	240° C.
Distillation, Engler flasks 760 mm.:—	Per Cent.	Per Cent.	Per Cent.	Per Cent.
To 150° C.	..	..	..	..
150°—200° C.	2	..	..	..
200°—250° C.	8	2	13	1
250°—300° C.	26	17	28	15
300°—350° C.	26	23	24	22
350° to asphalt	30	49	30	53
Asphalt residue	8	9	5	9
H_2S evolved on heating	Large quantities 115°—150°	Very small amount at 230°	Small quantity at 200°	Very small amount at 240
Colour of lower fractions	Yellow	Nearly colourless: light on standing.	Colourless: yellowish on standing.	Slightly yellow
Fuel value in B.T.U.	19,923	12,000	19,814	19,300
Illuminating oil fractions to 300°	36 %	19 %	11 %	16 %
Estimated depth of well	1,200 ft.	700(?) ft.	1,000 ft.	600 ft.
Sulphur content of crude oil	1·96 %	0·32 %	0·39 %	0·20 %

the series C_nH_{2n-2} and C_nH_{2n-4} series, and are not unsaturated aliphatic compounds. If cyclic compounds, they might respond to the Nikiforoff method of consecutive decomposition under increased pressure; that they do undergo progressive decomposition under continued distillation has already been established.—C. S.

ENGLISH PATENT.

Asphalt; Artificial ——. P. M. Justice, London. From Aktieselskabet Venezuela-Asfalt Kompagnie, Copenhagen. Eng. Pat. 21,799, Oct. 9, 1903.

Orinoco asphalt oil is added, with constant stirring, to powdered limestone containing lime or lime flour, and previously heated to about 200° C. The mixture may be charged into moulds and pressed into plates, or mixed with broken granite and formed into paving slabs.—A. G. L.

UNITED STATES PATENT.

Nitro-Product [from Heavy Petroleum Distillates]. L. Edeleanu and G. A. Filiti, Bukharest. U.S. Pat. 745,802, Dec. 1, 1903.

See Eng. Pat. 9416 of 1902; this Journal, 1903, 621. —T. F. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Dyestuffs; Action of Potassium Ferricyanide and Caustic Soda on ——. M. Prud'homme. Bull. Soc. Ind. Mulhouse, 1903, **73**, 294—297.

When a sample of a cotton tissue, dyed a dark shade of indigo (2 grms. of synthetical indigo per square metre), is immersed in a solution of potassium ferricyanide (1 to 5 per cent.) and caustic soda (3 per cent.), its colour changes first to dark purple and then, after gradually becoming paler, is finally transformed into a pale bluish pink. If the sample be now withdrawn and rinsed in running water, its colour changes to purple and then to a bright blue. A sample of the same indigo-dyed tissue gives, on treatment with caustic soda (2 per cent.), a pink-coloured solution. From this, cotton may be dyed a pink colour, which, on washing with water, changes to a bright blue. The colouring matter which dyes in this manner is presumably identical with that which remains after treating the indigo-dyed tissue with the potassium ferricyanide and caustic soda mixture as described. In confirmation of this view, it is found that no pink colour is left by the oxidising mixture upon the cotton after this has been treated with caustic soda. The author has not succeeded in extracting with dilute caustic soda solution any colouring matters of the type indicated from synthetical indigo or indirubin. From a sample of pseudo-indirubin, however, he obtained with the alkaline solution a green-coloured extract which dyed cotton a reddish blue, turning to a pink on washing with water. In view of these facts, it would appear probable that a series of dyestuffs of the indigo group exists, possessing the property of dyeing cotton in the same manner as the cotton-substantive dyestuffs, the members of which in the free state and in the condition of salts exhibit colours nearly complementary to each other.—E. B.

Triphenylmethyl; Analogues of ——. M. Gomberg. Ber., 1903, **36**, 3927—3930.

Triphenylmethyl is apparently a distinct basic radical. Its haloid derivatives, such as $(C_6H_5)_3C.Cl$, are salts, as is shown by their physical properties. Triphenylmethyl is colourless when solid, but in solution it is yellow, owing probably to the presence of $(C_6H_5)_3\overset{+}{C}$ and $(C_6H_5)_3\overset{-}{C}$ ions (Ber., **35**, 1902, 2406). A solution of triphenylchloromethane, treated with a metal, such as silver, becomes yellow immediately, owing to the formation of the unsaturated hydrocarbon triphenylmethyl. The analogues of the above, such as $(C_6H_4.CH_3)_3C.Cl$; $(C_6H_5)(C_6H_4CH_3)_2C.Cl$; $(C_6H_4NO_2)_3C.Cl$; $(CH_3O.C_6H_4)_3C.Cl$, all act in a similar manner and give various coloured solutions, the difference of colour being due to the presence of different ions. On exposure to the air all the solutions become colourless again, owing to oxidation. Triphenyl-chloro, -bromo-, and -iodomethane are colourless when solid, but when dissolved in an ionising solvent, such as liquid sulphur dioxide, they become yellow, owing probably to the presence of $(C_6H_5)_3.\dot{C}$ ions.—A. B. S.

Methyl Orange: Colour of Aqueous Solutions of ——, *and the Change produced by Acids.* F. Vaillant. Comptes rend., 1903, **137**, [21], 849—851.

Ostwald supposes that undissociated Methyl Orange is red, while its ion is yellow. Küster regards it as an acid, highly dissociable in dilute solution, but the ions of which tend to combine with hydrogen to form an electrically neutral substance, feebly red; the ions themselves, being intensely yellow, overpower the red tint of the neutral body in an aqueous solution, but are, in presence of the hydrogen ions of an acid, entirely converted into the red substance. The author finds that the molecular absorption of aqueous solutions of Methyl Orange is independent of the concentration, while according to either of the above views the colour should change on dilution; moreover, the electrical conductivity is so considerable as to render highly improbable the existence of Küster's "Non-ion." The author regards the change produced by acids as due to molecular transformation. It is progressive, and reaches a limit which is independent of the nature of the particular acid used; but the amounts of different acids required to push the transformation to the limit differ very widely: with a Methyl Orange solution of concentration 5×10^{-5}, 1/200 gram-equivalent of sulphuric acid is enough, while more than $\frac{1}{2}$ gram-equivalent of acetic acid is needed.—J. T. D.

ENGLISH PATENTS.

p-p-Diamidoacidyldiphenylamines and p-p-Diamidodiphenylamine; Manufacture of ——. O. Imray. From Farbwerke vormals Meister, Lucius und Brüning, Höchst a/Main, Germany. Eng. Pat. 543, Jan. 8, 1903.

p-p-Dinitroacetyldiphenylamine, or *p-p*-dinitroformyldiphenylamine, is produced by the nitration of acetyl- or formyl-diphenylamine respectively. The dinitro-compounds are reduced with iron filings and sulphuric acid, and the resulting diamino-compounds are hydrolysed with excess of sulphuric acid, when the *p-p*-diaminodiphenylamine separates as the sulphate, which is only slightly soluble. —A. B. S.

Monoazo Dyestuffs for Wool; Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 633, Jan. 9, 1903.

See U.S. Pat. 739,118 of 1903; this Journal, 1903, 1126. —T. F. B.

Phenylglycin-ortho-carboxylic Acid; Process for the Manufacture of ——. O. Imray, London. From Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 1326, Jan. 19, 1903.

See Addition, of July 12, 1902, to Fr. Pat. 306,302 of 1900; this Journal, 1903, 414.—T. F. B.

UNITED STATES PATENTS.

Organic Compounds; Electrolytic Reduction of ——, *by means of Titanium Compounds.* H. Hertlein and E. Oppermann, Assignors to Farbwerke vorm. Meister, Lucius und Brüning. U.S. Pat. 742,797, Oct. 27, 1903. XI. A., page 1355.

1-*Acetylamido*-2.4-*diamidobenzene.* O. Dressel, Assignor to Farbenfabriken of Elberfeld Co. of New York. U.S. Pat. 742,845, Nov. 3, 1903.

2.4-Dinitroacetanilide is treating with mild reducing agents, such as iron filings and dilute acetic acid. 1-Acetylamino-2.4-diaminobenzene is thus produced. It forms a white crystalline powder, soluble in water, which is transformed into aminomethylbenzimidazole on boiling with glacial acetic acid. The substance, but not the process, is claimed.—E. F.

Anthroquinone Alpha Disulphonic Acids; Process of Making ——. R. E. Schmidt, Elberfeld, Assignor to Farbenfabr. of Elberfeld Co., New York. U.S. Pat. 742,910, Nov. 3, 1903.

See Fr. Pat., 333,144 of 1903; this Journal, 1903, 1290.
—T. F. B.

French Patent.

Nitroso- and Nitro Compounds; Reduction of Aromatic ——, *with Formation of Ferrous Oxide.* R. Vidal. Fr. Pat. 333,365, June 25, 1903.

Aromatic nitro- and nitroso compounds, such as nitrobenzene, nitrotoluene, α-nitronaphthalene, dinitrobenzene, dinitrotoluene, di- and trinitronaphthalene, nitrosophenol, &c., are reduced to azoxy- or amino compounds by vigorous agitation with a large excess of cast-iron turnings in presence of water, but without acids. The ferrous oxide formed is calcined, with or without consecutive treatment with ferrous sulphate, in order to obtain iron oxides suitable for pigments, for polishing glass and metals, &c.
—E. F.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Carbon Tetrachloride [for Degreasing Textiles]. Goehrig. Soc. Ind. de Mulhouse, Oct. 14, 1903. Procès-verbaux, No. 8.

The author states from practical experience that carbon tetrachloride is not suitable for use in degreasing textiles, because it produces on the workmen anæsthetic effects similar to those produced by chloroform. Benzol is still more dangerous, its vapour being, in fact, poisonous. The best agent is petroleum benzine, the vapours of which are quite innocuous. A mixture of petroleum benzine and benzol produces effects analogous to those caused by benzol alone. With regard to inflammability, the author finds that the electric sparks generated by friction of the textile material (especially of silk) as it leaves the bath of benzine, can be prevented by incorporating with the latter, 0·1 per cent. of a mixture of 4 parts of oleine, 4 parts of alcohol, and 1 part of ammonia. A further precaution consists in passing the material, when it leaves the bath of benzine, over a metal plate. The degreasing is effected in sheet-iron vats containing the petroleum benzine, in which wooden receptacles holding the textile material, revolve. Each vat is surmounted by a sheet-iron frame, ending in a flue; and each frame can be hermetically closed by means of two iron shutters, so that in case of fire, any vat can be completely isolated from the others.—A. S.

Cotton Bleaching; Removal of Oil-stains in ——. A. Scheurer. Bull. Soc. Ind. Mulhouse, 1903, **73**, 288—293.

Experiments were made on the small scale with Turkey-red oil (recommended in a communication to the Mulhouse Industrial Society), oleic acid, and rosin, which were severally added, in one instance, to three portions of lime-water in which strips of a cotton tissue, spotted with petroleum and with mixtures of this with 25—75 per cent. of colza oil, were boiled, the samples being afterwards washed, soured, washed, boiled with a mixture of sodium carbonate, caustic soda, and rosin, again washed, soured, washed, and dried, the Turkey-red oil, oleic acid, and rosin being added, in a second instance, to a mixture of sodium carbonate, caustic soda, and rosin, in which similar strips of the oil-stained tissue were separately boiled, without having been previously treated with lime, the samples being afterwards treated as in the first case. The results showed that the oleic acid and Turkey-red oil had a slightly favourable influence upon the removal of the stains, while the influence of the rosin, thus employed in excess, was rather unfavourable to such action.—E. B.

Silk Mordanting [Weighting]; Economy of Tin in ——. P. Heermann. Färber-Zeit., 1903, **14**, [23], 417.

When silk is mordanted by repeated passages through tin chloride solution and fixation with soda, the author finds that the first passage is the most important. The amount of mordant chemically fixed in the second passage is much less than in the first. The amount fixed increases gradually in subsequent passages until at about the fifth, as much is fixed as in the first. The amount of mechanically adhering mordant decreases rapidly after the first passage, until at the tenth, only about half as much is taken up as in the first. If tin chloride solution of 10° B. be used, most of the mordant is fixed in the sericin and is removed by boiling off. With a solution of 30° B. the sericin and the fibroin are almost equally mordanted. Boiled-off silk holds a larger amount of the mordant mechanically than raw silk.—A. B. S.

Dyeing Process; The ——. G. v. Georgievics. Ber. 1903, **36**, 3787—3790.

Contrary to Binz and Schröter (see this Journal, 1903, 1126), the author finds that azobenzene-*p*-sulphonic acid does dye wool in a neutral bath. Binz and Schröter (*loc. cit.*) state that when wool is dyed with *p*-oxyazobenzene there is a chemical combination of this body with the substance of the wool-fibre. Against this the author finds that *p*-oxyazobenzene can be extracted from the dyed material in the free state by means of alcohol or benzene, and is therefore probably present in the free state on the fibre.
—A. B. S.

Oxalic Acid; Oxidation of —— *[Indigo Discharge].* W. P. Jorissen and L. T. Reicher. Zeits. f. Farben- u. Textil-Chem., 1903, **22**, 431.

The authors have investigated the oxidation of oxalic acid by free and combined oxygen in order to try to explain the action of this acid in accelerating the discharge of indigo by chromic acid. They have been unable to prove the formation of ozone or hydrogen peroxide in the oxidation of oxalic by chromic acid. Their failure in the latter case may be due to any hydrogen peroxide formed being immediately decomposed. From measurements of the velocity of oxidation of oxalic by chromic acid, the reaction is shown to be of the first order. Prud'homme (this Journal, 1903, 359, 491) ascribed the action of oxalic acid in the discharge of indigotin by chromic acid, to the formation of an instable double compound of chromic and oxalic acids, which oxidises the indigotin. This will only explain the reaction if it can be shown that the double reaction, the formation and decomposition of the double compound, takes place quicker than the direct oxidation of indigo by chromic acid. The reaction may possibly be a catalytic one, or a case of "induced oxidation."—A. B. S.

Silk Goods; The Causes of Stains on ——. R. Gnehm. Zeits. für Farben- u. Textil-Chem., 1903, **2**, [23], 453—455.

The author, in a previous communication (this Journal, 1903, 415), referred to his inability, after about 10 weeks' time, to produce in samples of dyed silks, weighted with stannic silicate-phosphate, brownish stains similar in character to those which, as pointed out by himself, in conjunction with Roth and Thomann (this Journal, 1902, 968), make their appearance during the storage of such fabrics. He expressed his belief, however, that the stains caused in this experiment by the action of sodium chloride would develop after a longer period of time. They have now done so. The sample of dyed silk tissue, which Sisley sent to the author (this Journal, 1903, 415), and upon which he had obtained with sodium chloride, after about four weeks, a reddish-brown spot, shows, after the lapse of nine months' time since the test was made at Zürich, a distinct brownish stain in the part to which the salt was applied. Exposure to an atmosphere of ozone and the passage of alternating electric currents in the air near the samples were found, during periods of seven weeks and one month respectively, to be without influence upon the formation of stains from a 5 per cent. solution of sodium chloride. From these and previous observations the conclusions are drawn: (1) Human perspiration is capable of producing stains and destruction of the fibre in dyed silk fabrics. (2) Inasmuch as similar stains, as Sisley (this Journal, 1902, 1328; 1903, 293 and 622) first pointed out, are caused by sodium chloride (and other metallic chlorides) which is present in perspiration, there is little doubt that such action is due to this constituent of the latter. (3) The duration of the action, to the point when the discoloration is perceptible, varies within wide limits. It is influenced by atmospheric and climatic conditions (see also this Journal, 1903, 293 and 362).—E. B.

Potassium Ferro- and Ferricyanide; Chemical Equilibrium between ——, in Presence of Alkalis. M. Prud'homme. VII., page 1346.

English Patents.

Silk, Artificial; Manufacture of ——. J. Stoerk, Brussels. Eng. Pat. 26,982, Dec. 8, 1902.

See Fr. Pat. 327,301 of 1902; this Journal, 1903, 949. —T. F. B.

Silk, Artificial; Machines for Manufacture of ——. R. W. Strehlenert, Berlin. Eng. Pat. 28,364, Dec. 23, 1902.

The conical vessel, which contains the coagulating liquid, and in which the forming nozzle is situated, is furnished, at its base, with an upwardly inclined return pipe, the top of which is connected, by a horizontal return conduit, with the conical vessel; the horizontal pipe, which enters the conical vessel tangentially, contains a liquid inlet, directed towards the conical vessel, so that the liquid circulates round the apparatus, carrying with it the threads, which are collected at the upper end of the inclined pipe, which is open.—T. F. B.

Slubbing, Yarn, &c., Machine for Mordanting, Dyeing, &c. ——. J. Kershaw, Bradford. Eng. Pat. 25,108, Nov. 15, 1902.

The material is packed in the dye-vat between a perforated false bottom and a perforated cover. Conical passages, each containing a vertical steam pipe, pass through the material from under the false bottom and project through the cover. These passages are in connection with the liquid under the false bottom. By means of the steam jets, the liquid is forced out of the top of the conical pipes against suitable deflectors, which distribute it over the cover; it passes through the material into the space under the false bottom, and then the same process is repeated continuously. By means of an arrangement of eccentrics, the false bottom can be alternately raised and owered, thus increasing or relaxing the pressure on the material.—A. B. S.

Fibrous Materials; Apparatus for Dyeing or Washing ——. W. Dargue, F. L. Dargue, and A. W. Dargue, Halifax. Eng. Pat. 7060, March 27, 1903.

The invention relates to a machine for hank dyeing, &c. The hanks are hung on rollers, which are rotated in the dye-bath. The rollers are carried by an endless chain arrangement, and, by suitable mechanism, can be lifted out of the liquid and made to travel on a moving carrriage to a suitable place for removing the dyed hanks and putting on others. The same mechanism returns them to the dye-vat. —A. B. S.

Dyeing, Bleaching, Mordanting, Washing, and Drying Cloth; Apparatus for ——. F. Cleff, Rauenthal, Germany. Eng. Pat. 16,549, July 28, 1903.

HE cloth is wound in a spiral manner on a frame, which evolves in the liquid. The arms of this frame consist of erforated pipes, through which the dye or other liquor is orced under pressure. The liquid is continuously circuated by means of a pump.—A. B. S.

Printing Textiles; Machines for ——. W. Rott and . Müllen, Lodz, Russia. Eng. Pat. 10,925, May 13, 1903.

HE machine consists practically of two simplex printing achines. The fabric is printed on one side in the first achine and then passed through the second, which prints he other side. The second machine is driven by the first hrough a gear wheel, which can be removed if necessary o as to cut out the second machine.—A. B. S.

Silk-like Effects on Fabrics or other Material; Production of Glossy ——. L. Lilienfeld, Vienna. Eng. Pat. 14,483, June 29, 1903.

Finely-powdered mica, white or suitably coloured, is mixed with a solution of a cellulose derivative, such as nitrocellulose, in a suitable solvent. The resulting mixture is printed on the desired material; this is dried, and can then be finished on ordinary finishing calenders. The cellulose solution can be coloured if necessary with dyes dissolved in spirit.—A. B. S.

Products [Discharges] from Aldehydic and Analogous Compounds; Manufacture of ——. L. Descamps, Lille, France. Eng. Pat. 19,446, Sept. 9, 1903.

These products are produced by the action of aldehydes or analogous bodies on hydrosulphites. They possess great stability in the dry state and at a high temperature, and develop energetic reducing properties under the action of heat and moisture, such as steaming, thus constituting good discharges for reducible colouring matters.—A. B. S.

French Patents.

Aniline Black on Wool. M. Prud'homme. Fr. Pat. 333,386, June 25, 1903.

The wool is worked in an oxidising bath of chromic and oxalic acids. After exposing to the air for a few minutes, it is dyed cold, in a bath containing aniline and hydrochloric acid. After dyeing, the wool is washed in hot water, and then oxidised further in a bath containing copper chloride, aniline salt, and chlorate of potash. The black is finally developed by drying or steaming. The colour is improved by adding certain metallic salts to the dye-bath.—A. B. S.

Cop Dyeing; Machine for ——. L. Détré. Fr. Pat. 333,677, July 10, 1903.

To facilitate the manipulation of the bobbins, they are placed on holders projecting from the sides of a vertical prism of three or more sides. This arrangement allows more room for putting on and removing the bobbins than the usual one.—A. B. S.

Dyeing in Closed Vessels; Apparatus for following the Course of ——. L. Détré. Fr. Pat. 333,678, July 10, 1903.

A small quantity of the material to be treated is placed in a miniature dye-vessel with glass walls, where it undergoes the same treatment as the material in the large vessel. —A. B. S.

Cleansing Material for Textiles. J. Ranouille. Fr. Pat. 333,636, May 26, 1903.

A claim is made for a mixture of carbonates, sulphates, and chlorides of sodium and potassium, for use as a substitute for wood ashes in cleansing fabrics in laundries, &c. —A. B. S.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

English Patent.

Silver or other Metals on Paper, Leather, or the like; Producing a Bright Coating of ——. F. Hilpert and F. Pauli, both of Nuremberg, Germany. Eng. Pat. 20,709, Sept. 26, 1903.

A mixture of solutions of ammonium-silver nitrate and of a reducing salt is applied to a glass plate, the silver film produced on which, after washing and drying, is covered with a warm solution of gelatin; the paper or leather to be coated is laid on the film and rolled. After drying, the film can be stripped from the glass surface, and adheres to the paper or leather. The reducing solution is prepared by boiling an aqueous solution of potassium-sodium tartrate and sugar, also containing a stated proportion of silver nitrate. Bright metallic coatings of other metals may be similarly obtained by the described process, modified by the use of a suitable reducing solution.—E. S.

French Patent.

Paper and Cardboard; Process of Waterproofing and Colouring ——. E. Ruch. Fr. Pat. 333,667, July 8, 1903.

Paper or cardboard coated with "Enchromine," a white preparation acquires a surface impervious to water. The same result may be obtained by the use of silicates, or by any of the compositions known as "cold-water paints." Any pigment can be added for producing a coloured surface. —M. J. S.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid; Concentration of ——. E. Hartmann and F. Benker. Zeits. angew. Chem., 1903, **16**, [48], 1150—1155.

The apparatus is a modification of and improvement on one devised by Adams in America in 1887, and adopted by Négrier and Co. at Périgeux, in France, in 1889 and 1890. (See Eng. Pats. 14,022 and 4171 of 1890; this Journal, 1891, 46, 639.) The chamber acid runs into the first of a series of eight leaden pans, which are arranged in two rows of four, so that the first and eighth are contiguous. From the last pan the acid is delivered into the uppermost of a series (save for small works there are usually two parallel and identical series) of 20 porcelain lipped basins arranged in steps. Each basin rests in a thin fireclay dish pierced with holes, the joint between them being made tight by a mastic of asbestos and water-glass. The whole series is contained in a flue made of volvic lava, so constructed that there is no communication between the portion below and the portion above the basins. Opposite each basin, in the side of the upper half of the flue, is an opening with a movable lava door, so as to allow access for repairs. Hot gases from three furnaces at the bottom of the series pass up the flue, under the basins, and under the leaden pans, effecting the concentration. The vapours from the acid ascend the upper half of the flue to the top, and pass into a small condenser, where they are partially condensed, the fairly strong acid so formed being returned to the top basin. The uncondensed vapours are taken by a pipe to the "recuperator," a large leaden vessel packed with small (rice-grain size) coke; from this there trickles acid of 1·16 to 1·31 sp. gr., which is returned to the pans. The gases which pass off from the recuperator are practically free from sulphuric acid. Sometimes the acid draining from the recuperator is used for accumulators; in this case the coke is replaced by pumice, quartz, or broken stoneware. A separate firing arrangement is provided for the pans, but is only used if the higher concentration arrangement is laid off for any reason. The installation described will produce daily 7,000—8,000 kilos. of 92 per cent., 5,000—6,000 kilos. of 94 per cent., 4,000—5,000 kilos. of 97—98 per cent. acid, with expenditure in coal of 15, 20, and 25 per cent. respectively, starting from the chamber acid. The authors claim a number of advantages over concentration in platinum or in cast-iron, and in part over the Kessler system of concentration.—J. T. D.

Potassium Ferro- and Ferricyanide; Chemical Equilibrium between —— *in presence of Alkalis.* M. Prud'homme. Bull. Soc. Chim., 1903, **29**, [20], 1010—1012.

Prolonged boiling with caustic potash causes potassium ferricyanide to become partially changed into potassium ferrocyanide; the change is complete in the presence of a reducing agent, such as glucose or indigo. The velocity of oxidation of the latter by a mixture of potassium ferricyanide and caustic soda is nearly proportional to the concentration of the solution:—$V = cR + c'$ and $V_1 = c_1S + c_1'$; c, c', c_1, and c_1' being constants. The velocity of oxidation of the same compound (in the form of indigo-dyed cotton) by a mixture of caustic soda, potassium ferricyanide, and potassium ferrocyanide is almost inversely proportional to the amount of the latter salt present. The fact that the transformation of potassium ferricyanide into potassium ferrocyanide is completed only in the presence of a reducing agent can be explained by assuming the existence of a state of chemical equilibrium between the compounds taking part in the action, in the sense indicated in the equation—$2K_3FeC_6N_6 + 2KOH \rightleftarrows 2K_4FeC_6N_6 + H_2O_2$—although it has not been proved that hydrogen peroxide is so formed. When hydrogen peroxide is added to a solution of potassium ferrocyanide, potassium ferricyanide and caustic potash are produced, as is shown by the discharging action upon indigo of the mixture and the pink coloration given it by phenolphthalein. A solution of potassium ferricyanide and caustic soda, to which an excess of hydrogen peroxide is added, first changes colour, and then becomes colourless, owing, presumably, to the formation of a molecular compound of potassium ferricyanide and sodium peroxide. The solution, moreover, loses its power of decolorising indigo. On heating, oxygen is evolved and potassium ferrocyanide is formed, the solution becoming pale yellow in colour. Hydrogen peroxide (12 vols.), acidified with sulphuric acid, slowly decolorises indigo; at a temperature of 70° C. the bleaching of a sample of cotton tissue, containing indigotin at the rate of 0·5 grm. per sq. m., takes place in about 15 hours' time. In the presence of alkalis the action is much more rapid: at 70° C. it occurs in 2½ hours. At the ordinary temperature nearly six days are required for the same action to take place.—E. B.

Manganous Salts; Behaviour of ——, *with Silver Peroxide.* O. Kühling. Zeits. angew. Chem., 1903, **16**, [48], 1145—1150.

While bismuth peroxide and, under certain conditions, lead peroxide, convert manganous salts into permanganate, other peroxides precipitate them in the form of manganese peroxide. Persulphates behave in the latter way, but Marshall having shown that the oxidation by persulphates proceeds, in presence of silver salts, as far as the formation of permanganate, the author has investigated the effect on manganous salts of silver peroxide. The peroxide was used in the form of "silver peroxide nitrate," $2Ag_3O_4 . AgNO_3$, produced at the anode during electrolysis of neutral silver nitrate solution. The results show that silver peroxide behaves similarly to lead peroxide. Small quantities of manganous salt in acid solution are completely converted, by a considerable excess (eight or nine times the amount indicated by the equation) of silver peroxide, into permanganate; but larger amounts give rise, even in presence of excess of silver peroxide, to precipitation of manganese peroxide.—J. T. D.

Oxygen; Extraction of ——, *by Partial Liquefaction of Air.* G. Claude. Comptes rend., 1903, **137**, [20], 783—786.

Air, contained in a reservoir at 2 atmospheres pressure, is supplied, having been cooled to —160° C. by passage through a spiral immersed in liquid air, to an apparatus consisting of a number of vertical tubes immersed in a bath of liquid air to about two-thirds of their height, and all communicating with a common reservoir at the bottom and a common reservoir at the top. The apparatus acts like a fractionating still-head, the liquefied air as it trickles down the tubes against the current of gas becoming continually richer in oxygen, and the ascending gas becoming continually richer in nitrogen. The rate of working and the composition of the liquid in the receiver vary with the pressure in the apparatus; at 0·7 atmosphere the escaping gas is almost pure (97—98 per cent.) nitrogen, while the liquid which collects in the lower reservoir contains 57 per cent. of oxygen. This concentration is thus achieved by the liquefaction of only about one-third of the volume of atmospheric air acted upon. Apparatus has already been constructed capable of yielding 30—40 cb. m. (1,000—1,400 cb. ft.) of 92 per cent. oxygen or 100—120 cb. m. (3,500—4,200 cb. ft.) of 55 per cent. oxygen per hour. —J. T. D.

Ferro- and Ferricyanic Acid; Chemical Equilibrium between ——. M. Prud'homme. XXIII., page 1368.

Persulphates; Electrolytic Production of ——. G. Levi. XI. A., page 1354.

hlorides, Bromides, and Iodides; Determination of ——. S. Benedict and J. F. Snell. XXIII., page 1368.

odine: Separation of ——, from Mixtures of Alkali Halides as Iodic Acid. Preparation of Pure Iodine. H. Baubigny and P. Rivals. XXIII., page 1368.

arbon in Carbides; Determination of ——. F. A. J. Fitzgerald and H. M. Loomis. XXIII., page 1367.

English Patents.

ulphuric Acid; Manufacture of —— [by the Chamber Process]. A. L. Stinville, Paris. Eng. Pat. 519, Jan. 8, 1903.

ee Fr. Pat. 323,252 of 1902; this Journal, 1903, 495.
—E. S.

ydrocyanic Acid, and Cyanide Salts therefrom; Manufacture of ——. J. H. Paul, Charlton, Kent. Eng. Pat. 72, Jan. 1, 1903.

alcium ferrocyanide is heated with sulphuric acid to roduce hydrocyanic acid gas, which is led into a solution f potassium or sodium hydroxide, to obtain solution of the orresponding cyanide. The loss involved in the similar se of potassium ferrocyanide, owing to the formation of potassium-iron ferrocyanide, which is only attacked with fficulty, is thus avoided.—E. S.

lkaline Chlorides; Electrolytic Decomposition of ——. J. D. Gilmour. Eng. Pat. 22,135, Oct. 11, 1902. XI. A., page 1354.

oluble Glass; Manufacture of ——. I. J. Brown. Eng. Pat. 24,237, Nov. 5, 1902. XI. A., page 1354.

Cyanides, Oxalates] Useful Products; Manufacture of ——, from or by means of Nitrates. C. F. Cross, London, and J. Young, Glasgow. Eng. Pat. 28,077, Dec. 19, 1902.

nitrate, preferably an alkali nitrate, or a mixture of itrates, is mixed with a carbohydrate of the sugar type, alkali or alkaline earth, and a little water, and the mass gradually heated, ultimately up to 150° to 170° C., to tain an alkali oxalate and a cyanide as main products. it be desired to obtain the maximum proportion of a anide, metallic iron is preferably added to the mixture; if sulphur or a sulphur compound is added, a thioanate (sulphocyanide) is produced. Ammonia evolved ring the heating operations may be recovered by suitable eans.—E. S.

aporating and Distilling Liquids [Sea or Salt Water]; Apparatus for ——. A. L. Normandy and F. Normandy. Eng. Pat. 361, Jan. 6, 1903. I., page 1340.

drosulphite Salts; Manufacture of ——. J. Y. Johnson, London. From the Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 2204, Jan. 29, 1903.

alkali metal, or alkali metal alloy, is caused to act on phur dioxide in the presence of a suitable diluent or vent, such as ether or absolute alcohol. If the latter is ployed, a temperature under 10° C. (say about 5° C.) ould be maintained during the reaction. The alkali metal gradually transformed into a solid white hydrosulphite t.—E. S.

ygen and Nitrogen from Atmospheric Air; Apparatus for Separating Gases from their Mixtures, especially ——. R. P. Pictet, Steglitz-bei-Berlin. Eng. Pat. 14,303, June 27, 1903. Under Internat. Conv., June 28, 1902.

e Fr. Pat. 328,600 of 1902; this Journal, 1903, 364.
—T. F. B.

United States Patents.

kalis and Alkali Earths; Manufacturing Hydrates of ——. F. Jahn, Ridley Park, Pa., Assignor to Harrison Bros. and Co., Philadelphia, Pa. U.S. Pat. 744,920, Nov. 24, 1903.

extended mass of porous material (metal), of which the phide is "physically and chemically resistant to the action of the residual electrolyte," is placed as an anode at the bottom of a vessel charged with an alkali or alkaline earth sulphide solution, an agitator being made the cathode. The production of barium hydroxide from barium sulphide solution by electrolysis, with a mass of finely-divided iron acting as anode, is especially claimed.—E. S.

Alumina and By-Products; Process of Making ——. L. R. Keogh, Assignor to N. J. Gareau, both of Pembroke, Canada. U.S. Pat. 744,765, Nov. 24, 1903.

Aluminium sulphate is mixed with sodium chloride and water to form a thick pulp, which is heated to from 200° to 300° C. whilst steam is passed through, to form a mixture of alumina and sodium sulphate, with evolution of hydrochloric acid. The alumina is then separated from the product. If compounds of iron are present with the aluminium sulphate, carbonaceous matter is added as well as sodium chloride, and after the mixture has been steamed, as in the former case, the mass is heated to redness in a reverberatory furnace. "Alum cake" may be substituted for aluminium sulphate in the process, in which case carbonaceous matter is added to the described mixture, whether iron compounds are or are not present, and a red heat is finally attained. (Compare U.S. Pat. 740,364, 1903; this Journal, 1903, 1130.)—E. S.

Ammoniacal Liquors; Apparatus for the Distillation of ——. G. Wilton, London. U.S. Pat. 745,470, Dec. 1, 1903.

See Eng. Pat. 24,831 of 1901; this Journal, 1903, 494.
—T. F. B.

Trisodium Phosphate; Manufacturing ——. E. H. Strickler, Baltimore, Md. U.S. Pat. 744,128, Nov. 17, 1903.

The product obtained by treating calcium phosphate with solution of nitre cake (sodium bisulphate), is concentrated, and furnaced with a carbonaceous material. The furnaced product is dissolved in water, and tribasic sodium phosphate is crystallised out of the solution.—E. S.

French Patents.

Barium Carbonate, Baryta, and Barium Dioxide; Manufacture of ——. A. N. Hélouis, L. Mauclaire, and E. Meyer. Fr. Pat. 333,724, July 10, 1903.

Barium sulphate is agglomerated with heavy carbon by a resin, and the mixture is heated in retorts similar to those employed in gas-making. The product is cooled in closed vessels, and when cold is moistened and treated in suitable apparatus with carbon dioxide gas, which may have been collected in the first operation. Barium carbonate is thus formed, and hydrogen sulphide. When a wet process is used, the barium sulphide, obtained as described, is dissolved in boiling water, and an oxide, such as manganese, zinc, or iron oxide, is added to form a sulphide, which precipitates, leaving barium hydroxide in solution, from which, after separation and drying, barium dioxide may be formed by known processes.—E. S.

Carbides of Alkali and Alkaline-Earth Metals; Manufacture of ——, by the Aluminium Thermic Process. A. N. Hélouis, L. Mauclaire, and E. Meyer. Fr. Pat. 333,725, July 10, 1903.

The vessel in which the reaction takes place is lined with magnesia bricks, reinforced internally by briquettes made up of alkaline-earth oxides or carbonates, mixed with carbon in proportion to form the carbides. A bath is formed in the interior by fusing a mixture of aluminium with iron or chromium oxide for instance, into which bath a mixture of the alkaline or alkaline-earth bases, mixed with carbon and aluminium, is placed. The temperature attained is stated to be 4,000° C., and the carbides produced are fused. The process is also available in obtaining corundum, for application of which as a refractory product in metallurgical furnaces and otherwise, a claim is made.—E. S.

Centrifugal Apparatus; A Quick Discharge ——, for Sorting out and Enriching Granular Materials, such as Phosphates, Kaolins, &c. L. Beaussart. First Addition, dated June 13, 1903, to Fr. Pat. 324,114 of Aug. 29, 1902. (See this Journal, 1903, 544.)

A DRUM covered with a baffle plate which leaves an annular space between it and the sides of the drum, is fixed to a vertical rotating shaft. Surrounding this shaft is a tube, passing through the cover and emerging beneath a metal dome placed at the bottom of the drum. The top part of the tube is funnel-shaped, and receives the materials, such as water charged with suspended particles, which are to be treated. On reaching the bottom of the drum, the centrifugal force separates out the solid matter, which adheres to the sides of the drum, and the clarified water rises in the drum and overflows at the top. When a sufficient amount of sediment has accumulated, a vertical pipe bent into a horizontal funnel at its lower extremity, is lowered into the drum by means of a lever, the sediment rises in this tube, and is collected at the discharge end.—L. F. G.

Phosphates; Process of Converting ——, into Dicalcium Phosphate, Hydrated Calcium Sulphate, and Carbon Dioxide. P. de Wilde. Fr. Pat. 333,344, June 24, 1903.

SEE Eng. Pat. 14,194 of 1903; this Journal, 1903, 1085.
—T. F. B.

Oxides of Antimony and Similar Products; System of Apparatus for the Condensation of ——. H. L. Herrenschmidt. Fr. Pat. 333,306, June 23, 1903.

THE fumes of metallic oxides, and especially those of antimony oxides, are passed from the generating furnace, of whatever kind, through chambers having baffle divisions, into a sheet-iron chamber, arranged to contain successive series of vertical tubes, open above and below into the upper and lower portions respectively of the chamber. Each vertical tube branches into two parts, which join at the top and the bottom, so that in traversing these the fumes divide into two portions, which reunite. The gases passing through a set of these pipes emerge below, to pass up a channel conducting to another similar set of pipes, and so on, the gases at the end being aspirated, washed, and discharged. Each of the vertically disposed pipes is provided with mechanism for discharge of the oxides collected.
—E. S.

Oxygen; Preparation of ——. G. F. Jaubert. First Addition, dated July 3, 1903, to Fr. Pat. 325,627 of Oct. 27, 1902. (See this Journal, 1903, 743.)

THE process described in the main patent is now modified in view of the preservation of the product. Dry chloride of lime is powdered with about one-twentieth of its weight of sulphate of copper, nickel, or cobalt, to constitute a powder which keeps well, and may be used at any time to evolve oxygen by treating it with a 15 per cent. solution of ferrous or manganous sulphate.—E. S.

Oxygen; Apparatus for the Industrial Manufacture of ——. B. Artigue. Fr. Pat. 333,603, July 6, 1903.

THE apparatus is adapted to carry out the process of obtaining oxygen described in Fr. Pat. 325,627 of 1903 (this Journal, 1903, 743), and includes a sheet-iron generator, in which is a revolving perforated cylinder to contain chloride of lime, alone, or mixed with cupric sulphate. The generator communicates with an elevated vessel charged with a solution of cupric and ferrous sulphates, or with the latter only. The oxygen evolved passes for storage into a gasometer, which may be connected to more than one generator (see preceding abstract).—E. S.

Graphite; Purifying ——, by Water and Petroleum. R. Glogner. Fr. Pat. 333,553, July 3, 1903.

THE crude graphite, after being freed from the heavier of its impurities by a preliminary washing, is worked up with water, to which a stated proportion of petroleum is afterwards added. The whole is then placed in a closed vessel, which is well rotated or agitated, and after it is brought to rest, water is injected upon the oil-carried floating layer of graphite to complete the purification.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Porcelain; Influence of Firing Temperature on the Quality of. G. Vogt. La Céramique, 1903, 6, [165], 65—66.

THE chief difference between the old hard Sèvres porcelain body and the new soft body being that the former contains 8·31 mols. of silica and the latter 14 mols., the author endeavoured to convert the former into the latter by adding the deficiency and firing at the corresponding temperatures. With this object he incorporated 76·6 per cent. of old body with 23·4 per cent. of ground silica, and applied to one portion of the resulting ware a calcareous glaze consisting of 4 mols. of silica, 0·5 mol. of alumina, 0·7 mol. of lime, and 0·3 mol. of potash; this ware was fired in an oxidising atmosphere at about 1,308° C. The other portion was glazed with Sèvres refractory glaze (pegmatite), containing 70 per cent. of felspar and 30 per cent. of quartz, and was fired in a reducing atmosphere at 1,400° C. In both cases excellent results were obtained, thus demonstrating that one and the same body will furnish porcelain of different qualities, by merely changing the glaze and the firing temperature, simply because the coefficient of expansion is modified by a difference in temperature of about 100° C. in the kiln. The conclusions drawn from this experience are that, provided the porcelain body contains sufficient kaolin to impart the necessary plasticity, and enough fusible matters and quartz to render the ware transparent, without unduly softening it, any desired quality of porcelain can be obtained by modifying the kiln temperature so as to change the coefficient of expansion. The reason for this is that all porcelain bodies that contain sufficient fusible constituents to be vitrifiable, tend, as the firing temperature rises, to acquire the coefficient of expansion of the hard body, it being immaterial whether the vitrifying ingredients consist largely of lime, as in hard Sèvres body, or of felspar alone, as in the new Sèvres body and others of similar character.—C. S.

Titanic Acid in Clays; Presence of ——. G. Vogt. La Céramique, 1903, 6, [165], 68.

ALTHOUGH the presence of titanic acid in clays was mentioned by Riley, as long ago as 1862, and subsequently by Seger, it seems to have very rarely formed the object of analytical determination since, notwithstanding the comparative ease with which it can now be detected by the strong yellow coloration furnished with hydrogen peroxide or sodium peroxide. The author, however, has found it in every one of the 37 varieties of French clays examined at Sèvres, the proportion ranging from 0·04 per cent. to 0·1[illegible] per cent. In addition to its influence on the fusibility of the other acids, it is considered possible that titanic acid may have an important effect on the colour acquired by clays and kaolins when fired, especially when ferric oxide is present; and it is therefore regarded as desirable that the acid should be tested for, at least qualitatively, in all analyses of clays.—C. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Portland Cement; Influence of Fineness of Grinding on the Clinkering of —— E. D. Campbell and S. Ball. J. Amer. Chem. Soc., 1903, 25, [11], 1103—1112.

Determining Clinker Temperature in the Rotory Kiln.—To ascertain the exact difference between the actual temperature of the clinker in the rotary kiln and that recorded by the Le Chatelier thermo-couple, a mixture of magnesite brick and fusible clay was ground fine, mixed with water to a strong paste, and formed into ⅜-in. cubes. These were fed to the rotary kiln together with pieces of Seger cones, and the temperature was raised until the pieces coming out showed the same degree of softening as a standard cone. From the results it appears that the observed temperature coincides with the clinker temperature at about 1270° C., but is 16° C. higher at 1000° C. and 19° lower at 1600° C.

he composition of the clinker produced at "some of the igher temperatures" was as follows :—"Total SiO_2, 21·55; otal Al_2O_3, 9·09; Fe_2O_3, 2·56; CaO, 63·01; MgO, 2·73; O_3, 0·60; total, 99·56 per cent." The molecular ratios the clinker calculated to the basis of 100 molecules of ilica are as follows :—SiO_2, 100; Al_2O_3, 24·9; Fe_2O_3, 4·5; aO, 315·2; MgO, 19·1.

Influence of Grinding.—The first sample contained 72·4 er cent. of grains that passed through a 200-mesh sieve, nd 13·2 per cent. between this and 100-mesh size. The iln temperatures ranged from 993° to 1612° C., and the arious resulting clinkers were made into cement with 1·5 er cent. of dehydrated gypsum. In the subsequent boiling st, only the specimens kilned between 993° and 1081° C. rnished perfect pats, all the other pats being either racked or disintegrated. In the second experiment, 98 er cent. of the material passed through the 200-mesh eve, and the kiln temperatures employed ranged from 22° to 1627° C. Under the boiling test the portions fired 1022° to 1071° C. furnished perfect pats, as did also ose kilned at 1475° to 1627° C., the intermediate ones eing cracked, warped, or disintegrated. All the tempera-res above 1500° C. gave clinkers of normal appearance, d the time of initial setting of the cement pats diminished the kiln temperature increased, though the time of the nal set remained nearly constant.

Examining the Reactions of Clinkering.—To throw me light on this question, some of the clinkers produced temperatures at which marked changes in the physical operties of the cement were observed were dissolved in lute hydrochloric acid. In the usual method, decomposi-on is retarded by the formation of gelatinous silicic acid on e particles of cement, and therefore digestion was employed, 5 grm. of the substance being boiled for 2—3 minutes 50 c.c. of hot water, and then stirred for about 5 minutes, ithout further heating, with an addition of 5 c.c. of hydro-loric acid. After filtration, the residue was washed with idified water to remove soluble salts, and gently ignited d weighed. The difference between this residue and e total insoluble residue, determined in the ordinary y was taken as "silica soluble in hydrochloric acid." e residue insoluble in hydrochloric acid was next iled with a 10 per cent. solution of sodium carbonate, tered, washed, and weighed, the loss being regarded as silica soluble in sodium carbonate." On treating the sidue from this operation with hydrofluoric acid, the sulting loss was set down as "silica removed by hydro-oric acid," and the final residue as "residue from hydro-oric acid." The results showed that the silica soluble hydrochloric acid increases with the kiln temperature ployed. The silica soluble in sodium carbonate attains maximum in the sample fired at 1352° C., the undecom-sed silicates being smallest in the same sample. The ount of undecomposed silicates increases with the rise temperature above 1352° C., and the proportion of silica erated when these silicates are treated with hydrofluoric d is about 50 per cent. The probability is that all the ginal silicates have been converted into readily decompos-le basic silicates below 1352° C., and that the increased antity of undecomposed silicates at higher temperatures is e to the more acid silicates left in the magma, from which true cement-forming constituents have separated.
—C. S.

English Patents.

ilns, or Ovens, for Burning Cement, Plaster, or Lime. G. H. Alexander, Birmingham. Eng. Pat. 21,480, Oct. 2, 1902.

CHARGING aperture is arranged in the top of the kiln, l a number of apertures are formed in the sides of the n opposite each other, so that the contents of the kiln y be emptied through one opening by an attendant rking at the opposite opening. Or else these apertures y be dispensed with, and the fire bars combined together l pivoted on one side so that the burnt charge may be ered bodily into a truck placed below the bars, which y be balanced by external weights. A forced draught is oduced just above the bars.—A. G. L.

Asphalt; Artificial ——. P. M. Justice. From Aktieselskabet, Venezuela-Asfalt Kompagnie. Eng. Pat. 21,799, Oct. 9, 1903. III., page 1343.

French Patents.

Stones, Artificial; Manufacture of ——. J. Purvis and T. Rouse. Fr. Pat. 333,433, June 29, 1903.

See Eng. Pat. 3291 of 1903; this Journal, 1903, 629.
—T. F. B.

Wood, Non-Inflammable; Process for Making ——. W. H. Peddle. Fr. Pat. 333,453, June 30, 1903.

See Eng. Pat. 14,522 of 1903; this Journal, 1903, 998.
—T. F. B.

Building Materials, Coatings, and other Applications; New Product for ——. J. E. Tolhill. Fr. Pat. 333,781, July 11, 1903.

Ten to 18 parts of any mineral or vegetable matter, such as slag, sawdust, sand, or asbestos, are mixed with one part of a basic cement, preferably calcined magnesite. The mixture is then moistened with a liquid, best obtained by dissolving equal parts of magnesium chloride and silicic acid in water, placed in moulds and allowed to dry. It may also be applied to walls, &c., in the form of a coating by means of a trowel. Silicic acid may also be used alone without any magnesium chloride.—A. G. L.

X.—METALLURGY.

[Steel], Small Bessemer Converter Process, and Cost of Applying it. Unckenholt. Stahl u. Eisen, 1903, **23**, 1227; Chem.-Zeit., 1903, **27**, [93], Rep. 307.

The author considers that the best converter capacity is 1,000 kilos. (1 ton). If smaller quantities are used the first charge is not hot enough; but when once the converter is heated, the weight of the charge may be reduced to 800—900 kilos For the small converter-process it is necessary to allow for a loss of 7 per cent., coupled with a consumption of coke equal to 15 per cent. in the cupola. The converter loss depends largely on the skill of the operator; it may be reckoned, however, at 10·5 to 11 per cent. in all, including 2·5—3 per cent. from the ferromanganese, ferrosilicon, spiegel, and aluminium added. From 1 to 2 M. of coke are used for warming the converters, moulds, &c., per 1,000 kilos. of steel.—W. G. M.

Sulphur in Iron; Influence of Silicon and Carbon on ——. F. Wüst and A. Schüller. Stahl u. Eisen, **23**, 1128; Zeits. angew. Chem., 1903, **16**, [47], 1134.

A very pure iron was melted with varying quantities of pure ferrous sulphide and of ferrosilicon. The results show that silicon cannot be regarded as useful in practice for desulphurising iron. Desulphurisation does, indeed, occur: with small percentages of silicon through the immiscibility of silicon with iron sulphide, and with larger percentages through the formation and volatilisation of silicon sulphide. With more than 20 per cent. of silicon practically the whole of the sulphur is thus removed. Ferrous sulphide and ferrosilicon, when heated together, enter into reaction, with evolution of heat, and a substance is volatilised which is found to be SiS, as it has the properties ascribed by Colson to that compound. Moisture reacts on it very readily, forming silica and hydrogen sulphide. Carbon and sulphur are usually looked on as mutually expelling one another from iron, and it is supposed that they form carbon bisulphide, which volatilises. The author finds, however, that no carbon bisulphide escapes when irons rich in carbon and in sulphur are fused together in a current of nitrogen. When a high carbon iron is fused and sulphur added, the carbon is expelled as the sulphur increases; with 25 per cent. of sulphur not more than 0·17 per cent. of carbon can be taken up by the iron. If a high-carbon iron be fused with ferrous sulphide, the two alloy very slowly, and the carbon is gradually expelled. The speed of reaction is retarded by the difference in density of the two for on cooling there is found a lower layer of iron containing the maximum amount of carbon compatible with the sulphur it contains, and an upper layer of ferrous sulphide which has taken up a very small amount of carbon. The author concludes that carbon does not act as a direct desulphuriser.—J. T. D.

Iron, Finery; Red-shortness of ——, and its Causes. G. A. Forsberg. Oesterr. Zeits. Berg- u. Hüttenw., 1903, **51**, 623; Chem.-Zeit., 1903, **27**, [93], Rep. 307.

ANALYSES and tests show that pig-iron which is free from sulphur and copper and contains but little silicon and manganese, affords an iron without any sign of red-shortness, if the temperature of the blast in the finery exceed 750° C. Red-shortness first appears when the sulphur in the pig-iron amounts to 0·009—0·010 per cent., and increases with the proportion of that element present, especially if copper or arsenic accompany it. The red-shortness of wrought iron is therefore caused by sulphur, either alone, or with copper or arsenic, and the assumption that oxide of iron contributes to the effect is erroneous.—W. G. M.

Irons and Mild Steels: Modes of Deformation and of Fracture of ——. F. Osmond, C. Frémont, and G. Cartaud. Comptes rend., 1903, **137**, [21], 851—853.

IRONS and steels have to be looked on as possessing simultaneously amorphous, cellular, and crystalline structure, and may undergo the strains, and break in the manner peculiar to bodies possessing any one of these types of structure.

For the same Steel, the application of static forces tends to produce strain, indicating amorphous or cellular structure, and ultimate fracture after considerable deformation; while tempering at a blue heat, sudden shocks, or rapidly alternating stresses favour crystalline strains, and ultimate sudden fracture without notable deformation.

For different Steels, crystalline strains and ultimate intercrystalline fracture are more probable, as the crystalline structure is more marked. Other metals may have structures as complicated as that of steel; but the mechanical properties arising from the different varieties of their structure are similar, while in the case of steel they are opposed. Cellular iron is plastic; crystalline iron is brittle; it is this duality which gives to iron its peculiar position among constructive materials, and explains the unforeseen fractures which occasionally occur in the members of steel structures.—J. T. D.

Ferrite and Cementite in Steel; Simultaneous Presence of ——. E. F. Lange. Metallographist, 1903, **6**, 9—13.

THE author finds that by prolonged heating at 600°—700° C., steel can be obtained in which the pearlite is entirely segregated into its constituents, ferrite and cementite. A steel containing 0·38 per cent. of combined carbon, 0·25 per cent. of silicon, 0·70 per cent. of manganese, 0·03 per cent. of sulphur, and 0·05 per cent. of phosphorus consisted entirely of free ferrite and free cementite; in other specimens, the segregation was only partial. This statement, which has been confirmed by Stead and by Arnold, is now accepted by Sauveur, who, in 1896, stated that free ferrite and free cementite never exist together in the same steel, but separate as the eutectic alloy, pearlite, only the excess appearing as ferrite or cementite.—A. S.

Classification [Gold Ores]; Notes on ——. T. L. Carter and D. V. Burnett. J. Chem. Met. and Min. Soc. of South Africa, 1903, **4**, [3], 119—125.

ON the Rand the mill pulp, after amalgamation, is usually classified for cyaniding into concentrates and coarse sands, sands, and slimes; but the classification is not well defined, as the character of the products depends upon the special treatment used.

Concentrates.—Pure concentrates are pratically unleachable, and are of little use for cyaniding. Sufficient sand (say 86 per cent.) is therefore mixed with the sulphides (14 per cent.) to render the material suitable for leaching; the mixed product amounts to about 8—9 per cent. of the mill product. The cyaniding frequently extends over 30 days. An experiment made by the authors has, however, shown that most of the gold is commonly extracted by the 10th day. The following scheme is proposed for dealing with the concentrates problem:—(*a*) Classifying concentrates and very coarsest of sand as clean as possible by means of increased "Spitzlutte" capacity, and dispensing with the use of the expensive vanners; and (*b*) Re-crushing and treating these concentrates and very coarse sand, in a revolving barrel or the like, with cyanide solution of suitable strength. The result would be considerably higher extraction, a more amenable sand product, owing to some of the finer portions of the coarse sands running into the tanks with the fine sands, a great saving in both time and cyanide, and the utilisation by sands of some of the tank capacity now occupied by concentrates and very coarse sands, so affording the latter an extra two days for treatment. In regard to the sands, the tanks are filled with this product either by the Mein-Butters distributors or with the aid of a man with a hose. The authors prefer the latter. Of the components of these sands most of the gold is present in the rich sulphides and coarse sands which are always found with them. In one case there were 3·73 per cent. of concentrates present, assaying 14·1 dwt. per ton, and 96·27 per cent. of sands, assaying only 0·57 dwt. per ton. In treating slimes it is essential that fine sands and float sulphides should be kept out of the slimes treatment tanks. The use of sufficiently large "Spitzkasten" to allow the fine sands to settle (so that they may be returned to the tailings wheel) facilitates this. The large Spitzkasten at first used to ensure a thorough settlement of the slimes are now being replaced by tanks of (say) 50 ft. in diameter, into which the slimes are run direct from the tanks. It is usual in some mines to run the ore-washings from the sorting house into the tailings wheel, with the result that the free gold present escapes extraction in the sand tanks and is found in the slimes plant. It is better to run them into pits, and to add lime, which helps both to settle and to neutralise them, after which the mixture is passed through the mill, where the free gold is caught. Attention is being given to the treatment of old tailings heaps. The author believes that the gold extracted from such a material is rendered available by the mechanical splitting up of the sulphides owing to weathering. In that case only the concentrates present are useful, and it would be better to dump the concentrates residues in a place apart from the rest of the tailings, so that they would be ready for future treatment after weathering.—W. G. M.

Cyanide Vats; A System of Handling Sand Mechanically for ——. C. Butters and A. F. Crank. Trans. Inst. of Min. and Metall. Read Nov. 19, 1903.

THE works are designed for the treatment of 275 tons of tailings daily, of which 55 per cent. consist of slimes and 45 per cent. of sands. The plant described is employed for the treatment of the sand, 125 tons being handled twice during the working day of 10 hours. The sand-handling plant consists of a Butters distributor for charging the (2) collecting vats, one Blaisdell bottom-discharge excavator for discharging all the vats, one Blaisdell centrifugal distributor for charging the (6) leaching vats, and a combination of four 16-in. belt conveyors for transport of the sand. The vats are 30 ft. diameter by 6 ft. deep, large enough to take 125 tons of sand; all are set upon one foundation, and each has a central conveying belt below. Two of them are used for collecting and draining the sands received from the tailings wheel; their contents are then removed to one of the six leaching vats for cyanide treatment. The distributor and the launder spout are supported by cranes, so that they may be used upon either spindle, excavator beam or discs. The excavating and distributing machines are movable steel structures, spanning the tanks and travelling upon 16-lb. rails placed 9 ins. outside, 12 ins. above, and extending the length of the line of vats. The Blaisdell excavator consists of a steel truss bridge, supporting at midspan the excavator and driving gears, and at one end the motor traverse gears. In dealing with a filled vat, the boring head is first brought over the opened central discharge valve, and driven through the sand. The excavator beam is then raised to clearance position and is brought over the discharge opening by moving the bridge forward. The beam is now lowered until the discs meet the sand, when the revolving gears may be started and the required feed set. The machine then runs without attention until it comes into contact with the automatic stop. The Blaisdell centrifugal distributor is supported at midspan of a movable steel bridge having a deck and trucks similar in design to those of the excavator, but not so heavy in construction. At one end of this bridge a tripper is placed overhanging a conveyor and diverting the sand from the latter to a conveyor upon the bridge deck. This discharges into a cast-iron hopper at the bridge centre. A revolving vertical spindle passes through the hopper, and has a horizontal steel disc keyed upon the lower end and provided with short radial vanes of angle iron. The vaned disc or distributor revolves rapidly, and sand falling from the hopper upon the whirling surface is showered evenly over the vat surface below. A cylindrical guard-ring of light sheet iron, 15 ins. wide and 24 ft. in diameter, surrounds the distributor, which prevents the loss of stray sand particles when filling near the top of the vat. When working the distributor, the shiftsman starts the traverse gears and runs the distributor into position over the closed central valve of an empty leaching vat. He then starts the distributor and conveyor. Leaving the machine, he passes along the sand-house to the switchboard of the motor driving the conveyors. After starting the conveyors, he passes on to the excavator, which he has previously placed in position. He now starts it, and, after watching for a few minutes to see that the feed of excavation is properly set, he leaves it to itself. This machinery, during the present year, has demonstrated that the work in the sand-house may be executed regularly in a given time entirely independent of labour conditions. Both the supply and cost of labour may be disregarded, for the primary consideration has now become merely the cost of power. The compact nature of sand in a collecting vat is well known. In these works, the sand is removed from the collecting vat and transferred to the leaching vat before leaching. One advantage gained is that the subsequent percolation is exceedingly sure, rapid, and thorough; 125 tons of sand will, when drained, form a deposit of 3 ft. 6 ins. deep in a 30-ft. collecting vat. After the complete disintegration secured by the excavating process, the sand is again broken up and blended by the action of the distributor, with the result that the 125 tons will produce a depth of 4 ft. 8 ins. in the 30 ft. leaching vats before the introduction of solution, and subsequently settle 8 ins. during treatment. The opportunity secured for complete percolation is obvious. At Virginia City the yearly cost of one electrical h.p. is 84·00 dols., or $\frac{48}{100}d.$ per h.p. hour. A high potential polyphase current is transmitted from the power station, 50 miles distant, to step-down transformers at the works, and from these is distributed to various motors. One of these motors drives a 110 volt D.C. generator, for supplying the power required by the excavator and distributor motors. An addition of 15 per cent. must therefore be made to the cost of h.p. used by these machines to cover the loss in the motor-generator set. With this addition the total cost per h.p. hour would be $1\frac{1}{10}$ c., and the costs are calculated on this basis in the following table. The distributor requires 2·35 h.p., at the average speed of 204 revolutions per minute, and will, of course, run for the same length of time as the excavator, and with a cost per h.p. hour of $1\frac{1}{10}$ c. ($\frac{55}{100}d.$). The conveyor system is run from a polyphase motor and requires 11·45 h.p. when Nos. 1, 2, and 3 are used. No. 4, when used, would require about 8 h.p., but it is not required with the present method of treatment. The total power used by this system for the double handling of 125 tons a day throughout the sand-house creates a daily expense made up of the following items:—

				Cents.
Discharging collecting vat...	30·5 h.p. hrs.	at	1·1 c. ...	33·55
Conveyors, Nos. 1, 2, and 3...	41·5	„	„ 0·96 c. .	39·80
Distributing................	8·5	„	„ 1·1 c. ...	9·35
Discharging leaching vat ...	11·5	„	„ 1·1 c. ...	12·65
Total cost for 125 tons..........		3s. 11d.		95·35
„ „ 1 ton				0·763

The time required for shifting machines, setting, lubrication, and cleaning up will usually amount to two hours per day, or 20 per cent. of a 10-hour day, for which 3 dols. (12s. 4d.) is paid. The working costs may be tabulated as follows:—

	s.	d.	Cents.
Power............................	3	11	95·35
Supplies and wear (estimated)	0	$10\frac{3}{16}$	21·90
Labour............................	2	$5\frac{9}{16}$	60·00
Total..........................	7	$3\frac{4}{16}$	177·25
Cost per ton		$0\frac{7}{16}$	1·415

If the works had to be enlarged from a capacity of 400 tons of tailings daily to a capacity of 1,000 tons, and the percentage of sand continued about what it is now, the only change required for enabling the machines to handle the 480 to 500 tons of sand twice in the 24 hours would be to replace the present excavator motor for one of greater power. The El Oro Mining and Railway Co., of Mexico, are now erecting a complete cyanide plant for their new 100-stamp mill. The plant for treating the sands consists of nine collecting vats, 22 ft. by 10 ft., served by one Blaisdell excavator, and 14 leaching vats, 40 ft. by 6 ft., in two rows, served by one excavator. By arranging a series of Robins belt-conveyors the contents of any one leaching vat can be transferred to any other leaching vat, or conveyed direct to the tailings dump; the capacity of excavators and of the belt-conveyors is 100 tons per hour. The estimated cost of working this plant in Mexico at the rate of 200 tons per day is $1\frac{1}{2}d.$ per ton. It requires the services of two men, the cost of power being taken at 2l. per h.p. per annum. No cyanide solution is ever run into the collecting tank, as its contents, after having been filled from the battery, are allowed to drain, and are then transferred by means of the excavator directly to the leaching tank. Therefore no loss of gold can take place from cyanide solution having been introduced into the collecting tank, as is the case when the collecting tank is filled directly from the battery, and gets its preliminary treatment of cyanide solution in the same tank. The use of the Blaisdell excavator reduces the number of vats required to produce a given result, as rapid percolation takes place in all the vats used for leaching, while at present only one-half the vats are in a condition for perfect percolation. This process has now removed one of the last difficulties in gradual elimination of hand labour from modern gold mills, so that the whole mill-work can be made practically automatic.—J. H. C.

Copper; Effect of Impurities on Commercial ——. E. A. Lewis. Engineering, Dec. 4, 1903, 753.

The impurities may be divided into three groups:—(1) Metals (lead, bismuth) which separate out round the copper crystals in the free state. (2) Metals (arsenic, antimony, tin, zinc) and also the non-metals oxygen, phosphorus, and sulphur, which unite with the copper and separate out round the crystals of the latter in the form of an alloy or compound. (3) Metals (iron, manganese, aluminium, and nickel) which form a solid solution with the copper. The addition of 0·2 per cent. of lead or bismuth to pure copper renders the metal so brittle that it cannot be rolled. Bismuth is far more injurious than lead, an addition of even 0·002 per cent. to pure copper being sufficient to make the latter brittle. Copper containing 0·2 per cent. of arsenic, phosphorus, or tin can be rolled hot and is very malleable. With 0·2 per cent. of antimony or zinc it frequently cracks at the edges when rolled. It may contain up to 1 per cent. of cuprous oxide, without the malleability being affected, if no other impurity be also present. Copper with 0·2 per cent. of iron, manganese, aluminium, or nickel has a micro-structure similar to that of the pure metal. The injurious effect of bismuth, lead, and antimony is neutralised, to some extent, by the addition of arsenic, but is intensified by the addition of tin, manganese, or aluminium. 0·5 per cent. of manganese or aluminium is capable of neutralising the injurious influence of 0·1 per cent. of sulphur. The following are stated to be the requirements for the four kinds of copper now in use for boiler tubes, &c.:—(1) Ordinary refined copper should contain 99·6 per cent. of copper, not more than 0·1 per cent.

lead or arsenic, or 0·05 per cent. of antimony, less than 0·005 per cent. of bismuth, and about 0·1 to 0·2 per cent. of oxygen, according to the amount of other impurities present. (2) Arsenical copper is harder and tougher and has a higher tensile strength, both at the ordinary temperature and at 250° C., than ordinary refined copper. It should contain at least three times as much arsenic as the amount of lead and bismuth, and in no case less than 0·6 per cent. of arsenic. (3) Phosphorised copper is harder than ordinary copper. It should contain 99·7—99·8 per cent. of copper, 0·05—0·1 per cent. of phosphorus, and not more than 0·04 per cent. of oxygen. (4) Copper containing 2 or 3 per cent. of nickel or manganese is harder and has a higher tensile strength than ordinary copper. It should not contain more than traces of lead or antimony. (See also this Journal, 1901, 254.)—A. S.

Aluminium; Welding of ——. S. Cowper-Coles. Electro-Chemist and Metall., 1903, **3**, 240—243.

After referring to some of the methods which have been proposed for welding aluminium (see Eng. Pats. 24,123 of 1899 and 6735 of 1900; this Journal, 1900, 251; 1901, 587), the author describes his own process. The machine in which the welding is effected is provided with two clamping screws, capable of being moved horizontally on suitable guides. The parts to be welded are inserted in the clamping screws and heated to the necessary temperature, and are then pressed together, whereby the two parts unite, whilst a ring of material consisting mainly of alumina is squeezed out, and forms an insulating and supporting collar around the joint. By means of a handle connected to suitable mechanism, a jet of water under pressure is now directed on to the weld, whilst, at the same time, a screen is interposed in front of the source of heat. It is stated that the joint, after the collar has been filed off, is as strong as the rest of the metal.—A. S.

Tin, Commercial; Analysis of ——. L. & G. Campredon. XXIII., page 1368.

Nickel; Analysis of Commercial ——. A. Hollard. XXIII., page 1369.

Iron; The Rusting of ——. *Part II.* G. T. Moody. Proc. Chem. Soc., 1903, **19**, [271], 239—240. (See this Journal, 1903, 745.)

The author has further investigated the causes of the rusting of iron, more particularly with reference to the influence of soluble substances, and finds that the salts of strong acids, such as sodium chloride and sulphate, potassium sulphate, ammonium sulphate, magnesium chloride and sulphate, calcium chloride and sulphate, and potassium chlorate have no retarding influence on rusting. These salts do not combine with and are not decomposed by carbonic acid. Compounds which inhibit rusting may be divided into two classes. The first contains substances having an alkaline reaction, such as sodium carbonate, hydroxide, phosphate and borate, ammonium carbonate, and barium and calcium hydroxides, all of which directly absorb and combine with carbonic acid. The second class includes salts of weak acids, such as potassium and sodium nitrites, sodium formate, sodium acetate, potassium ferrocyanide and chromate. These salts are all decomposed by carbonic acid. Potassium ferricyanide is a salt of a weak acid which does not appear to retard rusting in the least. This substance is, however, reduced by iron whether its solution be exposed to air or not, the metal becoming covered in either case with a mass of insoluble, greenish-blue cyanide. It may therefore be concluded that the influence of any particular compound on the atmospheric rusting of iron depends on its behaviour towards carbonic acid, and that only those substances which combine with or are decomposed by carbonic acid inhibit rusting. The aërial rusting of iron cannot be attributed to hydrogen peroxide, but must be regarded as a change involving the interaction of iron and acid and subsequent formation of rust by the oxidation of ferrous salt.

Zinc; Atmospheric Corrosion of ——. G. T. Moody. Proc. Chem. Soc., 1903, **19**, [272], 273. (See also this Journal, 1903, 745.)

The recorded observation that hydrogen peroxide may be detected during the oxidation of zinc in presence of water has been brought forward by Dunstan in support of his contention that, in the case of iron, hydrogen peroxide "is a necessary intermediate product of the chemical change involved in rusting" (see Report of the Steel Rails Committee of the Board of Trade for 1900). Strips of thin sheet zinc were suspended in a muslin bag and exposed to the atmosphere for five months. At the end of this period, the semi-crystalline scale was detached from the metal and dried; it had a composition closely agreeing with the formula $ZnCO_3, 3Zn(OH)_2$. The production of this basic carbonate may be regarded as evidence that the atmospheric corrosion of zinc is to be attributed not to direct oxidation of metal, but to an interaction with carbonic acid. This view is supported by the behaviour of zinc in a saturated solution of carbon dioxide. The metal dissolves with evolution of hydrogen and formation of zinc hydrogen carbonate. The resulting solution, when heated or exposed to air, becomes turbid, and on spontaneous evaporation yields a basic carbonate agreeing in composition with the product of atmospheric corrosion. The statement made by Dunstan (*loc. cit.*) that iron, zinc, and lead behave similarly towards hydrogen peroxide is not in agreement with the observations of the author. The author concludes that the atmospheric corrosion of zinc, like that of iron, is the result of interaction between metal and acid, and that the attack on zinc is less marked because the acid is in a great measure retained in combination as basic carbonate.

English Patents.

Cementation of Iron, Steel, and Cast Iron; Process for the ——. B. J. B. Mills, London. From J. Lecarme, Paris. Eng. Pat. 704, Jan. 10, 1903.

See Fr. Pat. 327,984 of 1902; this Journal, 1903, 1052.
—T. F. B.

Furnaces for the Roasting of Ores. W. T. Rushton, London. Eng. Pat. 26,782, Dec. 4, 1902.

The furnace is of the horizontal continuous roasting type, and in one of its forms comprises two rotating cylindrical muffles in series, one above the other, having fixed ends of an intermittent charging inlet to one cylinder, and an intermittent discharging outlet from the other cylinder, the lower cylinder being fed from the one above it. Each cylinder has an internal spiral conveying flange, with inclined baffles projecting laterally from the flange; the fixed ends are provided with inlets and outlets for air and gases, and there are intermittent feeding and discharge valves actuated by a cam on the rotating end of the cylinders. A heating chamber, immediately above one or more burners, is arranged below each cylinder. The invention may be applied to a furnace having any number of cylinders working in series or in parallel.—E. S.

Sulphides from Ores; Apparatus for Use in Certain Processes for the Extraction of ——. G. C. Marks, London. From Broken Hill Proprietary Co., Ltd., Australia. Eng. Pat. 6724, March 23, 1903.

The apparatus is adapted to carry out the concentration of sulphide ores by a continuous treatment of them by a saline solution, such as of salt cake, sodium, or potassium nitrate, or of zinc nitrate and nitric acid, by which treatment the richer portion of the ore floats, and can be mechanically separated from the tailings. The powdered ore is continuously delivered into a pan having a sloping bottom, with heating devices beneath, an adjustable feed-directing plate separating (except as to a small outlet) a sump or tailings receiver from the discharge launder which receives the floated products. Reference is made to Eng. Pats. 26,279 and 26,280 of 1902; this Journal, 1903, 913 and 1197. See also Fr. Pat. 326,867 of 1902, U.S. Pat. 735,071 of 1903, and Eng. Pat. 19,783 of 1903; this Journal, 1903, 871, 1001, and 1247.—E. S.

Aluminium; Process for Hardening ——. C. Sorensen, Slagelse, Denmark. Eng. Pat. 20,758, Sept. 26, 1903.

About 10 parts of aluminium are fused in a plumbago crucible with 1 part of potassium chloride at a temperature of about 800° C., and the liquid mass is poured on to sand to cool. Compare Eng. Pat. 9715 of 1903; this Journal, 1903, 914.—E. S.

Copper; Process of Hardening ——, *and Extracting Metals from Matrices.* S. Oxnam, Wolverhampton, and J. Oxnam, Tipton. Eng. Pat. 21,665, Oct. 8, 1903.

The copper to be hardened, is heated to dull redness, and is then immersed in urine, in which sugar may be dissolved. To extract a metal or mineral from its matrix, as galena or gold from quartz, the same process is used, whereby disintegration of the matrix is stated to be effected.—E. S.

United States Patents.

Steel; Process of Manufacturing ——. W. B. Brookfield, Syracuse, N.Y. U.S. Pat. 744,031, Nov. 17, 1903.

A mixture of from 94 to 70 parts of iron, 1 to 15 parts of chromium, and 5 to 15 parts of molybdenum, all by weight, are fused together, the molten mass is reduced to a fragmentary condition, *e.g.*, by allowing it to drop into a liquid, and the fragments are melted in crucibles, to form steel.—E. S.

Steel; Process of Manufacturing ——. W. B. Brookfield, Syracuse, N.Y. U.S. Pat. 744,032, Nov. 17, 1903.

From 94 to 60 parts, by weight, of iron, 5 to 25 parts of tungsten, and from 1 to 15 parts of chromium, are fused together, and subsequently treated as described in the preceding abstract, to form steel.—E. S.

Steel; Process of Manufacturing ——. W. B. Brookfield, Syracuse, N.Y. U.S. Pat. 744,033, Nov. 17, 1903.

The process described in the first of the two preceding abstracts is carried out upon a mixture of from 97 to 45 parts, by weight, of iron, 1 to 15 parts of chromium, 1 to 25 parts of tungsten, and 1 to 15 parts of molybdenum. —E. S.

Steel; Manufacturing ——. W. B. Brookfield, Syracuse, N.Y. U.S. Pat. 744,034, Nov. 17, 1903.

The process described in the first of the three preceding abstracts is conducted upon a mixture of from 99 to 80 parts, by weight, of iron, with from 1 to 20 parts of molybdenum.—E. S.

Steel; Process of Manufacturing ——. W. B. Brookfield, Syracuse, N.Y. U.S. Pat. 744,035, Nov. 17, 1903.

Part of the ingredients composing a steel, such ingredients including a base and a metallic alloying substance adding to the hardness of the product, are enclosed in a fusible case, and melted, together with the remaining part of the ingredients. The molten mass is then subdivided by dropping into a liquid, and the resulting fragments are melted together.—E. S.

Steel; Process of Manufacturing ——. W. B. Brookfield, Syracuse, N.Y. U.S. Pat. 744,036, Nov. 17, 1903.

Part of the ingredients for forming a steel, such ingredients including a base and a metallic alloying substance, are fused, and subdivided by dropping into a body of liquid. The fragments or nodules thus obtained are then fused with the remainder of the ingredients in reserve, for forming the steel. A claim is also made for an alloy of iron and chromium, produced by fusing these metals together, which alloy, after subdivision, is fused with molybdenum.—E. S.

Mercury and Amalgam from Ores; Machine for Recovering ——. T. H. Hicks, Fort Wayne, Ind., Assignor to the Hicks Gold and Silver Extraction Co., Georgia. U.S. Pat. 744,759, Nov. 24, 1903.

A reciprocating pan is provided with an amalgamated lining, and with amalgamated joints in the lining for the passage of mercury, and with grooves beneath the joints. —E. S.

French Patents.

Iron, Steel, and their Alloys; Manufacture of ——. J. B. De Alzugaray. Fr. Pat. 333,382, June 20, 1903.

The invention relates to obtaining iron, steel, or their alloys, wholly or in part, directly from the finely-powdered ores, these being mixed before furnacing, preferably in the form of briquettes, with the necessary reducing and refining substances. The proportion of carbon or its equivalent used, varies according to the nature of the ore, and the product which it is desired to produce. Fluxes may be added, and sometimes slags. Two classes of briquettes are described, one class containing carbon, with stated proportions of ore, fluorspar, sodium chloride, and chalk; and the other class without carbon, containing the ore, fluorspar, sodium chloride, a considerable proportion of a silicate, and chalk. These two classes of briquettes may be used together in adjusted proportions.—E. S.

Steel; Process for Transforming Cast Iron containing considerable Quantities of Chromium into ——. O. Massenez, Germany. First Addition, dated July 1, 1903, to Fr. Pat. 329,132 of Feb. 6, 1903. (See this Journal, 1903, 1002.)

Instead of adding chlorides or fluorides as fluxes to cast iron containing chromium fused in a reverberatory furnace, as in the main patent, easily fusible slags are chosen for the same purpose, which slags should not be so used as to take up more than 13 per cent. at most of their weight of chromium oxide. The process is also available in the case of iron containing more than 1 per cent. of chromium oxide.—E. S.

Steel; Manufacture of ——. T. J. Tresidder. Fr. Pat. 333,582, July 4, 1903.

The object of the invention is to manufacture a steel containing, in 10,000 parts by weight, from 28 to 32 parts of carbon, 25 to 30 parts of manganese, 225 to 250 parts of nickel, and 28 to 32 parts of tungsten. The charge, composed of about equal weights of hæmatite or of Swedish iron, and of steel scrap, is melted in a Siemens furnace, and when the proportion of carbon is reduced below 1·5 per cent., the required proportions of nickel, ferromanganese, and of ferro-tungsten are successively added to give the above-stated composition.—E. S.

Antimony; Manufacture of ——. H. L. Herrenschmidt. Fr. Pat. 333,340, June 24, 1903.

Antimony ore, containing from 40 to 50 per cent. of antimony, is treated in a converter furnace, on the hearth of which stated proportions of wood, coke, and ore are successively placed, the wood being first well lighted; the mass is covered by another layer of coke, and by antimony oxysulphide from a preceding operation. Air is blown in under pressure, and the antimony oxide which forms is collected in suitably disposed apparatus. Later, oxysulphides are stated to distil, and are received in the two first condensation chambers. A certain proportion of metallic antimony is formed by management of the blast, which metal is run off. The richer portion of the slags, &c. are treated in the following operation.—E. S.

Alloy of Aluminium, Copper, and Cadmium. Meteorit-Ges. m. b. H. Fr. Pat. 333,437, June 29, 1903.

See Eng. Pat. 16,453 of 1903; this Journal, 1903, 1090. —T. F. B.

Separation of Mixed Minerals; Mechanical ——, *according to their Densities.* G. Pereire. Fr. Pat. 333,507, July 1, 1903.

A rapid current of some inert gas, such as flue gases purified by washing with water, is passed over the finely-powdered mineral, and carries the particles away, depositing them at different distances, the heavier particles settling first, and the lighter last. The process can be used for the separation of zincite from calcite, and of coals from pyrites. —L. F. G.

Nickel-plating; Process of ——, and Products resulting therefrom. T. A. Edison. Fr. Pat. 333,614, July 7, 1903.

See U.S. Pat. 734,522 of 1903; this Journal, 1903, 1044.
—T. F. B.

Soldering Composition for Metals, and Process for its Manufacture. A. Nodon and G. Dary. Fr. Pat. 333,783, July 11, 1903.

The soldering is effected with a composition containing an absorbent of oxygen, such as will prevent the oxidation of the metal, and so render unnecessary the preliminary scraping ordinarily required. Such a composition is obtained by incorporating with lead a haloid salt of lead (or other fusible haloid salt) which at the heat of fusion gives off its halogen and absorbs oxygen from the atmosphere. The soldering composition referred to, may be formed by making lead ingots the anode in an electrolytic bath, prepared by a soluble alkali or alkaline-earth chloride, slightly acidulated by hydrochloric acid.—E. S.

Oxides of Antimony and similar Products; System of Apparatus for Condensation of ——. H. L. Herrenschmidt. Fr. Pat. 333,306, 1903. VII., page 1348.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Furnaces; Electric Resistance ——. F. A. J. FitzGerald. Amer. Electrochem. Soc., Sept. 1903. Electrochem. Industry, 1903, **1**, [14], 481.

Resistance furnaces are of two classes: in the first the current passes through the whole charge; in the second, along localised paths. Of the first is the furnace for making graphite electrodes, where the heat is generated mainly in the coke packing surrounding the electrodes. Of the second class are carborundum and "white-stuff" furnaces. In the former a central carbon core imparts heat to the mixed sand and coke surrounding it; it the temperature becomes too high, the product may be decomposed by vaporisation of silicon. The latter are similarly constructed, but work at a lower temperature, for the regulation of which Acheson uses several cores definitely spaced. Furnaces for making graphite in bulk have a granular charge of anthracite, coke, &c. (which, as such, are non-conductors), and a series of carbon cores; they begin in the second class of furnaces and end in the first. Since in all furnaces the resistance fluctuates, the adjustment of temperature is difficult.—W. A. C.

Diaphragms; Metallic ——. E. A. Byrnes. Amer. Electrochem. Soc., Sept. 1903. Electrochem. Industry, 1903, **1**, [14], 490.

Various conductors, such as magnetite, have a high resistivity when powdered, and are then less liable to act as bipolar electrodes. When used as diaphragms, they are either moulded with an inert binder, *e.g.*, silicates, ferrous hydroxide, &c., or are enclosed between perforated metal sheets.—W. A. C.

Persulphates; Electrolytic Production of ——. G. Levi. Gazz. chim. ital., 1903, **33**, [2], 81; Chem.-Zeit., 1903, **27**, [93], Rep. 308.

Starting with the object of determining the conditions most favourable to the production of persulphates, the author has arrived at the following conclusions. 1. In the production of ammonium persulphate without diaphragms and with the addition of a small quantity of potassium chromate, the temperature may, without injury, rise to 30° C., and without any lowering of the efficiency. The condition of the cathodes is almost without effect on the efficiency, if they are of platinum or nickel; a slight decrease is observable when lead is used, and an equally slight increase when carbon is employed. The condition of the anode surface, however, exerts a marked influence thus new anodes give a better result than do those of which the surface is rough or worn.—W. G. M.

Electrolytic Separation of Metals; Influence of Gases on —— [Separation of Nickel from Zinc]. Hollard and Bertiaux. XXIII., page 1369.

Alcohol; Synthetic ——. G. Arachesquesne.
XVII., page 1361.

English Patents.

Galvanic Cell. G. Pearson, Ilford, and L. Fiedler, London. Eng. Pat. 27,373, Dec. 11, 1902.

See U.S. Pat. 738,718 of 1903; this Journal, 1903, 1092.
—T. F. B.

Electrode for Galvanic Cells, and a Method or Process for Producing same. G. Pearson, Ilford, and L. Fiedler, London. Eng. Pat. 27,374, Dec. 11, 1902.

See U.S. Pat. 738,719 of 1903; this Journal, 1903, 1092.
—T. F. B.

Positive Electrodes for Secondary Batteries; Manufacture of ——. C. Roderbourg, Westphalia. Eng. Pat. 1088, Jan. 15, 1903.

The electrode is first obtained in the form of a negative plate of lead sponge, and is then immersed in a salt solution so that the latter completely fills the pores, after which the plate is dried. The lead sponge may also be directly produced by reduction from peroxide of lead in a salt solution. Salts of sulphuric acid, phosphoric acid, boric acid, and silicic acid, in which the metal is not precipitated by the lead, are suitable, sulphate of zinc being specially mentioned.—B. N.

Alkaline Chlorides; Electrolytic Decomposition of ——. J. D. Gilmour, Glasgow. Eng. Pat. 22,135, Oct. 11, 1902.

This specification relates to improvements on Eng. Pat. 18,397, 1900 (this Journal, 1901, 1220). Instead of employing a mechanical pulsating pump for pumping the alkali liquor, an automatically-acting siphon, or siphons, is used to give an intermittent discharge at regulated intervals from the storing cistern. Carbon plates are placed in the bottom, or bottom and sides, of the cathode vessel, so as to accelerate the liberation of sodium from the amalgam; or the amalgam may be circulated through an auxiliary vessel containing the carbon plates, and the current generated by the formation of the caustic alkali may be suitably carried off and utilised.—B. N.

Heating by Means of Electricity. I. J. Broun, Innsbruck, Austria. Eng. Pat. 24,235, Nov. 5, 1902.

In electrical heating, the resisting material, such as carbon or the like, is placed in non-conducting, refractory sheaths or tubes, such casings being placed in contact with the material to be heated. The carbon, instead of being placed in removable casings, may be enclosed in suitable chambers made in the vessel to be heated. It is recommended, especially in heating technical apparatus, to arrange the casings or chambers filled with pounded, flaky, or granular carbon, or other conducting or semi-conducting material, vertically, so that such material may settle or fall, interruption of the current being thus prevented. A U-shaped apparatus, of which the inner sides are non-conducting, and which is filled with granular carbon, forming the resistance interposed in the circuit, is stated to be suitable for heating liquids and gases. Many other examples are given.—E. S.

Soluble Glass; Manufacture of ——. I. J. Broun, Innsbruck, Austria. Eng. Pat. 24,237, Nov. 5, 1902.

To a mixture of sand with an alkali carbonate or sulphate, about 3 per cent. of a substance containing carbon (such as powdered coal briquettes) is added, and, when an alkali sulphate is used, an alkali chloride is also preferably added. The mass is wetted with water or tar, dried, and coarsely crushed, and is then heated in an electric resistance furnace. (Compare preceding abstract.)—E. S.

United States Patents.

Organic Compounds; Electrolytic Reduction of ——, by Means of Titanium Compounds. H. Hertlein and E. Oppermann, Assignors to Farbwerke vorm. Meister, Lucius und Brüning, Höchst a M. U.S. Pat. 742,797, Oct. 27, 1903.

Organic compounds are reduced electrolytically in presence of very small quantities of titanium salts, which act catalytically; for example, nitrobenzene can be reduced to aniline, azobenzene to benzidine, quinone to quinol. A vessel lined with lead and serving as cathode, contains dilute sulphuric acid and about 2 per cent. of titanium sulphate dissolved therein. As anode any first-class conductor not attacked, may serve. The circuit is closed and a concentrated solution of *o*-nitro-*p*-cresol-*o*-sodium sulphate is introduced without stirring, and at a moderate temperature. Part of the amido compound formed is precipitated. The remainder is obtained by concentrating the electrolyte. The whole is filtered, and the electrolyte may be used again. The reducing process, in presence of a diaphragm, may be conducted as follows for preparing aniline, chlorine being simultaneously produced:—50 litres of hydrochloric acid of 3 per cent. strength, containing a solution of about 1 to 2 per cent. of titanium chloride, are introduced into the cathode compartment of a cell, 1 kilo. of nitrobenzene and 600 c.c. of alcohol being then stirred in. The anode compartment contains an acidified solution of sodium chloride. The reaction is carried out hot, using a current density of 3 o 6 ampères per square metre. As soon as somewhat more han the theoretical quantity of current is used, the process s interrupted, and the aniline, which is obtained as a good ield, is isolated in the usual way. Various other examples re given. Compare U.S. Pat. 729,502 of 1903; this Journal, 1903, 872.—T. F. B.

Alkalis and Alkali Earths; Manufacturing Hydrates of ——. F. Jahn, Assignor to Harrison Brothers and Co. U.S. Pat. 744,920, Nov. 24, 1903. VII., page 1347.

Oily or Similar Impurities from Water; [Electric] Method of Separating ——. H. T. Davis and E. Perrett, Assignors to Davis-Perrett, Ltd. U.S. Pat. 744,171, Nov. 17, 1903. XVIII. B., page 1362.

French Patents.

iquids; Separation of ——, from one another, or from Solids Suspended or Dissolved in them, by means of the Electric Current. Siemens und Halske Akt. Ges. Fr. Pat. 333,348, June 25, 1903.

his process depends upon electrical osmosis. A conuous current of electricity is passed through the mixture be treated, with a porous division separating the vessel. ne liquid under treatment is placed with one electrode in e one compartment, and pure or acidulated water and the cond electrode in the other. Thus, solutions may be ncentrated, or may be partially expelled from spongy lids. Applied to sugar-refining, the negative pole is ced in water, and the positive pole is surrounded with a e, such as milk of lime, the juice to be treated being ntained in a central compartment separated by porous visions from the anode and cathode cells.—W. G. M.

etallic Oxides; Superficial Reduction of Agglomerations of —— [for Electrical Applications]. Soc. Anon. Le Carbone. Fr. Pat. 333,484, June 30, 1903.

e masses of metallic oxides, such as of cupric oxide, ich it may be desired for electrical purposes to reduce perficially, and superficially only, are heated to the nperature necessary to decompose the oil used in the uction, and are then immersed in sand, or other similarly rous inactive body, which has been moistened with the or grease chosen for use.—E. S.

(*B.*)—ELECTRO-METALLURGY.

Gold; Electro-metallurgy of ——. W. H. Walker. Amer. Electrochem. Soc., Sept. 1903; Electrochem. Industry, 1903, **1**, [14], 484.

The electric current is used in a cyanide bath (1) for dissolving gold from the ores at the anode, when it supplies the necessary oxygen; (2) for precipitating the metal at the cathode. The reaction at the latter is secondary, consisting in the decomposition by the cation, K, of the anion, $AuCy_2$; hence agitation is essential, and the efficiency can never be high. By the prevailing Siemens and Halske process, the ore is first leached separately and the auriferous liquor supplied to precipitating tanks. Various processes for carrying on both operations in one bath fail industrially because large masses of ore are needed to produce little gold, and must be kept in constant agitation. —W. A. C.

Copper Refining; Electrolytic ——. W. D. Bancroft. Amer. Electrochem. Soc., Sept. 1903; Eng. and Mining J., 1903, **76**, 740—742.

The author made a series of experiments to determine: (1) the relation between voltage, current density, and temperature, for pure copper plates set a definite distance apart in the electrolyte; (2) the relation between current efficiency, current density and temperature; and (3) the variation of cost with varying conditions of temperature and current density. As electrolytes, four solutions of the same composition as those employed technically, were used: (1) a solution containing 16 per cent. of crystallised copper sulphate and 9 per cent. of sulphuric acid, such as is used in multiple-system refineries; (2) the same with a small addition of sodium chloride (1 : 200,000,000 of solution); (3) a solution containing 16 per cent. of copper sulphate and 6 per cent. of sulphuric acid, such as is used in series-system refineries; (4) the same as 3, but with a small addition of sodium chloride. From the results the author concludes that the most economical working of an electrolytic copper-refining plant is obtained if the following conditions are observed, *viz.*, covered tanks; current density, 3·5 ampères per sq. dcm. (31·5 ampères per sq. ft.); temperature, 70° C. Under these conditions, taking the cost of power at 20 dols. per horse-power-year, the cost per ton of refined copper will be nearly 1 dol. less than the cost of working under so-called standard conditions for open tanks, namely, current density, 14 ampères per sq. ft.; temperature, 50° C.—A .S.

Sodium Hydroxide; Electrolysis of Fused ——, by Alternating Currents. C. Hambuechen. Amer. Electrochem. Soc., Sept. 1903; Electrochem. Industry, 1903, **1**, [14], 488.

The peculiarity of aluminium electrodes in permitting currents to pass in one direction only is made use of. Caustic soda is fused in an aluminium vessel, in which is placed an aluminium electrode surrounded by an iron electrode; a perforated aluminium diaphragm is interposed, which is insulated from the aluminium electrode by a porcelain sleeve at the top. Alternating currents of 9 amp. at about 4 volts give, under careful temperature regulation, a good yield of sodium. The corrosion of the aluminium is very slight.—W. A. C.

Zinc on Iron; Electro-Deposition of ——. O. Gabran. Elektrotechn. Zeits., 1903, **24**, 937; Chem.-Zeit., 1903, **27**, [93], Rep. 308.

Out of five baths experimented with, the best results were obtained with one containing 6,000 grms. of water, 1,200 grms. of zinc sulphate, and 60 grms. of sulphuric acid of 24° B. When using large baths a current of 6 ampères per sq. dcm. [55·7 per sq. ft.] was employed, the pressure being from 9 to 10 volts. This gave good results, and showed an electro-chemical equivalent [for zinc] of about 0·3 mgrm. An apparatus is described in the original article for the zinc coating of ships' hulls, the arrangement being pressed by a soft rubber ring against the ships' plates, of which a surface of about 0·8 sq. dcm. is exposed to the electrolytic action. A current of 65 ampères applied to this surface for 7 seconds gives a coating of sufficient thickness. Care is taken to provide for circulation of the liquid. The apparatus allows of the zinc coating of the rivets, which had been left unprotected.—W. G. M.

Nickel Plating; Corrosion of Anode in ——. O. W. Brown. Amer. Electrochem. Soc., Sept. 1903; Electrochem. Industry, 1903, **1**, [14], 487.

The highest efficiency in nickel plating is attained when the anode goes into solution at the same rate as the metal is deposited on the cathode. In reality the anode generally corrodes too slowly. The author's experiments show that cast nickel, which has a porous surface and is not quite pure, is a better anode material than rolled or electrolytic nickel; with the former an efficiency of 90 per cent., at a density of 5 ampères per square foot, is attainable. As a check, the reading of the back E.M.F. at the anode is recommended; it should not exceed 0·75 volt.
—W. A. C.

Brass from Steel; Electrolytic Process for Stripping ——. C. F. Burgess. Amer. Electrochem. Soc., Sept. 1903; Electrochem. Industry, 1903, **1**, [14], 483.

It is usual to braze bicycle frames by dipping them bodily into a bath of molten brass. To remove the surplus brass previous to enamelling, the goods are made anodes in a bath of sodium nitrate, whereby the steel surface becomes passive, and only the brass is dissolved away. Nickel, which itself becomes passive, cannot thus be stripped.
—W. A. C.

English Patent.

Partitions or Diaphragms for Electrolytic and Electroplating Purposes; Impts. in ——. P. Steenlet, Brussels. Eng. Pat. 16,988, Aug. 4, 1903.

The diaphragm consists of a permeable tissue or fabric impregnated with albuminous or organic materials, such as albumin or gelatin, which have been rendered insoluble by immersion in formaldehyde. Variation in strength of the organic matter in the bath is thus avoided, and the metallic deposit has all the physical and mechanical properties of the metal when worked and finished.—B. N.

United States Patents.

Metals and Alloys; Reduction of —— [*in Electric Furnace*]. F. J. Tone, Niagara Falls, N.Y. U.S. Pat. 745,122, Nov. 24, 1903.

The oxygen compounds of metals having nearly the same temperature of reduction and volatilisation are mixed with carbon, and heated in an "incandescent furnace," the zone of reaction and of maximum temperature in which is disposed in a substantially vertical direction. The process is claimed for the production of "metallic silicon in the form of a dense coherent pig or mass, produced by reduction of a silicon compound, and concurrent fusion of the product."—E. S.

Zinc; Electrolytic Refining of ——. H. Paweck, Vienna. U.S. Pat. 745,378, Dec. 1, 1903.

See Fr. Pat. 318,163 of 1902; this Journal, 1902, 1403.
—T. F. B.

Sodium; [Electrolytic] Manufacture of ——. T. Ewan, Assignor to the Cassel Gold Extracting Co., Ltd., Glasgow. U.S. Pat. 745,958, Dec. 1, 1903.

See Eng. Pat. 14,739 of 1902; this Journal, 1903, 804.
—T. F. B.

French Patents.

Furnace; Electric ——, *with Reaction Chamber for the Extraction of Metals from their Ores, and for the Simultaneous Refining of the Metallic Product.* Cie. du Réacteur Métallurgique. Fr. Pat. 333,366, June 25, 1903.

The plant consists of a shaft-furnace, rectangular in section, with a fore-hearth. The former contains the mineral to be treated, and is provided with a belt of tuyères a little above the bottom, and with water-cooled electrodes on the same level alternating with the tuyères on the shorter sides of the rectangle. A slag hole enables the slag to be drawn off, whilst the reduced metal runs into the fore-hearth to be refined. This hearth is provided with tuyères, through which can be blown air mixed with lime or silica, and also liquid hydrocarbons. The gases escape into the shaft of the adjacent reducing furnace, and only pass into the air after filtration through the incoming charge of unaltered ore. A subsidiary relief chimney is provided for use if necessary. A tap-hole is also arranged for.—W. G. M.

Zinc; Obtaining of ——, *by Electrolysis.* K. Kaiser. Fr. Pat. 333,773, July 11, 1903.

The ore, after roasting (and crushing), is treated with sufficient zinc chloride to agglomerate the mass, forming oxychloride of zinc. After drying, the mass is crushed and treated with hydrochloric acid, preferably while hot. In a quarter of an hour the whole of the zinc present should have dissolved, with, however, but little of the iron contained in the mineral. Electrolysis is then effected with insoluble anodes and zinc (iron or other) cathodes. The anodes may, with advantage, be made cylindrical and be rotated on their axes. Other chlorides may be used for leaching.
—W. G. M.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

Poppy-Seed Oil. Utz. Chem.-Zeit., 1903, **27**, 1176.

The author has found that practically all commercial poppy-seed oils contain more or less (up to 40 per cent.) sesamé oil. This is apparently due to careless methods of manufacture, as, at the present time, the prices of sesamé seed and sesamé oil are higher than the corresponding prices of poppy-seed and poppy-seed oil. In order to determine the characters of the pure oil, specimens were prepared from Indian, Levantine, and German poppy seed. The iodine value determined by the Hübl-Waller method was found to be 153·48 for the Indian oil, 157·52 for the Levantine oil, and 156·94 for the German oil. With regard to optical rotation, the author confirms Bishop's statement that pure poppy-seed oil is inactive; it is probable that the rotation of from 0 to + 4′ observed by Crossley and Le Sueur (this Journal, 1898, 989) was obtained with specimens containing sesamé oil. The following numbers were obtained for the refractive index and the butyro-refractometer (Zeiss) value at 15° C.:—

——	Refractive Index, n_D.	Butyro-Refractometer Value.
Indian poppy-seed oil...	1·4772	78·1
Levantine poppy-seed oil	1·4774	78·4
German poppy-seed oil .	1·4774	78·4
Sesamé oil	1·4742	73·0
Commercial poppy-seed oil (Oeillette).........	1·4764	76·7
Commercial poppy-seed oil (Levantine)	1·4764	76·7

—A. S.

Cod-Liver Oil and its Adulterants. E. W. Mann. Chem. and Druggist, 1903, **63**, 939.

In the following table are given the results of the examination of cod-liver oil and various oils used for adulterating it. The author found that the sulphuric acid colour test and the albumin test given in the B. P. are by no means reliable. Better results were obtained by adding one drop of a cooled mixture of 2 parts of nitric and 1 of sulphuric acid to 15 drops of the oil; no other oil examined by the author, other than genuine cod-liver oil, gave the characteristic reaction—a vivid salmon-pink colour, not darkening to any considerable extent on standing.

—	Sp. Gr.	Iodine Value.	Free Acid.	Saponification Value.	Unsaponifiable.	Reichert Value (2·5 grms.).	Sulphuric Acid Test.		Nitric + Sulphuric Acid Test.	
							Before stirring.	After stirring.	Before stirring.	After stirring.
			Per Cent.		Per Cent					
Cod-liver oil, Norwegian.	0·9262	147·79	0·36	184·1	7·74	2·0	Red-brown, tinged violet.	Violet	Orange-pink	Vivid salmon-pink.
Cod-liver oil, Newfoundland.	0·9258	139·25	0·45	188·4	9·87	2·0	"	"	Brownish pink.	Ditto, but not so vivid.
Cod-liver oil, Japanese.	0·9252	134·96	1·40	186·7	7·18	1·4	Intense violet.	Intense violet, nearly black	Bright violet	Greenish-brown.
Whale oil	0·9192	92·38	2·08	188·6	7·70	0·4	Light brown	Vandyke brown.	Pale brown	Very pale pink.
hark oil	0·9290	143·50	6·09	188·5	5·46	0·8	Brown	Red-brown	Brown	Brown
Haddock oil	0·9318	160·00	2·67	191·2	2·42	1·1	Orange-brown.	Brown	Light brown	Orange
Coalfish oil........	0·9272	139·10	1·35	186·1	6·52	0·7	Brown, tinged violet.	Violet	Orange-brown	Pale pink
eal oil	0·9275	123·40	2·79	194·5	3·60	2·5	Dark brown	Intense vandyke brown.	Pale brown	Pale orange
Dugong oil........	0·9203	66·60	2·39	197·5	3·74	2·5	Orange	Brown	Pale orange	Very pale brown.
Ling oil...........	0·9231	122·80	0·29	181·6	6·44	0·7	Violet-brown	Violet	Light brown	Pale brown
Menhaden oil	0·9301	145·80	2·50	186·1	6·73	2·2	Brown	Brown	Pink	Light, brownish pink.
Moi oil............	0·9186	116·60	0·18	164·7	15·06	1·8	Orange, tinged violet.	Vivid violet	Light brown	Pale orange-pink.
Brusmer (*Brosmius brosme*) oil.	0·9222	130·11	0·13	180·4	4·92	1·9	Violet	"	Brown	Pinkish orange.

—A. S.

French Patents.

Grease [from Water]; Process and Apparatus for Recovering ——. C. Kremer and R. Schilling. Addition, dated June 26, 1903, to Fr. Pat. 312,786, July 17, 1901.

See Eng. Pat. 14,461 of 1903; this Journal, 1903, 1095.
—T. F. B.

Oils, Vegetable; Apparatus for Bleaching and Concentrating ——. S. Lewiak. Fr. Pat. 333,558, July 3, 1903.

See Eng. Pat. 14,518 of 1903; this Journal, 1903, 1138.
—T. F. B.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

English Patents.

Lakes [from Azo Dyestuffs]; Manufacture of Red ——. C. D. Abel, London. From Act.-Ges. f. Anilinfabr., Berlin. Eng. Pat. 2503, Feb. 2, 1903.

See Fr. Pat. 329,037 of 1903; this Journal, 1903, 992.
—T. F. B.

Pigments and Processes of Making the same. W. J. Armbruster and J. Morton, St. Louis. Eng. Pat. 22,567, Oct. 19, 1903.

See U.S. Pat. 743,802 of 1903; this Journal, 1903, 1302.
—T. F. B.

Paint or Varnish; Improved Method of and Means for removing ——, *from Painted or Varnished Surfaces.* A. A. Eberson, St. Louis, U.S.A. Eng. Pat. 18,300, Aug. 24, 1903.

Paraffin or ceresin wax, or any wax, oil, or grease soluble in benzene or carbon bisulphide, is dissolved in one or both of these solvents, and to this solution a certain proportion of alcohol, or of wood spirit and acetone, is added. These mixtures remove paint without the employment of heat. Compare Fr. Pat. 325,659, 1902; this Journal, 1903, 752.
—M. J. S.

French Patents.

Nitroso and Nitro Compounds; Reduction of Aromatic ——, *with Formation of Ferrous Oxide.* R. Vidal. Fr. Pat. 333,365, June 25, 1903. IV., *page* 1344.

Zinc Salts, (Carbonate, Oxide, Sulphide, &c.) extracted directly from Zinc Ores; Process for adaptation of ——, *for Painting.* M. Malzac. Addition (No. 2001), dated June 29, 1903, to Fr. Pat. 329,079, Feb. 4, 1903; this Journal, 1903, 1007.

With the object of producing a mixture of zinc hydroxide and hydrocarbonate as a white pigment, the following process is claimed. The zinc ore is intimately pulverised with quicklime, the mixture is extracted with liquid ammonia, foreign metals are eliminated, and the ammoniacal liquid is distilled in a vacuum, with or without the application of heat.—M. J. S.

White; New ——, *for Paint, &c.* A. Fieux and L. Meynet. Fr. Pat. 333,588, July 6, 1903.

A mixture of 66 parts of magnesium silicate with 34 parts of anhydrous calcium sulphate, heated to about 600—800° C. to eliminate all moisture, forms a white pigment for which the name "Blanc Hélios" is proposed.—M. J. S.

Cement with Zinc Basis for Hot Joints. Bonneville & Co. Fr. Pat. 332,788, June 4, 1903.

Metallic zinc, in the finely subdivided condition in which it is deposited in the chambers in which zinc white is collected, is mixed into a paste with a drying oil. This mixture, which remains soft if kept in closed vessels, hardens when exposed to a steam heat, and furnishes a cement for the joints of steam pipes, &c. With linseed oil, and most of the other drying oils, a siccative is necessary; wood-oil, on the contrary, gives sufficient hardness when used in its natural state. Tow or hair may be added, as may also a proportion of whiting to increase the plasticity of the paste.—M. J. S.

Plastic Material with Zinc Base for the Production of Moulded Objects. Bonneville & Co. Fr. Pat. 333,671, July 8, 1903.

The mixture of powdered zinc and a drying oil, claimed as a cement for steam joints in Fr. Pat. 332,788 (above), may also be cast, stamped, or moulded into any form, and after exposure to a temperature of 100°—200° C. becomes extremely hard. In this state it can be sawn, turned, or carved, and takes a high polish.—M. J. S.

(*B.*)—RESINS, VARNISHES.

Gum Chicle; Characters of ——. F. O. Taylor. Amer. J. Pharm., **75**, 513. Pharm. J., 1903, **71**, 841.

The author finds that gum chicle (see this Journal, 1902, 438) has an acid value of 52·0; it contains no ethers or esters. On analysis it yielded 0·2 per cent. of ash, 2·2 per cent. of moisture, 82·7 per cent. of matter soluble in chloroform, and 84·7 per cent. of matter soluble in benzene.—A. S.

English Patent.

Linoleum-like Material. E. V. Clausen, Norre Nebel, Denmark. Eng. Pat. 19,233, Sept. 7, 1903. Under Internat. Conv., Oct. 22, 1902.

Albumin (50—80 parts), casein (50 parts), cork or leather refuse or the like (20—40 parts), flowers of sulphur (2—6 parts), and soda lye (5—16 parts) are intimately mixed and the mixture is rolled out into sheets; the essential components are alkali-albuminate and alkali-caseinate.
—R. L. J.

United States Patent.

Varnishes; Process of Manufacturing ——. W. T. Scheele, Assignor to W. J. Hooper, Baltimore, Md. U.S. Pat. 744,113, Nov. 17, 1903.

In the process of manufacturing varnishes, lacquers, &c., a comminuted gum is dissolved, at a temperature not exceeding 60°—65° F., in a ketone which has "its boiling point between 80° and 227° C."—M. J. S.

French Patents.

Varnish Substitute; Process of Manufacturing ——, *from Rosin Spirit* ("*Résinylle*"). R. Blume. Fr. Pat. 333,602, July 6, 1903.

The varnishes hitherto manufactured from rosin spirit dry with difficulty, soften when heated after drying, and become friable when mixed with pigments. These inconveniences are obviated by the addition of a non-drying oil, such as castor oil, and some rosin pitch, together with a small proportion of almond oil or mineral oil. To assist drying, resinates of lead and manganese, or any other siccative, may be added.—M. J. S.

Resin and Turpentine; New Process for Refining ——. L. Lalanne. Fr. Pat. 333,639, June 10, 1903.

In refining the crude resinous exudation from coniferous trees, by liquefying it at a moderate heat so as to allow the water, colouring matters, and other impurities to separate, it has been usual to add solutions of sodium carbonate or chloride with the object of increasing the difference between the densities of the resin and the water. The inventor claims that the addition of dry sodium chloride, instead of a solution, constitutes a distinct improvement in the process, as it effects an economy in the quantity of salt and of fuel required, shortens the operation, and gives both a greater yield and higher quality of refined resin.—M. J. S.

(*C.*)—INDIA-RUBBER.

Rubber in New Caledonia. Gummi-Zeit., 1903, **18**, [9], 179.

For some years past several firms in Noumea have sent rubber to the Sydney market. A *Ficus* (possibly *Ficus prolixa*) examined by Schlechter yielded a plentiful supply of good rubber. A large number of young plants were reared from seed in the Berlin Botanical Garden and sent to Togo for cultivation. Other rubber trees were discovered by Schlechter in New Caledonia, amongst them an *Alstonia*, which contained rubber even in the youngest parts of the plant and blossoms. The younger parts of all known rubber plants, including the best Hevea sorts, are useless for rubber production, as they yield a product of a bird-lime nature very rich in resin.—J. K. B.

Guayule; Rubber. Gummi-Zeit., 1903, **18**, [9], 179.

The guayule shrub (*Synantherea mexicana*) grows specially freely in the highlands of North Mexico, and the rubber is extracted from the crushed plants by means of steam or a hot dilute alkaline solution. The resin is separated by dilute sulphuric acid. It is not to be reckoned with the better qualities of rubber, but would do very well to mix with inferior kinds.—J. K. B.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Gelatin Rendered Insoluble by Salts of Chromium Sesquioxide; Composition of ——. A. L. Lumière and A. Seyewetz. Bull. Soc. Chim., 1903, **29**, [22], 1077—1088.

Normal salts of chromium sesquioxide, viz., the sulphate, sulphite, chloride, fluoride, acetate, formate, citrate, tartrate, and lactate, all render gelatin insoluble in the same manner as chrome alum, the effect being more marked, the less acid the salt, *i.e.*, the less alkali required to produce a permanent precipitate; basic chromium sulphate ("$Cr_2(SO_4)_2$") gives better results than the normal salts. An alkaline solution of chromium sesquioxide has no effect on gelatin, but if a solution of gelatin containing ammonia be mixed with the calculated quantity of chrome alum, the gelatin becomes quite insoluble; with excess of ammonia, no change takes place. The minimum quantity of chrome alum which can render gelatin insoluble, is 2 per cent. of the weight of gelatin used, whatever may be the concentration of the gelatin solution; 21 per cent. appears to be the maximum quantity of chrome alum absorbed by gelatin under any conditions; moreover, the nature of the acid of the chromium salt appears to have no influence on the reaction, as the quantity of chromium compound required is, in all cases, approximately equivalent to 2 per cent. of chrome alum. Gelatin thus treated leaves a residue of Cr_2O_3 on incineration. When gelatin is treated with solutions of chrome alum or chromic chloride, the ratio of chromium to acid radicle in the solution is approximately the same before and after the operation; washing with water gradually removes the acid, but makes the gelatin soft and soluble, but by washing repeatedly with very dilute ammonia, all trace of acid can be removed, and the gelatin remains insoluble; thus it would appear that in presence of hot water, the acid decomposes the compound of gelatin and chromium sesquioxide at first formed. Insoluble gelatin, treated with ammonia as above, has a content of 3·3—3·5 per cent. of chromium sesquioxide. Gelatin made insoluble by chromium compounds is green or violet, according to the chromium salt used; washing with dilute alkali destroys its transparency, and when dried it is green, hard, and brittle, but is reconverted to the original soft form by treatment with acids or alkalis. The amount of chromium present appears not to affect the fusing point of the resulting gelatin, which is about 30·95° C. Its properties generally, and the fact of its being readily dissociated, lead the authors to consider it an addition compound.—T. F. B.

English Patent.

Gelatin; Vegetable ——, *and Process of Manufacturing same* [*from Moss*]. A. L. Martin, Clinton, Iowa. Eng. Pat. 22,069, Oct. 13, 1903.

See U.S. Pat. 742,124 of 1903; this Journal, 1903, 1251.
—T. F. B.

United States Patent.

Tanning and Tawing Compound. G. S. Girard, Ohio, U.S.A. U.S. Pat. 744,252, Nov. 17, 1903.

Water, chrome-alum, and an alkali, *e.g.*, sodium carbonate, are mixed with iron protosulphate and sodium chloride t form a tanning liquor.—R. L. J.

French Patent.

Leather; Process of Making an Enamelled ——. W. B. Smith and J. D. Larkin. Fr. Pat. 333,460, June 30, 1903.

See Eng. Pat. 14,547 of 1903; this Journal, 1903, 1140.
—T. F. B.

XV.—MANURES, Etc.

French Patent.

Phosphated Chalk, or [other] Phosphated Matters; Process for rendering Assimilable ——, by a Treatment with Soda. P. Martinet and P. Torchon. Fr. Pat. 333,347, June 25, 1903.

The phosphated chalk is kept in contact with soda lye for from one to three days, and is then dried and furnaced at a low red heat. After methodical washing, the residue contains part of the phosphoric acid as dicalcium-hydrogen phosphate. The liquor, containing sodium phosphate, is treated with lime or with dolomite to obtain the corresponding citrate-soluble phosphate. The soda lye thus regenerated is used again.—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

Carbohydrates; Action of Hydrogen Peroxide on ——, in the Presence of Ferrous Sulphate. R. S. Morrell and J. M. Crofts. XXIV., page 1371.

United States Patent.

Evaporating Liquids [Sugar Solutions]; Apparatus for ——. G. Stade, Gross Wusterwitz. U.S. Pat. 745,921, Dec. 1, 1903.

See Eng. Pat. 1298 of 1903; this Journal, 1903, 1252.
—T. F. B.

French Patents.

Sugar; Process and Apparatus for Making ——. M. H. Miller, D. Huether, A. H. Hough, A. MacNeill, and R. Fisher. Fr. Pat. 333,354, June 25, 1903.

See Eng. Pat. 14,182 of 1903; this Journal, 1903, 1142.
—T. F. B.

Liquids; Separation of ——, from one another or from Solids Suspended or Dissolved in them, by Means of the Electric Current. Siemens and Halske Akt.-Ges. Fr. Pat. 333,348, June 25, 1903, XI. A., page 1355.

Calcium Sulphate from Solutions, particularly Saccharine Solutions; Elimination of ——. J. Weisberg. Fr. Pat. 333,539, July 2, 1903.

During the boiling of sulphured sugar juices calcium sulphate tends to form incrustations on the heating surfaces. In order to remove the calcium sulphate from the treated juice, this latter is agitated with a determined quantity of barium carbonate, together with a little lime, the liquor is heated and saturated with carbon dioxide, until the disappearance of a pink reaction with phenolphthalein paper. The liquid is then boiled for a few minutes and filtered, the calcium sulphate having been precipitated as calcium carbonate and barium sulphate.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Albumin of Foreign Organisms; Action on Organisms of the ——. M. Delbrück. Woch. f. Brau., 1903, 20, [48], 569.

By the injection of blood albumin into animals, L. Michaelis has found that the specific albumin of one organism is nearly always harmful to an organism of another species. This coincides with the author's view that peptase is to be regarded as a "combative" enzyme, the function of which is to destroy such intruding foreign albumin and convert it into non-specific lower products, which are not merely harmless but often useful. Yeast albumin is to be regarded as a poison for bacteria and *vice versâ*, and barley albumin is primarily harmful to yeast. Thus the process of digestion is not merely one of rendering albuminoids soluble and diffusible, but also a defensive process converting specific albuminoids into simple products. This view also explains why the living organism is always more virulent than the chemical products of its "combative" enzymes; the living butyric ferment is more harmful towards yeast than an equivalent quantity of butyric acid. The action of the specific albuminoids is added to that of the chemical excretion products. So long as the organism is living, its specific albumin fights against that of the intruding organism, and is continually renewed. On the malting floor the sound corns resist the attacks of fungi far more successfully than the dead corns. But as soon as one organism is dead, no further production of specific albumin takes place, and auto-digestion of the body by its own peptase sets in, providing food for the survivor. True resistance is only found when the building up and breaking down of the albumin are properly balanced in simultaneous activity. The intimate connection of these two processes suggests that they are effected by one and the same agent, *e.g.*, by the reversible activity of the same enzyme—peptase.
—J. F. B.

Melibiase [of Yeast]; and Comparative Studies on Maltase, Invertase, and Zymase. A. Bau. Woch. f. Brau., 1903, 20, [47 & 48], 560—564 and 575—579.

Influence of Chemical Reagents on Melibiase and other Yeast Enzymes.—Washed, bottom-fermentation beer yeast was pressed and then digested at the ordinary temperature for 29 hours with various chemical solutions; the yeast was separated and its action was tested on solutions of melibiose, maltose, and cane sugar. The enzyme melibiase was destroyed by treatment of the yeast with solutions of the following substances: oxalic acid, 1 per cent., sulphuric acid, 0·5 per cent, hydrochloric acid, 0·9 per cent., caustic soda, 1 per cent., silver nitrate, 0·1 per cent., mercuric chloride, 0·02 per cent.; alcohol at 95 per cent. strength weakened the enzyme somewhat, whilst a 4 per cent. solution of tartaric acid had no action. The maltase was destroyed by the action on the yeast of solutions of acetic acid at 1 per cent., oxalic acid, 0·5 per cent., lactic acid, 1 per cent., tartaric acid, 4 per cent., sulphuric acid, 0·5 per cent., hydrochloric acid, 0·9 per cent., caustic soda, 1 per cent., silver nitrate, 0·01 per cent., mercuric chloride, 0·1 per cent. The invertase was destroyed by caustic soda 0·5 per cent., silver nitrate, 0·1 per cent., and was badly crippled by mercuric chloride, 0·1 per cent. The other reagents, when used in the strengths specified above, were practically without effect upon invertase. The zymase was found to be very susceptible to the action of the reagents named, being destroyed by all in the strengths given. Hence it is concluded that melibiase is considerably more resistant to the action of chemicals than maltase, but less resistant than invertase.

Effect of Drying.—Melibiase and maltase retain their activity well, when the yeast is thoroughly dried at the ordinary temperature, and were found intact in a sample of yeast which had been preserved for nearly six years. When the yeast has been quite dried, it may be heated for several hours above 100° C. without destroying the melibiase and maltase. In the case of invertase the complete removal of the moisture at the lower temperatures is not so important, and this enzyme may be preserved in yeast which has been heated too rapidly to preserve the activity of the melibiase and maltase. Zymase is very sensitive to heat, and hence the yeast must be dried with the greatest care, if this enzyme is to be preserved.

Temperature at which the Enzymes are destroyed.—The washed yeast was heated for 30 minutes with distilled water at various temperatures. Under these conditions the maltase was destroyed at 55° C., the melibiase at 70° C., and the invertase at 75° C.

Temperature of Maximum Activity.—These experiments were conducted with expressed yeast cell juice, the relative extent of the hydrolysis being tested after $2\frac{1}{4}$ hours action at various temperatures. In the case of melibiase the most favourable temperature is 50° C., in the case of maltase, 40° C., and in the case of invertase, 52° C.

Action of Proteolytic Enzymes.—The order of resistance to proteolysis, when the yeast is caused to undergo auto-digestion, is invertase, melibiase, maltase, zymase.

Occurrence of Melibiase.—The general rule that bottom fermentation yeasts contain melibiase, whilst top fermentation yeasts do not, is approximately true, but it was never meant to be applied to yeasts outside the species *S. cerevisiæ*. Wine yeasts and wild yeasts are mostly free from melibiase

The author has confirmed Lindner's observations on most of the yeasts found to be exceptions to the general rule.
—J. F. B.

Malt; Studies in Kilning ——. G. Barth and K. Dinklage. Zeits. ges. Brauw., 103, **26**, [37], 601—606.

Kiln Temperature.—To measure the temperature of the iron floor of the kiln, a graduated galvanometer was connected up with a nickel wire soldered to the metal of the floor, and also with an iron wire similarly treated. The temperature of the hot-air flue and of the malt itself was taken in the usual way, and samples of the malt were drawn, at intervals, for analysis.

Nitrogen Determinations.—The method adopted was that of Dinklage (see under XXIII., page 1370), and the results gave an average of 1·6 per cent. of total nitrogen referred to the dry matter in the malt. The soluble nitrogenous constituents fluctuate considerably in quantity, increasing during the withering process, and reaching the maximum when the malt is in the air-dry stage. Similar variations occur in the coagulable nitrogenous matters. A possible explanation offered is that, when the malt drops on to the lower kiln floor, the high temperature (145° F.) of the metal plates causes some of the soluble albuminoids to coagulate, these decreasing in amount, whilst the percentage of non-coagulable nitrogen compounds remains almost, if not quite constant, for the first part of the time the malt is on the lower floor. Between the 9th and 15th hours—the malt temperature being 113°—154° F.—the percentage of non-coagulable nitrogen compounds increases progressively at the expense of the coagulable compounds. From this it is concluded that between these limits of temperature, a process analogous to peptonisation occurs, resulting in the formation of soluble, non-coagulable albumin. Some part in this reaction is probably played by the coagulable albumin in association with insoluble proteids. Above 176° F. the soluble and coagulable soluble nitrogenous compounds continue to decrease in quantity as the temperature rises. In this case the diminution of the total soluble nitrogen is largely influenced by that of the coagulable portion.

Ready-formed Sugars.—The Mason method (this Journal, 1903, 1061) was employed. The results showed a continuous diminution of reducing sugar throughout the kilning process, accompanied by an increase in saccharose which, however, remained constant beyond 176° F., being less readily caramelised at higher temperature than lævulose. The unfermentable reducing substances remained nearly constant all through.

Enzymic Activity. — Whilst the liquefactive enzyme in malt will stand comparatively high temperatures, the diastase is crippled by two hours' exposure to 190°—268° F., despite the small percentage of water in the malt. The acrospire continues to increase in length while the malt is on the upper floor of the kiln, but as there is no accession of saccharifying power, the phenomenon is probably due merely to an extension of the tissues rather than to actual growth.

Extract and Wort.—With the attainment of high kiln temperatures, the colour-depth and aroma of the wort begin to increase, but highly kilned malts gave opalescent worts, which furnished a less satisfactory coagulum when boiled, possibly owing to the alteration of coagulable nitrogenous substances in the final stage of kilning. Confirmation was afforded of the accuracy of previous workers' observation that a diminution of about 1 per cent. of total extract is produced by kilning. The attenuation varied with the kiln treatment, and proved lower in proportion as high kiln temperatures diminished the saccharifying power of the malt, and therefore the quantity of maltose formed.—C. S.

Malt; Points in regard to ——. A. R. Ling. Brewers' Journal, 1903, **39**, 526—527.

During last season the author observed the exceptionally high extracts yielded by malts, and also the low diastatic powers, as determined by the Lintner method. The malts, however, possessed normal saccharifying powers. The author believes that the ready saccharification and high yields are to be ascribed more to the condition of the starch than to the amount and nature of the diastase. The determination of diastatic power, although valuable to the working maltster, may be misleading, for the normal diastatic power one year may differ largely from that of another. Some samples of malt were analysed the day after unloading the kiln, and again after storage. The numbers did not differ much with the exception of the diastatic powers, which showed a marked increase after storage :—

——	1.	2.	3.	4.	5.
Diastatic power of sample from kiln.	13·9	16·0	15·6	15·4	20·0
Diastatic power of sample after storage.	23·8	22·7	31·3	35·7	38·4

The increase of diastatic power is accompanied by a general rise in the maltose-dextrin ratio of the worts prepared from the malts. It is well known that new malt does not give good results in the brewery, and that it is most satisfactory after it has been stored a few weeks, during which it becomes mellow. The author considers that the mellowing process is connected with an absorption of water.
—J. L. B.

Wild Yeast Infection through the Wood of the Fermentation Tuns; Further Observations on ——. F. Schönfeld. Woch. f. Brau., 1903, **20**, [49], 585—586.

Of all the causes of wild yeast infection of beer, in the author's experience, the wood of the fermentation tuns is by far the most frequent; in no other part of the plant is the infecting growth so vigorous and dangerous. For instance, in one case, a wooden vat, in which the hot wort was collected, was suspected, but turned out on examination to be perfectly sound, only a few badly nourished wild yeast colonies being found between the staves. On the other hand, the fermentation tuns, which had not been suspected, were found to be badly infected in places where the wood had become soft, as also were some pieces of rubber hose which had become "perished." It is a mistake to suppose that infection cannot reside in wood unless it be rotten and spongy, although such a condition is the worst and most certain cause, the soft wood becoming saturated with wild yeast growth to a depth of 1 mm. and the cells of the colonies always being in a most vigorous and well nourished condition. It is quite exceptional to find colonies of culture yeast which have penetrated the pores of the wood; this is attributable to the greater power of motion of wild yeast cells rather than to the larger size of the culture yeast cells. On the outer edge of the bung hole and in the bung hole itself the infecting wild yeasts are not nearly so numerous as inside the tun; they are chiefly torula species, and generally have a starved appearance, being less virulent than the wild yeasts inside. Hose pipes are sometimes infected with the virulent, well-nourished wild yeasts, and sometimes with colonies in the same condition as those on the outside of the bung holes. Another frequent source of infection is to be found in the wooden yeast-tubs; for which reason, metal tubs are far safer to use.—J. F. B.

Beers; Observations on the Chemical Analysis of ——. *Part II.* A. R. Ling. Brewers' Journal, 1903, **39**, [458], 478—479. (See also this Journal, 1903, 921.)

The demand for light bottled ales is an increasing one, and the ordinary process of natural conditioning, in bottle, is being superseded by artificial means. These may be divided into two systems. In the first the ale is allowed to develop condition naturally in specially strong casks, after which it is chilled, filtered, and bottled; at the low temperature the carbon dioxide remains dissolved in the beer at the ordinary atmospheric pressure. In the second of these systems, the ale is chilled, artificially carbonated, filtered, and bottled. It is obvious that the ales required for systems of the first class should be of the same type as those intended for the ordinary bottling process, since the condition is produced by a secondary fermentation. The ales which are chilled and artificially carbonated are intended for quick consumption. The author points out that there are limits to the particular type of ale fitted for these systems, and these limits can be conveniently fixed by his scheme of analysis (this Journal, 1903, 921). During filtration of beer the smaller organisms tend to pass through the filtering medium, and frequently the proportion of wild yeasts and bacteria is high, with the result that the beer develops disease. In chilled beers there is not the same risk as the chilling precipitates certain nitrogenous matters and hop resins, carrying with them the bacteria and other organisms. In the most satisfactory beers, the ratio of maltose to dextrin should not exceed 2 : 3. A common mistake is to add priming to beer before bottling, to increase the palate fulness. When so treated, a mawkish flavour often developes when the beer has been a fortnight in bottle. Some analyses of bottled stouts are given :—

	Dublin Stouts.		London Stouts.	
	(I.)	(II.)	(I.)	(II.)
Original gravity	1081·4	1074·1	1072·2	1069·7
Attenuation	1019·2	1021·7	1022·8	1020·9
Absolute alcohol per cent. by weight.	6·69	5·51	5·20	5·13
Total acidity (acetic acid)	0·20	0·20	0·16	0·14

Composition of Extract.

Fermented matter	63·5	58·7	55·7	56·6
Maltose (apparent)	5·1	9·6	12·1	12·2
Dextrin (apparent)	16·9	19·8	14·1	13·4
Ash	2·0	2·3	2·7	2·2
Other substances	12·5	9·6	15·4	15·6

—J. L. B.

Mannitol; Production of ——, by Deleterious Ferments in Wines. P. Mazé and A. Perrier. Ann. Inst. Pasteur, Sept. 25, 1903; Ann. de la Brasserie, 1903, **6**, [19], 442—450.

HE experiments were conducted with a ferment having he same physiological properties as Gayon's mannitic erment, being capable of secreting zymase, a lactic diastase, and probably a diastase splitting up sugar into hree molecules of acetic acid. In presence of free evulose it forms mannitol, this product resulting from the ecomposition of water and the combination of part of s elements with alcohol, to furnish acetic acid, whilst the est transforms the levulose into mannitol. This peculiarity anks the ferment along with that of Gayon, in a separate roup which no doubt contains other members, those ausing greasiness and bitterness in wines being probably mong them. Although the butyric ferments and other acteria liberate hydrogen, the gas in such cases does not onvert levulose into mannitol. These same ferments will ecompose mannitol; but though the excess of free ydrogen should react on levulose if a mixture of that ubstance and mannitol were present at any time during e fermentation, experiments made with a culture of an mylobacter failed to reveal the presence of mannitol. The onclusion formed therefore is that a localisation of diastatic tion occurs in micro-organisms, the living cell behaving ke an organised laboratory, where the chemical reactions oceeding simultaneously are nevertheless independent of e another.—C. S.

lcohol; Synthetic ——. G. Arachequesne. Ann. de la Brasserie, 1903, **6**, [17], 387—388.

the production of synthetic alcohol, carried out on a anufacturing scale at Saint-Alban des-Villars (Savoy), a ixture of metallic oxides and powdered coke is fused in e electric furnace, the product ("ethylogene") furnishing hylene when brought into contact with water. The gas collected and is passed through a series of large leaden oulf bottles charged with concentrated sulphuric acid. e resulting ethylsulphuric acid, on being gradually luted with water and distilled, furnishes alcohol, together th smaller or larger quantities of ether, acetic acid and etone, according to the care with which the operations are conducted. The spent mass from the gas generators is returned to the furnace after being mixed with more coke dust; and the sulphuric acid is concentrated for use over again after purification to remove sulphonated and other compounds that would injure the flavour of the alcohol. The theoretical consumption of coke is 50—53 kilos. per hectolitre of alcohol formed; but in practice it amounts to 200 kilos., though this quantity will probably be reduced in the large recuperative furnaces in the course of erection.

—C. S.

Malt; Determination of Soluble and Coagulable Nitrogenous Compounds in ——. K. Dinklage. XXIII., page 1370.

Starch Liquefying Power of Malt and other Diastatic Products; Determination of the ——. A. Pollak. XXIII., page 1370.

Methyl Alcohol in presence of Ethyl Alcohol; Detection of ——. L. D. Haigh. XXIII., page 1370.

English Patent.

Beer Wort; Continuous Process and Apparatus for Purifying ——. E. Hoffman, Pfeddersheim-Worms, Germany. Eng. Pat. 1073, Jan. 15, 1903.

This is a continuous process for filtering mashes. An endless series of filtering cells are filled in consecutive order and the contents drained off by suction, the residue in each cell being removed automatically before the cell is charged again with mash. The series of cells are passed in succession beneath a charging pipe conveying the mash and a sparge pipe for a second mash. The cells are hinged to facilitate discharge, and are provided with perforated bottoms and a suitable filtering medium. Funnel-shaped discharge chambers are situated beneath the cells which lead to discharge pipes dipping into a common tank. Float valves are fitted at the top of the pipes in the discharge chambers to prevent the supply pipes becoming empty and to assure a suction upon the filtering cells.

—J. L. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Bread; Fermentation of ——. C. Parenti. Boll. chim. farmac., 1903, **42**, 353; Chem.-Zeit., 1903, **27**, [93], Rep. 301.

Starchy matters, dextrin, and substances precipitable from aqueous solution by alcohol, and reducing sugar, were estimated in flour, and in the dough prepared from it both before and after fermentation. The quantity of starch was found to have suffered no alteration by fermentation, but the reducing sugar was reduced to a trace or to nil (from 2·31 to 0·13 per cent. was the average reduction in four experiments). The amount of the substances precipitable by alcohol increased, however (from 2·86 to 4·15 per cent. on an average). By a prolonged washing of the unfermented dough, the gluten may be isolated as an elastic controctile mass; a similar treatment of dough that has been fermented, however, leaves no noteworthy residue. These results confirm Boutroux's views that the fermentation of bread consists chiefly in the alcoholic fermentation of the sugar in the meal induced by the yeast added, and in a conversion of the gluten, which, in breaking up, produces soluble proteids. The origin of this conversion is to be found, not in the yeast, but in an enzyme contained in the meal itself. Starches such as dextrin remain unchanged during the fermentation.—W. G. M.

United States Patents.

Centrifugal Liquid-Separator [Cream]. G. Reunerfelt, Assignor to Kochkum, jun., and Ohlsson, all of New York. U.S. Pat. 744,938, Nov. 24, 1903.

The bowl of the machine is provided with one or more nozzles arranged tangentially, which are connected with cups or chambers adapted to hold the liquid, so as to utilise the hydrostatic pressure due to the rotation of the bowl. The skim-milk escape consists of a tube extending from near the periphery of the bowl towards the centre, and provided at its inner end with two openings, one of which is nearer to the axis of rotation than the other. The outlet from the bowl consists of a contracted tangential nozzle, directed substantially opposite to the direction of rotation of the bowl (See also U.S. Pat. 739,927; this Journal, 1903, 1121.)—R. A.

Casein; Process of Preparing Fat-free. O. Eberhard, Ludwigslust. U.S. Pat. 745,097, Nov. 24, 1903.

See Fr. Pat. 321,490 of 1902; this Journal, 1903, 225.
—T. F. B.

French Patents.

Soluble Albuminates; Preparation of ——. Soc. Bauer et Cie. Fr. Pat. 333,334, June 24, 1903.

Soluble albuminates are prepared by mixing casein or other animal or vegetable albuminous compound or alkaline albuminate (95 parts) in aqueous, ethereal, or alcoholic suspension, with a 50 per cent. solution of disodium distearylglycerophosphate (10 parts), and evaporating to dryness at the lowest possible temperature. In general, the alkali salts of glycerophosphoric acid containing substituted fatty radicals, *e.g.*, monostearyl-, monopalmityl-, dipalmityl-, mono-oleo- or dioleoglycerophosphoric acid (for preparation, see Hundeshagen, J. prakt. Chem. (2), pp. 28, 240), also substituted hexite phosphoric acids, *e.g.*, mannito-, dulcito- or sorbito-phosphoric acid (for preparation, see Portes and Prunier, J. Pharm. Chim. (6), pp. 15, 157, and Carie, Comptes rend., 1903, **136**, 366), are claimed for this purpose.
—R. L. J.

Milk; Process for Treating —— [for Cheese-making]. W. Cole. Fr. Pat. 333,494, July 1, 1903.

The cream is separated from the milk, then rendered slightly acid and treated with a current of air for from 15 to 30 minutes at a temperature of 15·5° to 26·6° C. It is now added to the bulk of the milk and the mixture allowed to stand for 12 hours, when the whey is drawn off as usual.
—W. P. S.

Milk; Treatment of ——. A Gaulin. Fr. Pat. 333,793, July 11, 1903.

An apparatus is described for adding predetermined quantities of sodium hydroxide solution to milk, to neutralise the acidity and prevent curdling during the pasteurising process. The apparatus is also suitable for adding measured quantities of acid to milk for the manufacture of casein.—W. P. S.

Eggs; Process and Substances for Use in Preserving ——. A. Pfaff. Fr. Pat. 333,505, July 1, 1903.

See Eng. Pat. 12,867 of 1903; this Journal, 1903, 960.
—T. F. B.

Alimentary Substance containing Lecithin and Iron; Preparation of an ——. E. Lavis. Fr. Pat. 333,540, July 3, 1903.

Yolk of egg is treated with three times its weight of acetone. The insoluble residue is separated, pressed to remove oil and some of the lecithin, and then again extracted with acetone. After removing the remaining free lecithin by means of a suitable solvent, the residue, containing combined lecithin and iron, is dried. The oil and removed lecithin may also be separated as secondary products.—W. P. S.

Flour; Treatment of ——, to Purify it and Increase its Nutritive Value. J. N. Alsop. Fr. Pat. 333,709, July 9, 1903.

See Eng. Pat. 14,006 of 1903; this Journal, 1903, 1062.
—T. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

United States Patent.

Oily or Similar Impurities from Water; Method of Separating ——. H. T. Davis and E. Perrett, Lewisham, Assignors to Davis-Perrett, Ltd., London. U.S. Pat. 744,171, Nov. 17, 1903.

The water to be treated is mixed with a suitable electrolyte, and electrolysed between metallic electrodes. The particles of oil are thereby made to adhere to metallic particles from the electrodes, and can then be readily removed from the surface of the water.—L. F. G.

French Patent.

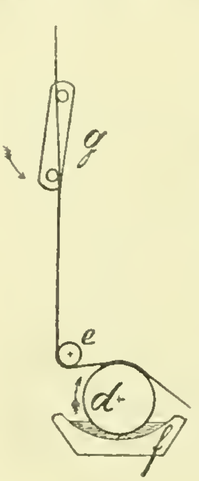
Sewage; Purification of ——. [Filter-Bed]. F. Eichen. Fr. Pat. 333,406, June 26, 1903.

Claim is made for the use of lignite-coke or peat-coke in the construction of filter-beds for the biological treatment of sewage.—W. P. S.

XIX.—PAPER, PASTEBOARD, Etc.

Paraffined Paper. Lux. Papier-Zeit., 1903, **28**, [98], 3528.

For waxing, a thin moderately sized calendered paper is the most suitable. The material is applied to one side of the paper by means of a roller revolving in a bath of melted wax, the excess being removed by a "doctor." The "doctor" consists of a pair of small cylinders so arranged that the paper in its vertical course passes between them with only a slight deflection; this arrangement is shown at *g* in the diagram. The lower roll of the "doctor" is constructed of a polished glass tube of 3 cm. diameter, heated internally by steam; this roll is situated at a distance of about 15 cm. above the waxing roll; when adjusted at a greater distance the quantity of wax retained by the paper is increased. Finally, the paper is conducted over guide rolls and cooled. The waxing material is chosen according to the purpose for which the paper is intended. For wrapping groceries an odourless, high-melting paraffin is preferred, for fruits, &c., beeswax is frequently used on account of its aroma.—J. F. B.



Rosin Sizing. C. Hofman. Papier-Zeit., 1903, **28**, [98], 3526—3527.

Many papermakers employ the so-called "white size" containing much free rosin because the colour of the paper may thereby be preserved whilst using a cheaper quality of rosin. The presence of much free rosin, however, causes rosin specks in the paper and creates much loss and annoyance by the stopping up of the wires and felts. The author prefers to obtain a nearly white size by employing the paler qualities of rosin, combining these with a fairly high proportion of soda, in spite of greater cost and the fact that it is necessary to use from 10 to 15 per cent. more of such size than of the darker grades. The stoppage of the wires and felts and the formation of froth on the machine can be prevented by increasing the proportion of soda in the size and by diluting the rosin-size to a concentration of 18 grms. of rosin per litre. It is advisable to test the size every time, before use, by pouring a litre of the milky solution into a basin of water, stirring and allowing the mixture to settle for an hour. When the water is poured off, the presence of coarse flakes at the bottom is a sure indication of subsequent trouble on the machine, as well as of poor sizing. The fault may be remedied by adding the size to the "stuff" in the beater before the latter is fully charged, and allowing it to run round for an hour with the roll off the bed-plate, whereby most of the rosin flakes are beaten up. The alum solution should never be added hot, and should not be stronger than 6° Beaumé. One-half of the alum should be added about two hours after the size, and the other half about 20 minutes before the beater is discharged; the presence of excess of alum should always be ensured by testing with litmus paper. Papers sized with much free rosin are stated to deteriorate. The composition of the water has a very great influence on the sizing, chalky waters never giving such good results as gypsum waters. An increase of lime salts in the water is to be counteracted by increasing the proportion of soda in the size.—J. F. B.

English Patent.

Viscose; Refining or Purifying ——. The Viscose Syndicate, Ltd., and C. F. Cross, London. Eng. Pat. 21,030, Sept. 30, 1903.

In order to separate cellulose xanthate in a form convenient for washing, thereby eliminating the alkaline by-products which accompany it in its crude solution, the latter is heated for one to two hours at 50° C. with constant stirring, and is then treated with twice its weight of a saturated solution of sodium bicarbonate, the separated solid being broken up by agitation, and then washed on a filter with bicarbonate solution, and also sodium sulphite. After centrifugalising, the cellulose is dissolved in strong caustic soda, thus re-forming the viscose in a purified form. A solution of sodium chloride and sodium sulphate is used to prevent re-hydration and re-solution of the product while under treatment.—G. W. McD.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Radio-active Substances [*Radium*]. Mme. S. Curie. Chem. News, 1903, **88**, [2282], 85—86; [2283], 97—99; [2285], 134—135; [2286], 145—147; [2287], 159—160; [2288], 169—171; [2289], 175—177; [2290], 187—188; [2291], 199—201; [2292], 211—212; [2293], 223—224; [2294], 235—236; [2295], 247—249; [2296], 259—261; [2297], 271—272.

Measurement of Intensity of Radiation.—The method consists in measuring the conductivity acquired by air under the influence of the radio-active body. The finely-powdered active material is spread over one disc of a plate condenser, which is connected to a source of high potential, and the current passing to the other disc, which is maintained at the potential of the earth, is measured by means of a quartz electric balance. With great differences of potential between the discs of the condenser, and with the discs a sufficient distance apart, a practically constant current is finally obtained, and this "current of saturation" or "limiting current" is taken as the measure of radio-activity.

Material.	Thickness of Layer of Active Material. mm.	Intensity of Limiting Current. 10^{-11} ampère.
Pitchblende from Johanngeorgenstadt	..	8·3
Pitchblende from Joachimsthal	..	7·0
„ Pribramm	..	6·5
„ Cornwallis	..	1·6
Chalcolite	..	5·2
Carnotite	..	6·2
Metallic uranium (containing a little carbon)	..	2·3
Black oxide of uranium, U_2O_5	..	2·6
Ammonium uranate	..	1·3
Uranium oxysulphide	..	1·2
Potassium uranium sulphate	..	0·7
Thorium oxide	0·25	2·2
„	0·50	2·5
„	2·50	4·7
„	3·00	5·5 (mean)
„	6·00	5·5 „
Thorium sulphate	0·25	0·8 „

Radio-activity of Thorium and Uranium Compounds.—The foregoing values for the limiting current were obtained with some radio-active minerals and compounds of uranium and thorium, a condenser with discs 8 cm. in diameter, and 3 cm. apart being used. In the case of uranium compounds the thickness of the layer has but little effect, but with thorium compounds, on the other hand, the action is only regular when a sufficiently thin layer (*e.g.*, 0·25 mm.) is used, whilst with thicker layers, the values for the limiting current are not only higher, but also vary between two extreme limits. For example, with a layer of thorium oxide, 6 mm. thick, the values varied between 3·7 and 7·3. These irregularities were due to the fact that in the case of thorium compounds, the radio-activity dispersed in the space between the discs is considerable as compared with the radio-activity of the solid substance, and, as the condenser was open to the air, the least draught caused a change in the intensity of the current. The rays emitted by thorium are more penetrating than those emitted by uranium; also the rays emitted by a thick layer of thorium oxide are more penetrating than those emitted by a thin layer. The radio-activity of thorium and uranium compounds is an atomic property, being proportional to the amount of the metal present.

New Radio-active Bodies.—Three different strongly radio-active bodies have been discovered in pitchblende:—(1) Polonium, allied to bismuth and separated from it by: (*a*) fractional precipitation of the sulphides from hydrochloric acid solution; (*b*) fractional sublimation of the sulphides *in vacuo*; (*c*) fractional precipitation of the basic nitrates. (2) Radium, allied to barium, and separated from it by fractional crystallisation of the chlorides from water, dilute alcohol, or water acidified with hydrochloric acid, or by fractional crystallisation of the bromides from water. (3) Actinium, allied to thorium, from which it has not been found possible to separate it. Radium is the only one of the three new elements which, up to the present, has been isolated in the form of a pure salt.

Preparation of Pure Radium Chloride.—The residue left after the extraction of the uranium from pitchblende, and consisting mainly of the sulphates of lead and calcium, silica, alumina, and iron oxide, together with smaller amounts of nearly all the other metals, is treated with a boiling concentrated solution of caustic soda, which dissolves the lead, silica, and alumina. The insoluble matter is washed free from sodium sulphate and treated with hydrochloric acid. Polonium and actinium pass into solution and are recovered, the former in the precipitate obtained with sulphuretted hydrogen, and the latter in the hydroxides precipitated by ammonia in the solution separated from the sulphides and oxidised. Smaller quantities of polonium and actinium also occur in the various waste liquors, &c., obtained during the process, and may be recovered. The portion insoluble in hydrochloric acid is washed, boiled with a concentrated solution of sodium carbonate, and the insoluble carbonates formed are washed and dissolved in hydrochloric acid free from sulphuric acid. The solution is treated with sulphuric acid, and the precipitate (yield, 10—20 kilos. from 1 ton of ore residue), which consists of the sulphates of barium (together with radium and calcium), lead, and iron, and a trace of actinium, is boiled with sodium carbonate solution. The insoluble carbonates are dissolved in hydrochloric acid, the lead precipitated as sulphide and filtered off, the filtrate oxidised by means of chlorine, the iron precipitated by ammonia and filtered off, and the filtrate treated with sodium carbonate. The insoluble carbonates (of barium, calcium, and radium) are converted into chlorides, and the latter washed with pure concentrated hydrochloric acid, which dissolves the calcium chloride. The residue consists of barium and radium chlorides (yield, 8 kilos. from 1 ton of material), and has a radio-activity 60 times as great as that of metallic uranium. The barium-radium chloride is dissolved in distilled water, the solution heated to boiling, and then allowed to cool. When a certain amount of the salt has crystallised out, the liquid is decanted and evaporated to dryness. Two portions, A and B, are thus obtained, of which B, consisting of the more soluble chloride, is the less active. The fractionation is repeated with each of the two portions, and the less active fraction of A is added to the more active fraction of B. The operations are repeated with each portion, until a certain fixed number (*e.g.*, 6) of fractions are obtained; the most soluble portion will then have only an inconsiderable radio-activity, and is withdrawn from the process. In the next series of fractionations a new fraction is made from the most soluble portion, and the crystals of the most active portion are withdrawn. In this way the activity of each fraction is maintained practically constant at about five times that of the next more soluble portion. When the quantity of liquid to be decanted becomes small, water acidified with hydrochloric acid is added, the proportion of acid being increased as the fractionation proceeds; towards the end it is only necessary to work with three or four fractions. When most of the inactive barium chloride has been removed, one fraction is withdrawn from one end, and another—the active chloride previously removed—is added at the other end. The fractionation is continued until the crystals of radium chloride show a spectrum practically free from barium lines. Radium chloride containing traces of barium chloride may be purified by dissolving in water, and precipitating by addition of alcohol, the barium chloride remaining dissolved in the slightly aqueous alcoholic solution. Crystals of pure radium chloride, like those of barium chloride, are colourless, but when a certain proportion of radium is present in the mixed chlorides, the crystals obtained have a yellow colour after some hours, verging on orange, and sometimes pink; the colour disappears in solution. The maximum degree of colour is obtained for a certain amount of radium present, and this fact is useful in checking the progress of the fractionation.

Atomic Weight of Radium.—The mean of three determinations of the atomic weight of radium in a specimen of pure radium chloride was 225, assuming the element to be divalent.

Characteristics of Radium Salts.—The chloride, nitrate, carbonate, and sulphate of radium resemble the corresponding salts of barium when freshly prepared, but they gradually become coloured. They are all luminous in the dark, and are the source of a spontaneous and continuous evolution of heat.

Radiation of the New Radio-Active Substances.—The radiation of radium consists of three different kinds of rays:—(1) The α-rays, forming the major part of the radiation, which are very slightly penetrating and are slightly deflected by a strong magnetic field in the same manner as cathode rays, but in the reverse direction. (2) The β-rays, which are not absorbed so readily as the α-rays, and are deflected by a magnetic field in the same manner and direction as cathode rays. (3) The γ rays, which are penetrating, are unaffected by the magnetic field, and are comparable to Röntgen rays. The radiation of polonium consists of α-rays. Uranium and thorium emit α- and β-rays; actinium appears to behave like radium. The deviable β-rays of radium are charged with negative electricity. On keeping a specimen of very active radium enclosed in a glass vessel for some time, and then making a scratch on the glass, the report of an electric spark was heard, and subsequent examination showed that the glass had been pierced by a spark. The phenomenon is comparable to the rupture of the glass of an overcharged Leyden jar. Radium emits rays which can be detected in air at a distance of several metres, and which are capable of penetrating great thicknesses of solid matter; the radiation of polonium, on the other hand, is only propagated in air to a distance of a few (4—6) cm., and is readily absorbed. The radiation of radium remains unaltered even at the temperature of liquid air. Prolonged heating at high temperatures has the effect of temporarily lowering the radio-activity to a very considerable extent, but in time (about two months) the body becomes more active than it was before being heated. The radiation of radium causes ready condensation of supersaturated water vapour, and also facilitates the passing of an electric spark between two metallic conductors.

Fluorescent and Luminous Effects.—The rays emitted by radium cause fluorescence of certain substances, *e.g.*, barium platinocyanide, the salts of the alkalis and alkaline earths, paper, cotton, glass, &c. Phosphorescent zinc sulphide is rendered extremely luminous. Diamonds become phosphorescent, and may thus be distinguished from paste imitations, which are rendered only faintly luminous. All barium-radium compounds are spontaneously luminous. The luminosity of the dry, anhydrous halogen salts is easily visible in the twilight or by gas-light, and, in the dark, is strong enough to read by. Radium compounds lose much of their luminosity in damp air, but regain it on drying. The light emitted by very active products changes colour after several months, becoming more violet and losing much of its intensity, but on dissolving the compound in water, and obtaining it again in a dry condition, the original luminosity is restored. Solutions of barium-radium salts which contain a large proportion of radium, are also luminous.

Evolution of Heat.—The amount of heat evolved is such that radium salts are maintained at a temperature 1·5° C. higher than that of their surroundings. One grm.-atom (225 grms.) of radium gives rise in one hour to 22,500 calories.

Chemical Effects.—Under the influence of radium, glass is coloured, generally brown or violet; the coloration is produced in the body of the glass, and remains after removal of the radium. Pure salts of alkalis are coloured blue, green, yellow, &c. Yellow phosphorus is converted into red phosphorus. Paper becomes brittle and scorched, and finally a number of holes are produced. Ozone is produced in air in direct contact with radium compounds. Barium-radium chloride or bromide, on keeping, slowly generates oxygen compounds of chlorine or bromine. A solution of a radium salt evolves hydrogen.

Induced Radio-activity.—Substances which remain for some time in the vicinity of a radium compound, or more especially of a solution of a radium compound, themselves become radio-active, but, in general, lose their activity with comparative rapidity when removed. Certain compounds, however, *e.g.*, celluloid, paraffin, caoutchouc, &c., retain their induced radio-activity for from 15 to 20 days. In the course of experiments on induced radio-activity, it was observed that a solution of a radium salt placed for some time in a confined space is no more active than pure water placed in a vessel in the same enclosure, when the equilibrium of activity is established. On removing the radium solution from the enclosure and allowing it to stand exposed to the air, the solution becomes nearly inactive, but it gradually regains its activity, if it be again enclosed in a stoppered flask. In making investigations of strongly radio-active products, special precautions must be taken against induced radio-activity. Dust particles, the air of the room and clothing all become radio-active, and the air also becomes a conductor. The capacity of radium compounds of causing induced radio activity can be almost entirely destroyed by prolonged heating to redness, but is again restored by dissolving the compound in water, evaporating to dryness, and drying at 120° C.

Variations of Activity of Radio-active Bodies.—The radio-activity of polonium diminishes with time. Radium salts, on the other hand, possess a permanent radio-activity; the activity increases from the time of preparation until it attains a limiting value after about one month, when it remains practically constant, even after many years. The variation of activity is in the opposite direction in the case of solutions of radium salts. A freshly prepared solution is very active, but when left exposed to the air, it rapidly loses activity and finally reaches a limiting activity, which may be considerably less than the original. (See also this Journal, 1900, 558, 785, 861, 937; 1901, 76, 290, 396, 625, 845, 1251; 1902, 76, 142, 196, 368, 726, 795, 796, 994, 1301; 1903, 49, 322, 657, 854, 857, 928, 969, 1020, 1146, 1212, 1310).—A. S.

Radio-active Thorium. F. Zerban. Ber., 1903, 36, [15], 3911—3912.

G. F. Barker claims to have isolated radio-active thorium compounds from monazite sand from Brazil and from North Carolina. The author, with K. A. Hofmann, had previously shown (this Journal, 1903, 1146) that all minerals from which they obtained radio-active thorium compounds contained uranium, and that the thorium compounds from sources free from uranium (Sotersdal gadolinite, Norwegian orthite and yttrotantalite), were inactive. He has now examined samples of monazite sand from Bahia, South Carolina, and Australia, and finds uranium in all of them, (0·038 and 0·04 per cent. in two samples). The thorium compounds from these sands were feebly radio-active, while the uranium preparations extracted from the sands acted as strongly on the electroscope as uranium oxide from pitchblende.—J. T. D.

Rare Earth Metals; Perfect Separations in the Series of ——. G. Urbain and H. Lacombe. Comptes rend., 1903, **137**, [20], 792—794.

In fractionally crystallising two salts, as a rule, only the less soluble or the more abundant can be obtained pure; at a certain concentration the two substances crystallise out in the same proportions as those in which they exist in solution. If the salts be isomorphous, however, each one of a series can be obtained pure by a sufficient number of fractionations, and this is the process which hitherto has chiefly served for separations in the rare earth series, except in the case of cerium, the formation of the peroxide of which has served as the basis of its separation. The existence of the intermediate fractions, however, has always been a source of trouble and of loss; and the authors have avoided this by utilising the isomorphism, with the double magnesium and rare earth nitrates, of the double nitrate of magnesium and bismuth (this Journal, 1903, 1212). By adding this salt to the double nitrates of samarium and of gadolinium with magnesium, for instance, the fractions consist successively of the salts of samarium, samarium and bismuth, bismuth, bismuth and gadolinium, and gadolinium; and by removing the bismuth from the mixed fractions by means of hydrogen sulphide, the whole of the samarium and of the gadolinium compounds present in the original mixture can be separately obtained.—J. T. D.

Cerium; Separation of ——, *by means of Potassium Permanganate.* C. R. Boehm. XXIII., page 1369.

Kermes Mineral. J. Bougault. Comptes rend., 1903, **137**, [20], 794.

No sufficient proof of the existence of antimony trioxide in kermes mineral has yet been given, and probably it does not contain any. Sodium pyroantimonate forms a considerable proportion of kermes. As tartaric acid extracts antimonious oxide from a mixture of antimonious sulphide and sodium pyroantimonate, kermes mineral probably owes its therapeutic action to antimonious oxides formed by its reaction on the acids of the stomach.—J. T. D.

Hydrocyanic Acid; Antidote for ——. Hertig. Südd Apoth.-Zeit, 1903, 216; Pharm. J., 1903, **71**, 777.

The author recommends hydrogen peroxide solution as an antidote for poisoning by hydrocyanic acid. Oxamide, which is stated to be harmless, is formed by the direct union of the two substances:

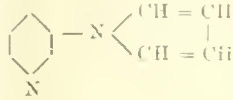
$$2HCN + H_2O_2 = NH_2.CO.CO.NH_2.$$

—A. S.

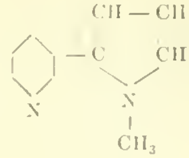
Nicotine; Synthesis of ——. A. Pictet, Comptes rend., 1903, **137**, [21], 860—862.

Nicotinic acid is esterified, converted into amide, and from this by means of hypobromite is prepared β aminopyridine. The mucate of this base by dry distillation yields N-pyridyl pyrrol, (I), which by passage through a red-hot tube undergoes molecular change into α-pyridylpyrrol. The potassium derivative of this treated with methyl iodide gives a methyl derivative; methyl and iodine attach themselves at the same time to the nitrogen of the pyridine nucleus, but are removed by distillation with lime, giving methyl-α-pyridylpyrrol, (II), (Cahours and Etard's isodipyridine, Blau's nicotyrine). This substance yields with iodine an iodo-derivative, which is transformed by tin and hydrochloric acid into a dihydro-derivative, (III), (isomeric with Pictet and Rotschy's nicoteïne; this Journal, 1901, 501). The dihydro compound yields with bromine a tetrabromide, which is reduced by tin and hydrochloric acid to a tetrahydro-derivative, identical with Pictet and Rotschy's inactive nicotine (IV) (this Journal, 1900, [illegible]).

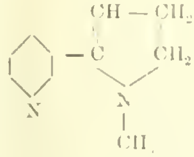
I.



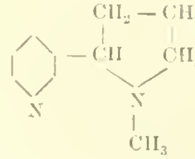
II.



III.



IV.



From this inactive nicotine a tartrate was prepared which was recrystallised from alcohol till its melting point and specific rotation agreed with those of the salt from natural nicotine; this tartrate, treated with sodium hydroxide, gave an alkaloid identical in boiling-point, density, and specific rotation with natural nicotine.—J. T. D.

Sparteïne Sulphate; Composition and Titration of ——. C. Moureu and A. Valeur. J. Pharm. Chim., 1903, **18**, [12], 545—546.

Sparteïne sulphate is laevo-rotatory; in aqueous solutions at concentrations between 3 and 6 per cent. the specific rotatory power, $[\alpha]_D = -22 \cdot 12^\circ$ at 15°—20° C. When heated at 100° C. sparteïne sulphate rapidly turns brown, with loss of water. *In vacuo* over sulphuric acid, it attains a constant weight with loss of 4 molecules of water of crystallisation. The salt, however, really crystallises with 5 molecules of water, as is shown by its analysis. Sparteïne being a mon-acid base towards phenolphthaleïn, the sulphate, $C_{15}H_{26}N_2H_2SO_4$ possesses one free acid function with that indicator, which permits of an accurate volumetric titration with aqueous decinormal solutions.—J. F. B.

Cocaine; Assay of Crude ——. W. Garsed. XXIII., page 1370.

Cod-liver Oil and its Adulterants. E. W. Mann. XII., page 1356.

Urea; Formation of ——, *by the Direct Hydrolysis of Lead Cyanate.* A. C. Cumming. Proc. Chem. Soc., 1903, **19**, [272], 274.

Lead cyanate is readily and quantitatively transformed into lead carbonate and urea by direct hydrolysis with boiling water: $Pb(CNO)_2 + 2H_2O = PbCO_3 + CON_2H_4$. This salt, which is prepared by adding lead nitrate to potassium cyanate solution from which the carbonate has previously been removed by barium nitrate, is fairly stable at ordinary temperatures and may be washed with cold water until free from impurities. (See also John Williams, J. Chem. Soc., 1868, **21**, 63.)

English Patents.

Pseudoionone; Process for the Preparation of Hydrolised —— *and its Homologues, and for their Transformation into Cyclic Ketones.* H. H. Lake, London. From Chuit, Naef, & Co., Geneva. Eng. Pat. 705, Jan. 10, 1903.

See Fr. Pat. 326,982 of 1902; this Journal, 1903, 880.

—T. F. B.

Methylene Citric Acid; Manufacture and Production of ——. H. E. Newton, London. From Farbenfabr. vorm. F. Bayer & Co., Elberfeld. Eng. Pat. 1579, Jan. 22, 1903.

See U.S. Pat. 722,275 of 1903; this Journal, 1903, 430.

—T. F. B.

Saccharin; Manufacture of ——. R. Barge, Stassfurt, Germany, and L. Givaudan, Geneva. Eng. Pat. 3563, Feb. 14, 1903.

o-Toluenesulphonamide is treated in alkaline or neutral solution with a quantity of a permanganate insufficient to oxidise the whole of the amide to saccharin, the manganese dioxide is filtered off, the unchanged amide is precipitated by neutralising the filtrate exactly, the solution is again filtered, and the saccharin precipitated by the addition of a mineral acid.—J. F. B.

Colloidal Salts of Heavy Metals. G. B. Ellis, London. From Chem. Fabr. von Heyden Act.-Ges., Radebeul. Eng. Pat. 19,168, Sept. 5, 1903.

Colloidal, soluble salts of the heavy metals, especially silver and mercury, are prepared by carrying out the usual "wet" methods of preparing the insoluble salts, in presence of colloidal organic compounds, *e.g.*, albuminous substances, gums, and their decomposition products. The product is extracted from the solution either by dialysing and evaporating at a low temperature or precipitating with alcohol. Colloidal mercuric salicylate is prepared by adding a solution of 16 parts of sodium salicylate in 500 parts of water to a solution of 27 parts of mercuric chloride in 2,000 parts of water, to which has been added a solution of 20 parts of albumin in 500 parts of water. The resulting solution is dialysed and evaporated. The following colloidal salts are claimed: mercurous chloride (see U.S. Pat. 740,855 of 1903; this Journal, 1903, 1306), bromide and iodide, mercuric salicylate and silver chromate; the latter being prepared by adding silver nitrate to a solution of potassium bichromate containing albumin, &c. —T. F. B.

United States Patents.

Mercurous Iodide; Soluble [Colloidal] ——. C. H. von Hoessle, Assignor to Chem. Fabr. von Heyden Act.-Ges., Radebeul. U.S. Pat. 742,429, Oct. 27, 1903.

See Eng. Pat. 19,168 of 1903, preceding this.—T. F. B.

Silver Chromate [Colloidal]. C. H. von Hoessle, Assignor to Chem. Fabr. von Heyden Act.-Ges., Radebeul. U.S. Pat. 745,843, Dec. 1, 1903.

See Eng. Pat. 19,168 of 1903; in Eng. Pats. preceding. —T. F. B.

French Patent.

Diphenol-mono-carboxylic Acid [p-Hydroxyphenyl-salicylic Acid], its Salts and Derivatives; Preparation of ——. J. Fabre. Fr. Pat. 333,720, July 10, 1903.

p-Diphenol (75 grms.) is dissolved by agitation with a solution of caustic soda, the solution is warmed and carbon tetrachloride (60 grms.) is gradually added. The mixture is boiled under a reflux condenser for 150 hours. The unaltered carbon tetrachloride is then distilled off, the unaltered diphenol is precipitated by saturating the liquid with carbon dioxide and the diphenolcarboxylic acid is extracted by means of ether after acidification. The product is purified by shaking the ethereal solution with a solution of potassium bicarbonate, and subsequently by conversion into the lead salt. The acid crystallises from aqueous alcohol and melts at 225° C.—J. F. B.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

English Patent.

Reproducing Pictures [Catatype]; Impts. in ——. O. Gros and W. Ostwald, Leipzig. Eng. Pat. 27,896, Dec. 17, 1902.

See addition, of Dec. 16, 1902, to Fr. Pat. 315,852, of 1901; this Journal, 1903, 963.—T. F. B.

United States Patent.

Photographic Reproductive Process. E. Ortmann, Detroit U.S. Pat. 744,223, Nov. 17, 1903.

Stipple printing plates are prepared by immersing photographic dry plates in a solution of bichromate, exposing them to light and washing out the soluble bichromate, then developing in the usual manner. This bichromate treatment is said to "cause the emulsion to divide into two sets of divisions when exposed to light, one set impervious to water, and the other capable of development into an opaque stipple."—T. F. B.

French Patents.

Reproducing Pictures, &c. [Catatype]; Process for ——. O. Gros. Addition, dated June 23, 1903, to Fr. Pat. 315,852, Nov. 12, 1901.

See Eng. Pat. 13,920, of 1903; this Journal, 1903, 1015. —T. F. B

Photographs in Natural Colours on Paper; Process for Producing Permanent ——. H. Reichel. Fr. Pat. 333,372, March 20, 1903.

See Eng. Pat. 6356, of 1903; this Journal, 1903, 1256. —T. F. B.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosion of Nitroglycerin; Circumstances attending an ——, which occurred in the Final Washing House of the Factory of the Cotton Powder Company, Limited, at Uplees Marshes, Faversham, Kent, on Aug. 23, 1903. By Major A. Cooper-Key, H.M. Inspector of Explosives.

Six hundred and fifty pounds of nitroglycerin, contained in the filter-tank, were involved in this explosion, which formed a crater 20 ft. in diameter and 6 ft. deep. No one was present, the building having been locked up for some 24 hours previously. In the final washing house, the nitroglycerin is treated with a succession of warm sodium carbonate solutions. During this process a flocculent material, consisting mainly of lime and carbonate of lime, and containing traces of nitroglycerin forms on the surface of the wash water and some of this material, known technically as "mud," remains behind with the nitroglycerin. To get rid of this the charge is passed through a layer of common salt on flannel. A small filter was used in the same building for the purpose of extracting the nitroglycerin from the salt and flannels used in the larger vessels, and the "mud" collected from the wash water. The inspector traces the explosion to the spontaneous decomposition of the "mud" left upon the filter-cloth followed by the explosion of the few pounds of nitroglycerin in the tank, which in turn communicated the explosion to the larger filter. A recommendation is made that filter-cloths should not, in future, be washed in the building which contains the main charge of nitroglycerin. —G. W. McD.

English Patent.

Kneading and like Machines employed in the Manufacture of Explosives; Impts. in ——. Kynoch, Ltd., Witton, and T. J. Ashley, Stanford-le-Hope, Essex. Eng. Pat. 456, Jan. 7, 1903.

The invention consists in feeding an inert ingredient of the explosive, such as acetone or vaseline, into the kneading machine through a narrow space provided between the casing of the machine and the bearings, so that the materials being kneaded in the machine cannot in any way have access to the bearings.—G. W. McD.

Explosives; Manufacture of ——. Kynoch, Ltd., Witton, and A. T. Cocking, Stanford-le-Hope, Essex. Eng. Pat. 457, Jan. 7, 1903.

In the manufacture of explosives, such as "Cordite MD," containing a high proportion of guncotton (65 per cent.), danger arises during the hand-mixing and subsequent incorporation in the kneading machines, because the proportion of nitro-glycerin is insufficient to moisten the whole of the guncotton. To minimise the danger arising from this dry guncotton dust, it is proposed to dissolve the nitroglycerin in its own volume of methylated spirit before adding it to the guncotton, and thus a thorough wetting of the latter is obtained. The acetone is added, as usual, in the incorporating machine, but a smaller quantity will suffice. Any other volatile liquid ingredient, such as ether, benzene, or naphtha, will also serve the purpose, provided it dissolves nitroglycerin, and does not gelatinize guncotton, and is used in sufficient proportion to thoroughly moisten the guncotton.—G. W. McD.

Explosive Powder ; A New ——. N Schnebelin, Paris. Eng. Pat. 21,365, Oct. 5, 1903. Under Internat. Conv., Oct. 30, 1902.

One kilo. of potassium chlorate is dissolved in $1\frac{1}{2}$ litres of boiling water, and to this is added $\frac{1}{4}$ kilo. of starch, previously dissolved in $\frac{1}{2}$ litre of water, and also $\frac{1}{4}$ kilo. of solid paraffin. After incorporation the mixture is poured out on to smooth plates and broken up into grains or flakes of any desired size.—G. W. McD.

United States Patents.

Phosphorus and Sulphur ; Compound of —— *[for Matches], and Method of Making Same.* E. W. Wheelwright, Birmingham. U.S. Pat. 745,546, Dec. 1, 1903.

See Eng. Pat. 3045 of 1902 ; this Journal, 1903, 229.
—T. F. B.

French Patents.

Vitroglycerin Explosive ; A Gelatinized ——, *and Method of Manufacture.* Soc. Dynamit Akt.-Ges. vormals Alfred Nobel et Cie. Fr. Pat. 333,413, June 29, 1903.

he invention consists in the use of carbohydrates wholly r partially soluble in water (sugar, starch, dextrin, &c.), n place of the insoluble carbohydrates usually employed in elatin dynamite explosives. With a 30 per cent. nitrolycerin composition the soluble carbohydrates produce a lastic body capable of being worked in the cartridge achines, whereas the insoluble carbohydrates would give friable and unworkable product. These soluble bodies hould be added to the nitroglycerin and collodion cotton t the commencement of gelatinization. The following omposition is given :—Nitroglycerin, 32 per cent.; collodion otton, 0·7 per cent. ; dextrin, 15·5 per cent.; vegetable il, 1 per cent.; ammonium nitrate, 35·8 per cent. ; mmonium oxalate, 3 per cent.; wood meal, 2 per cent.; odium chloride, 2 per cent. ; alum, 5 per cent.
—G. W. McD.

xplosives ; Manufacture of ——. Soc. Anon. des Poudres et Dynamites. Fr. Pat. 333,502, July 1, 1903.

laim is made for the use of solid nitro derivatives of the romatic series, such as bi- and trinitrotoluene and benzene, the manufacture of nitro-glycerin blasting explosives. he addition of these bodies to nitro-glycerin lowers its eezing-point from + 8° C. to − 20° C., and renders the nished explosive (blasting gelatin, geligoite, &c.), less ensitive to shock.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

United States Patent.

nalysing Gases ; Apparatus for ——. C. C. Tutwiler, Assignor to the United Gas Improvement Co., Philadelphia, Pa., U.S. Pat. 741,132, Nov. 17, 1903.

he apparatus comprises a burette, manometer, a gas pette, two double absorption pipettes with a common seal d connections fitted with valves for conducting gas into ther, and a four-way cock for establishing communication tween the various pieces of the apparatus.—L. F. G.

INORGANIC—QUANTITATIVE.

Indicators ; Theories of ——. J. Stieglitz. J. Amer. Chem. Soc., 1903, **25**, [11], 1112—1127.

The author considers that, while Ostwald is probably wrong with regard to the change of colour, he has correctly defined the guiding principles of the proper theoretical treatment of the question concerning the varying sensitiveness of indicators to acids and bases. He then proceeds to deal with the ionisation and chromophoric theories in relation to the change of colour and sensitiveness of indicators, and concludes that phenolphthalein and methyl orange act as a very weak acid and a very weak base respectively in their quinoid forms, and that their weakness is chiefly due to the instability of the quinoid isomers in the form of free acid or free base respectively. The lack of sensitiveness of phenolphthalein in the titration of a weak base like ammonia, and of methyl orange in titrating a weak acid like acetic acid, is attributed to the weaker (less ionised) condition of a weak acid or base in presence of its own salts than in pure aqueous solutions. Thus in titrating ammonia with hydrochloric acid, the formation of ammonium chloride destroys the red colour of phenolphthalein before the whole of the ammonia has been neutralised, the hydroxyl ions readily disappearing in presence of such an easily ionised salt. In fact, normal ammonia is weakened fifty times more by a given quantity of ammonium chloride than by the equivalent amount of hydrochloric acid.—C. S.

Methyl Orange ; Colour of Aqueous Solutions of ——, *and the Change produced by Acids.* P. Vaillant. IV., page 1343.

Carbon in Carbides ; Determination of ——. F. A. J. Fitzgerald and H. M. Loomis. Electrochem. Ind., 1903, **1**, [12], 410.

0·2—0·5 grm. of the carbide is mixed with 1 grm. of calcined magnesia and a weight of sodium peroxide equal to 10—15 times that of carbide taken, and heated, in a nickel crucible of 30 c.c. capacity, until the reaction is complete (30—40 seconds). The product is dissolved in water, and the carbon dioxide determined by any method, correction being made for carbonate in the sodium peroxide.—T. F. B.

Magnesium ; Volumetric Method for the Determination of ——. E. Rupp. Arch. der Pharm., 1903, **241**, [8], 608—613.

The magnesium is precipitated in the usual manner as magnesium ammonium arsenate, a known volume of sodium arsenate solution being added in excess, and the precipitate filtered off. The uncombined arsenate is then titrated iodometrically in the filtrate in the usual way. From the amount of arsenic acid consumed the amount of magnesium present is calculated. The method is said to have the advantage of greater accuracy than the gravimetric determination of the precipitated magnesium ammonium arsenate, and the necessity for correction for the solubility of that salt in the mother liquor is obviated.—J. O. B.

Antimony ; Quantitative Determination of ——. L. A. Youtz. School of Mines Quarterly, 1903, **24**, 407—421. See also this Journal, 1903, 711.

The author finds that in the determination of antimony by the Herroun-Weller method (see this Journal, 1882, 203, 517), the results, from some unexplained cause, are invariably almost exactly 1 per cent. (calculated as metallic antimony) too low, but are very concordant if the following conditions be observed. From 0·20 to 0·25 grm. of antimony is oxidised and dissolved by hydrochloric acid, 1 c.c. of nitric acid and successive additions of potassium chlorate, in the absence of tartaric acid. The solution is evaporated to 50 c.c., 15—20 c.c. of concentrated hydrochloric acid are added, and the whole is diluted to about 700 c.c. Three or four grms. of potassium iodide crystals are added to the cold solution, and the iodine set free is immediately titrated by standardised sodium thiosulphate solution. In the course of the investigation it was found that antimony is completely oxidised to antimonic acid by nitric acid and potassium chlorate in hydrochloric acid solution, in the absence of tartaric acid. (Compare Bŏsek, this Journal, 1895, 513.) Antimonic compounds are completely reduced to the antimonious condition by boiling with sulphur dioxide in an open or closed vessel, by sulphur dioxide and potassium bromide, and by potassium iodide in cold hydrochloric acid solution.—A. S.

Ferro- and Ferricyanic Acids; Chemical Equilibrium between ——. [Determination of Ferrocyanic Acid.] M. Prud'homme. Bull. Soc. Chim., 1903, **29**, [20], 1009—1010.

On adding a solution of chromic acid ($1CrO_3 : 200H_2O$) to one of potassium ferrocyanide acidified with sulphuric acid ($2{\cdot}11K_4FeC_6N_6 : 109H_2O : 5H_2SO_4$), a point is reached, before the ferrocyanic acid is wholly transformed into ferricyanic acid, when a drop of the solution turns guaiacum-paper blue. It is assumed that the ferricyanic acid, in producing the reaction, becomes hydrolysed into ferrocyanic acid and oxygen. As, however, the reverse reaction also occurs, chemical equilibrium will be represented by the reversible equation :—$2H_3FeC_6N_6 + H_2O \rightleftarrows 2H_4FeC_6N_6 + O$. The relative velocities of the two reactions were determined by observing the quantities of chromic acid respectively necessary, first, to oxidise a definite quantity of ferrocyanic acid to the point when the blue coloration of guaiacum-paper was produced, and, secondly, further to oxidise the acid until a drop of the solution placed upon common filter paper gives a spot which remains for a long time yellow coloured. They were thus found to be in the ratio of 10 : 1.

Ferrocyanic Acid Determination.—A drop of a solution of ferrocyanic acid placed upon ordinary, *i.e.*, incompletely washed, filter paper, gives a spot which almost instantaneously becomes blue. A solution of ferricyanic acid, on the other hand, gives a yellow spot which gradually changes to green. This difference in behaviour is utilised in estimating ferrocyanic acid, as follows :—A solution of a ferrocyanide, acidified with sulphuric acid (5 per cent.), is treated with a 5 per cent. solution of chromic acid until the guaiacum-paper test shows that the end of the reaction is near. The titration is, thereupon, continued, using common filter-paper for the indication of the end-point. As an excess of $\frac{1}{4}$ of a c.c. of the chromic acid solution is required to give, when a drop of the mixture is placed on the paper, a spot which permanently remains yellow, this quantity must be deducted from the number of c.c. added.—E. B.

Chlorides, Bromides, and Iodides; Determination of ——. S. Benedict and J. F. Snell. J. Amer. Chem. Soc., 1903, **25**, [11], 1139—1141.

The method proposed for determining chlorides, bromides, and iodides when present together, consists in first determining the total halogens (in the usual way), and then the iodine and chlorine successively, the bromine being taken by difference. For the iodine determination, a quantity of substance containing not more than 0·5 grm. of iodine or 0·15 grm. of chlorine, is dissolved in water and made up to about 50 c.c., twice as much neutral potassium iodate as is requisite to react with the whole of the bromine and iodine assumed present is then added, the mixed solution is acidified with 4—5 c.c. of 30 per cent. acetic acid and shaken up with 30—40 c.c. of carbon bisulphide until the liberated iodine is all taken up. After separating the two portions by means of a wet filter, the carbon bisulphide extract is washed with cold water on the filter, and filtrate and washings are set aside for the chlorine determination. The carbon bisulphide solution is transferred to a beaker and covered with 20—25 c.c. of 75 per cent. alcohol, the iodine being titrated by stirring with sodium thiosulphate, without a starch indicator. For the chlorine determination, the aqueous filtrate is treated with 5 c.c. of $_5$N nitric acid, and boiled in a covered beaker till colourless. The excess of iodate is destroyed by a slight excess of potassium iodide, and the solution again decolorised by boiling, a little more acid being added if necessary. The cooled liquid is neutralised with sodium carbonate, accuracy being secured by first adding calcium carbonate, followed by sodium carbonate solution until a precipitate just forms. The chlorine is determined by titration with silver nitrate in presence of potassium chromate as indicator.—C. S.

Iodine; Separation of ——, from Mixtures of Alkali Halides as Iodic Acid. Preparation of pure Iodine. H. Baubigny and P. Rivals. Comptes rend., 1903, **137**, [22], 927—929.

In the authors' method for separation of the halogens (this Journal, 1903, 1311), the bulk of the liquid to be evaporated before the chlorine and bromine can be determined is an inconvenience. The following method is less tedious and in many cases preferable :—Add to the solution of the salts 0·5 – 1·0 grm. of crystallised sodium carbonate, then add, very gradually, hot saturated solution of potassium permanganate, to permanent pink coloration, thus converting all the iodide into iodate. Add the requisite amounts of water and potassium permanganate (this Journal, 1897, 635, and 1898, 73), and when the latter is dissolved add the copper sulphate; the condenser is now attached, and solution of the copper salt promoted by agitation, caused by passing a gentle current of air. When the copper salt is dissolved heat on the water-bath and distil off the bromine. Afterwards, change the condenser, add sulphuric acid diluted with an equal volume of water, and distil off the chlorine. To the remaining liquid add silver nitrate, reduce the iodate by means of sulphurous acid, add a little nitric acid, boil, and filter off the precipitated silver iodide. If only the iodine is to be determined, or if the sum of the chlorine and bromine is sufficient, the two may be removed at once by distilling in a current of air after adding sulphuric acid and excess of permanganate. To prepare pure iodine, the chlorine and bromine present are removed as above, five-sixths of the liquid are neutralised by sodium hydroxide, heated to 100° C. for some hours with excess of normal sodium sulphite, the sulphates and sulphites precipitated by barium nitrate, and the excess of barium removed from the liquid by sulphuric acid. The remaining sixth of the liquid is treated with alcohol to reduce the permanganate, and the excess alcohol is expelled by boiling. The filtered liquid, when cold, is added to the iodide solution just prepared, when the whole of the iodine precipitates, and can be washed, dried, and sublimed.—J. T. D.

Tin, Commercial; Analysis of ——. L. and G. Campredon. Monit. Scient., 1903, **17**, 889.

Lead, Iron, Manganese, Zinc.—10 grms. of the metal are dissolved in a mixture of 10 c.c. of nitric and 80 c.c. of hydrochloric acid, the solution is neutralised with caustic soda, and an excess of sodium polysulphide added. After heating on the water-bath for two hours and then allowing to stand for 12 hours, the precipitate is filtered off, and washed with hot water containing sodium sulphide. The precipitated sulphides are dissolved in hot nitric acid, 10 c.c. of 50 per cent. sulphuric acid added, the solution evaporated till white fumes appear, the residue heated with water, cooled, and the lead sulphate filtered off, washed with cold water containing 5 per cent. of sulphuric acid, dissolved in hot ammonium acetate solution, and the lead determined as chromate. The filtrate is neutralised, 3 c.c. of hydrochloric acid added for each 100 c.c. of liquid, and any tin or copper present precipitated by hydrogen sulphide. The solution is then freed from hydrogen sulphide by boiling, cooled, and 2—3 c.c. of bromine added, followed by excess of ammonia. The precipitate is filtered off, washed with boiling water, and the iron and manganese separated in the usual manner. In the filtrate, the zinc is precipitated by sodium sulphide.

Arsenic, Antimony, Copper.—10 grms. of the metal are dissolved in a mixture of 30 c.c. of nitric and 60 c.c. of hydrochloric acid, the excess of nitric acid is expelled, the solution made faintly alkaline with caustic soda, 50 grm of oxalic acid are added, and the whole is diluted to about 750 c.c. Hydrogen sulphide is then passed for two hours through the boiling solution, the precipitate filtered off and washed with water containing hydrogen sulphide and oxalic acid. The precipitated sulphides are digested with 10 c.c. of caustic soda solution, and the copper in the insoluble copper sulphide is determined. The solution is treated with 50 c.c. of hydrochloric acid and the arsenic sulphide filtered off, washed in the usual manner, dried and weighed. The filtrate is neutralised with caustic soda, 10 grms. of oxalic acid added, and the antimony precipitated by passing hydrogen sulphide into the boiling solution.

Sulphur.—10 grms. of the tin are heated for 3—4 hours with 100 c.c. of strong hydrochloric acid, and the gas evolved is passed successively into two Durand flasks, each containing 100 c.c. of zinc acetate solution. The zinc sulphide formed is determined by titration with iodine and sodium thiosulphate solution.

Phosphorus.—1·25 grms. of the tin are dissolved in a mixture of 10 c.c. of nitric and 20 c.c. of hydrochloric acid, the solution is evaporated, the residue dissolved in 10 c.c. of hydrochloric acid, the tin precipitated as sulphide, the liquid diluted to 250 c.c. and filtered. 200 c.c. of the filtrate (= 1 grm. of tin) are heated to expel hydrogen sulphide, treated with 10 c.c. of nitric acid, evaporated to 15 c.c., neutralised with ammonia, acidified faintly with nitric acid, and the phosphoric acid determined as phosphomolybdate.

Tungsten, Stannic Oxide.—25 grms. of the tin are digested in the cold, with frequent agitation, with a solution of ferric chloride containing an equivalent of 40 grms. of iron, for 24 hours. The heavy black powder which remains undissolved is filtered off, washed with hot water faintly acidulated with hydrochloric acid until free from iron, dried, calcined and weighed. It is then fused in a platinum crucible with 1 grm. of sodium carbonate and 0·1 grm. of potassium nitrate, the mass dissolved in hot water, the solution acidified with hydrochloric acid, and evaporated to dryness. The residue is treated with 25 c.c. of hydrochloric acid, filtered, and the filter washed with hot water acidulated with hydrochloric acid. The precipitate is dissolved in ammonia, the solution evaporated to dryness, he residue ignited, and the tungstic acid weighed. In the hydrochloric acid solution, the tin is determined as sulphide. A sample of commercial tin analysed by the author contained: copper, 0·012; iron, 0·58; arsenic and antimony, traces; sulphur, 0·015; tungsten, 0·40; stannic oxide, 0·040; phosphorus, 0·010; and tin (by difference), 98·943 per cent.—A. S.

Nickel; Analysis of Commercial ——. A. Hollard.

Bull. Soc. Chim., 1903, **29**, [22], 1073—1077.

The author recommends the following method for the complete analysis of nickel:—5 grms. of the metal are dissolved in a beaker 6·5 × 18 cm., in 25 c.c. of nitric acid (1 : 1), 10 c.c. of sulphuric acid are added, and the solution is evaporated till fumes are evolved, when it is diluted, and ammonia is added in excess of 2—3 c.c. The solution is now boiled, 25 c.c. of ammonia and a few c.c. of pure hydrogen peroxide are added, and the solution is diluted to 300 c.c.; the nickel, cobalt, and copper are deposited electrolytically by a current of 1 ampère at 0° C., using platinum electrodes, the cathode being of ylindrical form, surrounding the anode, which is of wire in the form of a spiral. The liquid is filtered, and the preipitate of ferric oxide dissolved in sulphuric acid, and eprecipitated by ammonia, the solution is added to the main filtrate, and the whole is again electrolysed to remove he last traces of nickel. The solution remaining is filtered, nd the precipitate dissolved in dilute sulphuric acid; the rsenic and antimony are precipitated by sulphuretted hyrogen, and the filtrate reduced, made alkaline with ammonia, nd the iron deposited electrolytically, as before, at about 0° C.; since the deposit contains carbon, the iron must be etermined volumetrically. The solution from the electroysis is evaporated to dryness with excess of sulphuric and itric acids, dissolved in dilute hydrochloric acid, and the luminium precipitated by ammonia. Calcium is determined n this filtrate by precipitation as oxalate, and determination f the oxalic acid in the precipitate by means of peranganate. The filtrate from the calcium determination s precipitated with sodium arsenate, and the precipitate of ammonium magnesium arsenate distilled according to the method of Hollard and Bertiaux (this Journal, 1900, 563). The deposit of nickel, cobalt, and copper obtained by the first electrolysis is dissolved in dilute (1 : 1) nitric acid and the solution diluted to 300 c.c. and electrolysed hot, the copper being deposited. The solution is evaporated to a syrup, diluted and made alkaline with potassium hydroxide; the precipitate is dissolved in acetic acid, and 150—200 c.c. of a 50 per cent. solution of potassium nitrite are added, and the whole allowed to stand 12 hours. The precipitate is dissolved in a mixture of 1 part of sulphuric acid, 1 of water, and 3—4 of hydrochloric acid, evaporated till sulphurous fumes are evolved, and the cobalt deposited electrolytically, hot, as before. Carbon, sulphur, and silica are determined as usual; arsenic is determined by the Hollard and Bertiaux method, and antimony in the residue from the arsenic determination by distilling with zinc chloride and hydrochloric acid, and determining the antimony in the distillate by electrolysis.—T. F. B.

Electrolytic Separation of Metals; Influence of Gases on ——. [*Separation of Nickel from Zinc.*] Hollard and Bertiaux.

Comptes rend., 1903, **137**, [21], 853—855.

The successive deposition of metals from solution by variation of the electrode-potentials is in many cases impracticable because, in consequence of the high resistance of the bath and the low allowable excess of E.M.F. over the polarisation limit for the metal concerned, the possible current is so small. This high resistance is largely due to the evolution of hydrogen and oxygen at the electrodes, and by suppressing this evolution, many separations become possible which otherwise cannot be carried out. In the case of nickel and zinc, the process is as follows:—To the sulphates (about 0·25 grm. of nickel) add 10 grms. of ammonium sulphate, 5 grms. of magnesium sulphate, 5 c.c. of saturated solution of sulphur dioxide, and 25 c.c. excess of ammonia of sp. gr. 0·904. Make up to 300 c.c., and electrolyse at 90° C. (not below) with a current of 0·1 ampère. After four hours test a sample (1—2 c.c.) of the bath for nickel with ammonium sulphide, and continue the electrolysis for an hour after this test has shown the absence of nickel.—J. T. D.

Cerium; Separation of ——, *by means of Potassium Permanganate.* C. R. Boehm.

Zeits. angew. Chem., 1903, **16**, [47], 1129—1132.

Stolba's method of determining cerium by means of zinc oxide and permanganate gives results too high, if they be calculated from the equivalence of molecular weights of the substances; but it gives constant results, and can be safely used if the zinc oxide be thoroughly ignited in the first place, and the permanganate solution be standardised against a cerium solution of known content. It is not adapted, however, for the separation of cerium from its congeners and the preparation of pure cerium compounds, because of the difficulty of getting rid of the zinc. The author substitutes sodium hydroxide, and proceeds as follows:—In small portions of the solution the amounts of sodium hydroxide and of permanganate required to precipitate the cerium are approximately determined, and then the calculated quantities are separately dissolved, and the solutions added to the hot cerium solution. After boiling, a test sample is filtered off, the excess of permanganate, if any, destroyed by alcohol, and the colourless solution tested for cerium; if necessary, small additions of sodium hydroxide, permanganate, or both, are made to complete the precipitation. In separating cerium by Auer's method, it is difficult to precipitate the last portions; the addition of permanganate at once effects this, and cerium-free filtrates are readily obtained. Crude cerium carbonate is worked up by dissolving in slight excess of nitric acid, heating to separate silica, neutralising the filtrate with cerium carbonate, and precipitating by adding the calculated quantities of permanganate and of the crude carbonate, or, better, of permanganate and of sodium or potassium hydroxide or ammonia. The precipitate, after thorough washing, is treated with cold dilute nitric acid (10—20 per cent.), which extracts any co-precipitated oxides and but little cerium, and is then fractionally extracted with successive quantities of hot concentrated nitric acid, the purest cerium being the last fractions. All the manganese remains undissolved. To the cerium nitrate solutions ammonium nitrate is added, and the double nitrate crystallised.

—J. T. D.

ORGANIC—QUALITATIVE.

Methyl Alcohol in presence of Ethyl Alcohol; Detection of ——. L. D. Haigh. Pharm. Rev., 1903, **21**, 404. Chem.-Zeit., 1903, **27**, [93], Rep. 300.

The author has modified Prescott's test (Pharm. Arch., 1903, **4**, 86), applying it as follows:—1 c.c. of the alcohol to be tested is diluted to 10 c.c. with distilled water in a test-tube; if the sample is already dilute, a correspondingly larger quantity than 1 c.c. is taken. The test-tube is placed in a beaker of cold water, and a spiral of copper wire about 3 cm. long is heated to redness, and plunged into the dilute alcohol for a moment, after which the spiral is removed and dipped into water. This process is repeated some five or six times, in order to oxidise most of the alcohol. The contents of the test-tube are then filtered and boiled gently until the smell of acetaldehyde has vanished, or nearly so. The solution is then cooled, and transferred to a white porcelain dish, and 5 drops of alkaline phloroglucinol solution are added. If methyl alcohol had been present in the alcohol initially, a clear red colour will now appear, and will last for two or three minutes. A slight reddish coloration may be noticed, even if only ethyl alcohol had been present, but this colour would be very transient.—W. G. M.

ORGANIC—QUANTITATIVE.

Malt; Determination of Soluble and Coagulable Nitrogenous Compounds in ——. Th. Dinklage. Zeits. ges. Brau., 1903, **26**, [36], 585—587.

The following modification of Laszezynski's cold extraction method is recommended:—The malt is crushed fine, and extracted with cold water, for two hours, at room temperature, risk of autodigestion in the extract being thus reduced to a minimum. The solution is afterwards filtered, and the soluble nitrogenous compounds are determined in the clear filtrate. Another portion of this latter is boiled for some time, and the percentage of coagulable nitrogenous compounds is determined. This method is considered to harmonise better with brewing practice than does boiling the extract under pressure; though there is possibly some connection between the nitrogenous bodies that coagulate at temperatures above 212° F. and the sediments thrown down by pasteurised beer. The largest proportions of both soluble and coagulable albumin are furnished by malts of the Pilsen type (mean value, 31·8 and 24·5 per cent.), Vienna malts being second (29·5 and 25 per cent.), with Munich malts third (26·9 and 21·4 per cent.). The similar method of curing the first two is held accountable for their comparable quality, the finishing-off temperature being apparently the determining factor. A number of Munich malts with defective break gave much lower figures than those cited, the mean being 26·6 and 20·2 per cent. respectively. Referred to dry matter, the coagulable soluble nitrogen in a number of normal dark malts averaged 0·103 per cent., whereas the abnormal samples gave only 0·091 per cent.

—C. S.

Starch Liquefying Power of Malt and other Diastatic Products; Determination of the ——. A. Pollak. Woch. f. Brau., 1903, **20**, [19], 595—596. (See also this Journal, 1903, 826.)

For many technical purposes a deficient saccharifying power may be compensated by a high liquefying power. The author defines the liquefying power as the number of parts of starch which are fully liquefied by one part of the diastatic material in 30 minutes at 37·6° C. The determination is made with a 3 per cent. paste prepared from arrowroot, allowance being made for the moisture and ash. The malt or other substance is made up in the form of a 0·2 per cent. solution or extract. 10 c.c. of the starch paste are measured out into each of a series of test-tubes, correction having been made for the quantity of paste which adheres to the sides of the pipette under standard conditions. The test-tubes are then heated on the water-bath at 40° C., and the diastatic solution is added to each of the tubes in increasing quantities. Each tube is thoroughly shaken, and the whole series is heated at a temperature of 37·6° C. on the water-bath for 30 minutes. The tubes are then treated each with a certain number of drops of strong caustic potash solution. In those tubes in which unliquefied starch is still present, the drops of alkali will fall to the bottom, retaining their rounded form; but in those tubes in which the starch is fully liquefied, the drops of alkali will be dispersed in their fall. A still sharper test is obtained by adding a drop of phenolphthalein to each tube, and slowly inverting it once and back again whilst closed by the finger. In the presence of starch paste the red coloration is developed in uneven patches, whereas if the starch be fully liquefied, the coloration takes place uniformly at once. In order to determine the quantity of diastatic solution which should form the mean of the series chosen, a preliminary experiment should be made by causing one part of the diastatic material in the form of a 2 per cent. solution, as used for the determination of diastatic power, to act upon 7·5 times its weight of starch in the form of a 3 per cent. paste at 37·6° C., until a thermometer placed in the flask becomes distinctly visible; the time required for this reaction to take place is then noted. On the assumption that the quantity of starch liquefied is roughly proportional to the time required, the volume of 0·2 per cent. diastatic solution which will liquefy 10 c.c. of starch paste in 30 minutes can be calculated and used for the middle member of the series of test-tubes, the other members receiving more and less respectively. Determinations have shown that there is no relation between the starch liquefying and the saccharifying powers of malt; when the latter is deficient the former may frequently be high. The starch liquefying power shows itself to be more resistant to adverse influences than the saccharifying power.—J. F. B.

Cocaine; Assay of Crude ——. W. Garsed. Pharm. J., 1903, **71**, 784—791.

The author's work was divided into the following sections:—(1) Alkaloids of crude cocaine, *viz.*, cocaine, cinnamyl-cocaine, truxilline, and tropacocaine: (*a*) Behaviour towards reagents in aqueous solution; (*b*) Solubility in organic liquids; (*c*) Oxidation experiments with potassium permanganate. (2) Hydrolytic acid products of the four coca alkaloids, *viz.*, benzoic, cinnamic, and truxillic acids: (*a*) Oxidation experiments with potassium permanganate; (*b*) Experiments on the absorption of bromine; (*c*) Steam distillation experiments; (*d*) Solubility experiments; (*e*) Assay of mixtures of the acids; (*f*) Hydrolysis of the alkaloids; (*g*) Assay of crude cocaine. Two methods, based upon the experimental results obtained, have been devised for the assay of crude cocaine, of which the following is the one preferred, although the results for cinnamyl-cocaine are probably too high. The crude alkaloid is dissolved in sulphuric acid, and oxidised by potassium permanganate solution. Excess of ammonia is then added, and, without filtering, the unoxidised alkaloids are extracted with ether. The ethereal solution is evaporated, and the residue weighed, the loss of weight giving the amount of cinnamyl-cocaine. The residue is then dissolved in excess of N/10 alcoholic potash solution, an equal volume of water added, and the solution heated gently on the water-bath for half an hour in a small flask fitted with a cork and condensing tube. The alcohol is next expelled by evaporating the solution to a very small bulk, the residue diluted with water to about 10 c.c., and washed with 10 c.c. of ether. A slight excess of standard acid is then added, and the benzoic acid (from cocaine) and truxillic acid (from truxilline) are separated by taking advantage of the insolubility of the latter in water. The amount of each acid is determined by titration with N/10 alcoholic potash solution, and from the weights obtained the quantities of cocaine and truxilline are calculated. By this method the following results were obtained with specimens of crude cocaine from Truxillo and Java coca leaves :—

——	Alkaloids from Truxillo Coca.		Alkaloids from Java Coca.	
Crude alkaloid taken..........	0·1540 grm.		0·2010 grm.	
	Grm.	Per cent.	Grm.	Per cent.
Truxilline..........................	0·0280	18·2	0·0164	8·1
Cinnamyl-cocaine..............	0·0356	23·1	0·1024	51·0
Cocaine..............................	0·0800	52·0	0·0740	37·0
Total	0·1436	93·3	0·1928	96·1

—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Argon; New Method of Preparing ——. H. Moissan and A. Rigaut. Comptes rend., 1903, **137**, [20], 773–777. (See also Ramsay and Travers, Proc. Roy. Soc., 1899, **64**, 113—192.)

In this method the property, possessed by metallic calcium, of combining with nitrogen and with hydrogen to form compounds not dissociated at a red heat, is utilised. The operations are as follows :—1. Atmospheric air is deprived of its oxygen by passage over red-hot copper. 2. The nitrogen so obtained is passed again over red-hot copper, then over sulphuric acid pumice and solid potassium hydroxide, finally over a red-hot mixture of quicklime and metallic magnesium. After the traces of hydrogen evolved by these last materials have escaped, the gas is collected in a rubber gas-bag (collection over water is too wasteful, owing to the solubility of argon). From 100 litres of nitrogen are obtained about 10 litres of gas containing 10 per cent. of argon. 3. The gas from the bag is passed slowly over red-hot quicklime and magnesium, then over red-hot copper oxide, through sulphuric acid and potassium hydroxide tubes, and finally into a glass reservoir over mercury. This operation is carried out with the aid of a mercury pump, which first exhausts the whole apparatus, then aspirates the gas over, and transfers it to the collecting reservoir. The volume is now reduced to about 1,100 c.c., and the gas is argon containing 5—10 per cent. of nitrogen. 4. This gas is now slowly passed through two red-hot tubes, the first containing quicklime and magnesium, the second three or four nickel boats filled with metallic calcium. The exhaustion of the apparatus, and the collection of the residual gas (in vessels previously rinsed out with argon) are carried out as in operation 3. The gas is spectroscopically pure argon. The apparatus requires a good deal of space, and is very laborious to set up; but, once it is installed, two operators can produce about a litre of argon per 12 hours.—J. T. D.

Manganese as a Metallic Ferment; Stimulating or Paralysing Influences on ——. A. Trillat. Comptes rend., 1903, **137**, [22], 922—924.

The action of manganese salts (chloride, sulphate, acetate) in small quantity in effecting the oxidation of solutions of gallic acid and similar substances was studied, the solutions being so weak as to imitate physiological media, in the transformations of which manganese compounds have been shown to play a part. Manganese salts in neutral or faintly acid solution produced but slight effect, but were much more active in presence of alkali (corrections were made for the effect produced by alkali alone). Within limits, the acceleration of the oxidation is proportional to the amounts of alkali added; when the amount of alkali is constant, increase of manganese salt has at first an accelerating influence, but beyond a certain amount has a retarding or paralysing effect. In presence of traces of alkali, even infinitesimal amounts of manganese salt have a sensible oxidising action. As with diastatic actions, the progress of the oxidation may be stopped or retarded by the presence of certain substances in quantity too minute for the effect to be ascribed to their direct chemical action.

—J. T. D.

Bismuth Sulphide with Silver Sulphide and with Antimony Sulphide; Melting Points of Mixtures of ——. H. Pélabon. Comptes rend., 1903, **137**, [22], 920—922.

Bismuth Sulphide and Silver Sulphide.—The m. pt. curve is a series of straight lines, joining the following points :—

Silver Sulphide.	Melting Point.	Peculiarity.
Per Cent.	C.	
0·0	685	M. pt. of BiS.
6·5	648	Minimum.
20·5	750	Maximum.
34·0	732	Sudden increase in downward gradient.
72·0	585	Minimum.
100·0	845	M. pt. of Ag_2S.

The minima are the m. pts. of two eutectic mixtures; the maximum corresponds to $Ag_2S.4\,BiS$, and the point of change of slope to $Ag_2S.2\,BiS$.

Bismuth Sulphide and Antimony Sulphide.—In this curve there are no maxima nor minima; only two points of change of slope :—

Antimony Sulphide.	Melting Point.	Peculiarity.
Per Cent.	C.	
0·0	685	M. pt. of BiS.
31·7	632	Increase in downward gradient.
84·8	591	Decrease in downward gradient.
100·0	555	M. pt. of Sb_2S_3.

The two points of change of slope correspond to the mixtures or compounds, $3BiS.Sb_2S_3$ and $BiS.4Sb_2S_3$.

—J. T. D.

Acid Salts of Monobasic Acids. R. C. Farmer. Proc. Chem. Soc., 1903, **19**, [272], 274.

The substituted benzoic acids have the general property of forming salts containing 1 mol. of the free acid to 1 mol. of neutral salt. The potassium and ammonium salts were taken as typical, and the acid salts of benzoic acid and its methyl, hydroxy-, bromo-, and nitro-derivatives were examined. These substances form well-defined, crystalline compounds, which do not undergo any change at the melting points of the free acids; they are not affected by inert solvents, but are at once decomposed by water. Experiments on the ratio of distribution of the acids between benzene and aqueous solutions of their normal salts showed that these acid salts do not exist to any appreciable extent in aqueous solution. In alcohol, on the other hand, the dissociation is only partial, as was shown by molecular weight determinations at the boiling point.

Flowing Crystals. R. Schenck and E. Eichwald. Ber., 1903, **36**, [15], 3873—3877.

The authors and Lehmann have previously described as "liquid crystals" the peculiar, turbid, doubly-refracting melts obtained from *p*-azoxyanisol. Rotarski contends (Ber., 1903, **36**, 3158) that the melts thus described are emulsions of *p*-azoxy- and *p*-azoanisol, and that "liquid crystals" do not exist. The authors now show that *p*-azoxyanisol may be entirely freed from *p*-azo-anisol by means of concentrated hydrochloric acid, and that the purified *p*-azoxyanisol so obtained still shows the same phenomena on fusion.—E. F.

Carbohydrates; Action of Hydrogen Peroxide on ——, in the presence of Ferrous Sulphate. R. S. Morrell and J. M. Crofts. J. Chem. Soc., 1903, **83**, 1284—1292.

The authors have previously shown (J. Chem. Soc., 1899, **75**, 786; 1900, **77**, 1220; this Journal, 1902, 506) that by the action of hydrogen peroxide, in the presence of ferrous sulphate, on glucose, *d*-fructose, mannose, arabinose, rhamnose, and several other sugars, osones are formed,

and these were identified by the osazones formed by the action on them of phenylhydrazine, and, in the case of arabinose, of phenylmethylhydrazine. They have now tried the action of other substituted hydrazines on the osones, and have succeeded in isolating *p*-bromophenyl arabinosazone, melting at 171° C. with decomposition, *p*-bromophenyl-rhamnosazone, melting at 215° C. with decomposition, and rhamnose-*p*-bromophenylhydrazone, melting at 167° C. with decomposition. By the action of phenylbenzylhydrazine on rhamnose, no osazone nor hydrazone was produced, but probably a ketohydrazide. Besides the osones produced by the action of hydrogen peroxide on the sugars, various acids are formed. The acids produced from glucose and *d*-fructose are identical, and consist of glycollic, glyoxylic, oxalic, and trihydroxybutyric acids.
—A. S.

Invertase; Occurrence of ——, in Plants. J. H. Kastle and M. E. Clark. Amer. Chem. J., 1903, **30**, [5], 422—427.

Various plant tissues were cut up, dried at 40° C., and then powdered; suitable portions of the powdered tissues were weighed out and placed in bottles with 50 c.c. of water, and 0·5 c.c. of toluene as an antiseptic. These mixtures were used as controls for comparison with similar mixtures containing respectively 0·5 grm. of cane sugar and 0·5 grm. of starch in the form of paste. After digestion for 24 hours at 38°—40° C., the tests were boiled with Fehling's solution, and from the extent of the reduction the relative quantities of invertase and diastase in the plant tissues were roughly judged. Nineteen different species of plants, representing 14 families, were thus tested, and the results showed that the enzyme invertase is of general, if not universal, occurrence in plant tissues; it is even more frequently present than diastase. The following plants were all found to contain invertase in greater or smaller proportions in all the organs which were tested :—White and red radish, carrot, Jerusalem artichoke, potato, *Dahlia variabilis*, dandelion, onion, *spirogyra*, sugar-sorghum, sugar-beet, maize, wormwood (annual), pine leaves, unripe grapes, hemp, soy bean, broom rape, sweet potato, and *Robinia pseudacacia*; many of the organs of these plants contained little or no diastase. Invertase occurs abundantly in the leaves of plants, and the failure of some experimenters to detect the presence of this enzyme and that of diastase in certain foliage leaves is attributable to the fact that they attempted to prepare filtered aqueous extracts of the ferments, which in many cases is impossible. Invertase is not confined to those plants which store up cane sugar as their main reserve material, but it occurs even in those plant organs which are actively engaged in storing up starch or inulin; *e.g.*, the growing tubers of the potato and artichoke and the unripe grain of maize. It might have been expected that these young organs would contain a preponderating proportion of diastase or "inulase," but although those ferments are indeed present, the macerated organs act far more powerfully on cane sugar than they do on starch. The connection of the enzymes with the growing portion of the plant is illustrated in the case of the onion, the old bulbs of which contained neither invertase nor diastase, whilst in the sprouts from these old bulbs both enzymes were found in considerable quantities. The fact of the general occurrence of cane sugar and the enzyme invertase suggests that this sugar is one of the primary stages of plant synthesis, and that the products of its inversion play a necessary part in the metabolism, the different aldose and ketose types of these products determining, probably, their different functions.—J. F. B.

Diastase, at once Reducing and Oxidising; Existence in the Animal Organism, of a ——. J. E. Abelous and J. Aloy. Comptes rend., 1903, **137**, [21], 885—887.

The authors have found that certain oxidations in the animal organism proceed equally well or better in the absence of atmospheric air than when it is present, so that the oxygen they require is obtained from the substance of the organism itself. Their experiments lead them to the conclusion that the reducing diastase discovered by Abelous and Gérard (this Journal, 1899, 871) also produces these oxidations; it is through this diastase, no doubt, that elementary respiratory changes are effected.—J. T. D.

Arsenic, Crystalline and Amorphous; Action of Water and Dilute Caustic Soda Solutions on ——. W. T. Cooke. Proc. Chem. Soc., 1903, **19**, [271], 243 and 245.

Engel (Comptes rend., 1883, **96**, 1314) states that amorphous arsenic is unaltered in moist air, whilst the crystalline modification oxidises rapidly. The author's experiments were made with the view of ascertaining: (1) whether water alone had any action on either variety; (2) whether the action, if any, was increased by the presence of caustic soda; (3) and whether, in the presence of air, the crystalline variety dissolved to a greater extent in caustic soda solution than in water. The author's results seem to show that water, either alone or in the presence of caustic soda, has practically no action on arsenic. In the presence of air, however, direct oxidation takes place. If water be concerned in the oxidation, the formation of hydrogen arsenide might be anticipated: $2As + 3H_2O = As_2O_3 + 6H$; $2As + 6H = 2AsH_3$; but this gas was never found in the author's experiments. Th. Panzer (Chem. Centr., 1903, **2**, 821) has also shown that the oxidation of arsenic in moist air is due, not to the decomposition of water, but to the intervention of free oxygen.

Prizes.

VARNISHES; PREMIUMS FOR IMPROVED METHODS IN MANUFACTURING ——.

U.S. Cons. Rep., No. 1807, *Nov.* 21, 1903.

At the third general meeting of the Association of German Varnish Manufacturers, recently held at Berlin, the board of directors was empowered to offer premiums or prizes of several thousand marks for methods of manufacturing varnishes which involve noteworthy improvements. As an important subject for consideration, a method for the deodorisation of oil of turpentine is mentioned. The jury for awarding prizes consists of the board of directors and four other members. Communications are to be addressed to Mr. Louis Mann, Handelsrichter, Berlin, W., Meinecke Strasse 4.

New Book.

Final Report of the Royal Commission appointed to inquire into Arsenical Poisoning from the Consumption of Beer and other Articles of Food and Drink. Part I. Final Report. [Presented to both Houses of Parliament by Command of His Majesty.] Eyre and Spottiswoode, East Harding Street, Fleet Street, London, E.C., and 32, Abingdon Street, Westminster, S.W., Oliver and Boyd, Edinburgh, or E. Ponsonby, 116, Grafton Street, Dublin, 1903. Price 5½*d*.

This report is arranged under the following heads:—I. Further Observations regarding the Epidemic of Arsenical Poisoning in 1900, and as to the Medical and Public Health aspects of the Evidence received regarding Arsenic in Beer and Food. II. The suggested relation between the disease "Beri-beri" and Arsenical Poisoning. III. Tests for Arsenic in Foods and Substances used in the preparation and manufacture of Food. IV. Ways in which Foods are liable to become contaminated by Arsenic. V. Precautions which should be taken by Manufacturers to exclude Arsenic from Foods. VI. Present means of official control over Purity of Food, in relation to Arsenic. VII. Recommendations as to improvements in official control over the Purity of Food. VIII. Recommendations as to the proportions of Arsenic in Food which should now be held to constitute an offence under the Sale of Food and Drugs Acts.

Trade Report.

I.—GENERAL.

French Congo; Trade of ——.

Bd. of Trade J., Dec. 3, 1903.

Imports of Principal Articles.

——	1901.	1902.
	Frs.	Frs.
Metal manufactures	1,286,000	788,000
Alcohol	365,000	385,000
Chemicals, &c.	89,000	115,000

Exports of Principal Articles.

——	1901.	1902.
	Kilos.	Kilos.
Palm nuts	611,000	728,000
Caoutchouc	655,000	689,000
Palm oil	116,000	170,000
Copal, white	13,000	30,000

Japan; Production of Certain Goods in ——.

Financial and Economic Annual of Japan.
Bd. of Trade J., Dec. 3, 1903.

——		1899.	1900.	1901.
Porcelain and earthenware	yen	5,867,832	6,873,693	6,935,176
Lacquered ware	„	5,640,228	6,284,318	5,768,099
"Saké"	koku	3,989,478	4,615,068	4,041,139
Beer	„	87,256	120,371	91,046
Soy	„	1,838,566	1,572,351	1,722,708
Sugar	kwan	1,114,677	918,229	1,376,848
Matches	yen	5,871,506	5,886,388	9,266,689
Paper (Japanese)	„	11,992,950	13,985,137	12,650,647

Note.—Yen = 2*s.* 0½*d*; Kwan = 8·267 lb. avoirdupois; Koku = 39·7 galls.

Patents Act in Australia.

The Parliament of Federated Australia has passed a Patent Act to cover the six States forming the Commonwealth—namely, New South Wales, Victoria, Queensland, South Australia, West Australia, and Tasmania. New Zealand is excepted. The principal provisions are: Patents to be granted for 14 years to cover the six States; examination as to novelty to be made to a limited extent; actual working of the invention within the Commonwealth is not necessary; compulsory licences may be granted after two years to any person proving that the reasonable requirements of the public have not been satisfied; applications for patents may be filed by the inventor or his assignee, by the representative of a deceased inventor or assignee, or by a communicatee; additional patents are provided for at half-fees; a patent is valid as to all good claims, notwithstanding that it may contain one or more invalid claims; power is given to apply the provisions of the International Convention, period of priority to be 12 months, to accord with the additional Act of Brussels; existing State or Colonial patents may be converted into Commonwealth privileges for the unexpired period, but if the invention is not novel, has been published, or has been made the subject of a pending application in any State other than the State in which the existing patent was granted, then any such State may be excepted. The cost of a patent under the new Act to cover the six States will be about one-sixth of the cost of taking out patents at the present time to cover the same area. There is, however, a fee of 5*l.* payable before the actual issue of the patent, and a renewal fee of 5*l.* before the expiration of the seventh year.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Mineral Oil Industry of Germany.

Bd. of Trade J., Dec. 3, 1903.

The localities where mineral oil was found as long ago as the twelfth century, and where the same wells mostly still exist, are situated on an "oil line" extending from Verden to Brunswick, the most noteworthy places being Wietze, Steinförde, Oberg, Oelsburg, Oelheim, and others. At Wietze oil is found at a depth of between 130 to 196 feet, and in other localities at a somewhat greater depth. In Galicia a second "oil horizon" is often found at a depth of 656 to 984 feet; and still deeper borings, viz., to 1,960, and even to 2,850 feet, have been made there, and have struck very productive oil beds. Experts are stated to be of the opinion that, in Galicia, the deeper the borings the better the oil. It is stated that there are many distinct signs pointing to the widespread presence of oil in the province of Hanover. Up to the present the total production has reached only about five to six thousand tons per annum, but a very considerable increase in the yield is expected. The quality of the mineral oil found at Wietze differs according to the different boreholes and also according to the depth at which the oil is found. The oil is of two kinds, viz., either of a heavy or of a lighter sort. The latter is at present found at the greatest depths. The heavy oil is of a brownish-black colour and quite thick, and looks more like tar than petroleum; it contains 0·5 per cent. of benzine, 10 per cent. of burning oil, about 60 per cent. of lubricating oil, and 20 per cent. of tar. The lighter oil contains about 4 per cent. of benzine, 25 to 30 per cent. of burning oil, 45 per cent. vaseline oils, and 10 per cent. of tar. A large refinery is being erected at Linden, near Hanover, for distilling the mineral oils produced chiefly at Wietze. It may be observed that almost the entire quantity of lubricating oil required by the German railway companies is supplied by the Wietze oil wells.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

Dyed Goods containing Arsenic Prohibited in Sweden.

U.S. Cons. Reps., Dec. 3, 1903.

Efforts are being made in Germany to induce the Swedish Government to repeal or modify the regulations prohibiting the importation of goods coloured or dyed with preparations containing arsenic. It is requested also that a central inspection bureau be established in Sweden, with experts to investigate the presence of arsenic in goods entering Sweden. The law partially affects the importation of wall papers, carpets, dry goods, and textiles. While it is admitted that aniline dyes, ochre colours, and manganese oxide may contain traces of arsenic, yet there is no cause for fearing injurious effects therefrom.

VII.—ACIDS, ALKALIS, Etc.

Borax Production.

Chem. Trade J., Dec. 5, 1903.

The United States Geological Survey states that the production of borax in the States continues to be derived mainly from the colemanite deposits of California, although a small quantity is produced from the marsh deposits of California, Nevada, and Oregon. It has not been practicable to separate the total output of borax salts during 1902 into the crude and refined product; the reported returns, however, gave an aggregate production of refined borax and boric acid amounting to 17,202 short tons, valued at 2,434,994 dols., of which 862 short tons, valued at 155,000 dols., were stated to be boric acid. The production during 1901 was 17,887 short tons of crude borax, valued at 314,811 dols., and 5,341 short tons of refined borax, valued at 697,307 dols., a total value of 1,012,118 dols. The statistics of the production of borax in California, whence practically the entire output had been derived, for the past ten years are given in the following table :—

Year.	Quantity.	Value.
	Short Tons.	Dols.
1893	3,955	593,292
1894	5,770	807,807
1895	5,959	595,900
1896	6,754	675,400
1897	8,000	1,080,000
1898	8,300	1,153,000
1899	20,357	1,139,882
1900	25,837	1,013,251
1901	22,231	894,505
1902	16,304	2,279,994

VIII.—GLASS, POTTERY, AND ENAMELS.

LEAD GLAZE ; USE OF ——. FINAL AWARD.

Times, Dec. 8, 1903.

Lord James of Hereford has just signed his final award as umpire in the arbitration on the use of lead glaze in the making of pottery. The question was raised by the issue from the Home Office of special rules "for the manufacture and decoration of earthenware and china," and Lord James made a first award upon these on Dec. 30, 1901. His final award, dated Nov. 28 last, establishes a new rule 2, under which it is generally provided that after Feb. 1, 1904, no glaze shall be used which yields to a dilute solution of hydrochloric acid more than 5 per cent. of its dry weight of a soluble lead compound calculated as lead monoxide when determined in a manner prescribed by the rule. The use of a glaze "which does not conform to the above-mentioned conditions" is, however, to be permitted after due notice to the inspector for the district, subject to the adoption by the manufacturer of a new schedule of compensation to employés who may be suspended on being certified as suffering from plumbism (or lead poisoning) and subject also to periodical examination of the employés by the certifying surgeon. China scouring is excluded from the processes dealt with by these regulations. The prescribed method of testing the glaze is as follows :—" A weighed quantity of dried material is to be continuously shaken for one hour at the common temperature, with 1,000 times its weight of an aqueous solution of hydrochloric acid containing 0·25 per cent. of HCl. This solution is thereafter to be allowed to stand for one hour and to be passed through a filter. The lead salt contained in an aliquot portion of the clear filtrate is then to be precipitated as lead sulphide, and weighed as lead sulphate."

X.—METALLURGY.

COBALT MINING IN NEW CALEDONIA.

G. M. Colvocoresses. Eng. and Mining J., Nov. 28, 1903.

Very little has been written concerning the cobalt industry of the island, which, at the present moment, has attained a very considerable importance. The first claim was taken up in 1876, and shortly afterwards other claims were granted. The first official export figures are for 1888, when 2,595 metric tons of ore were shipped. Export figures for the ensuing years are as follows :—

Year.	Metric Tons.	Year.	Metric Tons.
1889	2,185	1896	5,204
1890	3,740	1897	4,570
1891	1,348	1898	2,373
1892	1,927	1899	3,287
1893	520	1900	2,437
1894	4,156	1901	3,123
1895	5,302	1902	7,512

These figures show the unstable condition which has always prevailed in the market. The quantity of cobalt ore produced and exported depends upon changes in the market price, since mines shut down at every fall in value reopen again as soon as the price goes up. From 1880 to 1884 attempts to smelt the ore here were made by the Société Le Nickel, of Paris, and later by the Maletra Company. A small quantity of matte carrying about 20 per cent. of cobalt was made, and also some that carried 35 per cent. of nickel and 10 per cent. of cobalt. But the smelting did not prove profitable, and only a few hundred tons of matte were ever sent away.

Formation and Nature of Ore.—The cobalt, like the nickel and chrome, is found in the serpentine formation. The cobalt deposits show no partiality to any particular locality, since they occur in all parts of the island, and even on the now detached Isle of Pines, off the south end, and the Isle Bélep, off the north. Asbolane is the name given to this cobalt ore, and it is a compound of manganese oxide with various protoxides, and containing from 2 to 9 per cent. of protoxide of cobalt (CoO). Two complete analyses of this ore are given, the first made by H. Capaux and the second by Thomas Moore, of Nouméa :—

I.		II.	
	Per Cent.		Per Cent.
H_2O	15·8	H_2O	9·05
MnO	38·2	MnO	55·55
CoO	7·9	CoO	8·45
NiO	3·6	NiO	2·66
Fe_2O_3	3·5	Fe_2O_3	3·88
Al_2O_3	18·8	Al	8·80
Alkali and alkaline earths	1·2	Mg	1·76
Active O	9·4	Ca	Traces
SiO_2 and chromito	0·5	Active O	7·85
		Insoluble, containing chromite	2·06
Total	98·9	Total	100·06

In some samples traces of zinc and of lithium are found.

LEUCITE IN ITALY.

Eng. and Mining J., Nov. 28, 1903.

An ore which could be utilised for the production of aluminium is leucite—anhydrous silicate of alumina and potash. It is characteristic of the volcanic region near Rome, and is found generally throughout the tufa or puzzolana in varying proportions, and either amorphous or crystalline. In 1901 permission was sought to work a bed of volcanic conglomerate which had been cut into in making the railway up to Frascati, and crops out a little distance from the town with a face 26 to 33 ft. high ; the overlying burden is about 3½ ft. of fine ash, covered with tillable soil. An analysis showed 55 per cent. of silica, 23·5 per cent. of alumina, and 21·5 per cent. of potash, all three of which could be utilised profitably and without waste. At present, however, the desired permission has been refused on legal and other grounds.

MINERAL PRODUCTION OF JAPAN.

Financial and Economical Annual of Japan ; Bd. of Trade J., Dec. 3, 1903

——		1899.	1900.	1901.
Gold	Momme	446,716	566,535	660,653
Silver	"	14,978,060	15,081,595	14,598,749
Copper	Kin	40,459,709	42,182,353	45,652,927
Iron	Kwan	6,151,033	6,624,147	18,680,043
Antimony	Kin	1,568,462	716,477	911,162
Manganese	"	18,893,440	26,384,526	27,115,884
Coal	Tons	6,721,798	7,429,457	8,945,939
Petroleum	Koku	474,406	767,092	983,799
Sulphur	Kin	17,062,186	24,064,196	27,580,478

Kwan = 1,000 momme = 8·267 lb. avoirdupois. Kin = 1·32 lb. avoirdupois. Koku = 39·7 galls.

MINERALS IN ONTARIO, CANADA.

Monetary Times, Toronto ; Bd. of Trade J., Dec. 3, 1903.

The Ontario Government has, by an Order in Council dated November 11, withdrawn from sale, lease, or exploration a belt of land 10 miles wide on each side of the Temiskaming and Northern Ontario Railway, extending from the north boundary of the township of Widdifield to the town of New Liskeard, the present terminus, as important discoveries of the ores of nickel, cobalt, silver, and arsenic have recently been made in that region. Some of the ores seem to be different from those previously discovered in any quantity. For example, the kupfer-nickel, which contains about 44 per cent. of nickel, and which hitherto has been found only in the form of a few small specimens, seems to exist, judging from surface indications, in commercial quantities.

Mineral Resources of Indo-China.

Eng. and Mining J., Dec. 5, 1903.

A recent report, prepared under the direction of the local government of Indo-China, gives some interesting information regarding the status of the mining industry in that colony. In Tonkin the most valuable resources under exploitation are the coal mines at Quang-Yen, where a French company is operating with much success. The output of this company in 1902 was about 317,000 tons of coal. There is a smaller mine in the same locality operated by Chinese, and two small mines in the province of Haiduong. In addition to coal, there are two iron mines in Thai-Nguyen and Phu-Lien, and an antimony mine at Quang-Yen. Permits have been granted recently for the exploitation of other minerals, including gold, silver, lead, copper, and zinc, but as yet none of the undertakings have reached the productive stage. In Annam the coal mines of Nong-Son employ about 700 coolies, and turn out about 100 tons a day. At the gold mines at Bong-Miu a cyanide plant has recently been installed, and it is expected that operations will be carried on steadily in the future. The concentrates from the ore are said to yield about 70 grms. of gold and 44 grms. of silver per ton. In Laos a French company is exploring tin mines at Pakhin-Boun, and has met with such success that it is preparing to add to its plant, the intention being to smelt and refine the tin at the mine.

Mineral Products; United States Census Reports of ——.

Eng. and Mining J., Dec. 5, 1903.

The Bureau of the Census at Washington publishes the following statistics, covering the production and value of some of the minor minerals in the United States in 1902:—Corundum and emery, 4,251 short tons, 104,605 dols.; garnet, 3,926 short tons, 132,820 dols.; infusorial earth, tripoli, and pumice, 6,240 short tons, 54,558 dols.; marl, 12,439 short tons, 12,741 dols.; buhrstones and millstones, 59,808 dols.; crystalline quartz, 43,085 dols.; grindstones and pulpstones, 667,431 dols.; oilstones and whetstones, 113,968 dols.; asbestos, 2,505 short tons, 46,200 dols.; barytes, 58,269 short tons, 193,884 dols.; bauxite, 29,222 long tons, 128,206 dols.; borax, 43,010 short tons, 2,383,614 dols.; sulphur and pyrites, 207,874 long tons, 947,089 dols. in value.

XIII. C.—INDIA-RUBBER, Etc.

Caoutchouc in Ceylon.

Deutsche Kolonialzeit., Sept. 24, 1903; U.S. Cons. Rep., No. 1805, Nov. 9, 1903.

The area planted with Para rubber in Ceylon is estimated at 3,000 acres. The best results have been secured in the South Kaltum district, which is about 100 feet above sea level and has an average rainfall of over 98·5 inches. The soil is mostly a sandy loam. Para rubber thrives also at an altitude of 3,000 feet, and will endure a variation of rainfall of from 70·9 to 147·6 inches. Each tree produces about a pound, worth about 95 cents. The quality of the rubber is often impaired by the use of such acid liquids as lemon juice to hasten the extraction of the juices from the trees.

XVI.—SUGAR, STARCH, Etc.

French Sugar Harvest in 1902–03.

U.S. Cons. Rep., No. 1813, Nov. 30, 1903.

The official statistics of the French sugar crop of 1902–03 have just appeared. The number of factories in operation was 319, 13 less than the year before, when only two factories in the whole of France were idle. The beets sold amounted to 6,266,946 tons, or nearly 33 per cent. less than the previous year. This was the result of the sugar crisis, which compelled manufacturers to offer low prices. The acreage planted decreased nearly 44,000 acres. The average capacity of all the factories was about 320 tons each per day of 24 hours, as against 329 tons in 1901–02 and 298 tons in 1900–01. This average capacity is considerably less than that of German and Austrian factories. The average density of the roots was 8·0, with variations to 8·3 in the department of Oise, and 7·8 in the departments of Nord, Pas-de-Calais, and Somme. The amount of sugar produced in 1902–03 was 735,708 tons, as against 992,579 tons in 1901–02. The yield of the roots, in refined sugar, in 1902–03 was greater than has ever been known in France, being 12·38 per cent. The previous year it was 11·24 per cent.

XVII.—BREWING, WINES, SPIRITS, Etc.

Spirit, &c., Exposition at Vienna; International ——.

U.S. Cons. Rep., Oct. 1903.

The exposition, which will be open from April 16 to May 31, 1904, is to illustrate (1) the present condition of the alcohol industry, with particular reference to the use of alcohol for technical purposes, and (2) other industries connected with products of fermentation, namely, (*a*) breweries, (*b*) distilleries, (*c*) malt-houses, (*d*) starch works, (*e*) production of fermented vinegar. The following groups of articles are to be made special objects:—Machines and apparatus for malt-houses, breweries, and distilleries, and also for the manufacture of yeast, starch, and vinegar, products of fermentation, such as beer, spirits, non-alcoholic liquors, yeast, starch, fermented vinegar, &c. Machines and apparatus for the utilisation of alcohol for technical purposes. Utilisation of denatured alcohol. Products manufactured partly with alcohol, such as varnish, perfumery, drugs, transparent soaps, &c. Laboratory and scientific apparatus for industries connected with products of fermentation; also apparatus for measuring and controlling. Industrial products used in the foregoing processes. The time for entering exhibits ended Sept. 30, 1903, but it is probable that an extension will be granted on application. The address of the committee in charge of the exposition is Niederösterreichischer Gewerbeverein I, Eschenbachgasse No. 11, Vienna, Austria.

Spirit Duty for Perfumes.

Pharm. J., Dec. 12, 1903.

In reply to the Manchester Chamber of Commerce, the Chancellor of the Exchequer has written, stating that the provisions of the Finance Act of 1902 did not apply to perfume manufacturers who used such large quantities of spirit, and that when perfumes were exported drawbacks were given equal to the duty, while for home consumption not only home manufacturers, but foreign also, had to pay duty. He did not think it would be practicable to abolish the preferential duty on spirit used in manufactures.

XVIII. A.—FOODS.

The Butter Regulations Committee.

Times, Dec. 8, 1903.

The final report of the departmental committee appointed by the Board of Agriculture and the Department of Agriculture and other Industries and Technical Instruction for Ireland "to inquire and report upon the desirability of regulations, under Section 4 of the Sale of Food and Drugs Act, 1899, for butter" has just been issued as a Parliamentary paper of 28 pages [Cd. 1749]. A copy of the minute appointing the committee, which is incorporated in the paper, sets forth that the committee was appointed to inquire and report:—As to what regulations, if any, may with advantage be made under Section 4 of the Sale of Food and Drugs Act, 1899, for determining what deficiency in any of the normal constituents of butter, or what addition of extraneous matter, or proportion of water in any sample of butter shall, for the purpose of the Sale of Food and Drugs Acts, raise a presumption, until the contrary is proved, that the butter is not genuine. In the interim report, which was issued early in 1902, the committee unanimously recommended the adoption of a limit of 16 per cent. for the proportion of water in butter to be fixed by a regulation under Section 4 of the Sale of Food and Drugs Act, 1899. In the present report the committee recommend a limit based on a deficiency in the normal constituents of butter. Analysts were almost unanimous in recommending that, if a limit were to be imposed, it should be based upon a determination of what all were agreed in regarding as the characteristic constituents of butter-fat—namely, the volatile acids. The Reichert-Wollny method of determining the amount of the volatile acids which butter may contain, fulfils, in the opinion of the committee, the conditions of a quantitative method which is to be made the basis of judicial proceedings. Further, the committee are strongly convinced of the desirability of extending the system of "ear-marking" margarine by requiring manufacturers to use as one of the vegetable oils to be employed in the production, 10 per cent. of sesamé oil. A number of the representatives of foreign countries who appeared before the committee considered that the only rational method of protecting this country against the importation of adulterated butter consisted in an effective system of control over the manufacture of butter and margarine on the part of the exporting country, and this idea commends itself to the committee, not in substitution for analysis, but as tending to minimise the difficulties and danger admittedly attending the imposition of limits. The committee therefore recommend:—(1) That the figure 24 arrived at by the Reichert-Wollny method should be the limit below which a presumption should be raised that butter is not genuine; (2) That the use of 10 per cent. of sesamé oil in the manufacture of margarine be made compulsory; (3) that steps should be taken to obtain international co-operation.

XX.—FINE CHEMICALS, Etc.

THORIUM; POSITION OF ——.

J. Gas Lighting, 1903, **84**, 527.

In a circular issued by the "Syndikat zum Schutze der Interessen der Gasglühlicht Ind.," Berlin, it is pointed out that since the beginning of the year the price of thorium nitrate, which had already experienced a considerable rise, has been repeatedly increased, and a still further advance is to be expected. Further, although up to the present the rise in the price of incandescent mantles has been kept within moderate limits, this has been due to certain old stocks of thorium or monazite sand not having been quite exhausted, which stocks, however, have now been disposed of.—A. S.

XXI.—PHOTOGRAPHIC MATERIALS.

PHOTOGRAPHIC MATERIALS IN SOUTH AFRICA.

Bull. Comm., Oct. 24. *Bd. of Trade J., Dec.* 10, 1903.

A considerable demand is developing in South Africa for photographic apparatus and sundries. Plates require a special preparation in order to enable them to resist the heat, although at the same time tropical plates are seldom used. Platinotype paper is in good demand, owing, it is said, to the extreme dryness of the "veldt" which renders carbon too friable. Owing to the strong sunlight in these parts, "Gaslight" papers are not successful.

Patent List.

N.B.—In these lists, [A.] means "Application for Patent," and [C.S.], "Complete Specification Accepted."

Where a Complete Specification accompanies an Application, an asterisk is affixed. The dates given are (i) in the case of Applications for Patents, the dates of application, and (ii) in the case of Complete Specifications Accepted, those of the Official Journals in which acceptances of the Complete Specifications are advertised.

Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

[A.] 26,310. Wilson. Funnel evaporator. Dec. 2.
„ 26,392. Ogle and The Rapid Cyanide Treatment, Ltd. Separation of solid and liquid particles by filtration. Dec. 3.
„ 26,471. Strehlenert. Centrifugal extraction apparatus. Dec. 3.
„ 26,575. Arnold. Apparatus for weighing substances such as nitroglycerine. Dec. 4.
„ 26,984. Rofe and Elworthy. Treating liquids with ozone and apparatus therefor. Dec. 8.
„ 27,007. Haines. Construction and arrangement of filtering apparatus. Dec. 10.
„ 27,121. Barker. Self sealing retort lids. Dec. 11.
„ 27,288. Wellcome and Hill. Method of and means for hermetically enclosing substances. Dec. 12.
[C.S.] 26,963 (1902). Dumons. Method of circulating or applying a liquid under pressure, applicable for the leaching or extraction of mineral or organic substances, the extraction of fatty or greasy substances, the dyeing and other treatment of textile materials, and other purposes, and means or apparatus for the application of the said method. Dec. 16.
„ 7510 (1903). Feld. Crucibles or seggars for use in the production of barium oxide, cyanides, and the like. Dec. 9.
„ 24,262 (1903). Duff. Washing or cooling towers. Dec. 16.

II.—FUEL, GAS, AND LIGHT.

[A.] 26,075. Moore. Crucible heating furnaces. Nov. 30.
„ 26,213. Roney. Furnaces.* Dec. 1.
„ 26,287, Moore. Furnaces. Dec. 1.
„ 26,347. Graigola Merthyr Co., Ltd., Yeo and Gregor. Manufacture of artificial fuel. Dec. 2.
„ 26,416. Colville and Sons, Ltd., and Hislop. Gas producers. Dec. 3.
„ 26,556. Kerness. Purifying lighting gas from hydrosulphuric acid. Dec. 4.
„ 26,596. Schweich. Manufacture of producer gas and producers therefor. Dec. 4.
„ 26,712. Grimwade. Continuous muffle furnaces or kilns. Dec. 7.
„ 26,776. Abel (Siemens and Halske Act. Ges.). Manufacture of incandescence bodies for electric glow lamps.* Dec. 7.
„ 26,974. Hartridge. Manufacture of artificial fuel.
[C.S.] 16,764 (1903). Dempster. Apparatus for making oil gas. Dec. 9.
„ 17,319 (1903). Davies and Davies. Bunsen gas burners. Dec. 9.
„ 23,751 (1903). Kiderlen. Gas generating apparatus. Dec. 16.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM, AND MINERAL WAXES.

[A.] 26,366. Lothammer and Trocquenet. Process for saponifying petroleum and other like hydrocarbons.* Dec. 2.
[C.S.] 2377 (1903). Lingner. *See under* XIII. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

[A.] 26,132. Newton (Bayer and Co.). Manufacture and production of new azo dyestuffs. Nov. 30.
„ 26,182. Imray (Meister, Lucius und Brüning). Manufacture of dyestuffs derived from anthracene. Nov. 30.
„ 26,379. Johnson (Kalle and Co.). Manufacture of black sulphur dyes. Dec. 2.
„ 26,700. Naef and Levinstein. Manufacture of new sulphurised dyestuffs. Dec. 7.
[C.S.] 2617 (1903). Levinstein, Mensching, and Levinstein, Ltd. Manufacture of para-amidoxylyl para-oxyphenylamine and analogous compounds and of dyestuffs therefrom. Dec. 9.
„ 2694 (1903). Ransford (Cassella and Co.). Manufacture of diphenylnaphthylmethane dyestuffs. Dec. 16.

[C.S.] 3182 (1903). Ransford (Cassella and Co.). Manufacture of derivatives of o-amidophenol sulpho acid and of colouring matters therefrom. Dec. 16.
„ 3480 (1903). Abel (Act.-Ges. f. Anilinfabr.). Manufacture of yellow sulphurised colouring matters. Dec. 9.
„ 4538 (1903). Imray (Meister. Lucius und Brüning). Manufacture of indigo and of an intermediate product therefor. Dec. 9.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

[A.] 26,531. Wakefield. Bleaching of textile fabrics and fibres. Dec. 4.
„ 26,632. Nicholson and Shepherd. Compound batching oil for dressing jute, wool, and like fibrous material. Dec. 5.
„ 27,070. Newton (Bayer and Co.). Process of discharging colouring matters on fibres. Dec. 10.
[C.S.] 28,646 (1902). Ribbert. Manufacture of fabrics coloured with indigo. Dec. 9.
„ 3479 (1903). Abel (Act. Ges. f. Anilinfabr.). Dyeing mixed silk and cotton goods with sulphurised dyestuffs. Dec. 9.
„ 24,327 (1903). Marshall and Times Coloured Spinning Co., Ltd. Apparatus for dyeing and similarly treating textile material upon bobbins or the like. Dec. 16.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

[C.S.] 2809 (1903). Imray (Meister, Lucius, und Brüning). Process for producing coloured effects on dyed paper. Dec. 9.

VII.—ACIDS, ALKALIS, AND SALTS.

[A.] 26,148. Jaubert. Preparation of oxygen (Fr. Appl., July 3, 1902).* Nov. 30.
„ 26,314. Garroway. Manufacture of basic ferric sulphate. Dec. 2.
„ 26,436. Warne. *See under* X.
„ 26,668. Meurer. *See under* X.
„ 26,996. Davis. Construction of ammonia stills. Dec. 9.
„ 27,194. Bloxam (Soc. Anon. d'Etudes Electro-chimiques). Manufacture of lead peroxide. Dec. 11.
„ 27,285. Bousfield. Manufacture of ozone. Dec. 12.
[C.S.] 27,189 (1902). O'Brien (Ceribelli). Leucitic product for the manufacture of products or compounds of aluminium, potassium, and silicon. Dec. 9.
„ 423 (1903). Hemingway. Treatment of waste pickle liquor for the removal or utilisation of free acid contained therein. Dec. 16.
„ 2211 (1903). Peter Spence and Sons, Ltd., Spence and Craig. Manufacture of potassium bichromate. Dec. 9.
„ 2223 (1903). Peter Spence and Sons, Ltd., Spence and Craig. Manufacture of ammonium bichromate. Dec. 9.
„ 2440 (1903). Campbell. Utilising gases given off in the calcination of copperas. Dec. 9.
„ 7510 (1903). Feld. *See under* I.
„ 9412. Oliver and Bevan. Utilisation of lime waste of alkali works and lime sulphate waste. Dec. 16.
„ 20,889 (1903). Kellner. *See under* XI.
„ 23,189 (1903). Gilman. *See under* XIII. A.

VIII.—POTTERY, GLASS, AND ENAMELS.

[A.] 26,216. Riddiford. Process for toughening glass. Dec. 1.
„ 26,620. Grimwade. Process of decorating pottery ware. Dec. 5.
[C.S.] 3632 (1903). Bigot. Manufacture of glazed or enamelled ceramic ware. Dec. 9.
„ 23,492 (1903). Kent. Manufacture of silica glass, and means to be employed therein. Dec. 9.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

[A.] 26,119. Hodgkinson. Impregnating wood and other porous material to protect it against damp, fungus, or insects, or for colouring. Nov. 30.
„ 26,240. Zachariasen. Drying clay, marl, and materials used in the manufacture of cement, &c. Dec. 1.
„ 26,478. Reinke. Artificial stone.* Dec. 3.
„ 26,751. Morris. Brick kilns. Dec. 7.
„ 26,778. Blount and Middleton. Kilns or furnaces especially applicable to burning lime, cement, &c. Dec. 7.
„ 26,899. Electric Timber-Seasoning and Preservation Co., Ltd., and West. Impregnation of porous, cellular, and fibrous substances, and apparatus therefor. Dec. 8.
„ 27,170. Seaton. Method of seasoning timber. Dec. 11.
„ 27,219. Boivie. *See under* XVIII. B.
[C.S.] 2726 (1903). Ellison. Manufacturing tar macadam. Dec. 9.
„ 2783 (1903). Sutcliffe, Speakman and Co., Ltd., and Sutcliffe. Method of making bricks, and apparatus therefor. Dec. 16.
„ 4135 (1903.) Wetter (Heise). Impregnation of wood. Dec. 16.
„ 18,736 (1903). Joseph. Cement. Dec. 9.

X.—METALLURGY.

[A.] 26,292. Ellis and Flanigan. Flux for soldering aluminium. (U.S. Appl., Dec. 31, 1902.)* Dec. 1.
„ 26,375. Michelis, Michelis, Kruse, and Kuhn. Process for hard-soldering aluminium.* Dec. 2.
„ 26,376. Michelis, Michelis, Kruse, and Kuhn. Process for hard-soldering cast-iron.* Dec. 2.
„ 26,391. Ogle and The Rapid Cyanide Treatment, Ltd. Extraction of metals from ores. Dec. 3.
„ 26,436. Warne. Precipitation of metallic compounds from their solutions. Dec. 3.
„ 26,570. Winter, and Pforzheimer Doubléfabr. Carl Winter. Process for manufacturing plated wire.* Dec. 4.
„ 26,668. Meurer. Producing metal sulphates or other salts from metal sulphides and sulphide ores containing iron. Dec. 5.
„ 27,767. Owen. Manufacture of iron and steel and apparatus therefor. Dec. 7.
„ 27,775. Abel (Siemens and Halske Akt.-Ges.). Manufacture of homogeneous masses of tantalum and like difficultly fusible metals.* Dec. 7.
„ 26,777. Guye. Treatment of lead sulphide or ores thereof to obtain volatile products therefrom. Dec. 7.
„ 26,911. Swinburne. Treating ores with chlorine. Dec. 9.
„ 26,976. Fyfe. Means for producing and depositing fumes from ores. Dec. 9.
„ 27,082. Wheatley. White metallic alloy.* Dec. 10.
„ 27,132. Marks (Delprat). Extracting zinc and other sulphides from their ores. Dec. 11.
„ 27,137. Pfleuger and Kuhn. Alloy for soldering. Dec. 11.
„ 27,172. Cowper-Coles and Co., Ltd., and Cowper-Coles. Hardening of metals and alloys. Dec. 11.
„ 27,198. Solbisky. Process for the recovery of iron. from pyrites, &c. Dec. 11.
[C.S.] 24,124 (1902). Maddern. Ore roasting furnace. Dec. 9.
„ 184 (1903). Elmore. Concentrating ores and apparatus therefor. Dec. 9.
„ 260 (1903). Beuker and Hartmann. Furnaces for roasting pyrites and other substances. Dec. 16.
„ 734 (1903). Herrenschmidt. Process of treating vanadiferous ores and products. Dec. 16.

[C.S.] 2612 (1903). Parfitt. Manufacture of metallic compounds having iron partly or wholly decarbonised for their principal constituents. Dec. 9.

„ 4327 (1903). Van Arsdale. Process of extracting copper from ore. Dec. 16.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

[A.] 26,083. Cardno and Dalton. Electric furnaces. Nov. 30.

„ 26,241. Leitner. Electrodes for secondary batteries. Dec. 1.

„ 27,249. Garuti and Pompili. Apparatus for collecting, separating, drying, and similarly treating oxygen and hydrogen generated by electrolysis of water. Dec. 12.

[C.S.] 17,399 (1903). Fuery (McCarty and Beebe). Process of decomposing water by electrolysis. Dec. 9.

„ 20,889 (1903). Kellner. Process and apparatus for the electrolysis of chlorides of the alkalies. Dec. 9.

XII.—FATTY OILS, FATS, WAXES, AND SOAP.

[A.] 27,019. Powell. Manufacture of fancy soaps. Dec. 10.

[C.S.] 3150 (1903). Smith and Scott. Extracting fatty matters from bones and other materials. Dec. 16.

„ 22,085 (1903). Godard. Purifying and deodorising oils and fatty matters. Dec. 16.

„ 22,086 (1903). Godard. Decolourising oils and fatty matters. Dec. 16.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

A.—Pigments, Paints.

[A.] 26,903. Hall. Paint composition.* Dec. 8.

„ 26,951. Rettenbain. Ink. Dec. 9.

[C.S.] 3174 (1903). Cross. Manufacture of ultramarine. Dec. 16.

„ 13,298 (1903). Scholz. Manufacture of white paint. Dec. 9.

„ 23,189 (1903). Gilman. Process of making lithophone and Glauber salt. Dec. 9.

B.—Resins, Varnishes.

[C.S.] 26,799 (1902). Godfrey. Machine for the manufacture of linoleum and the like. Dec. 9.

„ 2377 (1903). Lingner. Manufacture of a resinous product or class of product from wood tar. Dec. 9.

C.—India-rubber, &c.

[C.S.] 2695 (1903). Lucas. Insulating materials and artificial substitutes for ebonite, &c. Dec. 16.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

[C.S.] 4902 (1903). Jetter. Process of preparing a horn-like material from raw skins. Dec. 16.

XV.—MANURES.

[C.S.] 26,150. Horteloup. *See under* XIX.

XVI.—SUGAR, STARCH, GUM, Etc.

[A.] 26,779. Lafeuille. Annular moulds for treating sugar by centrifugal action. Dec. 7.

[C.S.] 26,570 (1902). Winter. Treatment of sugar juice. Dec. 9.

XVII.—BREWING, WINES, SPIRITS, Etc

[A.] 23,360. Tuckfield and Garland. Recovering alcohol and other volatile matters from waste or other products. Dec. 2.

[C.S.] 1690 (1903). Stanley and Farringdon Works and Pontifex and Sons, Ltd. Treating beer for bottling. Dec. 9.

„ 2519 (1903). Day and Gaskell. Treatment of distillery refuse or pot ale. Dec. 9.

„ 2520 (1903). Day and Gaskell. Treatment of distillery refuse and other materials of a hygroscopic character. Dec. 9.

„ 22,542 (1902). Nowak. Process for producing alcoholic beverages, &c. Dec. 9.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

A.—Foods.

[A.] 26,172. Streckeisen. Process for making milk powder which is soluble in water. Nov. 30.

„ 26,195. Nesfield. Sterilisation of water and other liquids and of alimentary substances to render same potable or edible. Dec. 3.

B.—Sanitation; Water Purification.

[A.] 27,219. Boivie. Treatment of sewage sludge and similar waste organic matter, and the manufacture therefrom of bricks, tiles, &c. Dec. 12.

XIX.—PAPER, PASTEBOARD, Etc.

[A.] 26,149. Horteloup. Manufacture of paper pulp. (Fr. Appl. Dec. 9, 1902.)* Nov. 30.

„ 26,150. Horteloup. Treatment of furze for obtaining a food for cattle, paper pulp, and a manure. (Fr. Appl., April 14, 1903.)* Nov. 30.

„ 26,733. Woods and Morgan. Manufacture of celluloid compounds. Dec. 7.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

[A.] 26,089. Verley and Givaudan. Manufacture of ionone.* Nov. 30.

„ 26,480. Imray (Meister, Lucius und Brüning). Manufacture of pyrocatechol derivatives. Dec. 3.

„ 26,785. Ellis (Chem. Fabr. von Heyden, Akt.-Ges.). Manufacture of new aromatic esters and of useful products therefrom.* Dec. 7.

[C.S.] 21,833 (1903). Newton (Bayer and Co.). Manufacture and production of derivatives of pyrimidine. Dec. 16.

„ 22,967 (1903). Newton (Bayer and Co.). Manufacture and production of pyrimidine derivatives. Dec. 16.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

[A.] 27,059. Beckwith and Carten. Photographic films.* Dec. 10.

[C.S.] 3196 (1903). Szczepanik. Production of photographic pictures in natural colours. Dec. 16.

„ 3546 (1903). Newton (Bayer and Co.). Developing photographic pictures. Dec. 16.

XXII.—EXPLOSIVES, MATCHES, Etc.

[A.] 26,575. Arnold. *See under* I.

„ 26,978. Talbot. Explosive compounds, and the manufacture thereof. Dec. 9.

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A

1897. Ablett, A. W., Box 1180, Johannesburg, Transvaal, S. Africa, Cyanide Works Manager.
1902. Acker, Chas. E., Acker Process Co., Niagara Falls, N.Y., U.S.A., Manufacturer.
1897. Ackermann, Eugene, 165, Cambridge Street, Warwick Square, S.W., Analytical Chemist and Civil Engineer.
1900. Ackroyd, Wm., Borough Laboratory, and (communications) Crossley Street, Halifax, Yorks, Analytical Chemist.
1892. Adams, Arthur, Kelvin House, Edgbaston Road, Smethwick, near Birmingham, Science Lecturer.
1884. Adams, M. A., Ashford Road, Maidstone, Kent, Public Analyst.
1902. Adams, O. Gore, School of Mines, Thames, Auckland, New Zealand, Director.
1897. Adams, Thos. H., 107, Crewe Street, Derby, Analyst.
1895. Adamson, G. P., 233, Reeder Street, Easton, Pa., U.S.A., Manufacturing Chemist.
1891. Adcock, S. R., St. Helen's Smelting Co., Atlas Court, St. Helen's, Lancashire, Analytical Chemist.
1901. Addison, Leonard, c/o Messrs. Burt, Boulton, and Haywood, Selzaete, Belgium, Chemist.
1901. Addison, Dr. Wm. L. T., Wm. Davies Co., Ltd., Front Street East, and (Journals) 513, Markham Street, Toronto, Canada, Chemist.
1898. Adgate, M., c/o General Chemical Co., Syracuse, N.Y., U.S.A., Chemist.
1898. Adiassewich, Alex. V., 17, Devonshire Square, London, E.C., Oil Engineer.
1896. Adler, Dr. Leon N., Adler Colour and Chemical Works, 100, William Street, New York City, U.S.A., Manufacturing Chemist.
1888. Adriance, Dr. John S., 105, East 39th Street, New York City, U.S.A., Analytical Chemist.
1899. Adrot, Léon, 38, Rue de la Station, Jette St. Pierre, Belgium, Chemist.
1901. Affelder, Oscar J., 1230, Sheffield Street, Allegheny, Pa., U.S.A., Chemist.
O.M. Affleck, Dr. J., Highfield, Woodend Park, Grassendale, near Liverpool, Alkali Inspector.
1903. Aicher, Chas. P., Camp Bird Mills, Ouray, Colo., U.S.A., Mill Manager.
O.M. Aitken, Dr. A. P., 38, Garscube Terrace; and (Journals) 8, Clyde Street, Edinburgh, Consulting Chemist.
1886. Aitken, J. B., Gerard's Fold Chemical Works, Widnes, Chemical Manufacturer.
1884. Akitt, Thos., Birksgate, Kircaldy, N.B., and (Journals) Lebong Donok, Benkoelen, via Padong, Sumatra, Chemist.
1883. Albright, G. S., The Elms, Park Road, Edgbaston, Chemical Manufacturer.
O.M. Albright, W. A., Mariemont, Edgbaston, Birmingham, Chemical Manufacturer.
1884. Alcock, Jno. W., Central Brewery, Mott Street, Birmingham, Maltster and Brewer.
1902. Alden, Frederick, 311, 17th Street, Milwaukee, Wis., U.S.A., Chemist.
1898. Allen, John, Chemical Laboratory, Pacific Mills, Lawrence, Mass., U.S.A., Chemist.
1901. Aldous, Hugh G., 21, Brechin Place, South Kensington, S.W., Brewery Director.
1900. Aldrich, Roger C., c/o F. R. Kalbfleisch Co., White and Boerum Streets, Brooklyn, N.Y., U.S.A., Mechanical Engineer.
1890. Aldrick, Edwin John, 53, Alpha Road, West Ferry Road, Millwall, E., Chemical Works Clerk.
1899. Alexander, D. Basil W., Denver Testing Laboratory, P.O. Box 1341, Denver, Colo., U.S.A., Chemist.
1900. Alexander, Jerome, c/o National Gum and Mica Co., 502—510, West 45th Street, New York City, U.S.A., Chemist.
1883. Alexander, W. T., 20, Booth Street, Moseley Street, Manchester; and Crumnock Bank, Victoria Crescent, Eccles, Drysalter.
1901. Allan, Dr. F. B., Chemical Laboratory, University of Toronto, Canada, Lecturer on Chemistry.
1891. Allan, F. H. Tielke, Portobello House, Wakefield, Analytical Chemist.
1898. Allan, John, 55, Northern Grove, West Didsbury, near Manchester, Chemist.
1902. Allbright, Wm. B., 5139, Lexington Avenue, Chicago, Ill., U.S.A., Chemical Engineer.
O.M. Alldred, C. H., 8, St. Margaret's Road, Plumstead Common, Kent, Analytical Chemist.
1898. Alleman, Dr. G., Swarthmore College, Swarthmore, Pa., U.S.A., Instructor in Chemistry.
O.M. Allen, A. H., Broomfield Road, Sheffield, Consulting Chemist.
1902. Allen, Chas. D., jun., 475, 4th Street, Brooklyn, N.Y., U.S.A., Chemist.
1891. Allen, E. W., Lea Mount, Glossop, Paperstainers' Manager.
O.M. Allen, J., 164, Upper North Street, Poplar, E., Manufacturing Chemist.
1901. Allen, R. F., Hart Park, New Brighton, N.Y., U.S.A., Chemist.
1889. Allen, R. L., Crewe Road, Sandbach, Cheshire, Analytical Chemist.
1886. Allen, Walter S., 34, South Sixth Street, New Bedford, Mass., U.S.A., Chemist.
1892. Allen, Walter W., Room 1709, 170, Broadway, New York City, U.S.A., Metallurgical Manager.
1900. Allen, Wilfrid T., c/o Hugh Wallace and Co., Ltd., 5, Fenchurch Street, London, E.C., Director.
1884. Allen, Wm., Evenley Hall, Brackley, North Hants.
1893. Allerton, Rt. Hon. Lord, F.R.S. (Journals), Allerton Hall, near Leeds; and c/o W. L. Jackson and Sons, Ltd., Buslingthorpe, Leeds, Tanner.
O.M. Allhusen, A., Gateshead-on-Tyne, Chemical Manufacturer.
1886. Allibon, G. H., 35, Eglantine Avenue, Belfast, Ireland, Chemical Works Manager.
1900. Allingham, Jno., 76, Gayville Road, Wandsworth Common, London, S.W., Assayer.
1887. Alliott, J. B., Messrs. Manlove, Alliott, and Co., Ltd., Nottingham, Mechanical Engineer.
1900. Allison, Thos. McGregor, Sargent Street, Bedminster, Bristol, Tanner.
1895. Allison, Wm. O., 100, William Street, New York City, U.S.A., Publisher of "Oil Paint and Drug Reporter."

1889. Alpiar, Agop, Smyrna, Asia Minor, [illegible] Manufacturer.
1899. Alsop, Wm. K., 30, Ferry Street, New York City U.S.A., Chemist.
1901. Alston, Robt. A., New Rietfontein Estates Gold Mines, Ltd., P.O. Knights, Rietfontein, Transvaal, Mining Engineer.
1899. Althouse, C. Scott, 315, North 6th Street, Reading, Pa., U.S.A., Analytical Chemist.
1898. Ambler, Chas. Taaffe, Dharbara Station, E.I. Ry., Bengal, India, Mine Owner and Contractor.
1897. Amend, Otto P., 205—211, Third Avenue, New York City, U.S.A., Chemist.
1900. Anderson, Jas. W., 1, Preston Villas, Halling, near Rochester, Kent, Analytical Chemist.
1889. Anderson, Robt. T. R., 80, Seedhill Road, Paisley, Technical Chemist.
1894. Anderson, Dr. W. Carrick, 2, Florentine Gardens, Hillhead, Glasgow, University Lecturer.
1895. Anderson, Wm., 19—21, Blackfriars Street, Edinburgh, Drysalter.
O.M. Anderton, G. H., Howendyke, Howden, Yorks, Chemical Manufacturer.
1896. Andreoli, Gabriel, P.O. Box 3725, Johannesburg, Transvaal Colony, South Africa, Electro-chemist.
1889. Andrews, C. W., c/o The John Crerar Library, Wabash Avenue and Washington Street, Chicago, Ill., U.S.A., Librarian.
1903. Anfilogoff, N. A., c/o The Roumanian Oil Trust, Ltd., Thames Haven, Stanford-le-Hope, Essex, Chemist.
O.M. Angell, J., 6, Beaconsfield, Derby Road, Withington, Manchester, Chemical Lecturer.
1892. Annandale, C. J. R., The Briary, Shotley Bridge, Co. Durham, Paper Maker.
1883. Annandale, Jas. H., The Vale, Polton, Midlothian, N.B., Paper Maker.
1897. Annis, Dr. E. G., Public Health Dept., Town Hall, Greenwich, S.E., Medical Officer of Health.
1887. Annison, R. H., 16, Water Lane, Tower Street, London, E.C., Master Lighterman.
1894. Ansbacher, L. A., P.O. Box 1934, New York City, U.S.A., Colour Manufacturer.
O.M. Ansdell, G., 3, Cross Lane, St. Mary-at-Hill, E.C., Analytical Chemist.
1902. Anthony, John, 82, Bay Street, Toronto, Canada.
1901. Auty, Albert M., c/o John Smith and Sons, Field Head Mills, Bradford, Chemist.
1899. Appleby, C. W., Farnworth, near Widnes, Lancashire, Pith and Size Manufacturer.
1895. Appleby, Prof. W. R., 911, 5th Street, S.E., Minneapolis, Minn., U.S.A., Professor of Mining and Metallurgy.
1894. Appleton, H. A., c/o Vinolia Co., Ltd., Carpenter's Road, Stratford, E., Analytical Chemist.
1897. Appleton, Jno. Howard, 209, Angell Street, Providence, R.I., U.S.A., Professor of Chemistry.
1900. Appleyard, Geo. H., c/o British Oil and Cake Mills, Ltd., 151, Cleveland Street, Hull, Chemist.
1903. Arbogast, Ralph, c/o Edison Storage Battery Co., Silver Lake, N.J., U.S.A., Chemist.
1901. Archbold, Dr. Geo., P.O. Box 283, Prescott, Ont., Canada, Consulting Chemist and Manager.
O.M. Archbutt, Leonard, The Yews, Madeley Street, Derby, Analytical Chemist.
1899. Archdale, T. Henry, 77, Queen's Road, Blackburn, Manager of Tar and Ammonia Works.
1901. Ardagh, Edw. G. R., 28, Leopold Street, Parkdale, Toronto, Canada, Chemist.
1900. Ardern, Edw., 2, Atkinson Road, Urmston, near Manchester, Chemist.
1901. Argall, Philip, 728-732, Majestic Buildings, Denver, Colo., U.S.A., Manager (Gold Extraction Works).
1902. Armstrong, Edward E., Pennsylvania Salt Manufacturing Co., Natrona, Pa., U.S.A., Manufacturing Chemist.
1899. Armstrong, Richard, Saul Street Soap Works, Preston, Lancashire, Soap Manufacturer.
1901. Arnold, G. Edmund, 6, Kingsfield Terrace, Faversham, Kent, Manager (Cotton Powder Co., Ltd.).
1899. Arnott, G. W. Campbell, Confederation Life Building, Toronto, Canada, Chemical Agent.
1901. Arundel, Arthur S. D., Penn Street Works, Hoxton, N., Paper Box Manufacturer.
1901. Asano, K. 25, Kitachonyacho, Kyobashi, Tokyo, Japan, Mining Chemist.
1900 Ashley, Harrison Everett, Box 291, Leetonia, Ohio U.S.A., Metallurgical Chemist.
1900. Ashton, Jas., Hacken Sewage Works, Great Lever, Bolton, Chemist and Manager.
1890. Ashton-Bost, W. D., Cartvale Chemical Works Paisley, N.B., Chemical Manufacturer.
1885. Ashwell, H., 117, Waterloo Crescent, The Forest, Nottingham, Bleacher and Dyer.
1885. Ashwell, J. H., 117, Waterloo Crescent, The Forest Nottingham, Bleacher and Dyer.
1894. Ashworth, Arthur, Fernhill Chemical Works, Bury, Lancs., Chemical Manufacturer.
1903. Ashworth, Jno. B., The Creamery, Broad Green, Liverpool, Manager.
1898. Aspinall, Thos., 42, Gilnow Road, Bolton, Analytical and Manufacturing Chemist.
1897. Aspinwall, Capt. H. C., Haskell, N.J., U.S.A., Explosives Manufacturer.
1900. Aston, Bernard C., Agricultural Department, Wellington, New Zealand, Chemist.
1891. Atkins, C. E., Teigngrace, Byculla Park, Enfield, N., Chronometer Maker.
1885. Atkinson, A. J., 44, Stewart Street, Cardiff, Analytical Chemist.
1902. Atkinson, Edwin B., Scartho House, Great Grimsby, Lecturer in Chemistry.
1900. Atkinson, Jno. W., Betteravia, Cal., U.S.A., Chemist.
O.M. Atkinson, R. W., 44, Stuart Street, Cardiff, Technical Chemist.
O.M. Attfield, Dr. J., F.R.S., Ashlands, Watford, Herts.
1900. Atwood, Frank W., 216, Milk Street, Boston, Mass., U.S.A., Chemist.
1895. Auchterlonie, Wm., jun., c/o Clark Thread Co., Newark, N.J., U.S.A., Dyeworks Manager.
1901. Auden, Dr. H. A., Municipal Technical Institute, Romford Road, West Ham, E., Head of Chemical Department.
1897. Auger, Chas. L., 425, Park Avenue, Paterson, N.J., U.S.A., Silk Dyer.
1887. Austen, Prof. Peter T., 218, St. John's Place, Brooklyn, N.Y., U.S.A., Professor of Chemistry.
1901. Austin, Herbert, c/o George Scott and Son, Ltd., 67, Lord Street, Liverpool, Engineer.
1902. Austin, J. H., Allscott, Wellington, Shropshire, Analytical Chemist.
1902. Avery, D., 23, Belmont Avenue, Kew, Melbourne, Vic., Australia, Teacher of Chemistry.
1901. Ayer, Harold O., 503, Whitaker Street, Savannah, Ga., U.S.A., Chemist.
1890. Aykroyd, H. E., Oakwood Dye Works, Bradford, Yorks, Dyer.
1899. Aylsworth, Jonas W., 223, Midland Avenue, East Orange, N.J., U.S.A., Chemist.

B

1895. Bacon, Nathaniel T., Peace Dale, Rhode Island, U.S.A., Chemical Engineer.
1897. Bacon, Wm., 4, New Court, Lincoln's Inn, W.C., Chemist.
1897. Badock, Stanley H., 41, Downleaze Road, Stoke Bishop, near Bristol, Smelter.
1898. Baekeland, Dr. Leo, Snug Rock, North Broadway, Yonkers, N.Y., U.S.A., Manufacturing Chemist.
1902. Baer, Dr. Samuel H., 158, Chambers Street, New York City, U.S.A., Consulting Chemist.
1903. Bailey, E. H. S., Kansas State University, Lawrence, Kas., U.S.A., Professor of Chemistry.
1885. Bailey, Edwin M., The Elms, East Calder, N.B., Technical Chemist.
1883. Bailey, Dr. G. H., Marple Cottage, Marple, Cheshire, Chemical Lecturer.

898. Bailey, Henry, 18, Lavender Sweep, Lavender Hill, S.W., Analytical Chemist.
1888. Bailey, Dr. T. Lewis, University College, Liverpool, Lecturer on Technological Chemistry.
1888. Bailey, Sir W. H., Albion Works, Salford, Manchester, Chemical Engineer.
1888. Bailey, Walter P., Fabrica de Productos Amoniacales, 2A, Aguada, Cadiz, Spain, Manufacturing Chemist.
1902. Baillie, Dr. Thos. B., 60, Rockfield Road, Liverpool, Chemist.
1902. Bain, Jas. Watson, 90, Charles Street, Toronto, Ont., Canada, Chemist.
1890. Baird, H. Harper, 14, Cross Street, Hatton Garden, London, E.C., Laboratory Furnisher.
1902. Baird, Dr. Julian W., Massachusetts College of Pharmacy, Boston, Mass., U.S.A., Professor of Chemistry.
1891. Baird, Wm., c/o Lewis Berger and Sons, Ld., Homerton, N.E., Technical Chemist.
1895. Baird, W. Raymond, 271, Broadway, New York City, U.S.A., Patent Lawyer.
1890. Bairstow, John, Burley, Queen's Park, Chester, Chemical Works Manager.
1902. Baker, Chas. F., Technical College, Sunderland, Lecturer in Chemistry.
1901. Baker, F. Guy Stirling, Marryatt's Lodge, The Forest, Snaresbrook, Essex, Student.
1883. Baker, Harry, Epworth House, Moughland Lane, Runcorn, Analytical Chemist.
1899. Baker, H. Fenimore, c/o Thomsen Chemical Co., Baltimore, Md., U.S.A., President.
1892. Baker, Julian L., 7, Addison Road, Bedford Park, W., Sugar Chemist.
1886. Baker, Theodore, c/o G. Henry, Pompton Lakes, N.J., U.S.A., Analytical Chemist.
1901. Baker, Wm. T., White House, Wouldham, near Rochester, Cement Works Chemist.
1900. Balbach, Wm., 100, William Street, New York City, U.S.A., Chemical Merchant.
1898. Baldwin, Abram T., Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Manufacturer.
1901. Ball, Edward, c/o B. Young and Co., Spa Road, Bermondsey, S.E., Glue and Size Manufacturer.
1903. Ball, S. F., Hull Avenue and 209th Street, Bronx Borough, New York City, U.S.A., Analytical Chemist.
1889. Ballantyne, H., 75, Chancery Lane, London, W.C., Analytical Chemist.
1892. Ballard, Ernest, Colwall, Great Malvern, Malt Vinegar Brewer.
O.M. Ballard, E. G., Greenfield Cottage, Hoole Road, Chester, Alkali Works Inspector.
1891. Ballinger, Jno., Free Library, Cardiff, Librarian.
1890. Baly, E. C. C., University College, Gower Street, London, W.C., Analytical Chemist.
O.M. Bamber, H. K., 9, Victoria Street, London, S.W., Consulting Chemist.
1894. Bamber, H. K. G., Ingress House, Greenhithe, Kent, Cement Works Chemist and Manager.
1898. Bamford, Harry, 1, Farcliffe Place, Bradford, Yorks, Dyer.
O.M. Banister, H. C., Elmhurst, Blundellsands, near Liverpool, Chemical Works Manager.
1890. Banks, Jno. H., c/o Ricketts and Banks, 104, John Street, New York City, U.S.A., Mining Engineer.
1895. Bannan, John F., North Andover, Mass., U.S.A., Chemist (Woollen Mill).
1885. Bauner, Samuel, 4, Ivanhoe Road, Liverpool, Petroleum Merchant.
O.M. Bannister, R., 59, Tregunter Road, South Kensington, S.W., Analytical Chemist.
O.M. Bannister, W., Victoria Lodge, Cork, Ireland, Manufacturing Chemist.
1901. Barber, René R., Georgetown, Ont., Canada, Analytical Chemist.
1892. Barden, Alf., Far Bank, Shelley, near Huddersfield, Glue and Size Maker.
1891. Barden, Sam., Woodhouse Mills, Shelley, near Huddersfield, Glue and Size Manufacturer.
1886. Bardsley, Robt., Messrs. Jewsbury and Brown, Ardwick Green, Manchester, Mineral Water Manufacturer.
1895. Bardwell, Fred. L., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Assistant Professor of Chemistry.
1903. Baringer, Fred. J., Eagle White Lead Works, 1020, Broadway, Cincinnati, Ohio, U.S.A., Chemist.
1902. Barker, Hugh S., 32, Cumberland Avenue, Sefton Park, Liverpool, Laboratory Furnisher.
1895. Barlow, Clinton W., 103—105, Greene Street, New York City, U.S.A., Merchant.
1901. Barlow, John J., 177, Manchester Road, Accrington, Calico Printer's Chemist.
1900. Barlow, Walter H., 152, Osbaldeston Road, Stoke Newington, N., Analytical Chemist.
1899. Barlow, Wm., 311, Market Street, Droylsden, near Manchester, Analytical Chemist.
1891. Barnes, Edward A., Dynamite Works, Modderfontein, Transvaal, Technical Chemist.
1901. Barnes, Fred., 46, Park Road, Sittingbourne, Kent, Paper Mill Chemist.
1884. Barnes, H. J., Phœnix Chemical Works, Hackney Wick, E., Manufacturing Chemist.
O.M. Barnes, Jos., Green Vale, Westhoughton, near Bolton, Lancashire, Analytical Chemist.
1884. Barnes, Jonathan, 301, Great Clowes Street, Manchester, Analytical Chemist.
1902. Barnett, Marcus S., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Sugar Works Chemist.
1897. Barnett, Robt. E., Leeds Technical School, Cookridge Street, Leeds, Headmaster.
1898. Barnicott, Jas. A., Messrs. May and Baker, Ltd., Garden Wharf, Church Road, Battersea, S.W., Chemical Manufacturer.
1901. Barr, Geo., P.O. Box 41, Providence, R.I., U.S.A., Calico Printer.
O.M. Barr, J., Dinting Vale, Dinting, near Manchester, Chemical Manager.
1890. Barraclough, Wm. H., Mortomley, near Sheffield, Analytical Chemist.
1900. Barralet, Edgar S., 4, Kenyon Mansions, Queen's Club Gardens, W. Kensington, W. Chemist.
1896. Barratt, J. Treeby, White Lead Works, Morden Wharf, E. Greenwich, S.E., Chemist and Manager.
1890. Barrett, Arthur A., 5, Strada del Pozzo Leone, Messina, Sicily, Manufacturer of Essential Oils.
1890. Barrie, D. McLaurin, Analytical Chemist.
1900. Barrow, Jos., 13, The Grove, Bebington, Cheshire, Chemist.
1898. Bartlett, Saml. A., c/o The Commercial Development Corporation, 31, Castle Street, Liverpool, Secretary.
1893. Barton, G. E., c/o Whitall, Tatum, and Co., Flint Glass Works, Millville, N.J., U.S.A., Technical Chemist.
1900. Barton, L. Edward, 283—285, Broadway, Albany, N.Y., U.S.A., Chemist.
1903. Bartripp, Geo. F., 31, Albert Road, Walthamstow, Essex, Analytical Chemist.
1895. Baskerville, Dr. Chas., University of North Carolina, Chapel Hill, N.C., U.S.A., Professor of Chemistry.
1884. Bassett, H., 26, Belitha Villas, Barnsbury, N.
1899. Bassett, Wm. H., Torrington, Conn., U.S.A., Chemist.
1890. Bate, William, c/o National Explosives Co., Ltd., Hayle, Cornwall, Technical Chemist.
1903. Bates, C. O., Cedar Rapids, Iowa, U.S.A., Teacher of Chemistry.
1884. Bateson, Percy, Cuckoo Lane, Gateacre, near Liverpool, Technical Chemist.
1885. Batty, R. B., Wharncliffe, Erdington, near Birmingham, Nickel Works Manager.
1900. Battye, Charles, Meltham, Swanston Street, South Geelong, Victoria, Australia, Lecturer on Chemistry.
1900. Baur, Jacob, 76—82, Illinois Street, Chicago, Ill., U.S.A., Liquid Carbonic Acid Manufacturer.
1898. Baxter, John G., c/o Mrs. Kitchell, Cemetery Lodge, Heckmondwike, Yorks, Chemist.

O.M. Baxter, W. H., Nuthurst, Streatham, S.W., Brewery Director.
1893. Bayly, Francis W., Royal Mint, Sydney, N.S.W., Australia, Assayer.
O.M. Baynes, J., Royal Chambers, Scale Lane, Hull, County and Borough Analyst.
1897. Beadle, Alec A., Greenheys, Granville Road, High Barnet, Herts., Electro-Chemist.
1886. Beadle, Clayton, Melrose, Hatherley Crescent, Sidcup, Kent, Consulting Chemist.
1890. Bealey, Adam C., c/o R. Bealey & Co., Radcliffe, Lancashire, Bleacher and Alkali Manufacturer.
O.M. Beanes, E., Moatlands, Paddock Wood, Kent, Manufacturing Chemist.
1883. Beaven, E. S., 5, Boreham Terrace, Warminster, Wilts, Maltster.
1897. Beaver, Chas. J., Somerleyton, Sherwood Avenue, Sale, Cheshire, Chemist.
1895. Bechi, G. de, c/o Messrs. W. Blythe and Co., Church, Lancs., Chemical Engineer.
1898. Beck, Herbert H., 105, South Queen Street, Lancaster, Pa., U.S.A., Chemist.
O.M. Beckett, G. H., Glendye Cottage, Stevenston, Ayrshire, Analytical Chemist.
1898. Beckett, Jos. H., 3, Leaback Avenue, Egremont, Cheshire, Analytical Chemist.
1899. Bedford, Alf. C., 26, Broadway, New York City, U.S.A., Chemical Merchant.
1891. Bedford, Chas. S., Broomleigh, Chapel Lane, Headingley, Leeds, Manufacturing Chemist.
1891. Bedford, Jas. E., Messrs. Wood and Bedford, Airedale Chemical Works, Leeds, Manufacturing Chemist.
O.M. Bedson, Prof. P. Phillips, Durham College of Science, Newcastle-on-Tyne, Professor of Chemistry.
1901. Beebe, Murray C., Nernst Lamp Co., Pittsburg, Pa., U.S.A., Engineer.
1901. Beevers, Clifford J., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Analyst.
1899. Behr, Dr. Arno, Pasadena, Cal., U.S.A., Chemist.
1902. Behrend, Dr. Otto F., Hammermill Paper Co., Erie, Pa., U.S.A., Vice-President.
O.M. Beilby, G., 11, University Gardens, Glasgow, Chemical Engineer.
1902. Bek, Lars P., Colonial Sugar Refining Co., Ltd., Pyrmont Refinery, Sydney, N.S.W., Australia, Analytical Chemist.
1884. Bell, C. Lowthian, Free Library, Middlesbrough-on-Tees, Soda and Iron Manufacturer.
1902. Bell, Edwin L., Vidal Dyes Syndicate, Ltd., West Ferry Road, Millwall, E., Manager.
1900. Bell, Hugh P., 30, Egerton Crescent, London, S.W., Chemist.
O.M. Bell, J. Carter, Bank House, The Cliff, Higher Broughton, Manchester, Public Analyst.
1886. Bell, J. Ferguson, Derby Gas Light and Coke Co., Derby, Gas Engineer.
O.M. Bell, Sir Lowthian, Bart., F.R.S., (Journals) Rounton Grange, Northallerton; and (subs.) c/o Bell Bros., Middlesbrough, Iron and Chemical Manufacturer.
1884. Bell, T. Hugh, Middlesbrough-on-Tees, Soda and Iron Manufacturer.
1902. Bement, Alburto, 218, La Salle Street, Chicago, Ill., U.S.A., Chemical Engineer.
O.M. Bendix, D., The British Alizarin Co., Limited, Silvertown, Victoria Docks, E.; Journals to 371, Romford Road, Forest Gate, E., Managing Chemist.
1898. Bendixen, Julius C., 61, Trafalgar Road, Old Kent Road, S.E., Leather Manufacturer.
1897. Benfey, Dr. Hans, 2, Sunnyside Terrace, Clayton, Manchester, Manufacturing Chemist.
O.M. Benger, F. B., The Grange, Knutsford, Cheshire, Manufacturing Chemist.
1903. Benham, Keith, Deans Hill, Stafford, Analytical and Consulting Chemist.
1902. Benjamin, Albert, c/o Thos. Hardcastle and Sons, Ltd., Firwood Works, Bolton, Colorist and Dyer.
O.M. Benjamin, Dr. M., Smithsonian Institution, Washington, D.C., U.S.A., Consulting Chemist, A.M.
1899. Bennett, Alex. H., Chemical Laboratory, 39, Lime Street, E.C., Works Chemist.
1901. Bennett, Arnold, c/o Saml. Osborn and Co., Clyde Steelworks, Sheffield, Chemist.
1884. Bennett, Thos., Birch Vale, near Stockport, Calico Printer.
1902. Bennie, P. McN., International Acheson Graphite Co., 48, Rue de Malte, Paris, Foreign Representative.
1901. Bentley, Wm. H., 6, Woodbine Terrace, Irlam, near Manchester, Technical Chemist.
1890. Bentz, Ernest, 107, Shaw Lane, Dinting, near Manchester, Lecturer on Dyeing.
1897. Berg, Julius, Elsässischer Petroleum Geselischaft, Waburg, Elsass, Germany, Oil Refinery Manager.
1884. Beringer, J. J., Basset Road, Camborne, Cornwall, Metallurgist.
1893. Berk, Fred. W., 1, Fenchurch Avenue, London, E.C., Chemical Manufacturer.
1903. Berkeley, Dr. Wm. N., San Juan, Puerto Rico, U.S. West Indies, Chemist.
1900. Bermingham, Jno., jun., c/o California Powder Works, Pinole, Contra Costa Co., Cal., U.S.A., Powder Works Superintendent.
1889. Bernard, Jas., jun., Casal das Rolas, Olivaes, near Lisbon, Chemical Works Manager.
O.M. Bernays, J., 96, Newgate Street, London, E.C., Civil Engineer.
1900. Berolzheimer, D. D., 317, South 18th Street, Philadelphia, Pa., U.S.A., Chemist.
1897. Berry, Albert E., 95, Osborne Road, Forest Gate, Essex, Works Manager.
1883. Berry, E. E., Bordighera, Italy, Technical Chemist.
1889. Berry, G. F., Atlas Chemical Works, West Ferry Road, Millwall, E., Chemical Works Manager.
1903. Berry, W. G., 329, West 83rd Street, Manhattan Borough, New York City, U.S.A., Chemist.
1898. Berwick, D. C., 62, Trinity Road, West Bromwich, and (Journals) c/o Chance Bros. & Co., Ltd., Glass Works, near Birmingham, Electro-Metallurgist.
1900. Best, Alf. W., 177, Cowley Road, Oxford, Sugar Planter.
1886. Best, Dr. T. T., Hardshaw Brook Chemical Works, St. Helens, Lancashire, Technical Chemist.
1901. Betts, Anson G., Troy, N.Y., U.S.A., Chemist.
O.M. Bevan, E. J., 4, New Court, Lincoln's Inn, London, W.C., Public Analyst and Consulting Chemist.
1900. Bevan, Jno. W., Risedale, St. James' Crescent, Swansea, Manager of Metallurgical Works.
O.M. Beveridge, Jas., "The Gables," Alderley Edge, Cheshire; and (Journals) c/o The Cushing Sulphite Fibre Co., Ltd., St. John, N.B., Canada, Pulp and Paper Manufacturer.
1900. Bevington, Col. S. B., 42, St. Thomas Street, Southwark, S.E., Leather Dresser.
1893. Bhaduri, Prof. K., Canning College, Lucknow, India, Professor of Chemistry.
1898. Bhattacharyya, Haripada, Foundry and Shell Factory, Cossipore, Calcutta, India, Chemist.
1896. Bibby, John, c/o J. Bibby & Sons, Formby Street, Liverpool, Student.
O.M. Bickerdike, W. E., Bryer's Croft, Wilpshire, near Blackburn, Manufacturing Chemist.
1895. Bicknell, G. Arthur, 839, East Madison Avenue, Cleveland, Ohio, U.S.A., Analytical Chemist.
1901. Bielecki, Dr. Jan, "Chemik Polski," 118, Marszalkowska Street, Warsaw, Russian Poland, Chemist.
1903. Bierwirth, L. W., Rock Grove House, Pompton Lakes, N.J., U.S.A., Civil Engineer (Laflin and Rand Powder Co.).
1884. Biggart, J. Wm., 29, Cathcart Street, Greenock, N.B., Analytical Chemist.
1891 Biggart, Wm. L., c/o Western Chemical Co., Inchgreen Street, Bogston, Greenock, Public Analyst.
O.M. Biggs, B., 110, Cannon Street, London, E.C., Chemical Merchant.
O.M. Billing, H. S., 11, Devon Terrace, Ford Park, Plymouth, Analytical and Managing Chemist.

18[illegible]. Billings, Edgar F., 404, Atlantic Avenue, Boston, Mass., U.S.A., Manufacturing Chemist.

1896. Billington, Chas., jun., Studleigh, Longport, Staffordshire, Metallurgist.

1898. Binney, Harold, Washington Life Building, 141, Broadway, New York City, U.S.A., Patent Lawyer.

1902. Binning, Stevenson, 101, Shooter's Hill Road, Blackheath, S.E., Technical Chemist.

1896. Bird, Arthur W., 10, Norfolk Square, London, W., Works Engineer.

1896. Bird, Jno. B., Minver House, 61, Bateman Street, Cambridge, Manure Manufacturer.

1903. Bird, Thos., 59A, Brook Street, Grosvenor Square, London, W., Surgeon.

1902. Bird, W. Robt., 217, Newport Road, Cardiff, Oil Merchant.

1895. Bird, Wm. R., (communications) 125, Goddard Avenue; (Journals) Laboratory, G.W.R. Works, Swindon, Wilts, Analytical Chemist.

1885. Birley, R. K., c/o Chas. Macintosh and Co., Ltd., Cambridge Street, Manchester, India-rubber Manufacturer.

1895. Bischoff, Dr. Ernst, 87–89, Park Place, New York City, U.S.A., Chemist.

1883. Bishop, A. Conway, Three Mills Lane, Bromley-by-Bow, E., Manufacturing Chemist.

1884. Bishop, Fred, c/o Burmah Oil Co., Rangoon, Burmah, Technical Chemist.

O.M. Bishop, G. A., Gartverrie Fireclay Works, Glenboig, N.B., Mining Engineer.

1903. Bishop, Howard B., 609, Greene Avenue, Brooklyn, N.Y., U.S.A., Chemist.

1902. Black, Walter G., 9, Routh Road, Wandsworth Common, S.W., Chemist.

1894. Blackmore, H. S., 206, South Ninth Avenue, Mount Vernon, N.Y., U.S.A., Chemist (Pure Aluminium and Chemical Company).

1899. Blackwell, G. G., 44–47, The Albany, Liverpool, Mineral and Metal Merchant.

1896. Blagden, Victor, 50–51, Lime Street, London, E.C., Chemical Merchant.

1883. Blagden, W. G., 4, Fenchurch Avenue, London, E.C., Chemical Merchant.

1897. Blair, Andrew A., 406, Locust Street, Philadelphia, Pa., U.S.A., Analytical Chemist.

1884. Blake, Jas., Thames Sugar Refinery, Silvertown, London, E., Sugar Refinery Manager.

1902. Blakemore, Geo. H., Great Cobar Copper Mine, Cobar, N.S.W., Australia, Metallurgist.

1890. Blakey, A. J., Dudbridge Mills, Stroud, Gloucestershire, Dyer.

1891. Blass, Edw., Essen (Ruhr), Germany, Civil Engineer.

1893. Blears, John, c/o Langworthy Bros. and Co., Lim., Greengate Mills, Salford, Dyer and Calico Printer.

O.M. Bles, A. J. S., 32, Chorlton Street, Manchester, Chemical Merchant.

1889. Bloede, Victor G., Station D., Baltimore, Md., U.S.A., Manufacturing Chemist.

1891. Bloomer, Fred. J., Penpont, Clydach, R.S.O., Glamorgan, Technical Chemist and Nickel Works Manager.

1886. Blount, Bertram, Chemical Laboratory, 2, Broadway, Westminster, S.W., Analytical Chemist.

1888. Bloxam, A. G., Birkbeck Bank Chambers, Chancery Lane, W.C., Analytical Chemist.

1890. Bloxam, W. Popplewell, c/o Indigo Improvements Syndicate, Dalsingh Serai, Tirhoot, Bengal, India, Research Chemist.

1902. Bluman, Nicholas J., 46, Sunderland Road, Forest Hill, S.E., Student of Chemistry.

1903. Blumenthal, Lionel, Crumpsall Vale Chemical Works, Blackley, near Manchester, Chemist.

1886. Blundstone, E. R., 14, Great Smith Street, Westminster, S.W., and (Journals) Heathfield, Park Road, Hampton Hill, Middlesex, Consulting and Analytical Chemist.

O.M. Boake, A., Warton Road, Stratford, E., Manufacturing Chemist.

1888. Boake, Edmund J., Aberffraw, Nursery Road, Loughton, Essex, Manufacturing Chemist.

1885. Board, J. T., Distillery, Cheese Lane, Bristol, Distiller.

1899. Boehm, Fred., 16, Jewry Street, London, E.C., Chemical Agent and Merchant.

1900. Böhm, Dr. L. K., 320, Broadway, New York City, U.S.A., Expert in Patent Law.

1898. Bogert, Prof. Marston T., Department of Organic Chemistry, Columbia University, New York City, U.S.A., Instructor in Organic Chemistry.

1901. Bolton, E. Richards, Manufacturing Chemist.

1892. Bookman, Dr. S., 9, East 62nd Street, New York City, U.S.A., Chemist.

1888. Boor, Leonard G., 39, Mincing Lane, London, E.C., Chemical Merchant.

1896. Boot, John C., Klatten, Java, Netherlands Indies, Chemist.

1894. Booth, Robt., 110, Cannon Street, London, E.C., Engineer.

1891. Boothby, Chas., Woolnough, Vicarage Road, Lea Bridge Road, London, E., Analytical Chemist.

1897. Borland, C. R., Oakland, Bergen Co., N.J., U.S.A., Chemist (Powder Works).

O.M. Borland, W. D., Beacon Lodge, Bean, *viâ* Dartford, Kent, Explosives Chemist.

O.M. Bothamley, C. H., Hurst Knoll, Weston-super-Mare, Somerset, County Director of Technical Instruction.

1890. Bott, Dr. W. Norman, 14, Great Smith Street, Westminster, S.W., Science Lecturer.

1884. Böttinger, Dr. H. T., Elberfeld, Germany; and (subs.) c/o The Bayer Co., Ltd., 19, St. Dunstan's Hill, E.C., Colour Manufacturer.

O.M. Bottle, Alex., 4, Godwyne Road, Dover, Pharmaceutical Chemist.

1901. Bottomley, Dr. J. Frank, 21, Wentworth Place, Newcastle-on-Tyne, Consulting Chemist.

O.M. Boulton, H. E., 64, Cannon Street, London, E.C., Chemical Manufacturer.

1890. Boulton, James, Crayford Mills, Stratford, E., Manufacturing Chemist.

O.M. Boulton, S. B., 64, Cannon Street, London, E.C., Chemical Manufacturer.

1883. Boulton, T. S., 14, Freegrove Road, Caledonian Road, N., Manager.

1900. Bourcoud, Augustin E., Gijón, Spain, Civil Engineer.

1902. Bousfield, E. Geo. P., St. Switbin's, Hendon, N.W., Electro-Chemist.

1884. Bow, R. H., 7, South Gray Street, Edinburgh, Civil Engineer.

1885. Bowen, S. B., Brickfield Chemical Works, Llanelly, South Wales, Chemical Manufacturer.

1899. Bowen, Wm., 45, Woodend Road, Erdington, Birmingham, Chemist.

1888. Bower, Frank, Truman's Brewery, Spitalfields, E., Analytical Chemist.

1897. Bower, Wm. H., 29th Street and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemical Manufacturer.

1892. Bowes, Harry, 53, Moss Bank, Higher Crumpsall, Manchester, Analytical Chemist.

1889. Bowing, Jno., Fuel Works, Tilbury, Essex, Consulting Chemist.

1883. Bowley, Jos. John, Wellington Works, Battersea Bridge, London, S.W., Chemical Manufacturer.

1899. Bowley, J. Plunkett, 1, Wellington Road, Battersea, S.W., Varnish Manufacturer.

1883. Bowman, Dr. F. H., Spinningfield, Deansgate, Manchester, Chemical Manufacturer.

1894. Bowman, Jas. H., Canada Chemical Manufacturing Co., London, Ont., Canada, Professor of Chemistry.

1884. Bowman, R., Cynwyd, near Corwen, N. Wales, Chemical Manufacturer.

1896. Bowman, Walker, 39, Cortlandt Street, New York City, U.S.A., Chemist.

1899. Bowtell, Norman E., Hazeldean, Heath Road, Runcorn, Cheshire, Works Chemist.

1893. Boyce, Frank, c/o Goodall, Backhouse, and Co., White Horse Street, Leeds, Technical Chemist.
1884. Boyd, Pythagoras, 6, Union Street, North Adams, Mass., U.S.A., Print Works Superintendent.
O.M. Boyd, W., P.O. Box 1829, Johannesburg, South Africa, Technical Chemist.
1899. Boyes, Herb. J., Rio de Janeiro Flour Mills, Ltd., Caixa do Correio 574, São Paulo, Brazil, Chemist.
1902. Brach, Dr. Ludwig K., c/o Dr. S. Brettenfeld, 180, East 75th Street, New York City, U.S.A., Chemist and Colourist.
1885. Bradburn, J. A., 401, Lowell Avenue, Syracuse, N.Y., U.S.A., Chemical Engineer.
1883. Bradbury, A., Queen Buildings, 11, Dale Street, Liverpool, Chemical Broker.
1902. Bradbury, S., Thornham New Road, Castleton, Manchester, Chemist.
1898. Bradford, Ernest, Ohio State University, Columbus, Ohio, U.S.A., Metallurgical Chemist.
1895. Bradford, Henry, c/o W. H. Gorringe, Aberfeldy, Southwick, near Brighton, Analytical Chemist.
1894. Bradley, Edw. F., The Star Brush Co., Ltd., Eden Grove, Holloway, N., Engineer.
1896. Bragg, Everett B., 1116, Michigan Avenue, Evanston, Ill., U.S.A., Manufacturing Chemist.
1891. Braithwaite, Isaac, Kendal, Westmoreland, Drysalter.
1897. Braithwaite, Jno. O., Hilika, Warren Road, Chingford, Essex, Pharmaceutical Research Chemist.
1897. Brakes, Jas., c/o Chateaugay Ore and Iron Co., Lyon Mountain, N.Y., U.S.A., Analytical Chemist.
O.M. Bramham, W., 86, Bow Road, London, E., and (communications) 115, Broadhurst Gardens, West Hampstead, London, N.W., Chemical Engineer.
O.M. Bramwell, Major E., Chemical Works, St. Helens, Lancashire, Chemical Manufacturer.
1883. Bramwell, Sir F., Bart., F.R.S., 5, Great George Street, Westminster, S.W., Civil Engineer.
O.M. Bramwell, G. H., Cowley Hill, St. Helens, Lancashire, Alkali Manufacturer.
1900. Brandwood, John, 175, Walshaw Road, Bury, Lancashire, Dyeworks Manager.
1902. Branegan, Jas. Aug., 4,523, North Uber Street, Philadelphia, Pa., U.S.A., Chemical Salesman.
O.M. Branson, F. W., Wynneholme, Far Headingley, Leeds, Pharmaceutical Chemist.
1901. Brearley, Harry, 53, Bower Road, Sheffield, Analytical Chemist.
1888. Breffitt, Wm., Glasshoughton, Castleford, Yorks, Glass Manufacturer.
1888. Bressey, Edw., 209, Romford Road, Stratford, E., Gold and Silver Refiner.
1901. Brewer, Dr. C. E., Wake Forest, N.C., U.S.A., Professor of Chemistry.
1900. Brewis, E. Theodore, 7, Cowper Street, Finsbury, E.C., Chemist.
1894. Breyer, Theodor, 105, Main Street, Peoria, Ill., U.S.A., Chemist (American Glucose Co.).
1885. Briant, L., 24, Holborn Viaduct, London, E.C., Analytical Chemist.
1890. Brierley, J. T., Highfield, Golden Hill, Leyland, near Preston, Lancs., Analytical Chemist.
1894. Briggs, J. Burnett, Vauxhall Soap Works, 6, Blackstock Street, Liverpool, Soap Manufacturer.
1893. Briggs, J. F., 12, Salisbury Road, Maidstone, Sugar Works Chemist.
1885. Briggs, T. Lynton, 188, Central Avenue, Flushing, Long Island, N.Y., U.S.A., Technical Chemist.
1886. Briggs, Wm., 13, Panmure Street, Dundee, Manufacturing Chemist.
1890. Brindley, G. F., c/o Niagara Electro-Chemical Co., Niagara Falls, N.Y., U.S.A., Chemical Engineer.
1903. Brinker, A. C., Camp Bird Mills, Ouray, Colo., U.S.A., Assayer and Chemist.
1891. Bristed, John, c/o Minnett and Co., Stansted, Essex, Manager.
1886. Bristow, G. W., 10, Philpot Lane, London, E.C., Chemical Manager.
1887. Broadbent, H., c/o Goodall, Backhouse, & Co., Sovereign Street, Leeds, Chemist.
1896. Broadhurst, W. Homer, 294, Lafayette Avenue Brooklyn, N.Y., U.S.A., Chemist.
1889. Brock, Arthur, Firework Factory, Sutton, Surrey, Firework Manufacturer.
O.M. Brock, J., Gwern-Tyno, Colwyn Bay, North Wales, Chairman of United Alkali Co., Ld.
1896. Brooke, C. B., jun., Colne House, Brantham, near Manningtree, Xylonite Manufacturer.
1900. Brooke, Jno. R., 36-37, Mincing Lane, London, E.C., Chemist.
1881. Brookes, E. A., c/o The Chilian Mills Co., Ltd., Chiguayante, Concepcion, Chile, Analytical Chemist.
1895. Brookman, Fred. W., 6, West Street, Rochdale, Manure Works Manager.
1893. Broome, F.S.J., Leaholme, Holloway, near Matlock Bath, Derbyshire, Assayer.
1901. Broome, Jos., 38, West 35th Street, Bayonne, N.J., U.S.A., Chemical Engineer.
O.M. Brotherton, E. A., M.P., Commercial Buildings, Leeds, Ammonia Distiller.
1884. Brown, Prof. A. Crum, F.R.S., 8, Belgrave Crescent, Edinburgh, Professor of Chemistry.
1902. Brown, A. H., Deloro, Ont., Canada, Metallurgist.
1891. Brown, Cæsar R., 23, Gower Road, Forest Gate, E., Works Foreman.
O.M. Brown, D., 93, Abbey Hill, Edinburgh, Chemical Manufacturer.
O.M. Brown, D., Donaghmore, Tyrone, Ireland, Soap Manufacturer.
1890. Brown, Edw. Hilton, c/o W. Ropes and Co., St. Petersburg, Russia, Analytical Chemist.
1894. Brown, Geo. E., c/o The Photogram, Ltd., Effingham House, Arundel Street, Strand, London, W.C., Chemist.
O.M. Brown, Henry, Cannon Brewery, Watford, Herts, Brewing Chemist.
1899. Brown, Dr. Henry C., The Chemical Works, King's Lynn, Chemical Manufacturer.
O.M. Brown, Dr. Horace T., F.R.S., 52, Nevern Square, Kensington, S.W., Brewing Chemist.
O.M. Brown, Dr. J. Campbell, 8, Abercromby Square, Liverpool, Professor of Chemistry.
1891. Brown, J. Henry, Minas d'Aljustrel Alemtejo, Portugal, Technical Chemist.
1901. Brown, Jos., Ashleigh House, Savile Town, Dewsbury, Manufacturing Chemist.
1892. Brown, Reginald B., (Journals) Uplands, Sanderstead Hill, South Croydon; (communications) Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhein, Germany, Dyer's Chemist.
1889. Brown, Robt., The Firs, Hartford, Northwich, Engineer.
1890. Brown, R. J., Technical School, Stockport, Principal.
1901. Brown, Samuel B., Loveclough, Rawtenstall, Lancashire, Calico Printer's Manager.
O.M. Brown, T., Skopelos, Hunstanton, Chemical Manufacturer.
O.M. Brown, Walter, c/o Jas. H. Dennis and Co., Ltd., Widnes, Technical Chemist.
1900. Brown, Walter B., c/o Nelson, Morris, and Co., U.S. Yards, Chicago, Ill., U.S.A., Chemist.
1897. Brown, Wm., 293, Great Clowes Street, Higher Broughton, Manchester, Engineer.
1901. Browne, Dr. Arthur L., 13-15, North Street, Baltimore, Md., U.S.A., Analytical Chemist.
1903. Browne, Dr. Chas. A., jun., Audubon Park, New Orleans, La., U.S.A., Sugar Chemist.
O.M. Browning, W., Broad Oak, Accrington, Calico Printer.
1901. Brownlie, David, 11, Langford Road, Heaton Chapel, near Manchester, Chemist.
1902. Brownrigg, Marcus P., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Analytical Chemist.
1902. Brownsdon, Dr. H. W., 62, Wellington Road, Charlton, S.E., Works Chemist.
1902. Bruce, Alex., Laboratory, Hyde Park Corner Colombo, Ceylon, Chemist.

1890. Bruce, Jas., Vauxhall Distillery, Liverpool, Distiller.

1900. Bruce, Wm. T., c/o Hugh Wallace and Co., Ltd., 5, Fenchurch Street, London, E.C., Director.

1892. Bruckmann, G. T., 192, 18th Street, Brooklyn, N.Y., U.S.A. Chemical Engineer.

O.M. Brunner, H., Holly Mount, Tarbock Road, Huyton, near Liverpool, Chemical Manufacturer.

1894. Brunner, H. Bertram, Winnington Park, Northwich, Chemist and Electrician.

1887. Brunner, J. F. L., 23, Wetherby Gardens, London, S.W., Chemical Manufacturer.

O.M. Brunner, Sir J. T., Bart., M.P., Druid's Cross, Wavertree, Liverpool, Chemical Manufacturer.

1902. Brunner, Roscoe, c/o Messrs. Brunner, Mond, and Co., Ltd., Northwich, Alkali Manufacturer.

1894. Brunton, J. Dixon, Wire Mill, Musselburgh, N.B., Wire Manufacturer.

1890. Bryce, John Annan, Messrs. Wallace Bros., 8, Austin Friars, London, E.C., Merchant.

1894. Bryce, Thos., Tharsis Mines, Huelva, Spain, Chemist.

1897. Bryson, Jas., Pumpherston Oil Works, Midcalder, N.B., Oil Works Manager.

1892. Buchanan, D. G., Mount Vernon House, Glasgow, and (Journals) c/o Gibbs and Co., Iquique, Chile, Analyst.

1902. Buchanan, Duncan G., 509, Church Street, Toronto, Ont., Canada, Chemist.

1888. Buchanan, Jas., jun., Caledonia Foundry, Brasenose Road, Liverpool, Engineer.

1897. Bucher, Prof. John E., Brown University, Providence, R.I., U.S.A., Assistant Professor.

1897. Buck, Chas. A., 521, Locust Street, South Bethlehem, Pa., U.S.A., Chief Chemist (Bethlehem Iron Co.).

1897. Bucknill, Jno. A., P.O. Box 52, Government Patent Office, Pretoria, Transvaal, Comptroller General of Patents.

O.M. Budden, E. R., 28, Church Row, Hampstead, N.W., Consulting Chemist.

1900. Bull, Dr. Benjamin S., 104, Humber Road, Blackheath, S.E., Technical Chemist.

1902. Bull, Irving C., P.O. Box, 294, Middletown, N.Y. U.S.A., Chemist.

1892. Bull, Johannes C., Athelstone, Havelock Street, Helensburgh, N.B., Chemical Engineer.

O.M. Bullock, J. L., 3, Hanover Street, Hanover Square, London, W., Manufacturing Chemist.

1899. Bult, Herbert J., 18, Billiter Street, London, E.C., Chemist.

O.M. Bumby, H., Coltness Ironworks, Newmains, N.B., Ironworks Manager.

O.M. Bunker, H. E., 19, Napier Street, Toronto, Ont., Canada, Technical Chemist.

1901. Bunting, Henry H., c/o Peruvian Corporation, Ltd., Lima, Peru, Analyst.

1894. Bunting, W. Lightfoot, Forest Bank, Crawshawbooth, near Manchester, Calico Printer.

1893. Burbridge, Jas., India-rubber Mills, Tottenham, N., India-rubber Manufacturer.

1886. Burdekin, G., jun., Park Villa, Prescot Road, St. Helens, Chemical Works Manager.

1896. Burford, Samuel F., The Firs, Kirby Muxloe, near Leicester, Analytical Chemist.

1898. Burge, Chas. H., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analyst.

1889. Bürger, Dr. J., 1, Birch Avenue, Talbot Road, Old Trafford, Manchester, Technical Chemist.

1901. Burgess, Prof. C. F., University of Wisconsin, Madison, Wis., U.S.A., Electro-chemical Engineer.

1889. Burgess, Geo., Hale Road, Ditton, Widnes, Chemist.

1894. Burgess, Herb. E., The London Essence Co., George Street, Camberwell Green, S.E., Chemist.

1889. Burgess, Wm. T., 46, Portland Road, Holland Park, London, W., Analytical Chemist.

O.M. Burghardt, Dr. C. A., Fern Cottage, Alderley Edge, Cheshire, Consulting Chemist.

1902. Burk, W. E., Male High School, Louisville, Ky., U.S.A., Chemist and Teacher.

1902. Burkard, Dr. Ernst, The Heyden Chemical Works, Garfield, N.J., U.S.A., Chemist.

1899. Burkhardt, Dr. G., Valea, Calugareasia, Roumania, Chemist.

1897. Burland, Lt.-Col. Jeffrey H., 824, Sherbrooke Street, Montreal, Canada, Paper and Card Manufacturer.

1896. Burland, Richard O., Bishopgate, Wigan, Manufacturing Chemist.

1900. Burleigh, Wm. F., c/o Murphy Varnish Co., Newark, N.J., U.S.A., Technical Chemist.

1897. Burls, Frank B., 4, Dyers Hall Road, Leytonstone, Essex, Chemist.

1898. Burls, Herbert T., 206, Lewisham High Street, St. John's, S.E., Mechanical Engineer.

1901. Burnand, Sydney, Manbré Saccharine Co., Ltd., Hammersmith, W., Manager.

O.M. Burnard, R., Plymouth Chemical Works, Plymouth, Chemical Manufacturer.

1891. Burnet, Henry K., North Brook Vitriol Works, Bradford, Yorks., Vitriol Maker.

1897. Burnet, Jno. Jas., 18, University Avenue, Glasgow, Architect.

1893. Burnham, J. C., Cordite Factory, Wellington, Nilgiri Hills, India, Analytical Chemist.

1900. Burnside, Chas. F., c/o International Smokeless Powder Co., Parlin, N.J., U.S.A., Chemist.

1890. Burn-Murdoch, J. V., Neuck, Larbert, N.B., Assayer.

1900. Burr, Edmund C., 1722, Vallejo Street, San Francisco, Cal., U.S.A., Manufacturer.

1900. Burr, E. Willard, Alvarado, Alameda Co., Cal., U.S.A., Sugar Manufacturer.

O.M. Burrell, B. A., 5, Mount Preston, Leeds, Analytical Chemist.

1897. Burrell, Loomis, Little Falls, Herkimer Co., N.Y., U.S.A., Manufacturer.

1892. Burrough, Horace, jun., 509, West Lombard Street, Baltimore, Md., U.S.A., Technical Chemist.

1901. Burrows, Dr. Eggleston, Northbourne, Eton Avenue, Hampstead, N.W., M.D.

1888. Burrows, Edw., Belle Vue Road, Low Fell, Gateshead-on-Tyne, Alkali Works Manager.

1901. Burton, Alf., c/o Merchants' Dyeing and Finishing Co., Ltd., 42, Front Street West, Toronto, Canada, Dyer and Finisher.

1903. Burton, Jno., 2, Green Street, Bethnal Green, E., Dye and Chemical Manufacturer.

1889. Burton, Wm., The Hollies, Clifton Junction, near Manchester, Potter's Chemist.

1897. Burwell, A. W., 125, Euclid Street, Cleveland, Ohio, U.S.A., Consulting Chemist.

1885. Bury, J. H., Church Chemical Works, near Accrington, Chemical Manufacturer.

1897. Bush, J. M., c/o W. J. Bush and Co., Ltd., Ash Grove, Hackney, E., Manufacturing Chemist.

O.M. Bush, Baron W. de, c/o W. J. Bush and Co., Ltd., Ash Grove, Hackney, E., Chemical Manufacturer.

1897. Butler, David B., 41, Old Queen Street, Westminster, S.W., Cement Expert.

1890. Butler, Paul, Lowell, Mass., U.S.A., Ammunition Manufacturer.

1885. Butler, Samuel, The Cedars, Compton, Wolverhampton, Brewer.

1886. Butler, W. W., Southfield, Norfolk Road, Edgbaston, Birmingham, Brewer.

O.M. Butterfield, J. C., 79, Endlesham Road, Balham, S.W., Analytical Chemist.

1892. Butterfield, W. J. A., Overdale, Bletchingley, Surrey, Analytical Chemist.

1883. Butt, E. N., 77, Hamilton Terrace, Maida Vale, W., Pharmaceutical Chemist.

1897. Butters, Charles, 28–31, Bishopsgate Street Within, London, E.C., Metallurgist.

1900. Butterworth, Elwell R., c/o Reversible Collar Co., 111, Putnam Avenue, Cambridge, Mass., U.S.A., Chemist.

1902. Butterworth, F. J., P.O. Box 54, Newark, N.J., U.S.A., Chemist.

1892. Buttfield, Horace V., 13, Wellington Road, Bush Hill Park, Enfield, N., Chemical Demonstrator.

O.M. Byard, A. G., c/o Burt, Boulton, and Heywood, Apartado 8, Bilbao, Spain, Technical Chemist.

1899. Byrnes, Eugene A., 918, F. Street, N.W., Washington, D.C., U.S.A., Examiner in Electro-Chemistry.

1893. Byrom, T. H., Laboratory, Wigan Coal and Iron Co., Wigan, Analytical Chemist.

1887. Bythway, M., 44. Lloyd Street, Albert Street, Manchester, Drysalter.

C

1884. Cabot, Godfrey L., 82, Water Street, Boston, Mass., U.S.A., Chemist.

1889. Cadett, Jas., Ashtead, Surrey, Photographic Dry Plate Maker.

1902. Cady, Walter B., c/o Hecla Portland Cement and Coal Co., Bay City, Mich., U.S.A., Chemist.

1901. Cady, Wm. H. 13, North Water Street, Philadelphia, Pa., U.S.A., Colour Chemist.

1891. Caines, G. S. A., 7, Rochester Terrace, Camden Road, London. N.W., Analytical Chemist.

1900. Cairns, Adam, Thistle Rubber Mills, Commerce Street, Glasgow, Manager.

1896. Cairns, F. Irvan, Anaconda, Mont., U.S.A., Metallurgist.

1897. Cairns, Wm., 5, Carlton Place, Glasgow, Plumber.

1891. Caldecott, W. Arthur, Box 67, Johannesburg, Transvaal, South Africa, Metallurgist.

1897. Calder. W. A. S., The Hollies, South Road, Smethwick, Chemical Manufacturer.

1888. Caldwell, Wm., Murray Street, Paisley, N.B., Drysalter.

1891. Calkin, Wm. S., Spring Forge, Pa., U.S.A., Paper Pulp Works Chemist.

1902. Calm, Chas. E., 190, Michigan Street, Chicago, Ill., U.S.A., Manufacturing Chemist.

1901. Calvert, Jos. E., Etna, Allegheny Co., Pa., U.S.A., Analytical Chemist.

899. Calvert, Sidney, State University, Columbia, Mo., U.S.A., Professor of Chemistry.

895. Cambier, Jacob. 910, Spruce Street, Pueblo, Colo., U.S.A., Chemist.

894. Cameron, Alex., Kronthal im Taunus, Germany, Chemical Engineer.

891. Cameron, Jas., 36, Mersey Lane South, Rock Ferry, near Birkenhead, Chemist.

888. Cameron, Peter, Bath Bridge Colour Works, Bristol, Colour Works Manager.

O.M. Cammack, J., 51, Denton's Green Lane, St. Helens. Technical Chemist.

901. Camp, J. M., c/o Carnegie Steel Co., Duquesne, Pa., U.S.A., Chemist.

886. Campbell. Andrew, c/o Burmah Oil Co., Ltd., Rangoon, Burmah, Analytical Chemist.

O.M. Campbell, Archibald, 1, Anson Street, Rugeley, Staffordshire, Technical Chemist.

902. Campbell, Ashley, Colonial Sugar Refining Co., Ltd., Pyrmont Refinery, Sydney, N.S.W., Australia, Analytical Chemist.

899. Campbell, Jas. Eunyce, Hotel Stanwix, Chandler Street, Worcester, Mass., U.S.A., Chemical Engineer.

886. Campbell, John, 75, Hudson Street, New York City, U.S.A., Dye Manufacturer.

901. Campbell, Kenneth F., M.Inst.C.E., 1, Peel Street, Huddersfield, Civil Engineer.

897. Canfield, F. D., jun., 402, Warburton Avenue, Yonkers, N.Y., U.S.A., Sugar Refiner.

893. Cannon, J. C., 12, Western Road, Shoreham, Sussex, Analyst.

O.M. Cannon, M., 25, Stormont Road, Clapham Common, S.W., Vinegar Works Manager.

891. Canziani, Enrico, 3, Palace Green, Kensington, W., Civil Engineer.

891. Carden, Albert J., Lea Valley Distillery, Warton Road, Stratford, E., Distiller.

893. Carey, Arthur, 1, Grassendale Road, Cressington, near Liverpool, Chemist.

O.M. Carey, Eustace, 20, Alexandra Drive, Sefton Park, Liverpool, Chemical Manufacturer.

O.M. Carlile, T., 23, West Nile Street, Glasgow, Chemical Manufacturer.

1895. Carlsson, Hugo, c/o Dominion Iron and Steel Co., Sydney, C.B., Canada, Analytical Chemist.

1883. Carmichael, Dr. H., 176, Federal Street, Boston, Mass., U.S.A., Analytical Chemist.

1896. Carmichael, Herbert, Bureau of Mines, Victoria, British Columbia, Public Analyst and Assayer.

1884. Carmody, Prof. Patrick, Government Laboratory, Port of Spain, Trinidad, Analytical Chemist.

1897. Carnell, Wm. C., c/o Tacony Chemical Works, Bridesbury, Philadelphia, Pa., U.S.A., Chemist.

1899. Carney, Jas. A., West Burlington, Iowa, U.S.A., Division Master Mechanic, C. B. & Q. Railroad.

O.M. Caro, Dr. H., Mannheim, Germany, Technical Chemist.

1900. Carp, B. M. A., Seragi Sugar Estate, Pekalongan, Java, N.E.I., Manager.

1893. Carpenter, C. C., South Metropolitan Gas Co., 709A, Old Kent Road, London, S.E., Civil Engineer.

1900. Carpenter, Frank B., Crenshaw Building, Richmond, Va., U.S.A., Chemist.

1900. Carpenter, Harry B., c/o Lister's Agricultural Chemical Works, Newark, N.J., U.S.A.

1903. Carpenter, H. C. Harold, The National Physical Laboratory, Bushy House, Teddington, Middlesex, Chemist and Metallurgist.

O.M. Carpenter, R. Forbes, Prestwich, Greencroft Gardens, West Hampstead, N.W., Chief Inspector under the Alkali, &c., Works Acts.

1885. Carruthers, J. G., Burnbrae House, Milngavie, N.B., Dyeworks Manager.

1901. Carson, Geo. C., c/o Fred. Hurst, Redding, Shasta Co., Cal., U.S.A., Mining Engineer.

O.M. Carteighe, M., 180, New Bond Street, London, W., Pharmaceutical Chemist.

1902. Carter, Jno. P., 626, South 24th Street, Philadelphia, Pa., U.S.A., Analytical Chemist.

1895. Carter, Stewart F., Windsor Printworks, North Adams, Mass., U.S.A., Technical Chemist.

1886. Carter, W. Chas., Hotel Alfonse, Sydney, Cape Breton, Nova Scotia, Canada, Analytical Chemist.

1889. Carulla, F. J. R., 84, Rose Hill Street, Derby, Chemical Manufacturer.

1902. Catchpole, Albert A., Ravensdeane, Grove Park, Lee, Kent, Works Chemist.

1900. Cathcart, Dr. Wm. R., c/o Schaefer Alkaloid Works, Maywood, N.J., U.S.A., Chemist.

1895. Catlin, Chas. A., 133, Hope Street, Providence, R.I., U.S.A., Chemist (Rumford Chemical Works).

1896. Caven, Robt. M., University College, Nottingham, Lecturer in Chemistry.

O.M. Cawley, G., 29, Great George Street, Westminster, S.W., Chemical Engineer.

O.M. Cawley, J., 278, Passaic Street, Newark, N.J., U.S.A., Analytical Chemist.

1897. Cawley, Thos. A., British Gelatin Works, New Bedford Road, Luton, Beds., Gelatin Manufacturer.

1900. Cayvan, Llewellyn L., 817, Pennsylvania Avenue, Kansas City, Mo., U.S.A., Chemist.

1902. Cerasoli, Alburto, 29, West Kensington Mansions, London, W., Engineer.

1891. Chadwick, Walter M., 24, West 3rd Street, Bayonne, N.J., U.S.A., Chemical Works Manager.

1897. Challen, Matthew B., School of Mines, Daylesford, Victoria, Australia, Assayer.

O.M. Chaloner, G., 30, Weston Park, Crouch End, N., Chemical Lecturer.

1894. Chaloner, G. W., 26, Eagle Wharf Road, Hoxton, N., Chemical Manager.

1901. Chamberlain, G. E., Flat A, 1457, Rokeby Street, Chicago, Ill., U.S.A., Chemist.

1902. Champion, Edmund C., c/o Iola Portland Cement Co., Iola, Kas., U.S.A., Chemist.

O.M. Chance, A. M., Chemical Works, Oldbury, near Birmingham, Chemical Manufacturer.

1883. Chance, J. F., New University Club, St. James' Street, London, S.W., Chemical Manufacturer.

O.M. Chandler, Dr. C. F., Columbia University, West 116th Street, New York City, U.S.A., Professor of Chemistry.

1900. Chandler, Prof. W. H., Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Chemistry.

1893. Chaplin, Dr. Edw. M., Public Analyst's Laboratory, Wakefield, Yorks, Analytical Chemist.

1890. Chapman, Alf. C., 8, Duke Street, Aldgate, E.C., Analytical Chemist.

O.M. Chapman, S., 36, Mark Lane, E.C., Chemical Manufacturer.

1894. Charlier, A. C. J., 54, Hornsey Rise, Crouch End, N., General Manager and Chemist.

1902. Charlton, Thos., 244, Frederick Street, San Francisco, Cal., U.S.A., Manufacturing Chemist.

1900. Chase, March F., c/o Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Chemist.

1889. Chase, R. L., Arnold Printworks, North Adams, Mass., U.S.A., Printworks Chemist.

1894. Chatard, Dr. T. M., , Chemical Engineer.

1900. Chattaway, Wm., Apothecaries' Hall, London, E.C., Consulting Chemist.

1898. Chattock, Herbert E., 23, Apsley Road, Clifton, Bristol, Oilcake Manufacturer.

1901. Cheetham, Howard, 18, St. Ann Street, Manchester, Chartered Patent Agent.

1894. Cheney, J. P., c/o Cheney Bros., South Manchester, Conn., U.S.A., Silk Manufacturer's Chemist.

1885. Cheyne, A. M., c/o Messrs. Burgoyne, 16, Coleman St., E.C., Analytical Chemist.

1899. Child, Josiah F., The London Essence Co., George Street, Camberwell Green, S.E., Technical Chemist.

1902. Chilwell, John, Oakeswell, Wednesbury, Analyst.

1893. Cholerton, A. F., Beech Leigh, Narboro' Road, Leicester, Manufacturing Chemist.

1890. Chorley, Jno. C., Lodge Lane, Bewsey, Warrington, Analytical Chemist.

O.M. Christie, J., Levenfield, Alexandria, N.B., Dyer and Printer.

1903. Christie, John, c/o The British Explosives Syndicate, Ltd., Pitsea, Essex, Analytical Chemist.

1898. Christison, Geo., Cremona, Cambridge Drive, Glasgow, Engineer.

1883. Christy, Thos., The Manor House, Wallington, Surrey; and 4, 10, and 12, Old Swan Lane, London, E.C., Chemical Botanist.

O.M. Chrystal, W. J., Shawfield Works Rutherglen, near Glasgow, Chemical Manufacturer.

O.M. Church, Professor A. H., F.R.S., Shelsley, Kew, Surrey, Professor of Chemistry in the Royal Academy.

1890. Church, Elihu D., jun., 65, Wall Street, New York City, U.S.A., Soda Manufacturer.

1896. Claflin, Alan, Littleton, Mass., U.S.A., Manufacturing Chemist.

1900. Clamer, Guilliam H., 46, Richmond Street, Philadelphia, Pa., U.S.A., Chemist.

1885. Clanahan, H. C., 79, Mosley Street, Manchester, Chemical Merchant.

1901. Clapham, Henry E., Laurel Bank, Wilsden, near Bradford, Yorks., Technical Chemist.

1891. Clapp, Ralph R., c/o Standard Ammonia Co., Ltd., Iceland Wharf, Old Ford, E., Ammonia Works Manager.

1889. Clapperton, J., jun., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Analytical Chemist.

1903. Clare, Henry, 107, Newgate Street, Morpeth, Northumberland, Schoolmaster.

1896. Clark, Donald, Bairnsdale, Victoria, Australia, Director of School of Mines.

1903. Clark, Edmund, 426, Sanford Avenue, Flushing, N.Y., U.S.A., Chemist.

1901. Clark, Herbert Noel, West Ham Gasworks, Stratford, E., Gas Engineer.

O.M. Clark, Dr. J., 138, Bath Street, Glasgow, Analytical Chemist.

1900. Clark, Jno., Broadway Works, Millwall Dock, London, E., Manufacturing Chemist.

1902. Clark, Robt. M., Rockbank, Partickhill, Glasgow, Chemist.

1902. Clark, Wm. Linus, Champion Coated Paper Co., Hamilton, Ohio, U.S.A., Chemist.

1891. Clarke, Goddard, South Lodge, Champion Hill, S.E., Drysalter.

1898. Clarke, J. F. Wyllie, Messrs. J. and R. Tennent, Wellpark Brewery, Glasgow, Brewery Proprietor.

1903. Clarke, Robt. W., Medley House, Rayne, Essex, Analyst.

1897. Clarke, Wm. B., Edison-Swan Electric Works, Ponders End, N., Electro-Chemist.

O.M. Claudet, A. C., 6, Coleman Street, E.C.; and (Journals) 9, Dalehain Gardens, Hampstead, N.W., Metallurgist.

O.M. Claudet, F. G., 181, Willesden Lane, N.W., Assayer and Metallurgist.

1889. Claus, Wm. H., c/o Claus and Ree, Clayton, Manchester, Manufacturing Chemist.

O.M. Clayton, E. G., Chemical Laboratory, 32, Holborn Viaduct, London, E.C., Consulting Chemist.

1895. Clayton, Dr. G. C., Maldon Lodge, Wavertree, Liverpool.

1899. Clayton, Harold, 51, Smallbrook Lane, Westleigh, Lancashire, Colourist and Chemist.

1891. Clayton, J. W., c/o Clayton and Jowett, Ltd., Concert Street, Liverpool, Essence Distiller.

1894. Clayton, Robt. H., 12, Park Avenue, Southport, and (Journals), 37, George Street, Cheetham Hill, Manchester, Chemist.

1893. Clemes, J. H., The Bracken, Newquay, Cornwall.

1886. Cleminshaw, E., Alkali Works, Oldbury, near Birmingham, Technical Chemist.

1883. Clemons, G. H., Cudbear Street, Hunslet Road, Leeds, Dyeware Manufacturer.

1899. Clergue, Francis H., Sault Ste. Marie, Ontario, Canada, Chemical Manufacturer.

1884. Clerk, Dugald, 18, Southampton Buildings, Chancery Lane, W.C., Engineer.

1899. Cleveland, D. B., 116, Olive Street, Cleveland, Ohio, U.S.A., Chemist.

1881. Cliff, Stephen, Wortley, near Leeds, Firebrick Maker.

1900. Clifford, Wm., Glenhurst, Sewage Outfall Works, Wolverhampton, Sewage Works Manager.

1896. Clinch, Jno. W., Eartfield House, Douglas, Isle of Man, Brewer.

O.M. Cloud, T. C., Wallaroo Smelting Works, Wallaroo, South Australia, Metallurgist and Manager.

O.M. Clowes, Prof. F., 40, Craven Street, Charing Cross, W.C.; and The Grange, College Road, Dulwich, S.E., Chief Chemist (L.C.C.).

1886. Clowes, G. A., Woodleigh, Arundel Road, Eastbourne, Brewer and Maltster.

1891. Clutton, J. H., Goring Villas, Burry Port, R.S.O., Carmarthenshire, Assayer.

1900. Clymer, Wm. B., c/o National Carbon Co., Cleveland, Ohio, U.S.A., Chemist.

1899. Coates, Chas. E., jun., Louisiana State University, Baton Rouge, La., U.S.A., Professor of Chemistry.

1888. Coats, Jno. T., 105, Broughton Street, Edinburgh, Manufacturing Chemist.

1893. Cobb, Jno. W., Farnley Ironworks, near Leeds, Technical Assistant to Managing Director.

1894. Coblentz, Dr. Virgil, College of Pharmacy, 115, West 68th Street, New York City, U.S.A., Chemical Lecturer.

1899. Cochran, Alfred, 559, Madison Street, Brooklyn, N.Y., U.S.A., Chemist.

1898. Cochrane, A. Lynde, 55, Kilby Street, Boston, Mass., U.S.A., Clerk (Cochrane Chemical Co.).

1895. Cochrane, Jno., Watford Bridge, New Mills, via Stockport, Calico Printer.

1901. Cockburn, John A., Ardeer, Stevenston, Ayrshire, Analytical Chemist.

1902. Cocking, Allan T., The Grove, Stanford-le-Hope, Essex, Ammunition Manufacturer.
1903. Cofman-Nicoresti, J., 41, Hart Street, Bloomsbury, W.C., Chemist.
1887. Coghill, P. de G., Borax Works, Old Swan, Liverpool, Technical Chemist.
1884. Cogswell, W. B., Syracuse, N.Y., U.S.A., Chemical Engineer.
1899. Cohen, Dr. Hermann, c/o S. Mandle, 3,943, West Pine Boulevard, St. Louis, Mo., U.S.A., Organic Chemist.
O.M. Cohen, Dr. J., Yorkshire College, Leeds, Analytical Chemist.
1900. Cohen, R. Waley, 11, Hyde Park Terrace, London, W., Chemist.
1897. Cohn, Alfred J., c/o Merck and Co., 13-19, University Place, New York City, U.S.A., Chemist.
1901. Cohn, Sigmund, 35, Frankfort Street, New York City, U.S.A., Metallurgical Chemist.
1891. Colby, Albert L., c/o Bethlehem Steel Co., South Bethlehem, Pa., U.S.A., Metallurgical Engineer.
1899. Colby, E. A., Baker Platinum Works, Newark, N.J., U.S.A., Metallurgical Chemist.
O.M. Colby, W. H., Carreg-wen, Aberystwith, Wales.
1893. Colefax, Dr. Arthur, 85, Onslow, London, S.W., Barrister-at-Law.
1893. Coleman, W. H., 4, Sunnyside Terrace, North Road, Clayton, Manchester, Tar Works Chemist.
O.M. Collens, E., Vinegar Works, Stourport, Worcestershire, Vinegar Works Manager.
1887. Collett, J. M., Guy's Cliff, Wotton, Gloucester, Chemical Manufacturer.
1901. Colley, Bernard T., c/o American Smelting and Refining Co., Omaha, Neb., U.S.A., Assayer.
1902. Colley, Hylton H., c/o Prime Western Spelter Co., Gas, Kas., U.S.A., Chemist.
1893. Collin, Dr. C. A., Ferguslie Threadworks, Paisley, N.B., Textile Chemist.
1898. Collingridge, Frank, Warwick Lodge, Hadley, Barnet, Chemist.
1883. Collins, J. H., 702, Salisbury House, Finsbury Circus, London, E.C., Technical Chemist.
1899. Collins, S. Hoare, Durham College of Science, Newcastle-on-Tyne, Agricultural Chemist.
1888. Collins, W. Hepworth, c/o Edw. Wihl & Co., 17, Nicholas Street, Manchester, Analytical Chemist.
1899. Collis, Walter T., Swinford House, Stourbridge, Worcestershire, Chemist.
1891. Colman, Dr. H. G., 27, Stirling Road, Edgbaston, Birmingham, Analytical Chemist.
1892. Colquhoun, Lewis, c/o South African Explosives Co., Modderfontein, Transvaal, Analytical Chemist.
1894. Colquhoun, W., Plas Penyddol, Bersham, near Wrexham, North Wales, Engineer.
1901. Colwell, J. Kear, Finsbury Town Hall, Rosebery Avenue, E.C., Analytical and Consulting Chemist.
1900. Comey, Arthur M., 32, Hawley Street, Boston, Mass., U.S.A., Technical Chemist.
1899. Conant, Francis M., c/o Sanderson and Porter, Mishawaka, Ind., U.S.A., Chemical Engineer.
1901. Connah, Jas., Normanhurst, Park Road, Sidcup, Kent, Government Analyst.
1883. Connor, C. C., 4, Queen's Elms, Belfast, Ireland, Chemist.
1891. Conradson, Pontus H., Galena Oilworks, Franklin, Pa., U.S.A., Analytical Chemist.
1889. Conroy, Dr. Jas. T., 13, Howard Drive, Grassendale, Liverpool, Chemist.
1887. Constable, W. H., Australian Alum Works, Runcorn; (communications) 33, Island Road, Garston, Liverpool, Analytical Chemist.
1902. Converse, W. A., Rooms 27-34, Rialto Building, Chicago, Ill., U.S.A., Chemist.
1891. Coode, J. Charles, 19, Freeland Road, Ealing, W., Civil Engineer.
1902. Cook, Arthur Jas., 167, Richmond Road, Hackney, N.E., Chemist (Cement Works).
1902. Cook, Chas. N., Silver Spring Bleaching and Dyeing Co., Providence, R.I., U.S.A., President.
O.M. Cook, H. J., The Firs, Woodford Green, Essex, Soap Manufacturer.
1888. Cook, Jno. J., Atlas Foundry, St. Helens, Lancashire, Ironfounder.
1899. Cook, R. Anderson, New Brunswick, N.J., U.S.A., Chemist.
1898. Cook, Thos. Alex., East London Soap Works, Bow, E., Soapmaker.
1899. Cook, Walter G., 9, Hendon Lane, Finchley, N., Analytical Chemist.
1894. Cook, Wm. Martyn, 142, Highbury New Park, London, N., Analytical Chemist.
1891. Cooke, Arthur W., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Analytical Chemist.
1901. Cooper, T. S., Beckfoot, Manchester, S.E., Calico Printing Chemist.
1891. Cooper, Walter J., (Communications) c/o South Wales Cement Co., Penarth, Cardiff; and (Journals) The Elms, Lower Penarth, South Wales, Cement Works Manager.
1897. Cooper, Wm. R., Carisbrooke, Upper Tulse Hill, S.W., Electrical Engineer.
1890. Corcoran, Bryan, 31, Mark Lane, London, E.C., Chemical Engineer.
1887. Cordner-James, J. H., Finsbury House, Blomfield Street, London, E.C., Mining Engineer.
1899. Cornelison, Dr. Robt. W., Bloomfield, N.J., U.S.A., Consulting Chemist.
1887. Cornett, Jas. P., Ford Paper Works, Hylton, near Sunderland, Paper Maker.
1903. Corrêa de Brito, Dr. L., Rua do Commercio, 6, Recife, Pernambuco, Brazil, Civil Engineer.
1889. Corrie, David, c/o Nobel's Explosives Co., Ltd., Polmont Station, N.B., Technical Chemist.
1902. Corse, Wm. Malcom, 258, Horton Avenue, Detroit, Mich., U.S.A., Chemist.
1898. Cosby, C. D., Radford House, Home Park Road, Saltash, Cornwall, Mining Engineer.
1894. Coste, J. H., 40, Craven Street, W.C.; and (Journals) 206, Amhurst Road, Hackney, E., Analytical Chemist.
1891. Cotton, W. F., Hollywood Roebuck, Co. Dublin, Gas Works Manager.
1898. Coupe-Annable, H. W., c/o Tungsten and Rare Metals Co., Queen's Road, Battersea, S.W., Chemist.
1894. Court, Heywood, 67, Surrey Street, Sheffield, Analytical Chemist.
1898. Courtney, Samuel, 37, The Mount, Belfast, Ireland, Manager.
1894. Cousins, W. J., 17, Temple Chambers, Temple Avenue, E.C., Consulting Chemist and Director.
1893. Cowan, W. J., 12, Park Avenue, Wood Green, N., Fine Colour Manufacturer.
1894. Coward, Percy, Sewage Disposal Works, Deighton, Huddersfield, Chemist.
1897. Cowburn, Arthur W., 29, Princess Street, Manchester, Chemical Merchant and Analytical Chemist.
1894. Cowburn, W. H., 14, Verulam Street, Upper Parliament Street, Liverpool, Chemical Merchant.
1891. Cownley, A. J., 13, Fenchurch Avenue, London, E.C., Analytical Chemist.
1891. Cowper-Coles, Sherard Osborn, Grosvenor Mansions, Victoria Street, Westminster, S.W., Metallurgical Engineer.
1903. Cox, Harry J., c/o Beggs and Cobb, Winchester, Mass., U.S.A., Superintendent.
1903. Cox, Jno. C., c/o Camp Bird Ltd., Ouray, Colo., U.S.A., Metallurgical Chemist.
1902. Coyle, Benj. C., City Laboratory, 17, Castle Street, Dublin, Analytical Chemsit.
1884. Craig, Geo., Chemical Laboratory, 95, Bath Street, Glasgow, Technical Chemist.
1895. Craig, Thos. J., c/o Messrs. Peter Spence and Sons, Manchester Alum Works, Manchester, Chemist.
1886. Crake, Wm., 394, Staniforth Road, Sheffield, Analytical Chemist.
1901. Crane, Fred. D., 28, Hillside Avenue, Montclair, N.J., U.S.A., Consulting Chemist.

1902. Crane, Jasper E., c/o Arlington Co., Arlington, N.J., U.S.A., Chemist.

1898. Cranfield, Wm., Higher Grade Board School, Halifax, Yorks, Teacher of Chemistry.

1902. Craven, Alfd. B., 91, Fielding Terrace, Armley, Leeds, Analytical Chemist.

1889. Craven, Chas. E., (communications) Oak Villa, Bramley, near Leeds; (Journals) Valley Dyeworks, Brookfoot, Brighouse, Yorks, Dyer.

1899. Craven, Jas., The Netherlands, Broughton Park, Manchester, Chemist.

1891. Craven, Jno., jun., 6, Halliwell Lane, Cheetham Hill, Manchester, Chemist.

1885. Craw, John, 15, Cadogan Street, Glasgow, Drysalter.

O.M. Crawford, D., Langdale's Chemical Manure Co., Lim., St. Laurence, Newcastle-on-Tyne, Manager.

1884. Crawford, D., 12, Abbey Grove, Eccles, Manchester, Dyer and Printer.

1890. Crawshaw, E., 25, Tollington Park, London, N., Dye Merchant.

1900. Crayen, Dr. Gustav, 446, West 23rd Street, New York City, U.S.A.

1895. Cremer, John H., 24, Superior Street, Cleveland, Ohio, U.S.A., Chemist and Metallurgist.

O.M. Cresswell, C. G., Ermyngarth, Ashtead, Surrey; and 9, Bridge Street, Westminster, S.W., Chemist.

1901. Cribb, Cecil, 136, Shaftesbury Avenue, London, W., Analytical and Consulting Chemist.

1886. Crichton, Donald G., (Journals) Nundle, viâ Tamworth, New South Wales; (subs.) Logan Bank, Cupar, Fife, N.B., Analytical Chemist.

1890. Criper, Wm. R., Cossipore Chemical Works, Cossipore, Calcutta, India, Manufacturing Chemist.

1902. Cripps, R. A., The Laboratory, Hayward's Heath, Sussex, Analyst.

1902. Croasdale, Dr. Stuart, 1574, York Street, Denver, Col., U.S.A., Mining Engineer and Metallurgist.

1899. Crombie, Jos. A., 1105, Metropolitan Avenue, Brooklyn, N.Y., U.S.A., Essential Oils Manufacturer.

1898. Crompton, Benj. F., Haigh Dyeworks, near Wigan, Lancs., Dyer.

1885. Crompton, Percy R., Elton Paper Mills, near Bury, Lancashire, Paper Maker.

1901. Cronquist, G. W., Billesholm and Bjuf Coal and Firebrick Co., Bjuf, Sweden, Technical Chemist.

1889. Cronquist, Prof. A., Werner, 5, Malmtorgsgatan, Stockholm, Sweden, Consulting Chemist.

O.M. Crookes, Sir Wm., F.R.S., 7, Kensington Park Gardens, Notting Hill, W., Analytical Chemist.

1899. Crosbie, Adolphe, Walsall Street Chemical Works, Wolverhampton, Chemical and Colour Manufacturer.

1896. Crosby, Thos., Llanelly Steelworks, Llanelly, South Wales, Metallurgist.

O.M. Crosfield, A. L., 46, Bidston Road, Oxton, Birkenhead, Analytical Chemist and Assayer.

1896. Crosfield, Capt. G. R., Volunteer Quarters, Sankey Street, Warrington, Soap Manufacturer.

1884. Cross, C. F., 4, New Court, Lincoln's Inn, London, W.C., Analytical Chemist.

1900. Crosskey, Alex., N., c/o Alloys Syndicate Ltd., New Dock, Llanelly, South Wales, Chemist.

1894. Crossley, Dr. Arthur W., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Organic Chemist.

1900. Crossley, Frank, Duchy Bank, Seedley Road, Pendleton, Manchester, Analytical Chemist.

1902. Crossley-Holland, F. W., 68, Parade, Leamington, Chemist and Druggist.

1892. Crossman, Tom, Albion Brewery, Coldhurst Street, Oldham, Brewing Chemist.

1884. Crow, Dr. J. K., 2, Ulundi Road, Blackheath, S.E., Technical Chemist.

1894. Crow, Henry W., 91, Romford Road, Stratford, E., Tar Distiller.

1902. Crowell, Henry H., Delewanna, N.J., U.S.A., Dyer.

1893. Crowther, Edw., Woodland Dyeworks, Headingley, Leeds, Dyer.

1883. Crowther, Horace W., The Beeches, West Bromwich, Technical Chemist.

1899. Crowther, J., South Australian School of Mines, Adelaide, Metallurgist.

1884. Crowther, W. M., Field House, Gomersal, near Leeds, Manufacturing Chemist.

1884. Crumbie, W. D., 146, Washington Street, East Orange, N.J., U.S.A., Analytical Chemist.

1902. Crush, E. H., 17, Foyle Road, Westcombe Park, Blackheath, S.E., Technical Chemist.

1903. Cullen, W. H., The Castner-Kellner Alkali Co., Ltd., Weston Point, near Runcorn, Cheshire, Engineer.

1892. Cullen, Wm., Dynamite Factory, Modderfontein, Transvaal, Chemist.

1897. Culmann, Dr. Julius, 216, Lancaster Avenue, Buffalo, N.Y., U.S.A., Chemist and Colourist.

1883. Cuming, James, jun., Chemical Works, Yarraville, Melbourne, Australia, Manure Manufacturer.

1897. Cunliffe, Albert J., Kern Mill Printworks, Whittle-le-Woods, Lancashire, Calico Printer.

1893. Cunningham, Edw., 79, Kilby Street, Boston, Mass., U.S.A., Chemical Engineer.

O.M. Curphey, W. S., Borva, Lenzie, N.B., Alkali Works Inspector.

1902. Currier, Edw. Eug., 15, Ferry Street, Everitt, Mass., U.S.A., Chemist.

O.M. Curry, W. A., Giltbrook Chemical Works, Awsworth, Notts; (Journals) Mount Pleasant, Giltbrook, Notts, Manager.

1898. Curtis, Marvin, 123, California Street, San Francisco, Cal., U.S.A., Wine Chemist.

1903. Cushing, Robt. P., Lock Haven, Pa., U.S.A., Chemist.

1902. Cutbush, Chas. C., 149, Westcombe Hill, Blackheath, London, S.E., Electrical Engineer.

1884. Cuthbertson, Sir J. N., 29, Bath Street, Glasgow, Chemical Broker.

1899. Cutler, Fred. F., 183, Essex Street, Boston, Mass., U.S.A., Publisher.

D

O.M. Dacie, J. C., Soap Works, Putney, London, S.W., Soap Manufacturer.

1897. Dains, Herbert H., 27, Inderwick Road, Stroud Green, N., Analytical Chemist.

1897. Dakin, Henry D., Jenner Institute of Preventive Medicine, Chelsea, S.W., Assistant Analyst.

1887. Dale, Jas., c/o Jas. H. Dale, 1, Dorothy Villas, Cavendish Road, West Croydon, Coppersmith.

1897. Dancer, Wm., 466, Chester Road, Old Trafford, Manchester, Analytical Chemist.

1884. Daniell, Louis C., (Journals) Royal Standard Brewery, Tamworth, New South Wales; and (subs.) c/o W. T. Allen & Co., 132, Queen Victoria Street, London, E.C., Brewer.

1902. Danziger, Jos. L., Columbia University, New York City, U.S.A., Analytical Chemist.

1885. Darby, Jno. H., Brymbo Hall, near Wrexham, Ironmaster.

1894. Darling, G. A., Robinson G. M. Co., Box 1,024, Johannesburg, S.A., Metallurgical Chemist.

O.M. Darling, W. H., 126, Oxford Street, Manchester, Analytical Chemist.

1887. Davenport, Dr. B. F., 161, Tremont Street, Boston, Mass., U.S.A., Consulting, Sanitary, and Toxicological Chemist.

1900. Davidson, Alex., jun., 2, Hamilton Park Terrace, Hillhead, Glasgow, Analytical Chemist.

1899. Davidson, Charles, 37, Heriot Street, Pollokshields, Glasgow, Analytical Chemist.

1901. Davidson, G. M., Chicago & N. W. Railroad Shops, P.O. Station E., Chicago, Ill., U.S.A., Chemist.

1883. Davidson, J. E., 40, Percy Gardens, Tynemouth, Chemical Manufacturer.

1891. Davidson, Richard, 44, High Street, Dundee, Oil Merchant's Clerk.

O.M. Davidson, R. Holden, c/o United Alkali Co., Ltd., Ammonia Soda Works, Fleetwood, Works Manager.
1897. Davies, Charles T., 405, Elm Street, Reading, Pa., U.S.A., Chemist.
1889. Davies, G. W., 8, Spring Hill, Stockport, Chemical Lecturer.
1898. Davies, Herbert E., The Laboratory, 28, Chapel Street, Liverpool, Analytical Chemist.
1898. Davies, Leyshon, 256, West George Street, Glasgow, Gunpowder Mills Manager.
1896. Davies, Llewellyn J., Bute Chambers, Bute Road, Cardiff, Analytical and Consulting Chemist.
1886. Davies, M. Lloyd, North American Chemical Co., Bay City, Mich., U.S.A., Alkali Works Manager.
1897. Davies, Saml. H., c/o H. S. Rowntree and Co., Cocoa Works, York, Research Chemist.
O.M. Davis, A. R., Denby Lodge, Wellington Road, Heaton Chapel, Stockport, Analytical Chemist.
1900. Davis, Arthur C., Saxon Portland Cement Co., Cambridge, Cement Maker.
1901. Davis, Bernard F., c/o W. J. Miller, Saladero Concordia, Concordia, Argentine Republic, Metallurgical Engineer.
1902. Davis, Charles B., c/o Jno. Krieg, 220, West 134th Street, New York City, U.S.A., Technical Chemist.
1902. Davis, Emerson, 515, Cass Avenue, Detroit, Mich., U.S.A., Chemist.
1893. Davis, Fred., 51, Imperial Buildings, Ludgate Circus, London, E.C., Analytical and Consulting Chemist.
O.M. Davis, George E., Sandilands, Knutsford, Cheshire, Chemical Engineer.
1898. Davis, G. Keville, Sandilands, Knutsford, Cheshire, Chemical Engineer.
1893. Davis, Herbert J., 65, Wall Street, New York City, U.S.A., Merchant.
O.M. Davis, H. W., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analytical Chemist.
O.M. Davis, T. Sebastian, 199, South Lambeth Road, London, S.E., Vinegar Works Chemist.
1897. Davis, Wm. A., 55B, Fulham Park Gardens, London, S.W., Chemist.
1893. Davis, W. Walley, Virginia Iron, Coal, and Coke Co., Roanoke, Va., U.S.A., Analytical Chemist.
1900. Daw, Fred W., Eureka Place, Ebbw Vale, Mon., Metallurgical Chemist.
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1896. Dawson, Geo., Holm Lea, Gorton Road, Reddish Stockport, Technical Chemist.
1886. Dawson, W. Haywood, British Alizarin Co., Limited, Silvertown, Victoria Dock, E.; and (Journals) 187, Eglinton Road, Woolwich, S.E., Technical Chemist.
1901. Day, Dr. David T., U.S. Geological Survey, Washington, D.C., U.S.A., Geologist.
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1896. Deakin, E. Carr, Egremont House, Belmont, near Bolton, Dyer.
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1903. Dean, Harry, 21, Greenhead Road, Huddersfield, Chemist.
1899. Deane, Leopold M., Davington House, Faversham, Kent, Chemist (Cotton Powder Co., Ltd.).
1892. Deaville, B., Hyson Green Works, Nottingham, Manufacturing Chemist.
1899. De Castro, J. Paul, Laboratory, Effingham House, Arundel Street, Strand, W.C., Consulting Chemist and Assayer.
1902. De Cew, J. A., c/o Canada Paper Mills, Windsor Mills, Quebec, Canada, Chemist.
1893. De Clerck, Maurice, Heule-lez-Courtrai, Belgium.
1884. Deering, W. H., Chemical Department, Royal Arsenal, Woolwich, S.E., Analytical Chemist.
1900. Deerr, Noel, Mauritius Estates and Assets Co., Ltd., Mauritius, Analytical Chemist.
1902. Deghuée, Dr. Jos. A., 247, Harrison Street, Brooklyn, N.Y., U.S.A., Chemist.
1901. De Jonge, Cornelius, 36, Doughty Street, Brooklyn, N.Y., U.S.A., Pharmaceutical Chemist.
1893. Delahaye, Philibert, 105, Rue St. Lazare, Paris (IX.), Gas Engineer.
1899. Delano, Warren, jun., 1, Broadway, New York City, U.S.A., Mine Operator.
1901. Delany, Chas., c/o Elliott Bros., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Chemist.
1896. De Lessing, G. C., 147, East 81st Street, New York City, U.S.A., Manufacturing Chemist.
1888. Dempsey, Geo. C., 165, Market Street, Lowell, Mass., U.S.A., Chemist.
1899. Denham, Wm. S., 2, Kelvinside Terrace North, Glasgow, Chemist.
1891. Denison, Joseph R., 18, Duckworth Lane, Bradford, Analytical Chemist.
1897. Dennis, John, Ellonville, Dalkeith, N.B., Contractor.
1898. Dent, Dr. Frankland, 10, Plaza del General Santogildes, Burgos, Spain, Consulting Chemist.
1901. Devas, Dr. Ernest W., Westward Ho., Wimbledon Common, S.W., Technical Chemist.
1890. De Velling, F. W., Higher Grade Board School, The Boulevard, Hull, Head Master and Science Lecturer.
1898. Dewar, Alex. H., c/o The Linoleum Manufacturing Co., Staines, Middlesex, Chemist.
O.M. Dewar, Prof. J., F.R.S., Royal Institution, Albemarle Street, W. (Journals); and 1, Scroope Terrace, Cambridge, Professor of Chemistry and Physics.
1894. Dewar, Jno. A., M.P., Murrayshall, Scone, Perthshire, N.B., Distiller.
1889. Dewey, Fred. P., McGill Building, Washington, D.C., U.S.A., Metallurgist.
1899. Dewez, Eugène, jun., Herve, Belgium, Tanner.
1891. De Wilde, Prof. P., 343, Avenue Louise, Brussels, Belgium, Professor of Chemistry.
1886. Dey, Preo Lall, 4, Beadon Street, Calcutta, Manufacturing Chemist.
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1897. Dick, Jno., c/o Jno. Dick, Ltd., 77, York Street, Toronto, Ont., Canada, Manufacturer.
1902. Dick, Jno., Wharf Road, Cubitt Town, London, E., Manager and Chemist.
1898. Dickenson, Frank, 26, O'Connell Avenue, Berkeley Road, Dublin.
1896. Dickenson, F. M., c/o Broken Hill Proprietary Co., 3, Great Winchester Street, E.C., Secretary.
1902. Dickerman, Judson C., 10, Minot Street, Woburn, Mass., U.S.A., Chemical Engineer.
1893. Dickerson, E. N., 15, Wall Street, New York City, U.S.A., Lawyer.
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1887. Dickson, Jno., Easter Fluchter, Baldernock, near Glasgow.
1898. Dickson, Samuel, 2, Broadway, Westminster, S.W., Analytical Chemist.
1899. Dieckmann, Dr. Otto, 1182, Harrison Avenue, Cincinnati, Ohio, U.S.A., Chemist.
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1891. Diestel, Wm., 77, William Street, New York City, U.S.A., Dyestuff Importer.
1898. Dillon, Wm., Laurel Bank, Halton, Leeds, Oil, Colour, and Varnish Manufacturer.
O.M. Divers, Dr. E., F.R.S., 9, Rugby Mansions, Addison Bridge, Kensington, W., Professor of Chemistry.
1903. Divine, Robt. E., Hamburg, Erie Co., N.Y., U.S.A., Chemist.
1899. Dixon, Fred. W., Longfellow House, Wellesley Hills, Mass., U.S.A., Dyer.

1888. Dixon, Prof. Harold B., F.R.S., Owens College, Manchester, Professor of Chemistry.
1885. Dixon, Jos., Spring Grove, near Sheffield, Paper Maker.
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1890. Dodd, A. J., River View, Belvedere, Kent, Oil Refiner.
1902. Dodd, T. H., 6, Granville Park, Blackheath, S.E., Chemist (Royal Arsenal).
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1900. Dodge, Dr. Francis D., c/o Dodge and Olcott, 137, Water Street, Brooklyn, N.Y., U.S.A., Chemist.
1897. Doerflinger, Wm. F., Acker Process Co., Niagara Falls, N.Y., U.S.A., Research Chemist.
1897. Dohme, Dr. Alf. R. L., Messrs. Sharp and Dohme, Baltimore, Md., U.S.A., Manufacturing Chemist.
1885. Doidge, H., 146, Church Street, Pietermaritzburg, Natal.
1897. Dolge, Carl B., Westport, Conn., U.S.A., Manufacturer of Instruments and Antiseptics.
1884. Donald, Jas., 96, Anerley Park, Anerley, S.E., Manufacturing Chemist.
1890. Donald, Samuel, Corporation Gasworks, Dundee, Analytical Chemist.
O.M. Donald, W., Great Oakley, Harwich, Essex, Analytical Chemist.
1900. Donald, Wm., Ridgefield Park, Bergen Co., N.J., U.S.A., Assayer and Chemist.
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1901. Donnelly, Francis, 351, Bridgeman Street, Bolton, Lancs., Manager (Varnish Co.).
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1897. Douglas, Geo., Heather Bank, Bingley, Yorks, Dyer.
1894. Douglas, Loudon M., Baltic Wharf, Putney, S.W., Chemical Manufacturer.
1884. Douglas, William, Diamond Plantation, Demerara, British Guiana, Chemical Engineer.
1900. Doulton, H. Lewis, Lambeth Pottery, London, S.E., Potter.
1902. Doveton, Godfrey D., Cyanide Works, Camp Bird Mills, Ouray, Col., U.S.A., Metallurgist.
1900. Dow, Allan W., 2016, Hillyer Place, Washington, D.C., U.S.A., Chemist (District Engineer's Dept.).
1898. Dow, Herbert H., Midland, Mich., U.S.A., Manufacturing Chemist.
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1902 Dowzard, Edwin, 78, Rawson Road, Seaforth, Liverpool, Analyst.
1901. Doxrud, Christian, Christiania, Norway, Professor of Chemical Technology.
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1886. Dreaper, W. P., Clifton Villa, Coggeshall Road, Braintree, Essex, Technical Chemist.
1901. Dreghorn, David, Greenwood, Pollokshields, Glasgow, Soap Maker.
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1896. Drewsen, Dr. Viggo B., 5, Beekman Street, New York City, U.S.A., Wood Pulp and Paper Expert.
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1887. Drown, Prof. T. M., The Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Analytical Chemistry.
1889. Drummond, Hon. G. A., Montreal, Canada.
1898. Drummond, Dr. Isaac W., 436, West 22nd Street, New York City, U.S.A., Chemist.
1899. Ducas, B. P., 151, Front Street, New York City, U.S.A., Chemical and Dyestuff Importer.
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1902. Duckworth, Wm. H., Fairlawn, Northenden Road, Sale, Cheshire, Manufacturing Chemist.
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1898. Duisberg, Dr. Carl, The Bayer Co., Ltd., (Journals) Elberfeld, Germany, (subscriptions) 19, St. Dunstan's Hill, E.C., Chemist.
1888. Dukes, T. William, Merchant.
1889. Duncan, Arthur W., 42, Trevelyan Street, Eccles, Manchester, Analytical Chemist.
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1898. Dunham, Edw. K., 338, East 26th Street, New York City, U.S.A., Professor of Bacteriology and Hygiene.
1901. Dunham, Henry V., c/o Casein Co., 37, Scheepmakershaven, Rotterdam, Holland, Chemist.
1889. Dunlop, Robt., Orepuki, Southland, New Zealand, Oil Works Manager.
1892. Dunn, Fred., 193, Collins Street, Melbourne, Victoria, Analytical Chemist.
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1901. Dunn, Wm. R., 157, South 6th Street, Easton, Pa., U.S.A., Cement Works Manager.
1902. Dunning, D. M., junr., Auburn, N.Y., U.S.A., Gas Engineer.
1901. Dunsford, Geo., Laboratory, Wigan Coal and Iron Co., Ltd., Wigan, Analytical Chemist.
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1897. Durant, H. T., Rhodesia Goldfields, Ltd., Buluwayo, Matabeleland, South Africa, Chemist.

1897. Durkee, Frank W., Tuft's College, Mass., U.S.A., Assistant Professor of Chemistry.

1899. Duryea, Chester B., 34, Gramercy Park, New York City, U.S.A., Starch Manufacturer.

1891. Duttson, W. H., Southwood, Silverdale, Sydenham, S.E., Merchant.

1899. Du Vivier, Ernest H., 441, West 21st Street, New York City, U.S.A., Chemist.

1891. Dvorkovitch, Dr. P., 6, Willow Bridge Road, Canonbury, N., Technical Chemist.

1903. Dyck, George E., The National Provisioners' Laboratory, 78—80, Broad Street, New York City, U.S.A., Analytical Chemist.

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902. Easterbrooks, Frank D., Raritan Copper Works, Perth Amboy, N.J., U.S.A., Chemist.

884. Eastick, C. E., Preston Lodge, Leytonstone, Sugar Works Manager.

.M. Eastick, J. J., Millaquin Refinery, Bundaberg, Queensland, Sugar Works Manager.

898. Eastick, S. Philip, 25, Woodville Road, Ealing, W., Chemical Engineer.

890. Eastlake, A. W., Caenwood House, Grove Road, Clapham Park, S.W., Petroleum Works Manager.

891. Eastwick, Jos. H., 2216, North 51st Street, Philadelphia, Pa., U.S.A., Chemist.

885. Eastwood, Edw., c/o Lever Brothers, Ltd., Port Sunlight, Birkenhead, Soapmaker.

902. Eastwood, Robert F., 128, Derby Road, Widnes, Chemist.

898. Eavenson, Alban, 2013 Vine Street, Philadelphia, Pa., U.S.A., Soap Works Chemist.

902. Eckel, Edwin Clarence, U.S. Geological Survey, Washington, D.C., U.S.A., Geologist.

892. Eddy, Harrison P., Sewage Purification Works, Worcester, Mass., U.S.A., Superintendent.

901. Eddy, W. Clifton, c/o American Beet Sugar Co., Grand Island, Neb., U.S.A., Superintendent.

894. Ede, Henry E., c/o Copaquire Copper Sulphate Co., Ltd., (Journals) Iquique, Chile; (subscriptions) 101, Leadenhall Street, London, E.C., Analytical Chemist.

885. Edge, Anthony, 79, Milton Street, Readville, Mass., U.S.A., Chemist.

900. Edgerley, Daniel W., Chilton Manufacturing Co., College Point, Long Island, N.Y., U.S.A., Chemist.

903. Edkins, Geo. J., 41, Parkholme Road, Hackney, N.E., Oil Refiner.

902. Edwards, H. Seaton, 19, Park Road, Port Sunlight, Cheshire, Analyst.

893. Edwards, Henry W., c/o Southern Smelting Co., Oakdale, Ga., U.S.A., Metallurgist.

885. Ehrenfeld, Prof. Chas. H., York Collegiate Institute, York, Pa., U.S.A., Professor of Chemistry.

896. Ehrhardt, Ernest F., Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhein, Germany, Research Chemist.

97. Ekenberg, Dr. M., Stockholm, Sweden, Technical Chemist.

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1885. Elborough, T., 59, Mark Lane, London, E.C., Manure Manufacturer.

1901. Elkan, Leo A., 594, Dearborne Avenue, Chicago, Ill., U.S.A., Tanner.

1903. Elkins, Arthur W., 520, Park Avenue, East Orange, N.J., U.S.A., Civil Engineer.

1900. Elliot, Harry T., Elliot's Buildings, Falkirk, N.B., Chemical Student.

1892. Elliot, John, Free Library, Wolverhampton, Librarian.

1884. Elliott, Dr. A. H., Consolidated Gas Co., 4, Irving Place, New York City, U.S.A., Analytical Chemist.

1896. Elliott, Dr. J. F., c/o Grimwade and Co., 82, Bishopsgate Street, E.C.; and (Journals), O'Connell Street, Sydney, N.S.W., Manufacturing Chemist

1902. Elliott, Victor G., Chemical Works, Rozelle, Sydney, N.S.W., Australia, Manufacturing Chemist.

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1893. Ellis, E. Victor, 21, Castle Street, Edinburgh, Analytical Chemist.

1902. Ellis, Frederick R., 15, Shadwell Road, Bishopston, Bristol, Chemist and Druggist.

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1902. Ellis, Wm. G., 31, Wellington Street, Toronto, Ont., Canada, Jeweller.

1891. Ellis, Prof. W. Hodgson, School of Practical Science, Toronto, Ont., Canada, Professor of Applied Chemistry.

1891. Ellison, Henry, Northfield, Cleckheaton, Yorks, Manufacturing Chemist.

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1901. Emerson, Dr. W. H., Georgia School of Technology, Atlanta, Ga., U.S.A., Professor of Chemistry.

1902. Emery, Arthur L., Palo Alto, Cal., U.S.A., Chemical Engineer.

1899. Emery, E. G., c/o N.Y. and St. Louis Mining and Mfg. Co., 302, Roe Buildings, St. Louis, Mo., U.S.A., Chemist.

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1899. Engledue, Col. W. J., 6, Grosvenor Hill, Wimbledon, S.W., Colonel (late) Royal Engineers.

1895. English, Frank H., 217, Strone Road, Manor Park, E., Analytical Chemist.

1899. Enright, Bernard, 330, East 4th Street, South Bethlehem, Pa., U.S.A., Analytical Chemist.

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1886. Ermen, F., jun., Nassau Mills, Patricroft, Manchester, Dyer and Bleacher.

1897. Escher, Paul, c/o Swift & Co., National Stockyards, St. Clair Co., Ill., U.S.A., Chemist.

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1883. Evans, Sir John, K.C.B., F.R.S., Nash Mills, Hemel Hempstead, Herts, Paper Maker.
1889. Evans, R. E., 3, Glencoe, Stratford-on-Avon, Brewing Chemist.
1896. Evans, Dr. Thos., University of Cincinnati, Ohio, U.S.A., Instructor in Technical Chemistry.
1898. Evans, Wm. Perceval, Canterbury College, Christchurch, New Zealand, Professor of Chemistry.
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1903. Evershed, John, Union Oil Mills, Copenhagen Place, Limehouse, E., Chemist.
1894. Ewan, Dr. Thos., 30, Lansdowne Crescent, Kelvinbridge, Glasgow, Chemist (Aluminium Co.).
1892. Exley, Arthur, Braemore, Vesper Road, Kirkstall, Leeds, Tanner.
1901. Eyles, Arthur H., Continental Manufacturing Co., Addingham, Del. Co., Pa., U.S.A., Chemist.

F

1898. Fade, Louis, c/o Deutsche Gold und Silber Scheide-Anstalt, Frankfort a/M., Germany, Chemist and Director.
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1902. Fahrig, Dr. Ernst, Commercial Museum, 233, South 4th Street, Philadelphia, Pa., U.S.A., Chief of Laboratories.
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1891. Fawcett, Jas. H., Federal Metal Agency, Ltd., 1, Leadenhall Street, London, E.C., Metallurgist.
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1903. Fawsitt, Dr. Chas. E., Chemical Department, The University, Edinburgh, Assistant in Chemistry.
1892. Feld, Walther, Chemische Fabrik, Linz a/Rhein, Germany, Chemical Works Director.
1897. Felix, Dr. Lorenz, 53, Rue Petit, St. Denis s/Seine, France, Technical Chemist.
1899. Ferguson Geo., Gleniffer Soap Works, Paisley, N.B., Soap Manufacturer.
1900. Ferguson, Geo. A., College of Pharmacy, 115, West 68th Street, New York City, U.S.A., Professor of Analytical Chemistry.
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1892. Ferguson, Wm. B., K.C., Barrister-at-Law.
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1900. Fillis, Frank, 43, Romilly Road, Barry, Glam., Cement Works Chemist.
1902. Finch, Chas. Allt, 130, King Street, Sydney, N.S.W., Australia, Analytical and Pharmaceutical Chemist.
1899. Fingland, Jno. J., Minas de Aznalcollar, Prov. de Sevilla, Spain, Analytical Chemist.
1892. Finlay, Kirkman, c/o Milne & Co., 123, Bishopsgate Street, London, E.C., East India Merchant.
1899. Finley, Norval H., 6638, Deary Street, Sta. A., Pittsburg, Pa., U.S.A., Chemist.
1903. Fish, Chas. C. R., 10, Park Square, Boston, Mass., U.S.A., Chemist.
1902. Fisher, Fred., Newaygo, Mich., U.S.A., Chemist.
1900. Fisher, Henry, 57, East 83rd Street, New York City, U.S.A., Teacher of Chemistry.
1902. Fisher, Pearson, c/o Messrs. Manlove, Alliott, and Co., Ltd., Bloomsgrove Works, Nottingham, Mechanical Engineer.
1901. Fisher, Wm. Elbertson, 67, Argyle Street, Toronto, Canada, Master Dyer.
O.M. Fisher, W. W., 5, St. Margaret's Road, Oxford, Chemical Lecturer.
1895. Fison, Jno., Messrs. Jas. Fison and Sons, Thetford, Norfolk, Chemical Manufacturer.
O.M. Fitzbrown, G., Ditton Copper Works, Widnes, Metallurgist.
1897. Fitzgerald, Francis A. J., c/o International Acheson Graphite Co., Niagara Falls, N.Y., U.S.A., Chemical Engineer.
1902. FitzGibbon, Thos., 36, Averill Street, Fulham Palace Road, Hammersmith, W., Analytical Chemist.
1900. Fitz-Randolph, R. B., State Laboratory of Hygiene, Trenton, N.J., U.S.A., Bacteriologist and Chemist.
1896. Flammer, E., Heilbronn a/N., Germany, Manufacturing Chemist.
1892. Flanagan, Chas. A., 54, Gorse Street, Stretford, Manchester, Manufacturing Chemist.
1901. Flavelle, Jos. W., c/o Wm. Davies Co., Toronto, Canada, Merchant.
1892. Fleming, J. Arnold, Britannia Pottery, Glasgow, Potter.
O.M. Fletcher, A. E., Coombe Lea, Dorking, Surrey, Ex-Chief Inspector Alkali, &c. Works.
1893. Fletcher, E. Morley, 3, Woodhouse Cliff, Leeds, Alkali Works Inspector.
O.M. Fletcher, F. W., Beauchamp Lodge, Enfield, Manufacturing Chemist.
1891. Fletcher, R. Jaques, North Geelong, Victoria, Manufacturing Chemist.
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1899. Focht, Louis, 105, E. Hanover Street, Trenton, N.J., U.S.A., Civil Engineer.

1890. Foden, Alfred, 19, Lancaster Avenue, Sefton Park, Liverpool, Metallurgical Chemist.

1900. Foersterling, Dr. H., c/o The Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Chemist.

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1895. Fogg, Chas. A., 39, Park Road, Bolton-le-Moors, Lecturer in Chemistry.

1901. Folsom, Herbert A., 5, Brighton Street, Providence, R.I., U.S.A., Textile Chemist.

1903. Forbes, David L. H., 14, Shannon Street, Toronto, Ont., Canada, Student.

1900. Forbes, Eli, Lancaster Mills, Clinton, Mass., U.S.A., Chemist.

1895. Forbes, Paul R., 614, Sears Building, Boston, Mass., U.S.A., Chemist and Assayer.

1893. Ford, J. B., jun., Michigan Alkali Co., Wyandotte, Mich., U.S.A., Secretary and Treasurer.

1889. Ford, Jno. S., Abbey Brewery, Edinburgh, Analyst.

1899. Forel, Geo., 32, Poue des Vosges, Strasburg, Alsace, Chemist.

1898. Forgie, Jas. T., Viewfield, Bothwell, N.B., Civil and Mining Engineer.

1885. Formoy, J. Arthur, Chestham, Grange Road, Sutton, Surrey, Oil Expert.

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1890. Forrester, A. M., Port Dundas Chemical Works, 20, Canal Bank, Glasgow, Analytical Chemist.

1902. Forstall, Alf. E., 58, William Street, New York City, U.S.A., Consulting Gas Engineer.

1899. Forster, Dr. Martin O., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.

1901. Forster, Miss E. L. B., c/o The Morgan Crucible Co., Ltd., Battersea, S.W., Analyst.

1902. Forster, Ferdinand E. P., c/o Messrs. Bass and Co., Laboratory, 19, Guild Street, Burton-on-Trent, Brewer's Chemist.

1884. Forster, Ralph C., c/o Messrs. Bessler, Waechter, & Co., 18 and 19, Fenchurch Street, E.C., Chemical Merchant.

1889. Fort, Jas., 16, Adelphi Bank Chambers, South John Street, Liverpool, Chemical Merchant.

1884. Forth, Henry, Meadowcroft, Marple, near Stockport, Drysalter.

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1888. Foster, Wm., Esholt House, Chapeltown, Leeds, Manufacturing Chemist.

1884. Foulis, Wm., 2, Montgomerie Quadrant, Kelvinside, Glasgow, Gas Engineer.

1891. Fowler, Gilbert J., Broad Oak, Urmston, near Manchester, Superintendent and Chemist (Manchester Corporation Sewage Works).

1898. Fowler, Theo. V., P.O. Box 168, Buffalo, N.Y., U.S.A., Chemical Works Manager.

1896. Fox, A. Stanley, 23, South Road, Faversham, Kent, Chemist (Cotton Powder Co., Ltd.).

1898. Fox, Jno., 76, Butler Street, Oldham Road, Manchester, Analyst.

1888. Fox, J. Wesley, 7, Bushell Street, London, E.C., Salt Merchant.

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1901. France, G. Herbert, Woodroyd Dyeworks, Low Moor, Bradford, Yorks., Dyer.

1899. Franchot, Stanislaus P., Niagara Falls, N.Y., U.S.A., Manufacturing Chemist.

1885. Francis, Edwd., Park Ravine, Nottingham, Chemical Lecturer.

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1894 Franck, Jerome W., 29, Broadway, New York City, U.S.A., Chemist.

1886. Frankenburg, Isidor, Greengate Rubber Works, Salford, Manchester, India rubber Manufacturer.

1895. Frankforter, Dr. G. B., University of Minnesota, Minneapolis, Minn., U.S.A., Professor of Chemistry.

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1902. Franklin, Chas. R., Gibbstown, Gloucester Co., N.J., U.S.A., Analytical Chemist.

1901, Frasch, Hans A., c/o F. T. Falding, 52, Broadway, New York City, U.S.A., Manager.

1900. Frasch, Herman, 681, Euclid Avenue, Cleveland, Ohio, U.S.A., Oil Refiner.

1891. Fraser, Leslie McG., 98, Commercial Road East, London, E., Chemical Engineer.

1902. Fraser, R. A., c/o Fraser & Co., Bootle, Liverpool, Fellmonger.

1886. Fraser, W. J., 121, Adelaide Road, London, N.W., Mechanical Engineer.

1902. Frederick, Geo. E., jun., P.O. Box 762, New York City, U.S.A., Chemical Merchant.

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1899. French, Alf., St. Bartholomew's Hospital, Rochester, Kent, Dispenser.

1899. French, H. Hutchins, Florenceville, Grove Road, Sutton, Surrey, Produce Broker.

1900. French, Thos., 1, Kelvinside Terrace West, Glasgow, Chemist.

1898. French, Wm., Storey Institute, Lancaster, Science Teacher.

1902. Frenzel, Arthur B., 1,540 Sherman Avenue, Denver, Colo., U.S.A., Consulting Engineer.

1888. Frew, Dr. Wm., Laboratory, Wellpark Brewery Glasgow, Brewing Chemist.

1886. Fries, Dr. Harold H., 92, Reade Street, New York City, U.S.A., Chemical Manufacturer.

1902. Fries, Jno. W., Winston, Salem, N.C., U.S.A., Cotton Manufacturer.

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1901. Fritchle, Oliver P., c/o Boston and Colorado Smelting Co., Argo, Colo., U.S.A., Metallurgical Chemist.

1898. Frith, J. Mason, Linden Lodge, Runcorn, Cheshire, Lime Burner.

1899. Fritzsche, Karl, c/o Schimmel and Co., Miltitz, near Leipzig, Germany, Manufacturer of Essential Oils.

1890. Frost, Dr. Howard V., 3958, Drexel Boulevard, Chicago, Ill., U.S.A., Professor of Chemistry.

1884. Frost, Joe, Storths Mill, Moldgreen, Huddersfield, Manufacturing Chemist.

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1894. Fuerst, Dr. Alex. F.,
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1889. Fuerst, Jos. F., 17, Philpot Lane, London, E.C., Chemical and Oil Merchant.

1895. Fuerst, W. F., 2, Stone Street, New York City, U.S.A., Chemical Merchant.

1894. Fuller, Chas. J. P., L. and Y. Railway Works, Horwich, near Bolton, Analytical Chemist.

1902. Fuller, Henry C., "The Madison," Madison Avenue, Detroit, Mich., U.S.A., Analytical Chemist.

1899. Fuller, Robt. F., Neston Park, Corsham, Wilts, Rubber Manufacturer.

1899. Fuller, W. M., (Journals) Bryn Tigid, Gold Tops, Newport, Mon.; and (subscription) c/o Morris & Griffin, Lim., Maindee, Newport, Mon., Chemical Manufacturer.

O.M. Fuller, Wm., 8, Orchard Road, Blackheath, S.E., Chemist.

1898. Fulmer, Elton, Pullman, Wash., U.S.A., Professor of Chemistry.

1896. Fulton-Smith, J., 20, Bold Street, Warrington, Brewer.

1885. Fyfe, Jno., 7, West George Street, Glasgow, Oil Works Director.

G

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1890. Gajjar, T. K., Techno-chemical Laboratory, Girgaum, Bombay, India, Consulting Chemist.

1884. Gall, Henry, 5, Rue Albert Joly, Versailles (S. et O.), France, Technical Chemist.

1897. Galletly, J. C., 101, Armadale Street, Dennistoun, Glasgow, Assistant to Professor of Metallurgy.

1901. Gallivan, Frank B., 56, Prospect Place, Brooklyn, N.Y., U.S.A., Chemist.

1901. Gallup, W. Arthur, Arnold Printworks, North Adams, Mass., U.S.A., Printer.

1901. Galpin, Harry T., 55, West 57th Street, New York City, U.S.A., Chemist.

1891. Galt, Hugh Allen, Columbia Chemical Co., Barberton, Ohio, U.S.A., Works Manager.

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1887. Gamble, Jas. N., The Laboratory, Procter and Gamble Co., Ivorydale, Ohio, U.S.A., Soap Manufacturer and Oil Refiner.

O.M. Gamble, J. C., Haresfinch, St. Helens, Chemical Manufacturer.

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1902. Gamer, A. C. C., P.O. Box 772, Tacoma, Wash., U.S.A., Chemist.

1894. Gane, Eustace H., 95, Fulton Street, New York City, U.S.A., Pharmaceutical Chemist.

1888. Gans, Adolf, Farbenfabrik von L. Cassella & Co., Frankfort o/Main, Germany, Dye Works Manager.

1901. Gansser, Dr. A., c/o Messrs. Lepetit, Dollfus and Gansser, Garessio-Ponte (Provincia di Cuneo), Italy, Chemical Engineer.

1896. Gardair, Aimé, 51, Rue St. Ferréol, Marseilles, France, Director of Chemical Co.

1893. Gardiner, H. J., 90, Cannon Street, London, E.C., Chemical Manufacturer.

1891. Gardner, Walter M., Municipal Technical College, Bradford, Director of Chemistry and Dyeing Department.

1897. Garfield, Jos., 7, Apsley Villas, Bradford, Yorks, Civil Engineer.

1888. Garibaldi, Joachim A., 21, Church Place, Gibraltar, Analytical Chemist.

1893. Garner, D. C., 40, Nichols Street, Leicester, Manufacturing Chemist.

1890. Garrett, F. C., Durham College, of Science, Newcastle-on-Tyne, Teacher of Science.

1900. Garrigues, Wm. E., 1123, Broadway, New York, City, U.S.A., Chemical Engineer.

1901. Garroway, Jno., 58, Buchanan Street, Glasgow, Manufacturing Chemist.

1899. Garroway, Wm., 694, Duke Street, Glasgow, Chemical Manufacturer.

1898. Garry, H. Stanley, 9, Clipstone Avenue, Nottingham, Manure Works Manager.

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1893. Garton, Rd. S., Woodycrest Avenue, Highbridge, New York City, U.S.A., Chemist.

1886. Gascoyne, Dr. W. J., 36, South Holliday Street, Baltimore, Md., U.S.A., Analytical Chemist.

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1902. Gaskell, Holbrook (H.), Bridge House, Sefton Park, Liverpool, Engineer.

1901. Gass, Jas. Kelly, 113, Vanhook Street, Camden, N.J., U.S.A., Dyer.

1897. Gaster, Leon, 37, Maida Vale, W., Electrical Engineer.

1895. Gate, Tom Erskine, (Journals) c/o Calder and Mersey Extract Co., Ltd.; and (subscriptions) Calder House, Dewsbury, Yorks, Manufacturing Chemist.

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1891. Geisler, Dr. Jos. F., New York Mercantile Exchange Building, 6, Harrison Street, New York City, U.S.A., Consulting Chemist.

1901. Gemmell, G. H., 4, Lindsay Place, George IV. Bridge, Edinburgh, Analytical Chemist.

1901. Gent, Percy W., c/o W. V. D. Kelley, 737, Summer Avenue, Newark, N.J., U.S.A., Chemist.

1897. Gent, Wm. T., Springfield, Misterton, near Gainsboro', Metallurgical Chemist.

1896. Genth, Fred. A., jun., 103, North Front Street, Philadelphia, Pa., U.S.A., Chemist.

1902. George, Wm. K., 80, Glen Road, Toronto, Ont., Canada, Manufacturer.

1894. Georgi, Carl, 77, John Street, New York City, U.S.A., Aniline Colour Importer.

O.M. Gerland, Dr. B. W., 105, Plantation Street, Accrington, Consulting Chemist.

1891. Gibb, Thos., Hunt's Cross, Liverpool, Metallurgist.

1903. Gibbings, Wm., 11, Howard Drive, Grassendale, Liverpool, Works Manager.

O.M. Gibbins, H. B., 177, Redland Road, Bristol.

1902. Gibbon, Edw., Ynys House, Clydach, R.S.O., Glam., Works Chemist.

1883. Gibbs, D. Cecil, Soap Manufacturer.

O.M. Gibbs, Wm. P., Fabriken, Hjerpen, Jemtland, Sweden, Analytical Chemist.

1893. Gibbs, W. T., Buckingham, Prov. Quebec, Canada, Manufacturing Chemist.

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O.M. Gibson, J. M., c/o Buckley Brick and Tile Co., Buckley, *viâ* Chester, Brick and Tile Manufacturer.

1898. Gies, Wm. J., College of Physicians and Surgeons, 437, W. 59th Street, New York City, U.S.A., Instructor in Physiological Chemistry.

1899. Gifford, Wm. E., 408, New Jersey Railroad Avenue, Newark, N.J., U.S.A., Chemist.

1892. Gilbard, T. Francis H., 245, Dalston Lane, Hackney, N.E., Analytical Chemist.

1897. Gilbody, Dr. Alex. W., Research Chemist.

1903. Gilby, Joseph W., Berners Street, Peterson Road, Wakefield, Works Chemist.

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1884. Gilchrist, Peter S., Charlotte, N.C., U.S.A., Chemical Engineer.

1900. Gildersleeve, W. H., Flintstone Tannery, Flintstone, Ga., U.S.A., Chemist.

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1886. Gill, Dr. Aug. H., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Assistant Professor of Gas Analysis.

1900. Gill, J. Arthur, Glencoe, Meadow Road, Rusthall, Tunbridge Wells, Analyst.

1901. Gill, Wm. S., 40, St. Paul Street, Aberdeen, Colour and Varnish Manufacturer.

1901. Gilles, Wm. S., Bradford Street, Bocking, near Braintree, Essex, Technical Chemist.

1903. Gillean, R. Hampson, c/o General Chemical Co., Bayonne, N.J., U.S.A., Chemist.

1888. Gillman, Gustave, A.M.I.C.E. Ferrocarril de Murcia, á Granada, Aguilas, Prov. de Murcia, Spain, Civil Engineer.
1892. Gilmour, J. D., 190, Butterfiggins Road, Glasgow, Chemist.
1891. Gimingham, Edw. A., 1, Cranbourne Mansions, Cranbourne Street, W.C., Electrician.
1900. Ginder, Wm. H., c/o American Sheet Steel Co., Vandergrift, Pa., U.S.A., Analytical Chemist.
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1889. Glaser, Chas., 21, South Gay Street, Baltimore, Md., U.S.A., Analytical and Consulting Chemist.
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1901. Glegg, Robt., 29, Kimberley Street, Liverpool, Analytical Chemist.
1894. Glen, Chas., Glengowan Printworks, Caldercruix, N.B., Calico Printer.
1890. Glen, J., jun., Glengowan Printworks, Caldercruix, N.B., Calico Printer.
1900. Glendenning, Arthur, 31, Bright Street, Middlesbrough, Analytical Chemist.
1884. Glendinning, H., Winnington Park, Northwich, Cheshire, Technical Chemist.
1895. Glenn, Wm., Baltimore Chrome Works, 1348, Block Street, Baltimore, Md., U.S.A., Chrome Manufacturer.
1888. Gloag, Robt. F., Grove Hill, Middlesbrough, Secretary.
O.M. Glover, G. T., 24, Craven Hill Gardens, Lancaster Gate, W., Chemical Works Manager.
1896. Glover, H., East Falls, Schuylkill, Philadelphia, Pa., U.S.A., Chemical Works Superintendent.
O.M. Glover, W., Rio Tinto Mines, Huelva, Spain, Technical Chemist
1896. Goetz, Isidore, 2, Kelfield Gardens, North Kensington, W., Mine Manager.
1898. Golding, Jno., Midland Agricultural and Dairy Institute, Kingston, Derby, Agricultural Chemist.
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1897. Goldschmiedt, Dr. Guido, Laboratory, II. Salmgasse 1, Prag, Austria, Professor in Imperial German University.
1895. Goldsmith, Byron B., 19, East 74th Street, New York City, U.S.A., Vice-President (American Lead Pencil Co.).
1899. Goldsmith, Jno. N., British Xylonite Co., Ltd., Manningtree, Essex, Chemist.
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1900. Goodchild, Wm. H., Elmwood Lodge, Long Lane, Finchley, London, N., Chemical Student.
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1898. Goodrich, Chas. G., Akron, Ohio, U.S.A., Rubber Manufacturer.
1884. Goodwin, C. C., The White House, St. John's Road, Bowdon, Cheshire, Soapmaker.
1894. Goodwin, Dr. W. L., The School of Mining, Kingston, Canada, Professor of Chemistry.
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1901. Gordon, A. T., c/o Oliver Iron Mining Co., Mount Iron, Minn., U.S.A., Chemist.
1898. Gordon, Colin, Storer's Wharf, Cubitt Town, E., and (Journals) Lynwood, Vanbrugh Hill, Blackheath, S.E., Chemical Engineer.
1884. Gordon, J. G., Queen Anne's Mansions, Westminster, S.W., Steel Manufacturer.
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1890. Goulding, Wm. Joshua, 25, Eden Quay, Dublin, Manure Manufacturer.
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1900. Grabill, Clarence A., Val Verde, Yavapai Co., Arizona, U.S.A., Chemist.
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1897. Granger, Dr. J. Darnell, 25, All Saints Street, Nottingham, Analytical Chemist.
1900. Granja, Rafael, c/o The Palen Co., Kingston, N.Y., U.S.A., Chemist.
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1896. Graves, Walter G., 555, Sibley Street, Cleveland, Ohio, U.S.A., Chemist.
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1902. Gray, John, Port Credit, Ont., Canada, Starch Manufacturer.
1896. Gray, Dr. Thos., 204, George Street, Glasgow, Lecturer in Chemistry.
1901. Greaves, Albert E., c/o P. Spence and Sons, Ltd., Goole Alum Works, Goole, Yorks, Works Chemist.
1891. Greaves, I. A. R., Morton, Gainsborough, Brewer.
1894. Greaves, Wm., Powell Duffryn Steam Coal Co., Aberaman, Aberdare, South Wales, Chemical Engineer and Chemist.
1894. Greeff, R. W., 20, Eastcheap, London, E.C., Chemical Agent.
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1897. Gref, Anthony, 40, Stone Street, New York City, U.S.A., Patent Lawyer.

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1900. Griffin, Dr. Jno. J., Catholic University of America, Washington, D.C., U.S.A., Professor of Chemistry.

1890. Griffin, John R., 20—26, Sardinia Street, Lincoln's Inn Fields, W.C., Chemical Apparatus Maker.

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1894. Griffiths, Thos., The Cedars, Clapham Common, S.W., Manufacturing Chemist.

1886 Grime, J., Calico Printer.

O.M. Grimshaw, H., Park Side, North Road, Clayton, Manchester, Chemical Manufacturer.

1902. Grimwade, Wilfrid R.; (Journals) 342, Flinders Lane, Melbourne, Vic., Australia; (subscriptions) c/o Grimwade, Ridley, and Co., 6, Trinity Square, London, E.C., Manufacturing Chemist.

O.M. Grimwood, R., 41, Lady Margaret Road, London, N.W., Analytical Chemist.

1900. Grimwood, Robt. G., 17, Dagmar Road, Stroud Green, N., Analytical Chemist.

O.M. Grindley, J., Upper North Street, Poplar, London, E., Tar Distiller.

1888. Gripper, Harold, Great Central Railway, Gorton, Manchester, Analytical Chemist.

1897. Gronemeyer, Herman H., 315, Amesbury Avenue, Cleveland, Ohio, U.S.A., Chemical Superintendent.

1900. Gross, Abraham, 341, Oakland Avenue, Pittsburg, Pa., U.S.A., Technical Chemist.

O.M. Grossmann, Dr. J., Harpurhey Chemical Works, Manchester, Chemical Manufacturer.

1896. Grosvenor, Wm. M., jun., c/o General Chemical Co., Hudson River Works, Edgewater, N.J., U.S.A., Electro-Chemist.

O.M. Groves, C. E., F.R.S., 352, Kennington Road, London, S.E., Chemist (Thames Conservancy).

1899. Gudemann, Dr. Edw., 4319, Vincennes Avenue, Chicago, Ill., U.S.A., Chemist.

1902. Guenther, Felix, jun., Sun Portland Cement Co., Ltd., P.O. Box 102, Owen Sound, Ont., Canada, Chemist.

1898. Guess, Harry A., Silver Lake Mines, Silverton, Colo., U.S.A., Chemist.

1899. Guest, Edw. Graham, 5, Churchhill, Edinburgh, Cereals Chemist.

1899. Guild, Frank N., University of Arizona, Tucson, Arizona, U.S.A., Professor of Chemistry.

1900. Guitermann, Edw. W., Passaic Printworks, Passaic, N.J., U.S.A., Chemist.

1894. Gulliver, Geo. W., c/o Burt, Boulton, and Haywood, Selzaete, Belgium, Chemist.

1883. Gunn, W. L., Broad Plain Soap Works, Bristol, Analytical Chemist.

1900. Günther, Chas. E., Liebig's Extract of Meat Co., Ltd., 9, Fenchurch Avenue, London, E.C., Merchant.

1902. Günther, Wm. J. W., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Inspector.

1894. Gurney, J. Clare, Fabrica Roma, La Union, Prov. de Murcia, Spain, Analytical Chemist.

1899. Gutcher, Wm., Singapore Oil Mills, Singapore, S.S., Superintendent Engineer.

1903. Guthrie, Alan, c/o Cooper, Allen, and Co., Cawnpore, India, Leather Trades Chemist.

1902. Guthrie, Fred. B., Chemical Laboratory, Department of Agriculture, Sydney, N.S.W., Australia, Chemist.

1892. Guthrie, John, Trentham Street, Dewsbury Road, Leeds, Chemical Works Manager.

1901. Guthrie, John M., 199, Ferry Road, Leith, N.B., Analytical Chemist.

1892. Guttmann, Oscar, 12, Mark Lane, London, E.C., Consulting Chemical Engineer, M. Inst. C. E.

H

1902. Haas, Herbert, Torreon, Coahuila, Mexico, Chemist and Metallurgist.

O.M. Habirshaw, W. M., Glenwood Works, Yonkers, N.Y., U.S.A., Chemical Engineer.

1883. Hacking, W. H., The Grange, Clayton-le-Moors, near Accrington.

1900. Haddock, Arthur G., Lynwood House, Norman Road, Runcorn, Cheshire, Technical Chemist.

1898. Haddow, Geo., Nobel's Explosive Co., Perranporth, R.S.O., Cornwall, Chemist.

1887. Hadfield, R. A., Newhall Road, Attercliffe, Sheffield, Steel Founder.

1884. Hadkinson, F., Pamphila Oil and Soap Works, Mitylene, Mediterranean, Oil Refiner and Soap Manufacturer.

O.M. Hadkinson, R., Smyrna, Asia Minor, Oil Refiner.

1902. Haff, Max M., P.O. Box 340, Niagara Falls, N.Y., U.S.A., Chemist.

1887. Haig, Robert, Mechanical Retorts Co., Limited, Murray Street, Paisley, N.B., Chemical Engineer.

1896. Haigh, De Lagnel, Avenue A and 13th Street, Bayonne City, N.J., U.S.A., Chemist.

1898. Haigh, Fred., 141, Autumn Street, Passaic, N.J., U.S.A., Chemist (Flax Spinning Co.).

1898. Haigh, Percy, Edge View, Alderley Edge, Cheshire, Analytical Chemist.

1888. Hailes, A. J. de, 15, Red Lion Square, W.C., Analytical Chemist.

1889. Haines, Reuben, Haines Street, near Chew Street, Germantown, Philadelphia, Pa., U.S.A., Analytical Chemist.

O.M. Hake, C. N., Department of Trade and Customs, Melbourne, Victoria, Inspector of Explosives.

1903. Halbert, Thos., c/o British South African Explosives Co., Modderfontein, Transvaal, Analytical Chemist.

1900. Hale, Albert C., 352A, Hancock Street, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.

1888. Hale, Edw. P., c/o Wakefield & Co., Gatebeck Kendal, and (communications) Endmoor, near Kendal, Analytical Chemist.

1887. Hall, Allan T., c/o Sissons Bros. & Co., Ltd., Hull, Oil Refiner and Varnish Manufacturer.

1886. Hall, Archibald D., 7, Fenchurch Avenue, London, E.C., Analytical Chemist.

1898. Hall, Clarence A., 517, North American Building, Philadelphia, Pa., U.S.A., Chemist.

O.M. Hall, Edgar, Silver Spur, Stanthorpe, Queensland, Australia, Technical Chemist.

1898. Hall, Frederick W., Holly Bank, Parsonage Road, Withington, Manchester, Dyer.

1902. Hall, Geo., c/o A. A. Vantine and Co., Broadway and 18th Street, New York City, U.S.A., Chemist.

1902. Hall, Henry, c/o Booth and Co., Irk Vale Works, Middleton, Lancashire, Dyer and Finisher.

1893. Hall, Jas. W., Bombay, Baroda, and Central India Railway, Sabarmata, near Ahmedabad, India, Linseed Oil Mills Manager.

1885. Hall, Jno. A., Victoria Chemical Works, Victoria, British Columbia, Analytical Chemist.

1900. Hall, Jos. J., 414, Fifth Avenue, Cedar Rapids, Iowa, U.S.A., Chemist.

1900. Hall, Prof. Robt. W., Havemeyer Laboratory, University Heights, New York City, U.S.A., Professor of Analytical Chemistry.

O.M. Hall, S., East London Soap Works, Bow, London, E., Soap Manufacturer.

1896. Hall, S. G., East London Soap Works, Bow E., Soap Maker.

1898. Hall, Wm. F., c/o Wanderer G. M. Co., Selukwe, Rhodesia, Cyanide Manager.

1886. Haller, Geo., Sussex House, 52, Leadenhall Street, London, E.C., Chemical Merchant.

1893. Haller, H. Loft, 26, Seale Lane, Hull, Analytical Chemist.

895. Halliwell, Edw., c/o Ribble Joint Committee, 16, Walton's Parade, Preston, Chief Inspector.
901. Hallock, Dr. Albert P., 440, First Avenue, New York City, U.S.A., Chemist.
892. Hamaguchi, K., Hiro Mura, Arito Gori, Wakayama Ken, Japan, Soy Manufacturer.
897. Hambly, Fred. J., Buckingham, Quebec, Canada, Chemist.
901. Hambuechen, Carl, 113, West Gorham Street, Madison, Wis., U.S.A., Electro-Chemist.
887. Hamilton, Jas. C., Arncliffe, Arnside, viâ Carnforth, Chemical Works Manager.
885. Hamilton, Oswald, Lancaster Cottage, Old Stratford, near Stony Stratford, Chemical Engineer.
884. Hamilton, Robert, Glengarnock Chemical Co., Ltd., Glengarnock, N.B., Works Manager.
892. Hamilton, Robt., 62, Tempest Road, Beeston Hill. Leeds, Analytical Chemist.
O.M. Hammill, M. J., The Gables, St. Helens, Alkali Manufactnrer.
898. Hammersley, W. Stanley, Longjumeau, S. et O., France, Tanner.
892. Hammond, Geo. W., Yarmouthville, Maine, U.S.A., Paper Co.'s Agent.
O.M. Hammond, J., Gas Works, Eastbourne, Sussex, Gas Manager.
902. Hampson, B. A., "Hampson's Buildings," Smith Street, Durban, Natal, S. Africa, Assayer and Geologist.
900. Hampton, F. T., Hill City, Tenn., U.S.A., Civil Engineer.
900. Haneock, Walter C., 10, Upper Chadwell Street, Myddelton Square, London, E.C., Analytical Chemist.
1896. Hand, Daniel, 30, Mount Pleasant Avenue, Newark, N.J., U.S.A., Chemist.
889. Handy, Jas. O., 325, Water Street, Pittsburg, Pa., U.S.A., Chemist.
1888. Hanks, Abbot A., 531, California Street, San Francisco, Cal., U.S.A., Assayer.
1901. Hanna, Charles E., 316, St. James' Street, Montreal, Canada, Secretary.
1899. Hanna, Dillinger C., 4262, Parkside Avenue, Philadelphia, Pa., U.S.A., Chemist and Superintendent.
O.M. Hanson, A. M., Abbey Printworks, Whalley, Blackburn, Print Works Chemist.
899. Hantke, Ernst, 646, Broadway, Milwaukee, Wis., U.S.A., Director of Brewers' School.
1991. Hardcastle, G. Fred., 9, Newtown Street, Leicester, Teacher of Science and Technology.
1894. Harden, Arthur, c/o British Institute of Preventive Medicine, Grosvenor Road, London, S.W., and (communications) 2, Marlborough Road, Richmond, S.W., Lecturer in Chemistry.
900. Hardwick, W. Roscoe, 13, Batavia Buildings, Hackins Hey, Liverpool, Chemist.
1902. Hardy, G. B., Belmont Gold Mine, Cordova, Ont., Canada, Metallurgist.
897. Harger, Dr. Jno., 11, Ivy Mount, Sutton on-Hull, Chemist.
1896. Hargreaves, Jas., Farnworth, Widnes, Lancashire, Chemical Engineer.
O.M. Hargreaves, Jno., Widnes, Alkali Manufacturer.
O.M. Harland, R. H., Plough Court, 37, Lombard Street, London, E.C., Consulting Chemist.
1893. Harlock, E. B., Newton Farm, Middlewich, Chemical Manufacturer.
1898. Harman, Edw. A., Elsinore, Gledholt, Huddersfield, Gas Engineer, M. Inst. C. E.
1903. Harms, Armin, 646, Broadway, Milwaukee, Wis., U.S.A., Brewing Chemist.
1903. Harrington, E. M., Aetna, Lake Co., Ind., U.S.A., Explosives Manufacturer.
O.M. Harrington, W. B., Leeview, Montenotte, Cork, Chemical Manufacturer.
1893. Harris, Arthur, 22, Marsh Gate Lane, Stratford, E., Soap Maker.
1885. Harris, Booth, jun., Beeleigh, Victoria Road Buckhurst Hill Essex, Soap Maker.
O.M. Harris, D., 16, Merchiston Avenue, Edinburgh, Chemical Manufacturer.
1897. Harris, Fred. W., Sanitary Chambers, Chemical Department, Glasgow, Public Analyst.
1900. Harris, Dr. Harry B., 212, Jones Street W., Savannah, Ga., U.S.A., Chemist.
1900. Harris, L. A., Wyoming, Wood Vale, Lordship Lane, London, S.E., Chemist.
1896. Harris, Wm. T. A., Ideal Soapery, East Street, Brompton, Adelaide, South Australia, Soap Maker
O.M. Harrison, A., Thames Sugar Refinery, Silvertown, London, E., Sugar Works Chemist.
O.M. Harrison, C., Hayle, Cornwall, Technical Chemist.
1892. Harrison, C. Leland, c/o Harrison Bros. and Co., Incorporated, 35th and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
O.M. Harrison, G. D., Netham Chemical Works, Bristol, Chemical Manufacturer.
1883. Harrison, G. H., Hagley, near Stourbridge, Firebrick Maker.
1884. Harrison, G. King, Hagley, near Stourbridge, Fireclay Mine Owner.
O.M. Harrison, J., Madore, Ballintemple, Cork, Chemical Engineer.
1892. Harrison, Prof. John B., C.M.G., Government Laboratory, Georgetown, Demerara, B.G., Government Analyst.
1898. Harrison, Wm. H., Knostrop Sewage Works, Leeds, and (communications) 1, Roundhay Grove, Harehills Lane, Leeds, Analytical Chemist.
1896. Hart, Bertram, c/o Tennants and Co., Clayton, Manchester, Analyst.
1886. Hart, Bertram H., The Elms, Old Charlton, S.E., Analytical Chemist.
O.M. Hart, Dr. E., Gayley Hall, Lafayette College, Easton, Pa., U.S.A., Professor of Chemistry.
1890. Hart, H. W., 13, Lynwood Villas, Darwen, Lancashire, Analytical Chemist.
1897. Hart, Wm. Beamont, Manchester Laboratory, 8, Exchange Street, Manchester, Consulting Chemist.
1886. Hartley, Arthur, The Brewery, Emsworth, Hants, Brewer.
1883. Hartley, Joseph, 43, High Road, Gorton, Manchester, Technical Chemist.
1889. Hartley, R. Kent, Springwood House, Middleton Junction, near Manchester, Chemical Works Manager.
O.M. Hartley, Prof. W. N., D.Sc., F.R.S., Royal College of Science, Dublin, Professor of Chemistry.
1897. Hartmann, Ernest E., Waialua, Oahu, Hawaii, Chemist.
1891. Hartog, Philip J., 6, Mauldeth Road West, Withington, Manchester, Analytical Chemist.
1892. Hartridge, Jas. Hills, Holmwood, Hendon, Manufacturing Chemist.
1901. Hartwell, S. Warren, 215, North 2nd Street, Easton, Pa., U.S.A., Chemist.
1901. Hartzell, Harry S., 126, North 4th Street, Allentown, Pa., U.S.A., Chemist.
1899. Harvey, Chas., 38, Shakespeare Crescent, Manor Park, E., Manufacturing Chemist.
1892. Harvey, E. Feild, Omrac, St. John's, Newfoundland, Chemist.
1885. Harvey, Ernest W., 20, Malwood Road, Balham, S.W., A.R.S.M. Engineer.
1888. Harvey, H. C., Raglan House, Brooklands, near Manchester, Chemist.
1891. Harvey, Sidney, South-Eastern Laboratory, Canterbury, Analytical Chemist.
1899. Harvey, Thos. F., 84, Henry Road, West Bridgford, Nottingham, Analyst (Drug Co.).
1883. Harvey, T. H., Cattedown, Plymouth, Chemical Manufacturer.
1900. Haskell, J. Amory, Laflin and Rand, Powder Co., 99, Cedar Street, New York City, U.S.A., President.
1900. Haslwanter, Chas., 908, Willoughby Avenue, Brooklyn, N.Y., U.S.A., Analytical Chemist.
1897. Hasslacher, Jacob, P. O. Box 1999, New York, U.S.A., President of Roessler-Hasslacher Chemical Co.

1894. Hatfield, Jno. A., Ivydene, Hydes Road, Wednesbury, Staffordshire, Analytical Chemist.
1887. Hatton, Wm. P., c/o W. R. Hatton & Sons, Wormwood Scrubs, W., Starch Works Manager.
1899. Haus, Simon V., c/o Eastman Kodak Co., Rochester, N.Y., U.S.A., Photographic Chemist.
1900. Havens, Dr. F. S., c/o Franklin H. Kalbfleisch Co., 35, Burling Slip, New York City, U.S.A., Silk Conditioner.
1899. Hawdon, H. S., Westoe Village, South Shields, Manager.
1895. Hawker, E. W., Adelaide Club, Adelaide, South Australia, Metallurgist.
1902. Hawkins, Clement C., c/o The Chatfield Mfg. Co., Carthage, Ohio, U.S.A., Chemist.
1897. Hawkins, Ernest M., Lime Tree Farm House, Stone Street, Petham, Canterbury, Chemist.
O.M. Hawkins, H., c/o American E.C. and Schultze Gunpowder Co., Ltd., Oakland, Bergen Co., N.J., U.S.A., Explosive Works Manager.
1893. Hawkins, J. Dawson, c/o Colo. Phila. Reduction Co., Colorado City, Col., U.S.A., Smelting Works Manager.
1887. Hawliczek, Josef, New Hydro Hotel, West Kirby, Cheshire (temp.), Technical Chemist.
1899. Haworth, Dr. Edw., Sunnyside, Norman Road, Runcorn, Cheshire, Chemist.
1895. Hay, Alex. B., Kelvindock Chemical Works, Maryhill, Glasgow, Manufacturing Chemist.
1898. Haycraft, Jos. H., St. Peter's, Adelaide, South Australia, Metallurgical Chemist.
1894. Haynes, David O., 8, Spruce Street, New York City, U.S.A., Proprietor of "Pharmaceutical Era."
1902. Hays, B. F., c/o Fraser Tablet Co., 454474, 18th Street, Brooklyn, N.Y., U.S.A., Chemist.
1902. Hazard, Dr. Elmer C., Shrewsbury, N.J., U.S.A., Chemist.
1894. Heal, Carlton, Duston, near Northampton; (Journals) c/o Northampton Tanning Co., St. James' End, Northampton, Chemical Student.
1899. Healey, Alfred E., Willesden Paper and Canvas Works, Willesden Junction, N.W., Managing Director.
1890. Heape, Chas., 19, George Street, Manchester, Calico Printer.
1898. Heasman, Walter, Castle Brewery, Bridgnorth, Salop, Brewer.
O.M. Heath, R. C., Myton Grange, near Warwick, Chemical Manufacturer.
1897. Heaton, John, 3, Belle Vue Park, Sunderland, Brewer and Chemist.
1895. Hebden, Jno. C., 64, Exchange Place, Providence, R.I., U.S.A., Works Manager and Chemist.
1889. Hecht, Jos., c/o McCormick Harvesting Machine Co., Chicago, Ill., U.S.A., Analytical Chemist.
1895. Hecker, Paul, 102, Fenchurch Street, London, E.C., Chemical Merchant.
1900. Heckman, J. Conrad, (Journals) c/o Larkin Soap Manufacturing Co., Seneca Street, Buffalo, N.Y., U.S.A., Chemist.
1889. Heckmann, C., 9, Görlitzerufer, Berlin, S.O., Germany, Chemical Apparatus Maker.
1885. Hedley, Armorer, Mayfield, Gesforth, Newcastle-on-Tyne, Soap Manufacturer.
1895. Hedley, Geo. H., Hedge Mill, Loudwater, Bucks, Chemical Manufacturer.
1902. Heebner, Prof. Chas. F., Ontario College of Pharmacy, Toronto, Canada, Professor of Pharmaceutical Chemistry.
1893. Hefford, Geo. W., County Technical Schools, Stafford, Chemical Instructor.
1903. Hegeman, John W., 102, Barbey Street, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Hehner, Otto, 11, Billiter Square, London, E.C., Analytical and Consulting Chemist.
1902. Heidenhain, Dr. Henry, c/o Royal Baking Powder Co., Kent Avenue and Morton Street, Brooklyn, N.Y., U.S.A., Chemist.
1902. Heike, Rudolph E., American Sugar Refining Co., P.O. Box L., Jersey City, N.J., U.S.A., Chemist.
1898. Heileman, W. H., (communications) U.S. Department of Agriculture, Bureau of Soils, Washington, D.C.; and (Journals) Elwell, Iowa, U.S.A., Expert Field Assistant.
1887. Hellier, E. A., 90, Marlborough Avenue, Hull, Varnish Manufacturer.
1885. Hellon, Dr. R., 40, New Lowther Street, Whitehaven, Analytical and Consulting Chemist.
O.M. Helm, H. J., Simonstone, Hammelton Road, Bromley, Kent, Government Analyst.
1898. Hemingway, Frank C. R., 133, Front Street, New York City, U.S.A.
1883. Hemingway, H., Marsh Gate Lane, Stratford, E., Chemical Manufacturer.
1884. Hempleman, F. S., Wennington House, Wennington, Romford, Essex, Manure Manufacturer.
1903. Hemstreet, George P., Hastings-on-Hudson, N.Y., U.S.A., Mechanical Engineer.
1883. Henderson, Prof. G. G., The Technical College, George Street, Glasgow, Professor of Chemistry.
1902. Henderson, Jas. A. Russell, 33, Blythswood Drive, Glasgow, Technical Chemist.
1900. Henderson, J. Brownlie, Government Analyst's Office, Brisbane, Queensland, Government Analyst.
1902. Henderson, J. C. A., 4, Sun Court, Cornhill, London, E.C., Gentleman.
1894. Henderson, Jos., Wolverton, Dunottar Avenue, Eaglescliffe Junction, near Stockton-on-Tees, Metallurgical Chemist.
1894. Henderson, Norman M., Broxburn Lodge, Broxburn, N.B., Oil Works Manager.
O.M. Henderson, W. F., Moorfield, Claremont Gardens, Newcastle-on-Tyne.
1893. Hendrick, Jas., Marischal College, Aberdeen, Lecturer on Agricultural Chemistry.
1889. Hennin, Alphonse, Portoferraio, Elba, Italy, Metallurgical Chemist.
1894. Henshaw, Sam., Chatterley, Tunstall, Stoke-on-Trent, Chemical Works Manager.
1894. Hepburn, J. G., Priory Works, Dartford, Kent, Leather Manufacturer.
1887. Herf, O., Herf & Frerichs Chemical Co., St. Louis, Mo., U.S.A., Chemical Manufacturer.
1897. Heriot, James, 18, Dumbiedykes Road, Edinburgh, Mineral Water Manufacturer.
1891. Heriot, T. H. P., 23, Wolseley Road, Crouch End, N., Analytical Chemist.
O.M. Herman, W. D., Holm Lea, Rainhill, Lancashire, Glass Works Chemist.
O.M. Heron, J., 110, Fenchurch Street, London, E.C., Brewing Chemist.
1899. Herrick, Rufus F., 16, Herrick Street, Winchester, Mass., U.S.A., Chemist.
1887. Herriot, Wm. Scott, 19, Kier Street, Pollokshields, Glasgow, Chief Engineer.
O.M. Herrmann, R. W., 59, Mark Lane, London, E.C., Chemical Merchant.
1891. Hersam, Ernest A., University of California, Berkeley, Cal., U.S.A., Assistant Professor of Metallurgy.
O.M. Herschel, Prof. A. S., F.R.S., Observatory House, Slough, Bucks, Hon. Professor of Experimental Physics.
1898. Hersey, Milton L., 146, St. James' Street, Montreal Canada, Consulting Chemist.
1901. Hershey, Aldus N., c/o Sharp and Dohme, Baltimore, Md., U.S.A., Chemist.
1898. Heslop, Oliver, 55, Sandown Lane, Wavertree, Liverpool, Analytical Chemist.
1885. Hess, Dr. Adolph, Kirkstall Road, Leeds, Chemical Manufacturer.
1891. Hetherington, Dr. Albert E., Ammonia Soda Works, Fleetwood, Lancashire, Analytical Chemist.
1894. Hewitt, A. H., The Green Island Cement Co., Lim., Hong Kong, China, Engineer.
O.M. Hewitt, Dr. D. B., Oakleigh, Northwich, Cheshire, Alkali Manufacturer.

1899. Hewitt, Edw. R., 13, Burling Slip, New York City, U.S.A., Glue Manufacturer.

1896. Hewitt, Dr. J. Theo., 8, Montpelier Road, East Twickenham, Lecturer.

1897. Hewitt, T. Lacey,
Analytical Chemist.

1890. Hewlett, John C., 40—42, Charlotte Street, Great Eastern Street, London, E.C., Manufacturing Chemist.

1893. Hey, Harry, 2, Ash Terrace, Savile Town, Dewsbury, Dyer.

1894. Heyl-Dia, G. Edw., 236, Great Clowes Street, Higher Broughton, Manchester, Chemical and Electrical Engineer.

1901. Heys, Thos., 110, Adelaide Street West, Toronto, Canada, Consulting Chemist.

1884. Heys, W. E., 70, Market Street, Manchester, Engineer and Patent Agent.

1903. Heys, Wm. G., 70, Market Street, Manchester, Consulting Engineer and Patent Agent.

1883. Heywood, J. H., 231, Drake Street, Rochdale, Technical Chemist.

O.M. Heywood, J. S., 7, Caledonian Road, King's Cross, London, N., Chemical Manufacturer.

1897. Hibbard, Paul L., 2291, North 41st Court, Chicago, Ill., U.S.A., Starch Chemist.

1901. Hiby, Dr. Walter, c/o Otto Hilgenstock Coke Oven Co., Ltd., 109, Victoria Street, London, S.W., Chemical Engineer.

1897. Hicks, Edwin F., 361, West 27th Street, New York City, U.S.A., Analytical Chemist.

1893. Hicks, Jas. A., c/o Dr. B. Redwood, 4, Bishopsgate Street Within, London, E.C., Analytical Chemist.

O.M. Higgin, W. H., Hollywood, Lostock, near Bolton-le-Moors, Chemical Manufacturer.

1901. Higginbottom, Alf., Quarry Bank, New Mills, near Stockport, Colourist.

1886. Higgins, C. L., Muspratt's Works, Widnes; and (Journals) 79, Bedford Street South, Liverpool, Manufacturing Chemist.

1901. Highley, Arnold, 20, Spotland Road, Rochdale, Chemist.

1897. Hill, George, Barton-on-Humber, Chemical Works Manager.

1897. Hill, Dr. Herbert M., University of Buffalo, N.Y., U.S.A., Professor of Chemistry and Toxicology.

O.M. Hill, J. K., 13, Osborne Place, Copland Road, Govan, near Glasgow, Manufacturing Chemist.

1892. Hill, Sydney, c/o Blundell, Spence, and Co., Ltd., Hull, Analytical Chemist.

1902. Hill, Wm. G. H., jun., American Rubber Co., East Cambridge, Mass., U.S.A., Chemist.

1898. Hill-Jones, Thos., 30, Bisham Gardens, Highgate, N., Manufacturing Chemist.

O.M. Hills, C. H., Anglesea Copper Works, Low Walker, Newcastle-on-Tyne, Copper Smelter.

1894. Hills, Harold F., 29, Cavendish Mansions, Clapton Square, London, N.E., Analytical Chemist.

1898. Hills, Thos. Herbert, Chemical Works, Deptford, S.E., Chemical Manufacturer.

O.M. Hills, W., 225, Oxford Street, London, W., Pharmaceutical Chemist.

1893. Hilton, Edgar G., 37, Kourlandsky Street, St. Petersburg, Russia, Varnish and Paint Manufacturer.

1899. Hinchley, J. W., 85, Gracechurch Street, London, E.C., Chemical Engineer.

O.M. Hindle, J. H., 8, Cobham Street, Accrington, Dyeworks Manager.

1883. Hinds, James, 127, Gosford Street, Coventry, Pharmaceutical Chemist.

1899. Hinks, Percy J., Tavern Street, Stowmarket, Chemist.

1891. Hinman, Bertrand C., 9, Worship Street, London, E.C., Metallurgical Chemist.

1892. Hinshelwood, Thos., Glasgow Oil and Paint Works, Glenpark Street, Glasgow, Oil Refiner.

1900. Hirsh, Jos. E., 1245, 85th Street, Brooklyn, N.Y., U.S.A., Chemist.

1895. Hirst, H. Reginald, Croft House, Batley, Yorks, Works Chemist.

1896. Hislop, Geo. R., Gas Work House, Craigielea, Paisley, N.B., Gas Engineer and Manager.

1900. Hobbs, Alex. F., Merrimack Manufacturing Co., Lowell, Mass., U.S.A., Printworks Superintendent.

1900. Hobbs, Dr. Perry L., Western Reserve Medical College, Cleveland, Ohio, U.S.A., Professor of Chemistry.

1894. Hodge, Andrew, 28, Grosvenor Road, Heaton Moor, near Stockport, Printworks Chemist.

1890. Hodges, Harry E., Long Island Railroad Co., Long Island City, N.Y., U.S.A., Chemical Engineer.

1902. Hodgkins, David H., 78, South Street, Newark, N.J., U.S.A., Manufacturing Chemist.

O.M. Hodgkinson, Dr. W. R., 18, Glenluce Road, Blackheath, S.E. (Journals); and Royal Artillery College, Woolwich, S.E., Prof. of Chemistry.

O.M. Hodgson, Chris., 33, Oakdale Road, Nether Edge, Sheffield, Metallurgical Chemist.

1897. Hodgson, Matthew, Leitrim Cottage, Wicklow, Ireland, Technical Chemist.

1890. Hodgson, Wm., 66, Deansgate, Manchester, Oil and Colour Broker.

1886. Hogben, W., c/o Viscoloid Co., Leominster, Mass., U.S.A., Chemist and Superintendent.

O.M. Hogg, T. W., (Journals) c/o John Spencer and Sons Newburn Steelworks, Newcastle-on-Tyne; and (communications) Castlenock, Ryton on-Tyne. Metallurgical Chemist.

1899. Holden, Archie Neill, c/o Hardman and Holden, Ltd., Miles Platting, Manchester, Chemist.

1903. Holden, G. E., 35, West Ashton Street, Eccles New Road, Weaste, Manchester, Works Chemist.

1887. Holden, G. H., Manchester Oxide Co., Ltd., Canal Street, Miles Platting, Manchester, Chemist.

1902. Holdsworth, Ernest T., Westholme, Great Horton, Bradford, Dyer.

1885. Holgate, T. E., 173, Hollins Grove, Darwen, Lancashire, Metallurgist.

1884. Holgate, Thos., Rockleigh, Savile Park, Halifax, Gas Engineer.

O.M. Holland, Philip, 22, Taviton Street, Gordon Square, London, W.C., Analytical Chemist.

1892. Holland, Philip H., 958, Sherbrooke Street, Montreal, Canada, Merchant.

1901. Hollick, Herbert, c/o General Chemical Co., Camden, N.J., U.S.A., Works Manager.

1902. Holliday, Lionel B., Lunnclough Hall, Huddersfield, Chemical Manufacturer.

1896. Hollings, J. Spencer, Brymbo, North Wales, Works Manager.

1900. Hollinshead, W. H., Vanderbilt University, Nashville, Tenn., U.S.A., Teacher of Chemistry.

1890. Holloman, Fred. R., 43, Southern Road, Plaistow, E., Sugar Works Chemist.

1890. Holloway, G. T., 57 and 58, Chancery Lane, W.C., Analytical and Consulting Chemist.

1900. Hollway, Jno., 6, Highbury Grange, London, N., Mine Owner.

1883. Holmes, Ellwood, Wyncote, Jesmond Park East, Newcastle-on-Tyne, Colour Manufacturer.

O.M. Holmes, F. G., 31, St. George's Road, Waterloo, Liverpool, Technical Chemist.

1900. Holthouse, Harold B., 12, Melton Grove, West Bridgford, Nottingham, Chemist.

1902. Holton, Alf. L., 385, Bradford Road, Manchester, Chemist.

1892. Holton, E. C., Sherwin-Williams Co., 100, Canal Street, Cleveland, Ohio, U.S.A., Chemist.

1893. Holzapfel, Max., Maritime Buildings, Quayside, Newcastle-on-Tyne, Manufacturer.

1893. Homfray, D., 6, Dartmouth Row, Greenwich, S.E., Analytical Chemist.

O.M. Hooper, E. Grant, Government Laboratory, Clement's Inn Passage, Strand, W.C.; and (Journals) 16, Royal Avenue, Sloane Square, S.W., Analytical Chemist.

1889. Hooper, Ernest F., Wear Fuel Works, Hendon Dock Sunderland, Technical Chemist.

1888. Hope, Jas., Dean House, Lenzie, N.B., Nickel Works Manager.

1892. Hopkins, Erastus, Lake Helen, Fla., U.S.A., Consulting Chemist.

1893. Hopkins, Gerald V., Nicholaston House, Penmaen, near Swansea; and (Journals) Silico, Rossland, Canada, Metallurgist.

1894. Hopkins, Herbert W., (Journals) c/o Waihi G. M. Co., Waihi, Paeroa, N.Z.; and 13, Harrington Gardens, South Kensington, S.W., Metallurgist.

1891. Hopkinson, John, Marion Street, Lister Hills, Bradford, Yorks, Lubricant Manufacturer.

1898. Hopwood, Wm. H., Strines, near Stockport, Printworks Chemist.

1895. Horne, Dr. W. D., Yonkers, N.Y., U.S.A., Consulting Chemist.

1900. Horsfall, Jno., 4, Grange Avenue, Rawtenstall, Manchester, Analytical and Consulting Chemist.

1902. Horsfall, L. H., c/o Binny and Co., Madras, India, Chemist.

1901. Horton, Edw., jun., 8, Orford Street, Chelsea, S.W., Student.

1889. Horton, William, 44, Cable Road, Hoylake, Cheshire, Analytical Chemist.

1902. Hosford, Roger F., 125, Milk Street, Boston, Mass., U.S.A., Chemical Engineer.

1892. Hosie, G. H., Yonderton, West Kilbride, Ayrshire, N.B., Technical Chemist.

1890. Hoskins, A. Percy, Gordonville House, Rosetta Park, Belfast, Ireland, Analytical Chemist.

1899. Hoskins, Wm., Room 55, 81, South Clark Street, Chicago, Ills., U.S.A., Chemist.

1899. Houlder, Bertram E., 11, Portland Road, Southall, Middlesex, Chemist.

1892. Houston, John, 26, Princess Street, Manchester, Drysalter.

1888. Houston, Robt. S., Hawkhead Road, Paisley, N.B., Analytical Chemist.

1891. Hovenden, Fred., Glenlea, Thurlow Park Road, West Dulwich, S.E.

O.M. Howard, A. G., Burnt House, Chigwell, Essex, Chemical Manufacturer.

1901. Howard, Bernard F., Devon House, Buckhurst Hill, Essex, Chemical Student.

O.M. Howard, D., Devon House, Buckhurst Hill, Essex, Chemical Manufacturer.

1887. Howard, D. Lloyd, (Journals), City Mills, Stratford, London, E. and (communications) Little Friday Hill, Chingford, Essex, Chemical Manufacturer.

1898. Howard, Henry, 175, Mountfort Street, Brookline, Mass., U.S.A., Chemical Engineer.

1902. Howard, Nelson A., c/o General Chemical Co., Hegewisch, Ill., U.S.A., Chemist.

O.M. Howard, W. D., City Mills, Stratford, London, E., Chemical Manufacturer.

1899. Howles, Fred., c/o McDougall Bros., Millwall Docks, London, E., Chemist.

1889. Howorth, F. Wise, c/o Lloyd Wise, 46, Lincoln's Inn Fields, W.C., Manufacturing Chemist.

1896. Hoyte, Percy S., Gas Works, Coxside, Plymouth, Gas Engineer.

1900. Hübner, Julius, 24, Delaunay's Road, Crumpsall, Manchester, Director of Dyeing and Papermaking Departments (Municipal School of Technology).

1898. Hudson, Albert W., 312, Colorado Building, 16th and California Streets, Denver, Colo., U.S.A., Assayer.

1902. Hudson, C. Edward, c/o E. G. Jepson and Co., Albion Walk Chambers, Leeds, Drysalter.

1899. Hudson, Dr. Edw. J., Cleveland Cliffs Iron Co., Gladstone, Mich., U.S.A., Chemist.

O.M. Hughes, J., 79, Mark Lane, London, E.C., Agricultural Chemist.

1898. Hughes, Raymond M., Oxford, Butler Co., Ohio, U.S.A., Professor of Chemistry and Physics.

1900. Hulley, Geo. D., c/o J. Eavenson and Sons, 20th and Wood Streets, Philadelphia, Pa., U.S.A., Soapworks Chemist.

1893. Humfrey, Chas., Hilderstone, Hartford, Cheshire, Alkali Works Manager.

1896. Humphrey, H. A., 38, Victoria Street, Westminster, S.W., Consulting Engineer.

1901. Humphrey, Henry C., c/o New York Glucose Co., Edgewater, N.J., U.S.A., Chemist.

1902. Humphrey, Rich. L., 1001, Harrison Building, Philadelphia, Pa., U.S.A., Civil Engineer.

1901. Humphreys, Otho F., Patton Paint Co., Milwaukee, Wis., U.S.A., Paint Manufacturer.

O.M. Humphrys, N. H., Gasworks, Salisbury, Wilts, Gas Engineer.

1895. Hunicke, Dr. H. Aug., 3532, Victor Street, St. Louis, Mo., U.S.A., Prof. of Applied Chemistry.

1900. Hunt, Arthur V., 76, Cromwell Street, Stretford, Lancashire, Analytical Chemist.

O.M. Hunt, Bertram, c/o C. D. Laing, 717, Taylor Street, San Francisco, Cal., U.S.A., Technical Chemist.

O.M. Hunt, Chas., 15, Victoria Street, Westminster, London, S.W., Gas Engineer.

O.M. Hunt, E., Myvod House, Wood Green, Wednesbury, Staffs., Chemical Manufacturer.

1883. Hunt, J. S., Appleton, Widnes.

O.M. Hunt, W., Hampton House, Wood Green, Wednesbury, Staffordshire, Chemical Manufacturer.

1897. Hunter, Prof. A. G. Kidston, (subs.) c/o John Hunter, 18, Great Clyde Street, Glasgow; and (Journals) P.O. Box 164, Dunedin, N.Z., Prof. of Chemistry.

1902. Hunter, Hy. Blount, Hunter Chemical Co., Norfolk, Va., U.S.A., Industrial Chemist.

1893. Hunter, Prof. Matthew, Rangoon College, Rangoon, Burmah, Prof. of Chemistry.

1892. Hunter, Sidney H., 202, Bow Road, E., Mechanical Engineer.

O.M. Huntington, Prof. A. K., King's College, Strand, London, W.C., Prof. of Metallurgy.

1897. Huntington, Dr. Harwood, University Club, 1, West 54th Street, New York City, U.S.A., Consulting Chemist.

1902. Huntly, Geo. N., 96, Gower Street, London, W.C., Analytical and Consulting Chemist.

1902. Huntoon, Louis D., Bristol, Tenn., U.S.A., Mining Engineer.

1900. Hurd, Geo. E., 72, Michigan Avenue, Chicago, Ill., U.S.A., Food Products Manufacturer.

1894. Hurry, E. H., Mechanical Engineer.

1884. Hurst, G. H., 22, Blackfriars Street, Salford, Manchester, Analytical Chemist.

1901. Hurty, Jno. N., Cor. Penn and Ohio Steets, Indianapolis, Ind., U.S.A., Analytical Chemist.

O.M. Huskisson, P. L., 77, Swinton Street, London, W.C., Chemical Manufacturer.

O.M. Huson, C. W., 18, Batavia Buildings, Hackins Hey, Liverpool, Analytical Chemist.

1894. Hutcheson, Jno. F., 22, St. Enoch Square, Glasgow, Chemical Manufacturer.

O.M. Hutchinson, C. C., 3, Harcourt Buildings, Temple, E.C., Barrister-at-Law and Chemical Engineer.

1900. Hutchinson, Edw. G., Gasworks, Pontefract Road, Barnsley, Yorks, Assistant at Gasworks.

O.M. Hutchinson, T. J., Aden House, Manchester Road, Bury, Analytical and Consulting Chemist.

1901. Hutton, Robt. S., Owens College, Manchester, Lecturer on Electro-Chemistry.

O.M. Huxley, Jas. H., c/o Vickers, Son, and Maxim, Ltd., River Don Works, Sheffield, Metallurgical Chemist.

1897. Hyams, Geoffrey M., P.O. Box 5104, and 312, Sears Building, Boston, Mass., U.S.A., Mines Manager.

1902. Hyde, Austin T., Box 365, Rumford Falls, Maine, U.S.A., Chemical Engineer.

1897. Hyde, B. T. Babbitt, c/o B. T. Babbitt, 82, Washington Street, New York City, U.S.A., Soap Manufacturer.

1899. Hyde, Fred. S., 215, Schermerhorn Street, Brooklyn, N.Y., U.S.A., Research Chemist.

1897. Hyde, Henry St. John, 210, East 18th Street, New York City, U.S.A.

1899. Hyde, Wm. Grantley, 26, Winsham Street, Clapham Common, S.W., Assayer.

1901. Hyman, Leonard W., Port Chester Chemical Co., Port Chester, N.Y., U.S.A., Analytical Chemist.

1896. Hyndman, H. H. Francis, Physical Laboratory, Leyden, Holland, Analytical and Consulting Chemist.

I

1898. Ibbotson, E. C., 3, Ashgate Road, Sheffield, Metallurgist.

1900. Ichioka, Dr. Tajiro, 10, Nishikatamachi, Hongo, Tokio, Japan, Chemist (Imperial Japanese Navy).

1885. Idris, T. H. W., 110, Pratt Street, Camden Town, N.W., Mineral Water Manufacturer.

1902. Ihart, John P., 127, West 38th Street, New York City, U.S.A., Technical Chemist.

1899. Imhoff, Dr. Paul, 18, Greenbank Road, Liverpool, Chemist.

1900. Imrie, John, 415, Shields Road, Pollokshields, Glasgow, Analytical Chemist.

1900. Ingalls, Walter R., 229, Ocean Street, Lynn, Mass., U.S.A., Mining Engineer and Metallurgist.

1889. Ingle, Dr. Harry, 15, John Street, Kirkcaldy, Fifeshire, Organic Chemist.

1891. Ingle, Herbert, Pretoria, Transvaal, Govt. Agricultural Chemist.

1884. Inglis, R. A., Culrain, Bothwell, N.B., Analytical Chemist.

1884. Irving, J. M., 17A, Dickinson Street, Cooper Street, Manchester, Chemical Merchant.

O.M. Irwin, W., 3, Wilton Polygon, Cheetham Hill, Manchester, Analytical Chemist.

1893. Isaac, J. F. V., Research Chemist.

1888. Isaac, T. W. Player, Barton Court, Abingdon, Chairman of Waterworks Co.

1896. Isaacs, Louis A., 110, Greencroft Gardens, West Hampstead, N.W.; (Journals), c/o Yeatman and Co., Ltd., Denmark Street, E, Manufacturer.

1901. Isakovics, Alois von, 449, East 121st Street, New York City, U.S.A., Manufacturing Chemist.

1903. Isherwood, Oswald, 6, Hardy Street, Peel Green, Patricroft, near Manchester, Chemical Engineer.

O.M. Isler, Otto, 35–37, Dickinson Street, Manchester, Chemical Merchant.

1900. Ittner, Dr. Martin H., c/o Colgate and Co., Jersey City, N.J., U.S.A., Soap and Essential Oil Chemist.

J

1890. Jackman, E. J., 60, Belgrave Road, Ilford, Essex, Technical Chemist.

1898. Jackson, Alf. Greville, George Street, Brisbane, Queensland, Electro-Chemical Engineer.

1901. Jackson, Daniel D., Mount Prospect Laboratory, Flatbush Avenue and Eastern Parkway, Brooklyn, N.Y., U.S.A., Chemist.

O.M. Jackson, Edward, Clovelly, Grove Avenue, Moseley, Birmingham, Alkali Works Inspector.

1891. Jackson, F., Smedley Bridge Works, Cheetham, near Manchester, Chemical Apparatus Maker.

1883. Jackson, Frederick, 14, Cross Street, Manchester, Laboratory Furnisher.

1884. Jackson, G. B., 7, Brazenose Street, Albert Square, Manchester, Chemical Manufacturer.

1901. Jackson, Henry A., 1101, Washington Street, Wilmington, Del., and Columbia University, New York City, U.S.A., Chemist.

1886. Jackson, John, 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer.

1901. Jackson, Percy G., Chemical Laboratory, Locomotive Department, Midland Railway, Derby, Chemist.

O.M. Jackson, R. V., c/o Scotch and Irish Oxygen Co., Polmadie, Glasgow, Technical Chemist.

1890. Jackson, Saml., c/o Binny and Co., Madras, India, Analytical Chemist.

1902. Jackson, Samuel, Wm. Metcalf, Ltd., Church, near Accrington, Director (Tar Distillery).

1898. Jackson, Thos., Clayton Chemical Works, Clayton, Manchester, Chemical Manufacturer.

1900. Jackson, Victor G., 167, Grove Lane, Denmark Hill, S.E., Chemist.

1901. Jackson, W. B., Glengowan Printworks, Caldercruix, N.B., Chemist.

1903. Jackson, Wm. D. N., 16, North Road, Wallsend-on-Tyne, Analytical Chemist.

1899. Jackson, W. E. Russell, Sunderland Brewery, Sunderland, Brewer.

1900. Jackson, Dr. W. Hatchett, Radcliffe Library, University Museum, Oxford, Librarian and Science Tutor (Keble College).

1893. Jackson, Rt. Hon. W. L., F.R.S. *See* Allerton, Rt. Hon. Lord.

1899. Jackson, W. Morton, c/o Manchester Oxygen Co., Ltd., Great Marlborough Street, Manchester, Manager.

O.M. Jackson, W. P., Saxilby, near Lincoln, Chemical Works, Manager.

1901. Jacobs, Charles B., 41, Broad Steeet, New York City, U.S.A., Chemist.

1901. Jacobsen, Rudolph C., 154, Lake Street, Chicago, Ill., U.S.A., Editor "Hide and Leather."

1900. Jacoby, Areli H., c/o New York and Boston Dyewood Co., 156, William Street, New York City, U.S.A., Chemist.

1897. Jacqué, Maurice, Fabrica de Dinamita, Galdacano, cerca Bilbao, Spain, Chemical Engineer.

1901. Jadhava, Khasberao B., Baroda, Bombay Presidency, India, Collector and District Magistrate.

1900. Jäger, B. M., c/o Geo. Jäger and Sons, 77, Burlington Street, Liverpool, Chemist, Sugar Refinery.

1886. Jago, Wm., Godrevy House, Wilbury Avenue, Hove, Sussex, Chemical Engineer.

1889. James, Alf., 56, New Broad Street, London, E.C., Mining Engineer.

1900. James, Edgar C., 202, Portway, West Ham, E., Chemist.

1883. James, E. T., British Alizarin Co., Ltd., Silvertown, Victoria Docks, E., Secretary.

1885. James, Dr. J. Wm., Aylmer House, Weston-super-Mare; and (Journals) 29, Redcliff Street, Bristol, Chemical Lecturer.

1893. James, Lawrence S., 32, Hawley Street, Boston, Mass., U.S.A., Gas Inspector.

1894. Jameson, A. H., 23, Mathewson Street, Providence, R.I., U.S.A., Chemist.

1902. Jameson, Lewis, 91, Queen Victoria Street, London, E.C., Consulting Chemist.

1890. Jantzen, Paul, 133, Fenchurch Street, London, E.C., Chemical Merchant.

O.M. Japp, Dr. F. R., F.R.S., The University, Aberdeen, Professor of Chemistry.

1890. Jarmain, Geo. S., Dalton Lodge, Huddersfield, Wool Extractor.

O.M. Jarmay, G., Hartford Lodge, Hartford, Cheshire, Alkali Manufacturer.

1894. Jarrett, H. T., 90, William Street, New York City, U.S.A., Chemist.

1884. Jarves, Deming, Michigan Carbon Works, Detroit, Mich., U.S.A., Manufacturing Chemist.

1900. Jarvie, Hugh, Earnest Soap and Glycerin Works, Coatbridge, N.B., Chemist.

1900. Jarvie, Jas., Monkland House, Kirkintilloch, N.B., Chemist.

1894. Jarvis, Talbot McL., Latrobe Cottage, Bedford, Brewer.

O.M. Jayne, Dr. H. W., 931, North Broad Street, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

O.M. Jekyll, J., Castle Moat House, Lincoln, Chemical Manufacturer.

1892. Jenkin, W. A., 5, Bella Vista, Minas de Rio Tinto, Provincia de Huelva, Spain, Metallurgical Chemist.

1894. Jenkins, John H. B., Laboratory, G.E.R. Works, Stratford, E., Analytical Chemist.

1894. Jenks, Robt. L., 89, Bartholomew Close, London, E.C., Chemist.
O.M. Jenner, E., 209, Markhouse Road, Walthamstow, Essex, Chemical Manufacturer.
1899. Jennings, Thos., Brookfield, Cork, Ireland, Chemical Manufacturer.
1899. Jerdan, Dr. David S., c/o J. and G. Cox, Ltd., Gorgie Mills, Edinburgh, Chemist (Gelatin Works).
1899. Jessop, Louis V., 8, Rockmead Road, Victoria Park, N.E., Chemist.
1896. Job, Robt., 109, Windsor Street, Reading, Pa., U.S.A., Analytical Chemist.
1886. Johnson, A. E., Claremont, Lyndhurst Road, Wolverhampton, Analytical Chemist.
1900. Johnson, Albert C., 320, East 25th Street, Baltimore, Md., U.S.A., Chemical Engineer.
1902. Johnson, Chas. M., 701, Orchard Street, Avalon, Allegheny Co., Pa., U.S.A., Chemist.
1891. Johnson, Edmond E., 37, Clova Road, Forest Gate, E., Chemical Engineer.
1900. Johnson, Edw., c/o Pereira, Carneiro, & Co., Rua do Commercio, No. 6, Pernambuco, Brazil, Sugar Works Manager.
1902. Johnson, Emil F., 96–98, Maiden Lane, New York City, U.S.A., Consulting Chemist.
1900. Johnson, F. Carter, National Acid Co., 714, Union Street, New Orleans, La., U.S.A., Chemical Engineer.
O.M. Johnson, J. E., 40, Idmiston Road, Stratford, London, E., Manufacturing Chemist.
1884. Johnson, J. Grove, 23, Cross Street, Finsbury, London, E.C., Assayer.
1895. Johnson, Jesse F., c/o Hamilton Powder Co., Montreal, Canada, Chemical Engineer.
1900. Johnson, Jno. E., c/o John Johnson and Co., 95—97, Liberty Street, New York City, U.S.A., Chemical Engineer.
1900. Johnson, Jno. W. H., (communications) York House, Thornhill, Dewsbury, (Journals) West Riding Rivers Board, Wakefield, Yorks, Analytical Chemist.
O.M. Johnson, S. H., Warren Hill House, Loughton, Essex, Chemical Engineer.
O.M. Johnson, T. A., Field House, Winnington Park, Northwich, Cheshire.
1895. Johnston, Alex. R., 18, Percy Street, Ibrox, Glasgow, Analytical Chemist.
1894. Johnston, G. Lawson, c/o Bovril, Ltd., 152, Old Street, E.C., Vice-Chairman.
1889. Johnston, Thos., Nobel's Explosives Co., Ltd., 195, West George Street, Glasgow, Manager.
1890. Johnston, Wm. A., The S. S. White Dental Manufacturing Co., Prince's Bay, Staten Island, N.Y., U.S.A., Dental Enamel Manufacturer.
1894. Johnston, Wm. E. Lawson, 152, Old Street, London, E.C., Assistant Chemist (Bovril, Limited).
O.M. Johnston, Wm. G., Chemical Works, Coatbridge Street, Port Dundas, Glasgow, Technical Chemist.
O.M. Johnstone, Jas., Shawfield Works, Rutherglen, Glasgow, Technical Chemist.
O.M. Johnstone, W. G., The Brewery, Newark-on-Trent, Chemist.
1902. Jollyman, Walter H., Spartan House, Colney Hatch Lane, Muswell Hill, N., Analyst.
1903. Jones, Alfred O., 18, Queen's Gardens, Tetherdown, Muswell Hill, N., Works Chemist.
1897. Jones, Chas. H., Minas de Rio Tinto, South Spain, Technical Chemist.
1902. Jones, David R., Standard Chemical Co., Deseronto, Ont., Canada, Chemical Engineer.
1902. Jones, Edgar S., Sulphide Corporation, Ltd., Cockle Creek, N.S.W., Australia, Metallurgical Chemist.
O.M. Jones, E. W. T., 10, Victoria Street, Wolverhampton, Analytical Chemist.
1897. Jones, Fred. W., Barwick, near Ware, Herts, Explosives Works Manager and Chemist.
1896. Jones, G. Cecil, Wisteria Cottage, Manningtree, Essex, Works Chemist.
1900. Jones, Gordon, Pystill, Holywell, Flints., North Wales, Paper Manufacturer.
1898. Jones, Henry, Broughton Bridge Mills, Salford, Dyer and Finisher.
O.M. Jones, H. Chapman, Royal College of Science, South Kensington, S.W., Senior Demonstrator in Chemistry.
1893. Jones, Herbert. *See* Sefton-Jones, H.
1901. Jones, Herbert J., 58, Claremont Road, Alexandra Park, Manchester, Chemist.
1899. Jones, Llewellyn J. W., Tacoma Smelting Co., Tacoma, Wash., U.S.A., Metallurgist.
1898. Jones, Martin L., c/o Ooregum G. M. Co., Oorgaum, Mysore State, India, Metallurgical Chemist.
1894. Jones, M. W., Greystonedale, Kensington Hill, Brislington, Bristol, Analytical Chemist.
1899. Jones, Thos. J., Anglo-Continental Guano Works, North Woolwich Road, E., Foreman.
1887. Jones, T. Tolley, 356, Little Collins Street, Melbourne, Victoria, Explosives Manufacturer.
1903. Jones, Wm. James, jun., Purdue University, La Fayette, Ind., U.S.A., Chemist.
O.M. Jones, W. Norris, Lancashire Metal Works, Widnes, Technical Chemist.
1902. Jonker Czn., Hendrik, c/o J. C. P. Hotz and Son, Ispahan, Persia, Chemical Engineer.
1899. Joplin, Geo. C., 12, Harrington Street, Sydney, N.S.W., Australia, Analyst.
1897. Jorissen, Dr. Wm. P., Koninklijk Inst. v. d. Marine, Willemsoord, Holland, Editor.
1900. Josephson, Edgar, 131, Amity Street, Brooklyn, N.Y., U.S.A.
1891. Joslin, Omar T., Spring Grove Avenue (opp. Bates), Cincinnati, Ohio, U.S.A., Chemical Engineer.
1887. Jouët, Dr. C. H., Roselle, Union Co., N.J., U.S.A., Technical Chemist.
1889. Journand, Louis, 21, Grand Rue, Bourg-de-Péage, Drôme, France, Technical Chemist.
1888. Joy, Douglas G., The Rookery, Stevenage, Herts, Oil Refiner.
1887. Jürgensen, Dr. Rolof, Karlsgasse 5, Prag-Zizkov, Austria, Chemist.
1900. Just, Jno. A., 116, East Castle Street, Syracuse, N.Y., U.S.A., Chemist.
O.M. Justice, P. M., 55–56, Chancery Lane, London, W.C., Patent Agent.

K

1898. Kahn, Julius, 100, West 80th Street, New York City, U.S.A., Manufacturer of Rubber Goods.
1896. Kalbfleisch, Franklin H., 33–35, Burling Slip, New York City, U.S.A., Chemical Manufacturer.
1884. Kalle, Dr. Wm., Biebrich-am-Rhein, Germany, Colour Manufacturer.
1899. Karas, Jno., c/o Buffalo Shirt Co., 565-577, Washington Street, Buffalo, N.Y., U.S.A., Laundryman.
1901. Kasson, Henry R., 1209, Stock Exchange Building, Chicago, Ill., U.S.A., Asphalt Chemist.
1901. Kauder, Dr. E., c/o Merck and Co., University Place, New York City, U.S.A., Chemist.
1892. Kaufmann, Dr. Herbert M., c/o Mutual Chemical Co., Jersey City, N.J., U.S.A., Chemist.
1885. Kawakita, Michitada, Imperial Engineering College, Tokio, Japan, Analytical Chemist.
O.M. Kay, Wm. E., Marple Lodge, Marple, Cheshire, Printworks Chemist.
1897. Kearns, Jno. S., Baxenden House, near Accrington, Chemist and Dyer.
1894. Kebler, Lyman F., Department of Agriculture, Bureau of Chemistry, Washington, D.C., U.S.A., Chief of Drug Laboratory.
1900. Keeble, Arthur J., Peterborough, Cement Manufacturer.
1886. Keiser, Prof. E. H., Washington University, St. Louis Mo., U.S.A., Professor of Chemistry.

1900. Kelf, Henry C., c/o East India Distilleries, Nellikuppam, S. Arcot, Madras, India, and (Journals) 85, Warren Road, Leyton, Essex, Sugar Chemist.
1900. Kellner, Dr. Carl, Laby., Borschkegasse No. 8, Vienna, IX/2, Austria, Paper Chemist.
1885. Kellner, Dr. Wm., 135, Victoria Road, Old Charlton, S.E., Chemist to War Department.
1901. Kelsey, D. McC. Stone, 192, Woodlawn Avenue, Saratoga Springs, N.Y., U.S.A., Manufacturing Chemist.
1901. Kelsey, Jas. W., 2, West View, Blackhill, co. Durham, Chemist and Metallurgist.
1889. Kempson, John F., Pye Bridge Chemical Works, near Alfreton, Derbyshire, Chemical Manufacturer.
1901. Kennedy, Alex., Kenmill House, Bothwell, N.B., Rosin Distiller.
1903. Kennedy, Hugh Watson, 626, South 19th Street, Philadelphia, Pa., U.S.A., Chemist.
1891. Kenrick, Prof. Edgar B., 282, Assiniboine Avenue, Winnipeg, Manitoba, Canada, Prof. of Chemistry.
1901. Kenrick, Dr. Frank B., 209, John Street, Toronto, Canada, Lecturer on Chemistry.
1888. Kent, Wm. J., Holly Lodge, Hornsea, Yorks, Assayer, and Chemical Engineer.
1889. Kenyon, Thos., The Shrubbery, Hilton Park, Prestwich, near Manchester, Manufacturing Chemist.
1900. Keppelmann, Alf. J., P.O. Box 1549, Philadelphia, Pa., U.S.A., Chemical Merchant.
1888. Ker, Alan D., Millburn Chemical Works, Garngad Hill, Glasgow Chemical Manufacturer.
1899. Kern, Walter P., 282, Lafayette Avenue, and (Journals) c/o General Chemical Co., Dundee Works, Passaic, N.J., U.S.A., Chemist.
1894. Kerr, Jas., Surgeons Hall, Edinburgh, Lecturer on Chemistry.
1890. Kerr, Saml. T., 516, North Delaware Avenue, Philadelphia, Pa., U.S.A., Salt Manufacturer.
1897. Kerr, Wm. M., c/o General Chemical Co., 608, Philadelphia Bourse, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1896. Kershaw, Jno. B. C., Faraday House, 8, Charing Cross Road, London, W.C., Analytical Chemist.
1902. Kessler, Henry W., Brandt, Susquehanna Co., Pa., U.S.A., Manufacturing Chemist.
1893. Kestner, Paul, 22, Boulevard Vauban, Lille, France, Chemist.
1898. Keswick, Wm., M.P., 3, Lombard Street, London, E.C., Merchant.
1900. Kewley, Jas., Arbory Road, Castletown, Isle of Man, Technical Chemist.
1890. Keys, W. H., Lyndon House, West Bromwich, Oil and Chemical Manufacturer.
1892. Kibbie, W. Oakes, G.P.O., Denver, Colo., U.S.A., Chemical Engineer.
1896. Kier, Thos., Thornliebank, Glasgow, Chemist.
1900. Kilgore, Benj. W., Raleigh, N. Carolina, U.S.A., Chemist.
1901. Kilmer, Fred. B., New Brunswick, N.J., U.S.A., Chemical Manufacturer.
O.M. Kinch, E., Royal Agricultural College, Cirencester, Professor of Chemistry.
O.M. King, A. J., (Journals) Ingersley Vale, and (communications) Rock Bank, Bollington, near Macclesfield, Bleacher and Finisher.
1884. King, C. M., Campsie Alum Works, Lennoxtown, N.B., Alum Manufacturer.
1887. King, Sir James, Bart., 115, Wellington Street, Glasgow, Chemical Manufacturer.
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1897. King, Joshua, Clarewood, Camberley, Surrey, Indian Civil Service (retired).
1887. King, Robt., 115, Wellington Street, Glasgow, Chemical Manufacturer.
1895. King, Sidney J., 49, Arundel Square, Barnsbury, N., Colour and Dyestuff Traveller.
O.M. King, Walter R., (Journals) Avalon, Trinity Avenue, Southend-on-Sea; and (Subscriptions) 17, Wilson Street, Finsbury, E.C., Chemical Manufacturer.
1899. King, Wm. R., Box 695, Summit, N.J., U.S.A., Mechanical Engineer.
1896. Kingdon, G. Holman, 9, Grappenhall Road, Stockton Heath, Warrington, Technical Chemist, M.A., Oxon.
1899. Kingsford, Edw. A., 91, Petherton Road, Highbury, N., Manufacturing Chemist.
1883. Kingsford, T. P., Oswego, N.Y., U.S.A., Starch Manufacturer.
O.M. Kingzett, C. T., Elmstead Knoll, Chislehurst, Kent, Technical Chemist.
1892. Kinnicutt, Professor L. P., 77, Elm Street, Worcester, Mass., U.S.A., Professor of Chemistry (Worcester Polytechnic Institute).
1897. Kipping, Dr. F. Stanley, F.R.S., University College, Nottingham, Prof. of Chemistry.
1898. Kirkland, Archd., 80, High Street, Irvine, N.B., Baker.
1897. Kirkland, Robt., Grand Junction Glue and Chemical Co., Ltd., Market Harborough, Chemist.
1900. Kirkpatrick, Stafford F., 96, Barrie Street, Kingston, Ont., Canada, Assayer.
1887. Kitamura, Y. (Journals), c/o R. Fujihanaya, Yokoyamacho Sanchome, Tokyo, Japan, Agricultural Chemist.
1902. Kitchen, Wm. J., Port Melbourne North, Vic., Australia, Soap and Candle Manufacturer.
1891. Kitson, Sir James, Bart., M.P., Gledhow Hall; and (Journals) Monkbridge Iron and Steel Co., Ltd., Leeds, Iron and Steel Manufacturer.
1883. Kitto, B., 26, Lancaster Road, Finsbury Park, London, N., Analytical Chemist.
1900. Kittredge, H. G., 42, Linden Avenue, Dayton, Ohio, U.S.A., Chemist.
1900. Kleber, Dr. Clemens, Union Avenue, Clifton, N.J., U.S.A., Director (Fritzche Bros.' Laboratory).
1888. Kleemann, Dr. S., Farben Fabrik, Forcheim, Bavaria, Analytical Chemist.
1898. Klein, Otto H., Room 110, Stewart Building, 280, Broadway, New York City, U.S.A., Consulting Engineer.
1889. Klipstein, A., 122, Pearl Street, New York City, U.S.A., Chemical Manufacturer.
1902. Klipstein, Ernest C., 116, Prospect Street, East Orange, N.J., U.S.A., Chemical Manufacturer.
1891. Knaggs, Alfred B., Bradley Lane, Huddersfield, Technical Chemist in Dyeworks.
1900. Knapp, Rudolf E., 487, East Congress Street, Detroit, Mich., U.S.A., Chemist.
1892. Knecht, Dr. E., Municipal School of Technology, Manchester; and (Journals) 5, Station Road, Crumpsall, Manchester, Professor of Tinctorial Chemistry.
1900. Kniffen, Fred., U.S. Naval Smokeless Powder Factory, Indian Head, Md., U.S.A., Chemist.
1887. Knight, A. H., 2, Gerald Road, Oxton, Cheshire, Assayer.
1884. Knight, Henry, Stanley House, 73, Anfield Road, Liverpool, Colour and Varnish Manufacturer.
O.M. Knight, J. B., Silvertown Soapworks, Silvertown, London, E., Soap Manufacturer.
1894. Knight, Wm. A., Sexey's Trade School, Bruton, Somerset, Head Master.
1887. Knights, J. West, Public Laboratory, Tenison Road, Cambridge, Analytical Chemist.
1885. Knipler, F., c/o R. Harper and Co., Port Melbourne, Victoria, Starch Manufacturer.
1883. Knowles, Joshua, Stormer Hill, Tottington, near Bury, Calico Printer.
1886. Knox, E. W., Colonial Sugar Refining Co., Sydney, N.S.W.; and c/o Parbury Henty & Co., 20, Eastcheap, London, E.C., Sugar Manufacturer and Refiner.
1902. Knudsen, Hans, 29a, Gillingham Street, London, S.W., Inventor.
1895. Koechl, Victor, 122, Hudson Street, New York City; (Journals) 47, Montgomery Place, Brooklyn, N.Y. U.S.A., Dye Merchant.

1901. Koehler, Dr. H., c/o Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Manager.

1901. Kohl, Herbert C., Craigsville, Va., U.S.A., Cement Works Chemist.

1884. Kohn, Dr. Charles A., M.Sc., Sir John Cass' Technical Institute, Jewry Street, Aldgate, E.C., Principal.

1902. Kohnstamm, Lothair S., 87, Park Place, New York City, U.S.A., Chemist.

1884. Kolb, J., Soc. Anon. des Manuf. de Produits Chimiques, Lille, France, Chemical Manufacturer.

1902. Kottmann, Dr. Gustav, Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Analytical Chemist.

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1894. Krause, Dr. Albert H., 32, Wellington Avenue, Cleveland, Ohio, U.S.A., Chemist (Grasselli Chemical Co.).

O.M. Krause, Prof. Dr. G., "Chemiker-Zeitung," Cöthen, Germany, Editor.

O.M. Krause, O. H., c/o American Sugar Refining Co., Jersey City, N.J., U.S.A., Chemical Engineer.

1898. Krebs, H. J., Wilmington, Del., U.S.A., Manufacturing Chemist.

1903. Kremer, Frank N., 646, Broadway, Milwaukee, Wis., U.S.A., Chemist.

1900. Kremers, Dr. Edw., Madison, Wis., U.S.A., Professor (University of Wisconsin).

O.M. Kühl, W. H., 73, Jägerstrasse, Berlin, Germany, Bookseller.

1900. Kunheim, Erich, 32, Dorotheenstrasse, Berlin, N.W., Germany, Chemist.

1885. Kupferberg, Dr. H., 303, Collyhurst Road, Manchester, Technical Chemist.

1896. Kuttroff, Adolf, 128, Duane Street, New York City, U.S.A., Chemical Merchant.

1900. Kuttroff, Fred., 128, Duane Street, New York City, U.S.A., Merchant.

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1898. Kynaston, Wm. C. R., Analyst.

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1890. Lacey, E. C., 10, Clarence Road, Croydon, Manufacturing Chemist.

O.M. Lacey, T. S., Gas Works, York Road, King's Cross, London, N.W., Gas Engineer.

1899. Lachman, Albert, California Wine Association, San Francisco, Cal., U.S.A., Wine Merchant.

1888. Lagerwall, Dr. Ivar, Sunthorpe, Wallington, Surrey, Petroleum Manufacturer.

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1902. Laist, Fredk., Chemical Department, University of Utah, Salt Lake City, Utah, U.S.A., Chemist.

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1900. Lamar, Wm. R., c/o Mallinckrodt Chemical Works, St. Louis, Mo., U.S.A., Chemist.

1893. Lamb, Morris Chas., 151, Westcombe Hill, Blackheath, S.E., Chemist.

1900. Lambert, Walter S., Morriston Place, Clydach, R.S.O., Glamorgan, Analyst.

1899. Lamborn, Leebert Lloyd, 134, Willoughby Avenue, Brooklyn, N.Y., U.S.A., Factory Superintendent.

1895. Lancaster, Jno. C., 260, Alfreton Road, Nottingham, Engineering Works Manager.

1900. Lauder, Geo. D., 1, Balmoral Road, Nottingham, Lecturer.

1895. Landin, John, 40, Drottninggatan, Stockholm, Sweden, Public Analyst.

1903. Lane, Nathaniel J., U.S. Laboratory, 641, Washington Street, Manhattan Borough, New York City, U.S.A., Analytical Chemist.

1890. Lang, Jas. G., Dominion Hotel, Victoria, B.C., Canada, Analytical Chemist.

1893. Lang, Dr. Wm. R., University of Toronto, Canada, Professor of Chemistry.

O.M. Langdon, Dr. M. J., 16, Harriet Street, Stretford, Manchester, Analytical Chemist.

1890. Lange, Dr. Martin, Utrechtsche Weg 40, Amersfoort, Holland, Analytical Chemist.

1892. Langer, Dr. Carl, Ynyspenllwch, Clydach, R.S.O., Glamorganshire, Analytical Chemist.

1897. Langmuir, Arthur C., c/o Marx and Rawolle, 9, Van Brunt Street, Brooklyn, N.Y., U.S.A., Analytical Chemist.

1902. Langmuir, F. Leighton, 350, Bloor Street West, Toronto, Canada, Chemist.

1898. Langstaff, Wm., c/o Grasselli Chemical Co., Tremley, N.J., U.S.A., Chemist.

1900. Lant, Herbert, "Ivy Bank," Wath-on-Dearne, near Rotherham, Yorks., Chemist and Manager.

1903. Larter, Alfred T, The Basingstoke Ironworks, Basingstoke, Hants, Chemist.

1884. Latham, Baldwin, Parliament Mansions, Victoria Street, Westminster, S.W., Civil Engineer.

1889. Latham, J. J., Mill House, Bold, Widnes, Chemical Works Manager.

O.M. Lawrence, Jas., Repauno Chemical Works, Paulsboro', N.J., U.S.A., Assistant Manager.

O.M. Laws, J. P., 2, Aigburth Vale, Liverpool, S., Analytical Chemist.

1885. Lawson, Arthur J., Marsh Soapworks, Bristol, Soap Manufacturer.

1888. Lawson, Dr. T. A., 90, Boundary Road, London, N.W., Colour Chemist.

1900. Lawson, Wm., Alameda Sugar Co, Alvarado, Cal., U.S.A., Chemist.

1893. Lawton, Thos., Calthorpe House, Aldridge Road, Perry Barr, Birmingham, Chemical Works Manager.

1890. Laycock, Dr. W. F., 46, Boar Lane, Leeds, Analytical Chemist.

1902. Lazell, Ellis Warren, 1619, Filbert Street, Philadelphia, Pa., U.S.A., Chemist.

1898. Lean, Geo., 15, Park Terrace, Glasgow, Chemist.

1897. Leathart, Thos. H., Lead Works, Newcastle-on-Tyne, Lead Manufacturer.

O.M. Leather, Dr. J. Walter, Dehra Dun, United Provinces, India, Government Agricultural Chemist.

1897. Le Bosquet, Maurice, Technical Chemist.

1893. Le Boutillier, Clement, c/o Taylor Iron and Steel Co. High Bridge, N.J., U.S.A., Chemist.

1896. Lecomber, W. G., Beech House, Ashton Grove, Ashton-on-Mersey, Cheshire, Engineer.

1896. Lederle, Dr. E. J., Health Department, New York City, U.S.A., Chief Chemist.

1892. Ledoff, Prof. A., Technological Institute, Kharkoff, Russia, Professor of Chemistry.

1895. Ledoux, Dr. Albert R., 99, John Street, New York City, U.S.A., Chemist.

1901. Lee, FitzHugh, c/o Grasselli Chemical Co., Cleveland, Ohio, U.S.A., Superintendent.

1898. Lee, Jno. L., Woodfield, Lytham, Lancashire, Dyer and Bleacher.

1885. Lee, S. Wright, 6–10, Whitechapel, Liverpool, Wholesale Druggist.

1891. Lee, Theo. H., (subsn). Edgcumbe Villa, Clevedon, Somerset; and (Journals) St. John Del Rey Mine, Morro Velho, Villa Nova de Lima, Minas Geraes, Brazil; Analytical Chemist.

1899. Lee, Waldemar, Palmerton, Pa., U.S.A., Chemist.

1886. Leeds, F. H., 26, East Bank, Stamford Hill, N., Analytical Chemist.

1889. Leese, Joseph, 3, Lord Street West, Southport.

1901. Lefebvre, Georges, Compagnie du Phospho-Guano, 60, Rue de Bondy, Paris, Director.

1901. Leffler, Rudolf L., c/o Thos. Firth and Sons, Ltd., Norfolk Works, Sheffield, Metallurgical Chemist.

1901. Leitbfried, Jno. E., Bethlehem, Pa., U.S.A., Analytical Chemist.

1888. Leigh, Cecil, Birmingham Metal and Munition Co., Adderley Park Rolling Mills, Birmingham, Technical Chemist.

1902. Leighton, A. E., 78, Hillfield Avenue, Hornsey, N., Analytical Chemist.

1894. Leitch, Jno. W., Milnsbridge Chemical Works, near Huddersfield, Aniline Dye Manufacturer.

1898. Leman, Wm. T., c/o Paragon Refinery Co., Toledo, Ohio, U.S.A., Oilworks Manager.

1894. Lenders, A. W. H., c/o Glucose Sugar Refining Co., Davenport, Iowa, U.S.A., Technical Chemist.

1901. Lengfeld, Dr. Felix, 202, Stockton Street, San Francisco, Cal., U.S.A., Manufacturing Chemist.

1883. Lennard, F., 70, Gracechurch Street, E.C.; and (Journals) Merrow Croft, Merrow, Guildford, Chemical Manufacturer.

1884. Leonard, Wm. J., Hope Chemical Works, Hackney Wick, E., Naphtha Distiller.

1888. Lequin, E., Directeur Général des Usines de Produits Chimiques de la Société de St. Gobain, 1, Place des Saussaies, Paris (VIII^e.).

1894. Leslie, Hugh M., Marikuppam, Mysore State, South India, Chemical Engineer.

1899. Lesser, Wm., P.O. Box 162, Albany, N.Y., U.S.A., Manufacturing Chemist.

1900. Lessuer, Chas. B., San Finx Tin Mines, Ltd., Carrill, Spain, Metallurgical Chemist.

1896. Lester, Isaac E., 57, Westminster Road, Handsworth, Birmingham, Steelworks Manager.

1892. Lester, J. H., Royal Exchange, Manchester, Analytical Chemist.

1899. Le Sueur, Henry R., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Demonstrator.

1894. Lett, Stephen J., 19, Bensham Manor Road, Thornton Heath, S.W., Chemical Engineer.

1898. Leuthardt, Peter, 33, Rydal Gardens, Streatham, London, S.W., Chemical Manufacturer.

1891. Lever, Wm. H., Thornton House, Thornton Hough, Cheshire, Soap Manufacturer.

1901. Levett, Walter, Fairview, St. Margaret's Avenue; and (Journals) Mines Safety Explosives Co., Stauford-le-Hope, Essex, Factory Manager.

1900. Levine, Edmund J., c/o The Fiberloid Co., 7, Waverley Place, New York City, U.S.A., Chemist.

1901. Levinstein, Dr. Herbert, Crumpsall Vale Chemical Works, Crumpsall, and (Journals) Hawkesmoor, Fallowfield, Manchester, Chemist.

O.M. Levinstein, Ivan, Crumpsall Vale Chemical Works, Crumpsall, near Manchester, Colour Manufacturer.

1901. Levy, Dr. Albert, The Mond Nickel Co., Ltd., Clydach, R.S.O., Glamorgan, Works Chemist.

1887. Lewes, Prof. Vivian B., Royal Naval College, Greenwich, S.E. Professor of Chemistry.

1898. Lewin, H. James, Royal Victoria Yard, Deptford, S.E., Analytical Chemist.

1889. Lewis, A. E., 56, Thomas Lane, Knotty Ash, Liverpool, Analytical Chemist.

1896. Lewis, Daniel C., c/o Millville Manufacturing Co., Millville, N.J., U.S.A., Dye and Bleach Works Chemist.

1900. Lewis, Ernest A., 310, Dudley Road, Birmingham, Chemist and Metallurgist (Muntz Metal Co.).

1902. Lewis, Fredk. H., Craigsville, Va., U.S.A., Manager (Virginia Portland Cement Co.).

1900. Lewis, John, 57, East Dulwich Road, East Dulwich, S.E., Cashier (Paint Works).

1900. Lewis, Saml. J., 122, Newington Causeway, London, S.E., Pharmaceutical Chemist.

1889. Lewkowitsch, Dr. Julius, 71, Priory Road, West Hampstead, N.W., Consulting Chemist.

1901. Lichtenstein, Alf. S., Arnold Printworks, North Adams, Mass., U.S.A., Chemist.

O.M. Lichtenstein, Theodore, Chemical Works, Silvertown, E., Manufacturing Chemist.

1892. Liddle, G. A., 313, Walmersley Road, Bury, Lancs., Chemist, Dyewood Extract Works.

1885. Liddle, W. T., Woodville, Walmersley Road, Bury, Lancs., Manager, Dyewood Extract Works.

O.M. Liebmann, Dr. A., 10, Marsden Street, Manchester, Analytical Chemist.

1899. Liedbeck, P. F. Alarik, 43, Strandwagen, Stockholm, Sweden, Chemical Engineer.

O.M. Lightfoot, T. E., 88, Arden Terrace, Accrington, Calico Printer's Chemist.

1898. Lilly, Josiah K., c/o Eli Lilly and Co., Indianapolis, Ind., U.S.A., Manufacturing Pharmacist.

1885. Lilly, Oliver M., The Croft, Spondon, Derby, Colour Manufacturer.

1897. Lindsay, Robt., Rosshead, Alexandria, N.B., Chemist.

1901. Lindsay, Robt. D., P.O. Box 4654, Johannesburg, Transvaal, Chemist.

1890. Ling, Arthur R., Laboratory, 2, St. Dunstan's Hill, E.C., and (Journals) Hazeldene, Kingston Road, New Malden, Analytical and Consulting Chemist.

1901. Lippincott, Warren B., 3616, Genesee Street, Kansas City, Mo., U.S.A., Chemist.

1896. Lishman, Geo. P., Bunker Hill, Fence Houses, Co. Durham, Colliery Chemist.

1896. Littell, R. Ballantine, 50, South Walnut Street, East Orange, N.J., U.S.A., Chemist.

1901. Little, C. A., Elyria, Ohio, U.S.A., Analytical Chemist.

1900. Little, Jno. G., c/o Casa Steel y Ca., Coquimbo, Chile, Assayer.

1883. Little, Wm. G., Blendon Grove, Bexley, Kent, Chemical Manufacturer.

O.M. Littlejohn, Jas., c/o African Banking Corporation, Johannesburg, Transvaal, Analytical Chemist.

1902. Littlewood, Dr. Jas. B., U.S. Patent Office, Washington, D.C., U.S.A., Chemical Examiner.

1886. Liversedge, A. J., Clock House, Arundel Street, Strand, W.C., Mechanical Engineer.

O.M. Liversidge, Prof. A., F.R.S., The University, Sydney, New South Wales, Professor of Chemistry.

1883. Livingston, W. J., London County Council, Spring Gardens, London, S.W., Analytical Chemist.

1899. Lloyd, Charles, (subscriptions) c/o Lake View Consols, Ltd., Salisbury House, London Wall, London, E.C.; and (Journals) c/o Manager, Lake View Consols, Ltd., Boulder, Western Australia, Secretary.

1900. Lloyd, Fred. J., Muscovy House, Trinity Square, London, E.C., Analyst.

1900. Lloyd, Thos. H., The Laboratory, Penygtaig, Dinas, R.S.O., Wales, Analyst.

1901. Lober, Jno. B., Vulcanite Portland Cement Co., Room 1415, Real Estate Trust Building, Philadelphia, Pa., U.S.A., Cement Manufacturer.

1899. Lockwood, Alfred A., 48, East Street, Faversham, Kent, Metallurgist.

1899. Loder, Francis H., 9, St. John's Park, Blackheath, S.E., Director.

1888. Lodge, Edw., 25, Scale Hill, Cowcliffe, Huddersfield, Teacher of Wool Dyeing.

1900. Loeb, Dr. Morris, New York University, University Heights, New York City, U.S.A., Professor of Chemistry.

1901. Loebell, Eugene, jun., 30, Dickenson Road, Rusholme, Manchester, Brewers' Chemist.

1891. Loewenthal, Dr. R., Uhlandstrasse, 39, Frankfurt a/M., Germany, Textile Chemist and Lecturer on Dyeing.

1899. Logan, John, Offendene, Oakfield Drive, Ashton-on-Mersey, Indigo-Blue Dyer.

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1888. Lombard, Emile, 12, Rue Breteuil, Marseilles, France, Director of Pyrites Co.

1901. Long, Eugene J., c/o E. O'Callaghan and Son, City Tannery, Limerick, Ireland, Tanner.

1902. Longden, Alf. Hy., Stanton-by-Dale, Nottingham, Analytical Chemist.

1898. Longstaff, Jas. P., Chemical Department, Heriot Watt College, Edinburgh, Assistant.

1902. Loomis, Henry M., 261, Third Street, Niagara Falls' N.Y., U.S.A., Chemist.
1890. Lord, F. J., 4, Winmarleigh Street, Warrington, Analytical Chemist.
1896. Lord, Jno. Lloyd, 23, Park View, Elton, Bury, Lancs., Chemist and Manager.
1897. Lord, N. W., 338, West 8th Avenue, Columbus, Ohio, U.S.A., Professor of Metallurgy.
O.M. Lorenz, H., 7 and 8, Idol Lane, London, E.C., Chemical Merchant.
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O.M. Louis, D. A., 77, Shirland Gardens, London, W., Metallurgist and Mining Engineer.
1894. Louis, Prof. Henry, Durham College of Science, Newcastle-on-Tyne, Professor of Mining.
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1899. Love, Wm., 28, Royal Exchange Square, Glasgow, Managing Director (Broxburn Oil Co., Ltd.).
1895. Lovejoy, Frank W., Kodak Park, Rochester, N.Y., U.S.A., Chemical Engineer.
O.M. Lovibond, J. W., Lake House, Salisbury, Tintometer Manufacturer.
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1897. Low, Albert H., P.O. Drawer 1537, Denver, Colo., U.S.A., Metallurgical Chemist.
1900. Low, Prof. Wilson H., Cudahy Packing Co., South Omaha, Neb., U.S.A., Chemist.
1887. Lowe, Clement W., Cornbrook, Legh Road, Knutsford, Cheshire, Manufacturing Chemist.
1900. Lowe, Herbert G., c/o Falulah Paper Co., Fitchburg, Mass., U.S.A., Paper Manufacturer.
O.M. Lowe, W. F., 9, Hough Green, Chester, Analytical Chemist.
1885. Lowson, J. G. F., Hollycot, Lasswade, N.B., Paper Maker.
1895. Lucas, Alf., Survey Department, Public Works Ministry, Cairo, Egypt, Analyst.
1892 Lucas, Bernard R., 3, Dyar Terrace, Winnington, Northwich, Alkali Works Manager.
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1900. Lummus, Walter E., 62, Newhall Street, Lynn, Mass., U.S.A., Manager (Commonwealth Manufacturing Co.).
1888. Lund, Jas., 142, Hawthorne Street, Malden, Mass., U.S.A., Ammonia Works Manager.
1888. Lundholm, Carl O., Journals to Nobel's Explosives Co., Ltd., Ardeer Factory, Stevenston, Ayrshire, Explosives Works Manager.
1898. Lundteigen, Andreas, Union City, Mich., U.S.A., Chemist.
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1894. Lungwitz, Theo., c/o Chas. Pfizer and Co., 81, Maiden Lane, New York City, U.S.A., Superintending Chemist.
1885 Lapton, Sydney A., 102, Park Street, Grosvenor Square, London, W.
1890. Luthy, Edmund O., 2419, Ohio Avenue, Cincinnati Ohio, U.S.A., Distiller.
1884. Lüthy, Otto, Maywood, N.J., U.S.A., Analytical Chemist.
1895. Luxmoore, Dr. Chas. M., Reading College, Reading, Lecturer on Chemistry.
1899. Luxton, Thos., 28, Albany Street, Hull, Teacher of Chemistry.
1885. Lye, W. T., Leagrave Hall, near Luton, Beds, Straw Dyer.
1884 Lyle, James, Ardesco, Plaistow Wharf, Victoria Docks, E., Sugar Refiner.
1885. Lyle, Jno., 21, Mincing Lane, London, E.C., Sugar Refiner.
1902. Lyle, Robert F., Berry Yards Sugar Refinery, Greenock, N.B., Analytical Chemist.
1889. Lymn, Arthur H., 125, Alexandra Road, Wimbledon, Chemical Works Manager
1899. Lynn, R. Rankine, 7, Highburgh Terrace, Dowanhill, Glasgow, Chemical Engineer.
1899. Lynn, Vaughan G., c/o Messrs. Best and Co., Madras, India, Merchant.
1898. Lynne, Miss Mary S., 326, 4th Avenue, Pittsburg, Pa., U.S.A., Chemist.
1902. Lyon, Edwd. H., 141, Charles Street, New York City, U.S.A., Manufacturing Chemist.
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1894. Mabey, Fred O., 196, Amhurst Road, Hackney, N.E., Wine Merchant.
1891. Macadam, Herbert E., Milton House, Selsdon Road, Wanstead, E., Manure Works Manager.
1894. Macadam, Stevenson, 55, York Place, Edinburgh, Analytical Chemist.
1894. McAlley, Robt., Bankside, Falkirk, N.B., Paint Works Manager.
1891. Macallan, J., 3, Charlemont Terrace, Clontarf, Dublin, Analytical Chemist.
1892. Macara, Thos., jun., 6, West Bank Terrace, Hillhead, Glasgow, Chemical Student.
1889. McArthur, Jno., 196, Trinity Road, Wandsworth Common, S.W., Chemist.
1887. McArthur, J. B., Price's Patent Candle Co., Limited, Bromborough Pool, near Birkenhead, Oil Works Chemist.
1886. Macarthur, J. G., 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer.
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1901. MacArthur, Jno. S., 15, St. John's Road, Pollokshields, Glasgow, Paint and Varnish Manufacturer.
1892. McArthur, Thos., 7, Temple, Dale Street, Liverpool, Drysalter and Dyewood Extractor.
1892. McBretney, E. G., 23, Ferrybridge Road, Castleford, Yorks, Glass Works Chemist.
1901. McCaffery, Richard S., San Pedro, New Mexico, U.S.A., Mining Engineer and Metallurgist.
1898. MacCallum, D. A., 10, Midlothian Drive, Shawland, Glasgow, Chemist.
O.M. McCallum, J. M., Southdene, Paisley, N.B., Soap Manufacturer.
O.M. McCalman, D., 18, Harbour Street, Irvine, N.B., Technical Chemist.
1894. McCann, Owen, c/o J. Gilton and Co., Oriel Street, Vauxhall Road, Liverpool, Printing Ink Manufacturer.
1893. McCombie, C., 19, St. Dunstan's Hill, London, E.C., Drug and Chemical Merchant.
O.M. McCowan, W., Brewer.
1897. McCrae, Dr. John, jun., East London Technical College, People's Palace, Mile End Road, London, E., Chemical Demonstrator.
1898. McCreath, Wm. D., Tarff Creamery, Twynholm, Kirkcudbright, N.B., Analytical Chemist.

1884. McCulloch, J., Oakleigh, Rose Street, Garnet Hill, Glasgow, Chemical Works Manager.
1900. McCulloch, John, Glencoe, Lostock Gralam, Cheshire, Chemical Engineer.
O.M. McDaniel J. J., Woodlands, Bandon, Ireland, Distiller.
O.M. Macdonal'd, A., 72, Great Clyde Street, Glasgow.
1897. MacDonald, G. W., c/o Pigou, Wilkes, and Laurence, Ltd., Dartford, Kent, Explosives Chemist.
1894. McDonald, John, Distillery Offices, Fort William, N.B., Distiller.
O.M. Macdonald, J. W., c/o Messrs. H. Tate & Sons, Love Lane, Liverpool, Analytical Chemist.
1902. Macdonald, Peter, jun., Mazapil Copper Co., Ltd., Concepcion del Oro, Zacatecas, Mexico, Analytical Chemist.
1899. MacDonald, S. Fremont, c/o Ashtabula Hide and Leather Co., Ashtabula, Ohio, U.S.A., Tanner.
O.M. McDonald, T. M., Walilabo Estate, St. Vincent, West Indies, Sugar Chemist.
1899, McDougall, Hugh, Mount Pleasant, Uddingston, N.B.; (Journals to) Johuson's Cement Works, Gateshead-on-Tyne, Chemical Engineer.
1895. McDougall, Isaac, jun., High Bank, Didsbury, Manchester, Student.
1895. McDougall, Isaac S., High Bank, Didsbury, Manchester, Manufacturing Chemist.
1890. McDougall, J. T., Dunolly, Morden Road, Blackheath, S.E., Manufacturing Chemist.
1889. MacEwan, Peter, 64, Southwood Lane, Highgate, N., Editor of "Chemist and Druggist."
1891. McEwen, Atholl F., , Analytical Chemist and Assayer.
1901. McEwen, Duncan C., 3, Armadale Place, Greenock, N.B., Metallurgical Chemist.
1902. McFarland, Alan R., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.
O.M. Macfarlane, R. F., Tharsis Copper Works, East Moors, Cardiff, Technical Chemist.
1884. Macfarlane, Thos., Inland Revenue Dept., 317, Queen Street, Ottawa, Canada, Analyst to Dominion of Canada.
1901. McFarlane, Walter, Sunnyside, Mansewood, Pollockshaws, Glasgow, Printworks Manager.
1890. McFarlane, W. W., 522, West 9th Street, Chester, Pa., U.S.A., Dyeworks Manager.
1900. McFie, Robt. A., The Nickel Co., Kirkintilloch, N.B., Chemist.
1893. McGhie, T. Burns, c/o Quirk, Barton, and Co., Normandy Wharf, Rotherhithe, S.E., Analytical Chemist and Assayer.
1891. McGill, Dr. J. T., Vanderbilt University, Nashville, Tenn., U.S.A., Adjunt Professor of Chemistry.
1899. MacGillivray, Wm. A., c/o Swansea Safety Fuse Co., Pipe House Wharf, Swansea, Analytical Chemist.
1887. McGlashan, John, Cawnpore Sugar Works, Cawnpore, India, Technical Chemist.
1902. McGovney, Chas. S., Experiment Station, West La Fayette, Ind., U.S.A., Chemist.
1884. McGowan, John, Ash House, Talke, near Stoke-upon-Trent, Colliery Manager.
1896. McIlhiney, Dr. Parker C., 145, East 23rd Street, New York City, U.S.A., Chemist.
1894. McIlwaine, Alf. W., Stoneferry, Hull, Oil Manufacturer.
O.M. MacIndoe, G. D., Woodlands, Southlands, New Zealand, Chemical Works Manager.
1903. Macintire, Benj. Gould, Massachusetts Inst. of Technology, Boston, Mass., U.S.A., Chemist.
1901. Macintosh, John, c/o Curtis' and Harvey, Explosives Factory, Cliffe-at-Hoo, Kent, Analytical Chemist.
1888. MacKean, Wm., Welsbach Incandescent Gas Light Co., Ltd., Broomhill Road, Wandsworth, S.W., Technical Chemist.
O.M. McKechnie, D., Eccleston Grange, Prescot, Lancashire, Copper Extractor.
O.M. McKechnie, D. M., Metal Works, Widnes, Lancashire, Copper Extractor.
1887. McKellar, W. G., c/o United Alkali Co., Ld., Eglinton Works, Irvine, N.B., Technical Chemist.
1895. McKenna, Dr. Chas. F., 221, Pearl Street, New York City, U.S.A., Chemist.
1899. Mackensie, Alex. H., 12, Hale Street, North Adams, Mass., U.S.A., Colour Mixer.
1900. Mackenzie, J. Kenneth, 1120, Rookery Building, Chicago, Ill., U.S.A., Mining Engineer.
1885. Mackenzie, T. E., , Technical Chemist.
1884. Mackenzie, Dr. W. Cossar, Tewfikieh College of Agriculture, Ghizeh, Egypt, Analytical Chemist.
1893. McKerrow, C. A., Eversley, Wilmslow, Cheshire, Analytical and Consulting Chemist.
1893. McKesson, John, 91, Fulton Street, New York City, U.S.A., Manufacturing Chemist.
1891. Mackey, W. McD., Victoria Chambers, Leeds, Analytical Chemist.
1900. McKillop, George F., Broxburn Oilworks, Broxburn, N.B., Works Chemist.
1890. McKillop, Jno., 99, Brook Green, London, W., Metallurgist.
1902. McKim, Wm., 69, Linden Street, Yonkers, N.Y., U.S.A., Colour Maker.
1884. McKinlay, R. W., Ameliaville, Aytoun Road, Pollokshields, N.B., Metal Merchant.
1901. McLaren, Daniel, Brookdale, Grey Street, Stalybridge, Teacher of Chemistry.
1898. McLaurin, Robt., 414, Sauchiehall Street, Glasgow, Chemist.
1888. MacLean, Alex. S., 31, Bank Street, Greenock, N.B., Soap Refiner.
O.M. McLellan, J. Y., 112, Claude Road, Cardiff, Chemical Manufacturer.
1892. McLeod, Jas., Westhill, Cardross Road, Dumbarton, N.B., Analytical Chemist and Gas Examiner.
1903. MacMahon, F. W., Kilmorie Works, Forest Hill, S.E., Chemist (Oxychlorides, Ltd.).
1896. McMaster, Daniel, McMurray's Royal Paper Works, Wandsworth, S.W., Paper Mill Manager.
1894. Macmillan, Arch., 12, Hastings Street, Sunderland.
O.M. McMillan, W. G., 8, Leigham Court Road, Streatham, S.W., Metallurgical Chemist.
1889. McMurtrie, J. M., 21, Princes Street, Pollokshields, Glasgow, Brass Founder.
1900. McMurtrie, Dr. Wm. T., 440, West End Avenue, New York City, U.S.A., Chemist.
1895. McMurtry, G. C., Copper Smelting Works, Lithgow, N.S.W., Australia, Metallurgist.
1884. Macnab, C., Lillyburn, Milton of Campsie, N.B., Calico Printer.
O.M. Macnab, W., Edinburgh Lodge, Howick Place, Victoria Street, S.W., Analytical Chemist.
O.M. Mactear, Jas., 28, Victoria Street, Westminster, S.W., Chemical Engineer.
1892. McVie, Jas. P., Ravenscraig, Canning Street, Hebburn-on-Tyne, Analytical Chemist.
1894. McVitie, Robt., 12, Greenhill Gardens, Edinburgh, Biscuit Manufacturer.
1901. Maertens, Emile, P.O. Box 1002, Providence, R.I., U.S.A., Engineer.
1895. Magnus, Isidor, 52, Leadenhall Street, London, E.C., Chemical Merchant.
1901. Magruder, Egbert W., Department of Agriculture, Richmond, Va., U.S.A., Chemist.
1885. Mahon, R. W., N.Y. Central and Hudson River Railroad, West Albany, N.Y., U.S.A., Analytical Chemist.
1898. Main, Wm., 299, Jefferson Avenue, Brooklyn, N.Y., U.S.A., Chemical Expert.
O.M. Major, J. Lewis, Sculcoates, Hull, Tar Distiller and Chemical Manufacturer.
1886. Mallinckrodt, Edw., Mallinckrodt Chemical Works, St. Louis, Mo., U.S.A., Manufacturing Chemist.
1897. Mallory, J. Halsey, 409, Fitten Building, Atlanta, Ga., U.S.A., Assistant Chemist (The American Cotton Oil Co.).
1896. Mann, E. A., Government Chemical Laboratory, Fremantle, Western Australia, Government Inspector of Explosives.

1893. Mann, Harold H., Indian Tea Association, Royal Exchange Buildings, Calcutta, India, Research Chemist.

1890. Mann, Jas. S., 521, Barking Road, Plaistow, Essex, Analyst.

1891. Mann, John C., c/o Major and Co., Ltd., Sculcoates, Hull, Chemist.

1900. Manna, Haridas, 4, Gulu Ostagur's Lane, Calcutta, India, Chemist and Doctor.

O.M. Mannington, H. T., Marshlea, Beaconsfield Road, Farnworth, Widnes.

1896. Manoukian, Dr. Wahan, 71, Elsasserstrasse II., Trep. Links, Berlin, N., Germany, Analytical Chemist.

1892. Mansbridge, Wm., 133, Park Grove, Hull, Chemist

1893. Marchlewski, Dr. L., Strzelecka, 9, Krakow, Austria.

1883. Markel, Dr. K., Lodge Lane, Bewsey, Warrington, Technical Chemist.

1886. Markham, A. D., 71, Queen Street, Hull, Pharmaceutical Chemist.

1902. Marriott, F. Grant, 14, Selby Street, Toronto, Canada, Chemical Student.

1901. Marsden, Dr. Fred, Chemische Fabrik, Sulzbach in Oberpfalz, Germany, Chemist.

O.M. Marsh, J. T., Ammonia Soda Works, Fleetwood, Lancashire, Chemist.

1883. Marsh, W., Union Alkali Co., Soho Works, Manchester, Chemical Manufacturer.

1895. Marshall, Arthur, Hope Cottage, Church Hill, Loughton, Essex, Explosives Chemist.

1891. Marshall, Dr. Hugh, 12, Lonsdale Terrace, Edinburgh, Professor of Chemistry.

1895. Marshall, Frank G., 4, Woodhouse Terrace, Bewick Road, Gateshead, Technical Chemist.

1901. Marshall, Jos. W., Boulevard Higher Grade School, Hull, Science Lecturer.

1896. Marshall, Percy S., Union Laboratory, Half Moon Street, Huddersfield, Assistant Chemist.

1883. Marshall, Wm., Carisbrook, Queen's Road, Cheadle Hulme, Cheshire, Dyer.

1884. Marshall, Wm., 35, Streathbourne Road, Balham, S.W., Analytical Chemist.

1891. Martin, Alex. M., Douglas Villa, Dunbeth Road, Coatbridge, N.B., Analytical Chemist.

1895. Martin, Chas. H., 14, Aldred Street, Crescent, Salford, Oil and Soap Works Assistant Manager.

1901. Martin, David, jun., South Inch Brewery, Perth, Brewer.

1885. Martin, H., 67, High Street, Wellington, Somerset, Manure Works Manager.

O.M. Martin, N. H., Ravenswood, Low Fell, Gateshead-on-Tyne, Manufacturing Chemist.

1899. Martin, Wm E., c/o Kynoch Ltd., Arklow, Co. Wicklow, Ireland, Chemist.

O.M. Martin, W. H., 183B, King's Road, Chelsea, London, S.W., Analytical Chemist.

1887. Martineau, Sydney, Northwood, Rydal Road, Streatham, S.W., Sugar Chemist.

1894. Martyn, T. Graham, 11, Stratton Terrace, Truro, Cornwall, Metallurgist.

1902. Marx, Joseph S., California Powder Works, Pinole, Cal., U.S.A., Chemist.

O.M. Mason, J., Eynsham Hall, Witney, Oxon, Director of Pyrites Co.

1887. Mason, J. Francis, Eynsham Hall, Witney, Oxon.

1892. Mason, Thos., Hyson Green Works, Nottingham, Manufacturing Chemist.

1903. Massey, Joseph B., 60, Colne Road, Burnley, Chief Sanitary Inspector.

O.M. Masson, Prof. D. Orme, University of Melbourne, Victoria, Australia, Professor of Chemistry.

1889 Master, Ardesheer B., 679, Tardeo, Bombay, India, Chemical Manufacturer.

1901. Master, Chaturbhai G., Khodi-Ambli, Ahmedabad, India, Size and Chemical Manufacturer.

1902. Masujima, Bunjiro, 19, Honjoku Midoricho Sanchome, Tokyo, Japan, Prof. of Applied Chemistry.

1903. Masure, Gaston, 7, Rue de Constantine, Rouen, France, Chemist.

1902. Masury, Fred. L. M., 43, West 87th Street, New York City, U.S.A., Explosives Manufacturer.

1893. Mather, Colin, Salford Iron Works, Manchester, Engineer.

O.M. Mather, J., Blaydon Chemical Works, Blaydon-on-Tyne, Manager.

1900. Mather, Wm., c/o British Aluminium Co., Ltd., Larne Harbour, co. Antrim, Ireland, Chemist.

1890. Matheson, W. J., 182–184, Front Street, New York City, U.S.A., Chemical Merchant.

1901. Mathew, W. E. B. de Vere, 23, South Side, Clapham Common, S.W., Analytical Chemist.

1900. Mathews, Dr. Jno. A., c/o Crucible Steel Co. of America, Syracuse, N.Y., U.S.A., Chemist.

1898. Mathewson, E. P., Anaconda, Mont., U.S.A., Metallurgist.

1888. Mátos, Louis J., 99, North 19th Street, East Orange, N.J., U.S.A., Chemist.

1896. Matsui, G., c/o Japan Sugar Refinery Co., Onagigawa, Tokio, Japan, Chemical Engineer.

O.M. Matthews, C. G., 31, Stapenhill Road, Burton-on-Trent, Brewing Chemist.

1896. Matthews, Donald J., 165, Ebury Street, London, S.W., Chemist.

1899. Matthews, Dr. J. Merritt, 225, South 45th Street, Philadelphia, Pa., U.S.A., Professor of Chemistry and Dyeing (Philadelphia Textile School).

1889. Mawdsley, W. H., c/o Gold Mining Co., Ltd., Mount Morgan, Queensland, Chemist.

1903. Maxim, Hudson, 891, Sterling Place, Brooklyn, N.Y., U.S.A., Chemist and Mechanical Engineer.

1894. Maxwell, Jno., Solway Chemical Works, Silloth, and (communications) English Street, Carlisle, Cumberland, Chemical Manure Manufacturer.

1897. May, George H., c/o Fabrikoid Co., Newburgh, N.Y., U.S.A., Assistant Chemist

1901. May, Dr. Sidney, 313, East 112th Street, New York City, U.S.A., Lecture Assistant.

1884. Mayenfeld, Dr. E. von Salis. See under "Salis."

1896. Mayfield, A. S., 11, Beresford Avenue, Hull, Analyst.

1892. Mayfield, H. B., Normanhurst, Mundy Street, Heanor, near Nottingham, Dyer.

1901. Mayfield, Thos., Fair View House, Heanor, near Nottingham, Hosiery Manufacturer.

1885. Mayhew, E. W. A., High Street, Freemantle, Western Australia, Manufacturing Chemist.

1900. Maywald, F. J., 1028, 72nd Street, Brooklyn, N.Y., U.S.A., Technical Chemist.

1892. Meacham, Chas. S., c/o Ohlsson's Cape Breweries, Ltd., Cape Town, South Africa, Brewer.

1902. Meade, Richd. K., c/o Edison Portland Cement Co., Stewartville, N.Y., U.S.A., Chemist.

1898. Meeds, Alonzo D., 103, Boston Block, Minneapolis, Minn., U.S.A., City Gas Inspector and Chemist.

1896. Meggitt, Loxley, Wheatsheaf Works, Alexandrina, Sydney, N.S.W., Australia, Analytical Chemist.

1901. Meier, Dr. Franz, Basle Chemical Works, Basle, Switzerland, Chemist.

1888. Meikle, Jno., 8, Melrose Street, Great Western Road, Glasgow, Journalist.

1902. Melcher, Arthur C., 58, Bowen Street, Newton Centre, Mass., U.S.A., Chemist.

O.M. Meldola, Prof. R., F.R.S., 6, Brunswick Square, London, W.C., Professor of Chemistry.

1901. Meldrum, And. N., 92, Bonnymuir Place, Aberdeen, Lecturer on Chemistry.

1891. Meldrum, Jas. Jones, Atlantic Works, City Road, Manchester, Manufacturing Engineer.

1891. Mellen, E. D., 1590, Massachusetts Avenue, Cambridge, Mass., U.S.A., Treasurer (Curtis, Davis, and Co.)

O.M. Mellon, W. W., 9, Glenart Avenue, Blackrock, Co. Dublin, Ireland, Manufacturing Chemist.

1902. Mellor, Percy H., Burton Road, Woodville, near Burton-on-Trent, Pottery Manager.

O.M. Mellor, S., Magnesium Metal Co., Patricroft, Manchester, Metal Refiner.

1884. Melville, D., P.O. Box No. 1, Woodmere, Wayne Co., Mich., U.S.A., Chemical Works Manager.

1900. Mende, Alex. P., 536, West 14th Street, New York City, U.S.A., Manufacturing Chemist.
1893. Mensching, Dr. C., (Journals) Crumpsall Vale Works, Blackley, near Manchester; and 62, Delannays Road, Crumpsall, Manchester, Chemist.
O.M. Menzies, R. C., Inveresk Mills, Musselburgh, N.B., Paper Maker.
1892. Mercer, C. A., 22, Streathbourne Road, Upper Tooting, S.W., Chemical Apparatus Maker.
1886. Mercer, J. B., 330, Lower Broughton Road, Manchester.
O.M. Mercer, F. M., 34, Camomile Street, London, E.C., Manufacturing Chemist.
1890. Merck, E., Darmstadt, Germany, Manufacturing Chemist.
1887. Merrell, Geo., Lock Box 786, Cincinnati, Ohio, U.S.A., Manufacturing Chemist.
1903. Merrill, Mrs. Frances B., Merrill Process Co., Jones Point, N.Y., U.S.A , President.
1899. Merrill, Frank H., Los Angeles Soap Co., Los Angeles, Cal., U.S.A., Factory Superintendent.
1902. Merritt, Wm. G., c/o Berry Bros., Ltd., Varnish Works, Detroit, Mich., U.S.A., Chemist.
1901. Merson, Geo. F., 24, Newgate Street, Newcastle-on-Tyne, Manufacturing Pharmaceutical Chemist.
1897. Meslans, Prof. M., 59, Quai de la Baronnie, Ablon (Seine et Oise) France, Professor of Chemistry.
O.M. Messel, Dr. R., 147, Victoria Street, London, S.W., Chemical Manufacturer.
1899. Metcalf, Howard F., Farr Alpaca Co., Holyoke, Mass., U.S.A.
1886. Metcalf, Jno., Moorfield, Altham, near Accrington, Tar Distiller.
1898. Metz, Herman A., P.O. Box 2178, New York City, U.S.A. (Victor Koechl and Co., Dyestuffs and Chemicals).
1900. Mewborne, Robt. G., c/o Kentucky Tobacco Product Co., Louisville, Ky., U.S.A., Chemist.
1902. Meyer, August R., Room 402, New England Building, Kansas City, Mo., U.S.A., Metallurgist.
1898. Meyer, Dr. Franz, 68, Broad Street, New York City, U.S.A , Metallurgical and Chemical Engineer.
1902. Meyer, Dr. Fredk. L., 2028, Park Avenue, Philadelphia, Pa., U.S.A., Chemist.
1902. Meyer, Jas. O., Laboratory, C. B. and Q. R. R. Co., Aurora, Ill., U.S.A., Chemist.
1900. Meyer, Karl, Osterbrogade, 60, Kopenhagen, O., Denmark, Chemist.
1902. Meyrick, L. J., 137, City Road, Birmingham, Assistant Analyst.
1896. Miles, G. Wellington, 29, Central Street, Boston, Mass., U.S.A., Analytical Chemist.
1889. Milestone, W. C., 7, Heathfield Road, Wandsworth Common, S.W., Chemical Works Manager.
1899. Millar, Jas. H.,
Laboratory Manager.
1897. Millard, Edgar J., 40–42, Charlotte Street, London, E.C.. Chemist and Manager.
1883. Miller, Dr. A. K., Kilvert's Buildings, Withy Grove, Manchester, Analytical Chemist.
1884. Miller, A. Russell, Hill Park, Bothwell, N.B., Printworks, Chemist.
O.M. Miller, E. V., Sugar Works, Chelsea, Auckland, New Zealand, Sugar Works Chemist.
889. Miller, Geo., Wood Lane, Halewood, near Liverpool, Technical Chemist.
897. Miller, Dr. Edmund H., School of Mines, Columbia University, New York, U.S.A., Chemist.
900. Miller, Hampton K., Lake City, Fla., U.S.A., Chemist (Florida A. & M. College).
893. Miller, Dr. Harry E., 1015, Chestnut Street, Oakland, Cal., U.S.A., Chemist.
902. Miller, H. Harold, Consumers' Gas Co., 269, Front Street, E., Toronto, Canada, Chemist.
883. Miller, Dr. H. von, Beatrixgasse 32, Wien III., Austria, Chemical Manufacturer.
894. Miller, Dr. John A., 40–45, Lewis Block, Buffalo, N.Y., U.S.A., Consulting Chemist, State Analyst.
1897. Miller, Jas., Minas de São Bento, Santa Barbara de Matto Dentro, Minas Geraes, Brazil, Metallurgical Chemist.
1894. Miller, J. Carlile, 89, Rumford Street, Bridgeton, Glasgow, Manufacturing Chemist.
1888. Miller, J. Hopkins, 5, Catherine Street, Parliamentary Road, Glasgow, Dyeworks Chemist.
1889. Miller, Jno. Poynter, Sandilands Chemical Works, Aberdeen. Technical Chemist.
1881. Miller, Dr. N. H. J., Harpenden, near St. Albans, Agricultural Chemist.
1899. Miller, P. Schuyler, Mount Prospect Laboratory, Flatbush Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1898. Miller, Rudolf E. W., 8, Stanley Villas, Greenway Road, Runcorn, Chemist.
1901. Miller, Stuart B., 148, Hancock Street, Cambridge, Mass., U.S.A., Chemical Engineer.
1884. Miller, T. Paterson, The Cairns, Cambuslang, near Glasgow, Dyer and Printer.
1901. Miller, W. Lash, 50, St. Alban Street, Toronto, Canada, Associate Professor of Physical Chemistry.
1884. Miller, W. M., Caledonia Estate, Prov. Wellesley, Penang, S.S., Sugar Chemist.
1902. Milligan, Robert E., c/o New York Continental Jewell Filtration Co., 40, W. Quincy Street, Chicago, Ill., U.S.A., Chemical Engineer.
1903. Millington, Abraham, c/o J. Parry, E.V. Wharf, The Docks, Newport, Mon., Metallurgical Chemist.
O.M. Mills, Prof. E. J., F.R.S., 11, Greenhill Road, Harrow, Professor of Chemistry.
1903. Milnes, Cresswell; 8, Knock Hall Grove, Greenhithe, Kent, Chemist.
1887. Milnes, Edmund, Seedfield, Bury, Lancashire, Dyeing Extract Maker.
1902. Milnes, Ernest E., c/o Joseph Smithson, Ltd., India Buildings, Halifax, Yorks, Chemist.
1901. Milroy, Andrew, 9, Hatfield Terrace, Ibrox, Glasgow, Manager.
1895. Miner, Harlan S., c/o Welsbach Light Co., Gloucester City, N.J., U.S.A., Technical Chemist.
1889. Miniati, T., Penketh, near Warrington, Chemist.
1895. Mitchell, Chas. A., c/o Beaufoy and Co., South Lambeth Road, S.W., Analyst.
1901. Mitchell, Frank H., Orono, Penobscot Co., Maine, U.S.A., Tutor in Chemistry.
1898. Mitchell, G. D. H., c/o S. S. White Dental Manufacturing Co., Prince's Bay, Staten Island, N.Y., U.S.A., Chemist.
1902. Mitchell, John, c/o W. Mitchell and Sons, Ayr, N.B., Provision Curer.
1883. Mitchell, J. W., Plantation House, Clough Fold, near Manchester, Waste Bleacher.
O.M. Mitting, E. K., 43, Highfield South, Rock Ferry, Cheshire, Technical Chemist.
1900. Mixner, Albert F., c/o Homeward Bound G. M. Co., Yalwal, viâ Nowra, N.S.W., Australia, Metallurgist.
1895. Moale, Dr. Philip R., c/o Asheville Printing Co., 3, West Court Square, Asheville, N.C., U.S.A., Analytical Chemist.
1902. Möckel, Heinrich A., c/o D. M. Base and Co., Roaring Springs, Pa., U.S.A., Chemist and Engineer.
O.M. Mohr, Dr. B., 69A, Parliament Hill, Hampstead, N.W., Consulting Chemist and Metallurgist.
1894. Mole, Herbert B., Ivy Cottage, Shepton Mallet, Somerset, Brewer.
1902. Molesworth, F. H., 39, Hunter Street, Sydney, N.S.W., Australia, Analytical Chemist.
O.M. Mond, Dr., L., F.R.S., 20, Avenue Road, Regent's Park, N.W.; and 64, Via Sistina, Rome, Alkali Manufacturer.
1891. Mond, Robt. L., Winnington Hall, Northwich, Chemist.
1890. Moodie, Wm. E.. Alexandria Works, Alexandria, N.B., Analytical Chemist.
1901. Moody, Chas. J., Lake View Consols Mine, Boulder, West Australia, Analyst and Assayer.
1898. Moody, Dr. Herbert R., Hobart College, Geneva, N.Y., U.S.A., Science Instructor.

1884. Mook, Chas., 2, Kapellenstrasse, Eisenach, Germany, Alkali Works Director.

1902. Mooney, Luke, 36, West 52nd Street, Bayonne, N.J., U.S.A.

1887. Moore, Chas. C., Harley Buildings, 11, Old Hall Street, Liverpool, Chemist.

1901. Moore, Chas. W., 33, Demesne Road, Whalley Range, Manchester, Chemical Student.

1902. Moore, Fred., Victoria Chemical Co., Ltd., Victoria, B.C., Canada, Manufacturing Chemist.

1892. Moore, Dr. Geo. D., 201, Salisbury Street, Worcester, Mass., U.S.A., Professor of Chemistry.

1902. Moore, Jas. H., Saltville, Va., U.S.A., Chemist.

1899. Moore, Quintin, jun., Dalmarnock Chemical Works, 89, Rumford Street, Glasgow, Works Manager.

1899. Moore, Dr. Russell, W., 47, Linden Place, Orange, N.J., U.S.A., Chemist (U.S. Appraiser's Office).

1885. Moore, R. T., 156, St. Vincent Street, Glasgow, Mining Engineer.

1890. Moore, Thos., Laboratoire du Service Local, Noumea, New Caledonia, Analytical Chemist.

1903. Moran, Geo. A., 333, Haverhill Street, Lawrence, Mass., U.S.A., Chemist.

1890. Mordle, F. Dare, Guilderoy, Matlock Bath, Derbyshire, Starch Manufacturer.

1902. More, Andrew, 18, Tunley Road, Harlesden, London, N.W., Government Analyst

1901. Morgan, Dr. Gilbert T., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.

1890. Morgan, J. Jas., Waun Villa, Neath, Assayer.

1898. Morgan, Thos. M., Longue Pointe, near Montreal, Canada, Manufacturer.

1885. Morgans, Thos., 60, Queen Square, Bristol, Civil Engineer.

1901. Moriarty, John J., 5, D'Arcy Street, Toronto, Canada, Assistant Chemist.

1902. Morison, Jas., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Analytical Chemist.

1897. Morison, Samuel L., 15, Broad Street, New York City, U.S.A., Water Engineer.

O.M. Moritz, Dr. E. R., 45, Great Tower Street, London, E.C., Brewing Chemist.

1885. Morley, Dr. H. Forster, 5, Lyndhurst Road, Hampstead, N.W., Professor of Chemistry.

1902. Morrell, Dr. R. S., Gonville and Caius College, Cambridge. Lecturer.

1884. Morrice, Jas. A., 1, Prince's Terrace, Dowanhill, Glasgow, Starch and Gum Manufacturer.

1898. Morris, Edgar F., Grey House, Barrington Road, Altrincham, Cheshire, Research Chemist.

1897. Morris, Harry, Avenue House, Doncaster, Chemical Merchant.

1890. Morris, Herbert N., Gorton Brook Chemical Works, Manchester, Technical Chemist.

O.M. Morris, J. Haydn, 9, Rathbone Road, Wavertree, Liverpool, Technical Chemist.

1902. Morrison, Jos., Wellfield, Farnworth, Widnes, Manager.

1901. Morse, Willard S., Apartado A., Aguascalientes, Mexico, Assistant Manager.

O.M. Morson, T., 31, Southampton Row, London, W.C., Manufacturing Chemist.

1889. Morton, Jas., Dalquhurn Works, Renton, N.B., Dyeworks Manager.

1897. Morton, Jno., North Road, St. Helens, Lancashire, Analytical Chemist.

1899. Morton, Thos. W., 8, Luxemburg Gardens, Hammersmith, W., Headmaster.

1902. Mosbaugh, Francis R., c/o Huntsville and Bracebridge Tanning Co., Huntsville, Ont., Canada, Chemist.

1882. Mosenthal, Henry de, 220, Winchester House, Old Broad Street, E.C., Explosives Company Manager.

1894. Moszczenski, J. von, Tartar Chemical Co., Ninth Street and Gowanus Avenue, Brooklyn, N.Y., U.S.A., Consulting Chemist.

1897. Motion, Jno., c/o Valvoline Oil Co., Edgewater, N.J., U.S.A., Oil Refinery Chemist.

1887. Moul, Frank, Aldersgate Chemical Works, Southall, Technical Chemist.

1901. Moule, Jno. W., Sulphide Corporation, Ltd., Cockle Creek, N.S.W., Metallurgical Chemist.

1884. Moult, J., Underhill, Low Fell, Gateshead-on-Tyne, Secretary.

1898. Moulton, Prof. Chas. W., Vassar College, Poughkeepsie, N.Y., U.S.A., Professor of Chemistry.

1892. Mount, Edw., Oaklands, Aughton, near Ormskirk, Assistant Secretary (United Alkali Company).

O.M. Muir, J. P., 233, Camden Road, London, N., Chemist.

1890. Muir, Jas. Stanley, 8, Westminster Gardens, Glasgow, W., Chemist.

1896. Muir, Wm., 97, Church Street, Edmonton, Middlesex, Merchant.

1894. Muir-Smith, W., c/o A. B. Fleming & Co., Ltd., Caroline Park, Edinburgh, Oil Works Manager.

O.M. Müller, Dr. H., F.R.S., 13, Park Square East, Regent's Park, London, N.W., Research Chemist.

1896. Mundy, Lionel, 27, Merton Road, Kensington, W., Importer of Unfermented Wines.

1887. Munroe, Prof. Chas. E., Columbian University, Washington, D.C., U.S.A., Professor of Chemistry and Dean.

1900. Munsell, Dr. Chas. F., c/o Devoe and Raynolds Co., 110, Horatio Street, New York City, U.S.A., Colour Chemist.

1900. Munton, Fred. T., The Oak House, Winsford, Cheshire, A.R.S.M., Analytical Chemist.

1897. Murch, D. Wilshin, 6, Victoria Road, Wednesbury, Staffs., Chemist.

1886. Murdoch, R. H. M., 4, Nobel's Villas, Stevenston, Ayrshire, Explosives Chemist.

1899. Murphy, Albert J., The Laboratory, 11, Lyddon Terrace, Leeds, Brewer's Chemist.

1901. Murray, Benjamin L., c/o Merck and Co., University Place, New York City, U.S.A., Chemist.

1903. Murray, Chas. B., c/o Carnegie Steel Co., Braddock, Pa., U.S.A., Chemist.

1899. Murray, Jas. J., c/o Mountain Copper Co., Ltd., Iron Mountain, Shasta Co., Cal., U.S.A., Mining Engineer.

1901. Murray, Jas. P., Toronto Carpet Manufacturing Co., Ltd., King Street and Fraser Avenue, Toronto, Canada, Carpet Manufacturer.

1902. Murray, Jno. C., "Studley," Coburg Road., Halifax, N.S., Canada, Assayer and Chemist.

1896. Murray, Dr. Thos. S., 1, Nelson Street, Dundee, Professor of Chemistry.

1898. Murray, Rd., Laurel Bank, Potternewton Lane, Chapel Allerton, Leeds, Analyst.

O.M. Muspratt, E. K., Seaforth Hall, near Liverpool, Alkali Manufacturer.

1894. Muspratt, Max, 2, Mannering Road, Sefton Park, Liverpool, Technical Chemist.

O.M. Muspratt, S. K., 9, Church Street, Flint, North Wales, Alkali Manufacturer.

O.M. Muter, Dr. Jno., The Chatelet, Horley, Surrey, Chemical Lecturer.

1895. Muurling, T. J. R., P.O. Box 2660, New York City, U.S.A., Dyestuff Importer.

1903. Myers, Edgar C., Iowa State College, Ames, Iowa, U.S.A., Agricultural Chemist.

1897. Myers, Dr. Henry C., University of California, Berkeley, Cal., U.S.A., Prof. of Chemistry.

1891. Myers, Wm. S., Nitrate of Soda Propaganda, 12, John Street, New York City, U.S.A., Director.

N

1902. Naef, Dr. Ernest E., 28, George Street, Cheetham Hill, Manchester.

1884. Naef, Dr. P., 132 (1034), Woody Crest Avenue, near 165th Street, New York City, U.S.A., Technical Chemist.

1903. Naef, Jno. J., 416, Eleventh Avenue, Paterson, N.J., U.S.A., Chemist.

1897. Nairn, Michael, Ben Dhu, Kirkcaldy, N.B., Linoleum Manufacturer.

1901. Nakagawa, Sōsuke, Hokkaidō Cement Co., Kamiiso, near Hakodate, Japan, Chief Engineer.

1903. Nakayama, Takakichi, Burgess Sulphite Fibre Co., Berlin, N.H., U.S.A., Chemist.

1901. Nanabhai, Krishnalal, 8–10, Nepean Sea Road, Malabar Hill, Bombay, India, Technological Chemist.

1893. Napier, Jno. W., Gas Works, Alloa, N.B., Manager and Chemist.

1897. Nash, Leonard M., 281, Seven Sisters Road, Finsbury Park, N., Works Chemist.

1900. Nathan, Major Fred. L., R.A., Royal Gunpowder Factory, Waltham Abbey, Essex, Superintendent.

1898. Nation, Edmund C., 237, Smith Street, Peekskill, N.Y., U.S.A., Manager (Highlands Chemical Co.).

1892. Naylor, Wm., 3, Garstang Road, Fulwood Park, Preston, Lancs., Chemist.

O.M. Naylor, W. A. H., 38, Southwark Street, London, S.E., Manufacturing Chemist.

1902. Neal, Thos., c/o Acme White Lead and Colour Works, Detroit, Mich., U.S.A., Secretary.

1899. Neale, Harry A., Brentwood, Clothorn Road, Didsbury, Manchester, Chemist.

1901. Neale, Percy R., c/o Messrs. Morris and Co., Doncaster, Yorks, Chemical Manufacturer.

1899. Neate, Percy J., "Belsize," Watts Avenue, Rochester, Kent, Director of Cement Co.

1902. Neave, Geo. B., Technical College, 204, George Street, Glasgow, Assistant to Professor of Chemistry.

1898. Neil, Jas. Millar, 176, Roxborough Street East, Rosedale, Toronto, Canada, Technical Chemist.

1890. Neill, Geo. D., Drumslea, Greenock, N.B., Sugar Refiner.

1898. Neilson, Alex. McG., c/o Arthur May and Co., Durban, Natal, Analytical Chemist.

1889. Neilson, Thos., Metallurgical Chemist.

1902. Neish, Arthur C., Columbia University, New York City, U.S.A., Chemist.

1893. Nelson, Arthur J., 381, Edge Lane, Droylsden, Manchester, Chemist.

1898. Nelson, Elnathan K., Paris, Ill., U.S.A., Chemist.

1897. Nelson, Walter, Messrs. Geo. Nelson, Dale, & Co., Ltd., Emscote Mills, Warwick, Gelatin Manufacturer.

1902. Nesbitt, Dr. Beattie, 44, Adelaide Street, W., Toronto, Canada, Physician.

1901. Neufville, Dr. Rudolf de, c/o Metallurgische Gesellschaft, Frankfort a/M., Germany.

1902. Neumann, Dr. Edgar, c/o Bell and Neumann, 3, Mincing Lane, London, E.C.

1899. Neurath, Dr. F., Gr. Schiffgasse, 12, Vienna, II. 3, Austria, Chemist.

O.M. Newall, F. S., Washington, co. Durham, Chemical Manufacturer.

889. Newberry, Spencer B., Sandusky Portland Cement Co., Sandusky, Ohio, U.S.A., Cement Works Manager.

896. Newcomen, Thos., Chemical Works, Lydbrook, near Ross; Wood Distiller.

O.M. Newlands, B. E. R., 2, St. Dunstan's Hill, London, E.C., Analytical and Consulting Chemist.

O.M. Newlands, W. P. R., 232, Amesbury Avenue, Streatham Hill, S.W., Sugar Chemist.

884. Newton, Jno., Park Green, Macclesfield, Silk Dyer.

O.M. Newton, Jno., Manor Works, Rotherhithe New Road, London, S.E., Manure Manufacturer.

900. Newton, Dr. Wm., 39, Mincing Lane, London, E.C., Chemist.

901. Nibelius, Axel W. T., American Forcite Powder Manufacturing Co., Landing, N.J., Chemist.

884. Nichols, J. A., Stanley Mount, New Mills, near Stockport, Teacher of Science.

888. Nichols, W. H., The Nichols Chemical Co., 25, Broad Street, New York City, U.S.A., Manufacturing Chemist.

897. Nicholsen, Harry, Smethurst Furnace, Penmaenpool, near Dolgelly, North Wales, Assayer.

1901. Nicholson, Jos., McClary Manufacturing Co., London, Ont., Canada, Enamel Ware Manufacturer.

O.M. Nicholson, J. C., Hunslet Chemical Works, Leeds, Chemical Manufacturer.

1897. Nicholson, Wm. J., Ardeer, Stevenston, Ayrshire, N.B., Chemist.

1897. Nickel, Herman, c/o The N. K. Fairbank Co., 3rd and Convent Streets, St. Louis, Mo., U.S.A., Chemist.

1888. Nickolls, John B., The Laboratory, Grange, Guernsey, Analytical Chemist.

O.M. Nicol, Dr. W. W. J., 15, Blacket Place, Edinburgh, Chemical Lecturer.

1900. Nield, J. H., c/o General Chemical Co., Bayonne Works, Bayonne, N.J., U.S.A., Superintendent.

1898. Nightscales, Geo., 13, Spring Street, Hull. Oil Merchant.

1899. Nihoul, Dr. Edw., Waremme, Belgium, Director of the Liège Tannery School.

O.M. Nimmo, Jas., Penshurst, 8, Lawrence Road, South Norwood, S.E., Analytical Chemist.

1885. Nishigawa, T., Ryuso Kaisha, Osaka, Japan, Director of Sulphuric Acid and Soda Works.

1898. Nishikawa, T., c/o Nippon, Seimikaisha, Onoda, Nagato, Japan, Chemist.

O.M. Nolting, Dr. E., Ecole de Chimie, Mulhouse, Alsace, Germany, Professor of Chemistry.

O.M. Norman, F. J., Lyndhurst, Higher Runcorn, Cheshire. Chemical Manufacturer.

1900. Norman. Geo. M., Moro-Phillips Chemical Works, Camden, N.J., U.S.A., Chemist.

1892. Norman, J. T. 23. Leadenhall Street, E.C., Consulting Chemist.

1898. Norris, Albert P., 760, Massachusetts Avenue, Cambridgeport, Mass., U.S.A., Assistant Chemist.

1899. Norris, Geo. L., Standard Steel Works, Burnham, Mifflin Co., Pa., U.S.A., Chemist.

1893. Norris, Wm. M., Princeton, N.J., U.S.A., Leather Chemist.

1902. North, Barker, Glenholme, Glenholme Road, Manningham, Bradford, Lecturer in Chemistry.

1890. North, E. Gordon N., Peña de Hierro, por Rio Tinto, Huelva, Spain, Technical Chemist.

O.M. Northing, J., The Murrough, Wicklow, Ireland, Technical Chemist.

O.M. Norton, Dr. S. A., 363, East Town Street, Columbus, Ohio, U.S.A., Professor of Chemistry (Ohio State University).

1887. Norton, Dr. T. H., U.S. Consulate, Mezereh, Mamouret-ul-Aziz, Turkey-in-Asia, open Mail, *viâ* Constantinople, Ph.D., Sc.D., U.S. Consul.

1901. Novarine, John L., 79, Main Street, Brooklyn, N.Y., U.S.A., Chemist.

1899. Noyes, Henry, (Subscriptions) c/o J. C. Lanyon and Sons, Gresham House, Old Broad Street, London, E.C.; and (Journals), 17, Queen Street, Melbourne, Vic., Australia, Engineer.

1901. Noyes, Wm. A., 2115, North 9th Street, Terre Haute, Ind., U.S.A., Professor of Chemistry.

O

1894. Oakes, Geo. A., Bloomfield, N.J., U.S.A., Woollen Mill Owner.

1884. O'Beirne, W. G., British Chemical Works, Clydebank, Glasgow, Manufacturing Chemist.

1900. O'Brien, Frederick, Sunningdale, Lilymead Avenue, Knowle, Bristol, Analytical Chemist.

1900. O'Byrne, Leo C., 996, Washington Boulevard, Chicago, Ill., U.S.A., Chemist.

1902. Oekel, Reinhold, 9, Walton New Road, Warrington, Technical Chemist.

1901. O'Connor, Chas. P., 149, Clinton Street, Brooklyn, N.Y., U.S.A., Analytical Chemist.

1887. Oddie, Jas., School of Mines, Ballarat, Australia, Chemical Lecturer.

1888. Oddy, Robert W., 60, Waterhouse, Toad Lane, Rochdale, Chemist.

1901. Odling, Francis J., Box 314, G.P.O., Melbourne, Vic., Australia, Mining Engineer.

O.M. Odling, Dr. Wm., F.R.S., 15, Norham Gardens, Oxford, Professor of Chemistry.

1884. Oehler, K., Offenbach-am-Main, Germany, Colour Manufacturer.

1888. Ogata, Saburo, Zohei Shikyoku, Okurasho, Tokyo, Japan, Assayer.

1901. Ogden, Richard L., 314, North Main Street, Bethlehem, Pa., U.S.A., Chemist (U.S. Navy).

1896. Ogilvy, D. J., Gest Street ; and C. H. and O. R. R., Cincinnati, Ohio, U.S.A., Manufacturing Chemist.

1902. Oglesby, Wm. R., Wabash Portland Cement Co., Stroh, La Grange Co., Ind., U.S.A., Chemist.

1901. Ogston, Alex. G., Ardoe, near Aberdeen, N.B., Soap Manufacturer.

1898. Olden, Chas., Hunstanton, Norfolk, Metallurgical Engineer.

1884. Oliver, F., 31, Horsley Hill Road, Westoe, South Shields, Analytical Chemist.

1902. Oliver, Frank M., 755, North 38th Street, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

1888. Oliver, Wm. Letts, 101, Vernon Street, Oakland, Cal., U.S.A., Mining Engineer.

1901. Olivier, Dr. Louis, 22, Rue du Général-Foy, Paris, 8^e, Directeur (Revue Générale des Sciences).

O.M. Ollerenshaw, S., 96, Davyhulme Lane, Urmston, Manchester, Technical Chemist.

1899. Olsson, Gustav, c/o Hecla Compressed Gas Co., West 3rd Street, Chelsea, Mass., U.S.A., Manufacturing Chemist.

1902. O'Neill, Chas., British Dyewood and Chemical Co., Ltd., Dyewood Mills, Parkhead, Glasgow, Chemist and Colourist.

O.M. O'Neill, E. H., Johnson's Saccharum Co., Limited, Stratford, London, E., Managing Director.

1898. Ormerod, Ernest, The University, Birmingham, Chemical Student.

1894. Ormerod, John, Globe Leather Works, Castleton, Manchester, Tanner and Currier.

O.M. Orr, A., 35A, Bligh Street, Sydney, New South Wales, Analytical Chemist.

O.M. Orr, J. B., Chestnut Lodge, Widnes, Lancashire, Chemical Manufacturer.

1884. Orr, Robert ; c/o Jas. Miller, Son, and Co., 79, West Nile Street, Glasgow ; and (Journals), Kinnaird, Larbert, N.B., Manufacturing Chemist.

1899. Orr, Thos. W., Esperanza Nitrate Co., Taltal, Chile, Chemist.

1890. Orsman, Wm. Jas., Chemical Laboratory, Gathurst, near Wigan, Explosives Chemist.

1897. Osborne, Thos. B., P.O. Box 485, New Haven, Conn., U.S.A., Chemist.

1900. Osbourne, Jno. P., 572, Alexandra Parade, Dennistoun, Glasgow, Analytical Chemist.

1896. Osmond, Jno. H., c/o Smith, Bell, & Co., Manila, Sugar Works and Technical Chemist.

1889. Ostlere, Edward, Messrs. Barry, Ostlere, & Co., Kirkcaldy, N.B., Linoleum Manufacturer.

1900. O'Shaughnessy, Francis R., Home Farm, Tyburn, Birmingham, Chemist.

1885. O'Shea, L. T., University College, Sheffield, Chemical Lecturer.

O.M. O'Sullivan, C., F.R.S., 140, High Street, Burton-on-Trent, Brewer and Chemist.

1883. O'Sullivan, J., High Bank, Burton-on-Trent, Brewing Chemist.

1893. Oswell, Benj. L., 5, Balmoral Road, Burton-on-Trent, Brewer's Chemist.

1898. Oushkoff, John P., c/o P. K. Oushkoff & Co., Moscow, Russia, Chemical Manufacturer.

1887. Overtoun, Lord, 7, West George Street, Glasgow, Chemical Manufacturer.

1891. Owens, Caradoc, 88, Great Clowes Street, Lower Broughton, Manchester, Dyer's Manager.

1903. Ozias Ramon E., 732, Clinton Avenue, Newark, N.J., U.S.A., Assayer.

P

O.M. Packard, E., jun., Bramford, near Ipswich, Manure Manufacturer.

1899. Paessler, Dr. Joh., Vorstand der Deutschen Versuchsanstalt für Lederindustrie, Freiberg in Sachsen, Germany, Chemist.

O.M. Page, F. J. M., 54, Sutherland Street, Pimlico, S.W., Chemical Lecturer.

1901. Page, Ralph H., 217, Vinewood Avenue, Detroit, Mich., U.S.A., Chemist (Solvay Co.).

1886. Pagès, Albert, 34, Boulevard Henri IV., Paris, Technical Chemist.

1892. Paine, Augustus G., 60, Times Building, New York City, U.S.A., President of Paper Making Co.

O.M. Paine, S., Devisdale, Bowdon, and (Journals) Otter Works, Manchester, Pharmaceutical Chemist.

1902. Pakes, Dr. Walter C. C., Government Laboratory, Pretoria, South Africa, Analyst and Bacteriologist.

1903. Palmenburg, O. W., 107, West 70th Street, New York City, U.S.A., Chemist.

1902. Palmer, Fredk. G., Mervyndene, Court Road, West Norwood, S.E., Analyst.

1887. Palmer, T. Chalkley, Box 19, Chester, Pa., U.S.A., Manufacturing Chemist.

1887. Palmer, Thos. C., 98, Commercial Road East, London, E., Engineer.

1902. Paquin, Felix, Memphis, Tenn., U.S.A., Chemist.

O.M. Park, J., Millburn Chemical Works, Garngad Hill, Glasgow, Chemical Manager.

1888. Parker, Chas. E., Vine House, Penketh, Warrington, Tanner.

1894. Parker, Chas. E., 164, New Street, New Brunswick, N.J., U.S.A., Chemist.

1898. Parker, Charles H., Craigside, Clark Street, Wolverhampton, Chemist.

1894. Parker, Dr. J. Gordon, Herold's Institute, Drummond Road, Bermondsey, S.E., Head of Tanning School.

1891. Parker, Edw., Laburnum House, Rushford Park, Levenshulme, Manchester, Analytical Chemist.

1897. Parker, Matthew A., 13, Hamilton Crescent, Partick, Glasgow, Assistant to Professor of Chemistry.

1901. Parker, Col. Richard H., N.Y. Testing Laboratory, Long Island City, N.Y., U.S.A., Analytical Chemist.

O.M. Parker, Thos., Manor House, Tettenhall, Wolverhampton, Electrical Engineer.

1894. Parker, Thos. J., Bayonne, N.J., U.S.A., Chemical Works Manager.

1903. Parker, Wm. B., 60, Clifton Road, Rugby, Chief Chemist (British Thomson-Houston Co., Ltd.).

1901. Parker, Dr. Wm. Huntington, 177, State Street, Boston, Mass., U.S.A., Chemist in Charge (U.S. Appraiser).

1898. Parker, W. W., Whitehouse Street Tannery, Bristol, Tanner.

1901. Parkes, Albert E., 43, Whitehorse Street, Stepney, E., Analytical Chemist.

1898. Parmelee, C. W., Seminary Place, New Brunswick, N.J., U.S.A., Chemist.

1898. Parrish, Saml., 80, Grange Avenue, Chapeltown Road, Leeds, Teacher of Chemistry.

1896. Parry, John, Ebbw Vale Wharf, Newport, Mon., Analytical Chemist.

1901. Pass, James, Onondaga Pottery Co., Syracuse, N.Y., U.S.A., Pottery Manufacturer.

1902. Patch, Jas. A., Syrian Protestant College, Beirût, Syria, Instructor in Chemistry.

1902. Patchett, Isaac, 11, Field Hill, Batley, Yorks, Science Master.

1897. Patchett, Jas., Oakworth, Hadley, Wellington, Salop, Ironmaster.

1903. Paterson, David, Leabank, Rosslyn, Midlothian, Colour Chemist.

1884. Paterson, John, Belle Isle Place, Workington, Cumberland, Mechanical Engineer.

1887. Paton, J. M. C., Messrs. Manlove, Alliott & Co., Ltd., Nottingham, Mechanical Engineer.

1886. Paton, W. Grant, 18, Bertram Road, Liverpool, Alkali Works Manager.

1901. Patterson, Chas. A., c/o Repauno Chemical Co., Chester, Pa., U.S.A., Analytical Chemist.

O.M. Patterson, Geo., c/o The Manbré Saccharine Co., Ltd., Fulham Palace Road, Hammersmith, W., Technical Chemist.

1893. Patterson, Harry J., College Park, Prince George's Co., Md., U.S.A., Agricultural Chemist.

O.M. Patterson, T. L., Maybank, Finnart Street, Greenock, N.B., Sugar Works Manager.

1902. Patterson, Wm. Hamilton, Fernlea, Danes Road, Rusholme, Manchester, Student.

1884. Pattinson, Dr. H. Salvin, 75 Side, Newcastle-on-Tyne, Analytical Chemist.

O.M. Pattinson, J., 75, The Side, Newcastle-on-Tyne, Consulting Chemist.

O.M. Pattison, Jas., Dimnamona, Kilmalcolm, N.B., Chemical Merchant.

1889. Pattison, Percy J., 5, Kingsley Road, Forest Gate, E., Technical Chemist.

1900. Paul, Dr. L. Gordon, Market Hall Chambers, Huddersfield, Consulting Chemist.

1891. Paul, Jas. H., Albion Chemical Co., Riverside, Charlton, S.E., Analytical Chemist.

1902. Pauli, Dr. Hermann, 48, Cecil Street, Greenheys, Manchester, Scientific Chemist.

1902. Pay, Walter Herbert, Government Laboratory, Durban, Natal, S. Africa, Chemist and Assayer.

O.M. Payne, J. B., 15, Mosley Street, Newcastle-on-Tyne, Manufacturing Chemist.

1888. Peak, C. P., Bridgewater Chemical Works, Wigan, Manufacturing Chemist.

1898. Pearce, Edw. D., Messrs. T. P. Shepard and Co., P.O. Box 1336, Providence, R.I., U.S.A., Manufacturing Chemist.

1894. Pearce, Jas. Stanley, Clements, Snaresbrook, Essex, Chemical Manufacturer.

1897. Pearce, Richard, Argo, Col., U.S.A., Smelting Works Manager.

1883. Pearce, W., The Elms, Salway Hill, Woodford, Essex, Chemical Manufacturer.

1893. Pearson, Frank P., Arnold Printworks, North Adams, Mass., U.S.A., Printworks Manager.

1894. Pearson, Wm. H., 6, Fenchurch Buildings, London, E.C., Analytical Chemist.

O.M. Pechiney, A. R., Salindres, Gard, France, Chemical Engineer.

1898. Peck, Dr. Ernest L., Claremont, Merrilocks Road, Blundellsands, near Liverpool, Analytical Chemist.

1898. Peckham, Stephen F., Room 104, 280, Broadway, New York City, U.S.A., Chemist.

1894. Peden, Jno., 30, Ardgowan Street West, Greenock, N.B., Analytical Chemist.

O.M. Pedler, Prof. A., C.I.E., F.R.S., Writer's Buildings, Calcutta, India, Director of Public Instruction.

1886 Pedler, J. R., 47, Tregunter Road, South Kensington, S.W., Clerk.

1903. Peffer, Harry C., P.O. Box 218, East St. Louis, Ill., U.S.A., Manufacturing Chemist.

1899. Pell, A., 7, Elphinstone Circle, Bombay, India, Chemist.

1897. Pellew, Chas. E., Columbia University, New York City, U.S.A., Adjunct Professor of Chemistry.

1888. Pemberton, Henry, jun., 1008, Clinton Street, Philadelphia, Pa., U.S., Manufacturing Chemist.

1896. Penney, Mulgrave D., 11, High Street, Hull, Analytical Chemist.

1903. Pennington, R. W. R., "Carbonic," Bombay, India, General Manager and Engineer (Sirdar's Carbonic Acid Co., Ltd.).

1890. Pennock, J. D., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Technical Chemist.

1885. Pentecost, S. J., Nottingham Road, New Basford, and (Journals), Sherwood Hill Works, Sherwood Rise, Nottingham, Lace Dresser.

1887. Pentermann, H. T., 37, Clifton Crescent, Peckham, S.E., Brewing Chemist.

1892. Peploe, D. H. T., Seale Lodge, Farnham, Surrey.

1899. Peppel, S. Vernon, 233, West 11th Avenue, Columbus, Ohio, U.S.A., Chemist.

1885. Perkin, A. G., 8, Montpelier Terrace, Hyde Park, Leeds, Technical Chemist.

1898. Perkin, Dr. F. Mollwo, Borough Polytechnic Institute, Borough Road, S.E., Head of Chemical Department.

O.M. Perkin, Dr. W. H., F.R.S., The Chestnuts, Sudbury, Harrow, Research Chemist.

1887. Perkin, Dr. W. H., jun., F.R.S., Fairview, Wilbraham Road, Fallowfield, Manchester, Professor of Chemistry.

1896. Perkins, Chas. W., P.O. Box 573, Waterbury, Conn., U.S.A., Chemist and Druggist.

1893. Perkins, T. S., 39, Garden Place, Brooklyn, N.Y., U.S.A., Chemist.

1899. Perks, Walter G., (Journals) Glanafon, and (communications) c/o National Explosives Co., Ltd., Hayle, Cornwall, Manufacturer.

1902. Perrett, Fred., jun., 9, Altenburg Gardens, Lavender Hill, London, S.W., Chemist.

1901. Perry, Chas. M., 238, Cottage Street, Pawtucket, R.I., U.S.A., Bleach and Dyeworks Chemist.

1887. Perry, D., Norwood, Lenzie, N.B., Manufacturing Chemist.

1895. Perry, Jos. H., 276, Highland Street, Worcester, Mass., U.S.A., Teacher of Chemistry.

1901. Persons, Ashton C., 159, Prospect Street, Willimantic, Conn., U.S.A., Chemist.

1893. Pethybridge, Walter, 3, Rhodesia Road, Clapham Rise, S.W., Chemist and Assayer.

1902. Petsche, B. W., 25, Fairview Street, Yonkers, N.Y., U.S.A., Chemist.

1883. Pettigrew, J., 6, St. Helen's Place, Bishopsgate, E.C., Technical Chemist.

1892. Pettigrew, Robt., c/o Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Electrochemist.

1902. Pettitt, Alf., 691, Fulton Street, Brooklyn, N.Y., U.S.A., Chemist.

O.M. Peyton, E. P., Chemical Works, Lister Street, Birmingham, Chemical Manufacturer.

1900. Peyton, Wm. C., c/o Peyton Chemical Co., Room 30, 4th Floor, Mills Building, San Francisco, Cal., U.S.A., Chemist.

1888. Philip, Arnold, Chemical Laboratory, H.M. Dockyard, Portsmouth, Electro-Metallurgist and Electrical Engineer.

1886. Phillips, A. G., 11, Essex Villas, Phillimore Gardens, Kensington, W., Barrister-at-Law.

1891. Phillips, G. Brinton, (Journals) 622, Race Street; (communications) 2007, De Lancey Place, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

O.M. Phillips, Harcourt, 9, Crawford Avenue, Bolton, Analytical Chemist.

1895. Phillips, S. Chas., 47, Cannon Street, London, E.C., Chemical Engineer.

1898. Phillips, Wm. H., 100, Milton Avenue, East Ham, E., Soapmakers' Assistant.

1883. Phipson, Dr. T. L., Casa Mia, Putney, S.W., Analytical and Consulting Chemist.

1894. Picard, Hugh F. K., 44, London Wall, London, E.C., Metallurgist.

O.M. Pick, Dr. S., Direction der Soda Fabrik, Szczakowa, Galizien, Austria, Chemical Engineer and Manager.

1902. Pickard, R. H., Merlin Road, Blackburn, Teacher and Analyst.

1897. Pickert, Leo. W., American Sugar Refining Co., Granite Street, South Boston, Mass., U.S.A., Chemist.

1899. Pidduck, E. W., University College of Wales, Aberystwith, Wales, Assistant Chemist.

1901. Pierce, Ira L., Woodbury, Gloucester Co., N.J., U.S.A., Chemist (Repauno Chemical Co.).

1837. Pilhashy, Benj. M., 1325, Lincoln Avenue, Walnut Hills, Cincinnati, Ohio, U.S.A., Chemist (Pure Culture Yeast Co.).

1888. Pilkington, G., Laboratory, Victoria Buildings, Silver Street, Bury, Lancashire, Analytical Chemist.

1893. Pilley, Thos. W., 33, Grove Hill Road, Denmark Hill, S.E., Analytical Chemist.

1894. Pilling, John E., Agnew Villas, 78, Whitegate Drive, Blackpool, Chemist.

1900. Pinto-Leite, A., c/o W. R. Hardwick, 13, Batavia Buildings, Hackins Hey, Liverpool, Manufacturing Chemist.

1883. Pipe, Jas., Messrs. Wm. Henderson & Co., Irvine, N.B., Chemical Manufacturer.

1896. Piper, Walter E., Boston Rubber Shoe Co., Malden, Mass., U.S.A., Chemist.

1899. Pirie, Alex. G., Messrs. Alex. Pirie and Sons, Ltd., Stoneywood Works, Bucksburn, Aberdeenshire, Paper Manufacturer.

1900. Pitman, Jno. R., c/o Laflin and Rand Powder Co., Pompton Lakes, N.J., U.S.A., Chemist.

O.M. Pitt, T., 16, Coleman Street, London, E.C., Manufacturing Chemist.

1902. Pittard, Jno., 30, Mansfield Road, Ilford, Essex, Chemical Manufacturer.

1884. Pittuck, F. W., 15, Stratford Grove, Heaton, Newcastle-on-Tyne, Technical Chemist.

1899. Pizey, Jas. H., 22, Duke's Avenue, Muswell Hill, N., Chemist.

1894. Platten, Frank, c/o Elliot's Metal Co., Limited, Selly Oak Works, near Birmingham, Metallurgical Chemist.

1890. Platts, Jno. C., Heaton Moor Lodge, Heaton Chapel, near Stockport, Metallurgical Chemist.

1896. Plaut, Albert, 128, William Street, New York City, U.S.A., Wholesale Druggist.

1888. Playfair, David J., 7, Victoria Crescent, Dowanhill, Glasgow, Manufacturing Chemist.

1891. Pocklington, Hy., 41, Virginia Road, Leeds, Assurance Co.'s Local Manager.

1901. Pollard, Wm., Museum, Jermyn Street, London, S.W., Chemist (H.M. Geological Survey).

1902. Pollitt, Jas. C. T., Wheatsheaf Works, Alexandria, Sydney, N.S.W., Managing Chemist.

1893. Pollitt, R. B., De Beers Explosives Works, Somerset West, C.C., South Africa, Civil Engineer.

1883. Pollock, A., Kirkland, Bonhill, Dumbartonshire, Dyeworks Manager.

1890. Pomeroy, Dr. Chas. T., 55, Broad Street, Newark, N.J., U.S.A., Ink Manufacturer.

1896. Pond, Prof. G. G., State College, Centre Co., Pa., U.S.A., Professor of Chemistry.

O.M. Pond, J. A., 99, Queen Street, Auckland, New Zealand, Analytical Chemist.

1900. Pont, Francis G. du, Wilmington, Del., U.S.A., Manufacturer.

1895. Pont, Pierre S. du, Wilmington, Del., U.S.A., Explosives Manufacturer.

1896. Poole, Herman, 157, West 106th Street, New York City, U.S.A., Manufacturing Chemist.

O.M. Pooley, T. A., Beverley, Hersham Road, Walton-on-Thames, Analytical Chemist.

1892. Pope, Frank, c/o The Dunwoody Bros. Soap Co., Denver, Col., U.S.A., Chemist.

O.M. Pope, S., 35, Victoria Road, Runcorn, Chemical Works Manager.

1899. Pope, Thos. H., 59, Gillott Road, Edgbaston, Birmingham, Chemist.

1900. Pope, Prof. W. J., F.R.S., Municipal School of Technology; and (Journals), 7, Albion Road, Fallowfield, Manchester, Professor of Chemistry.

1900. Popplewell, Jos. M., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Chemist.

1899. Porter, A. Felix, Haskell, N.J., U.S.A., Explosives Chemist.

1896. Porter, Herbert, 6, Cavendish Road, Chorlton-cum-Hardy, Manchester, Alkali Inspector.

1902. Porter, J. Edw., P.O. Box 785, and 205, W. Genesee Street, Syracuse, N.Y., U.S.A., Chemist.

1901. Porter, Jno. L., New Orleans Sewerage Board, 602, Carondelet Street, New Orleans, La., U.S.A., Chemist.

1899. Potter, Chas. A., 198, Waterman Street, Providence, R.I., U.S.A., Chemist.

1884. Potter, Chas. E., Love Lane Sugar Refinery, Liverpool, Sugar Works Chemist.

1888. Potter, Chas. J., Heaton Hall, Newcastle-on-Tyne, Cement Manufacturer.

O.M. Potter, E. P., Salwick Hall, near Preston, Alkali Manufacturer.

1899. Potter, Rowland S., 2, Museum Hill, Haslemere, Surrey, Chemist.

1902. Potts, Cuthbert, Hawkesbury Agricultural College, Richmond, N.S.W., Lecturer in Chemistry.

1900. Potts, Geo. E., Dover, N.J., U.S.A., Explosives Manufacturer.

1902. Potts, Henry Wm., Hawkesbury Agricultural College, Richmond, N.S.W., Chemist and Principal.

1892. Potts, Joseph T., Price's Patent Candle Co., Bromboro' Pool, near Birkenhead, Chemist.

1900. Pough, Frank H., 146, Hicks Street, Brooklyn, N.Y., U.S.A., Manager (Bergen Point Sulphur Works).

1889. Powell, A. Ernest, Craigowan, Clarendon Road, Whalley Range, Manchester, Oil Merchant.

1900. Powell, Harry J., Whitefriars Glass Works, London, E.C., Glass Manufacturer.

1884. Powell, L. S., 5, Campden Hill Square, London, W., Electrician.

1897. Power, Dr. Fred. B., Wellcome Research Laboratories, 6, King Street, Snow Hill, London, E.C., Director.

1902. Powney, Wm. E. F., 67, Barrett's Grove, Stoke Newington, N., Analytical Chemist.

1900. Pratt, N. P., Laboratory, Atlanta, Ga., U.S.A., Manufacturing Chemist.

1889. Pratt, Walter E., 17, East Road, Lancaster, Analytical Chemist.

1897. Prentice, Dr. Bertram, Royal Technical Institute, Salford, Lecturer on Chemistry.

1902. Prentice, Dr. David, 5, Vermont Street, Beverley Road, Hull, Chemist.

1903. Prentice, Jas., Cossipore Sugar Works, Calcutta, India, Chemist.

1888. Prescott, Dr. Albert B., Ann Arbor, Mich., U.S.A.

1900. Prescott, Saml. C., Mass. Inst. of Technology, Boston, Mass., U.S.A., Instructor in Bacteriology.

1891. Preston, Alf., 29, Southfields, Manchester Road, Bury, Lancs., Chemist.

1883. Preston, R., Grasmere, Whitefield, near Manchester, Manufacturing Chemist.

O.M. Price, A. F., 524, Sacramento Street, San Francisco, Cal., U.S.A., Analytical Chemist.

1902. Pringsheim, Dr. H. H., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Chemist.

1899. Prinsen-Geerligs, H. C., Tegal, Java, Netherlands Indies, Director of Sugar Cane Experimental Station.

1893. Pritchard, Edgar J., North Hill, Swansea, Works Manager.

1896. Prochazka, Dr. Geo. A., 138, West 13th Street, New York City, U.S.A., Colour Manufacturer.

1897. Prochazka, John, 15, East 12th Street, New York City, U.S.A., Coal-Tar Colour Chemist.

O.M. Procter, Prof. H. R., Yorkshire College, Leeds; and (Journals) Rowangarth, Ben Rhydding, near Leeds, Yorks, Lecturer on Tanning.

1881. Procter, J. W., Skeldergate Bridge, York, Manure Manufacturer.

1890. Proctor, Miss Anne J., Free Library, Widnes, Librarian.

O.M. Proctor, C., 99, Underhill Road, East Dulwich, S.E., Analytical Chemist.

O.M. Proctor, W. W., 33, The Side, Newcastle-on-Tyne Assayer and Analytical Chemist.

1901. Propach, C., 189, East Kinzie Street, Chicago, Ill., U.S.A., Colour Merchant.

1894. Proude, Jas., 30, Cromwell Terrace, Halifax, Yorks, Soap Works Chemist and Manager.

1899. Pullar, Edmund, Keirfield, Bridge of Allan, N.B., Manufacturer.

1894. Pullar, Herbert S., Pullar's Dyeworks, Perth, N.B., Dyer.

O.M. Pullar, Sir Robert; Journals to J. Minto, Sandeman Public Library, Perth, N.B., Dyer.
O.M. Pullar, R. D., Pullar's Dyeworks, Perth, N.B., Dyer.
1902. Pantan, H. H. C., 10, London Chambers, Durban, Natal, Public Analyst.
1894. Purdie, Dr. Thos., F.R.S., 14, South Street, St. Andrews, N.B., Professor of Chemistry.

Q

1903. Queneau, Augustin L., c/o New Jersey Zinc Co., Newark, N.J., U.S.A., Mining Engineer.
1887. Quibell, Oliver, Manure Manufacturer.
1902. Quinan, Kenneth B., c/o De Beers Explosives Works, Somerset West, Cape Colony, South Africa, Chemist.
1897. Quinan, Wm. R., De Beers Explosives Works, Cape Town, South Africa, Superintendent (Powder Works).
1897. Quirk, Jno. S., Lead Smelting Works, St. Helens, Lancs., Manager.

R

1898. Radcliffe, Lionel G., 6, Alma Terrace, Old Trafford, Manchester, Chemist.
1884. Rademacher, H. A., (Journals). P.O. Box 243, Lawrence, Mass., U.S.A.; and c/o Law Office of Pierson and Pease, Chamber of Commerce, Chicago, Ill., U.S.A., Consulting Technical Chemist.
1900. Radley, Ernest, 49, Ernest Street, West Norwood, S.E.
O.M. Rae, Geo., Craigfoot, Milton-of-Campsie, N.B., Assayer.
1897. Rae, Roderic H., Claremont, Turner's Hill, Cheshunt, Herts, Engineer (Edison-Swan Electric Works).
1895. Raegener, Louis C., 141, Broadway, New York City, U.S.A., Lawyer.
1901. Ralston, Wm., 3, Windsor Terrace, Linthouse, Govan, Glasgow, Government Chemist.
1902. Ramsay, A. Alexander, Laboratory, Department of Agriculture, 136, George Street, Sydney, N.S.W., Assistant Chemist.
O.M. Ramsay, Sir William, K.C.B., D.Sc., LL.D., F.R.S., University College, Gower Street, London, W.C.; Journals to 12, Arundel Gardens, W., Professor of Chemistry.
1888. Ramsay, W., c/o Laird Bros., Ironworks, Birkenhead, Chemist and Assayer.
1898. Ramsden, Andrew, Deccan Sugar Co., Ltd., Samalkot, Godaveri District, India, Manager.
1883. Ramsden, J., Suffolk Lodge, Park Hill, Clapham, S.W., Brewer.
1901. Ransom, Francis, The Chilterns, Hitchin, Herts, Manufacturing Pharmaceutical Chemist.
1898. Raschen, Dr. Julius, The Highlands, Runcorn, Cheshire, Consulting Chemist (United Alkali Co.).
1893. Ratcliff, Frank D., The Cottage, Green Hill, Bromsgrove, Staffs, Vinegar Brewer.
1898. Ratcliffe, Walter, 21, Mawdsley Street, Bolton, Analytical Chemist.
1895. Rau, Dr. H. M., 130–132, Pearl Street, New York City, U.S.A., Chemist.
1901. Rauter, Dr. G., Bismarckstrasse, 108, Charlottenburg, 4, bei Berlin, Germany, Engineering Chemist.
1901. Rawlins, Herbert J. L., Hope Cottage, Rainhill, Lancashire, Managing Director.
O.M. Rawson, Chris., 41, St. Augustine Road, Bedford, Anal. and Cons. Chemist.
1883. Rawson, Dr. S. G., Technical Schools, Huddersfield, Analytical Chemist.
1895. Read, E. J., 69, Sheen Lane, Mortlake, Surrey, Analyst.
1890. Reade, Thos., Sebright House, Tettenhall Wood, Wolverhampton, Manufacturing Chemist.
O.M. Readman, Dr. J. B., Mynde Park, Hereford, Analytical and Consulting Chemist.
O.M. Reddrop, J., Sound Cottage, Sound, near Nantwich, Analytical Chemist.
1902. Redfern, C. G., 4, South Street, Finsbury, London, E.C., Patent Agent.
1890. Redgate, J. G., Traffic Street, Nottingham, Aërated Water Manufacturer.
1901. Redpath, Leon W., International Smokeless Powder and Dynamite Co., Parlin, N.Y., U.S.A., Chemist.
O.M. Redwood, Dr. Boverton, 4, Bishopsgate Street Within, London, E.C., Petroleum Expert.
1884. Redwood, I. I., Bantry House, Picardy Hill, Belvedere, Kent, Technical Chemist.
1887. Redwood, Robt., 4, Bishopsgate Street Within, London, E.C., Secretary.
1891. Redwood, T. Horne, Olveston, Sedlescombe Road, St. Leonard's-on-Sea, Analytical Chemist.
1886. Rée, Dr. A., 15, Mauldeth Road, Withington, Manchester, Aniline Dye Manufacturer
1884. Reed, Albert E., The Grange, Leigham Court Road, Streatham, S.W., Paper Works Chemist.
1902. Reed, Herbert C., c/o Stamford Manufacturing Co., Stamford, Conn., U.S.A., Chemist.
1895. Reed, Dr. J. Hastings, Hambledon Mill, *viâ* Cairns, North Queensland, Sugar Manufacturer.
1893. Reekie, J. A., 51, Blackford Brow, Whitefield, near Manchester, Calico Printer's Colour Mixer.
1883. Reeks, T. H., 106, Queen Victoria Street, London, E.C., Analytical and Consulting Chemist.
1901. Rees, Harald B., c/o Harris-Rees Tanning Co., Sylva, N.C., U.S.A., Tanner and Currier.
1897. Rees, W. H., Big Pine, Inyo Co., Cal., U.S.A., Chemist.
1900. Reese, Dr. Chas. L., c/o Repauno Chemical Co., Chester, Pa., U.S.A., Chemist.
1897. Reid, Andrew, 133, Minard Road, Crossmyloof, Glasgow, Chemist.
1896. Reid, Robt., Oil Mills, Horbury Bridge, near Wakefield, Chemical Student.
1895. Reid, T. Anderson, 8, Ashton Drive, Hunt's Cross, Liverpool, Works Manager.
O.M. Reid, Walter F., Fieldside, Addlestone, Surrey, Technical Chemist.
1893. Reid, Wm., jun., Bombay Dyeworks, Dadur, Bombay, India, Dyer.
1898. Reitmeyer, Robt. E. D., 1 & 2, Rangoon Street, London, E.C., Chemical Merchant.
1901. Remington, J. Percy, jun., 417, Bourse Building, Philadelphia, Pa., U.S.A., Chemist.
1900. Remington, J. Stewart, Aynsome, Grange-over-Sands, R.S.O., Lancs., Consulting Chemist.
1903. Remsen, President Ira, Johns Hopkins University, Baltimore, Md., U.S.A., President.
1884. Renaut, F. W., 17, Emanuel Avenue, Friar's Park, Acton, W., Secretary.
O.M. Rennie, Dr. E. H., University of Adelaide, South Australia, Professor of Chemistry.
O.M. Rennoldson, W. L., c/o United Alkali Co., Ltd., Hebburn-on-Tyne, Manager.
1901. Renwick, Frank F., Glengall, Woodford Green, Essex, Chemist (Photographic Works).
1885. Reoch, R., River Point, R. I., U.S.A., Print Works Manager.
1894. Rettie, Theodore, 16, Great King Street, Edinburgh, Metallurgical Chemist.
1895. Reubens, Chas. M., c/o Brady Brass Co., 202, Tenth Street, Jersey City, N.J., U.S.A., Chemist.
1896. Reuter, Dr. L. H., 434, East 87th Street, New York City, U.S.A., Chemist.
1902. Reuterdahl, Arvid, 194, Calla Street, Providence, R.I., U.S.A., Consulting Electrical Chemist.
O.M. Reynolds, Dr. J. Emerson, F.R.S., Trinity College, Dublin, Professor of Chemistry.
O.M. Rhodes, E., c/o Thos. Vickers & Sons, Widnes, Technical Chemist.
1892. Rhodes, Jos., Church Bridge House, Accrington Print Works Chemist.

1902. Rhodin, B.E.F., Sault Ste. Marie, Ont., Canada, Chemical Engineer.
1895. Ricarde-Seaver, Major F. J., 16, Grafton Street, Bond Street, W., Metallurgist.
1901. Richard, Geo. A., Mount Morgan Mine, Queensland, Australia, Metallurgical Engineer.
1889. Richrds, Edgar, 341, West 88th Street, New York City, U.S.A., Analytical Chemist.
1888. Richardson, Clifford, New York Testing Laboratory, Long Island City, N.Y., U.S.A., Chemical Engineer.
1888. Richardson, D. B., Aucheneck, Killearn Station, N.B., Chemical Merchant.
1884. Richardson, F. W., Broad Oak, Oak Avenue, Bradford, Yorkshire, Analytical Chemist.
1892. Richardson, G. E., Branch House, Batley, Yorks, Manufacturing Chemist.
1900. Richardson, Jno. H., c/o H. D. Pochin and Co., Ltd., Salford, Manchester, Manager.
1889. Richardson, S. M., 415, Main Street, Bonhill, N.B., Analytical Chemist.
1891. Richardson, Walter W., 1, Montpellier Terrace, Cliff Road, Leeds, Manufacturing Chemist.
1894. Richardson, Wm. H., Newsky Thread Mills, Malaja Bolotnaja, St. Petersburg, Russia, Textile Chemist.
1886. Richmond, H. D., Fair Hoho, Grimwood Road, Twickenham, Chief Chemist (Aylesbury Dairy Co.).
1898. Richmond, Jno. R., Woodend Park, Grassendale, Liverpool, Alkali Works Manager.
1901. Richmond, Sylvester O., c/o A. H. Allen, 67, Surrey Street, Sheffield, Analytical Chemist.
1884. Richmond, W. H., Liver Alkali Co., Limited, Ditton Road, Widnes, Alkali Manufacturer.
1886. Riddell, R., 87, Horninglow Street, Burton-on-Trent, Brewer.
1894. Ridding, Howard C., School of Mines, Redruth, Cornwall, Principal.
1884. Rideal, Dr. Samuel, Chemical Laboratory, 28, Victoria Street, Westminster, S.W., Analytical and Consulting Chemist.
O.M. Ridsdale, C. H., Ferndale, Linthorpe, Middlesbrough, Yorks, Analytical Chemist.
1899. Riederer, Emil J., 251, West 95th Street, New York City, U.S.A., Chemist.
1902. Riederer, Herman S., 251, West 95th Street, New York City, U.S.A., Chemist.
1892. Riker, Jno. J., 45, Cedar Street, New York City, U.S.A., Merchant.
O.M. Riley, E., 2, City Road, Finsbury Square, London, E.C., Metallurgical Chemist.
1902. Riley, Fred., 27, Dover Street, Crumpsall, Manchester, Traveller.
O.M. Riley, J. E., Arden Hall, near Accrington, Chemical Manufacturer.
1884. Riley, Jno., Mayfield, Thornliebank, near Glasgow, Print Works Manager.
1893. Riley Wm., Castleton, Manchester, Chemical Manufacturer.
1893. Rink, Arnold, 9, Butler Street, Milton Street, London, E.C., Tannin Extract Manufacturer.
1889. Rintoul, Wm., Royal Gunpowder Factory, Waltham Abbey, Essex, Explosives Chemist.
1901. Ripley, Philip F., c/o American Woollen Co., Maynard, Mass., U.S.A., Chemist.
1900. Rising, Willard B., Berkeley, Cal., U.S.A., Professor of Chemistry.
1885. Ritson, T. N., 1, West Cliff Villas, West Cliff Road, Ramsgate, Gas Engineer.
1899. Rivington, W. John, 24, Mark Lane, London, E.C., Newspaper Proprietor.
O.M. Rix, W. P., Ashfield Cottage, Liverpool Road, Newcastle, Staffordshire, Potter.
1890. Roberts, C. F., Linfitts, Delph, vià Oldham, Chemical Merchant.
1887. Roberts, F. A., Cornbrook Chemical Works, Hulme, Manchester, Chemical Manufacturer.
O.M. Roberts, F. G. Adair, Oak Hill Lodge, Frognal, N.W., Chemical Manufacturer.
1901. Roberts, H. E. U. (Journals), 11, Albion Terrace, Faversham, Kent; and 9, St. James' Street, Bath. (Cotton Powder Co., Ltd.), Chemist.
1885. Roberts, R. Wightwick, 22, Calle Arturo Prat, Valparaiso, Chili, Analytical and Consulting Chemist.
1900. Roberts, Wm. Brittain, Wilderspool House, Warrington, Brewer and Analyst.
1902. Roberts, Wm. H., 52, Devonshire Road, Princes Park, Liverpool, S., Analytical Chemist.
1902. Robertshaw, Chas. D., 22, Hemstall Road, W. Hampstead, London, N.W., Analytical Chemist.
1894. Robertson, Alex., Argyle Chemical Works, Oban, N.B., Manufacturing Chemist.
1891. Robertson, Alex. A., 12, Bennison Drive, Grassendale, Liverpool, Technical Chemist.
1897. Robertson, Andrew J., 2914, East Main Street, Richmond, Va., U.S.A., Analytical Chemist.
1903. Robertson, Fred., 128, Wellington Street, Glasgow, Analytical Chemist.
1892. Robertson, Geo. H., 30, Hemstall Road, West Hampstead, N.W., Electro-Chemist.
1900. Robertson, Jas., 103, Whifflet Street, Coatbridge, N.B., Analytical Chemist.
1891. Robertson, Dr. Robt., (communications) 9, Sewardstone Road; (Journals) Royal Gunpowder Factory, Waltham Abbey, Essex, Analytical Chemist.
1901. Robertson, Robert, California Powder Works, Santa Cruz, Cal., U.S.A., Superintendent.
1895. Robins, Walter, Wanstead Cottage, New Wanstead, Essex, Chemist.
1897. Robinson, Clarence J., Westerleigh, West New Brighton, N.Y., U.S.A., Chemist.
1900. Robinson, Edw. B., Victoria Oil Works, Nitshill, near Glasgow, Oil Distiller.
1902. Robinson, Hy. Fishwick, Culcheth Chemical Works, Newton Heath, Manchester, Manufacturing Chemist.
O.M. Robinson, H. H., 75, Finborough Road, West Brompton, S.W., Analytical Chemist.
O.M. Robinson, Jos., Farnworth, Widnes, Chemical Manufacturer.
O.M. Robinson, Jno., 8, Kaludah Terrace, Albert Road, Widnes, Chemical Engineer.
1887. Robinson, Thomas, (Journals) 401, West Street, Glasgow; and (communications), The Villa, Nitshill, N.B., Chemical Works Manager.
1902. Robitschek, Carl, 200, Worth Street, New York City, U.S.A., Scientific Brewer.
1894. Robson, Jas., 204, George Street, Glasgow, Chemist.
1894. Rodda, Edw. D., 6, Gold Street, Roath, Cardiff, Engineer.
1884. Rodger, Edw., 1, Clairmont Gardens, Glasgow, W.
1900. Rogers, Geo. J., Wallaroo Smelting Works, South Australia, Chemist.
1890. Rogers, Harry, 5, Stoke Newington Common, London, N.
1899. Rogers, John, Ardeer Factory, Stevenston, Ayrshire, N.B., Chemist.
1901. Rogerson, John W., The Larches, Green Street Green, Orpington, Kent, Maltster.
1890. Rogerson, W. J., 38, Southwark Street, London, S.E., Wholesale Druggist.
1898. Roller, H. C., c/o Ampère Electro-chemical Co., Port Chester, N.Y., U.S.A., Superintendent.
1899. Rollin, Chas., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
O.M. Rollin, J. C., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
1898. Roode, Rudolf de, International Paper Co., Glens Falls, N.Y., U.S.A., Chemist and Superintendent.
O.M. Roscoe, Sir Henry, F.R.S., 10, Bramham Gardens, South Kensington, S.W., Consulting Chemist.
1901. Roscow, Jas., 471, Park Avenue, Paterson, N.J., U.S.A., Colourist and Chemist.
1893. Roscow, Jno. F., c/o United States Finishing Co., Norwich, Conn., U.S.A., Print Works Chemist.
1899. Roscow, Wm., 24, Prince Street, Pawtucket, R.I., U.S.A., Analytical Chemist.

1901 Rose, Jno. Leonard, 454, Cheetham Hill Road, Manchester, Chemist.

1902. Rosebrugh, Prof. T. R., 666, Spadina Avenue, Toronto, Canada, Professor of Electrical Engineering.

1902. Rosendale, Otto M., 516, Oregonian Building, Portland, Oregon, U.S.A., Mining Engineer.

1897. Rosengarten, Dr. Geo. D., 1700, Fitzwater Street, Station D, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

1896. Rosenheim, Dr. Otto, 68, Belsize Park Gardens, Hampstead, N.W., Analytical and Research Chemist.

1887. Ross, Alex. J. J., Tayavalla, Falkirk, N.B., Chemical Manufacturer.

1893. Ross, Arthur, 1, Glengall Road. Old Kent Road, London, S.E., Analytical Chemist.

1901. Ross, Herbert W., 1070, 16th Street, Oakland, Cal., U.S.A., Chemist.

1887. Ross, Jas. G., (Journals) 5–9, Sunbury Place, Belford Road; and (subscriptions) 47, Comely Bank Place, Edinburgh, Analytical Chemist.

1900. Ross, Raymond, Public Analyst's Office, Burnley, Lancashire, Analytical Chemist.

1888. Rothwell, C. F. Seymour, 15, Skerton Road, Old Trafford, Manchester, Print Works Chemist.

O.M. Rottenburg, Paul, Messrs. Leisler, Bock & Co., 105, West George Street, Glasgow, Chemical Merchant.

1896. Round, Wm., 100, Bagot Street, Birmingham, Analytical Chemist.

1900. Rountree, Walter B., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Chemist.

1899. Rouse, H. W., 62, Russell Road, Custom House, E., Foreman (Sulphuric Acid Works).

1903. Rouse, Wm., 63, John Street, Alexandria, Dumbartonshire, Chemist.

O.M. Rowland, W. L., 4800, Chester Avenue, Philadelphia, Pa., U.S.A., Chemist.

1901. Rowley, Walter Eugene, c/o Schoellkopf, Hartford, and Hanna Co., 100, William Street, New York City, U.S.A.

884. Roxburgh, J. W., Levenbank Cottage, Jamestown, Dumbartonshire, N.B., Print Works Manager.

899. Roy, Benjamin, Ailsa Lodge, 17, Whitelow Road, Chorlton-cum-Hardy, Manchester, Chemist.

896. Royal-Dawson, H., (Journals) 22, Lyndhurst Gardens, Cretfield Road, Ealing, W., Brewer's Chemist.

898. Royle, Chas. L., c/o East India Distilleries and Sugar Factories, Ltd., Nellikuppam, S. Arcot, Madras, India, Sugar Chemist.

898. Royle, Thos. H., Bareilly, United Provinces, India, Chemist.

O.M. Royle, T., 329, Upton Lane, Forest Gate, Essex, Chemical Engineer.

O.M. Royse, S. W., St. Andrew's Chambers, 20, Albert Square, Manchester, Chemical Engineer.

890. Royston, Ernest R., 15, Water Street, Liverpool, Patent Agent.

902. Rücker, Dr. Hermann von, c/o Buchanan and Co., Torreon, Coahuila, Mexico, U.S.A., Chemist.

896. Ruddock, Fred. G., Lower Walton, Warrington, Analytical Chemist.

895. Rudge, Alfred, Sutton Alkali Works, St. Helens, Analytical Chemist.

884. Ruffle, Jno., Musley, Ware, Herts., Consulting Chemist and Electrician.

898. Ruhl, Louis, c/o Roessler and Hasslacher Chemical Co., P.O. Box 1999, 100, William Street, New York City, U.S.A., Chemical Merchant.

902. Ruhoff, O. E., c/o Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Chemist.

.M. Rumble, C., Belmont Works, Battersea, London, S.W., Candle Works Chemist.

899. Rumbold, Wm. R., Mill House, Holmwood, Surrey, Electro-Metallurgist.

895. Rump, Ernst, The Leeds Phosphate Works, Hunslet, Leeds, Manager.

899. Rushby, Wm., 22, Surrey Street, Batley, Yorks, Analyst.

1901. Rushton, Benjamin, Waterloo, Whalley Road, Accrington, Analytical Chemist.

1887. Russell, D., Cadham, Markinch, Fife, N.B., Paper Maker.

1896. Russell, G. Harrison, 7, Heath Bank Road, Devonshire Park, Birkenhead, Chemist (Glue and Gelatin Works).

1884. Russell, Jno., Anchor Brewery, Britten Street, Chelsea, London, S.W., Brewer.

O.M. Russell, Dr. W. J., F.R.S., 34, Upper Hamilton Terrace, London, N.W., Professor of Chemistry.

1901. Rust, Robt. R., c/o Prime Western Spelter Co., Gas., Kansas, U.S.A., Chemist.

1884. Ryland, Howard P., Agricultural Chemist.

S

1895. Saalfeld, Adolphe, 2, South King Street, Manchester, Chemical Merchant.

1895. Saarbach, Dr. L., 114, Pearl Street, New York City, U.S.A., Consulting Chemist.

1883. Sadler, A. E., Sand Hall, Ulverston, Lancashire, Manufacturing Chemist.

O.M. Sadler, Dr. S. A., M.P., Middlesbrough-on-Tees, Colour Manufacturer.

1884. Sadtler, Dr. S. P., 145, North 10th Street, Philadelphia, Pa., U.S.A., Consulting Chemist.

1896. Sadtler, Dr. S. S., N.E. corner of 10th and Chestnut Streets, Germantown, Pa., U.S.A., Chemist (U.S. Customs).

1897. Sage, C. Edward, 2, Charterhouse Street, London, E.C., Consulting Chemist.

1902. Sahm, Louis N., 22, Cliff Street, New York City, U.S.A., Chemist.

1897. St. John, Harry, Queen Street Brewery, Sunderland, Brewer and Analyst.

1884. Salamon, A. G., 1, Fenchurch Avenue, London, E.C., Consulting Chemist.

1885. Salamon, Jno., Rainham, S.O., Essex, Manufacturing Chemist.

1884. Salis-Mayenfeld, Dr. E. von., P.O. Box 165, Albany, N.Y., U.S.A., Technical Chemist.

1902. Salter, M. J., 65, Park Road, Crouch End, London, N., Analytical Chemist.

O.M. Samuel, W. Cobden, 66, Croxted Road, West Dulwich, S.E., Analytical Chemist.

O.M. Samuelson, Rt. Hon. Sir Bernhard, Bart., F.R.S., 56, Prince's Gate, London, S.W., Ironmaster.

1896. Samuelson, Francis A. E., Sir B. Samuelson and Co., Ltd., Middlesbrough, Ironmaster.

1895. Samuelson, Godfrey B., c/o Messrs. W. T. Glover and Co., Salford, Electrical Manufacturer.

1901. Sanders, C. Newell, Roanoke, Va., U.S.A., Railway Chemist.

1902. Sanders, Warren W., Chemist.

1895. Sanderson, John, 4, Lancaster Road, Belsize Park, N.W., Chemist.

1898. Sanderson, T. C., Richmond Avenue, Port Richmond, Staten Island, N.Y., U.S.A., Chemical Engineer.

1884. Sandon, R., 42, Lewisham Road, Dartmouth Park, N.W., Examiner at Patent Office.

O.M. Sanford, P. Gerald, Analytical Laboratory, 20, Cullum Street, E.C., Public Analyst and Consulting Chemist.

1890. Saniter, E. H., 51, Grange Road West, Middlesbrough, Analytical Chemist.

1901. Sargent, Dr. Geo. W., Carpenter Steel Co., Reading, Pa., U.S.A., Chemist and Metallurgist.

1896. Saunders, Walter M., 20, Dewey Street, Olneyville, R.I., U.S.A., Analytical Chemist.

1895. Savage, Arthur E., Charles Street, Elsternwick, Victoria, Australia, Metallurgist.

1895. Sawers, Wm. D., 1, Athole Gardens Place, Glasgow, Chemist.

1901. Sawyer, Harris E., 27, Bellevue Street, Dorchester, Mass., U.S.A., Chemist and Bacteriologist.

1898. Saxe, Sigmond, 107, Manhattan Avenue, New York City, U.S.A., Manufacturing Chemist.

1895. Sayer, Harry, 82, Victoria Street, London, S.W., Metallurgical Chemist.

1894. Sayers, Jos. J., Mayville, Stevenston, Ayrshire, Explosives Chemist.

1895. Scales, F. Shillington, "Jersey," St. Barnabas Road, Cambridge.

1899. Schaak, Dr. Milton F., 108, Penn Street, Brooklyn, N.Y., U.S.A., Chemist.

O.M. Schack-Sommer, Dr. G., 48, Marlborough Mansions, Victoria Street, S.W., Sugar Refiner.

1884. Schad, Julius, York Buildings, 33, Mosley Street, Manchester, Aniline Co.'s Agent.

1899. Schaefer, Dr. L., Maywood, N.J., U.S.A., Manufacturing Chemist.

1898. Schaffer, Herbert A., 347. Broadhead Street, Easton, Pa., U.S.A., Chemist (Portland Cement).

1886. Schellhaas, Henry Alf., Thornhill, Beach Road, Hartford, Northwich, Mechanical Engineer.

1894. Schidrowitz, Dr. P., 57, Chancery Lane, W.C., Research Chemist.

1895. Schieffelin, Dr. W. Jay, 841, Southern Boulevard, New York City, U.S.A., Manufacturing Chemist.

1901. Schieren, G. Arthur, 47, Ferry Street, New York City, U.S.A., Mechanical Engineer and Tanner.

1902. Schjölberg, T. E., Taltal, Chile, S. America, Chemist.

1902. Schlegel, Jno. Wm., 602, East 5th Street, New York City, U.S.A., Chemist.

1893. Schleicher, Francis J., 38, West Tenth Street, Long Island City, N.Y., U.S.A., Technical Chemist.

1902. Schlesinger, Basil E., 92, Mount Vernon Street, Boston, Mass., U.S.A., Chemist.

1901. Schlichting, Emil, 61, Hicks Street, Brooklyn, N.Y., U.S.A., Chemist.

1902. Schloss, Joseph A., Apartado, 65, Monterey, Mexico, Analytical Chemist.

1901. Schneider, Edw. J., c/o Union Carbide Co., Niagara Falls, N.Y., U.S.A., Chemist.

1899. Schniewind, Dr. F., 277, Broadway, New York City, U.S.A., Chemist.

1897. Schoder, Dr. Robt., 6, Brandreth Road, Balham, S.W., Chemist.

1902. Schofield, Jas. A., The University, Sydney, N.S.W., Australia, Lecturer in Chemistry.

O.M. Scholefield, H. E., Edge Hill Chemical Works, Liverpool, Chemical Manufacturer.

1898. Scholes, Geo. R., Liebig's Extract of Meat Co., Ltd., 21. Longue Rue des Claires, Antwerp, Belgium, Analytical Chemist.

1902. Schoonmaker, H.. 703. West 9th Street, Cincinnati, Ohio, U.S.A., Metallurgical Chemist.

1895. Schroeder, E. August, c/o Church and Co., 36, Ash Street, Brooklyn, N.Y., U.S.A., Chemist.

1900. Schroller, Wm., 20, Mount Street, Manchester, Engineer.

1894. Schryver, Dr. S. B., Effingham House, Arundel Street, Strand, W.C., Chemist.

1901. Schultze, Wm., 102, Academy Street, Jersey City Heights, N.J., U.S.A., Chemist.

1902. Schulze, Emil A., 80, Sistova Road, Balham, S.W., Incandescent Mantle Manufacturer.

1893. Schüpphaus, Dr. R. C., 174, Broadway, New York City, U.S.A., Consulting Chemist.

1893. Schwab, Dr. L. C., Sedanstrasse 53, Bernburg, Anhalt, Technical Chemist.

1901. Schwartz, David, c/o Southern Cotton Oil Co., Gretna La., U.S.A., Chemist.

1902. Schwarz, Gustav A., 63, Wall Street, New York City, U.S.A., Manager (Grasselli Chemical Co.).

1900. Schwarz, Dr. Henry P., c/o Western Sugar Refining Co., Potrero, San Francisco, Cal., U.S.A., Chemist.

1889. Schweich, Emil, 20, Hyde Park Square, London, W., Technical Chemist.

1894. Schweitzer, Dr. H., 40, Stone Street, New York City, U.S.A., Analytical Chemist.

1891. Scott, Andrew, Royal Gunpowder Factory, Waltham Abbey, Essex, Analytical Chemist.

1893. Scott, A. Ross, Verreville, Lenzie, N.B., Manufacturing Chemist.

1889. Scott, Ernest G., 2. Talbot Court, Gracechurch Street, London, E.C., Soap Works Chemist.

1898. Scott, Jas., Cawnpore Woollen Mills, Cawnpore, India, Chemist.

1894. Scott, Jno. Gillespie. Annislea, Northfield, Liberton, near Edinburgh, Analytical Chemist.

1901. Scott, Leonard C., 1358, Wilton Avenue, Chicago, Ill., U.S.A., Chemist.

1894. Scott-Smith, G. E., 67, Surrey Street, Sheffield, Analytical Chemist.

1902. Scott, Walter, 83, Albert Road, Levenshulme, Manchester, Chemist.

1889. Scovell, M. A., Lexington, Kentucky, U.S.A., Agricultural Chemist.

1887. Scrutton, Willis J. C., 18, Billiter Street, London, E.C., Analytical Chemist.

1896. Scrymgeour, Wm., Whistlebrae, Lamington Heights, Kalgoorlie, West Australia, Chemist.

O.M. Scudder, F., Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Analytical Chemist.

1895. Seabrooke, H. Cecil, Black Ash, Grays, Essex, Research Chemist.

1900. Searby, Fred. M., West Berkeley, Cal., U.S.A., Oilworks Superintendent.

1889. Searl, Albert, Montreux, Victoria Road, Sidcup, Kent, Technical Chemist.

1898. Searle, Alf. B, 280, Western Bank, Sheffield, Analytical Chemist.

1896. Sedding, G. H. P., c/o Florida Syndicate, Jacksonville, Florida, U.S.A., Chemist.

1901. Sederholm, Erik, 28, Jakopsgatan, Stockholm, Sweden, Chemist (Royal Navy Board).

1901. Seeler, Dr. F., c/o Geo. Lueders and Co., Chemical Works, Elizabeth, N.J., U.S.A., Manufacturing Chemist.

1893. Sefton-Jones, Herbert, c/o W. P. Thompson and Co., 322, High Holborn, W.C., Analytical Chemist.

1902. Segaert, Edw., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Analytical Chemist.

1899. Seher, A., c/o Maas and Waldstein, Riverside Avenue, Newark, N.J., U.S.A., Chemist.

1896. Seldner, Rudolph L., 1395, Dean Street, Brooklyn, N.Y., U.S.A., Instructor in Chemistry.

1884. Semet, Louis, 217, Chaussée de Vleurgat, Brussels, Alkali Manufacturer.

1898. Sen (Gupta), Nagendra Nath, 18, Lower Chitpur Road, Calcutta, India, Physician and Chemist.

1895. Senger, Robt., 37, Warren Street, New York City, U.S.A., Manufacturing Chemist.

1899. Senior, Francis L., Lock 28, Sanford, Maine, U.S.A., Mill Chemist.

O.M. Sevin, C., 68, Central Hill, Upper Norwood, S.E., and (Journals) c/o Dollman & Pritchard, 9 and 10, King Street, Cheapside, E.C., Chemical Engineer and Oil Refiner.

1900. Seward, Geo. O., Holcomb Rock, Va., U.S.A., Chemist.

1896. Seyler, Clarence A., Technical Institute, Nelson Terrace, Swansea, Chemist and Assayer.

1889. Seymour-Jones, A., Cambrian Leather Works, Wrexham, Leather Manufacturer.

1892. Shanks, Arch., Bridgend Mills, Dalry, Ayrshire, N.B., Chemist.

1883. Sharp, James, Shirley Manor, Wyke, near Bradford, Yorks, Dyer.

1891. Sharpe, Granville H., 11 & 12, Great Tower Street, London, E.C., Analytical Chemist.

1884. Sharples, Stephen P., 26, Broad Street, Boston, Mass., U.S.A., Analytical Chemist.

1896. Sharpley, Wm. P., Haywood, Poplar Avenue, Edgbaston, Birmingham, Analytical Chemist.

1900. Sharwood, Wm. J., c/o Montana Mining Co., Marysville, Lewis and Clarke Co., Mont., U.S.A., Metallurgical Chemist.

1900. Shattuck, A. F., The Solvay Process Co., Detroit, Mich., U.S.A., Chemist.
1885. Shaw, F. W., Temple House, Heapey, near Chorley, Lancashire, Analytical Chemist.
1883. Shaw, Geo., 35, Temple Row, Birmingham, Patent Agent.
1890. Shaw, H. Dixon, Bond Street, Dewsbury, Yorks, Analytical and Consulting Chemist.
1902. Shaw, Wm. R., Oak Lea, Carlton Road, Godley, near Hyde, Cheshire, Chemist (Tennants and Co.).
O.M. Shearer, A., 36, Demesne Road, Alexandra Park, Manchester, Technical Chemist.
O.M. Shenstone, W. A., F.R.S., Tufleigh, St. Vincent Rocks, Clifton, Bristol, Chemical Lecturer.
1892. Shenton, Jas. P., 29, Claude Road, Chorlton-cum-Hardy, near Manchester, Analytical Chemist.
1902. Shepard, Chas. H., Chemical Laboratory, Union Iron Works, San Francisco, Cal., U.S.A., Chemist.
1889. Shepard, Dr. Chas. U., P.O. Box 284, Charleston, S.C., U.S.A.
1900. Shepherd, E. Sanger, 5–7, Gray's Inn Passage, Holborn, W.C., Scientific Instrument Maker.
1893. Shepherd, H. H. B., Northcote, Mount Pleasant Lane, Upper Clapton, N.E., Chemist.
1898. Shepherd, Reginald des F., c/o Calico Printers' Association, 56, Mosley Street, Manchester, Printworks Chemist.
1895. Sherman, G. W., c/o North Western Rubber Co., Litherland, near Liverpool, General Manager.
1899. Shero, John E., c/o Pittsburg Reduction Co., Niagara Falls, N.Y., U.S.A., Chemist.
1893. Shields, Dr. John, 4. Stanley Gardens, Willesden Green, London, N.W., Chemist.
1899. Shillitoe, Frank, 35, Pontefract Road, Castleford, Yorks, Chemist.
1896. Shimomura, K., c/o Osaka Seimi Works Co., Kawagishicho, Nishiku, Osaka, Japan, Chemist.
1886. Shimosé, Masachika, Shimosé Powder Works, Takinogawa, near Oji, Tokyo, Japan, Chemical Engineer.
1902. Shimotome, Henyi, Higher Technical School, Asakusa, Tokyo, Japan, Professor of Chemistry.
1888. Shishkoff, Sergius A., Mojga, Elabouga, Govt. of Viatka, Russia, Manufacturer Glass Works.
1893. Shishkoff, Waldemar A., Chemical Engineer.
1899. Sholes, Chas. E., c/o General Chemical Co., 25, Broad Street, New York City, U.S.A., Chemical Salesman.
1900. Shonk, Albert, 6, York Road, West Hendon, Analytical Chemist.
1899. Shores, Dr. Jeff. H., Derby Road, Farnworth, Widnes, Chemist.
1897. Shorey, Dr. Edmund C., Office of Board of Health, Honolulu, H.I., Chemist.
1902. Shubridge, Sydney Y., M.I.C.E., Gasworks, Lower Sydenham, S.E., Gas Engineer.
1901. Shukoff, Dr. Alexis A., Borowaja, No. 86, St. Petersburg, Russia, Technical Chemist.
1899. Shuler, Darius P., Sudbury, Ont., Canada, Chemist.
1890. Shutt, Frank T., Central Experimental Farm, Ottawa, Canada, Agricultural Chemist.
1901. Siau, Raymond L., 32, Sussex Villas, Kensington, W., Carbohydrate Research Chemist.
1902. Sibley, Samuel E., 3, Rutland Road, Ilford, Essex, Technical Chemist.
1902. Siebold, Alfred, Eglinton Dyewood Mills, Alloa, N.B., Technical Chemist.
1901. Silberrad, Dr. Oswald, Hill Top, Shooter's Hill, Kent, Research Chemist.
O.M. Sill, T. T., c/o United Alkali Co., Ld., Flint, North Wales, Alkali Works Manager.
1892. Silvester, Harry, 78, Holyhead Road, Handsworth, Birmingham, Analytical and Consulting Chemist.
1901. Sim, Wilfrid A., c/o Wm. Sim and Son, 40, Jane Street, Leith, N.B., Colour Manufacturer.
1899. Simeons, Carl, 70, Finsbury Pavement, London, E.C., Gelatine Manufacturer.
1898. Simon, Dr. A., 55–56, Bishopsgate Street, E.C., Chemical Engineer.
1890. Simonds, Dr. F. M., 159, Front Street, New York City, U.S.A., Mining Engineer and Assayer.
1902. Simonson, Wm., 126, West 9th Street, Cincinnati, Ohio, U.S.A., Chemist.
1897. Simpson, E. S., Geological Survey Laboratory, Museum Street, Perth, West Australia, Assayer.
O.M. Simpson, W. S., Halcyon House, Private Road, Enfield, N., Analytical Chemist.
1900. Sims, W. Edgar, Portinscale Lodge, Higher Crumpsall, Manchester, Technical Chemist.
1894. Sinclair, Dr. W., 60, Stirling Road, Trinity, Edinburgh, Chemist.
1890. Sindall, R. W., 80, Manor Road, Brockley, London, S.E., Paper Mills Chemist.
1889. Singer, Ignatius, c/o Whitaker Bros., and Co., Newlay, near Leeds, Manufacturing Chemist.
1899. Singmaster, J. Arthur, c/o New Jersey Zinc Co. of Penna., Palmerton, Pa., U.S.A., Chemist.
1901. Sinnatt, Frank S., Glenside, Church Lane, Moston, Manchester, Demonstrator of Chemistry.
O.M. Sisson, G., jun., c/o Washington Chemical Co., Ltd., Washington Station, R.S.O., Co. Durham, Works Manager.
1885. Skaife, Wilfred T., 630, Sherbrooke Street, Montreal, Canada, Sugar Chemist.
1894. Skelton, John R., c/o Norwich Crape Co., Ltd., St. Augustine's, Norwich, Technical Chemist.
1901. Skertchley, Sydney A. R., Albuhera, Marlborough Road, S. Croydon, Mining Engineer.
1897. Skertchley, W. P., Laboratory, 11, Billiter Square, E.C., Analytical Chemist.
1891. Skilton, C. F. E., Brewery House, Staines, Brewer.
1901. Skinner, Hervey J., c/o Little and Walker, 7, Exchange Place, Boston, Mass., U.S.A., Chemist.
1896. Skurray, Thos., United Breweries, Abingdon, Berks, Brewer.
1897. Skvortzoff, Basil N., (communications), Works of Oushkoff & Co.; (Journals), Igonin̂n̂ovo, Kazan, Russia, Chemical Technologist.
O.M. Slade, H. E., India Rubber Works, Streatham Common, London, S.W., Rubber Works Manager.
1887. Slatter, Geo. W., Carlton Terrace, Nab Wood, Shipley, Yorkshire, Analytical Chemist.
1895. Slocum, Dr. Frank L., 401, South Linden Avenue, E.E., Pittsburg, Pa., U.S.A., Chemist.
1899. Slosson, Edwin E., University of Wyoming, Laramie, Wyoming, U.S.A., Professor of Chemistry.
1883. Smail, J. J., Warren Wood, Hayes Common, Beckenham, Kent, Chemical Manufacturer.
1901. Smale, Dr. F. J., c/o Wm. Davies Co., Toronto, Canada, Chemist.
1898. Small, Fritz H., c/o Graton and Knight Manufacturing Co., Worcester, Mass., U.S.A., Chemist.
O.M. Smetham, A., 16, Brunswick Street, Liverpool, Analytical Chemist.
1884. Smiles, Jas., 173, Bruntsfield Place, and (Journals) Blandfield Chemical Works, Lower Broughton Road, Edinburgh, Manufacturing Chemist.
1886. Smith, Alfred, Excelsior Chemical Works, Clayton, Manchester, Manufacturing Chemist.
1898. Smith, Alf. B., Whiteley House, Glossop, Derbyshire, Bleacher and Dyer's Manager.
1897 Smith, Allan, c/o Kellner-Partington Paper Pulp Co., Hallein, bei Salzburg, Austria, Paper Mills Chemist.
1898. Smith, Andrew E., P.O. Box 90, Queenstown, C.C., S. Africa, Chemist.
1896. Smith, Andrew T., 43, Castle Street, Liverpool, Chemical Broker.
1893. Smith, Edgar B., Prince Regent's Wharf, Silvertown, E., Chemist.
1895. Smith, Dr. E. Ellsworth, 26, East 29th Street, New York City, U.S.A., Consulting Physiological Chemist.
O.M. Smith, Edgar F., c/o E. M. Robson, Trelawny, Fairfax Road, Bedford Park, W., Analytical Chemist.
1892. Smith, Ernest A., The Assay Office, Leopold Street, Sheffield, Assayer.
1900. Smith, E. Sell, 219, East Market Street, Warren, Ohio, U.S.A., Manufacturing Chemist.

1898. Smith, E. Shrapnell, 35, Botanic Road, Wavertree, Liverpool, Chemical Engineer.

1891. Smith, Francis P., 20–21, Queenhithe, Upper Thames Street, London, E.C., Chemist.

1902. Smith, Frank Gurney, 7, Luxemburg Gardens, Brook Green, W., Chemical Student.

O.M. Smith, G., Rosehall Terrace, Falkirk, N.B., Explosive Works Manager.

1897. Smith, Sir Geo. J., Messrs. Bickford, Smith, & Co., Ltd., Tuckingmill, Cornwall, Fuse Manufacturer.

1890. Smith, Harry, 74, Holly Avenue, Jesmond, Newcastle-on-Tyne, Technical Chemist.

1890. Smith, Harry E., L.S. & M.S. Railway, Collinwood, Ohio, U.S.A., Analytical Chemist.

1900. Smith, H. Ewing, 22, City Road, London, E.C., Manufacturing Chemist.

1902. Smith, Hy. Geo., Technological Museum, Harris Street, Ultimo, Sydney, N.S.W., Australia, Assistant Curator and Chemist.

1901. Smith, H. Procter, 52, St. John's Street, Coatbridge, N.B., Metallurgical Chemist.

O.M. Smith, H. R., 1, Aubert Park, Highbury, London, N., Analytical Chemist.

1901. Smith, H. Sutcliffe, Edward Ripley and Son, Ltd., Bowling Dyeworks, Bradford, Managing Director.

1890. Smith, H. Wood, c/o John Batt and Co., Ltd., 39, Old Broad Street, London, E.C., Chemist.

1897. Smith, James, 30, Milner Road, Aigburth, Liverpool, Analytical Chemist.

1893. Smith, Jas. F., 15, Second Avenue, Halifax, Yorks, Analytical Chemist.

O.M. Smith, J., Ash Grove House, Radcliffe, Manchester.

1901. Smith, J. Cruickshank, 20, Nassau Street, Mortimer Street, London, W., Technical Chemist.

O.M. Smith, Dr. J. H., Wollishofen, Zürich, Switzerland, Chemical Manufacturer.

1884. Smith, J. Johnstone, Lockwood Brewery, Huddersfield, Brewing Chemist.

1902. Smith, Jno., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia.

1898. Smith, John, Hartley Street Dyeworks, Dewsbury, Yorks, Dyer.

1896. Smith, Joseph Kent, Glascoed, Shavington Avenue, Hoole, Chester, Metallurgical Chemist.

1888. Smith, J. Tertius, Richmond House, Plaistow, Essex, Technical Chemist.

O.M. Smith, Jno. W., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Analytical Chemist.

1890. Smith, J. Wm., Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.

1898. Smith, R. F. Wood, Laboratory, 89, Bartholomew Close, E.C., Consulting Chemist.

1890. Smith, R. Greig, Linnean Society's House, Elizabeth Bay, Sydney, N.S.W., Analytical Chemist.

1890. Smith, R. Watson, 45, Millbrae Road, Langside, Glasgow, Chemical Works Manager.

1900. Smith, T. Connell, Blandfield Chemical Works, Edinburgh, Manufacturing Chemist.

1897. Smith, Theophilus R., c/o Brotherton & Co., Haigh Park Chemical Works, Stourton, near Leeds, Chemist.

1896. Smith, Walter E., 158, Doyle Avenue, Providence, R.I., U.S.A., Instructor in Chemistry.

1903. Smith, Dr. Warren R., Lewis Institute, Chicago, Ill., U.S.A., Teacher.

O.M. Smith, Watson, 34, Upper Park Road, Haverstock Hill, N.W., Editor of Society's Journal.

O.M. Smith, Wilfred, 182, West Street, Glasgow, Chemical Manufacturer.

1896. Smith, Dr. W. Stanley, Bryntirion, Bersham, near Wrexham, North Wales, Brewer.

O.M. Smithells, Prof. A., F.R.S., Yorkshire College, Leeds, Professor of Chemistry.

1902. Smither, F. W., 20, Cole Building, Nashville, Tenn., U.S.A., Analytical Chemist.

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1902. Smoot, Albert M., 1263, Waverly Place, Elizabeth N.J., U.S.A., Analytical Chemist.

1902. Smyth, Dr. Morland, c/o Mander Bros., John Street, Wolverhampton, Chemist.

1902. Smythe, Jno. A., Durham College of Science, Newcastle-on-Tyne, Demonstrator in Chemistry.

1902. Smythe, Dr. J. S., c/o W. Meadowcroft and Son, Ltd., Regent Street, Blackburn, Analytical Chemist.

1888. Snape, Dr. H. Lloyd, Balholm, Lathom Road, Southport, Director of Education for Lancashire.

1896. Snowdon, Jno., jun., Messrs. Snowdon, Sons, & Co., Millwall, E., Chemical and Oil Manufacturer.

1900. Snyder, Geo. D., 31, Bradford Street, Brooklyn, N.Y., U.S.A., Chemist.

1902. Snyder, Prof. Harry, 2090, Commonwealth Avenue, St. Anthony Park, Minn., U.S.A., Professor of Agricultural Chemistry.

1900. Sodeau, Wm. H., 114, Park Road, Newcastle-on-Tyne, Chemist.

1894. Sohn, Chas. E., 2, Harpur Street, Bedford Row, London, W.C., Analyst.

1895. Solvay, Armand, 25, Rue Prince Albert, Brussels, Gérant de la Société Solvay et Cie.

1884. Solvay, Ernest, 43, Rue des Champs Elysées, Brussels, Alkali Manufacturer.

1903. Somermeier, Edw. E., 1590, Neil Avenue, Columbus, Ohio, U.S.A., Chemist.

1897. Somerset, H. St. John, jun., Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia, Assayer.

1884. Sommer, Adolf, corner 1st and Binney Streets, East Cambridge, Boston, Mass., U.S.A., Pharmaceutical Chemist.

1894. Sonstadt, Edw., Church Fields, Cheshunt, Herts, Chemical Technologist.

1896. Sorel, Ernest, 119, Rue Notre Dame-des-Champs, Paris, VI., Engineer.

1896. Souther, H., 440, Capitol Avenue, Hartford, Conn., U.S.A., Chemical and Metallurgical Engineer.

1892. Southern, Thos., Jr., Wheathill Chemical Works, St. Simon Street, Salford, Manufacturing Chemist.

1883. Soward, A. W., 28, Therapia Road, Honor Oak, S.E., Principal Clerk (Legacy Duty Office).

1890. Sowerby, Thos. H., Canal Soap Works, Verney Road, Rotherhithe New Road, S.E., Soap Manufacturer.

O.M. Sowerby, W. M., c/o United Alkali Co., Ltd., Allhusen Works, Gateshead-on-Tyne, Lancashire, Alkali Works Manager.

1887. Spackman, Chas., Rosehaugh, Clitheroe, Lancashire, Portland Cement Manufacturer.

1900. Sparks, John C., c/o The De la Vergne Refrigerating Machine Co., foot of East 138th Street, New York City, U.S.A., Chemist.

1901. Sparrow, J. Marcellus, c/o Imperial Varnish and Colour Co., Ltd., 6–22, Morse Street, Toronto, Canada, Varnish and Colour Manufacturer.

1883. Spence, D., Alum Works, Manchester, Alum Manufacturer.

O.M. Spence, F., Alum Works, Manchester, Alum Manufacturer.

1900. Spence, Howard, (Journals) Audley, Broad Road, Sale, Cheshire, and c/o Peter Spence and Sons, Ltd., Alum Works, Manchester, Chemical Manufacturer.

1901. Spence, Jno. Davidson, 415, Ashton New Road, Clayton, Manchester, Chemist.

1894. Spence, J. Napier, 69, Frithville Gardens, Shepherd's Bush, W., Teacher of Chemistry.

1883. Spence, Jno. W., Tiviot Colour Works, Manchester Road, Stockport, Drysalter.

1900. Spencer, Harold R.S., Spring Side, Sharples, Bolton, Lancs., Paper Maker.

1884. Spencer, Jno., Globe Tube Works, Wednesbury, Tube Manufacturer.

O.M. Spencer, J. W., Newbiggin House, Kenton, Newcastle-on-Tyne, Steel Manufacturer.

1901. Spencer, Robt., jun., c/o E. Ripley and Son, Ltd. Bowling Dyeworks, Bradford.

1902. Sperry, Elmer A., 855, Case Avenue, Cleveland, Ohio, U.S.A., Electrical Engineer.

1897. Sperry, Erwin S., P.O. Box 656, Bridgeport, Conn., U.S.A., Metallurgist.

1884. Spiegel, Dr. Adolf, Messel, bei Darmstadt, Germany, Analytical Chemist.

1899. Spieler, Aug. J., c/o The Will and Baumer Co., Syracuse, N.Y., U.S.A., Stearic Acid Works Superintendent.

1889. Spies, Adolph, 102, Fenchurch Street, London, E.C., Chemical Merchant.

1889. Spies, Hermann, 102, Fenchurch Street, London, E.C., Chemical Merchant.

1885. Spiller, A., Edison-Swan Electric Co., South Benwell Works, Newcastle-on-Tyne, Electrician.

O.M. Spiller, J., 2, St. Mary's Road, Canonbury, London, N., Consulting Chemist.

1896. Spoor, J. L., Madras Cement Works, Madras, India; and (Journals), Rede Court, Rochester, Kent, Portland Cement Manufacturer.

O.M. Sprengel, Hermann Johann Philipp, Ph.D. (Heidelb.), F.R.S., Royal Prussian Professor (titular); Journals to Prof. Sprengel, F.R.S., Savile Club, 107, Piccadilly, London, W., Chemist.

1900. Spurge, Edw. C., Société Française de l'Industrie Chimique, 7, Quai de Seine, Courbevoie, near Paris, Chemist.

1901. Spurlin, Oscar L., Drawer 13, Columbia, S.C., U.S.A., Chemist.

O.M. Squire, P. W., 413, Oxford Street, London, W., Pharmaceutical Chemist.

O.M. Squire, Dr. W. S., Clarendon House, St. John's Wood Park, N.W., Chemical Engineer.

1901. Staempfli, Major W., Worblaufen, Bern, Switzerland, Director (Swiss Smokeless Powder Factory).

1896. Stafford, Chas. H., (Journals) c/o The Birkacre Printing Co., and Hollyfield, Weldbank, Chorley, Colourist.

O.M. Stahl, Dr. K. F., 57th Street and A. V. Ry., Pittsburg, Pa., U.S.A., Chemical Works Manager.

1884. Stanning, John, Broadfield, Leyland, near Preston, Bleacher.

1902. Stansfield, Edgar, Whalley, near Blackburn, Lancashire, Lecturer in Chemistry.

1888. Stantial, Frank G., c/o Cochrane Chemical Co., Everett, Mass., U.S.A., Technical Chemist.

1885. Staples, H. J., The Old Hall, Spondon, Derby, Colour Manufacturer.

O.M. Stark, J. F., 9 Allfarthing Lane, Wandsworth, S.W., Works Superintendent.

1896. Statham, Noel, Compañia General de Productos Quirmicos del Aboño, Gijón, Spain, Engineer.

1895. Stead, J. Christopher, 42, Grove Green Road, Leytonstone, N.E., Chemist and Manager.

O.M. Stead, J. E., 11, Queen's Terrace, Middlesbrough-on-Tees, Analytical Chemist.

1898. Stearns, Theron C., 41, Montgomery Street, Jersey City, N.J., U.S.A., Consulting Chemist.

O.M. Stebbins, Dr. J. H., 80, Madison Avenue, New York City, U.S.A., Analytical Chemist.

O.M. Steedman, R. H., Golftyn, Carrick Road, Ayr, N.B., Chemical Manufacturer.

1896. Steel, Fred. W., c/o Cuming, Smith, and Co., Yarraville, Melbourne, Vic., Analytical Chemist.

1900. Steel, Jno. S., Adelaide Chemical Works, New Thebarton, Adelaide, South Australia, Chemist.

1884. Steel, R. Elliott, 38, East Park Parade, Northampton, Headmaster.

O.M. Steel, Thos., Colonial Sugar Refinery, O'Connell Street, Sydney, N.S.W., Australia, Sugar Chemist.

1897. Stein, Sigmund, 214, Upper Parliament Street, Liverpool, Sugar Refinery Manager.

1897. Steinhart, Dr. Oscar J., 4, Palace Street Mansions, Buckingham Gate, S.W., Manufacturing Chemist.

1901. Steinmetz, Chas. P., Research Laboratory, General Electric Co., Schenectady, N.Y., U.S.A., Electrician.

1887. Stenhouse, T., Townhead, Rochdale, Analytical Chemist.

1892. Stephens, M. E., 4, Carlton Gardens, London, S.W., and (Journals) 57–60, Aldersgate Street, London, E.C., Ink Manufacturer.

1884. Stephens, H. Chas., M.P., 4, Carlton Gardens, London, S.W., Ink Manufacturer.

1889. Stern, Arthur L., Southbank, Stapenhill Road, Barton-on-Trent, Brewing Chemist.

O.M. Steuart, D. R., Osborne Cottage, Broxburn, West Lothian, N.B., Oilworks Chemist.

1899. Stevenot, G. A., c/o Schoellkopf, Hartford, and Hanna Co., 100, William Street, New York City, U.S.A., Chemist.

1898. Stevens, Arthur F., 61, Balfour Road, Highbury New Park, N., Paper Examiner.

1902. Stevens, Hy. P., The Firs, Ash, Surrey, Demonstrator in Chemistry.

1894. Stevens, Jno. H., 295, Ferry Street, Newark, N.J., U.S.A., Manufacturing Chemist.

1902. Stevens, M. White, Bedford Villa, Plymouth, Chemist.

1884. Stevens, Wm., The Native Guano Co., Ltd., 29, New Bridge Street, Blackfriars, E.C., Secretary.

1899. Stevenson, Arnold, 4, Porchester Gardens, London, W., Chemist.

1901. Stevenson, M. R., Morrison and Cass Paper Co., and (Journals) Ward House, Tyrone, Blair Co., Pa., U.S.A., Chemist.

O.M. Stevenson, Dr. T., Guy's Hospital, London, S.E., Chemical Lecturer.

O.M. Stevenson, W., Standard Works, 95A, Southwark Street, London, S.E., Chemical Manufacturer.

1901. Stewart, David B. D., Aberdeen Comb Works, Hutcheon Street, Aberdeen, Managing Director.

1890. Stewart, Robt., 66, Henry Road, West Bridgford, Nottingham, Chemical Works Manager.

1896. Stewart, R. Patrick, 59, Wellwood Terrace, Kerr Street, Kirkintilloch, N.B., Analytical Chemist.

O.M. Stewart, S., c/o Michael Nairn and Co., Ltd., Linoleum Works, Kirkcaldy, N.B., Technical Chemist.

1899. Stewart, Saml., 16, Great George Street, Westminster, S.W., and (Journals) Parkhurst Park Road, Wallington, Surrey, Managing Director (Explosives Co.).

1901. Stifel, Walter H., 1319, Locust Street, Allegheny, Pa., U.S.A., Tanner.

1903. Stillwell, Albert G., 55, Fulton Street, New York City, U.S.A., Chemist.

1886. Stirk, Jos., Ferncliffe, Elm Bank, Nottingham, Brewer's Engineer.

1893. Stock, F. W. Keating, Dinsdale Rectory, Darlington, Analytical and Consulting Chemist.

1900. Stockdale, Edgar, Printworks, Birstall, Yorks, Colour Mixer.

1888. Stockdale, Wm., Irwell Printworks, Stacksteads, near Manchester, Calico Printer.

1887. Stocks, H. B., Lynwood, Neston, Cheshire, Analytical Chemist.

1901. Stoddart, Chas. W., 246, Equitable Building, Denver, Col., U.S.A., Chemist and Metallurgist.

1903. Stoddard, Jesse D., c/o Operating Board, American Radiator Co., Lake and Dearborn Streets, Chicago, Ill., U.S.A.

1885. Stoddart, F. Wallis, Western Counties Laboratory, Bristol, Analytical Chemist.

1899. Stoddart, Reginald F., 102, Smedley Road, Cheetham, Manchester, Chemist.

O.M. Stoer, J., 6, Hanover Quay, Dublin.

O.M. Stoker, G. N., 9, Lessar Avenue, Clapham Common, S.W., Analytical Chemist.

1899. Stokes, Alf. W., Laboratory, Vestry Hall, Paddington Green, W., Public Analyst.

1898. Stokes, Dr. Henry N., U.S. Geological Survey, Washington, D.C., U.S.A., Chemist.

1892. Stone, Frank, Laboratory, 193, Collins Street, Melbourne, Victoria, Analytical Chemist and Assayer.

1900. Stone, Geo. C., c/o New Jersey Zinc Co., 11, Broadway, New York City, U.S.A., Engineer.

1899. Stone, I. F., 100, William Street, New York City, U.S.A., Chemical Merchant.

1888. Stone, Thos. W., Chemical Works, St. George, Bristol, Chemical Manufacturer.

1902. Storar, John, (Journals) Coniston Lodge, Hornsea; and (communications) c/o Messrs. Reckitt and Sons, Hull, Chemical Engineer.

O.M. Storey, I. H., Haverbreaks, Lancaster, Chemical Manufacturer.

1902. Storr, Bertram V., 1, Oakfield Road, Ilford, Essex, Chemist.

1888. Stowe, W. T., Inland Revenue, Wellington, Salop, Analytical Chemist.

1883. Strangman, J. Pim, 38, Rue Desbordes-Valmore, Passy, Paris, Bleacher.

1903. Strickler, Emerson H., Johns Hopkins Club, 516, Park Avenue, Baltimore, Md., U.S.A., Chemist.

1887. Strong, Colin R., 13, St. Ann Street, Manchester, Oil Merchant.

O.M. Stuart, C. E., 29, Mosley Street, Newcastle-on-Tyne, Chemical Apparatus Dealer.

1896. Stuart, Harry T. R., Know Mill House, Entwistle, near Bolton, Printworks Sub-Manager.

O.M. Stuart, T. W., 7, Livingston Drive, Sefton Park, Liverpool, Alkali Works Manager.

1901. Stuart, Dr. W. Theophilus, 197, Spadina Avenue, Toronto, Canada, Physician and Professor of Chemistry.

1896. Stubbs, Augustus J., 50, Calle de Ferraz, Madrid, Spain.

O.M. Studer, Dr. A., Postgebäude, Olten, Switzerland, Consulting Chemist.

1890. Studer, Simon J., Helvetia, Stockton Heath, near Warrington, Technical Chemist.

1898. Styles, R. Curling, Knockhall, Greenhithe, Kent, Analytical Chemist.

1900. Suart, Arthur B., St. Paul's Works, Paul Street, Finsbury, E.C., Manager of Melting Department.

1896. Suckert, Dr. J. J., 253, Broadway, New York City, U.S.A., Manufacturing Chemist.

1895. Sudborough, Dr. J. J., University College of Wales, Aberystwith, Lecturer in Chemistry.

1889. Sulman, H. L., 44, London Wall, London, E.C., Chemist and Metallurgist.

1895. Summers, Bertrand S., c/o McCormick Harvesting Machine Co., 7, Monroe Street, Chicago, Ill., U.S.A., Electro-Chemist.

1902. Summerskill, Dr. Wm., 92, Harrow Road, Leytonstone, N.E., Ethyl Chloride Manufacturer.

1890. Sumner, Harold, Worthington, near Wigan, Dyer and Bleacher.

1896. Sunderland, A., 84, Hainworth Wood Road, Ingrow, Keighley, Teacher of Chemistry.

1899. Sundström, Carl, c/o Solvay Process Co., Detroit, Mich., U.S.A., Chemist.

1895. Sundström, Karl J., Trenton, Wayne Co., Mich., U.S.A., Manufacturing Chemist.

1884. Sutherland, D. A., 28, Victoria Street, Westminster, S.W., Consulting Technical Chemist and Assayer.

1894. Sutherland, Geo., Croft Cottage, Bonhill, N.B., Chemist.

1887. Sutherland, Jas., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Chemist.

O.M. Sutherland, R. M., Lime Wharf Chemical Works, Falkirk; and Solsgirth, Dollar, N.B., Chemical Manufacturer.

1899. Sutherst, Dr. Walter F., 2, Vermont Villas, Napier Road, Wembley, Middlesex, Science Master.

1901. Sutro, H. H., 126, Liberty Street, New York City, U.S.A., Chemist.

O.M. Sutton, Francis, Norfolk County Laboratory, Redwell Street, Norwich, Analytical Chemist.

1886. Sutton, F. Napier, 6, Grosvenor Gardens, Willesden Green, N.W., Alkali Works Inspector.

1900. Sutton, W. Lincolne, Hillcroft, Eaton, Norwich, Public Analyst.

O.M. Swan, J. Cameron, 4, Nicholas Buildings, Newcastle-on-Tyne, Manufacturing Chemist.

O.M. Swan, Dr. Jos. W., F.R.S., 58, Holland Park, London, W., Chemist and Electrician.

1898. Swanson, Jas. F., (Journals) c/o Sres Gildermeister and Co., Iquique, Chile; (subs.) c/o Mr. R. Glover, 13, Belville Street, Greenock, N.B., Technical Chemist.

1884. Swinburne, Geo., (Journals), 99, Queen Street, Melbourne, Australia; (subs.) c/o C. R. Lee and Co., 5, Laurence Pountney Hill, E.C., Gas Engineer.

1901. Swinton, Ralph S., c/o W. J. Bush, Incorporated, Linden, N.J., U.S.A., Analytical Chemist.

1902. Sylow, Paul L. P. G., Korsör, Alexandra Street, Drummoyne, Sydney, N.S.W., Australia, Analytical Chemist.

O.M. Syme, W. B., Elm Cottage, Addiewell, West Calder, N.B., Oil Works Chemist.

1900. Symes, Dr. W. H., Government Health Officer.

T

1895. Taber, G. H., 1840, South Broad Street, Philadelphia, Pa., U.S.A., Dept. Superintendent (Atlantic Refining Co.).

1896. Takagi, T., c/o Sumitomo, Kobé, Japan, Chemical Engineer.

O.M. Takamatsu, T., Tokyo University, Japan, Analytical Chemist.

O.M. Takamine, Dr. J., 1611, Amsterdam Avenue, New York City, U.S.A., Engineer.

1890. Takayama, Jintaro, Nando Machi, 26, Ushigome, Tokio, Japan, Director (Imperial Industrial Experiment Station).

1901. Talati, K. E., Minocheher Leather Works, Dharavi, Bombay, India, Leather Dresser.

1903. Talbott, Dr. B. E., Chaneyville, Md., U.S.A., Manufacturing Chemist.

1902. Talley, Thos. Washington, c/o Tuskegee Institute, Tuskegee, Ala., U.S.A., Chemist.

1898. Tanaka, Keishin, Matsuba Hotel, Kudansaka, Uye, Tokio, Japan, Chemist.

1900. Tankard, Arnold R., 67, Surrey Street, Sheffield, Analytical Chemist.

O.M. Tate, F. H., 9, Hackins Hey, Liverpool, Analytical and Technical Chemist.

1902. Tate, Francis G. H., Inglewood, Beckwith Road, Dulwich, S.E., Assistant Analyst (H.M. Customs).

O.M. Tatlock, J., 45, Renfrew Street, Glasgow, Laboratory Furnisher.

O.M. Tatlock, R. R., Novara, Stirling, N.B., Consulting Chemist.

1902. Tatters, Hugh Lee, 17, Waterloo Road, Runcorn, Cheshire, Analytical Chemist.

1892. Tatton, Reginald A., Mersey and Irwell Joint Commission, 44, Mosley Street, Manchester, Civil Engineer.

O.M. Taubman, R., 12, Eton Road, Haverstock Hill, N.W., Analytical Chemist.

1901. Taussig, Emil, 26, East 59th Street, New York City, U.S.A., President (West Disinfecting Co.).

1898. Taverner, W., Ashland, Oregon, U.S.A., Brewers' Chemist.

1901. Tayler, Jno. Bernard, 2, Alma Terrace, Wavertree, Liverpool, Works Chemist.

1902. Taylor, Arthur P., 460, Jarvis Street, Toronto, Ont., Canada, Manufacturer.

1898. Taylor, B. Franklin, Gainesville Cotton Oil Co., Gainesville, Ga., U.S.A., Manufacturing Chemist.

1902, Taylor, Edward R., Penn Yan, N.Y., U.S.A., Manufacturing Chemist.

1902. Taylor, Francis O., c/o Parke, Davis, and Co., Detroit, Mich., U.S.A., Analytical Chemist.

1886. Taylor, G. Crosland, Ravenscar, Helsby, near Warrington, Electrical Engineer.

1894. Taylor, G. Midgley, 27, Great George Street, Westminster, S.W., Analytical Chemist.

1893. Taylor, G. W., Dinting Vale Printworks, Dinting, near Manchester, Printworks Chemist.

O.M. Taylor, H. E., 702, Alexandra Parade, Dennistoun Glasgow, Lead Works Manager.

1883. Taylor, Jas., Department of Mines, Sydney, N.S.W., Australia, Government Metallurgist.

1888. Taylor, Jas. Davis, 9, Mincing Lane, London, E.C., Chemical Merchant.

1898. Taylor, Jas. M., 59, Kenmare Road, Sefton Park, Liverpool, Analytical Chemist.

1901. Taylor, John, Crawford Municipal Technical School, Cork, Ireland, Science Master.

1901. Taylor, Jno., 3, Rossett Road, Great Crosby, near Liverpool, Works Chemist.

1888. Taylor, J. Scott, c/o Winsor and Newton, Ltd., 38, Rathbone Place, London, W., Technical Chemist.

1896. Taylor, Martin, "The Clough," Buckhurst Hill, Essex, Chemical Works Manager.

1901. Taylor, M. J., 77, Front Street, E., Toronto, Canada, Soap Manufacturer.

1898. Taylor, Newman, Alexandra and E. D. Sassoon Mills, Chinchpoogley, Bombay, India, Resident Engineer.

1901. Taylor, Sidney H., 2, Warwick Road, Weston, Bath, Works Chemist.

1902. Taylor, Thos., 12, Ancaster Drive, Great Western Road, Glasgow, Chemical Manufacturer.

1902. Taylor, Tom., jun., c/o Durant, Taylor and Co., 68, Major Street, Manchester, Chemical Merchant.

1898. Taylor, Walter, 20, Canning Street, Bury, Lancs., Technical Chemist.

1885. Taylor, W. J., 55, Forsyth Street, Greenock, N.B., Technical Chemist.

1887. Teanby, G. W. A., Elvin Lodge, East Dereham, Norfolk, Analytical Chemist.

1899. Teas, Wm. Holmes, Ridegway, Pa., U.S.A., Chemist.

O.M. Teed, Dr. F. L., Chem. Laby., 9, Mincing Lane, London, E.C., Analytical Chemist.

O.M. Tennant, Sir Chas., Bart., 40, Grosvenor Square, W.; Glen, Peeblesshire, N.B., and Journals to St. Rollox, Glasgow, Alkali Manufacturer.

1884. Tennant, Jas., Alex. Fergusson and Co., Ltd., 38, McAlpine Street, Glasgow, Lead and Colour Manufacturer.

1896. Tennille, Geo. F., c/o Southern Cotton Oil Co., Savannah, Ga., U.S.A., Chemist.

1888. Terry, Albert, Verulam, Mount Albert Road, Balwyn, near Melbourne, Victoria, Brewer.

1884. Terry, Hubert L., 3, Herbert Street, Moss Side, Manchester, Technical Chemist.

O.M. Tervet, R., 54, Penshurst Road, South Hackney, E., Oil Works Manager.

1902. Test, Wm. H., 716, Brown Street, Lafayette, Ind., U.S.A., Assistant Professor of Chemistry.

1893. Tetley, C. F., Messrs. Jos. Tetley and Son, The Brewery, Leeds, Brewer.

1897. Tetlow, Wm. E., Ash Cottage, Ashfield, Dunblane, N.B., Chemist.

1903. Thatcher, Ed. J., Firfield House, Knowle, near Bristol, Merchant and Manufacturer.

1886. Thew, Walter H., Talbot House, Arundel Street, Strand, W.C., Director.

1901. Thiry, Jos., Inchcape, Southill Road, Chislehurst, Kent, Manager (Coke Oven Co.).

O.M. Thomas, Chas., J.P., D.L., Pitch and Pay, Stoke Bishop, near Bristol, Soap Manufacturer; Deputy Chairman, Midland Railway.

1894. Thomas, H. Russell, Broad Plain Soap Works, Bristol, Soap Manufacturer.

1902. Thomas, Jas. E., Box 192, Germiston, Transvaal, South Africa, Cyanide Manager.

O.M. Thomas, J. W., Overdale, Shortlands, Kent, Analytical Chemist.

1902. Thomas, Nehemiah M., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia.

1901. Thomas, Octavius, Gas and Water Offices, Pentre, Glamorganshire, Gas and Water Engineer.

1888. Thomas, S. Percy, 2, Landrock Road, Hornsey, N., Technical Chemist.

1898. Thomas, Wm. Harrison, jun., Passaic Print Works, Passaic, N.J., U.S.A., Printworks Chemist.

1885. Thompson, Prof. Claude M., 38, Park Place, Cardiff, Professor of Chemistry.

1898. Thompson, Edw. C., 40, Glenluce Road, Westcombe Park, S.E., Manufacturing Chemist.

1893. Thompson, G. Rudd, 69, Dock Street, Newport, Mon., Analytical and Consulting Chemist.

1895. Thompson, Gustave W., c/o National Lead Co., 40, Adams Street, Brooklyn, N.Y., U.S.A., Chemist.

1903. Thompson, Jno. T., Corporation Sewage Works, Knostrop, Leeds, Analyst.

1885. Thompson, W., Sankey Hill, Earlestown, Lancashire, Sugar Refiner.

1884. Thompson, W. G., Tonge Springs Works, Middleton, near Manchester, Colour Manufacturer.

O.M. Thompson, W. P., Patent Office, 6, Lord Street, Liverpool, Patent Agent.

1896. Thomsen, Alonzo L., Maryland Club, 1, East Eager Street, Baltimore, Md., U.S.A., Manufacturing Chemist.

1902. Thomson, Allen B., c/o Spencer, Chapman, and Messel, Ltd., Silvertown, E., Chemical Engineer.

1884. Thomson, G. Carruthers, 53, Bedford Road, Rock Ferry, Birkenhead, Engineer.

1891. Thomson, Jas. M., Royal Gunpowder Factory, Waltham Abbey, Essex, Manager (Cordite Branch).

1901. Thomson, J. M., New Hermand Oil Co., Ltd., Breich Works, West Calder, N.B., Manager.

1894. Thomson, John, c/o Manufacture d'Impressions de Malaunay, Seine Inférieure, France, Printworks Manager.

1884. Thomson, Robt. T., 156, Bath Street, Glasgow, Analytical Chemist.

1899. Thomson, Thos., (Journals) Waterproofing Co., Barrhead; and Westlea, Barrhead, near Glasgow, Manufacturer.

O.M. Thomson, W., Royal Institution Laboratory, Manchester, Analytical and Consulting Chemist.

1890. Thomson, Wm. Thos., Royal Gunpowder Factory, Waltham Abbey, Essex, Explosives Chemist.

1902. Thorburn, Jas., Holmwood, Rectory Road, Stanford-le-Hope, Essex, Analytical Chemist.

1900. Thorman, J. Stanley, West Ham Gasworks, Stratford, E., Chemist.

O.M. Thorne, Dr. L. T., 2, Denbigh Gardens, Richmond-on-Thames; and (Journals) Southampton Wharf, Battersea, S.W., Technical Chemist.

O.M. Thorneycroft, Wallace, East Plean House, Bannockburn, N.B., Technical Chemist.

1891. Thornton, Chris., 16, Hillside Avenue, Providence, R.I., U.S.A., Printworks Manager.

1891. Thornton, David H., Brookfoot Dyeworks, Brighouse, Yorks, Dyer.

1887. Thornton, H., Redbourn, Ashford, Middlesex, Analytical Chemist.

1899. Thornton, Wm., (Journals) c/o Isaac Brandon & Bros., Panama, Central America; and (subsn.) c/o Thos. Thornton, Hermand, West Calder, N.B., Chemist.

1895. Thorp, Frank H., Mass. Inst. of Technology, Boston, Mass., U.S.A., Instructor in Industrial Chemistry.

O.M. Thorpe, Dr. T. E., C.B., F.R.S., Government Laboratory, Clement's Inn Passage, Strand, W.C.; and (Journals) 61, Ladbroke Grove, Notting Hill, W., Chief Chemist (Customs and Inland Revenue).

1902. Thurlow, Nathaniel, Ampère Electro-Chemical Co., Niagara Falls, N.Y., U.S.A., Chemist.

1898. Thurnauer, Dr. Gustav, c/o Aurora Metal Co., Aurora, Ill., U.S.A., Chemist.

1901. Tilden, Philip S., c/o Franklin H. Kalbfleisch Co., 35, Burling Slip, New York City, U.S.A., Manufacturing Chemist.

O.M. Tilden, Prof. W. A., F.R.S., The Oaks, Murray Road, Northwood, Middlesex, Professor of Chemistry.

1900. Tilley, Jas. W., Melrose, Raleigh Gardens, Brixton Hill, London, S.W., Research Chemist.

1901. Timmans, W. G., 108, Peel Street, Derby, Chemical Works Manager.

1886. Timmins, A., Argyll Lodge, Higher Runcorn, Civil Engineer.

O.M. Timmis, T. Sutton, Widnes, Chemical Manufacturer.

1894. Tipler, Fred. C., 48, Brooklyn Street, Crewe, Analytical Chemist.

1890. Tobey, C. H., Collingwood, Ontario, Canada, Tannery Chemist.

1894. Toch, Maximilian, c/o Toch Bros., 468–472, West Broadway, New York City, U.S.A., Chemist.

1893. Tocher, Jas. F., 1, Chapel Street, Peterhead, N.B., Pharmaceutical Chemist.

1886. Todd, A. M., 204, North Rose Street, Kalamazoo, Mich., U.S.A., Manufacturing Chemist.

1899. Tompkins, Vreeland, 533, Communipaw Avenue, Jersey City, N.J., U.S.A., Analytical Chemist.

O.M. Toms, F. Woodland, States Analyst's Office, St. Heliers, Jersey, Analytical Chemist.

1902. Tone, Frank Jerome, c/o The Carborundum Co., Niagara Falls, N.Y., U.S.A., Manager.

1899. Tone, Jay E., 1427, Woodland Avenue, Des Moines, Iowa, U.S.A.

1896. Tonkin, John, 2603, East Broad Street, Richmond, Va., U.S.A., Manufacturing Chemist.

1902. Torrey, Charles A., jun., 17, Park Vale, Brookline, Mass., U.S.A., Chemist.

1889. Tothill, M. A. L., Castle and Buitengracht Streets, Cape Town, S. Africa, Manufacturing Chemist.

O.M. Towers, J. W., Brantwood, Allerton, near Liverpool, Analytical Chemist.

1903. Townsend, C. Eyre-Coote, 113, Jerningham Road, New Cross, S.E., Commission Agent.

1893. Townsend, Chas. F., 1, Morgan Road, Bromley, Kent, Chemist.

1892. Townsend, Chas. W., 19, Crawford Street, Port Dundas, Glasgow, Chemical Manufacturer.

1892. Townsend, Oliver C., 1, Horton Crescent, Rugby, Chemical Manufacturer.

1897. Towse, Walter, c/o Messrs. E. and J. Richardson, Elswick Leather Works, Newcastle-on-Tyne, Technical Chemist.

1899. Trantom, Dr. Wm., 10, Field Road, New Brighton, Cheshire, Chemist.

1894. Traphagen, Dr. Frank W., Montana Agricultural Experimental Station, Bozeman, Mont., U.S.A., Chief Chemist.

1900. Traquair, Jno., Glenfield Starch Works, Paisley, N.B., Analytical Chemist.

1893. Travers, Morris W., University College, London, W.C., Chemist.

1889. Trechmann, A. O., Holborough Cottage, Snodland, Kent, Cement Works Chemist.

1885. Trechmann, Dr. C. O., Warren Cement Works, Hartlepool, Cement Manufacturer.

1895. Treharne, F. Gwilym, Wrangbrook, Llanishen, near Cardiff, Analytical Chemist.

1885. Trewby, Herbert, 62, St. John Street, London, E.C., Analytical Chemist.

1883. Tribe, P. C. M., 46, Breakspear's Road, St. John's, S.E., Secretary.

1901. Trigger, Oliver, Chem. Dept., Royal Arsenal, Woolwich, S.E., Analytical Chemist.

1898. Tripp, Dr. E. Howard, (Journals) Municipal Technical College; and 46, Terrace Road, Swansea, Science Master.

O.M. Trobridge, A., c/o Trobridge and Co., Ltd., South Shore Road, Gateshead-on-Tyne, Technical Chemist.

1897. Trotman, Saml. R., King's Walk Chambers, Parliament Street, Nottingham, City Analyst.

1900. True, Percival E., Bowker Chemical Co., Elizabeth, N.J., U.S.A., Chemical Engineer.

1887. Tsukiyama, S., Nippon Seito Kaisha, Osaka, Japan, Paper Mills Chemist.

1894. Tucker, Alex. E., 35, Paradise Street, Birmingham, Metallurgist and Chemist.

1897. Tucker, Samuel A., Columbia University, New York City, U.S.A., Tutor in Industrial Chemistry.

1886. Tuer, Arthur H., Thornhill, near Wigan, Analytical Chemist.

1903. Tufts, C. G., 30, Chenango Street, Binghampton, N.Y., U.S.A., Chemical Engineer.

1888. Tulloch, John, Rossie House, Hebburn-on-Tyne, Analytical Chemist.

1901. Tulloch, Wm. F., 7, West George Street, Glasgow, Merchant.

1899. Turnbull, Dr. Andrew, Leather Industries Department, Yorkshire College; and (Journals) 32, St. Michael's Road, Headingley, Leeds, Assistant.

1888. Turnbull, G. W., The Haws, Carnforth, Lancashire, Metallurgical Chemist.

1884. Turnbull, W. S., 37, West George Street, Glasgow, Chemical Manufacturer.

1902. Turner, Basil, 14, Castlereagh Street, Sydney, N.S.W., Australia, Metallurgist.

1889. Turner, H. B. H., 68, Upper Berkeley Street, Portman Square, W., Sugar Refiner.

1902. Turner, Jos., c/o Read, Holliday, and Sons, Ltd., Huddersfield, Chemist.

1897. Turney, Fred. N., 76, Rue Wilson, Brussels, Belgium, Leather Dresser.

1887. Turney, Sir J., Springfield, Alexandra Park, Nottingham, Tanner.

1891. Turri, Geo. G., Salisbury Building, cor. of Queen and Bourke Streets, Melbourne, Vic., Australia, Patent Agent.

1890. Tweedy, Jas., 306A, Burdett Road, Limehouse, E., Metallurgical Chemist.

1891. Twitchell, E., Wyoming, Ohio, U.S.A., Candle Works Manager.

1897. Twynam, H., c/o Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia, Mining Engineer.

O.M. Twynam, T., Hawthorne House, Slaid Hill, Moortown, Leeds, Metallurgist.

O.M. Typke, P. G. W., Lawn House, New Malden, Surrey, Chemical Manufacturer.

1893. Tyrer, Chas. T., Stirling Chemical Works, Stratford, E., Manufacturing Chemist.

O.M. Tyrer, T., Stirling Chemical Works, Stratford, E., Chemical Manufacturer.

1899. Tysoe, Jos., South Metropolitan Gas Co., East Greenwich, S.E., M. Inst. C.E., Gas Engineer.

U

1894. Uhlig, E. C., 48, Barclay Street, New York City, U.S.A., Glass Works Chemist.

1900. Uhlig, W. C., c/o Hygeia Distilled Water Co., 349, West 12th Street, New York City, U.S.A., Chemist.

1900. Ulmer, Geo. F., c/o Arbuckle Bros., Sugar Refinery, Foot of Pearl Street, Brooklyn, N.Y., U.S.A., Chemist.

O.M. Umney, C., 50, Southwark Street, London, S.E., Manufacturing Chemist.

1889. Underhill, Thos. J., 73, Pepy's Road, New Cross, S.E., Inspector of Stores.

1885. Underwood, G. R., Box 460, Peabody, Mass., U.S.A., Glue Works Chemist.

1898. Unglaub, Oscar, c/o Thom, Domeier, and Co., Ltd., Pendleton, Manchester, Soap Manufacturer.

1883. Usmar, J. H., 22, Billiter Street, London, E.C., Chemical Merchant.

V

1896. Van der Linde, Harold, 47, Front Street West, and (Journals) 101, Tyndall Avenue, Toronto, Canada, Chemist (India-rubber and Gutta-percha Manufacturing Co.).

1895. Vanderpoel, Dr. Frank, 153, Center Street, Orange, N.J., U.S.A., Chemist.

1902. Van der Sleen, Nicolaas, Gedempte Oude Gracht, 47, Haarlem, Holland, Consulting Chemist and Bacteriologist.

1897. Van Gelder, Arthur P., c/o American Forcite Powder Manufacturing Co., Landing, N.J., U.S.A., Chemist.

1891. Van Gundy, Chas. P., Laboratory, B. & O. R. R., Baltimore, Md., U.S.A., Metallurgical Chemist.

1896. Van Ingen, Dudley A., New Jersey Zinc Co., Newark N.J., U.S.A., Chemist.

1896. Van Laer, Norbert, Truman's Brewery, Burton-on-Trent, Brewer and Chemist.

1897. Van Marken, J. C., 150, Queen Victoria Street, E.C., Chemical Engineer.

1899. Van Slooten, Wm., 52, Sidney Place, Brooklyn, N.Y., U.S.A., Mining Engineer and Metallurgist.

1902. Vanwinckel, W. H., c/o Lyman Bros. and Co., Ltd., 71, Front Street East, Toronto, Canada, Chemist.

1902. Van Zwaluwenburg, Jas. G., Box 69, Argentine, Kansas, U.S.A., Analytical Chemist.

1888. Vargas-Vergara, J. M., Apartado No. 237, Bogota, Republic of Colombia, S. America, Metallurgical Chemist.

O.M. Vasey, T. E., 6, South Parade, Leeds; (Journals) P.O. Box 1149, Montreal, Canada, Chemical Engineer.

894. Veitch, Geo., Chemical Works, Crieff, N.B., Manufacturing Chemist.

898. Verity, Ben, Magog, Prov. Quebec, Canada, Printworks Chemist.

897. Verity, Victor, 83, Lexington Street, East Boston, Mass., U.S.A., Chemical Works Foreman.

O.M. Vickers, Wm., c/o Thos. Vickers and Sons, Miles Platting, Manchester, Chemical Manufacturer.

895. Vigelius, Carl, 175, Pearl Street, New York City, U.S.A., Shellac Bleacher.

896. Vincent, Jos. A., Rooms 207–8, 421, Chestnut Street, Philadelphia, Pa., U.S.A., Mechanical Engineer.

897. Vlies, Leonard E., Fernroyd, Wellington Road, Whalley Range, Manchester.

O.M. Voelcker, E. W., 22, Tudor Street, London, E.C., Agricultural Chemist.

887. Voelcker, Dr. J. A., 20, Upper Phillimore Gardens, Kensington, W., Agricultural Chemist.

901. Vogel, G. C., 583, Cass Street, Milwaukee, Wis., U.S.A., Tanner.

897. Vogel, Julius L., 91, Blackfriars Road, S.E., Engineer.

1899. Vogeler, Gustav, 17, Philpot Lane, London, E.C., Merchant.

1900. Volney, Dr. Carl W., Keyport, N.J., U.S.A., Chemist (Smokeless Powder Co.).

1897. Voorhees, Louis A., P.O. Box 357, New Brunswick, N.J., U.S.A., Agricultural Chemist.

1899. Voorhees, Samuel S., c/o Supt. Architect, Treasury, Washington, D.C., U.S.A., Chemist.

1902. Vorisek, Dr. Anton, College of Pharmacy, 115—119, West 68th Street, New York City, U.S.A., Instructor.

1888. Vörster, Fritz, Cöln-Marienburg, Germany, Manufacturing Chemist.

1885. Voss, Hermann, 19, Beckenham Road, Beckenham, Kent, Manure Works Manager.

1899. Voss, Walter A., Melrose, Whitworth Road, South Norwood, S.E., Manufacturing Chemist.

1899. Vreeland, Cornelius D., Upper Montclair, N.J., U.S.A., Manufacturing Chemist.

W

1885. Waché, Alf., 9, Place St. François Xavier, Paris, France, Caustic Potash Manufacturer.

1896. Wachtel, Gregory, 6, Manejny Pereulok, St. Petersburg, Russia, Chemical Engineer.

1895. Waddington, Thos. W., 74, Blackburn Road, Padiham, Lancashire, River Inspector.

1902. Wade, Frank, 10, Shirley Road, Southsea, Assistant Admiralty Chemist.

1890. Wade, Jas. L., 28, West Kensington Gardens, London, W., Chemical Manufacturer.

1889. Wadman, W. E., 102, Lord Avenue, Bayonne, N.J., U.S.A., Manufacturing Chemist.

1897. Wagner, Dr Theodore B., 1444, Wilson Avenue, Chicago, Ill., U.S.A., Chemist.

1893. Wagner, W. G., Glyndhurst, Ealing Common, W., Manufacturing Chemist.

1884. Wainwright, Dr. J. H., 159, Front Street, New York City, U.S.A., Analytical Chemist.

1895. Wainwright, Wm., c/o Spooner and Bailey, Chemical Manure Works, Eling, near Southampton, Chemist.

1901. Waite, C. Nelson, c/o General Artificial Silk Co., 32, South Broad Street, Philadelphia, Pa., U.S.A., Chemist.

1899. Wakefield, Wm. C., c/o Savile Town Chemical Co., Ltd., Savile Town, Dewsbury, Chemist.

1894. Waldman, Louis J., P. O. Box 162, Albany, N.Y., U.S.A., Aniline Dye Manufacturer.

1895. Waldstein, Dr. Martin E., 107, Murray Street, New York City, U.S.A., Manufacturing Chemist.

1887. Walker, Archibald, 8, Crown Terrace, Glasgow, Distiller.

1900. Walker, David C., Gibbonsville, Idaho, U.S.A., Analytical Chemist.

1886. Walker, E. Robinson, 18, St. Ann's Street, Manchester, Patent Agent.

1897. Walker, H. V., 38, Clinton Street, Brooklyn, N.Y., U.S.A., Chemist.

1894. Walker, Dr. Jas., University College, Dundee, Professor of Chemistry.

1902. Walker, Jas., Knowle House, Mirfield, Yorks, Woollen Manufacturer.

1897. Walker, Jas. W., Fernlea, Irvine, N.B., Chemical Manufacturer.

1902. Walker, Jno. H., Gourepore Works, Naihati, E.B.S.R., Bengal, India, Chemist.

1884. Walker, S. R., 19, Wolsey Street, Radcliffe, Manchester, Foreman Dyer.

1895. Walker, W. Sloane, c/o Walker, Ltd., Litherland, near Liverpool, Tanner.

1900. Walker, Dr. Wm. H., 19, Exchange Place, Boston, Mass., U.S.A., Chemical Expert.

1897. Wallace, Edwin C., P.O. Box 42, Cambridgeport, Mass., U.S.A., Chemist.

1897. Wallace, Robt. A., Dorset Hall, Merton, Surrey, Chemical Manufacturer.

1883. Wallace, Robert, 20, Murrayfield Avenue, Edinburgh, Distiller.

O.M. Waller, Dr. Elwyn, 7, Franklin Place, Morristown, N.J., U.S.A., Professor of Chemistry.

1899. Wallerstein, Dr. Max, 105, East 91st Street, New York City, U.S.A., Chemist.

1900. Walls, Arthur W., North Woburn, Mass., U.S.A., Chemist (Acid Works).

1886. Walsh, F. T., Lowell Dyeworks, Lowell, Mass., U.S.A., Colour Printer.

1901. Walsh, Lionel O. P., c/o Burt, Boulton, and Haywood, Ltd., Prince Regent's Wharf, Silvertown, E., Chemist.

1902. Walton, Thos. M., Colonial Sugar Refining Co., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Analytical Chemist.

1895. Want, W. Philip, 44, Bishopsgate Street Without, London, E.C., Pharmacist and Editor.

1901. Warburton, Frank, Woodhouse Hill, Hunslet, Leeds, Manager.

1896. Warburton, Thos., 48, Hyde Road, Ardwick, Manchester, Chemist.

O.M. Ward, Geo., Messrs. Hirst, Brooke, and Hirst, Millgarth Mills, Leeds, Chemical Works Manager.

1891. Ward, G. J., The Cottage, Hallam Fields, near Nottingham, Civil Engineer.

1884. Ward, Howard Chas., Yeatton, Hordle, Lymington, Hants, Deputy Chairman of Gas Co.

1898. Ward, John, Barnstone Blue Lias Lime Co., Ltd., Barnstone, Notts, Manager.

1899. Ward, Wm. J., c/o Olive and Partington, Broughton Bridge Paper Mills, Manchester, Chemist.

O.M. Wardale, J. D., Redheugh Engine Works, Gateshead-on-Tyne, Engineer.

1892. Warden, Jno. B., 5, Eton Gardens, Glasgow, Analytical Chemist.

1897. Wardle, Sir Thos., 54, St. Edward Street, Leek, Staffordshire, Silk Dyer.

1902. Waring, W. Geo., Webb City, Mo., U.S.A., Metallurgical Chemist.

1885. Warington, Robt., F.R.S., Harpenden, Herts, Agricultural Chemist.

1899. Warnes, Arthur R., 18, Suffolk St., Newland, Hull, Soapworks Chemist.

1890. Warren, Fiske, 220, Devonshire Street, Boston, Mass., U.S.A., Paper Manufacturer.

1902. Warren, H. D., The Gutta Percha and Rubber Manufacturing Co., Ltd., 45—49, West Front Street, Toronto, Canada, President.

1890. Warren, Jno. Davis, 7, Essex Road, Acton, W., Manufacturing Chemist.

1901. Warren, Jno. E., Eagle Chemical Works, Barchester Street, Poplar, E., Tar Distiller.

1885. Warren, T. T. P. Bruce, Tamworth Villa, Earlham Grove, Forest Gate, Essex, Analytical Chemist.

1885. Waterfall, W. B., c/o Avon Manure Co., Bristol; and (Journals) Thirlmere, Clavering Road, Redland, Bristol, Manure Manufacturer.

1890. Waterhouse, Major-General Jas., Oak Lodge, Court Road, Eltham, Kent, Assistant Surveyor-General of India (retired).

1891. Waterhouse, Robt., c/o W. A. Bishop and Co., Ltd., Dial Mills, Warrington, Analytical and Agricultural Chemist.

1902. Watkins, E. J., 38, Tudor Road, Upton Park, E., Works Chemist.

1900. Watkins, Norman, Box 767, Honolulu, Hawaiian Islands, Chemist.

1898. Watkins, Willard H., c/o Schoellkopf, Hartford, and Hanna Co., 163, Oliver Street, Boston, Mass., U.S.A., Colourist.

1894. Watmough, Benj., 1, Ryeburn, Stanley Road, and (Journals) c/o Messrs. Brotherton and Co., Ammonia Works, Calder Vale, Wakefield, Analytical Chemist.

1891. Watson, Alex. Forbes, St. James's Gate Brewery, Laboratory, Watling Street, Dublin, Chemist.

1884. Watson, Chas., Dawsholm Chemical Works, Maryhill, Glasgow, Manufacturing Chemist.

1894. Watson, Chas. Ernest, c/o Peter Spence and Sons, Manchester Alum Works, Manchester, Chemical Assistant.

1890. Watson, Eric E., (Journals) The Queensland Smelting Co., Aldershot, Maryborough, Queensland, Australia; (subs.) c/o S. Watson, Queen Insce. Buildings, Dale Street, Liverpool, Metallurgical Chemist.

1895. Watson, H. Ard, Ashwood, North Hill Road, Headingly, Leeds, Tar Distiller.

1901. Watson, Herbert J., "Robert Land," Stevenston Road, Kilwinning, Ayrshire, Chemist.

1894. Watson, Jas., 60, West Park Terrace, South Shields, Alkali Works Manager.

O.M. Watson, Jno., Box 250, Johannesburg, Transvaal, South Africa, Technical Chemist.

O.M. Watson, Jno. C., Schluesselberg, near St. Petersburgh, Russia, Technical Chemist.

1891. Watson, Jno., 56, Cantwell Road, Woolwich Common, S.E., Analytical Chemist.

O.M. Watt, A., c/o Macfie & Sons, 34, Moorfields, Liverpool, Sugar Works Chemist.

1901. Watt, Francis L., 111, Lauderdale Mansions, Lauderdale Road, Maida Vale, W., Student.

1900. Watts, Chas. J., 40, City Road, London, E.C., Manufacturer.

1893. Watts, Jno. Isaac, Fairleigh, Hartford, Cheshire, Alkali Works Manager.

1900. Webb, Jno. F., 20, Louvaine Road, St. John's Hill, Battersea, S.W., Mining and Electrical Engineer.

1901. Webb, Wm. J., 90, Ash Street, Yonkers, N.Y., U.S.A., Superintendent of Printing Department.

1891. Weber, C. Otto, Heathfield, Middleton Road, Crumpsall, Manchester, Analytical Chemist.

1884. Webster, C. S. Stanford, Malvern House, Redland, Bristol, Professor of Chemistry.

1901. Webster, Geo. J., Standard Chemical Co., Ltd., Gooderham Building, Toronto, Canada, Secretary.

1902. Webster, Jno., Chemical Laboratory, Guy's Hospital, S.E., Analyst.

1897. Wedge, Utley, Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., U.S.A., Chemist.

1901. Wedlake, H. D.,
Technical Chemist.

1902. Weed, Hy. T., 651, Greene Avenue, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.

1893. Weeks, H. B., 2, Infield Park Road, Barrow-in-Furness, Analytical Chemist.

1895. Weems, Dr. J. B., Iowa Agricultural College, Ames, Iowa, U.S.A., Agricultural Chemist.

1898. Weeple, Lawrence, Pinchin's Wharf, Broad Street, Ratcliff, E., Colour Works Chemist.

1897. Weigall, Arthur R., No. 70c, Settlement, Yokohama, Japan, Metallurgical Engineer.

1896. Weightman, Alf. T., 11, Chepstow Road, Croydon, Electro-Chemist.

1902. Weiskopf, Erich, Dynamite Factory, Modderfontein, Transvaal, South Africa, Chemist.

1902. Weiss, Georg A., Chemische Fabrik, Ahlden a/Aller, Hannover, Germany, Chemical Manufacturer.

1898. Weissmüller, Rudolf E. *See* Miller, R. E. W.

1893. Welch, J. Cuthbert, Montreal and Boston Copper Co., Boundary Falls, B.C., Canada, Metallurgist.

1899. Weldon, Leonard E., Lime Villas, Egypt Road, Nottingham, Dyer.

1891. Wells, Jas. Gray, Trent House, Branston, Burton-on-Trent, Brewing Chemist.

1894. Wells, Pierson L., 86, Joralemon Street, Brooklyn, N.Y., U.S.A., Patent Lawyer and Engineer.

1885. Welsh, Jas., Horrocks Lane Dyeworks, Red Bank, Manchester, Printworks Manager.

1890. Welsh, Thos. L., 3, Prince's Gardens, Dowanhill, Glasgow, Analytical Chemist.

O.M. Welsh, W., Holt Town, Manchester.

1897. Wense, Dr. W., Chem. Fabr. Griesheim-Elektron, Griesheim a/Main, Germany, Manager.

1902. Werner, Dr. David T., 114, South 9th Street, Lebanon, Pa., U.S.A., Teacher.

1890. Werner, Emil A., 5, Church Avenue, Rathmines, Dublin, Chemical Demonstrator.

1884. Wessel, Carl, (communications) Geheimer Commerzienrath. C. Wessel, Bernburg; and (Journals) Deutsche Solvay-Werke, Act. Ges., Bernburg, Anhalt, Germany, Alkali Manufacturer.

1889. Wesson, D., P.O. Box 458, Savannah, Ga., U.S.A., Technical Chemist and Cotton-Oil Expert.

1903. West, Leonard, 203, Uttoxeter New Road, Derby, Manufacturing Chemist.

1900. Westenfelder, B. D., c/o American Oak Leather Co., Cincinnati, Ohio, U.S.A., Chemist.

1885. Westmoreland, J. W., 3, Love Lane, Eastcheap, E.C., Metallurgical Chemist.

1898. Weston, David B., Box 503, Sharon, Mass., U.S.A., Chemist.

1894. Weston, Robt. S., 14, Beacon Street, Boston, Mass., U.S.A., Chemist and Bacteriologist.

1885. Weston, Wm., H.M. Dockyard, Portsmouth, Analytical Chemist.

1902. Wethered, Wm. P., Redcourt, Carnatic Road, Mossley Hill, Liverpool, Manager.

1890. Wetter, Jasper, 37–39, Essex Street, Strand, W.C., Patent Agent.

1883. Wetzel, H. A., Box 488, Detroit, Michigan, U.S.A., Manufacturing Chemist.

O.M. Whalley, L. J. de, 172, Erlanger Road, New Cross, S.E., Sugar Chemist.

1898. Wheeler, Edw. J., 79, Chapel Street, Albany, N.Y., U.S.A., Analytical Chemist.

1903. Wheeler, Ernest, 335, Park Road, Oldham, Lancashire, Analytical Chemist (Platt Bros. and Co.).

1902. Wheeler, Frank G., New York Mills, Oneida Co., N.Y., U.S.A., Chemist.

1895. Wheelwright, Dr. E. W., Greenholme, Westfield Road, Acock's Green, near Birmingham.

1898. Whichelo, Matthew A., 9, Eversfield Road, Eastbourne, Aërated Water Manufacturer.

O.M. Whiffen, T., Lombard Road, Battersea, London, S.W., Manufacturing Chemist.

O.M. Whiffen, Thos. J., Harefield, Southfields, S.W., Manufacturing Chemist.

O.M. Whiffen, W. G., Lombard Road, Battersea, London, S.W., Manufacturing Chemist.

1902. Whipple, G. C., Mount Prospect Laboratory, Flatbush Avenue, and Eastern Parkway, Brooklyn, N.Y., U.S.A., Chemist.

1893. Whitaker, Alf., Newlaithes Grange, Horsforth, Leeds, Dyer.

1890. Whitaker, H. L., Harwood Island, Clarence River, New South Wales, Sugar Chemist.

1899. Whitaker, Milton C., c/o Welsbach Light Co., Gloucester City, N.J., U.S.A., Chemist.

1895. Whitaker, Thos., Newlay Hall, near Leeds, Dyer.

O.M. Whitaker, Thorp, (Journals) Bradford Dyers' Association, Ltd.; and 35, Pemberton Drive, Bradford, Yorks, Dyer's Chemist.

O.M. White, A. Dowler, 65, Deodar Road, Putney, London, S.W., Chemical Manufacturer.

1898. White, Alf. H., 1003, East University Avenue, Ann Arbor, Mich., U.S.A., Instructor in Chemical Technology.

1893. White, Arthur F., 30, Cornwall Terrace, Manningham, Bradford, Yorks, Manufacturing Druggist.

1902. White, Geo. Arthur, P.O. Box 70, Vandergrift, Pa., U.S.A., Chemist.

1901. White, H. Graham, 24, Bidston Road, Oxton, Birkenhead, Works Chemist.

1889. White, Henry, 2, Bransby Street, Upperthorpe, Sheffield, Manufacturing Chemist.

1887. White, J. Campbell. *See* Overtoun, Lord.

1898. White, Jno., County Offices, St. Mary's Gate, Derby, Public Analyst to County of Derby.

O.M. White, Paul T., Horton Field House, West Drayton, Chemical Manufacturer.

1894. White, W. Gilchrist, 86, Bay Street, Port Glasgow, N.B., Calico Printer's Chemist.

O.M. White, W. H., The Cottage, Killingworth, Newcastle-on-Tyne, Chemical Manufacturer.

1892. Whitehead, J., 8, West Street, Rochdale, Dyer.

1897. Whitehead, Robt. J. G., 4, Lethington Avenue, Langside, Glasgow, Chemist.

1885. Whiteley, R. Lloyd, 5, Bagnall Street, West Bromwich, Staffordshire, Chemical Lecturer.

1892. Whiteside, Jno. L., 376, St. Helen's Road, Bolton-le Moors, Chemical Lecturer.

1885. Whittaker, C. J., West Bank, Lytham, Lancashire, Chemical Engineer.

1901. Whitton, Jas. T., c/o Nobel's Explosives Co., Ltd., Ardeer, Stevenston, N.B., Chemist.

1884. Whowell, F., Carr Bank, Tottington, Bury, Lancashire, Bleacher.

1899. Wiarda, Jno. C., 259—273, Green Street, Brooklyn, N.Y., U.S.A., Manufacturing Chemist.

1897. Wiborg, F. B., The Ault and Wiborg Co., Cincinnati, Ohio, U.S.A., Manufacturer.

1890. Wickens, B. Foster, 31, Bermondsey Wall, London, S.E., Managing Director (Wickens, Pease & Co., Ltd.).

1903. Wickham, Fred. S., 95, Cazenove Road, Stamford Hill, N., Manufacturer.

1887. Wielandt, Dr. Wm., Phillipstrasse, 7—8, Berlin, N.W., Chemist.

1900. Wiener, Aug. F., c/o Vanadium Alloys (1901), Ltd., 31, Lombard Street, London, E.C., General Manager.

1883. Wiggin, W. W., Wiggin Street, Birmingham Heath, Birmingham, Nickel Refiner.

1897. Wigglesworth, Henry, 25, Broad Street, New York City, U.S.A., Manufacturing Chemist.

O.M. Wightman, C., 1, Fenchurch Avenue, London, E.C., Chemical Merchant.

1839. Wild, Roland C., The Grange, New Eltham, Kent, Analytical Chemist.

1893. Wilder, F. L., Morro Velho, Villa Nova de Lima, Estado de Minas Geraes, Brazil, Assayer.

1902. Wilder, Salmon W., jun., Merrimac Chemical Co. 77, Broad Street, Boston, Mass., U.S.A., Treasurer.

1899. Wildman, Arthur J., 17, Streatfield Avenue, East Ham, E., Chemist.

1902. Wiley, Harvey W., Bureau of Chemistry, Department of Agriculture, Washington, D.C., U.S.A., Chief.

1903. Wilkie, Jno. M., 83, Henry Road, West Bridgford, Nottingham, Analytical Chemist.

1885. Wilkin, Sir Walter, K.C.M.G., Appold Street, Finsbury, E.C., Yeast Manufacturer.

1901. Wilkins, Albert D., Bellevue P.O. Station, Allegheny, Pa., U.S.A., Chemist.

1895. Wilkins, Charles, 40, Church Lane, Hornsey, N., Manufacturing Perfumer.

1899. Wilkins, H. A. J., c/o New Jersey Zinc Co., 71, Broadway, New York City, U.S.A., Mining Engineer.

1900. Wilkins, W. G., (Journals) c/o Derby Chemical Colour Co., 17, Bridge Street; and 59, Uttoxeter Road, Derby, Colour Manufacturer.

1886. Wilkinson, J. B., Tong Street, Dudley Hill, Bradford, Yorks, Chemical Manufacturer.

1898. Wilkinson, Walter S., P.O. Box 835, Baltimore, Md., U.S.A., Asphalt Block Manufacturer.

1884. Will, W. Watson, 1, St. Agnes Place, Kennington Park; and (Journals) 162, Kennington Park Road, S.E., Professor of Organic Chemistry.

1893. Willcox, Benjamin, 47, Lincoln's Inn Fields, London, W.C., Patent Agent.

1898. Willcox, Frank A., 18, Holmlands Park, Sunderland, Explosives Chemist.

1900. Willenz, Dr. Michel, Rue Haringrode, 4, Antwerp, Belgium, Leather Trades Chemist.

1895. Williams, David T., 9, Calvert Terrace, Swansea, Chemist.

1891. Williams, Henry J., 161, Tremont Street, Boston, Mass., U.S.A., Chemical Engineer.

1896. Williams, Jno. Taylor, 2, Queen Street, Wellington, Salop, Brewer.

1902. Williams, Percy, British Uralite Co., Ltd., Higham, near Rochester, Kent, Chemist.

1885. Williams, Rowland, Hale Cote, Haverbreaks, Lancaster, Analytical Chemist.

1900. Williams, Saml. H., Glastonbury, Conn., U.S.A., Soap Manufacturer.

1891. Williams, Seward W., 8, Brighton Avenue, East Orange, N.J., U.S.A., Pharmaceutical Laboratory Manager.

1885. Williams, T. Howell. *See* Idris, T. H. W.

1884. Williams, Prof. W. Carleton, Firth College, and 23, Broomgrove Road, Sheffield, Professor of Chemistry.

1902. Williams, Walter Scott, 21, Hoosac Street, North Adams, Mass., U.S.A., Chemical Engineer.

1887. Williams, W. Collingwood, 68, Grove Street, Liverpool, Analytical Chemist.

O.M. Williams, W. J., Station F., 2215, Bridge Street, Frankford, Philadelphia, Pa., U.S.A., Analytical Chemist.

1899. Williamson, G. N., 14, Dey Street, New York City, U.S.A., Manufacturing Chemist.

1894. Williamson, J. Alex., 14, Milton Avenue, Highgate, N., Analytical Chemist.

O.M. Williamson, Robt., Low Walker, Newcastle-on-Tyne, Technical Chemist.

1895. Willson, Thos. L., St. Catherine's, Ont., Canada, Electrical Engineer.

1891. Wilson, A. Poole, 16, Nora Terrace, Glasnevin, Dublin, Ireland, Analytical Chemist.

1890. Wilson, Alf., c/o Messrs. J. and E. Sturge, 18, Wheeley's Lane, Birmingham, Manufacturing Chemist.

1884. Wilson, Anthony W., 20, Westcott Street, Hull, Colour Works Manager.

1888. Wilson, Cecil H., 31, Minna Road, Burngreave Road, Sheffield, Metallurgical Chemist.

O.M. Wilson, C. J., 14, Old Queen Street, Westminster, S.W.

1888. Wilson, David, jun., Carbeth, Killearn, by Glasgow.

1885. Wilson, Frank, 7, Bedford Square, London, W.C., Brewer.

1903. Wilson, Geo. C., Mysore Gold Mines, Marikuppam, Mysore State, India, Chemist.

O.M. Wilson, G. E., The Chemical Works, Oldbury, near Birmingham, Chemical Manufacturer.

1902. Wilson, Geo. W., 18, Dinting Vale, Dinting, near Manchester, Works Chemist.

1899. Wilson, Gordon, Apartado 121, Mexico, D.F., Chemist and Assayer.

1886. Wilson, Jno., Tyneside, Hagley Road, Birmingham, Technical Chemist.

1896. Wilson, Jno., The Vines, Oxford Road, Runcorn, Chemical Engineer.

1902. Wilson, Jno. B., Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia, Mining Engineer.

O.M. Wilson, J. H., 6, Fenchurch Buildings, E.C., Chemical Manufacturer.

1902. Wilson, Leonard P., Stocksfield, Church Road North, Hanwell, W., Technical Chemist.

O.M. Wilson, R. H., Eaglescliffe, R.S.O., Co. Durham, Chemical Manufacturer.

1885. Wilson, Dr. W. H., Presidency College, Madras, India, Lecturer on Physics.

1900. Wilson, Walter A., Ardeer, Stevenston, Ayrshire, N.B.

1890. Wilson, W. W., The Grange, Carbrook, near Stalybridge, Analytical Chemist.

1884. Wilton, Thos., Winsor House, Beckton, E., Tar Works Manager.

1901. Wing, Herbert H., Monticello, N.Y., U.S.A., Chemical Engineer.

1892. Wing, J. D., 22, William St., New York City, U.S.A., Merchant.

1893. Wingate, Hamilton M., Glenthorpe, Cotham Grove, Bristol, Technical Chemist and Metallurgist.

1892. Wingfield, T. R., 5, Bromwich Street, Bolton, Brewer.

O.M. Wingham, A., Livermead House, Torquay, Metallurgical Chemist.

O.M. Winser, P. J., Moor House, Biddulph Moor, Congleton, Cheshire, Soap Works Manager.

O.M. Winsloe, H., c/o Tennants & Co., Clayton, Manchester, Manufacturing Chemist.

1892. Winstanley, Hy., Mayfield, Sutton Road, Heaton Norris, near Stockport, Technical Chemist.

1886. Winstone, E. H., Members' Mansions, 36, Victoria Street, London, S.W., Ink and Paint Manufacturer.

1892. Wirtz, Dr. Quirin, 28, Great Ormond Street, W.C., Consulting Chemist.

1900. Wishart, Harlan L., c/o Lake Superior Powder Co., Marquette, Mich., U.S.A., Chemist.

1889. Wishart, Jno., 39, St. Vincent Place, Glasgow, General Manager (Oakbank Oil Co., Lim.).

1902. Withers, Prof. W. A., State A. and M. College, West Raleigh, N.C., U.S.A., Professor of Chemistry.

1899. Withinshaw, John G., Penketh, near Warrington, Tanner.

O.M. Witt, Dr. Otto N., Siegmundshof, 21, Berlin, N.W., Professor of Chemistry.

1892. Witthaus, Dr. R. A., Cornell Medical College, First Avenue and 28th Street, New York City, U.S.A., Professor of Chemistry.

1894. Woltereck, Dr. H. C., 3, Edinburgh Mansions, Howick Place, Victoria Street, S.W., Consulting Chemist.

1903. Wolton, Wm. R., c/o Joseph Fison and Co., Ltd., Ipswich, Manager.

1890. Wood, Ebenezer, Stephenson Street, Canning Town, E., Manufacturing Chemist.

1900. Wood, Frank, Hazelhurst, Doncaster Road, Barnsley, Yorks, Assistant Manager (Glass Works).

1901. Wood, Frank S., 25, Suffolk Street, Newland, Hull, Cement Works Chemist.

1887. Wood, Jos. T., 62, Park Road, Nottingham, Tanner.

1886. Wood, Wm. 128, Chaussée de Turnhout, Antwerp, Belgium, Bleacher and Dyer.

O.M. Woodcock, R. C., American and Continental Sanitas Co., 636–642, West 55th Street, New York City, U.S.A., Technical Chemist.

1888. Woodham, Kingston G., 5, Lethbridge Road, Southport; and (Journals) c/o Price's Patent Candle Co., Ltd., 3, Cross Street, Manchester, Oilworks Manager.

1902. Woodhead Chas. E., 40, Westwood Street, Moss Side, Manchester, Chemist.

1884. Woodhead, Jas., Inglewood, Slaithwaite, near Huddersfield, Tar Distiller.

1890. Woodman, Dr. Durand, 127, Pearl Street, New York City, U.S.A., Analytical Chemist.

1900. Woodrow, John, Albyn Cottage, Broxburn, N.B., Chemist.

1902. Woodside, F. Frank, Chesco Chemical Co., Uwchland, Pa., U.S.A., General Manager.

1896. Woodward, Jas., 31, Coventry Road, Ilford, Essex, Government Analyst.

1896. Woolf, Julian, 51, Buckland Crescent, South Hampstead, N.W., Manufacturer.

1889. Woolf, Mortimer, Yeatman and Co., Denmark Street, E.; and (Journals) Mayfield, Mortimer Road, St. John's Wood, N.W., Vinegar Brewer.

.M. Woolley, G. S., Victoria Bridge, Manchester, Pharmaceutical Chemist.

891. Woolworth, J. G., 11, Halsey Street, Providence, R.I., U.S.A., Consulting Chemist.

901. Worden, Edw. C., Celluloid Zapon Co., Milburn, N.J., U.S.A., Analytical Chemist.

888. Worms, Emil, Elabouga, Govt. of Viatka, Russia, Technical Chemist.

.M. Worrall, H., Crimsworth, Whalley Range, Manchester, Dyer.

03. Worstall, Robt. A., c/o Chicago Varnish Co., Chicago, Ill., U.S.A., Chemist.

95. Worth, F. G., The Acetylene Illuminating Co., 3, Victoria Street, London, S.W., Managing Director.

00. Worthington, Arthur, Starrcliffe Terrace, Great Lever, Bolton, Chemist and Sub-Manager.

94. Wotherspoon, Peter, 135, Bede Burn Road, Jarrow-on-Tyne, Chemist.

96. Wrampelmeier, T. J., 222, Sansome Street, San Francisco, Cal., U.S.A., Chemist.

M. Wray, O. J. P., Haslemere, Coleraine Road, Blackheath, S.E., Chemist (British Alizarin Co., Ltd.).

01. Wren, E. Cecil, Glencoe, Eaglescliffe, R.S.O., Co. Durham, Vinegar Brewer.

95. Wright, Arthur C., c/o Turner, Morrison and Co., 6, Lyons Range, Calcutta, India, Chemist.

01. Wright, Harold E., c/o Sir B. Samuelson and Co., Ltd., Middlesbrough, Chemist.

85. Wright, Jos., 19, Arboretum Street, Nottingham, Lace Dresser.

M. Wright, L. T., The Mountain Copper Co., Keswick, Cal., U.S.A.

04. Wright, Sidney B., c/o Ponsonby and Bolton, 48, Queen Street, Melbourne, Vic., Australia, Chemist.

0. Wright, Walter J., 11, Albion Terrace, Faversham, Kent, Chemist (Cotton Powder Co.).

0. Wülfing, Dr. Charles, Hönningen a/Rhein, Germany, Technical Chemist.

1890. Wyatt, Dr. Francis, 39, South William Street and 29, Stone Street, New York City, U.S.A., Consulting Chemist.

O.M. Wyld, Jno., The Avenue, Lidgett Park, Roundhay, Leeds, Chemical Works Manager.

Y

1900. Yamaoka, S., 10, Nishikatamachi, Hongo, Tokio, Japan, Chief Engineer.

1901. Yardley, Frank, c/o Henry Jutson and Sons, Liverpool Street, Birmingham, Chemical Manufacturer.

1899. Yates, Arthur, Lebong Donok, Bencoolen, Sumatra, Netherlands Indies, Metallurgist.

O.M. Yates, F., 64, Park Street, Southwark, London, S.E., Chemical Manufacturer.

O.M. Yates, R., 64, Park Street, Southwark, London, S.E., Chemical Manufacturer.

1897. Yates, Wm. H., 32, Chester Road, Southport, Lancashire. Technical Chemist.

1898. Yetton, Thos., Fen Villa, Queen's Road, Loughton, Essex, Distiller's Chemist.

1894. Yoeum, Dr. Jno. H., 325, Academy Street, Newark, N.J., U.S.A., Chemist.

1886. Yoshida, Dr. H., Imperial University of Kyoto, Kyoto, Japan, Prof. of Chemistry.

1900. Yoshitake, E., 18, Tatsuokacho, Hongo, Tokyo, Japan, Chemist.

1885. Young, Alfred C., 53A, Algiers Road, Ladywell, S.E.

1901. Young, A. Henry I., Kapannenstrasse, 24, Greifswald, Pomerania, Germany, Student.

1885. Young, Brougham, 2A, Sigdon Road, Dalston, N.E., Analytical Chemist.

1902. Young, Chas. C., 40, Stone Street, New York City, U.S.A., Colourist.

1890. Young, Dr. Geo., Firth College, Sheffield, Chemist.

1896. Young, Henry S., c/o Borneo Co., Ltd., Kuching, Sarawak; and 13, Balham Grove, Balham, S.W., Technical Chemist.

1900. Young, J. Bertram, 1639, North 19th Street, Philadelphia, Pa., U.S.A., Chemist.

1899. Young, Jas. S., Capellitas Copper Co., Pilciao, Prov. de Catamarca, Argentine Republic, Metallurgist.

O.M. Young, Jno., 2, Montague Terrace, Kelvinside, Glasgow, Technical Chemist.

1886. Young, Jno., (Journals,) Claremont House, Beverley Road, Hull; and Gasworks, Sculcoates, Hull, Gas Engineer.

1898. Young, J. W., 4, Portland Terrace, Newcastle-on-Tyne, Inspector under Alkali Acts.

1902. Young, Roland F., c/o Wouldham Cement Co., West Thurrock, near Grays, Essex, Cement Works Chemist.

1883. Young, Prof. Sydney, F.R.S., 6, Windsor Terrace, Clifton, Bristol, Professor of Chemistry.

O.M. Young, W. C., Chemical Laboratory, 19 and 20, Aldgate, London, E.C., Gas Examiner and Consulting Chemist.

1898. Young, W. Gathorne, Analyst's Office, G.N.R., Doncaster, Yorks, Chief Chemist.

1902. Youtz, Dr. Lewis A., Lawrence University, Appleton, Wis., U.S.A., Professor of Chemistry.

Z

1899. Zabriskie, C. B., 100, William Street, New York City, U.S.A., Manager (Pacific Coast Borax Co.).

1897. Zacharias, Dr. P. D., Philhellinon Street, 22, Athens, Greece, Industrial Chemist.

1902. Zahn, Edw., 117, Sherwood Avenue, Syracuse, N.Y., U.S.A., Chemist.

1897. Zahorski, Dr. Boleslas, North American Chemical Co., Bay City, Mich., U.S.A., Technical Chemist.

1898. Zehetmayr, Ferd. F., 85, Gracechurch Street, London, E.C., Merchant.

1899. Zilz, Henry, 22, Bush Lane, London, E.C., Agent (Badische Anilin und Soda Fabrik).

O.M. Zimmermann, A., 3, Lloyd's Avenue, London, E.C., Chemical Agent.

1897. Zinsser, Dr. Fred. G., Hastings upon-Hudson, N.Y., U.S.A., Manufacturing Chemist.

1895. Zoeller, E. V., Tarboro', N.C., U.S.A., Cotton-Seed Oil Refiner and Pharmacist.

1899. Zumbeck, Aug., 66, Mark Lane, London, E.C., Chemical Merchant.

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